

Department of Planning, Lands and Heritage  
Environmental Assessment Report  
Mandogalup Improvement Scheme

9 November 2021

57020-124538 Rev 2

JBS&G Australia Pty Ltd T/A Strategen-JBS&G

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# 1. Introduction

## 1.1 Overview

The Department of Planning, Lands and Heritage (DPLH) is preparing the Mandogalup Improvement Scheme (IS) to guide land use planning and future development of approximately 331 ha located south of Rowley Road, north of Anketell Road and west of the Kwinana Freeway (the Subject Area; Figure 1.1). The Subject Area is located approximately 26 km south of Perth CBD within the City of Kwinana (the City).

In addition to the Subject Area, the City also requested that DPLH consider seven additional lots (19.6 ha; herein referred to as "Sandwich Lots") for potential inclusion in the IS (Figure 1.1).

The Subject Area is zoned predominantly Rural under the City's Local Planning Scheme (LPS) No. 2 (LPS) and Metropolitan Region Scheme (MRS). A variety of land uses currently occur within the Subject Area including:

- Rural residential properties
- Market gardening
- Sand extraction
- Conservation (Bush Forever Site 393)
- Mandogalup Pioneer Reserve
- Mandogalup fire station.

The Sandwich Lots are zoned Rural under the City's LPS No. 2 and MRS. Current land use of the Sandwich Lots includes rural residential, horticulture and commercial vehicle parking.

Land uses surrounding the Subject Area and Sandwich Lots include:

- The Kwinana Freeway, Rural land uses (including market gardening) and residential development to the east
- Anketell Road and The Spectacles wetland to the south
- Bush Forever Sites 268 and 267 and Rural land uses to the west
- City of Kwinana LPS No. 2 Policy Area 11 (Postans East) associated with Alcoa tailings ponds (part of the Alcoa Residue Disposal Area [RDA]) to the west and south-west
- Hope Valley - Wattleup Redevelopment Area to the north-west
- Rural land uses (including market gardening), Urban (residential) land uses, the proposed Rowley Road extension and Frankland Park to the north.

The above land uses have been considered in determining the IS, and where relevant, have been discussed throughout this report.

## 1.2 Purpose and scope of this document

This Environmental Assessment Report (EAR) has been prepared to support the preparation of the IS and includes identification of:

- applicable legislation, policy and guidance
- the environmental, bushfire and heritage characteristics of the Subject Area
- potential impacts to the above characteristics associated with the proposed Scheme

- relevant environmental approvals, including current approvals over the site and anticipated approvals that may be required and;
- the likely spatial and management responses of future development to ensure that any identified potential impacts can be mitigated or managed.

### **1.3 Stakeholder consultation**

The DPLH has developed a stakeholder engagement strategy. The IS will be developed in consultation with State and Local Government agencies, industry groups, environmental groups and the local community.

Key State environmental agencies to be consulted include:

- Environmental Protection Authority (EPA)
- Department of Water and Environmental Regulation
- Department of Biodiversity, Conservation and Attractions.

#### **1.3.1 Environmental Protection Authority**

##### **1.3.1.1 Air Quality**

In June 2016, the Minister for Environment requested the EPA provide advice on the size of a land use planning buffer relating to health and amenity impacts of dust, now and into the future, in respect of potential urban development in the Mandogalup area.

In 2017, the EPA published advice pursuant to section 16(e) of the Environmental Protection Act 1986. The key findings in the EPA's advice include:

- The eastern area of Mandogalup is located sufficiently far away from the RDA, and outside the predominant wind field that generates dust from the RDA, that there is negligible health risk and low likelihood of unreasonable amenity impacts in this area; and
- Air quality in the north and north-east Mandogalup area does not appear to meet recently revised national air quality goals for particulates. This is likely due to a combination of dust from Alcoa's RDA, and sand and limestone quarrying in the area.

It is understood that air quality considerations are being addressed separately to this EAR by another consultant, and therefore Strategen-JBS&G has not provided any assessment or discussion in relation to this air quality buffer.

##### **1.3.1.2 Part IV Environmental Protection Act 1986**

In accordance with Section 122B of the *Planning and Development Act 2005* (PD Act) Improvement Schemes are required to be referred to EPA for assessment against its Environmental Principles, Factors and Objectives (pursuant to Section 48 of the *Environmental Protection Act 1986* [EP Act]). It is therefore anticipated that the IS will be referred to the EPA for their assessment under the provisions of the *Environmental Protection Act 1986*.

Section 5 includes a high-level assessment of the proposed rezoning against the EPA's Environmental Principles, Factors and Objectives.



<b>Legend:</b> MIP 47 boundary (331.2 ha) Cadastral boundary Sandwich lots (19.56 ha) Roads (MRWA)			 0 300 metres	Mandagalup, WA  <b>SITE LOCATION</b>
	Job No: 57020	Scale 1:14,000 at A4		<b>FIGURE: 1.1</b>
	Client: Taylor Burrell Barnett	Coord. Sys. GDA 1994 MGA Zone 50		
	Drawn By: hsullivan    Checked By: CT	Version: A	Date: 16-Dec-2019	

## 2. Legislation, policies and guidelines

Key statutory and policy documents are listed below, and where specifically relevant to the proposed rezoning, are described in detail in the following sections.

### 2.1 Federal legislation

#### 2.1.1 *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Department of the Environment and Energy (DEE). The EPBC Act aims to protect and manage nine Matters of National Environmental Significance (MNES) throughout Australia including:

- World Heritage Properties
- National Heritage Places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth Marine Areas
- Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

A number of EPBC Act referrals and approvals intersect the Subject Area, which are summarised in Table 2.1. It is anticipated that vegetation currently existing within the boundaries of EPBC approval areas will be cleared over time. Within the Subject Area, a large portion of black cockatoo habitat and 'Banksia woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC)' contained within Lots 2 and 10 is planned for removal to facilitate sand extraction and is currently being assessed under the Commonwealth EPBC Act (EPBC 2018/8182), and under Section 38 of the Western Australian EP Act. This is discussed further in Section 4.

**Table 2.1: Existing EPBC Act Approvals within the Subject Area**

EPBC reference	Status	Referral/ Approval area	Expiry date
EPBC 2014/7126	Approved	Lot 9002 on Plan 417428	31 July 2024
EPBC 2018/8182	Under assessment	Lot 2 on Plan 11392 and Part Lot 10 on Plan 69890	N/A
EPBC 2018/8186	Not a controlled action (approved)	Lot 52 on Plan 9780	N/A
EPBC 2018/8264	Not a controlled action (approved)	Part Lots 9006 on Plan 70124, 9002 on Plan 69132, Lot 11 on Plan 79538 and Lot 9000 on Plan 31293	N/A

Remaining areas of the Subject Area contain habitat suitable for Threatened black cockatoo species, as well as potential "Banksia woodlands of the Swan Coastal Plain TEC" and "Tuart woodlands and forests of the Swan Coastal Plain TEC", which are MNES under the EPBC Act. The potential impacts to MNES and associated EPBC Act referral/ approval requirements are discussed in Section 4.4 and Section 4.5 of this report.

## 2.2 State legislation

The environmental assessment has been conducted with reference to the following State legislation which provides for the environmental and heritage values, and bushfire risk addressed within this report:

- *Biodiversity Conservation Act 2016* (BC Act)
- EP Act
- *Biosecurity and Agriculture Management Act 2007* (BAM Act)
- *Rights in Water and Irrigation Act 1914* (RIWI Act)
- *Aboriginal Heritage Act 1972 (WA)* (AH Act)
- *Contaminated sites Act 2003* (CS Act)
- *Planning and Development Act 2005*.

### 2.2.1 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* has now replaced the *Wildlife Conservation Act 1950* (WC Act). On 3 December 2016, several parts of the new Act were enacted by the State Governor. The remaining parts of the Act and the associated Regulations came into effect on 1 January 2019.

In addition to providing for the protection of flora and fauna, the *Biodiversity Conservation Act 2016* includes provisions for threatened ecological communities, threatening processes, critical habitats and environmental pests.

The potential for State listed threatened and priority species and communities to occur within the Subject Area is discussed in Sections 3.6 and 3.7.

### 2.2.2 Environmental Protection Act 1986

The EP Act is administered by the EPA. The EP Act provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing.

Part IV of the EP Act makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes. The EPA uses environmental principles, factors and associated objectives as the basis for assessing whether a proposal or land use planning scheme's impact on the environment is acceptable.

As outlined in Section 1.3.1, the IS will be referred to the EP Act under Section 38 and/ or 81 of the *Planning and Development Act 2005* during the future rezoning process, and may choose to formally assess the proposal under Section 48 of the EP Act, where significant impacts to the EPA factors are possible. An assessment against the EPA factors has been provided in Section 5.

### 2.2.3 State Planning Policies

The Western Australian Planning Commission (WAPC) prepares and adopts state planning policies under statutory procedures set out in part 3 of the *Planning and Development Act 2005*. State planning policies relevant to the IS, Sandwich Lots and/ or this EAR are listed below:

- State Planning Policy 2.1: *Peel-Harvey Coastal Plain Catchment Policy* (SPP 2.1)
- State Planning Policy 2.4: *Basic Raw Materials* (SPP 2.4)

- State Planning Policy 2.5: *Rural Planning* (SPP 2.5)
- State Planning Policy 2.8: *Bushland Policy for the Perth Metropolitan Areas* (SPP 2.8)
- State Planning Policy 2.9: *Water Resources* (SPP 2.9)
- State Planning Policy 3.1: *Residential Design Codes* (SPP 3.1)
- State Planning Policy 3.5: *Historic Heritage Conservation* (SPP 3.5)
- State Planning Policy 3.7: *Planning in Bushfire Prone Areas* (SPP 3.7)
- State Planning Policy 4.1: *State Industrial Buffer Policy* (SPP 4.1)
- State Planning Policy 5.4: *Road and Rail Transport Noise and Freight Considerations in Land Use Planning – Section 5.3 Noise Criteria* (SPP 5.4)
- State Planning Policy 7.0: *Design of the Built Environment and Apartment Design Guide* (SPP 7.0)

Where relevant, the above SPPs have been discussed throughout this EAR.

### **2.3 Environmental Protection Authority (EPA) guidance**

The EAR has given consideration to the recommendations of key EPA policy and guidance as listed below:

- *Environmental Factor Guideline - Social Surroundings*
- *Environmental Factor Guideline - Human Health*
- *Environmental Factor Guideline - Inland Waters*
- *Environmental Factor Guideline - Terrestrial Fauna*
- *Environmental Factor Guideline - Terrestrial Environmental Quality*
- *Environmental Factor Guideline – Landforms*
- *Environmental Factor Guideline - Flora and Vegetation*
- *Environmental Protection Peel Inlet - Harvey Estuary Policy 1992*
- *WA Environmental Offsets Policy 2011 and guidelines*
- *EPA Guidance Statement No. 33 Environmental Guidance for Planning and Development (EPA 2008)*
- *Environmental Protection Bulletin No. 20 Protection of naturally vegetated areas through planning and development.*

Given that air quality is outside of the scope of Strategen-JBS&G, this EAR has not considered the EPA's Environmental Factor Guideline for air quality nor has it considered the *Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999* and *Environmental Protection (Kwinana) (Atmospheric Wastes) Regulations 1992*.

### **2.4 Local government policies, strategies and guidance**

The City has developed numerous policies, strategies and guidelines relevant to planning and the environment, as listed below. Reference to these documents has been made throughout the report where applicable to a specific environmental factor.

- Conservation of Remnant Vegetation
- Cultural Policy and Plan

- Design Guidelines for Medium Density Development
- Development within Special Rural zones
- Planning for Bushfire Protection Guidelines
- Landscape Feature and Tree Retention
- Site Requirements and Standards for Development within the Industrial Zones
- Public Open Space
- Residential Subdivision and Development
- Street trees and verge treatments
- Local Biodiversity Study.

### 3. Overview of existing environment

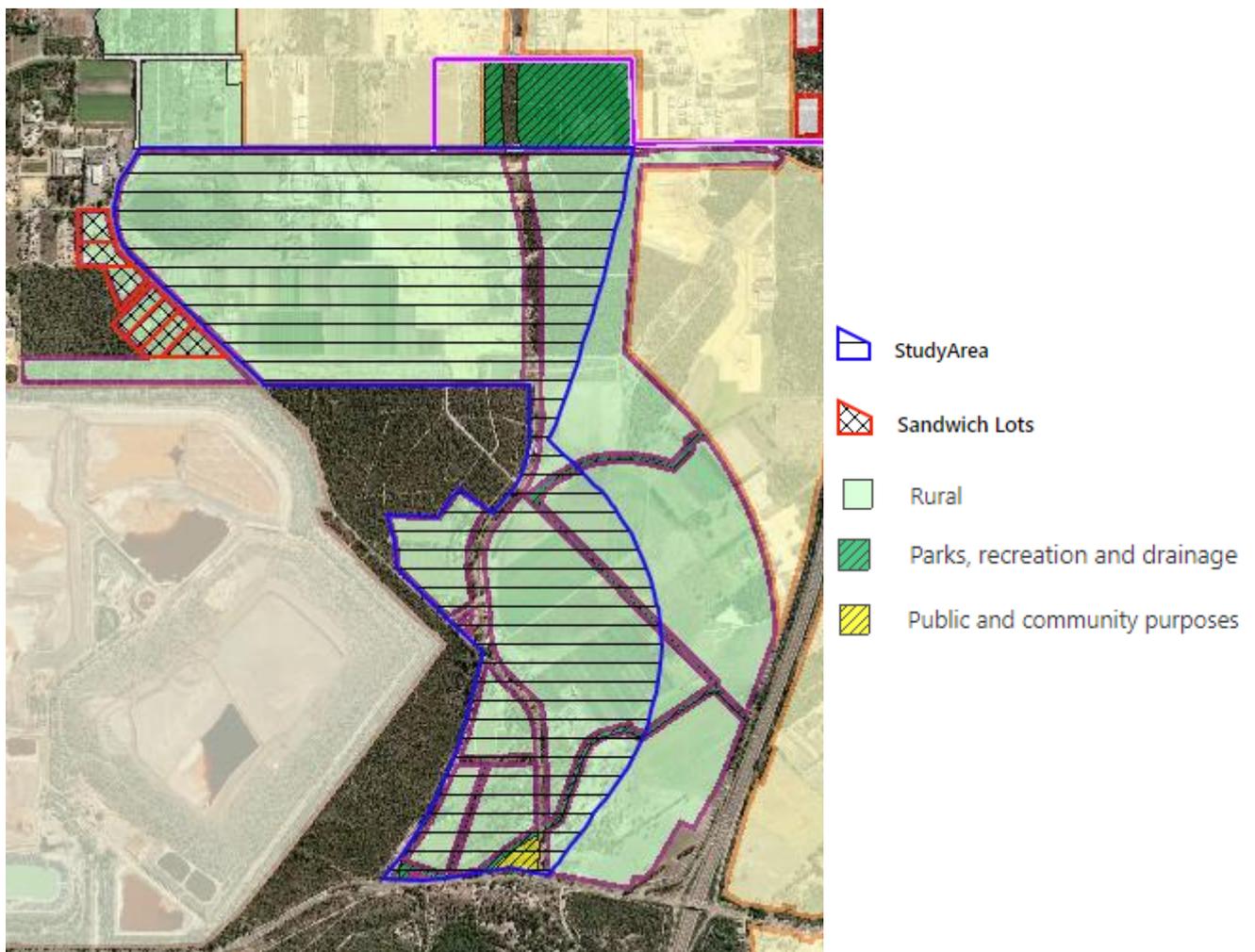
#### 3.1 Land use

##### 3.1.1 Current land use zones

The Subject Area is zoned predominantly Rural under the City’s Local Planning Scheme (LPS) No. 2 (LPS) and Metropolitan Region Scheme (MRS). In addition to Rural uses, the following additional uses are currently permissible under the City’s LPS (Plate 1):

- Public Purposes (Lot 76 Mandogalup Road, north of Anketell Road)
- Park recreation and drainage (Peel Main Drain and Sub Drain).

Under the MRS, Norkett Road (also referred to as Hammond Road extension) is mapped as an ‘Other Regional Road’, extending north through the centre of the Subject Area, however this road extension is not currently constructed. Additionally two planning control areas (PCAs) exist at the northern and southern site boundaries, associated with Rowley Road PCA 112 and Anketell Road PCA 111, respectively.



**Plate 1: City of Kwinana LPS No. 2 land use zoning**

A variety of land uses currently occur within the Subject Area including:

- rural residential properties
- market gardening

- sand extraction
- conservation (Bush Forever Site 393)
- Mandogalup Pioneer Reserve
- Mandogalup fire station.

The Sandwich Lots are zoned Rural under the City's LPS No. 2 and MRS. Current land use of the Sandwich Lots includes rural residential and commercial uses.

### **3.1.2 Previous land use**

Based on a review of historical aerial imagery, the Subject Area and Sandwich Lots have been previously used for general rural/ agricultural uses (market gardening, horse agistment) as well as sand extraction. Land uses within two of the Sandwich Lots appear to include horticultural commercial vehicle uses.

Potential contamination sources associated with historic use of the Subject Area and Sandwich Lots are discussed further in Section 3.10.

### **3.1.3 Surrounding land use**

Land uses surrounding the Subject Area and Sandwich Lots include:

- The Kwinana Freeway, Rural land uses (including market gardening) and residential development to the east
- Anketell Road and The Spectacles wetland to the south
- Bush Forever Sites 268 and 267 and Rural land uses to the west
- City of Kwinana LPS No. 2 Policy Area 11 (Postans East) associated with Alcoa tailings ponds (part of the Alcoa Residue Disposal Area [RDA]) to the west and south-west
- Hope Valley - Wattleup Redevelopment Area to the north-west
- Rural land uses (including market gardening), Urban (residential) land uses, the proposed Rowley Road extension and Frankland Park to the north.

The compatibility of surrounding land uses with future development within the Subject Area, is further discussed in Section 4.1.

## **3.2 Topography**

Topography across the Study Area is generally varied and influenced by current land use. The topographic contours have been taken from LiDAR (2008) and are shown in Figure 3.1.

The northern section of the Study Area shows topography generally sloping east to west from 35 and 40 mAHD to 10 mAHD at the north-western corner of the Study Area. Contours shown in in Figure 3.1 around the sand quarry are likely not representative of current elevations.

For example, the mound suggested in the northern area near Rowley Road appears to represent stock-piling of sand on the land in 2008. No such mound is evident in the recent aerial photograph in Figure 3.1.

In the southern section of the Study Area, there are three topographic mounds at 20 to 23 mAHD which generally slope towards Peel Main Drain (12 to 13 mAHD). The Main Drain is shown as a more incised channel near the southern end of the Study Area and shallower amongst the market garden areas of Mandogalup Swamp (13 mAHD).

Consideration of topography and determination of appropriate levels and grades for development will be undertaken by the project engineer.

### 3.3 Landscape and geology

Regional landscape mapping (DAFWA 2012) identifies the following eight landscape units within the Subject Area and Sandwich Lots (Figure 3.2):

- 211SpW\_SWAMP:Swamp.
- 211Sp\_\_S1b:Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.
- 211Sp\_\_S2a:Lower slopes (1-5%) of dune ridge with moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown subsoils and minor limestone outcrop.
- 211Sp\_\_S4a:Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.
- 211Va\_\_V9:Areas of former swamps which have been artificially drained, with uniform loamy or peaty sands.
- 212Bs\_\_B1:Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak ironorganic hardpan at depths generally greater than 2 m; banksia dominant.
- 212Bs\_\_B2:Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.
- 212Bs\_\_B4:Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.

Regional geological mapping (Gozzard 1983) identifies three geological units within the Subject Area and Sandwich Lots:

- SANDY SILT (Ms<sub>5</sub>)- dark brownish grey silt, with disseminated fine-grained quarts sand, firm, variable clay content, of lacustrine origin.
- SAND (S<sub>7</sub>)- pale yellowish brown, medium to coarse-grained sub-angular quartz, trace of feldspar, moderately sorted, of residual origin.
- SAND (S<sub>8</sub>)- very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted, of aeolian origin.)

The Ms<sub>5</sub> geological unit is limited to wetland areas (described in Section 3.4.4). The S<sub>7</sub> unit occurs predominantly in the western portions of the Subject Area and Sandwich Lots, while S<sub>8</sub> occurs predominantly in the eastern portion.

The compatibility of development with the broadly mapped soil types within the Subject Area and Sandwich Lots is discussed in Section 4.2.

### 3.4 Hydrology

#### 3.4.1 Groundwater

The Subject Area is located within the following groundwater catchment areas and sub-areas:

- Cockburn groundwater catchment area
  - Thompsons sub-area
  - Cockburn confined sub-area
  - Valley sub-area

- Jandakot groundwater catchment area
  - Mandogalup sub -area
  - Jandakot confined sub-area.

The Subject Area is situated upon three groundwater aquifers, which are (in order of proximity to ground level):

- Perth Superficial Swan
- Perth Leederville
- Perth Yarragadee North.

Regional historical maximum groundwater contour mapping (DWER 2004) indicates that the water table is situated at approximately 12 m AHD in the north-western portion of the Subject Area, increasing to approximately 20 m AHD in the north-eastern corner of the Subject Area (see Figure 3.1).

Based on a review of groundwater contour data (DWER 2004), regional topographic contours and expressions of surface water (based on aerial imagery and site walkover), groundwater is above natural surface level in the north-western corner of the Subject Area. Depth to groundwater in the north-eastern portion of the Subject Area is expected to be up to 20 m below ground level, while groundwater in the southern portions of the Subject Area is anticipated to range from “at surface” to over 15 m below ground level.

Depth to groundwater in the location of the Sandwich Lots is expected to range from two metres in the north, up to 20 m in the south (see Figure 3.1).

A number of groundwater bores and associated abstraction licences currently exist across the Subject Area and Sandwich Lots. This is further discussed in Section 4.3.1.

### **3.4.2 Public drinking water source area**

The *Metropolitan Water Supply, Sewerage and Drainage Act 1909* (MWSSD Act) and the *Country Areas Water Supply Act 1947* (CAWS Act) identify and categorise public drinking water source areas (PDWSA) as catchment areas, water reserves, or underground water pollution control areas.

There are no mapped PDWSAs within or adjacent to the Subject Area or Sandwich Lots. The nearest PDWSA is located approximately 1 km east of the Subject Area.

### **3.4.3 Surface water**

The Subject Area is located within the following surface water catchment areas and sub-areas:

- Cockburn/ Kwinana Coastal surface water area
  - Cockburn/ Kwinana Coastal subarea
- Serpentine River Catchment surface water area
  - Lower Serpentine subarea.

The Peel Main Drain and sub-drain occur within the central and southern portions of the Subject Area. The Peel main drain is a rural drain that forms a regional drainage network, running through many wetlands and other low-lying areas (DoW 2009; Figure 3.3).

Water flows from Banjup Swamp to the north-east, through Mandogalup Swamp (North and South) within the Subject Area, to the Spectacles Wetlands south of the Subject Area (Figure 3.3). The Peel main drain contributes approximately 48 per cent of the water entering the Spectacles (the

remainder is from groundwater) and therefore plays an important ecological function to the local wetland network (DoW 2009).

### 3.4.4 Geomorphic wetlands

The nature of the protection and management of Swan Coastal Plain wetlands should be afforded is guided by the appropriate management category they have been assigned. These management categories are listed below:

**Table 3.1: Wetland management categories and management objectives**

Category	Objective
Conservation (C category) Wetlands	To preserve wetland (natural) attributes and functions
Resource Enhancement (R category) wetlands	To restore wetlands through maintenance and enhancement of wetland functions and attributes
Multiple Use (M category) wetlands	To use, develop and manage wetlands in the context of water, town and environmental planning

Mapping of the geomorphic wetlands of the Swan Coastal Plain (DBCA 2019a) identifies four wetlands within the Subject Area (see Figure 3.3). These are listed in Table 3.2.

**Table 3.2: Geomorphic wetlands within the Subject Area**

UFI	Wetland type	Wetland management category
6610 (Wattleup Lake)	Basin/ lake	Resource Enhancement
6531	Basin/ dampland	Multiple Use
6530 (Mandogalup Swamp North)	Basin/ dampland	Multiple Use
6538 (Mandogalup Swamp South)	Basin/ dampland	Multiple Use

Management considerations regarding the presence of a Resource Enhancement Wetland within the Subject Area are further discussed in Section 3.4.3. It should also be noted that this Resource Enhancement Wetland forms part of Bush Forever Site 393.

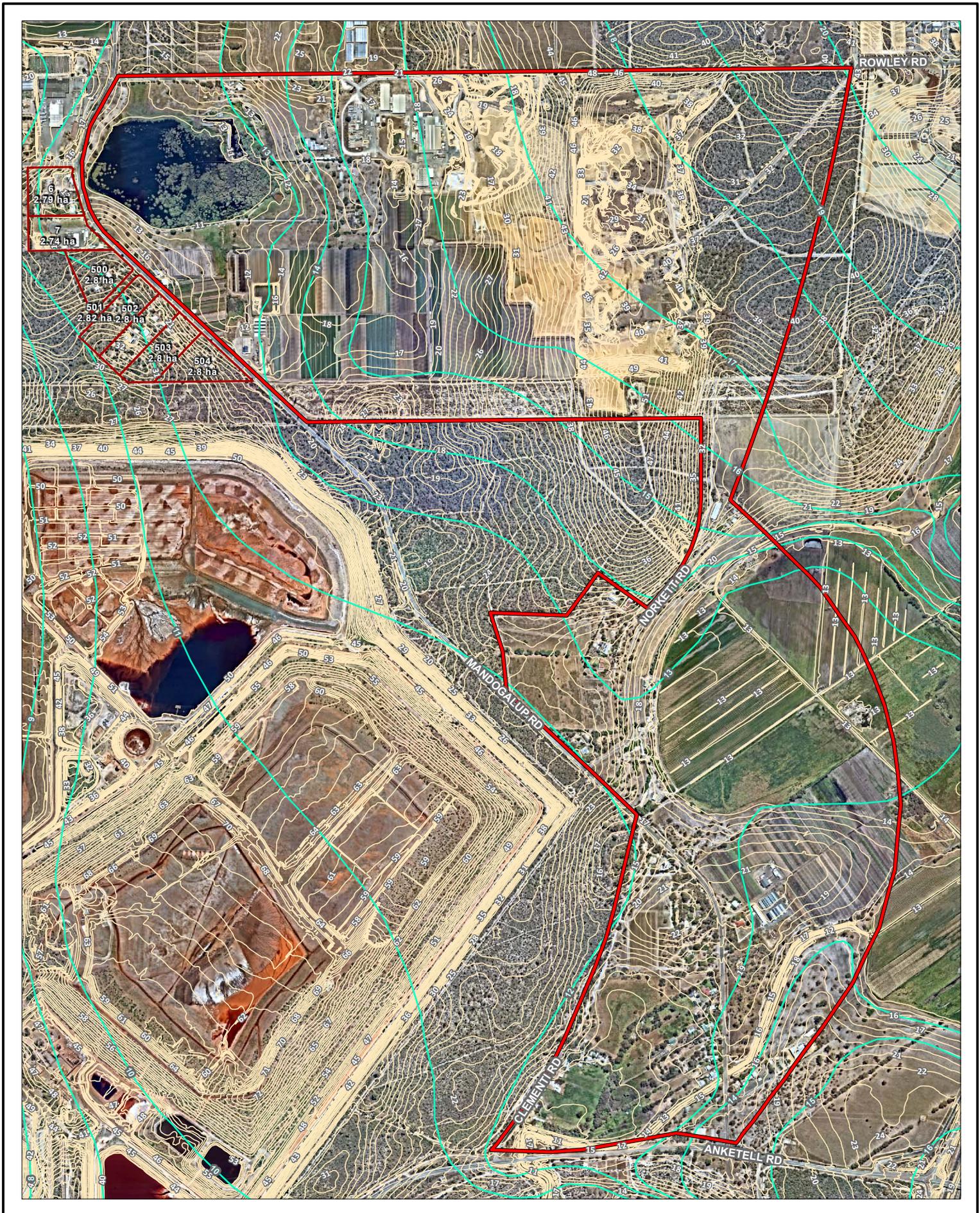
There are no mapped wetlands within the Sandwich Lots.

### 3.5 Acid sulfate soils

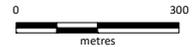
Acid sulfate soils (ASS) are naturally occurring, iron-sulfide rich soils, sediments or organic substrates, formed under waterlogged conditions. If exposed to air, these sulfides can oxidise and release sulfuric acid and heavy metals. This process can occur due to drainage, dewatering or excavation.

The eastern portions of the Subject Area are mapped as having a “moderate to low” risk of ASS occurring within 3 m of the natural surface. Low lying areas in the north-western, central and south western portions of the Subject Area are mapped as having a “high to moderate” risk of ASS occurring within 3 m of the natural surface. A significant portion of the north of the Subject Area, the central west and the Sandwich Lots do not have a known risk of ASS.

ASS risk mapping is present in Figure 3.4, and ASS management requirements are discussed in Section 4.9.



- Legend:**
- MIP 47 boundary (331.2 ha)
  - Sandwich lots (19.56 ha)
  - Topographic contours (1m)
  - Groundwater contours (historic maximum)



Mandogalup, WA

**TOPOGRAPHIC AND GROUNDWATER CONTOURS**

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

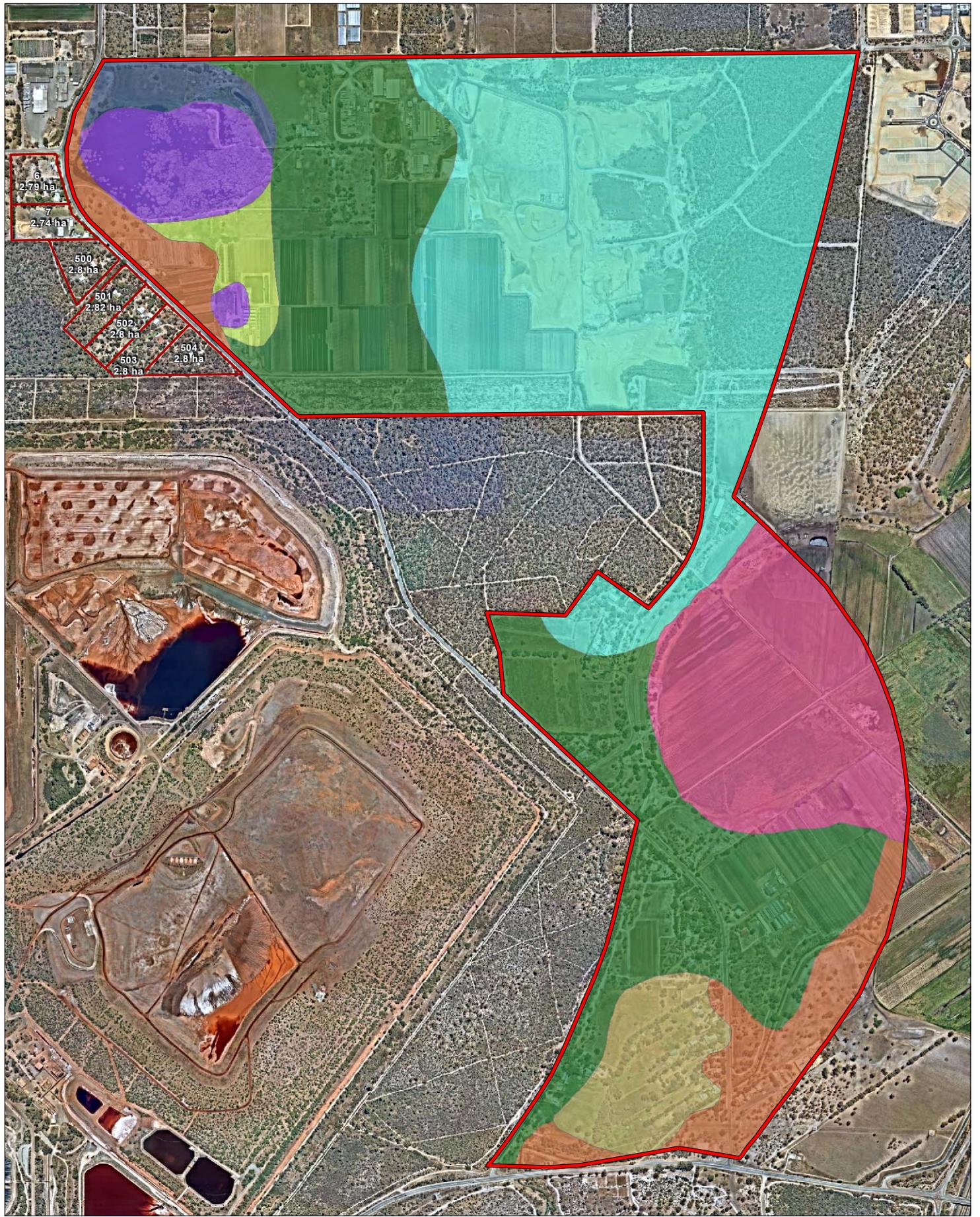
Drawn By: cthatcher

Checked By: CoB

Version: A

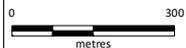
Date: 24-Mar-2020

**FIGURE 3.1**



**Legend:**

- MIP 47 boundary (331.2 ha)
- Sandwich lots (19.56 ha)
- Soil landscape mapping (DPIRD-027)
- 211SpW\_SWAMP-Swamp.
- 211Sp\_S1b:Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.
- 211Sp\_S2a:Lower slopes (1-5%) of dune ridge with moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown subsoils and minor limestone outcrop.
- 211Sp\_S4a:Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.
- 211Va\_V9:Areas of former swamps which have been artificially drained, with uniform loamy or peaty sands.
- 212Bs\_B1:Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.
- 212Bs\_B2:Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.
- 212Bs\_B4:Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.



Mandagalup, WA

**GEOLOGY**

Job No: 57020

Scale 1:14,000 at A4

Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

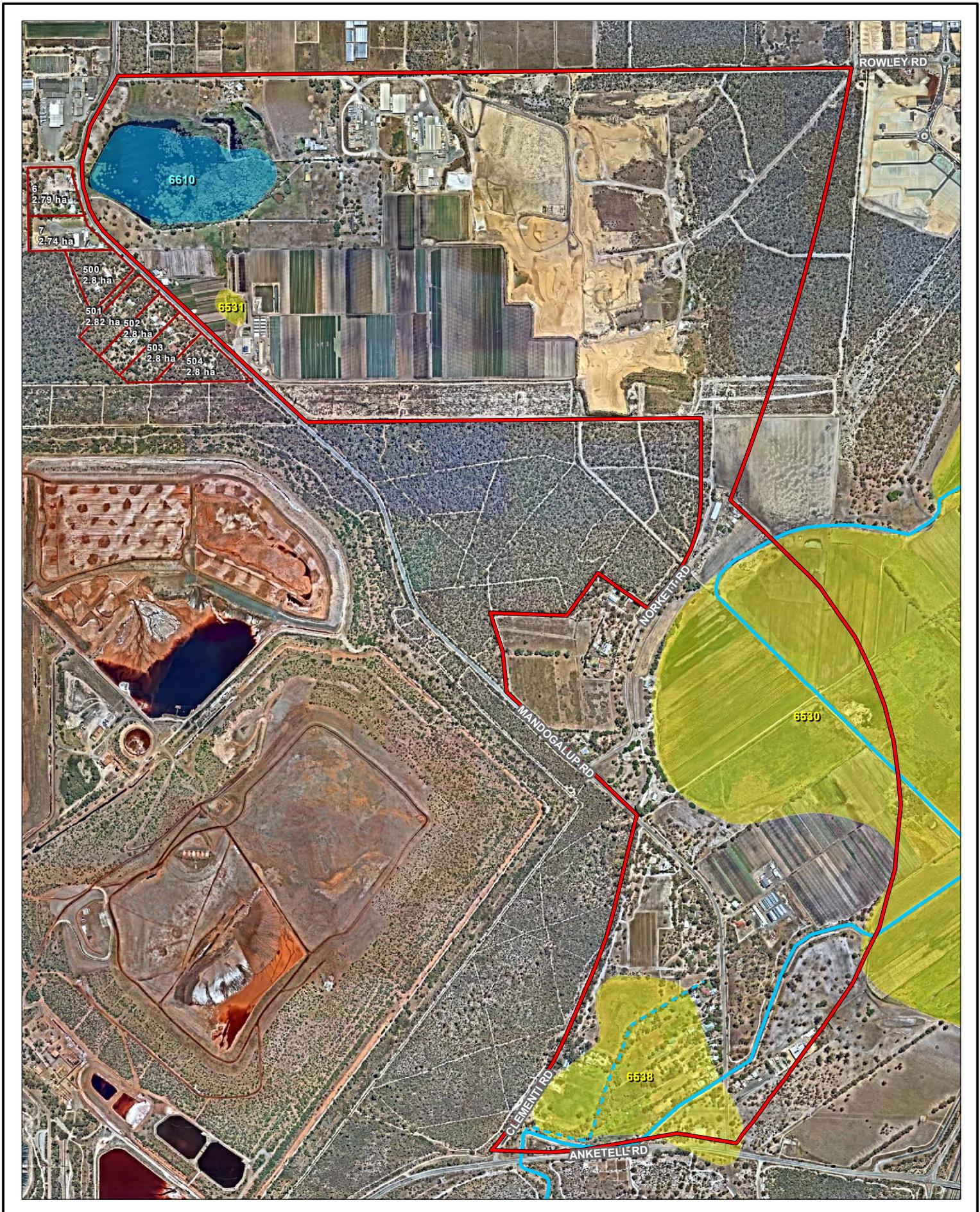
Drawn By: hsullivan

Checked By: CT

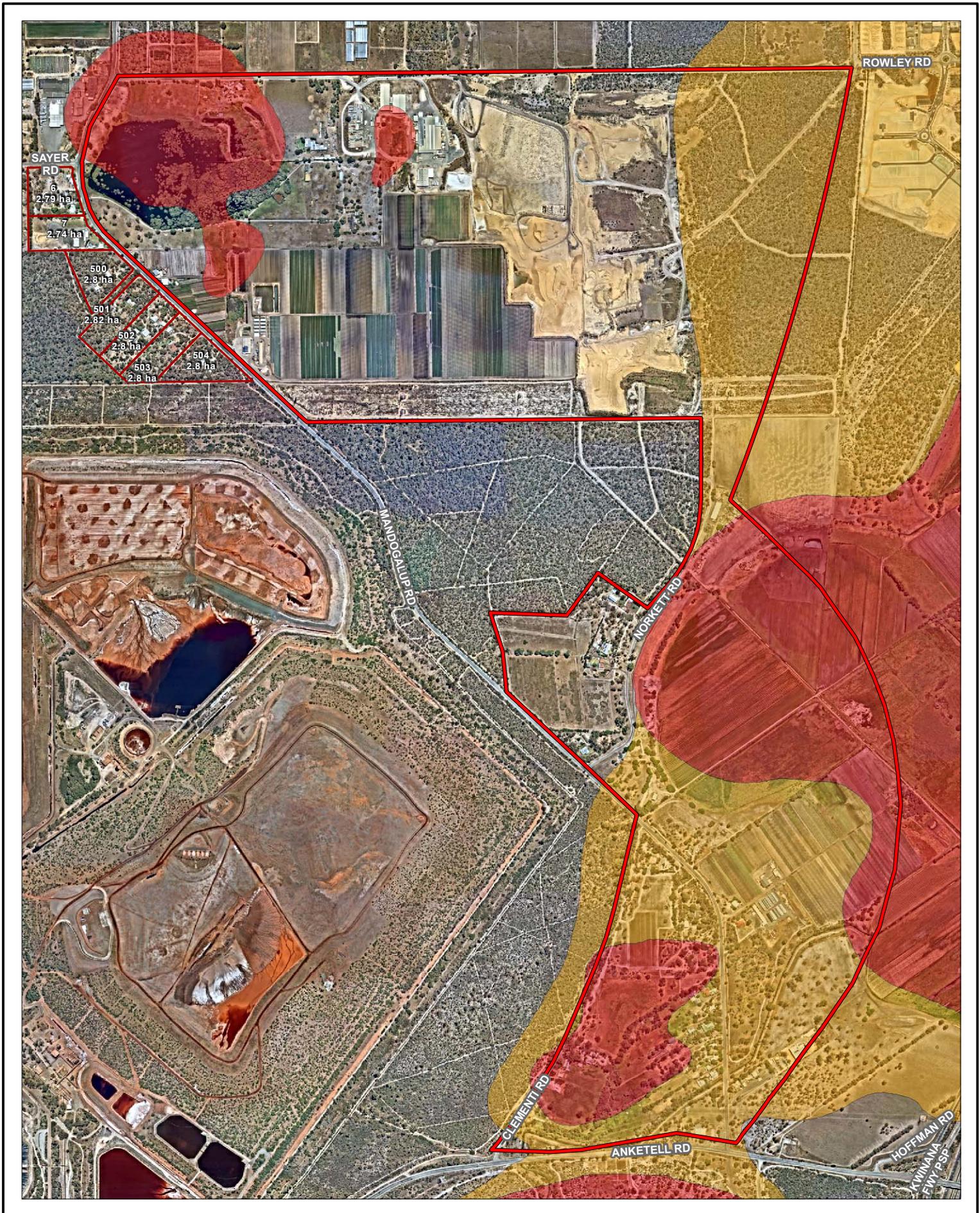
Version: A

Date: 16-Dec-2019

**FIGURE: 3.2**



<b>Legend:</b> MIP 47 boundary (331.2 ha) Sandwich lots (19.56 ha) Resource Enhancement Multiple Use		<b>Drainage channels</b> Peel main drain Peel sub-drain		 Scale 1:14,000 at A4 Coord. Sys. GDA 1994 MGA Zone 50		Mandogalup, WA <b>SURFACE WATER FEATURES</b>	
Job No: 57020 Client: Taylor Burrell Barnett Drawn By: hsullivan		Checked By: CoB Version: A Date: 16-Dec-2019				<b>FIGURE: 3.3</b>	



<b>Legend:</b> MIP 47 boundary (331.2 ha) Sandwich lots (19.56 ha) <b>Acid sulfate soil risk mapping (DWER)</b> High to moderate risk Moderate to low risk				Mandogalup, WA
	Job No: 57020			<b>ACID SULFATE SOIL RISK</b>
	Client: Taylor Burrell Barnett		Scale 1:14,000 at A4 Coord. Sys. GDA 1994 MGA Zone 50	
	Drawn By: hsullivan	Checked By: CoB	Version: A	Date: 16-Dec-2019

### 3.6 Vegetation and flora

#### 3.6.1 Desktop assessment

##### 3.6.1.1 Flora

The Commonwealth EPBC Act and State BC Act provide for the listing and protection of threatened flora. Additionally, at a State level, DBCA list “priority” species which are possibly threatened species that do not meet survey criteria, or are otherwise data deficient.

Desktop searches were conducted using a 5km buffer of the centre-point of the Subject Area, in *NatureMap* (DBCA 2019b) and the EPBC *Protected Matters Search Tool* (PMST). The objective of these searches was to identify flora species of conservation significance potentially occurring within the Subject Area and Sandwich Lots.

The searches identified a total of eight threatened and five priority flora species as having been previously recorded, or with potentially suitable habitat occurring within 5 km of the centre-point of the Subject Area (Appendix A). The species returned by the desktop searches are listed below:

- *Andersonia gracilis* (Slender Andersonia) – Threatened (EPBC Act; BC Act)
- *Caladenia huegelii* (Grand Spider Orchid)- Threatened (EPBC Act; BC Act)
- *Diuris micrantha* (Dwarf Bee-orchid)- Threatened (EPBC Act; BC Act)
- *Diuris purdiei* (Purdie's Donkey-orchid) – Threatened (EPBC Act; BC Act)
- *Drakaea elastica* (Glossy-leaved Hammer Orchid) – Threatened (EPBC Act; BC Act)
- *Drakaea micrantha* (Dwarf Hammer-orchid) – Threatened (EPBC Act; BC Act)
- *Eleocharis keigheryi* (Keighery's Eleocharis) – Threatened (EPBC Act; BC Act)
- *Lepidosperma rostratum* (Beaked Lepidosperma) – Threatened (EPBC Act; BC Act)
- *Cyathochaeta teretifolia* – Priority 3 (DBCA listed)
- *Pimelea calcicola*– Priority 3 (DBCA listed)
- *Pithocarpa corymbulosa* (Corymbose Pithocarpa)– Priority 3 (DBCA listed)
- *Stylidium paludicola* – Priority 3 (DBCA listed)
- *Dodonaea hackettiana* (Hackett's Hopbush)– Priority 4 (DBCA listed).

Of the species listed above, based on general habitat requirements (Table 3.6), three Threatened and one Priority flora species were considered to have the potential to occur within the Subject Area and Sandwich Lots, as follows:

- *Caladenia huegelii* (Threatened – Endangered [EPBC Act]; Threatened [BC Act])
- *Dodonaea hackettiana* (P4)
- *Drakaea elastica* (Threatened – Endangered [EPBC Act]; Threatened [BC Act])
- *Drakaea micrantha* (Threatened – Vulnerable [EPBC Act]; Threatened [BC Act])

The potential for these species to occur within the Subject Area is discussed further in Section 3.6.2.1.

**Table 3.3: Threatened and Priority flora potentially occurring within the Subject Area and Sandwich Lots**

Species	Conservation status		Description	Potential to occur
	EPBC Act	BC Act/ DBCA listing		
<i>Andersonia gracilis</i>	Threatened – Endangered	Threatened	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 <i>Calothamnus hirsutus</i> (hairy clawflower), <i>Verticordia densiflora</i> (compact featherflower), <i>Kunzea recurva</i> (recurved kunzea) and <i>Banksia telmatiaea</i> over sedges (Western Australian Herbarium 1998-, DEE 2019a).	<b>Unlikely</b> due to absence of preferred habitat. While wetlands are present within the Subject Area, these are heavily degraded, with understorey species largely displaced by weeds and ornamental species. None of the associated species were recorded within the Subject Area or Sandwich Lots.
<i>Caladenia huegelii</i>	Threatened – Endangered	Threatened	A slender orchid from 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 <i>Banksia</i> , <i>Allocasuarina</i> and Jarrah woodlands (Western Australian Herbarium 1998-, DEE 2019a).	<b>Possible.</b> Potential habitat is present within VT6, VT7 and VT10.  Habitat is also present within VT12; however, two seasons of survey for this species were conducted over two consecutive years, and no individuals were recorded.
<i>Cyathochaeta teretifolia</i>	-	P3	A rhizomatous, clumped, robust perennial, grass-like or herb (sedge), to 2 m high and to 1.0 m wide. Flowers are brown. Habitat for this species includes grey sand or sandy clay within swamps or creek edges (Western Australian Herbarium 1998-).	<b>Unlikely</b> due to absence of preferred habitat. While wetlands are present within the Subject Area, these are heavily degraded, with understorey species largely displaced by weeds and ornamental species.
<i>Diuris micrantha</i>	Threatened – Vulnerable	Threatened	A slender orchid to 60 cm tall. Yellow flowers with reddish-brown markings measuring 1.3 cm across. Habitat for this species occurs within clay-loam substrates in winter-wet depressions or swamps.	<b>Unlikely</b> due to absence of preferred habitat. While wetlands / winter-wet depressions are present within the Subject Area, these are heavily degraded, with understorey species largely displaced by weeds and ornamental species.
<i>Diuris purdiei</i>	Threatened – Endangered	Threatened	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-). <i>Diuris purdiei</i> 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	<b>Unlikely</b> due to absence of preferred habitat. No areas comprising an intact understorey of dense heath or sedges with key emergent species were recorded within the Subject Area.

			dense heath with scattered emergent <i>Melaleuca preissiana</i> , <i>Corymbia calophylla</i> , <i>E. marginata</i> and <i>Nuytsia floribunda</i> (DEE 2019a).	
<i>Dodonaea hackettiana</i>	-	P4	An erect shrub or tree, 100 to 500 cm tall. Flowers are yellow to green/red and occur mainly from July to October. Habitat for this species occurs in sand and outcropping limestone (Western Australian Herbarium 1998-).	<b>Present.</b> Species was recorded within VT7, in remnant vegetation alongside Norkett Road.
<i>Drakaea elastica</i>	Threatened – Endangered	Threatened	A slender orchid to 30 cm tall with a prostrate, round to heart shaped leaf. Singular, bright green, glossy flower. The species grows on bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps, typically in banksia ( <i>Banksia menziesii</i> , <i>B. attenuata</i> and <i>B. ilicifolia</i> ) woodland or spearwood ( <i>Kunzea glabrescens</i> ) thicket vegetation. <i>D. elastica</i> often occurs with other orchid species (DEE 2019a).	<b>Possible</b> due to presence of preferred habitat in VT7, i.e. banksia woodland alongside swamps.  VT15 potentially contained suitable habitat; however, this area may have been cleared since surveys were undertaken of the area in 2005.  Suitable habitat may formerly have been present within VT9; however, heavy disturbance has resulted in the displacement of most native understorey with grassy weeds.  Marginal habitat is also present within VT12; however, two seasons of survey for this species were conducted over two consecutive years, and no individuals were recorded.
<i>Drakaea micrantha</i>	Threatened – Vulnerable	Threatened	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 from 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 2019a).	<b>Possible</b> due to presence of preferred habitat. Potential habitat is located within firebreaks near tracts of remnant bushland, e.g. around Sandwich Lots and lots adjacent to Bush Forever sites.
<i>Eleocharis keigheryi</i>	Threatened – Vulnerable	Threatened	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 ( <i>Casuarina obesa</i> ), Flooded Gum ( <i>Eucalyptus rudis</i> ), Red Robin Bush ( <i>Melaleuca lateritia</i> ), Swamp	<b>Unlikely</b> due to absence of preferred habitat. While VT4 contained vegetation within and adjacent to standing water associated with a drainage channel, this water was deeper than 15 cm.

			Paperbark ( <i>M. raphiophylla</i> ), Common Spike-sedge ( <i>Eleocharis acuta</i> ), <i>Aponogeton hexatepalus</i> , Veined Swamp Wallaby Grass ( <i>Amphibromus nervosus</i> ) and herbs such as <i>Wurmbea</i> , <i>Tribonanthes</i> and <i>Leptocarpus</i> spp. (Western Australian Herbarium 1998-, DEE 2019a).	
<i>Lepidosperma rostratum</i>	Threatened – Endangered	-	A rhizomatous sedge to 30 cm in diameter. Stems are circular in cross section and flowers are spike-like and up to 4 cm long. Habitat for this species occurs in sandy soils among low heath comprised of <i>Banksia telmatiaea</i> and <i>Calothamnus hirsutus</i> in winter-wet swamps (Western Australian Herbarium 1998-, DEE 2017a).	<b>Unlikely</b> due to absence of preferred habitat and associated species.
<i>Pimelea calcicola</i>	-	P3	An erect to spreading shrub to 1 m tall. Flowers are pink and visible between September to November. Habitat for this species occurs in sand on coastal limestone ridges (Western Australian Herbarium 1998-).	<b>Unlikely</b> due to absence of preferred habitat.
<i>Pithocarpa corymbulosa</i>	-	P3	An erect to scrambling perennial herb 50 to 100 cm tall. Flowers are white and are present from January to April. Habitat for this species occurs within gravelly or sandy loam amongst granite outcrops (Western Australian Herbarium 1998-, DEE 2019a).	<b>Unlikely</b> due to absence of preferred habitat.
<i>Stylidium paludicola</i>	-	P3	Reed-like perennial, herb, 35 to 100 cm tall. Leaves are tufted, linear or subulate or narrowly oblanceolate. Flowers are pink and occur in October to December. Habitat for this species occurs in peaty sand over clay and winter wet areas, often in Marri and Melaleuca woodland or Melaleuca shrubland (Western Australian Herbarium 1998-).	<b>Unlikely</b> due to absence of preferred habitat. While winter-wet areas are present within the Subject Area, the majority of these have been severely disturbed and understorey replaced with no-native species, or completely cleared for market gardens.

### 3.6.1.2 Regional vegetation

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

The Subject Area and Sandwich Lots comprises two Beard (1981) vegetation associations. The percentage remaining of each vegetation association within the Swan Coastal Plain (Perth) IBRA sub-region, is provided in Table 3.4 (GoWA 2019a).

**Table 3.4: Vegetation associations within the Subject Area and Sandwich Lots**

Vegetation association code	Description	Percentage remaining (%)	% Current Extent Protected (IUCN I - IV) for Conservation (proportion of Pre-European Extent)
6	medium woodland; tuart & jarrah	23.72	3.3
1001	medium very sparse woodland; jarrah, with low woodland; banksia & casuarina	22.05	2.8

System 6 mapping refers to vegetation mapping undertaken at a Vegetation Complex scale by Heddle *et al.* (1980). This is the primary source of information used to calculate potential impacts of proposals to clear native vegetation on the Swan Coastal Plain. The Subject Area and Sandwich Lots occurs within the following broad vegetation complexes described by GoWA (2019b) in Table 3.5. The percentage remaining of each vegetation complex within the Swan Coastal Plain (Perth) IBRA region, is also provided in Table 3.5 (GoWA 2019b).

**Table 3.5: Vegetation complexes within the Subject Area and Sandwich Lots**

Complex name	Description	Percentage remaining (%)	Current percentage remaining within lands Protected (IUCN I-IV) for Conservation (%)
Karrakatta Complex- Central and South	Predominantly open forest of <i>Eucalyptus gomphocephala</i> (Tuart) - <i>Eucalyptus marginata</i> (Jarrah) - <i>Corymbia calophylla</i> (Marri) and woodland of <i>Eucalyptus marginata</i> (Jarrah) - Banksia species. <i>Agonis flexuosa</i> (Peppermint) is co-dominant south of the Capel River.	23.49	3.87
Bassendean Complex Central and South	Vegetation ranges from woodland of <i>Eucalyptus marginata</i> (Jarrah) - <i>Allocasuarina fraseriana</i> (Sheoak) - Banksia species to low woodland of Melaleuca species, and sedgeland on the moister sites. This area includes the transition of <i>Eucalyptus marginata</i> (Jarrah) to <i>Eucalyptus todtiana</i> (Pricklybark) in the vicinity of Perth.	26.87	1.86
Herdsmen Complex	Sedgeland and fringing woodland of <i>Eucalyptus rudis</i> (Flooded Gum) - Melaleuca species.	32.11	10.83

The *National Objectives and Targets for Biodiversity Conservation 2001–2005* (Commonwealth of Australia 2001) recognise that the retention of 30 per cent or more of the pre-clearing extent of each ecological community is necessary if Australia’s biological diversity is to be protected. This is the threshold level, below which species loss appears to accelerate exponentially and loss below this level should not be permitted (DER 2014a). In recognition of past land use planning decisions, constrained areas have been identified on the Swan Coastal Plain within which, retention objectives may be varied to “at least 10%”. Given that the Subject Area is located within the Perth Metropolitan

Region and has been identified for potential future development, the retention objective of 10% is likely considered appropriate.

The percentage of the pre-European extent remaining within the Swan Coastal Plain (Perth) IBRA region, of the vegetation associations and complexes listed above, is above the 10 percent threshold for constrained areas, and potential clearing of vegetation within the Subject Area will not reduce the remaining extent of these associations and complexes to 10 percent or less.

### 3.6.1.3 Threatened and Priority Ecological Communities

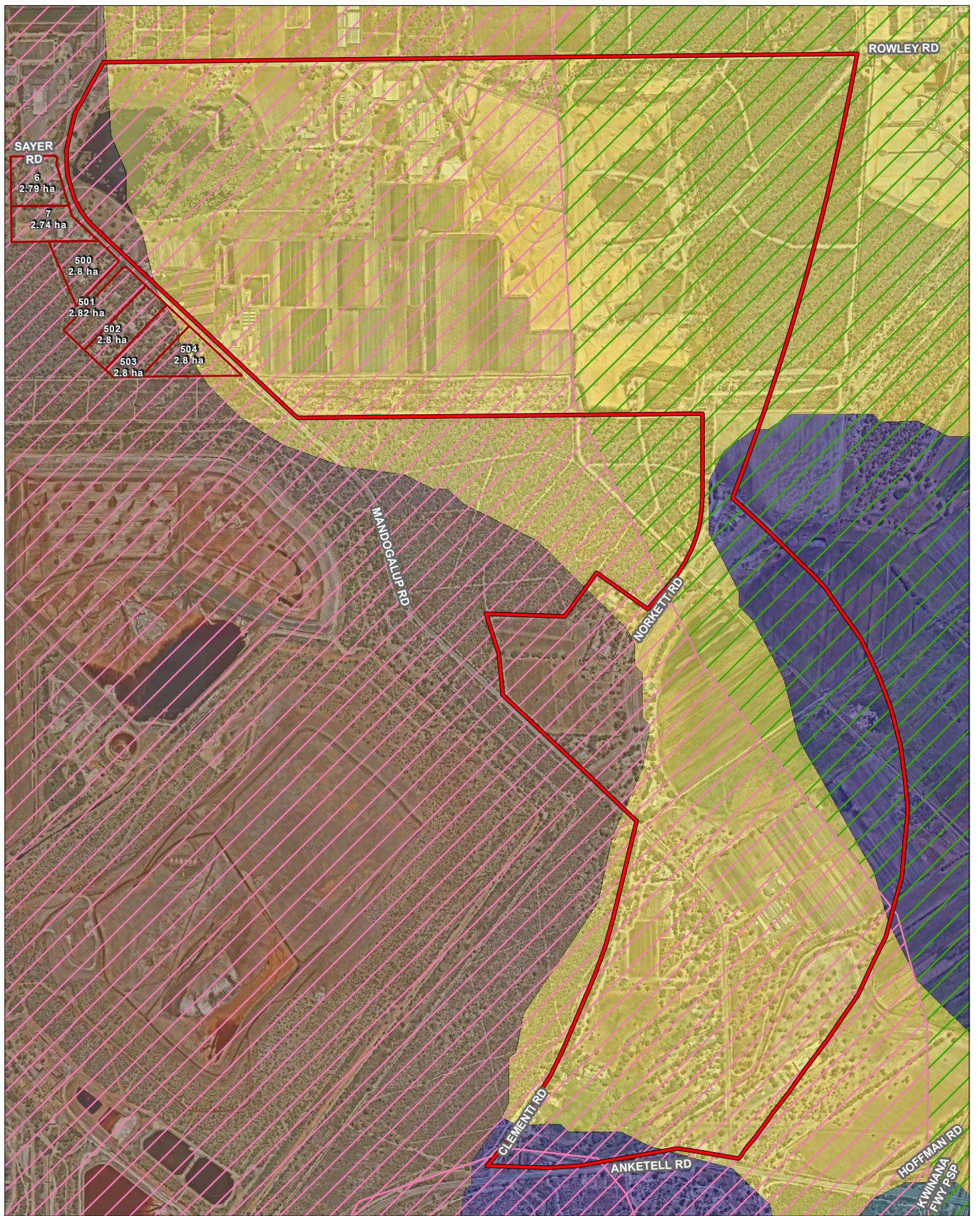
The Commonwealth EPBC Act and State BC Act provide for the listing and protection of threatened ecological communities (TECs). Additionally, at a State level, DBCA list “priority” ecological communities (PECs) which are possibly threatened but that do not meet survey criteria, or are otherwise data deficient.

One TEC listed under the BC Act, one TEC listed under the EPBC Act, and three PECs listed by DBCA have been identified as having the potential to occur in the broader area, based on a desktop assessment (Strategen 2018). These ecological communities are listed in Table 3.6.

**Table 3.6: TECs and PECs identified in proximity to the Subject Area**

Community identifier	Community name	Listing under BC Act	Listing under EPBC Act
Various floristic community types (FCTs)	Banksia woodlands of the Swan Coastal Plain	Various listings; encompasses multiple state-listed TECs and PECs	Endangered
Limestone ridges (SCP 26a)	<i>Melaleuca huegelii</i> - <i>Melaleuca systema</i> shrublands on limestone ridges	Endangered	NA
SCP21c	Low lying <i>Banksia attenuata</i> woodlands or shrublands	Priority 3	Endangered
SCP22	<i>Banksia ilicifolia</i> woodlands, southern Swan Coastal Plain	Priority 3	Endangered
SCP24	Northern Spearwood shrublands and woodlands	Priority 3	Endangered

The potential for the TECs and PECs to occur within the Subject Area, is discussed in Section 3.6.2.4.



**Legend:**

- MIP 47 boundary (331.2 ha)
- Sandwich lots (19.56 ha)
- Vegetation system (Beard)**
- Bassendeian
- Spearwood
- Vegetation complex (Heddle)**
- Bassendeian Complex-Central and South
- Cottesloe Complex-Central and South
- Herdsman Complex
- Karrakatta Complex-Central and South

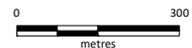


Job No: 57020

Client: Taylor Burrell Barnett

Drawn By: hsullivan

Checked By: CoB



Scale 1:14,000 at A4

Coord. Sys. GDA 1994 MGA Zone 50

Version: A

Date: 16-Dec-2019

Mandogalup, WA

**PRE-EUROPEAN VEGETATION MAPPING**

**FIGURE: 3.5**

### 3.6.2 Site surveys

A number of publicly available flora and vegetation surveys have been previously conducted across portions of the Subject Area, as outlined in Table 3.7.

**Table 3.7: Previous flora and vegetation surveys conducted**

Landholdings	Survey	Date of survey	Reference
The survey included the following titles within the Subject Area: <ul style="list-style-type: none"> <li>• Lot 10 on Plan 069890</li> <li>• Lot 2 on Plan 011392</li> <li>• Lot 53 on Plan 009780</li> <li>• Lot 4 on Plan 011392</li> <li>• Lot 664 on Plan 202790</li> <li>• Part Lot 791 on Plan 202790</li> <li>• Lot 663 on Plan 202790</li> <li>• Lot 665 on Plan 202618</li> <li>• Lot 666 on Plan 202618</li> <li>• Lot 667 on Plan 202618</li> <li>• Lot 668 on Plan 202618</li> <li>• Lot 2 on Diagram 039567</li> <li>• Lot 669 on Plan 202618</li> <li>• Lot 670 on Plan 202618</li> <li>• Lot 671 on Plan 202618</li> <li>• Lot 9002 on Plan 069132</li> <li>• Lot 9006 on Plan 70124</li> <li>• Lot 9002 on Plan 417428</li> </ul>	Flora, Vegetation, Fauna and Wetland Assessment	6 <sup>th</sup> and 7 <sup>th</sup> September 2005	Cardno 2005
	Targeted Priority And Threatened Flora Search	23 <sup>rd</sup> and 24 <sup>th</sup> October 2012	Plantecology Consulting 2012
The survey included the following titles within the Subject Area: <ul style="list-style-type: none"> <li>• Lot 9006 on Plan 070124</li> <li>• Lot 9002 on Plan 069132</li> </ul>	Level 2 Detailed Flora and Vegetation Survey	<ul style="list-style-type: none"> <li>• September and late November 2004</li> <li>• November 2006</li> <li>• March 2007</li> <li>• September and October 2004 (targeted searches)</li> </ul>	RPS 2010
	Targeted Declared Rare Flora Survey	• 23 <sup>rd</sup> and 24 <sup>th</sup> October 2012	Woodman Environmental Consulting 2014
	Level 1 flora and vegetation survey	• 19 January 2017	Strategen Environmental 2018
The survey included the following titles within the Subject Area: <ul style="list-style-type: none"> <li>• Lot 10 on Plan 069890</li> <li>• Lot 2 on Plan 011392</li> </ul>	Detailed Flora and Vegetation Survey	<ul style="list-style-type: none"> <li>• 18<sup>th</sup> July 2017</li> <li>• 10<sup>th</sup> and 11<sup>th</sup> October 2017</li> </ul>	Strategen Environmental 2017

Subsequent to the above studies, Strategen-JBS&G Senior Botanists conducted two field surveys across the Subject Area and Sandwich Lots on 24 October and 14 November 2019, and 30 September and 1 October 2020. The field surveys were conducted according to standards set out in the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). It is noted that access permission was not granted for Lot 503 (on Diagram 61498) and Lot 3 (on Diagram 050536), as such these lots have not been subject to assessment.

The Strategen-JBS&G flora and vegetation survey report is provided in Appendix B.

#### 3.6.2.1 Flora

As outlined in Table 3.7, targeted surveys have been conducted across a number of lots within the Subject Area. During the surveys listed in Table 2.1, no threatened flora listed under the EBPC Act or

BC Act, or DBCA listed Priority flora have been recorded within lots which have been subject to a targeted flora survey.

During the 2019 survey undertaken by Strategen-JBS&G (Appendix B), one Priority flora species, *Dodonaea hackettiana* (P4) was recorded in intact remnant native vegetation within the road verge on the western side of Norkett Road.

While the majority of vegetation is heavily degraded and infested with weeds, VT7 (refer to Table 3.8) has the potential to contain *Drakaea elastica* and *Caladenia huegelii*; however, only a small area (0.08 ha) occurs within the Subject Area. *Drakaea micrantha* also has the potential to occur within firebreaks adjacent to areas of intact remnant native vegetation, i.e. Sandwich Lots, lots adjacent to remnant vegetation in Bush Forever sites (i.e., Lot 51 and 23 Mandogalup Rd). These areas have not been subject to a targeted flora survey.

### 3.6.2.2 Vegetation types

Nine native vegetation types (VTs) have been identified within the portions of the Subject Area and Sandwich Lots. The vegetation types are described in Table 3.8 and Table 3.9

**Table 3.8: Vegetation Types recorded within the Subject Area**

Vegetation Type	Description	Area (ha)	Percentage of area within Subject Area (%)
<b>Within Scheme site boundary</b>			
3	Open woodland of <i>Eucalyptus rudis</i> , <i>Melaleuca raphiophylla</i> and <i>Eucalyptus marginata</i> over introduced species.	0.925	0.279
4	Woodland of <i>Eucalyptus rudis</i> , <i>Melaleuca raphiophylla</i> , <i>Agonis flexuosa</i> over mixed in.	12.330	3.723
5	Open woodland of <i>Eucalyptus gomphocephala</i> , <i>Eucalyptus rudis</i> and occasionally <i>Corymbia maculata</i> , <i>Allocasuarina fraseriana</i> and <i>Banksia menziesii</i> over isolated shrubs of <i>Xanthorrhoea preissii</i> and other native species over introduced grasses.	5.048	1.524
6	Woodland of <i>Eucalyptus gomphocephala</i> , <i>Banksia menziesii</i> , <i>Melaleuca raphiophylla</i> , and <i>Melaleuca preissiana</i> over shrubland of <i>Acacia pulchella</i> , <i>Macrozamia riedlei</i> , <i>Hibbertia hypericoides</i> and mixed introduced species.	1.229	0.371
7	Woodland of <i>Eucalyptus gomphocephala</i> , <i>Allocasuarina fraseriana</i> and <i>Banksia attenuata</i> over shrubland of <i>Xanthorrhoea preissii</i> and <i>Macrozamia riedlei</i> over mixed native and introduced herbs and shrubs	0.546	0.165
8	Woodland of <i>Eucalyptus marginata</i> , <i>Banksia attenuata</i> and <i>Allocasuarina fraseriana</i> over isolated shrubs to open shrubland of <i>Jacksonia sternbergiana</i> , <i>Acacia saligna</i> , and <i>Xanthorrhoea preissii</i> over mixed introduced species.	0.285	0.086
9	Open woodland of <i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia attenuata</i> and <i>Banksia menziesii</i> over shrubland of <i>Hibbertia hypericoides</i> , <i>Acacia pulchella</i> , <i>Macrozamia riedlei</i> over herbland of <i>Burchardia</i> sp., <i>Tetraria octandra</i> and mixed introduced species.	31.404	9.482
Revegetation/ regrowth	Mixed shrubland within powerline corridor.	10.949	3.306
Planted - Pines	Plant <i>Pinus</i> sp.	2.443	0.738
Parkland Cleared	Open woodland of native tree species over non-native understorey	8.272	2.498
Cleared	Cleared - varies between completely cleared for hardstand, housing or infrastructure, paddocks comprising introduced grass and herb species, and residential gardens planted with ornamental species. (Not considered to be native vegetation)	257.771	77.829
Total native vegetation	Excludes "Cleared" areas and "Planted-pines"	<b>70.988</b>	21.269

**Table 3.9: Vegetation Types recorded within the Sandwich Lots**

Vegetation Type	Description	Area (ha)	Percentage of area within Sandwich Lots (%)
<b>Within Sandwich Lots</b>			
1	Woodland of <i>Corymbia calophylla</i> , <i>Allocasuarina fraseriana</i> and <i>Banksia attenuata</i> over open heath of <i>Xanthorrhoea preissii</i> , <i>Hibbertia hypericoides</i> and <i>Macrozamia riedlei</i> mixed native and introduced species .	0.975	50.212
2	Open woodland of <i>Eucalyptus marginata</i> and <i>Allocasuarina fraseriana</i> and occasionally <i>Banksia grandis</i> over open heath of <i>Xanthorrhoea preissii</i> , <i>Macrozamia riedlei</i> over introduced species .	0.748	0.455
4	Open woodland of <i>Eucalyptus rudis</i> , <i>Melaleuca raphiophylla</i> and <i>Eucalyptus marginata</i> over introduced species .	0.216	6.982
7	Woodland of <i>Eucalyptus rudis</i> , <i>Melaleuca raphiophylla</i> , <i>Agonis flexuosa</i> over mixed inr * <i>Leptospermum laevigatum</i> , * <i>Ricinus communis</i> , * <i>Ficus</i> sp., <i>Typha orientalis</i> and * <i>Poaceae</i> spp. in standing water .	0.890	5.356
8	Open woodland of <i>Eucalyptus gomphocephala</i> , <i>Eucalyptus rudis</i> and occasionally ^ <i>Corymbia maculata</i> , <i>Allocasuarina fraseriana</i> and <i>Banksia menziesii</i> over isolated shrubs of <i>Xanthorrhoea preissii</i> and other native species over introduced grasses.	2.432	1.549
9	Woodland of <i>Eucalyptus gomphocephala</i> , <i>Banksia menziesii</i> , <i>Melaleuca raphiophylla</i> , and <i>Melaleuca preissiana</i> over shrubland of <i>Acacia pulchella</i> , <i>Macrozamia riedlei</i> , <i>Hibbertia hypericoides</i> and mixed introduced species.	1.626	6.376
Parkland cleared	Open woodland of native tree species over non-native understorey	7.009	17.419
Cleared	Cleared - varies between completely cleared for hardstand, housing or infrastructure, paddocks comprising introduced grass and herb species, and residential gardens planted with ornamental species. (Not considered to be native vegetation)	0.064	11.650
Total native vegetation	Excludes "Cleared" areas	13.896	88.349

### 3.6.2.3 Vegetation condition

Vegetation condition within the areas surveyed, has been described using the vegetation condition scale for the South West Botanical Province outlined in Table 3.10 (Keighery 1994). A breakdown of vegetation condition within the Subject Area and Sandwich lots is provided in Table 3.11 and Table 3.12 respectively.

**Table 3.10: Vegetation condition scale (Keighery 1994)**

Condition rating	Description
Pristine	Pristine or nearly so, no obvious sign of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback, grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

Condition rating	Description
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

**Table 3.11: Vegetation condition recorded within the Subject Area**

Vegetation Condition	Area (ha)	Percentage of the Subject Area
Very good	40.50	12.22
Good	3.01	0.91
Degraded - good	0.40	0.12
Degraded	14.86	4.48
Completely degraded	272.41	82.25

**Table 3.12: Vegetation condition recorded within the Sandwich Lots**

Vegetation Condition	Area (ha)	Percentage of the Sandwich Lots
Very Good	1.54	11.05
Good – very good	0.71	5.12
Good	2.15	15.42
Degraded - good	1.63	11.65
Degraded	0.63	4.55
Completely degraded	7.29	52.22

#### 3.6.2.4 Threatened ecological communities

The following TECs are present within the Subject Area and/ or the Sandwich Lots (based on vegetation surveys conducted):

- Banksia woodlands of the Swan Coastal Plain (TEC under EPBC Act; Priority 3 PEC listed by DBCA)
- Tuart woodlands and forests of the Swan Coastal Plain (TEC under EPBC Act; Priority 3 PEC listed by DBCA).

#### **Banksia woodlands of the Swan Coastal Plain EPBC Act listed TEC**

Four patches across both the Subject Area and Sandwich Lots are considered to form the Banksia Woodlands of the Swan Coastal Plain EPBC Act listed TEC. They cover 37.04 ha in total. The most substantial patches of this TEC are located within the Sandwich lots and within the north-eastern portion of the Subject Area. One patch is located along the south-western boundary of the Subject Area (Figure 3.8). Further details of assessment under the key diagnostic criteria for the TEC and the distribution of this community can be found in the Flora, Vegetation and Black Cockatoo Habitat Assessment (Appendix B).

#### **Banksia woodlands of the Swan Coastal Plain State listed PEC**

The description, area and condition thresholds that apply to the EPBC Act listed Banksia woodlands of the Swan Coastal Plain TEC, also apply to this Priority ecological community. Given this, the occurrences of the Banksia woodlands of the Swan Coastal Plain EPBC Act listed TEC are considered to also represent the Banksia woodlands of the Swan Coastal Plain State listed PEC.

#### **Tuart woodlands and forests of the Swan Coastal Plain TEC**

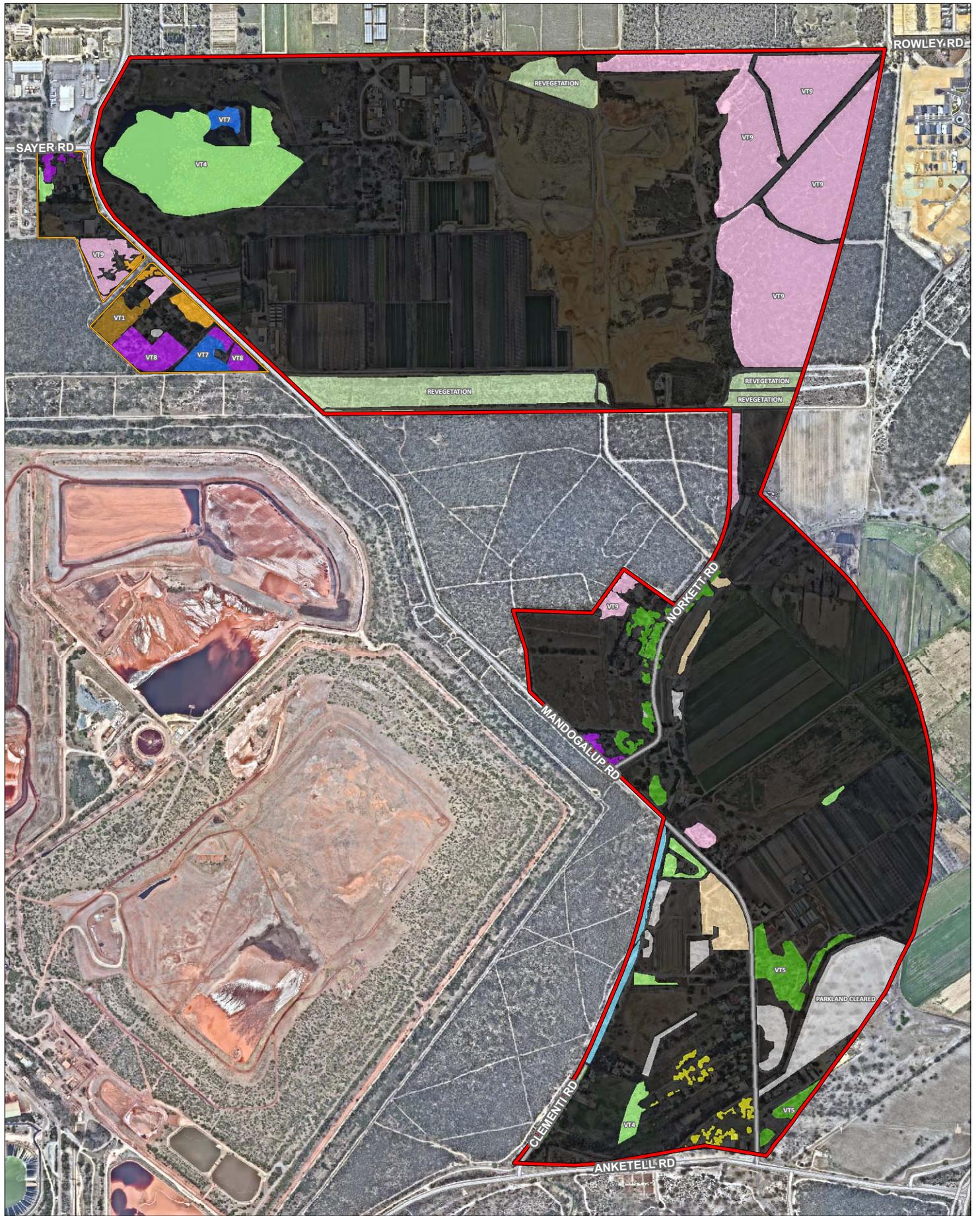
Vegetation within the south-eastern portion of the Subject Area has been assessed as forming a 10.06 ha patch of the Tuart Woodlands and forests of the Swan Coastal Plain EPBC Act listed TEC

(Figure 3.8). It is noted that, in accordance with the conservation advice for the TEC, the 10.06 ha area of the assessed “patch” includes bare ground with little/ no vegetation value. This reflects the requirement to include a 30 m buffer from the outer canopy of Tuarts in the mapping of TEC.

Further details of assessment under the key diagnostic criteria for the TEC and the distribution of this community can be found in the Flora, Vegetation and Black Cockatoo Habitat Assessment (Appendix B).

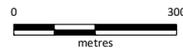
**Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC**

The description, area and condition thresholds that apply to the EPBC Act listed TEC, also apply to the State listed Priority ecological community. Given this, the occurrences of the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain TEC are considered to also represent the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC.



**Legend:**

- |   |               |   |                  |   |     |
|---|---------------|---|------------------|---|-----|
|  | Subject area  |  | Cleared          |  | VT3 |
|  | Sandwich lots |  | Parkland cleared |  | VT4 |
|  | Roads (MRWA)  |  | Planted - Pines  |  | VT5 |
|   |               |  | Revegetation     |  | VT6 |
|   |               |  | VT1              |  | VT7 |
|   |               |  | VT2              |  | VT8 |
|   |               |   |                  |   | VT9 |



Mandogalup, WA

**VEGETATION TYPES**

Job No: 57020

Scale 1:14,000 at A4

Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

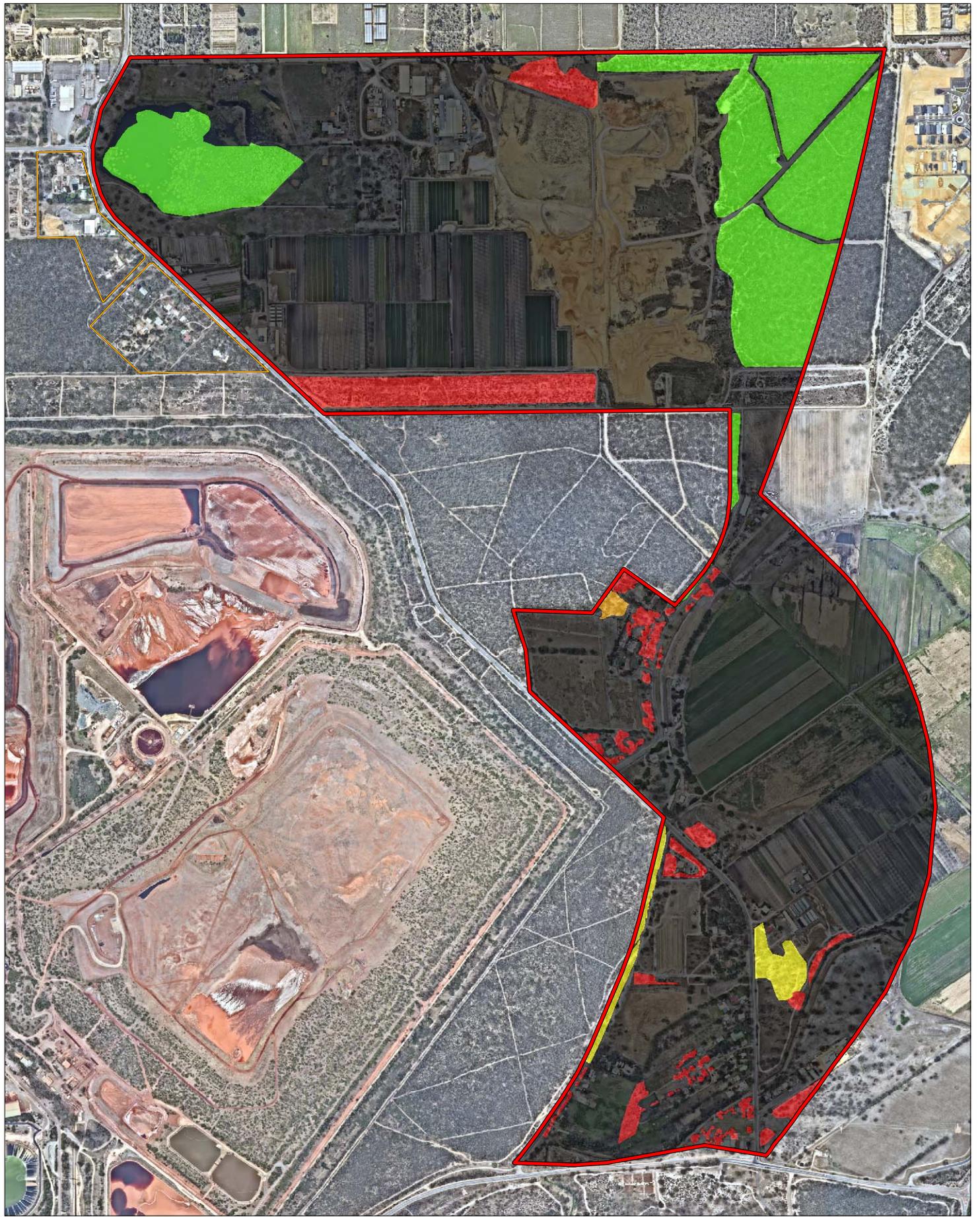
Drawn By: cthatcher

Checked By: CC

Version: A

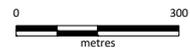
Date: 17-Dec-2020

**FIGURE: 3.6**



**Legend:**

- Subject area
- Sandwich lots
- Vegetation condition**
- Very good
- Good
- Degraded - good
- Degraded
- Completely degraded



Mandogalup, WA

**VEGETATION CONDITION**

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

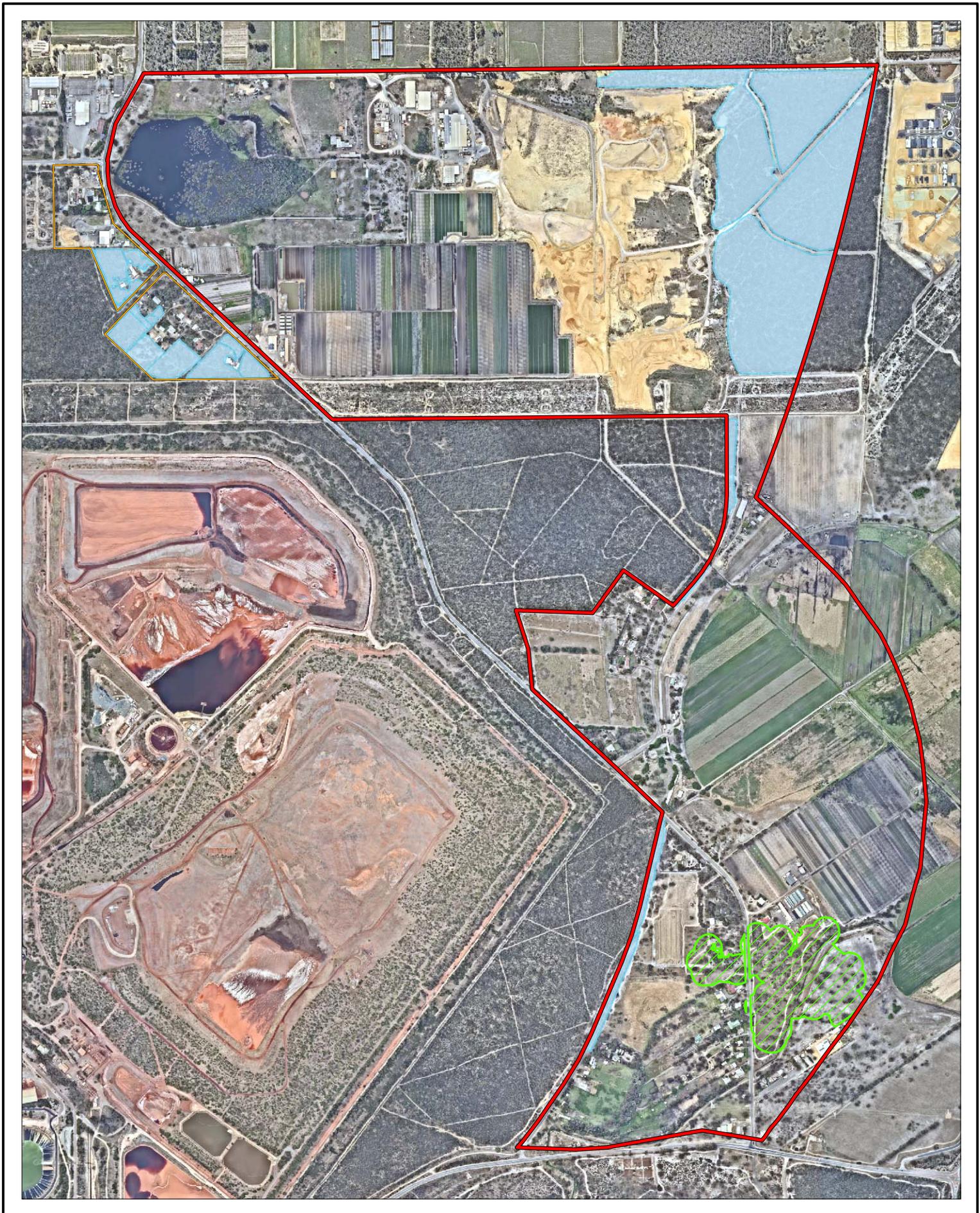
Drawn By: chatcher

Checked By: CT

Version: A

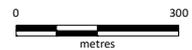
Date: 17-Dec-2020

**FIGURE: 3.7**



**Legend:**

- Subject area
- Sandwich lots
- Banksia woodlands of the SCP
- Tuart woodlands and forests of the SCP



Mandagalup, WA

TECS / PECS

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: chatcher

Checked By: TS

Version: A

Date: 17-Dec-2020

**FIGURE: 3.8**

### 3.7 Fauna and habitat

#### 3.7.1 Desktop assessment

The Commonwealth EPBC Act and State BC Act provide for the listing and protection of threatened fauna. Additionally, at a State level, DBCA list “priority” species which are possibly threatened species that do not meet survey criteria, or are otherwise data deficient.

Desktop searches were conducted using a 5km buffer of the centre-point of the Subject Area, in *NatureMap* (DBCA 2019b) and the EPBC *Protected Matters Search Tool* (PMST). The objective of these searches was to identify fauna species of conservation significance potentially occurring within the Subject Area and Sandwich Lots.

The searches identified a total of 14 threatened, eight priority and one specially protected fauna species as having been previously recorded, or with potentially suitable habitat occurring within 5 km of the centre-point of the Subject Area (Appendix A). The threatened and priority species returned by the desktop searches are listed in Table 3.13, along with their conservation status, habitat preference and likelihood of occurrence.

Of the threatened, priority and specially protected species identified by the desktop searches, the following are considered to possibly or likely occur, or are known to occur within the Subject Area and/ or Sandwich Lots:

- *Calyptorhynchus banksii naso* (Forest Red-tailed Black-Cockatoo; FRTBC)- Threatened (EPBC Act/ BC Act)
- *Calyptorhynchus latirostris* (Carnaby's Cockatoo; CC)
- *Falco peregrinus* (Peregrine Falcon)
- *Isoodon fusciventer* (Quenda)
- *Lerista lineata* (Perth Slider)
- *Neelaps calonotos* (Black-striped Snake)
- *Synemon gratiosa* (Graceful Sunmoth).

Additionally, one migratory terrestrial species and 17 migratory wetland species were identified by the desktop searches. The migratory terrestrial species (*Motacilla cinerea*; Grey Wagtail) has not been recorded from the Perth Metropolitan area and is highly unlikely to utilise the sight (Atlas of Living Australia and Birdlife 2015).

The migratory wetland species may utilise the REW in the north-western portion of the Subject Area, however are likely to favour the larger wetlands located north and south of the Subject Area; Thomsons Lake and The Spectacles (respectively).

**Table 3.13: Threatened and Priority fauna potentially occurring within the Subject Area and Sandwich Lots**

Species	Conservation status		Habitat description	Potential to occur
	EPBC Act	BC Act/ DBCAs listing		
<i>Botaurus poiciloptilus</i> Australasian Bittern	Threatened – Endangered	Threatened	The Australasian Bittern’s preferred habitat is comprised of 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. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over a muddy or peaty substrate (Marchant and Higgins 1990).	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Calidris canutus</i> Red Knot	Threatened – Endangered	Threatened	The Red Knot predominantly inhabits intertidal mudflats, sandflats and sandy beaches along sheltered coasts and are occasionally seen on terrestrial saline wetlands near the coast, but rarely use inland lakes or swamps.	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Calidris ferruginea</i> Curlew Sandpiper	Threatened – Critically Endangered	Threatened	The Curlew Sandpiper occurs on intertidal mudflats of sheltered coastal areas such as estuaries, bays, inlets and lagoons, in shallow waters. They also occur in non-tidal swamps, lakes and lagoons. They occur less often in inland areas such as ephemeral and permanent lakes, dams, waterholes and bore drains.	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Calyptorhynchus banksii</i> <i>naso</i> Forest Red-tailed Black-Cockatoo	Threatened – Vulnerable	Threatened	The Forest Red-tailed Black-Cockatoo occurs predominantly in dense eucalypt forests of jarrah, marri and karri, and occasionally in more open woodland habitats. They forage on marri, jarrah and other native and non-native vegetation species. They breed and nest in woodland or forest in live or dead eucalypt trees. Roosting occurs in tall eucalypt trees within or on the edges of forests and woodlands.	<b>Likely to occur</b> due to presence of suitable habitat.
<i>Calyptorhynchus baudinii</i> Baudin's Cockatoo	Threatened – Endangered	Threatened	Baudin’s Cockatoo occurs predominantly in jarrah, marri and karri eucalypt forests, and less frequently in woodlands and cleared urban areas. During breeding season they forage on banksia, hakea, and dryandra species. During non-breeding season they forage in marri forests. Breeding occurs predominantly in woodland or forest habitats, nesting in hollows of live or dead trees of karri, marri, wandoo and tuart (DSEWPac 2012). They roost typically in eucalypt trees near permanent water sources.	<b>Unlikely</b> to occur based on distribution range (ERIN 2019c).
<i>Calyptorhynchus latirostris</i> Carnaby's Cockatoo	Threatened - Endangered	Threatened	Carnaby’s Cockatoo occurs in uncleared or remnant native eucalypt woodland, and heathlands containing hakea, dryandra,	<b>Likely to occur</b> due to presence of suitable habitat.

Species	Conservation status		Habitat description	Potential to occur
	EPBC Act	BC Act/ DBCAs listing		
			banksia and grevillia species. They forage on a range of native and non-native vegetation. They breed in eucalypt woodlands, mainly within the wheatbelt region, in large hollows of live or dead eucalypt trees. Roosting occurs near water sources in large trees such as marri and pine trees.	
<i>Dasyurus geoffroii</i> Chuditch	Threatened – Vulnerable	Threatened	The Chuditch occurs in jarrah forests and woodlands, and mallee heath and shrublands.	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Falco peregrinus</i> Peregrine Falcon	Not listed	Other specially protected fauna	The Peregrine Falcon is not restricted to a specific habitat, and can occur across woodlands, grasslands and coastal cliffs.	<b>Possibly</b> occurs within the project area due to presence of suitable habitat.
<i>Falsistrellus mackenziei</i> Western False Pipistrelle	Not listed	Priority 4	The Western False Pipistrelle predominantly inhabit wet sclerophyll forests of Karri, Jarrah and Tuart eucalypts, roosting in branches, stumps and hollows of old trees (Australian Museum 2019).	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Hydromys chrysogaster</i> Water rat	Not listed	Priority 4	The Water-rat is associated with a range of permanent aquatic habitats. This species favours most types of freshwater habitats, and can also occur in mangrove and estuarine areas (Burbidge 2016).	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Isodon fusciventer</i> Quenda	Not listed	Priority 4	The Quenda occurs across a broad range of habitats such as forests and dense scrub vegetation, to open croplands or pastures that contain or are adjacent to dense native vegetation. They are also associated with wetlands on the Swan Coastal Plain (DEC 2012).	<b>Known to occur</b> within the project area and has been directly (dead specimen) and indirectly (diggings) recorded.
<i>Leipoa ocellata</i> Malleefowl	Threatened – Vulnerable	Threatened	The Malleefowl occurs in shrublands and low woodlands dominated by mallee and acacia species. They favour environments with dense vegetation and require an abundance of leaf litter and a sandy substrate for breeding.	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Lerista lineata</i> Perth Slider	Not listed	Priority 3	The Perth Slider is found in sandy coastal heath and low scrubland, banksia woodland, tuart open woodland over deep sands, and coastal dunes immediately adjacent to the beach. They are believed to favour white to grey sandy substrates and sandy areas with limestone outcrops (Gaikhorst <i>et al.</i> 2017).	<b>Possibly</b> occurs within the project area due to nearby records (the Spectacles) (Cardno 2005).
<i>Myrmecobius fasciatus</i> Numbat	Threatened - Endangered	Threatened	The Numbat has historically occupied a range of habitats, including eucalypt forest and woodland, Acacia woodland and Triodia grassland, however they now only occur in a small portion of their former range. They are reliant upon adequate ground cover for protection from predation and eucalypt species that provide logs and hollows (DPaW 2017).	<b>Unlikely</b> due to a lack of suitable habitat within the project area.

Species	Conservation status		Habitat description	Potential to occur
	EPBC Act	BC Act/ DCA listing		
<i>Neelaps calonotos</i> Black-striped Snake	Not listed	Priority 3	The Black-striped Snake inhabits Banksia woodland and sandy areas in the Perth Region (ALA 2019).	<b>Likely</b> due to the presence of good quality Banksia woodland within and surrounding the project area (Cardno 2005).
<i>Notamacropus eugenii</i> <i>subsp. derbianus</i> Tammar Wallaby	Not listed	Priority 4	The Tammar Wallaby inhabits dense, low vegetation including coastal scrub, heath, dry sclerophyll forest and thickets in mallee and woodland, and feeds in open grassy areas. This species is nocturnal.	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Numenius madagascariensis</i> Eastern Curlew	Threatened – Critically Endangered	Threatened	The Eastern Curlew occurs on mudflats or sandflats associated with sheltered coastal areas, such as estuaries, bays, harbours, inlets and lagoons. They are also often recorded within mangroves and saltmarshes. The Eastern Curlew does not breed in Australia. In southern Western Australia, eastern curlews are recorded from Eyre, and there are scattered records from Stokes Inlet to Peel Inlet. The species is a scarce visitor to Houtman Abrolhos and the adjacent mainland, and is also recorded around Shark Bay. It is also recorded on Norfolk Island and Lord Howe Island (Marchant & Higgins 1993).	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Oxyura australis</i> Blue-billed Duck	Not listed	Priority 4	The Blue-billed Duck is almost wholly aquatic, and is seldom seen on land. Non-breeding flocks, often with several hundred individuals, congregate on large, deep open freshwater dams and lakes in autumn. The Blue-billed duck occurs in freshwater to saline terrestrial wetlands (Birdlife International 2016).	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Pseudocheirus occidentalis</i> Western Ringtail Possum	Threatened – Critically Endangered	Threatened	The current distribution of the Western Ringtail Possum is patchy and largely restricted to the moister south-western corner of Western Australia (de Tores 2008), especially near coastal areas of peppermint ( <i>Agonis flexuosa</i> ) woodland and peppermint/tuart associations from the Australind/Eaton area to the Waychinicup National Park. The species occurs within the Esperance Plains, Jarrah Forest, and Warren IBRA Bioregions, as well as the South West and South Coast Natural Resource Management Regions.	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Rostratula australis</i> Australian Painted Snipe	Threatened – Endangered	Threatened	The Australian Painted Snipe occurs in shallow terrestrial wetlands, permanent and temporary lakes, swamps and claypans. They favour environments hosting tussocks of grass, sedges, rushes/reeds and samphire. They breed and nest in shallow wetlands with areas of bare wet mud and canopy cover nearby.	<b>Unlikely</b> due to a lack of suitable habitat within the project area.
<i>Sternula nereis nereis</i> Australian Fairy Tern	Threatened – Vulnerable	Threatened	The Australian Fairy Tern nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. This	<b>Unlikely</b> due to a lack of suitable habitat within the project area.

Species	Conservation status		Habitat description	Potential to occur
	EPBC Act	BC Act/ DBCA listing		
			species has also been found in embayments of a variety of habitats including offshore, estuarine or lake islands, wetlands and mainland coastlines.	
<i>Synemon gratiosa</i> Graceful Sunmoth	Not listed	Priority 4	The Graceful Sunmoth is associated with two habitat types, namely the coastal heathland on Quindalup dunes where the preferred host plant ( <i>Lomandra maritima</i> ) is abundant, and Banksia woodland on Spearwood and Bassendean dunes where the second known host plant ( <i>L. hermaphrodita</i> ) is widespread.	<b>Possibly</b> occurs within the project area due to presence of suitable habitat.
<i>Westralunio carteri</i> Carter's Freshwater Mussel	Threatened - Vulnerable	Threatened	The Carter's Freshwater Mussel occurs in freshwater lakes, rivers and streams in sandy or muddy sediments. Greatest densities associated with exposed submerged tree roots ( <i>Eucalyptus rudis</i> , <i>Melaleuca</i> spp. and others), woody debris and overhanging riparian vegetation near stream banks and edges of lakes/dams.	<b>Possibly</b> occurs within the project area due to presence of suitable habitat at north-western REW. However, based on <i>Naturemap</i> (DBCA 2019) search results, this species has not been recorded within 5km of the Subject Area.

### 3.7.1.1 Black cockatoo habitat

Habitat distribution mapping for CC and FRTBC identify the Subject Area within the non-breeding range of CC and within the potential breeding range of FRTBC (ERIN 2016a and b).

Broadly mapped potential feeding areas for Carnaby’s Cockatoo (DBCA *et. al* 2011) identify large intact areas of potential CC foraging habitat within the north-eastern portion of the Subject Area and within the Sandwich Lots. Several smaller pockets of potential CC foraging habitat occur adjacent to the REW in the north-western portion of the Subject Area, adjacent to Bush Forever site 268 and in the southern portion of the Subject Area.

Known and potential breeding sites have been mapped by DBCA *et. al* (2011). This mapping does not identify any known or potential breeding sites for CC within or adjacent to the Subject Area and Sandwich Lots. As outlined above, the Subject Area and Sandwich Lots are not within the known breeding range of CC or BC. The nearest confirmed breeding site for CC is located approximately 10.5 km to the north east of the Subject Area.

A search of the Great Cocky Count data set prepared by Birdlife WA (2018) identified one known roosting site within 2 km of the Subject Area and Sandwich Lots (site code: KWIWANR002). The roosting site is located to the east of the Subject Area. Five CC were recorded at the roosting site between 2010 and 2018, and no FRTBC were recorded from this roosting site.

No roosting sites were identified within the proposal area Birdlife WA (2018).

### 3.7.2 Field surveys

A number of publicly available fauna habitat surveys have been previously conducted across portions of the Subject Area, as outlined in Table 3.14.

**Table 3.14: Previous fauna habitat surveys conducted within the Subject Area**

Landholdings	Survey	Date of survey	Reference
The survey included the following titles within the Subject Area: <ul style="list-style-type: none"> <li>• Lot 10 on Plan 069890</li> <li>• Lot 2 on Plan 011392</li> <li>• Lot 53 on Plan 009780</li> <li>• Lot 4 on Plan 011392</li> <li>• Lot 664 on Plan 202790</li> <li>• Part Lot 791 on Plan 202790</li> <li>• Lot 663 on Plan 202790</li> <li>• Lot 665 on Plan 202618</li> <li>• Lot 666 on Plan 202618</li> <li>• Lot 667 on Plan 202618</li> <li>• Lot 668 on Plan 202618</li> <li>• Lot 2 on Diagram 039567</li> <li>• Lot 669 on Plan 202618</li> <li>• Lot 670 on Plan 202618</li> <li>• Lot 671 on Plan 202618</li> <li>• Lot 9002 on Plan 069132</li> <li>• Lot 9006 on Plan 70124</li> <li>• Lot 9002 on Plan 417428</li> </ul>	Flora, vegetation, fauna and wetland assessment	6 <sup>th</sup> and 7 <sup>th</sup> September 2005	Cardno 2005

Landholdings	Survey	Date of survey	Reference
The survey included the following titles within the Subject Area: <ul style="list-style-type: none"> <li>Lot 9002 on Plan 417428</li> <li>Lot 668 on Plan 202618</li> <li>Lot 669 on Plan 202618</li> <li>Lot 791 on Plan 202790</li> <li>Lot 663 on Plan 202790</li> <li>Lot 664 on Plan 202790</li> </ul>	Level 1 fauna survey and habitat assessment	<ul style="list-style-type: none"> <li>10<sup>th</sup> December 2010 (detailed habitat assessment)</li> <li>14<sup>th</sup> December 2010 and 17<sup>th</sup> January 2011 (reconnaissance fauna survey)</li> </ul>	Emerge 2011
The survey included the following titles within the Subject Area: <ul style="list-style-type: none"> <li>Lot 9006 on Plan 070124</li> <li>Lot 9002 on Plan 069132</li> </ul>	Black cockatoo habitat assessment	<ul style="list-style-type: none"> <li>28<sup>th</sup> June 2013</li> <li>2<sup>nd</sup> and 4<sup>th</sup> July 2013</li> </ul>	Strategen Environmental 2013
The survey included the following titles within the Subject Area: <ul style="list-style-type: none"> <li>Lot 10 on Plan 069890</li> <li>Lot 2 on Plan 011392</li> </ul>	Black cockatoo habitat assessment	10 <sup>th</sup> and 11 <sup>th</sup> October 2017	Strategen Environmental 2017

Surveys undertaken by Strategen Environmental (2017) and Emerge (2011) within portions of the Subject Area, identified potential nesting habitat trees, some with potentially suitable nesting hollows (>10 cm diameter). Subsequent to the above studies, a Strategen-JBS&G Senior Ecologist conducted two field surveys within vegetated lots on 24<sup>th</sup> October and 14<sup>th</sup> of November 2019, as well as 30 September and 1 October 2020. It is noted that access permission was not granted for Lot 503 (on Diagram 61498) and Lot 3 (on Diagram 050536), as such these lots have not been subject to a significant tree survey.

A total of 362 potential nesting habitat trees and 35 potentially suitable hollows (of at least 10 cm diameter) were identified within the Subject Area (Figure 3.9). The potential nesting habitat trees include the following species; *Eucalyptus marginata*, *Eucalyptus gomphocephala*, and *Eucalyptus rudis*.

A total of 48 potential nesting habitat trees and 8 potentially suitable hollows were identified within the Sandwich Lots, including the following species; *Corymbia calophylla*, *Eucalyptus marginata* (Figure 3.11).

An assessment of black cockatoo foraging habitat for each vegetation type recorded within the Subject Area and Sandwich Lots is presented in Table 3.15 and Table 3.16 respectively.

**Table 3.15: Black cockatoo foraging species recorded within the Subject Area**

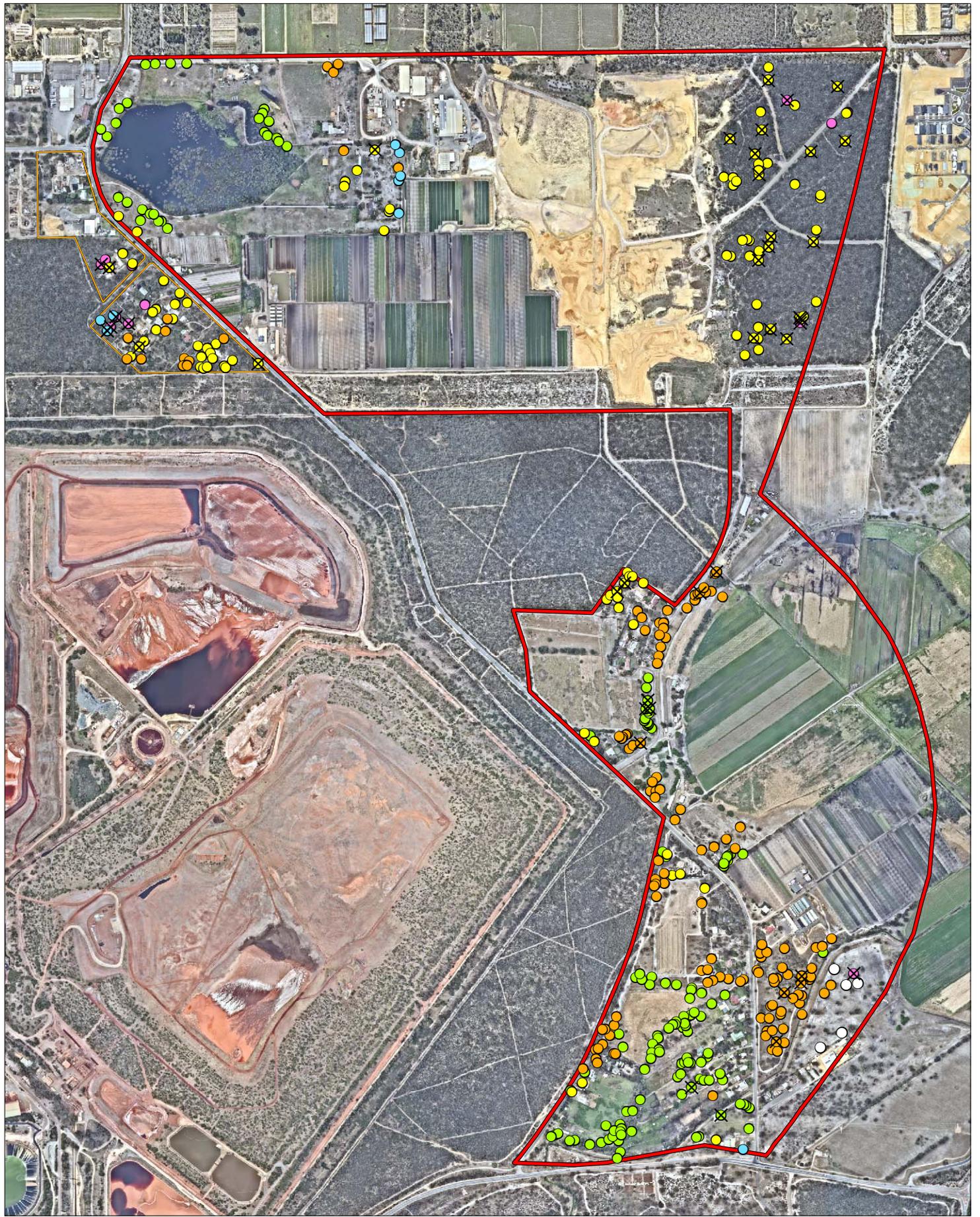
Vegetation type	Black cockatoo foraging species	Area of potential CC foraging habitat (ha)	Area of potential FRTBC foraging habitat (ha)
3	CC - <i>Eucalyptus rudis</i> , <i>Eucalyptus marginata</i> FRTBC - <i>Eucalyptus marginata</i> (Strategen 2019)	0.9	0.9
4	CC - <i>Eucalyptus rudis</i> , <i>Agonis flexuosa</i> , <i>Ficus</i> sp. FRTBC - None (Strategen 2019)	12.3	0
5	CC – <i>Eucalyptus gomphocephala</i> , <i>Eucalyptus rudis</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia menziesii</i> , <i>Xanthorrhoea preissii</i> FRTBC – <i>Allocasuarina fraseriana</i> (Strategen 2019).	4.9	4.9
6	CC – <i>Eucalyptus gomphocephala</i> , <i>Banksia menziesii</i> FRTBC – None (Strategen 2019).	1.2	0

Vegetation type	Black cockatoo foraging species	Area of potential CC foraging habitat (ha)	Area of potential FRTBC foraging habitat (ha)
7	CC - <i>Eucalyptus gomphocephala</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia attenuata</i> , <i>Xanthorrhoea preissii</i> , FRTBC - <i>Allocasuarina fraseriana</i> (Strategen 2019).	0.5	0.5
8	CC – <i>Eucalyptus marginata</i> , <i>Banksia attenuate</i> , <i>Allocasuarina fraseriana</i> , <i>Acacia saligna</i> , <i>Xanthorrhoea preissii</i> FRTBC - <i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i> (Strategen 2019)	0.2	0.2
9	CBC – <i>Eucalyptus marginata</i> , <i>Banksia menziesii</i> , <i>Xanthorrhoea preissii</i> , * <i>Corymbia maculata</i> , <i>Jacksonia furcellata</i> , <i>Hakea prostrata</i> FRTBC - <i>Eucalyptus marginata</i>	31.3	31.3
Revegetation	Mixed shrubland regrowth within powerline corridor. Unlikely to provide foraging habitat for CC or FRTBC.	10.9	10.9
Planted - Pines	Moderate (CBC and FRTBC)	2.4	2.4
Parkland Cleared	Open woodland of native tree species over non-native understorey. Poor (CBC) FRTBC - none.	8.27	8.27
Cleared	Cleared – varies between completely cleared for hardstand, housing or infrastructure, paddocks comprising introduced grass and herb species, and residential gardens planted with ornamental species. (Not considered to be native species). Unlikely to provide foraging habitat for CC or FRTBC.	257.4	257.4
Total area of VTs containing potential CC and FRTBC foraging habitat within the Subject Area (excludes “Cleared” areas)		72.87	51.1

**Table 3.16: Black Cockatoo foraging species recorded within the Sandwich lots**

Vegetation type	Black Cockatoo foraging species	Area of potential CC foraging habitat (ha)	Area of potential FRTBC foraging habitat (ha)
1	CC – <i>Corymbia calophylla</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia attenuate</i> , <i>Xanthorrhoea preissii</i> FRTBC - <i>Corymbia calophylla</i> , <i>Allocasuarina fraseriana</i> (Strategen 2019).	0.9	0.9
2	CC – <i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia grandis</i> , <i>Xanthorrhoea preissii</i> FRTBC - <i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i> (Strategen 2019).	0.7	0.7
4	CC - <i>Eucalyptus rudis</i> , <i>Agonis flexuosa</i> , <i>Ficus</i> sp. FRTBC – None (Strategen 2019).	0.2	0
7	CC - <i>Eucalyptus gomphocephala</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia attenuata</i> , <i>Xanthorrhoea preissii</i> , FRTBC - <i>Allocasuarina fraseriana</i> (Strategen 2019).	0.8	0.8

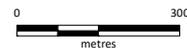
Vegetation type	Black Cockatoo foraging species	Area of potential CC foraging habitat (ha)	Area of potential FRTBC foraging habitat (ha)
8	CC – <i>Eucalyptus marginata</i> , <i>Banksia attenuate</i> , <i>Allocasuarina fraseriana</i> , <i>Acacia saligna</i> , <i>Xanthorrhoea preissii</i> FRTBC - <i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i> (Strategen 2019).	2.4	2.4
9	CBC – <i>Eucalyptus marginata</i> , <i>Banksia menziesii</i> , <i>Xanthorrhoea preissii</i> , * <i>Corymbia maculata</i> , <i>Jacksonia furcellata</i> , <i>Hakea prostrata</i> FRTBC - <i>Eucalyptus marginate</i> .	1.6	1.6
Parkland Cleared	Open woodland of native tree species over non-native understorey. Poor (CBC and FRTBC) habitat.	0.06	0.06
Cleared	Cleared – varies between completely cleared for hardstand, housing or infrastructure, paddocks comprising introduced grass and herb species, and residential gardens planted with ornamental species. (Not considered to be native species). Unlikely to provide foraging habitat for CC or FRTBC.	7.0	7.0
Total area of VTs containing potential CC and FRTBC foraging habitat within the Sandwich Lots (excludes “Cleared” areas)		6.66	6.46



**Legend:**

- Subject area
- Sandwich lots
- X Hollow present - potentially suitable

- Significant Black Cockatoo habitat trees
- *Corymbia calophylla*
  - *Eucalyptus gomphocephala*
  - *Eucalyptus marginata*
  - *Eucalyptus rudis*
  - *Eucalyptus* sp.
  - N/A



Mandagalup, WA

**BLACK COCKATOO HABITAT**

Job No: 57020

Scale 1:14,000 at A4

Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: cthatcher

Checked By: CC

Version: A

Date: 17-Dec-2020

**FIGURE: 3.9**

### 3.8 Conservation areas

*State Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region (SPP 2.8)* aims to provide a policy and implementation framework that ensures bushland protection and management issues throughout the Perth Metropolitan Region are adequately addressed and integrated with broader land use planning and decision-making (WAPC 2010). The policy predominantly deals with two distinct subjects, Bush Forever areas and local bushland areas.

In accordance with SPP 2.8, proposals must recognise regionally significant bushland and outline methods by which it will avoid, minimise and offset any likely adverse impacts it will have on regionally significant bushland.

#### 3.8.1 Bush Forever

Bush Forever site 393 is located within the north-western corner of the Subject Area (associated with Wattleup Lake). A small portion of Bush Forever site 268 is mapped within the Subject Area, within the Norkett Road reserve and Lot 3 on Diagram 050536 (Figure 3.10).

Additionally, the central and south-western portions of the Subject Area directly abut the large Bush Forever site (268), and the Sandwich Lots directly abut Bush Forever site 267. The northern-western portion of the Subject Area shares a common boundary with Bush Forever site 393.

The management of Bush Forever areas both within the Subject Area, and the interfaces with Bush forever areas abutting the Subject Area require consideration during planning of the IS. This is discussed further in Section 4.6.

#### 3.8.2 DBCA managed lands

There are no areas managed by DBCA within the Subject Area or Sandwich Lots. Nearby areas including parts of The Spectacles located approximately 40 m to the south, and Harry Waring Marsupial Reserve located approximately 800 m to the north, are conservation areas managed by DBCA.

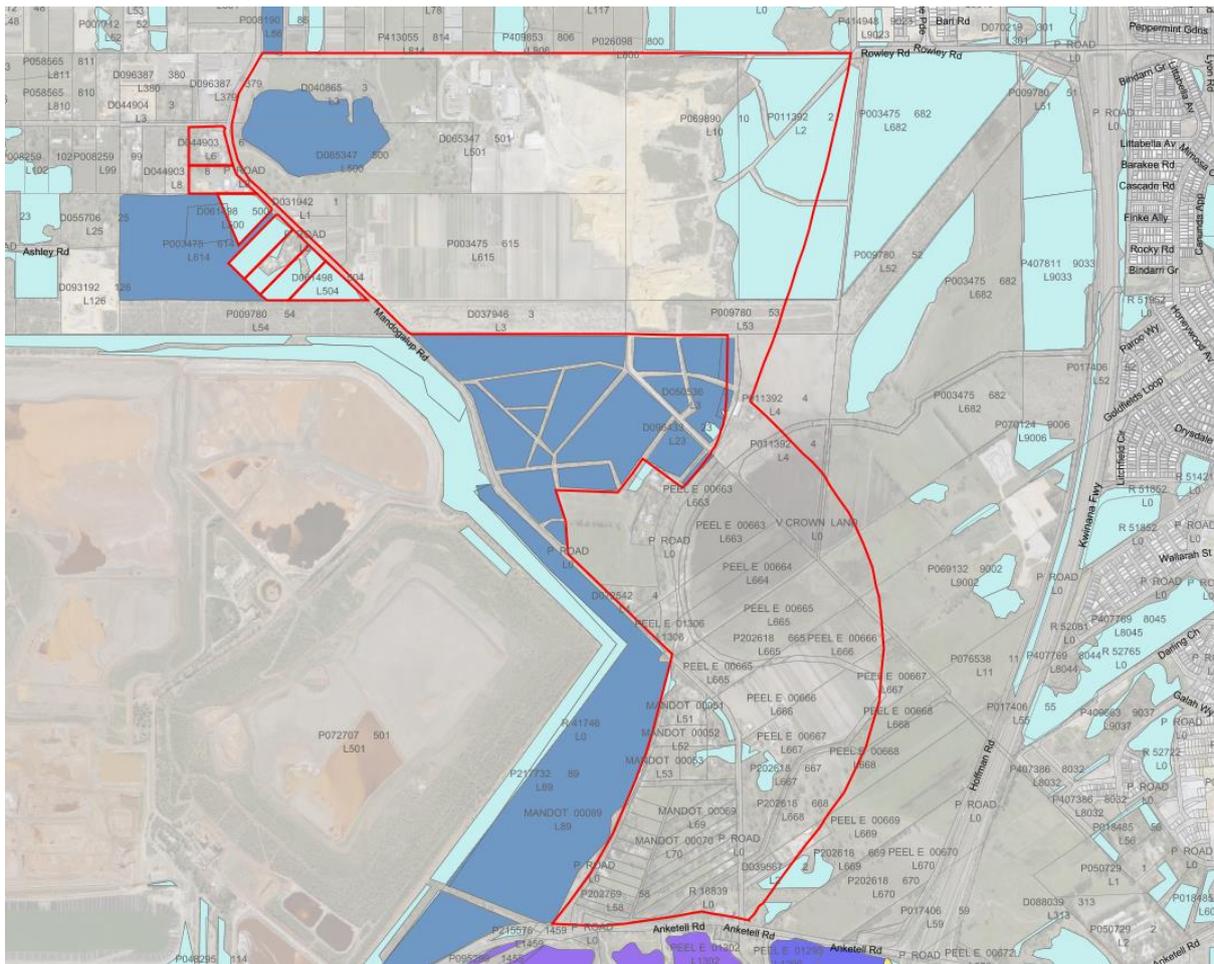
#### 3.8.3 Local Natural Areas

Local Natural Areas (LNAs) are natural areas that exist outside of Bush Forever Sites (Swan Coastal Plain), the CALM Managed Estate and Regional Parks. In the past these areas have been referred to as Local Biodiversity Areas. LNAs may be recognised by local government as priority areas for consideration in land use planning.

Local natural areas are mapped (WALGA 2019) within the north-eastern portion of the Subject Area, as well as in isolated patches in the southern parts of the Subject Area (Plate 2). The Sandwich Lots are also predominantly mapped as local natural areas.

It is noted that the largest and most intact LNA mapped within the Subject Area (Lots 2 and 10) is proposed to be cleared under a separate proposal, unrelated to the IS. This proposal is currently being assessed under the EPBC Act (EPBC 2018/8182) and under s. 38 of the EPA Act (EPA 2197). EPBC 2018/8182 and EPA 2197 depict an area of 4.1 ha which will be retained, including no less than 3.74 ha of vegetation.

Where possible, the IS will retain vegetation associated with mapped LNAs, as discussed in Section 4.6.



**Plate 2: LNAs as indicated in pale blue (darker blue depicts Bush Forever; WALGA 2019)**

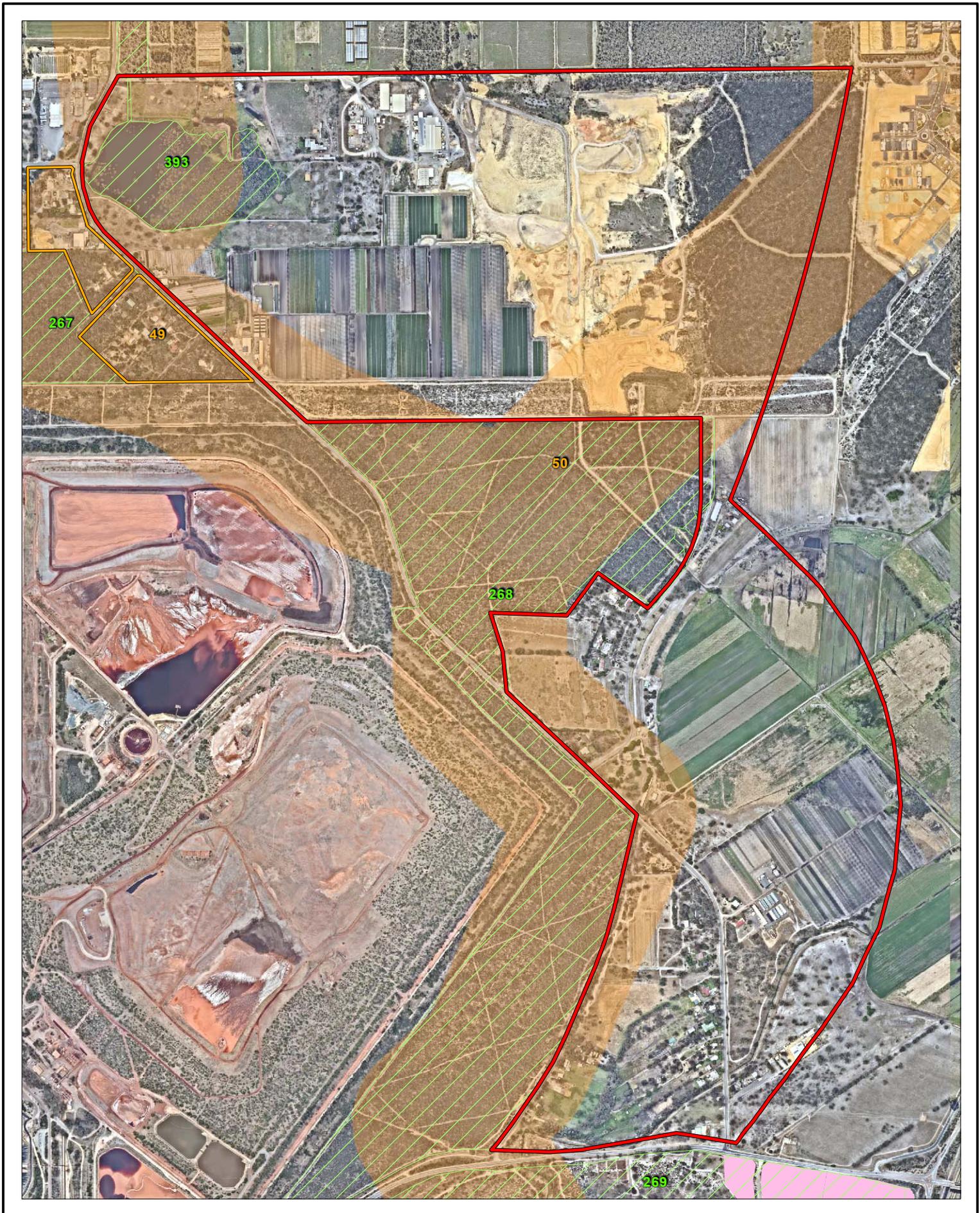
### 3.9 Ecological linkages

Regional Ecological Linkages link protected Regionally Significant Natural Areas by retaining the best condition conservation areas and local natural areas available between them that can act as stepping stones for flora and fauna (WALGA 2019).

Regional ecological linkages for the Perth Metropolitan Region were identified and mapped by the Perth Biodiversity Project in 2003. Spatial data maintained by WALGA (2003) identifies two regional ecological linkages mapped within the Subject Area (Linkage 49 and Linkage 50; Figure 3.10). Of these two linkages, Linkage 49 also occurs within the Sandwich Lots.

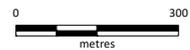
The mapped ecological linkages are largely associated with the conservation areas identified in Section 3.8, particularly Bush Forever sites.

Opportunities to retain and enhance conservation areas and ecological linkages are discussed in Section 4.6.



**Legend:**

- Subject area
- Sandwich lots
- Bush Forever site (DOP)
- Regional Ecological Linkages
- Legislated Lands and Waters (DBCA)
- Crown Freehold - Dept Managed



Mandogalup, WA

**CONSERVATION AREAS AND ECOLOGICAL LINKAGES**

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: cthatcher

Checked By: CoB

Version: A

Date: 17-Dec-2020

**FIGURE 3.10**

### 3.10 Contamination

The *Contaminated Sites Act 2003* (CS Act) defines contamination as having a substance present in land or water above background concentrations that presents a risk of harm to human health or the environment. The Act also provides for the identification, recording, management and remediation of contaminated sites. Contamination commonly occurs through accidental leakage and spillage, or poor site management practices.

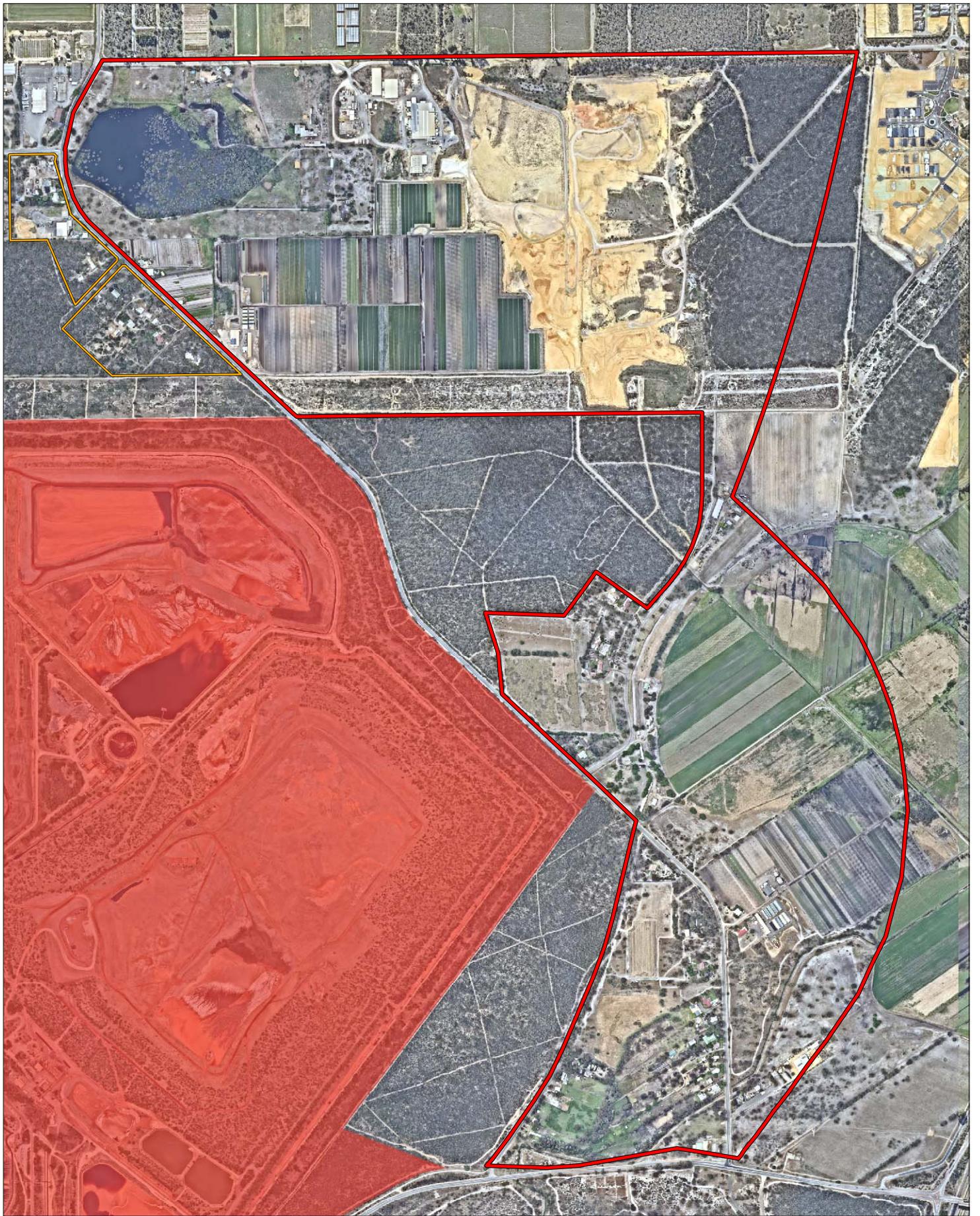
The *Contaminated Sites Database* (DWER 2019b) does not identify any registered contaminated sites within the Subject Area or Sandwich Lots. A registered contaminated site (status: remediation required) is located west of the Subject Area, associated with Alcoa's tailing ponds. The Basic Summary of Records (BSR) (Appendix C) identifies the nature of contamination as "alkali groundwater plumes are present beneath the Source Site".

The BSR makes reference to migration of contaminated water to another "affected site" to the east of Alcoa's landholding, and states that the affected site has been separately classified. However, it is noted that the *Contaminated Sites Database* (DWER 2019b) does not identify any registered contaminated sites, east of the Alcoa landholding, in the local vicinity. As such, it is possible that there are landholdings within or immediately adjacent to the Subject Area and Sandwich Lots that are classified as potentially contaminated (as a result of contaminated groundwater migration) and investigations required. Further investigation and/ or liaison with DWER and Alcoa will likely be required to determine the extent of any contamination affecting the Subject Area and Sandwich Lots, from Alcoa land uses.

It is noted that a number of market garden operations currently occur, or have previously operated within the Subject Area. The *Contaminated Sites Guidelines* (DER 2014b) identify market gardens as a potentially contaminating land use as a result of the potential for contaminants (such as metals, acids, paint residue, alkalis, solvents, salts, hydrocarbons or cyanide) to be discharged to the environment.

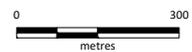
Additionally, a number of buildings (residences, sheds, workshops) occur across the Subject Area and Sandwich Lots that potentially contain asbestos or other hazardous materials.

A preliminary site investigation should be undertaken prior to development, to determine the potential nature of contamination (if any) across the Subject Area and Sandwich Lots, and to develop and implement a sampling and analysis plan where further investigations are warranted.



**Legend:**

- Subject area
- Sandwich lots
- Contaminated sites (DWER-059)
- Contaminated - remediation required



Mandogalup, WA

**CONTAMINATED SITES**

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: cthatcher

Checked By: CoB

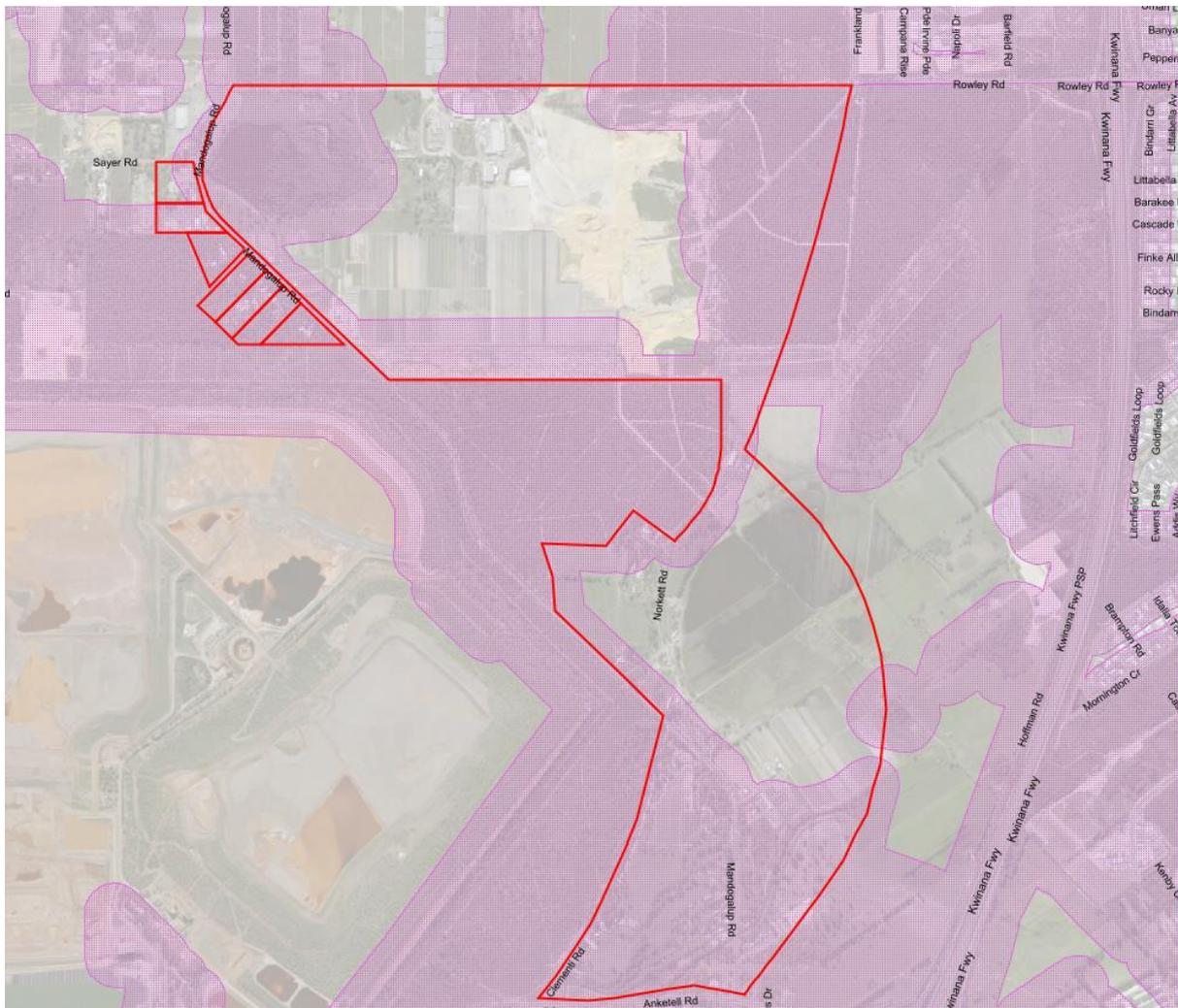
Version: A

Date: 17-Dec-2020

**FIGURE 3.11**

### 3.11 Bushfire risk

Portions of the Subject Area and Sandwich Lots are identified as bushfire prone areas (OBRM 2019), as shown in Plate 3.



**Plate 3: Map of Bushfire Prone Areas (OBRM 2019)**

As a result of the bushfire prone status of the Subject Area, a Bushfire Management Plan (BMP) is required to accompany the IS strategic planning proposal, to address the following requirements of *State Planning Policy 3.7 Planning in Bushfire Prone Areas (SPP 3.7)*, namely Policy Measure 6.3:

- a bushfire hazard level (BHL) assessment or where lot layout is known, a Bushfire Attack Level (BAL) contour assessment to determine the indicative acceptable BAL ratings across the Subject Area
- identification of any bushfire hazard issues arising from the above assessment
- assessment against the bushfire protection criteria requirements contained within the Guidelines demonstrating compliance can be achieved in subsequent planning stages.

A BMP is being prepared in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (the Guidelines; WAPC 2017), as discussed further in Section 4.8.

It is understood that residential development is occurring to the north-east of the Subject Area, and the majority of the vegetation in the north-eastern portion of the Subject Area (Lots 2 and 10) is

proposed to be cleared. As such, it is anticipated the predominant and permanent bushfire hazards will be associated with the Bush Forever sites located to the south, west and north of the Subject Area. Where the development interfaces with intact vegetation, appropriate separation to development (habitable buildings) to achieve a bushfire attack level (BAL) rating of BAL-29 or lower will be required.

Additionally, the development will be required to ensure adequate water supply for firefighting purposes, and appropriate vehicular access and egress provisions for residents and emergency services in accordance with the Guidelines. This is discussed further in Section 4.8.

### 3.12 Heritage

#### 3.12.1 Indigenous heritage

The *Aboriginal Heritage Act 1972* (AHA Act) aims to protect Aboriginal heritage by registering Aboriginal sites (places and/or objects) that are of cultural importance to Aboriginal people. Any proposal to use or alter an area of land, for purposes such as research or development, must first determine if Aboriginal sites occur within the proposed area. If an Aboriginal site is found to occur, permission must be sought from the Minister for Aboriginal Affairs before that land can be used or altered in any way.

A search of the Department of Planning, Lands and Heritage – Aboriginal Heritage Places mapping tool (DPLH 2017) found no registered Aboriginal heritage sites within the Subject Area or Sandwich Lots.

Two “Other Heritage Places”, Mandogalup Swamp Spectacles (Place ID: 3427, Type: Mythological, Hunting Place, Water Source) and Norkett Road (Place ID: 4360, Type: Artefacts/Scatter) intersect with the Subject Area but have a status of “Stored Data/Not a Site” and therefore do not meet the criteria to be considered a registered site.

#### 3.12.2 European heritage

European cultural heritage places are recorded in a variety of different heritage listings. Some of these listings give statutory protection to heritage places, through requirements for heritage-related approvals or referrals. These are listed below:

**Table 3.17: Listing categories of European cultural heritage places**

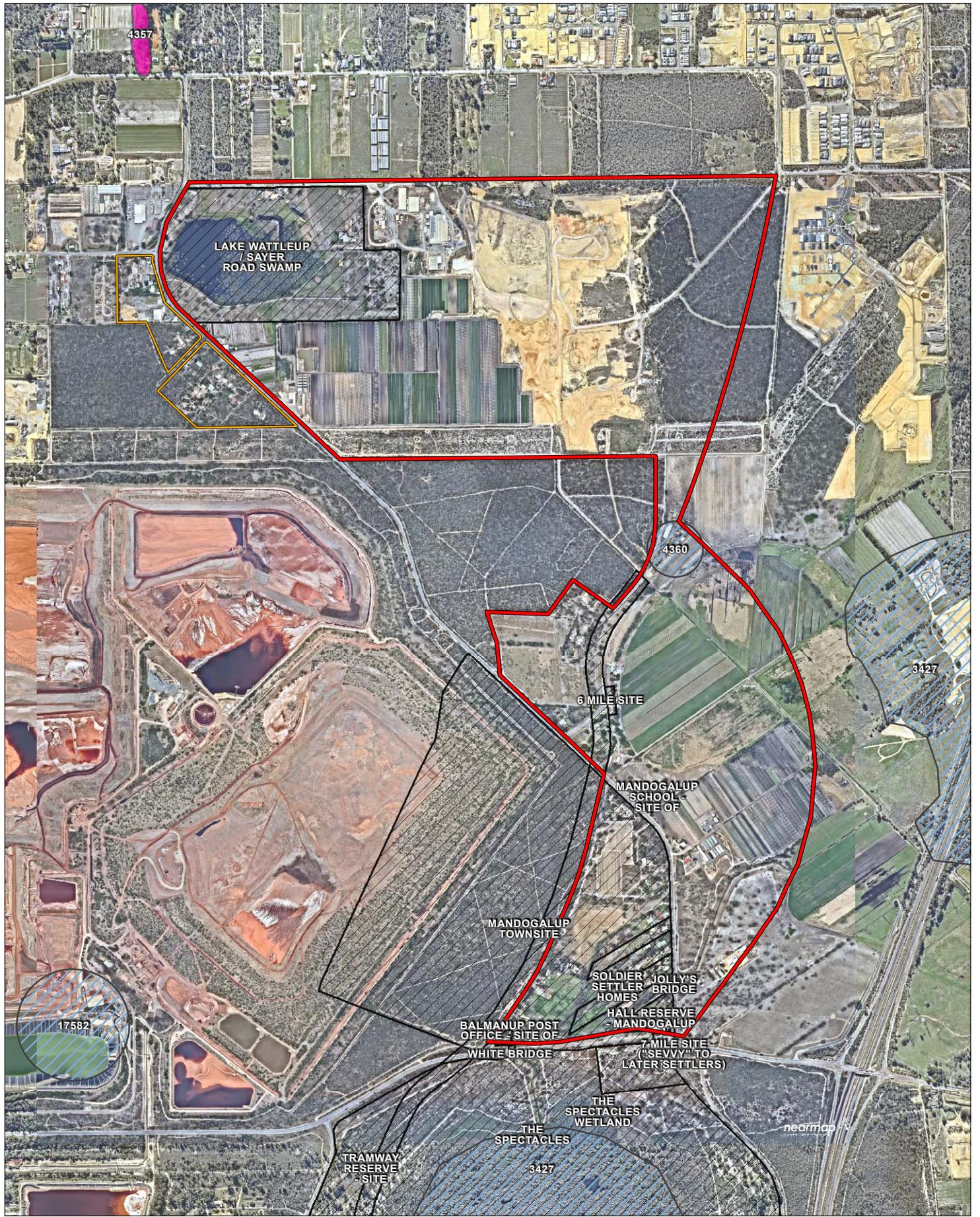
Type	Organisation	Legislation	What is listed
State register	Heritage Council (assisted by the Department of Planning, Lands and Heritage [DPLH])	<i>Heritage Act 2018</i> and <i>Heritage Regulations 2019</i>	Places of State significance included in the State Register of Heritage Places
Conservation Order	Heritage Council (assisted by DPLH)	<i>Heritage Act 2018</i> and <i>Heritage Regulations 2019</i>	Places of State significance or potential State significance (special cases)
Heritage Agreement	Heritage Council (assisted by DPLH)	<i>Heritage Act 2018</i> and <i>Heritage Regulations 2019</i>	Places protected by long-term agreement between the parties
Heritage List	Local Governments	<i>Planning and Development Act 2005</i>	Places of local heritage significance
National Heritage List	Australian Heritage Council	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Places of national significance

A search of the *inHerit* database identified 10 heritage places as listed below in Table 2.1, 9 of which are on the City’s Municipal Inventory. None are listed as State Registered Places or Places of National Significance.

**Table 3.18: European heritage sites mapped within the Subject Area**

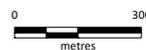
Place Number	Place Name	Statutory Listings	Other listings
12087	Mandogalup Post Office (fmr)	N/A	Municipal Inventory Adopted 13 May 1998 (City of Kwinana)
12100	Hall Reserve - Mandogalup	N/A	Municipal Inventory Adopted 13 May 1998 (City of Kwinana)
12123	Mandogalup School Cottage - site	N/A	N/A
12130	7 Mile Site ("Sevvy" to later settlers)	N/A	Municipal Inventory Adopted 13 May 1998 (City of Kwinana)
12106	Lake Wattleup / Sayer Road Swamp	N/A	Municipal Inventory Adopted 13 May 1998 (City of Kwinana)
12111	Mandogalup School - Site of	Heritage List Adopted 20 Nov 1992 (City of Kwinana)	Municipal Inventory Adopted 13 May 1998 (City of Kwinana)
12125	Mandogalup Townsite	N/A	Municipal Inventory Adopted 13 May 1998 (City of Kwinana)
12114	Jolly's Bridge	N/A	Municipal Inventory Adopted 13 May 1998 (City of Kwinana)
12129	6 Mile Site	N/A	Municipal Inventory Adopted 13 May 1998 (City of Kwinana)
12092	Soldier Settler Homes, Mandogalup	N/A	Municipal Inventory Adopted 13 May 1998 (City of Kwinana)

Sites listed by local governments on their municipal inventories are generally considered significant to their local community.



**Legend:**

- Subject area
- Sandwich lots
- Municipal Inventory (SHO-005)
- Aboriginal Heritage Places (DAA-001)
- Other Heritage Place
- Registered Site



Mandogalup, WA

**INDIGENOUS AND EUROPEAN HERITAGE**

Job No: 57020

Scale 1:18,000 at A4

Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: cthatcher

Checked By: CoB

Version: A

Date: 17-Dec-2020

**FIGURE: 3.12**

## 4. Potential impacts, management and approvals

The potential impacts, management and approval requirements associated with the attributes identified in Section 3, are discussed in this section.

The environmental, bushfire and heritage considerations discussed in this section that require a spatial response are depicted in Figure 4.1. It is noted that noise contours are not mapped on this figure, and are displayed in the report produced by Lloyd George Acoustics (2020).

### 4.1 Surrounding land use

#### 4.1.1 Major roads

The proximity of major roads; Kwinana Freeway, Anketell Road and Rowley Road (potential future extension along northern Subject Area boundary) to the Subject Area is an important consideration in determining appropriate placement of sensitive land uses, as a result of potential noise implications.

*State Planning Policy 5.4 Road and Rail Noise (SPP 5.4)* has been prepared for the purpose of minimising the impact of road and rail noise on noise-sensitive land use and development within specified trigger distances of strategic freight and major traffic routes and other significant freight and traffic routes. This policy applies where there is proposed noise-sensitive land use within the policy's trigger distance of a transport corridor, as specified in Table 1 of SPP 5.4. Through its objectives, SPP 5.4 seeks to:

- protect the community from unreasonable levels of transport noise
- protect strategic and other significant freight transport corridors from incompatible urban encroachment
- ensure transport infrastructure and land-use can mutually exist within urban corridors
- ensure that noise impacts are addressed as early as possible in the planning process
- encourage best practice noise mitigation design and construction standards.

A set of noise targets for noise-sensitive land use is outlined in Table 4.1, which are to be achieved by proposals under which SPP 5.4 applies.

**Table 4.1: Noise targets for noise-sensitive land uses as defined in SPP 5.4.**

Outdoor noise target		Indoor noise target	
55 dB $L_{Aeq}(\text{Day})$	50 dB $L_{Aeq}(\text{Night})$	40 dB $L_{Aeq}(\text{Day})$ (Living and work areas)	35 dB $L_{Aeq}(\text{Night})$ (Bedrooms)

Given that development is proposed within the specified trigger distance to strategic freight and major traffic routes, namely Kwinana Freeway to the east and Anketell Road to the south, a Transportation Noise Assessment has been undertaken by Lloyd George Acoustics (Lloyd George Acoustics 2019) for the Subject Area to determine the level of exposure to traffic and freight noise.

Two noise receivers were placed along Kwinana Freeway and Anketell Road to measure the average noise levels from each of these traffic routes, which are presented in Table 4.2 and Table 4.3 below.

**Table 4.2: Measured average noise levels – Kwinana Freeway**

Date	Average Weekday Noise Level (dB)			
	$L_{A10,18\text{hour}}$	$L_{Aeq,24\text{hour}}$	$L_{Aeq}(\text{Day})$	$L_{Aeq}(\text{Night})$
Monday 21 October 2019	73.4	69.9	71.0	66.1
Tuesday 22 October 2019	72.8	69.5	70.8	64.2
Wednesday 23 October 2019	74.0	71.1	72.0	68.5
Thursday 24 October 2019	74.0	71.0	71.9	68.2
Friday 25 October 2019	74.0	70.9	71.8	68.1
<b>Weekday average</b>	<b>73.6</b>	<b>70.5</b>	<b>71.5</b>	<b>67.0</b>

**Table 4.3: Measured average noise levels – Anketell Road**

Date	Average Weekday Noise Level (dB)			
	L <sub>A10,18hour</sub>	L <sub>Aeq,24hour</sub>	L <sub>Aeq (Day)</sub>	L <sub>Aeq (Night)</sub>
Friday 15 November 2019	65.1	65.0	63.9	66.6
Monday 18 November 2019	64.5	62.1	62.3	61.8
Tuesday 19 November 2019	62.5	60.0	60.2	59.4
Wednesday 20 November 2019	66.8	66.2	65.6	67.3
Thursday 21 November 2019	64.8	66.3	66.1	66.8
<b>Weekday average</b>	<b>64.8</b>	<b>63.9</b>	<b>63.6</b>	<b>64.4</b>

Based on the measured average noise levels for Kwinana Freeway and Anketell Road, Lloyd George Acoustics (2020) have recommended that future premises with a noise-sensitive nature be located away from these traffic routes, and that premises not considered to be noise-sensitive be located nearer to these routes to provide potential noise barrier effects to sensitive land uses behind them. Where future noise sensitive premises are located in areas above the outdoor noise targets, Lloyd George Acoustics (2020) have recommended treatments including noise walls and quiet house design packages.

It is noted that the noise assessment has not considered the potential extension of Rowley Road (and associated Westport development) or Hammond Road. Additional studies are to be undertaken to understand the potential implications of these roads.

#### **4.1.2 Market gardens**

A number of market gardens exist, both within and surrounding the Subject Area. Market gardens are potentially contaminating land uses (DER 2014b) and are known to generate gaseous, dust, noise and odour emissions. As a result of these potential emissions, the EPA recommend a separation buffer between market gardens and sensitive land uses (such as residential land uses) ranging from 300 m to 500 m depending on the size of the operation (EPA 2005). It is noted that a reduced separation distance may be supported where technical studies demonstrate that risks associated with potential emissions are mitigated.

Research has shown a single row of trees is effective in capturing up to 80 per cent of pesticide spray drift from an application upwind (Harden cited in DNR, 1997) and that a 20m vegetated buffer (with 10 m cleared either side, total 40 m) containing a mix of species and foliage types will reduce spray drift to less than 1 per cent at the sensitive receptor (Centre of Pesticide Application and Safety, University of Queensland cited in DNR, 1997). The Department of Health provides the following requirements for vegetative buffers to be effective barriers to spray drift:

- be located as close as practicable to the point of release of the spray
- be a minimum total width of 40 m made up of 10 m cleared fire break area either side of a 20 m wide planted area
- contain random plantings of a variety of tree and shrub species of differing growth habits, at spacings of 4 to 5 m
- include species with long, thin (needle-like) and rough (furry/hairy) foliage which facilitates the more efficient capture of spray droplets and which are fast growing and hardy
- foliage should be from the base to the crown; mixed plantings of trees may be required to ensure there are no gaps in the lower canopy
- provide a permeable barrier which allows air to pass through the buffer – a porosity of 0.5 is acceptable (that is, approximately 50 per cent of the screen should be air space)
- have a mature tree height twice the height of the spray release height

- have mature height and width dimensions which do not detrimentally impact upon adjacent crop land.

Consideration of appropriate setbacks and interface treatments between sensitive land uses and market gardens will be required for both market gardens external to the Subject Area, and market gardens within the Subject Area (including during land use transition).

#### 4.1.3 Alcoa operations

As outlined in Section 3.1.3, air quality considerations associated with Alcoa's operations are not discussed in this report.

In addition to air quality considerations, Alcoa's operations have resulted in classification of Lot 501 (on Plan 72707) as a contaminated site under *the Contaminated Sites Act 2003*. Implications associated with contaminated sites status of these land holdings is discussed further in Section 4.7.

#### 4.1.4 Conservation areas

The Subject Area and Sandwich Lots abut a number of conservation areas (Figure 3.10), including:

- Bush Forever site 268
- Bush Forever site 267
- Bush Forever site 393.

Additionally, the Spectacles is located approximately 40 m to the south.

The above conservation areas require consideration in relation to interface treatments to protect these conservation areas from future development, as well as consideration in relation to providing appropriate separation to protect future development from associated bushfire hazards.

Policy measures for the protection of Bush Forever sites are outlined in SPP2.8. SPP 2.8 applies to any proposal or decision-making that is likely to have an adverse impact on regionally significant bushland within a Bush Forever area. SPP 2.8 defines an adverse impact as *"a significant indirect impact on a Bush Forever area through development directly abutting regionally significant bushland that is likely to result in, but not limited to, significant hydrological impacts, the spread of dieback, direct drainage into regionally significant bushland, significant access and weed infestation issues, fire management issues and other significant management implications or threatening processes arising from development."*

To avoid potential adverse impacts to Bush Forever, appropriate interface treatments should be applied. These measures should be determined in consultation with Department of Biodiversity, Conservation and Attractions, the City and land owners/ managers of Bush Forever sites, and may include:

- Conservation fencing and signage to restrict pedestrian/ vehicular access
- Appropriate batter grades, as determined in consultation with the DBCA/Bush Forever site manager, so that vegetation within the Bush forever sites is not adversely impacted by development
- Appropriate management of stormwater onsite (i.e. no direct drainage into Bush Forever)
- Development and implementation of weed and Dieback hygiene controls during construction.

It is noted that bushfire risk and management is discussed in Section 4.8.

## 4.2 Geology and soils

Regional geological mapping (Gozzard 1983) identifies three geological units within the Subject Area and Sandwich Lots; SANDY SILT (Ms<sub>5</sub>), SAND (S<sub>7</sub>) and SAND (S<sub>8</sub>).

The Ms<sub>5</sub> geological unit is limited to wetland areas. The S<sub>7</sub> unit occurs predominantly in the western portions of the Subject Area and Sandwich Lots, while S<sub>8</sub> occurs predominantly in the eastern portion.

Table outlines the compatibility of each of these soil types with waste disposal, road construction, urbanisation and excavation.

**Table 4.4: Soil and land use compatibility (Gozzard 1983)**

Soil type	Suitability for specified use						Notes
	Solid waste disposal	Liquid waste disposal	Septic tanks	Road construction	Urbanisation	Excavation (mining and quarrying)	
SANDY SILT (Ms <sub>5</sub> )	Activity undesirable for the environment	Activity undesirable for the environment	Activity undesirable for the environment	Possible problems for activity	Activity undesirable for the environment	Possible problems for environment	High water table, prone to flooding, differential settlement may occur.
SAND (S <sub>7</sub> )	Possible problems for environment	Possible problems for environment	Possible problems for environment	Activity compatible	Activity compatible	Activity compatible	Few limitations, some settlement under foundations can be expected, some ability to attenuate pollutants due to small clay content, usually considerable depth to water table due to topography.
SAND (S <sub>8</sub> )	Possible problems for environment	Activity undesirable for the environment	Possible problems for environment	Activity compatible	Activity compatible	Activity compatible	Well drained, when vegetation free it could be remobilised (subject to erosion, drainage disposal is only a problem in areas of high water table.

Development should avoid areas of SANDY SILT associated with the REW in the north-western portion of the Subject Area. Where development is proposed in SANDY SILT across other parts of the Subject Area, the importation of fill (or cut-fill) will likely be required to achieve appropriate separation to groundwater.

Areas of SAND are expected to be compatible with urbanisation and the construction of roads.

Based on land use compatibility described by Gozard (1983), development should be connected to sewer to avoid potential environmental impacts. Where this cannot be achieved, a land capability assessment for onsite effluent disposal would be required, and compliance with the *Government Sewerage Policy 2019* would need to be demonstrated.

The onsite geological environment, and land use suitability should be determined by geotechnical investigations and recommendations prior to development occurring.

## 4.3 Hydrology

### 4.3.1 Groundwater

As outlined in Section 3.4.1, groundwater is expected to be above natural surface level in the north-western corner of the Subject Area and groundwater in the southern portions of the Subject Area is anticipated to range from “at surface” to over 15 m below ground level.

Appropriate separation (1.2 m) between building floor level and the maximum expected groundwater table is required, in accordance with *Better Urban Water Management* (DoW 2008). Prior to development, groundwater monitoring should be undertaken to confirm maximum groundwater levels.

A number of groundwater bores and associated abstraction licences currently exist across the Subject Area and Sandwich Lots. Groundwater abstraction licences are able to be transferred to new landowners and therefore these bores could be utilised for groundwater abstraction where required, such as for construction purposes or irrigation of public open space.

The suitability of groundwater for abstraction may need to be confirmed through water quality sampling, particularly noting the potential for contamination of groundwater migrating from Alcoa's operations (discussed in Section 4.7).

Separately, development of the Subject Area and Sandwich Lots will be required to demonstrate how groundwater will be managed to ensure pre-development groundwater conditions are maintained in accordance with *Better Urban Water Management* (DoW 2008) guidelines and will be addressed through the standard water management requirements of the planning process, including:

- A District Water Management Plan to support future rezoning
- A Local Water Management Plan to support future Structure Plans
- An Urban Water Management Plan to support future Subdivision applications.

A hydrological report is being prepared by JDA Consultant Hydrologists to support the Improvement Scheme.

#### **4.3.2 Surface water**

As outlined in Section 3.4.3, the Peel main drain traverses the IS area and plays an important ecological function to the local wetland network.

Pre-development surface water conditions will be maintained within future development areas in accordance through development of District, Local and Urban Water Management Plans, where required.

A hydrological report is being prepared by JDA Consultant Hydrologists to support the Improvement Scheme.

#### **4.3.3 Geomorphic wetlands**

As outlined in Section 3.4.4, a Resource Enhancement Wetland occurs within the north-western portion of the Subject Area. The management objective for REWs is to restore these wetlands through maintenance and enhancement of wetland functions and attributes. The REW will be retained and an appropriate buffer applied from any development.

While there is no formal policy for wetlands and associated buffers, guidance is provided in the EPA (2008) *Environmental Guidance for Planning and Development* (Guidance Statement (GS) 33) and the DPLH (2005) *Draft guideline for the determination of wetland buffer requirements*. As outlined in GS 33, there are many land uses that can result in an adverse impact to wetlands if not appropriately managed. These include, but are not limited to:

- clearing of vegetation
- draining water into or out of a wetland
- filling with soil or other material
- direct discharge or disposal of stormwater and/or effluent into the wetland or its buffer

- use, storage or disposal of nutrients or chemicals
- waste disposal or processing
- dewatering
- use of fertilisers, sprays (for example, sprays for midge and mosquito control) and watering (irrigation)
- recreational activities, which may contribute to compaction of ground, damage to vegetation, introduction of weeds, rubbish
- disturbance of acid sulfate soils (see Section 4.9)
- any other works or development in the wetland or its buffer.

The buffer adjoining a wetland helps to maintain the ecological processes and functions associated with the wetland, and aims to protect the wetland from potential adverse impacts (EPA 2005). The EPA (2005) outlines that wetlands that are to be protected require a minimum 50 metre buffer distance, or alternatively a site-specific buffer requirement may be determined. A separation buffer of 30 m is generally accepted by regulatory agencies, between the mapped boundary of the REW and development. Where the 30 m buffer area is degraded, occasionally a reduced buffer can be accepted where there is an improved environmental outcome. For example, a 20 m buffer could potentially be accepted, if the 20 m area is revegetated, and land uses adjacent to the buffer are passive and compatible with the objectives for REWs.

It is noted however, that the REW occurs within BF and that additional separation to development may be warranted. There is a possibility that due to the presence of standing water and native vegetation surrounding the wetland, the REW may be viewed with greater conservation significance and a 50 m buffer recommended by DBCA.

As the wetland is an REW, and is located within a Bush Forever site, development within the wetland itself would not be permissible. Any land uses proposed within the wetland buffer would need to be commensurate with the objectives for REWs, being, maintenance and enhancement of wetland functions and attributes, as well as the objectives of SP2.8. As such, uses within the buffer may include vegetation protection, rehabilitation, and potentially passive land uses in degraded areas, where agreed to by WAPC in consultation with DBCA and the land owner/ manager.

#### **4.4 Vegetation and flora**

As a result of historic land uses within the Subject Area and Sandwich Lots (such as market gardening), intact vegetation is limited. Of the areas subject to a flora and vegetation survey within the Subject Area, approximately 72% of these areas are mapped as "cleared". Of the areas subject to a flora and vegetation survey within the Sandwich Lots, approximately 48% of these areas are mapped as "cleared".

As outlined in Section 3.6 the following TECs and PECs are present within the Subject Area and Sandwich Lots:

- Banksia woodlands of the Swan Coastal Plain (TEC under EPBC Act; Priority 3 PEC listed by DBCA)
- Tuart woodlands and forests of the Swan Coastal Plain (TEC under EPBC Act; Priority 3 PEC listed by DBCA).

Given the limited vegetation within the Subject Area, development should be concentrated in areas which are mapped as "completely degraded" and "degraded". Areas of vegetation which are of "good" quality or better, should be prioritised for retention, where possible.

Based on the flora and vegetation surveys undertaken to date, no Threatened and one Priority flora species, *Dodonaea hackettiana* (P4) has been recorded (in intact remnant native vegetation within the road verge on the western side of Norkett Road). Priority 4 species are species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons. Priority 4 species are not formally protected but are considered during the planning and approvals process and where possible, development should avoid clearing of this species.

Any vegetation, trees and flora proposed to be retained as part of future development can be protected through construction management practices including:

- Demarcation with flagging tape
- Identification of root protection zones
- Dieback hygiene management
- Weed hygiene management
- Dust controls.

#### 4.5 Fauna and habitat

The following conservation significant fauna species are considered to possibly or likely occur, or are known to occur within the Subject Area and/ or Sandwich Lots:

- *Calyptorhynchus banksii naso* (Forest Red-tailed Black-Cockatoo; FRTBC)- Threatened (EPBC Act/ BC Act)
- *Calyptorhynchus latirostris* (Carnaby's Cockatoo; CC)
- *Falco peregrinus* (Peregrine Falcon)
- *Isoodon fusciventer* (Quenda)
- *Lerista lineata* (Perth Slider)
- *Neelaps calonotos* (Black-striped Snake)
- *Synemon gratiosa* (Graceful Sunmoth).

Additionally, 17 conservation significant migratory wetland species may utilise the REW in the north-western portion of the Subject Area. These species however, are likely to favour the larger wetlands located north and south of the Subject Area; Thomsons Lake and The Spectacles (respectively).

A total of 82.87 ha of CC foraging habitat and 51.1 ha of FRTBC foraging habitat has been identified within the Subject Area, excluding cleared areas which may provide additional habitat. A total of 6.66 ha of CC foraging habitat and 6.46 ha of FRTBC habitat has been identified within the Sandwich Lots, excluding cleared areas. A portion of the black cockatoo habitat mapped within the Subject Area is contained within Lots 2 and 10 and is proposed to be cleared to facilitate sand extraction for a separate proposal, which is currently subject to assessment under the Commonwealth EPBC Act and State EP Act (EPBC 2018/8182 and EPA 2197). Pending the outcome of these assessments and any areas negotiated for retention, the amount of black cockatoo habitat remaining within the Subject Area or Sandwich Lots, at the time of development may be reduced.

A total of 362 potential nesting habitat trees and 35 potentially suitable hollows have been identified within the Subject Area (Figure 3.9; species including *Eucalyptus marginata*, *Eucalyptus gomphocephala*, *Eucalyptus rudis*, *Corymbia calophylla*).

A total of 48 potential nesting habitat trees and 8 potentially suitable hollows have been identified within the Sandwich Lots (Figure 3.9; species including *Corymbia calophylla*, *Eucalyptus marginata*).

Where possible, future development should avoid impacts to black cockatoo habitat including significant trees, particularly those with potentially suitable nesting hollows. Any rehabilitation proposed (such as of the REW or ecological linkages) or landscaping, should consider use of black cockatoo foraging, roosting and breeding species, to create habitat for these threatened species. Additionally, consideration should be given to the creation of habitat for other avian and ground dwelling fauna (such as within public open space, Bush Forever site 268 or ecological linkages) where development constraints permit.

Fauna habitat to be retained should be protected through construction management measures, such as demarcation of retention areas prior to clearing taking place. Additionally, fauna relocation and pre-clearing hollow inspections can be undertaken in accordance with any conditions of future subdivision approvals, development approvals or clearing approvals.

Where significant residual impacts are anticipated to State listed species, the EPA may choose to assess the scheme amendment.

Where significant residual impacts are anticipated to Commonwealth listed MNES, an EPBC Act referral will be warranted.

#### **4.6 Conservation areas and ecological linkages**

A number of conservation areas are located within and adjacent to the Subject Area and Sandwich Lots, as outlined in Section 3.8 and displayed in Figure 3.10. These conservation areas are “connected” via mapped regional ecological linkages.

The IS provides opportunities to retain and enhance conservation areas and ecological linkages through retention of vegetation and trees, as well as the creation of ecological linkages or “green links”, where development constraints permit.

Ecological linkages are intended to serve as stepping stones of habitat which facilitate the maintenance of ecological processes and the movement of organisms within, and across, a landscape (WALGA and DEC 2009). To serve this function, ecological linkages are preferred to be >500 m in width, and not less than 100 m in width (Davis 2008, Saunders *et al.* 1991, Mason *et al.* 2006, Major *et al.* 1999).

The most obvious opportunity to enhance the existing mapped regional ecological linkage is within and surrounding Bush Forever site 393, including the REW and associated buffer, where rehabilitation would result in an improved environmental outcome. Vegetation within the Sandwich Lots also currently contributes to the north-western ecological linkage.

It is understood however that development constraints (such as bushfire risk) may make formal ecological linkages difficult to achieve. As an alternative, “green links” could be proposed. Where any local or public open space is proposed, landscaping with native vegetation can be utilised for the purpose of habitat creation, whilst ensuring that bushfire hazards are appropriately managed. Native vegetation planting and tree retention could also be accommodated within road reserves to achieve green linkages. Additionally, any Asset Protection Zones (APZs) required (as outlined in Section 4.8) can retain up to 15% canopy cover and may contain ground cover in a managed state (as per Appendix D).

#### **4.7 Contamination**

A number of potential contamination sources have been identified as part of the desktop assessment of this EAR, both within and adjacent to the Subject Area. These include:

- Potential contamination of groundwater associated with Alcoa’s operations

- Potential contamination associated with historic market gardening land uses
- Potential presence of asbestos and other hazardous materials associated with dated buildings and rural land uses.

A preliminary site investigation should be undertaken prior to development, to determine the potential nature of contamination (if any) across the Subject Area and Sandwich Lots, and to develop and implement a sampling and analysis plan where further investigations are warranted.

Where these investigations identify that remediation or restriction of land uses are warranted, future development will be required to take this into consideration.

#### **4.8 Bushfire risk**

As a result of the bushfire prone status of the Subject Area, a Bushfire Management Plan (BMP) is required to accompany the IS strategic planning proposal, to address the following requirements of *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7), namely Policy Measure 6.3:

- a bushfire hazard level (BHL) assessment or where lot layout is known, a Bushfire Attack Level (BAL) contour assessment to determine the indicative acceptable BAL ratings across the Subject Area
- identification of any bushfire hazard issues arising from the above assessment
- assessment against the bushfire protection criteria requirements contained within the Guidelines demonstrating compliance can be achieved in subsequent planning stages.

A BMP has been prepared in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (the Guidelines; WAPC 2017) which details the bushfire hazard and management considerations for the Subject Area and Sandwich Lots.

It is anticipated the predominant post-development bushfire hazards will be associated with the Bush Forever sites located to the south, west and north of the Subject Area. Where the development interfaces with intact vegetation, appropriate separation to development (habitable buildings) to achieve a bushfire attack level (BAL) rating of BAL-29 or lower will be required.

Additionally, the development will be required to ensure adequate water supply for firefighting purposes, and appropriate vehicular access and egress provisions for residents and emergency services in accordance with the Guidelines.

#### **4.9 Acid sulfate soils**

As outlined in Section 3.5, the eastern portions of the Subject Area are mapped as having a “moderate to low” risk of ASS occurring within 3 m of the natural surface. Low lying areas in the north-western, central and south western portions of the Subject Area are mapped as having a “high to moderate” risk of ASS occurring within 3 m of the natural surface (Figure 3.4).

The disturbance of ASS occurs when these soils are drained or excavated, releasing elements such as metals and nutrients from the soil profile which can then be mobilised/transported to waterways, wetlands and groundwater systems, often with deleterious environmental and economic impacts. (DER 2015).

In accordance with DER 2015, ASS investigations should be undertaken where any of the following activities are proposed:

- soil or sediment disturbance of 100 m<sup>3</sup> or more in areas mapped as ‘high to moderate risk of ASS occurring within 3m of natural soil surface’

- soil or sediment disturbance of 100 m<sup>3</sup> or more with excavation from below the natural watertable in areas mapped as 'moderate to low risk of ASS occurring within 3m of natural soil surface'
- lowering of the watertable, whether temporary or in areas mapped as 'high to moderate risk' of AASS or PASS occurrence' or 'moderate to low risk of AASS or PASS occurrence within 3m of natural soil surface'
- extractive industry works (e.g. mineral sand mining) in areas where ASS are generally found (refer to Table 1 of DER 2015)
- flood mitigation works, including construction of levees and flood gates, in areas where ASS are generally found (refer to Table 1 of DER 2015).

Where ASS investigations are required and ASS is detected, and ASS Management Plan will be required to be prepared and implemented. ASS are generally considerable manageable and not a constraint to development.

#### **4.10 Heritage**

All Aboriginal Heritage Sites are protected under the *Aboriginal Heritage Act 1972*, whether or not they have been previously identified or registered, provided that the Subject Area meets the criteria under Section 5 of that Act. As such, development of the Subject Area and Sandwich Lots should be undertaken in accordance with the DPLH and Department of Premier and Cabinet *Aboriginal Heritage Due Diligence Guidelines 2013*.

As outlined in the guidelines, due diligence may involve one or all of the following actions:

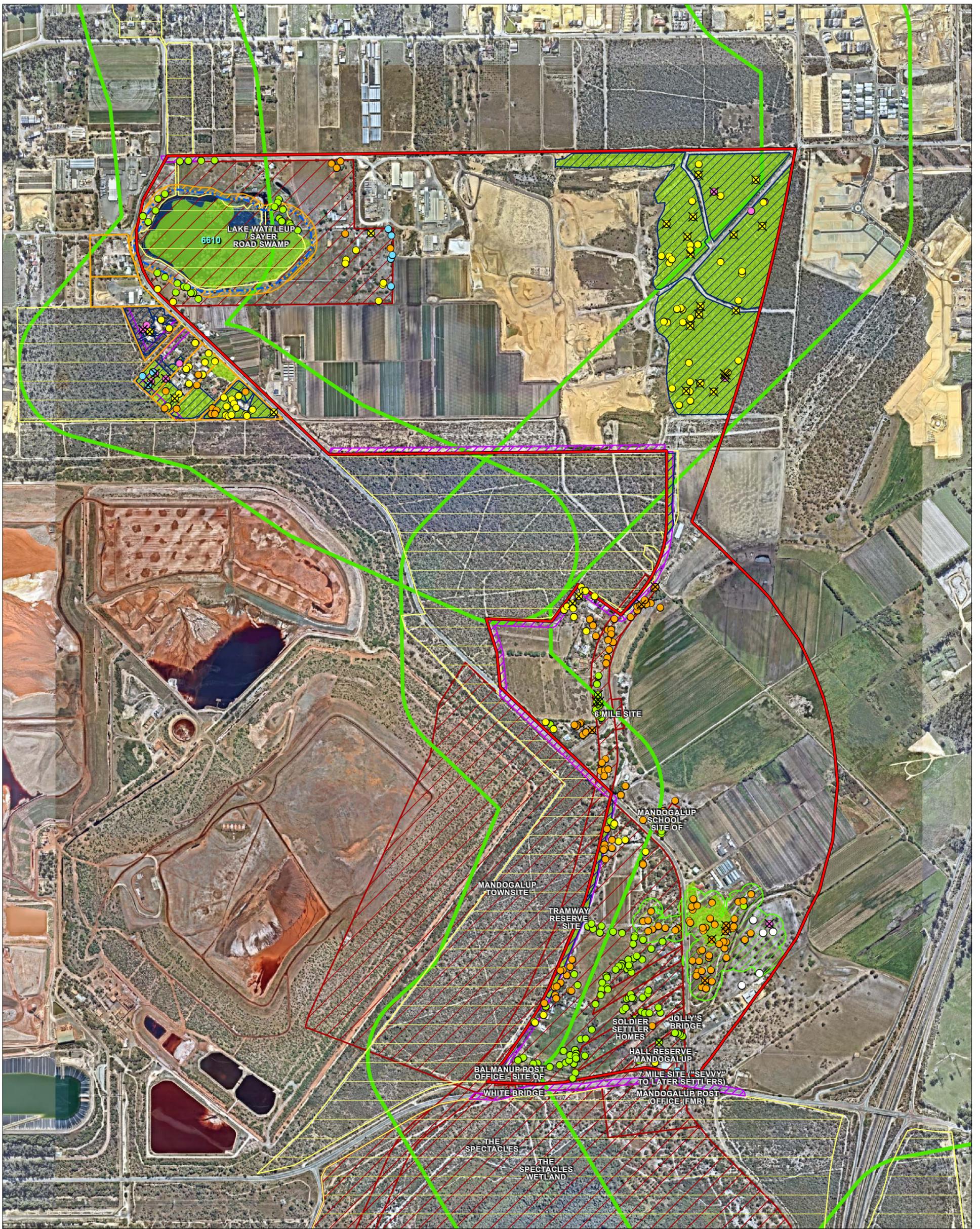
- assessing the landscape where an activity is to take place
- assessing the proposed activity and the potential impact on the landscape
- searching the Register of Aboriginal Sites and the Aboriginal Heritage Inquiry System
- consulting with the relevant Aboriginal people
- agreeing to an Aboriginal heritage survey
- other heritage management strategies.

A desktop assessment did not identify any registered Aboriginal heritage sites within the Subject Area or Sandwich Lots. Liaison with DPLH is required to determine if an Aboriginal heritage survey or consultation with relevant Aboriginal people is warranted.

Alternatively, future development should ensure that all site contractors are appropriately inducted on Aboriginal heritage due diligence, and are instructed to stop works in the event that any artefacts are uncovered, until these have been assessed by a suitably qualified person and relevant authorities to determine if an Aboriginal heritage site is present (under Section 5 of the Act).

Where the presence of an Aboriginal heritage site is confirmed, a Section 18 application and consent will be required under the Act prior to any works disturbing the Subject Area.

A number of European heritage sites are mapped within the Subject Area. Prior to development in the location of European heritage sites, the City should be consulted to determine the compatibility of any land uses proposed, and to identify any development restrictions or opportunities.



<b>Legend</b> MIP 47 boundary (331.2 ha) Sandwich lots European Heritage Sites Regional Ecological Linkages Bush Forever site (DOP) Resource Enhancement Wetland (REW) 30m buffer of REW Vegetation in good or better condition Tuart woodlands and forests of the SCP Banksia woodlands of the SCP <b>Indicative APZs</b> 17m wide APZ 21m wide APZ		<b>Significant Black Cockatoo habitat trees</b> <i>Corymbia calophylla</i> <i>Eucalyptus gomphocephala</i> <i>Eucalyptus marginata</i> <i>Eucalyptus rudis</i> <i>Eucalyptus</i> sp. N/A Hollow present - potentially suitable	 Job No: 57020 Client: Taylor Burrell Barnett Drawn By: hullivan Checked By: CT Version: A Date: 10-Dec-2020	0 350 metres Scale 1:12,000 at A4 Coord. Sys. GDA 1994 MGA Zone 50	<b>Mandogalup, WA</b> <b>SUMMARY OF ENVIRONMENTAL, HERITAGE AND BUSHFIRE SPATIAL CONSIDERATIONS</b> <b>FIGURE: 4.1</b>
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## **5. Assessment against the EPA Principles, Factors and Objectives**

To be completed following development of land use plan.

## 6. Conclusion

To be completed following development of land use plan.

## 7. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

Strategen-JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by Strategen-JBS&G, and should not be relied upon by other parties, who should make their own enquires.

This report does not provide a complete assessment of the environmental status of the Subject Area, and it is limited to the scope defined herein. Should information become available regarding conditions at the Subject Area including previously unknown sources of contamination, Strategen-JBS&G reserves the right to review the report in the context of the additional information.

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## Appendix A NatureMap and PMST database searches

# NatureMap Species Report

Created By Guest user on 10/10/2019

**Kingdom** Plantae  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Method** 'By Circle'  
**Centre** 115° 50' 32" E, 32° 11' 37" S  
**Buffer** 5km  
**Group By** Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	452	1913
Priority 3	4	6
Priority 4	1	9
Rare or likely to become extinct	3	20
<b>TOTAL</b>	<b>460</b>	<b>1948</b>

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Rare or likely to become extinct</b>				
1.	1596 <i>Caladenia huegelii</i> (Grand Spider Orchid)		T	
2.	12938 <i>Diuris micrantha</i>		T	
3.	1639 <i>Drakaea elastica</i> (Glossy-leaved Hammer Orchid)		T	
<b>Priority 3</b>				
4.	16245 <i>Cyathochaeta teretifolia</i>		P3	
5.	5237 <i>Pimelea calcicola</i>		P3	
6.	8163 <i>Pithocarpa corymbulosa</i> (Corymbose Pithocarpa)		P3	
7.	25800 <i>Stylidium paludicola</i>		P3	
<b>Priority 4</b>				
8.	4763 <i>Dodonaea hackettiana</i> (Hackett's Hopbush)		P4	
<b>Non-conservation taxon</b>				
9.	? <i>Anigozanthos humilis</i>			
10.	? <i>Arnocrinum preissii</i>			
11.	? <i>Austrostipa compressa</i>			
12.	? <i>Austrostipa semibarbata</i>			Y
13.	? <i>Burchardia congesta</i>			
14.	? <i>Hovea pungens</i>			Y
15.	? <i>Hovea trisperma</i> var. <i>trisperma</i>			
16.	? <i>Hybanthus calycinus</i>			Y
17.	? <i>Kunzea glabrescens</i>			
18.	? <i>Lepidosperma squamatum</i> s.l.			
19.	? <i>Lomandra caespitosa</i>			
20.	? <i>Lotus subbiflorus</i>			
21.	? <i>Lysimachia arvensis</i>			
22.	? <i>Mesomelaena pseudostygia</i>			Y
23.	? <i>Microlaena stipoides</i>			
24.	? <i>Phlebocarya ciliata</i>			
25.	? <i>Phyllanthus calycinus</i>			Y
26.	? <i>Pterostylis sanguinea</i>			
27.	? <i>Rytidosperma occidentalis</i>			
28.	? <i>Sowerbaea laxiflora</i>			
29.	? <i>Vicia sativa</i>			Y
30.	3262 <i>Acacia cochlearis</i> (Rigid Wattle)			
31.	3282 <i>Acacia cyclops</i> (Coastal Wattle)			
32.	3374 <i>Acacia huegelii</i>			
33.	3502 <i>Acacia pulchella</i> (Prickly Moses)			
34.	30032 <i>Acacia saligna</i> subsp. <i>saligna</i>			
35.	3557 <i>Acacia stenoptera</i> (Narrow Winged Wattle)			
36.	3602 <i>Acacia willdenowiana</i> (Grass Wattle)			
37.	6203 <i>Actinotus glomeratus</i>			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
38.	1775 <i>Adenanthos cygnorum</i> (Common Woollybush)			
39.	11837 <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> (Common Woollybush)			
40.	1791 <i>Adenanthos obovatus</i> (Basket Flower)			
41.	17202 <i>Agonis flexuosa</i> var. <i>flexuosa</i>			
42.	184 <i>Aira caryophyllea</i> (Silvery Hairgrass)	Y		
43.	<i>Aira caryophyllea</i> / <i>cupaniana</i> group			
44.	185 <i>Aira cupaniana</i> (Silvery Hairgrass)	Y		
45.	187 <i>Aira praecox</i> (Early Hairgrass)	Y		
46.	1728 <i>Allocasuarina fraseriana</i> (Sheoak, Kondil)			
47.	1732 <i>Allocasuarina humilis</i> (Dwarf Sheoak)			
48.	198 <i>Amphipogon laguroides</i>			
49.	20184 <i>Amphipogon laguroides</i> subsp. <i>laguroides</i>			
50.	200 <i>Amphipogon turbinatus</i>			
51.	7833 <i>Angianthus preissianus</i>			
52.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
53.	1411 <i>Anigozanthos manglesii</i> (Mangles Kangaroo Paw, Kurulbrang)			
54.	11261 <i>Anigozanthos manglesii</i> subsp. <i>manglesii</i>			
55.	3688 <i>Aotus gracillima</i>			
56.	3692 <i>Aotus procumbens</i>			
57.	1264 <i>Arnocrinum preissii</i>			
58.	8779 <i>Asparagus asparagoides</i> (Bridal Creeper)	Y		
59.	20283 <i>Astartea scoparia</i> (Common Astartea)			
60.	<i>Asterella drummondii</i>			
61.	6334 <i>Astroloma pallidum</i> (Kick Bush)			
62.	<i>Austrostipa</i> ? <i>semibarbata</i>			Y
63.	17234 <i>Austrostipa compressa</i>			
64.	17240 <i>Austrostipa flavescens</i>			
65.	17245 <i>Austrostipa mollis</i>			
66.	17253 <i>Austrostipa semibarbata</i>			
67.	<i>Austrostipa</i> sp.			
68.	37421 <i>Austrostipa</i> sp. <i>Marchagee</i> (B.R. Maslin 1407)			
69.	233 <i>Avena barbata</i> (Bearded Oat)	Y		
70.	36441 <i>Babingtonia camphorosmae</i> (Camphor Myrtle)			
71.	1800 <i>Banksia attenuata</i> (Slender Banksia, Piara)			
72.	32580 <i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> var. <i>dallanneyi</i>			
73.	1822 <i>Banksia ilicifolia</i> (Holly-leaved Banksia)			
74.	1830 <i>Banksia littoralis</i> (Swamp Banksia, Pungura)			
75.	1834 <i>Banksia menziesii</i> (Firewood Banksia)			
76.	32077 <i>Banksia sessilis</i> var. <i>cygnorum</i>			
77.	1852 <i>Banksia telmatiaea</i> (Swamp Fox Banksia)			
78.	741 <i>Baumea articulata</i> (Jointed Rush)			
79.	743 <i>Baumea juncea</i> (Bare Twigrush)			
80.	5382 <i>Beaufortia elegans</i> (Elegant Beaufortia)			
81.	48868 <i>Bellardia viscosa</i>	Y		
82.	749 <i>Bolboschoenus caldwellii</i> (Marsh Club-rush)			
83.	4413 <i>Boronia crenulata</i> (Aniseed Boronia)			
84.	11503 <i>Boronia crenulata</i> subsp. <i>crenulata</i> var. <i>crenulata</i>			
85.	16636 <i>Boronia crenulata</i> subsp. <i>viminea</i>			
86.	4417 <i>Boronia dichotoma</i>			
87.	3710 <i>Bossiaea eriocarpa</i> (Common Brown Pea)			
88.	6341 <i>Brachyloma preissii</i> (Globe Heath)			
89.	8661 <i>Brachypodium distachyon</i> (False Brome)	Y		
90.	3000 <i>Brassica tournefortii</i> (Mediterranean Turnip)	Y		
91.	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
92.	245 <i>Briza minor</i> (Shivery Grass)	Y		
93.	<i>Briza</i> sp.			
94.	249 <i>Bromus diandrus</i> (Great Brome)	Y		
95.	12770 <i>Burchardia congesta</i>			
96.	1276 <i>Caesia micrantha</i> (Pale Grass Lily)			
97.	1277 <i>Caesia occidentalis</i>			
98.	<i>Caladenia</i> ? <i>flava</i>			
99.	1586 <i>Caladenia discoidea</i> (Dancing Orchid)			
100.	1592 <i>Caladenia flava</i> (Cowslip Orchid)			
101.	1599 <i>Caladenia latifolia</i> (Pink Fairy Orchid)			
102.	15361 <i>Caladenia longicauda</i> subsp. <i>calcigena</i>			
103.	17760 <i>Caladenia nobilis</i>			
104.	<i>Caladenia</i> sp.			
105.	2848 <i>Calandrinia corrigioloides</i> (Strap Purslane)			
106.	19309 <i>Calectasia narragara</i>			
107.	34942 <i>Callitriche brutia</i> subsp. <i>brutia</i>	Y		

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
108.	36600 <i>Callitris pyramidalis</i> (Swamp Cypress)			
109.	5411 <i>Calothamnus hirsutus</i>			
110.	5415 <i>Calothamnus lateralis</i>			
111.	5439 <i>Calytrix angulata</i> (Yellow Starflower)			
112.	5458 <i>Calytrix flavescens</i> (Summer Starflower)			
113.	5460 <i>Calytrix fraseri</i> (Pink Summer Calytrix)			
114.	5476 <i>Calytrix sapphirina</i>			
115.	2795 <i>Carpobrotus edulis</i> (Hottentot Fig)	Y		
116.	1162 <i>Cartonema philydroides</i>			
117.	2951 <i>Cassytha flava</i> (Dodder Laurel)			
118.	2957 <i>Cassytha racemosa</i> (Dodder Laurel)			
119.	11799 <i>Cassytha racemosa forma racemosa</i>			
120.	41568 <i>Cenchrus setaceus</i> (Fountain Grass)	Y		
121.	6542 <i>Centaurium tenuiflorum</i>	Y		
122.	1125 <i>Centrolepis drummondiana</i>			
123.	1134 <i>Centrolepis polygyna</i> (Wiry Centrolepis)			
124.	2889 <i>Cerastium glomeratum</i> (Mouse Ear Chickweed)	Y		
125.	18156 <i>Chamaecytisus palmensis</i> (Tagasaste)	Y		
126.	1280 <i>Chamaescilla corymbosa</i> (Blue Squill)			
127.	11299 <i>Chamaescilla corymbosa var. corymbosa</i>			
128.	7937 <i>Cirsium vulgare</i> (Spear Thistle, Scotch Thistle)	Y		
129.	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
130.	4555 <i>Comesperma integerrimum</i>			
131.	15611 <i>Conospermum stoechadis subsp. stoechadis</i> (Common Smokebush)			
132.	6348 <i>Conostephium pendulum</i> (Pearl Flower)			
133.	6349 <i>Conostephium preissii</i>			
134.	1418 <i>Conostylis aculeata</i> (Prickly Conostylis)			
135.	11826 <i>Conostylis aculeata subsp. aculeata</i>			
136.	1436 <i>Conostylis juncea</i>			
137.	1454 <i>Conostylis setigera</i> (Bristly Cottonhead)			
138.	11597 <i>Conostylis setigera subsp. setigera</i>			
139.	<i>Conyza ?bonariensis</i>			
140.	7939 <i>Conyza bonariensis</i> (Flaxleaf Fleabane)	Y		
141.	<i>Conyza sp.</i>			
142.	20074 <i>Conyza sumatrensis</i>	Y		
143.	48259 <i>Cortaderia selloana subsp. selloana</i>	Y		
144.	1285 <i>Corynotheca micrantha</i> (Sand Lily)			
145.	7945 <i>Cotula coronopifolia</i> (Waterbuttons)	Y		
146.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
147.	11563 <i>Crassula colorata var. colorata</i>			
148.	19625 <i>Cymbalaria muralis subsp. muralis</i>	Y		
149.	806 <i>Cyperus polystachyos</i> (Bunchy Sedge)			
150.	816 <i>Cyperus tenuiflorus</i> (Scaly Sedge)	Y		
151.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
152.	35618 <i>Darwinia sp. Karonie</i> (K. Newbey 8503)			
153.	1218 <i>Dasypogon bromeliifolius</i> (Pineapple Bush)			
154.	3807 <i>Daviesia divaricata</i> (Marno)			
155.	3832 <i>Daviesia physodes</i>			
156.	3845 <i>Daviesia triflora</i>			
157.	16595 <i>Desmocladus flexuosus</i>			
158.	299 <i>Deyeuxia quadriseta</i> (Reed Bentgrass)			
159.	1259 <i>Dianella revoluta</i> (Blueberry Lily)			
160.	11636 <i>Dianella revoluta var. divaricata</i>			
161.	17838 <i>Dielsia stenostachya</i>			
162.	9027 <i>Diplolaena drummondii</i>			
163.	19649 <i>Disa bracteata</i>	Y		
164.	7054 <i>Dischisma arenarium</i>	Y		
165.	<i>Diuris corymbosa/magnifica</i>			
166.	1634 <i>Diuris laxiflora</i> (Bee Orchid)			
167.	12939 <i>Diuris magnifica</i>			
168.	3095 <i>Drosera erythrorhiza</i> (Red Ink Sundew)			
169.	3106 <i>Drosera macrantha</i> (Bridal Rainbow)			
170.	3109 <i>Drosera menziesii</i> (Pink Rainbow)			
171.	48710 <i>Drosera micrantha</i>			
172.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
173.	29178 <i>Drosera porrecta</i>			
174.	<i>Drosera sp. "climbing"</i>			
175.	3135 <i>Drosera zonaria</i> (Painted Sundew)			
176.	<i>Ehrharta ?longiflora</i>			Y
177.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
178.	349 <i>Ehrharta longiflora</i> (Annual Veldt Grass)	Y		
179.	<i>Ehrharta</i> sp.			
180.	1645 <i>Epiblema grandiflorum</i> (Babe-in-a-cradle)			
181.	6133 <i>Epilobium hirtigerum</i> (Hairy Willow Herb)			
182.	13949 <i>Eremaea asterocarpa</i>			
183.	13950 <i>Eremaea asterocarpa</i> subsp. <i>asterocarpa</i>			
184.	5541 <i>Eremaea pauciflora</i>			
185.	14104 <i>Eremaea pauciflora</i> var. <i>pauciflora</i>			
186.	15446 <i>Eryngium pinnatifidum</i> subsp. <i>pinnatifidum</i>			
187.	5615 <i>Eucalyptus decipiens</i> (Limestone Marlock, Moit)			
188.	5708 <i>Eucalyptus marginata</i> (Jarrah, Djara)			
189.	13547 <i>Eucalyptus marginata</i> subsp. <i>marginata</i> (Jarrah)			
190.	5763 <i>Eucalyptus rudis</i> (Flooded Gum, Kulurda)			
191.	13511 <i>Eucalyptus rudis</i> subsp. <i>rudis</i>			
192.	5790 <i>Eucalyptus todtiana</i> (Coastal Blackbutt)			
193.	3872 <i>Euchilopsis linearis</i> (Swamp Pea)			
194.	20014 <i>Euphorbia hyssopifolia</i>	Y		
195.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
196.	3880 <i>Eutaxia virgata</i>			
197.	1747 <i>Ficus carica</i> (Common Fig)	Y		
198.	2969 <i>Fumaria capreolata</i> (Whiteflower Fumitory)	Y		
199.	<i>Fumaria</i> sp.			
200.	907 <i>Gahnia trifida</i> (Coast Saw-sedge)			
201.	20247 <i>Gamochaeta calviceps</i>	Y		
202.	20475 <i>Gastrobium capitatum</i>			
203.	20473 <i>Gastrobium ebracteolatum</i>			
204.	20483 <i>Gastrobium linearifolium</i>			
205.	1520 <i>Gladiolus caryophyllaceus</i> (Wild Gladiolus)	Y		
206.	6587 <i>Gomphocarpus fruticosus</i> (Narrowleaf Cottonbush)	Y		
207.	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
208.	6161 <i>Gonocarpus pithyoides</i>			
209.	7538 <i>Goodenia pulchella</i>			
210.	14282 <i>Gratiola pubescens</i>			
211.	12824 <i>Grevillea vestita</i> subsp. <i>vestita</i>			
212.	<i>Haemodorum</i> sp.			
213.	1475 <i>Haemodorum spicatum</i> (Mardja)			
214.	2197 <i>Hakea prostrata</i> (Harsh Hakea)			
215.	2214 <i>Hakea trifurcata</i> (Two-leaf Hakea)			
216.	2216 <i>Hakea varia</i> (Variable-leaved Hakea)			
217.	3961 <i>Hardenbergia comptoniana</i> (Native Wisteria)			
218.	6839 <i>Hemiandra pungens</i> (Snakebush)			
219.	38320 <i>Hemiandra</i> sp. <i>Jurien</i> (B.J. Conn & M.E. Tozer BJC 3885)			
220.	1293 <i>Hensmania turbinata</i>			
221.	5134 <i>Hibbertia huegelii</i>			
222.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
223.	45534 <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i>			
224.	5162 <i>Hibbertia racemosa</i> (Stalked Guinea Flower)			
225.	48381 <i>Hibbertia striata</i>			
226.	5173 <i>Hibbertia subvaginata</i>			
227.	5176 <i>Hibbertia vaginata</i>			
228.	444 <i>Holcus lanatus</i> (Yorkshire Fog)	Y		
229.	6222 <i>Homalosciadium homalocarpum</i>			
230.	3966 <i>Hovea pungens</i> (Devil's Pins, Puyenak)			
231.	3968 <i>Hovea trisperma</i> (Common Hovea)			
232.	12859 <i>Hovea trisperma</i> var. <i>trisperma</i>			
233.	12741 <i>Hyalosperma cotula</i>			
234.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
235.	6224 <i>Hydrocotyle blepharocarpa</i>			
236.	6240 <i>Hydrocotyle scutellifera</i>			
237.	5817 <i>Hypocalymma angustifolium</i> (White Myrtle, Kudjid)			
238.	35070 <i>Hypocalymma angustifolium</i> subsp. <i>Swan Coastal Plain</i> (G.J. Keighery 16777)			
239.	5825 <i>Hypocalymma robustum</i> (Swan River Myrtle)			
240.	8086 <i>Hypochaeris glabra</i> (Smooth Catsear)	Y		
241.	9352 <i>Hypochaeris radicata</i> (Flat Weed, Cats-ear)	Y		
242.	1070 <i>Hypolaena exsulca</i>			
243.	17841 <i>Hypolaena pubescens</i>			
244.	<i>Iridaceae</i> sp.			Y
245.	20200 <i>Isolepis cernua</i> var. <i>setiformis</i>			
246.	917 <i>Isolepis marginata</i> (Coarse Club-rush)			
247.	19700 <i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
248.	4012 <i>Jacksonia furcellata</i> (Grey Stinkwood)			
249.	4029 <i>Jacksonia sternbergiana</i> (Stinkwood, Kapur)			
250.	1178 <i>Juncus bufonius</i> (Toad Rush)	Y		
251.	1186 <i>Juncus microcephalus</i>	Y		
252.	1188 <i>Juncus pallidus</i> (Pale Rush)			
253.	1190 <i>Juncus planifolius</i> (Broadleaf Rush)			
254.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
255.	5832 <i>Kunzea ericifolia</i> (Spearwood, Pondil)			
256.	15498 <i>Kunzea glabrescens</i> (Spearwood)			
257.	20019 <i>Lachnagrostis filiformis</i>			
258.	8096 <i>Lactuca serriola</i> (Prickly Lettuce)	Y		
259.	18585 <i>Lagenophora huegelii</i>			
260.	467 <i>Lagurus ovatus</i> (Hare's Tail Grass)	Y		
261.	4052 <i>Latrobea tenella</i>			
262.	1307 <i>Laxmannia ramosa</i> (Branching Lily)			
263.	11911 <i>Laxmannia ramosa</i> subsp. <i>ramosa</i>			
264.	1309 <i>Laxmannia squarrosa</i>			
265.	7572 <i>Lechenaultia expansa</i>			
266.	7574 <i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia)			
267.	44490 <i>Leontodon rhagadioloides</i>	Y		
268.	<i>Lepidosperma</i> ?aff. <i>costale</i>			Y
269.	925 <i>Lepidosperma angustatum</i>			
270.	937 <i>Lepidosperma longitudinale</i> (Pithy Sword-sedge)			
271.	940 <i>Lepidosperma pubisquamum</i>			
272.	944 <i>Lepidosperma scabrum</i>			
273.	<i>Lepidosperma scabrum</i> (inland form)			Y
274.	<i>Lepidosperma</i> sp.			
275.	<i>Lepidosperma</i> sp. Brixton Street broad inflorescence			
276.	<i>Lepidosperma</i> sp. Brixton Street broadish inflorescence			Y
277.	<i>Lepidosperma</i> sp. Brixton Street narrow inflorescence			
278.	945 <i>Lepidosperma squamatum</i>			
279.	<i>Lepidosperma squamatum</i> s.l.			
280.	946 <i>Lepidosperma striatum</i>			
281.	1653 <i>Leporella fimbriata</i> (Hare Orchid)			
282.	1077 <i>Leptocarpus canus</i> (Hoary Twine-rush)			
283.	1080 <i>Leptocarpus scariosus</i>			
284.	2342 <i>Leptomeria cunninghamii</i>			
285.	2344 <i>Leptomeria empetriformis</i>			
286.	2350 <i>Leptomeria pauciflora</i> (Sparse-flowered Currant Bush)			
287.	5850 <i>Leptospermum laevigatum</i> (Coast Teatree)	Y		
288.	6360 <i>Leucopogon australis</i> (Spiked Beard-heath)			
289.	6374 <i>Leucopogon conostephioides</i>			
290.	6436 <i>Leucopogon propinquus</i>			
291.	7676 <i>Levenhookia pusilla</i> (Midget Stylewort)			
292.	<i>Levenhookia pusilla</i> /stipitata			
293.	7677 <i>Levenhookia stipitata</i> (Common Stylewort)			
294.	9289 <i>Lobelia anceps</i> (Angled Lobelia)			
295.	7408 <i>Lobelia tenuior</i> (Slender Lobelia)			
296.	6515 <i>Logania vaginalis</i> (White Spray)			
297.	478 <i>Lolium rigidum</i> (Wimmera Ryegrass)	Y		
298.	<i>Lolium</i> sp. (annual)			
299.	<i>Lomandra</i> ?caespitosa			
300.	<i>Lomandra</i> ?preissii			
301.	1223 <i>Lomandra caespitosa</i> (Tufted Mat Rush)			
302.	1228 <i>Lomandra hermaphrodita</i>			
303.	14542 <i>Lomandra micrantha</i> subsp. <i>micrantha</i>			
304.	1234 <i>Lomandra nigricans</i>			
305.	1239 <i>Lomandra preissii</i>			
306.	1246 <i>Lomandra suaveolens</i>			
307.	8564 <i>Lotus subbiflorus</i>	Y		
308.	1198 <i>Luzula meridionalis</i> (Field Woodrush)			
309.	1097 <i>Lyginia barbata</i>			
310.	18049 <i>Lyginia imberbis</i>			
311.	1656 <i>Lyperanthus serratus</i> (Rattle Beak Orchid)			
312.	36375 <i>Lysimachia arvensis</i> (Pimpernel)	Y		
313.	6456 <i>Lysinema ciliatum</i> (Curry Flower)			
314.	5281 <i>Lythrum hyssopifolia</i> (Lesser Loosestrife)	Y		
315.	2839 <i>Macarthuria australis</i>			
316.	18119 <i>Macrozamia fraseri</i>			
317.	85 <i>Macrozamia riedlei</i> ( <i>Zamia</i> , Djiridji)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
318.	4079 <i>Medicago polymorpha</i> (Burr Medic)	Y		
319.	5900 <i>Melaleuca cuticularis</i> (Saltwater Paperbark)			
320.	13271 <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>			
321.	13273 <i>Melaleuca incana</i> subsp. <i>incana</i>			
322.	5926 <i>Melaleuca lateritia</i> (Robin Redbreast Bush)			
323.	5946 <i>Melaleuca pauciflora</i>			
324.	5952 <i>Melaleuca preissiana</i> (Moonah)			
325.	5959 <i>Melaleuca raphiophylla</i> (Swamp Paperbark)			
326.	5964 <i>Melaleuca seriata</i>			
327.	18598 <i>Melaleuca systema</i>			
328.	5978 <i>Melaleuca teretifolia</i> (Banbar)			
329.	5980 <i>Melaleuca thymoides</i>			
330.	4085 <i>Melilotus indicus</i>	Y		
331.	955 <i>Mesomelaena pseudostygia</i>			
332.	957 <i>Mesomelaena tetragona</i> (Semaphore Sedge)			
333.	485 <i>Microlaena stipoides</i> (Weeping Grass)			
334.	1658 <i>Microtis atrata</i> (Swamp Mignonette Orchid)			
335.	15419 <i>Microtis media</i> subsp. <i>media</i>			
336.	6189 <i>Myriophyllum crispatum</i>			
337.	6199 <i>Myriophyllum tillaeoides</i>			
338.	492 <i>Neurachne alopecuroidea</i> (Foxtail Mulga Grass)			
339.	6974 <i>Nicotiana glauca</i> (Tree Tobacco)	Y		
340.	12782 <i>Ophioglossum gramineum</i>			
341.	36177 <i>Ornduffia albiflora</i>			
342.	4113 <i>Ornithopus compressus</i> (Yellow Serradella)	Y		
343.	4358 <i>Oxalis purpurea</i> (Largeflower Wood Sorrel)	Y		
344.	527 <i>Paspalum dilatatum</i>	Y		
345.	1550 <i>Patersonia occidentalis</i> (Purple Flag, Koma)			
346.	30471 <i>Patersonia occidentalis</i> var. <i>angustifolia</i>			
347.	30472 <i>Patersonia occidentalis</i> var. <i>occidentalis</i>			
348.	4343 <i>Pelargonium capitatum</i> (Rose Pelargonium)	Y		
349.	40423 <i>Pentameris airoides</i> (False Hairgrass)	Y		
350.	6006 <i>Pericalymma ellipticum</i> (Swamp Teatree)			
351.	16477 <i>Pericalymma ellipticum</i> var. <i>ellipticum</i>			
352.	2273 <i>Persoonia saccata</i> (Snottygobble)			
353.	2299 <i>Petrophile linearis</i> (Pixie Mops)			
354.	2301 <i>Petrophile macrostachya</i>			
355.	2312 <i>Petrophile striata</i>			
356.	19825 <i>Petrorhagia dubia</i>	Y		
357.	552 <i>Phalaris paradoxa</i> (Paradoxa Grass)	Y		
358.	1478 <i>Phlebocarya ciliata</i>			
359.	16177 <i>Phyllangium paradoxum</i>			
360.	4675 <i>Phyllanthus calycinus</i> (False Boronia)			
361.	2793 <i>Phytolacca octandra</i> (Red Ink Plant)	Y		
362.	18117 <i>Pimelea rosea</i> subsp. <i>rosea</i>			
363.	6249 <i>Platysace compressa</i> (Tapeworm Plant)			
364.	6253 <i>Platysace filiformis</i>			
365.	4524 <i>Platytheca galioides</i>			
366.	<i>Poaceae</i> sp.			
367.	8175 <i>Podolepis gracilis</i> (Slender Podolepis)			
368.	8182 <i>Podotheca angustifolia</i> (Sticky Longheads)			
369.	8183 <i>Podotheca chrysantha</i> (Yellow Podotheca)			
370.	8184 <i>Podotheca gnaphalioides</i> (Golden Long-heads)			
371.	582 <i>Polypogon monspeliensis</i> (Annual Beardgrass)	Y		
372.	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
373.	<i>Poranthera microphylla</i> /moorokatta			
374.	1670 <i>Prasophyllum drummondii</i> (Swamp Leek Orchid)			
375.	10853 <i>Prasophyllum plumiforme</i>			
376.	8189 <i>Pseudognaphalium luteoalbum</i> (Jersey Cudweed)			
377.	15426 <i>Pterostylis aspera</i>			
378.	44723 <i>Pterostylis glebosa</i>			
379.	1693 <i>Pterostylis recurva</i> (Jug Orchid)			
380.	12217 <i>Pterostylis sanguinea</i>			
381.	<i>Pterostylis</i> sp.			
382.	2718 <i>Ptilotus drummondii</i> (Narrowleaf Mulla Mulla)			
383.	11260 <i>Ptilotus drummondii</i> var. <i>drummondii</i> (Pussytail)			
384.	4181 <i>Pultenaea reticulata</i>			
385.	16367 <i>Pyrorchis nigricans</i> (Red beaks, Elephants ears)			
386.	8195 <i>Quinetia urvillei</i>			
387.	6012 <i>Regelia ciliata</i>			

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388.	3085 <i>Reseda luteola</i> (Wild Mingnonette)	Y		
389.	13300 <i>Rhodanthe citrina</i>			
390.	14485 <i>Romulea flava</i> var. <i>minor</i>	Y		
391.	1556 <i>Romulea rosea</i> (Guildford Grass)	Y		
392.	14924 <i>Romulea rosea</i> var. <i>communis</i>	Y		
393.	40426 <i>Rytidosperma occidentale</i>			
394.	6483 <i>Samolus junceus</i>			
395.	11647 <i>Samolus repens</i> var. <i>repens</i>			
396.	7603 <i>Scaevola canescens</i> (Grey Scaevola)			
397.	978 <i>Schoenus brevisetis</i>			
398.	982 <i>Schoenus clandestinus</i>			
399.	984 <i>Schoenus curvifolius</i>			
400.	986 <i>Schoenus efoliatus</i>			
401.	992 <i>Schoenus grandiflorus</i> (Large Flowered Bogrue)			
402.	6033 <i>Scholtzia involucrata</i> (Spiked Scholtzia)			
403.	2909 <i>Silene gallica</i> (French Catchfly)	Y		
404.	15972 <i>Silene gallica</i> var. <i>gallica</i>	Y		
405.	8225 <i>Siloxerus humifusus</i> (Procumbent Siloxerus)			
406.	7020 <i>Solanum linnaeanum</i> (Apple of Sodom)	Y		
407.	7022 <i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
408.	9367 <i>Sonchus hydrophilus</i> (Native Sowthistle)			
409.	8231 <i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
410.	1312 <i>Sowerbaea laxiflora</i> (Purple Tassels)			
411.	4211 <i>Sphaerolobium vimineum</i> (Leafless Globe Pea)			
412.	2316 <i>Stirlingia latifolia</i> (Blueboy)			
413.	7693 <i>Stylidium brunonianum</i> (Pink Fountain Triggerplant)			
414.	7774 <i>Stylidium piliferum</i> (Common Butterfly Triggerplant)			
415.	7785 <i>Stylidium repens</i> (Matted Triggerplant)			
416.	25806 <i>Stylidium scarosum</i>			
417.	7798 <i>Stylidium schoenoides</i> (Cow Kicks)			
418.	1260 <i>Stypania glauca</i> (Blind Grass)			
419.	2329 <i>Synaphea spinulosa</i>			
420.	15532 <i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
421.	11143 <i>Thelymitra graminea</i>			
422.	20731 <i>Thelymitra vulgaris</i>			
423.	20728 <i>Thelymitra xanthotricha</i>			
424.	<i>Thysanotus ?thyrsoides</i>			
425.	1318 <i>Thysanotus arbuscula</i>			
426.	1319 <i>Thysanotus arenarius</i>			
427.	1338 <i>Thysanotus manglesianus</i> (Fringed Lily)			
428.	<i>Thysanotus manglesianus/patersonii</i> complex			
429.	1339 <i>Thysanotus multiflorus</i> (Many-flowered Fringe Lily)			
430.	1343 <i>Thysanotus patersonii</i>			
431.	<i>Thysanotus</i> sp.			
432.	1351 <i>Thysanotus sparteus</i>			
433.	1357 <i>Thysanotus thyrsoides</i>			
434.	1358 <i>Thysanotus triandrus</i>			
435.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
436.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			
437.	1363 <i>Tricoryne tenella</i>			
438.	1038 <i>Tricostularia neesii</i>			
439.	17145 <i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Y		
440.	<i>Trifolium campestre/dubium</i>			
441.	14738 <i>Trifolium resupinatum</i> var. <i>resupinatum</i>	Y		
442.	4360 <i>Tropaeolum majus</i> (Garden Nasturtium)	Y		
443.	8254 <i>Urospermum picroides</i> (False Hawkbit)	Y		
444.	8255 <i>Ursinia anthemoides</i> (Ursinia)	Y		
445.	38388 <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Y		
446.	15725 <i>Verbesina encelioides</i>	Y		
447.	15432 <i>Verticordia densiflora</i> var. <i>densiflora</i>			
448.	4320 <i>Vicia hirsuta</i> (Hairy Vetch)	Y		
449.	11474 <i>Vicia sativa</i> subsp. <i>nigra</i>	Y		
450.	722 <i>Vulpia bromoides</i> (Squirrel Tail Fescue)	Y		
451.	<i>Vulpia</i> sp.			
452.	7384 <i>Wahlenbergia capensis</i> (Cape Bluebell)	Y		
453.	7389 <i>Wahlenbergia preissii</i>			
454.	8282 <i>Waitzia suaveolens</i> (Fragrant Waitzia)			
455.	12072 <i>Wurmbea dioica</i> subsp. <i>alba</i>			
456.	1256 <i>Xanthorrhoea preissii</i> (Grass tree, Palga)			
457.	<i>Xanthorrhoea</i> sp.			

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458.	6289 <i>Xanthosia huegelii</i>			
459.	2331 <i>Xylomelum occidentale</i> (Woody Pear, Djandin)			
460.	1049 <i>Zantedeschia aethiopica</i> (Arum Lily)	Y		

**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

<sup>1</sup> For NatureMap's purposes, species flagged as endemic are those whose records are wholly 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.

# NatureMap Species Report

Created By Guest user on 10/10/2019

**Kingdom** Animalia  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Method** 'By Circle'  
**Centre** 115° 50' 32" E, 32° 11' 37" S  
**Buffer** 5km  
**Group By** Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	213	4380
Other specially protected fauna	1	2
Priority 3	2	147
Priority 4	6	90
Protected under international agreement	9	45
Rare or likely to become extinct	7	257
<b>TOTAL</b>	<b>238</b>	<b>4921</b>

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
<b>Rare or likely to become extinct</b>				
1.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)		T	
2.	24731 <i>Calyptorhynchus banksii</i> subsp. <i>naso</i> (Forest Red-tailed Black Cockatoo)		T	
3.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)		T	
4.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)		T	
5.	48400 <i>Calyptorhynchus</i> sp. (white-tailed black cockatoo)		T	
6.	24092 <i>Dasyurus geoffroyi</i> (Chuditch, Western Quoll)		T	
7.	24146 <i>Myrmecobius fasciatus</i> (Numbat, Walpurti)		T	
<b>Protected under international agreement</b>				
8.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)		IA	
9.	24786 <i>Calidris melanotos</i> (Pectoral Sandpiper)		IA	
10.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)		IA	
11.	24789 <i>Calidris subminuta</i> (Long-toed Stint)		IA	
12.	25741 <i>Limosa limosa</i> (Black-tailed Godwit)		IA	
13.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)		IA	
14.	24806 <i>Tringa glareola</i> (Wood Sandpiper)		IA	
15.	24808 <i>Tringa nebularia</i> (Common Greenshank, greenshank)		IA	
16.	41351 <i>Xenus cinereus</i> (Terek Sandpiper)		IA	
<b>Other specially protected fauna</b>				
17.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
<b>Priority 3</b>				
18.	25147 <i>Lerista lineata</i> (Perth Slider, Lined Skink)		P3	
19.	25249 <i>Neelaps calonotos</i> (Black-striped Snake, black-striped burrowing snake)		P3	
<b>Priority 4</b>				
20.	24189 <i>Falsistrellus mackenziei</i> (Western False Pipistrelle, Western Falsistrelle)		P4	
21.	24215 <i>Hydromys chrysogaster</i> (Water-rat, Rakali)		P4	
22.	48588 <i>Isoodon fusciventer</i> (Quenda, southwestern brown bandicoot)		P4	
23.	48024 <i>Notamacropus eugenii</i> subsp. <i>derbianus</i> (Tammam Wallaby, Tammam)		P4	
24.	24328 <i>Oxyura australis</i> (Blue-billed Duck)		P4	
25.	33992 <i>Synemon gratiosa</i> (Graceful Sunmoth)		P4	
<b>Non-conservation taxon</b>				
26.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
27.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
28.	24262 <i>Acanthiza inornata</i> (Western Thornbill)			
29.	24560 <i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
30.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
31.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
32.	42368 <i>Acritoscincus trilineatus</i> (Western Three-lined Skink)			
33.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
34.	<i>Aname mainae</i>			
35.	24312 <i>Anas gracilis</i> (Grey Teal)			
36.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
37.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
38.	47414 <i>Anhinga novaehollandiae</i> (Australasian Darter)			
39.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
40.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
41.	24991 <i>Aprasia repens</i> (Sand-plain Worm-lizard)			
42.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
43.	<i>Arachnura higginsi</i>			
44.	<i>Araneus cyphoxis</i>			
45.	<i>Araneus senicaudatus</i>			
46.	41324 <i>Ardea modesta</i> (great egret, white egret)			
47.	24340 <i>Ardea novaehollandiae</i> (White-faced Heron)			
48.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
49.	<i>Argiope protensa</i>			
50.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
51.	24353 <i>Artamus cyanopterus</i> (Dusky Woodswallow)			
52.	<i>Artoria flavimana</i>			
53.	<i>Artoria linnaei</i>			
54.	<i>Artoriopsis expolita</i>			
55.	<i>Austracantha minax</i>			
56.	24318 <i>Aythya australis</i> (Hardhead)			
57.	<i>Backbourkia brounii</i>			
58.	<i>Barnardius zonarius</i>			
59.	24319 <i>Biziura lobata</i> (Musk Duck)			
60.	42381 <i>Brachyurophis semifasciatus</i> (Southern Shovel-nosed Snake)			
61.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
62.	24729 <i>Cacatua tenuirostris</i> (Eastern Long-billed Corella)	Y		
63.	25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
64.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
65.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
66.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat)			
67.	24187 <i>Chalinolobus morio</i> (Chocolate Wattled Bat)			
68.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
69.	43380 <i>Chelodina colliei</i> (South-western Snake-necked Turtle)			
70.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
71.	33939 <i>Cherax cainii</i> (Marron)			
72.	<i>Cherax destructor</i>			
73.	<i>Cherax quinquecarinatus</i>			
74.	<i>Cherax sp.</i>			
75.	24980 <i>Christinus marmoratus</i> (Marbled Gecko)			
76.	<i>Chroicocephalus novaehollandiae</i>			
77.	24288 <i>Circus approximans</i> (Swamp Harrier)			
78.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
79.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
80.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
81.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
82.	<i>Cormocephalus novaehollandiae</i>			
83.	25592 <i>Corvus coronoides</i> (Australian Raven)			
84.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
85.	25701 <i>Coturnix ypsilophora</i> (Brown Quail)			
86.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
87.	24422 <i>Cracticus tibicen subsp. dorsalis</i> (White-backed Magpie)			
88.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
89.	25399 <i>Crinia glauerti</i> (Clicking Frog)			
90.	25400 <i>Crinia insignifera</i> (Squelching Froglet)			
91.	<i>Crustulina bicrucata</i>			
92.	30893 <i>Cryptoblepharus buchananii</i>			
93.	30899 <i>Ctenophorus adelaidensis</i> (Southern Heath Dragon, Western Heath Dragon)			
94.	25027 <i>Ctenotus australis</i>			
95.	25039 <i>Ctenotus fallens</i>			
96.	<i>Cyclosa trilobata</i>			
97.	24322 <i>Cygnus atratus</i> (Black Swan)			
98.	<i>Cyrtophora parnasia</i>			
99.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
100.	25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella)			
101.	25766 <i>Delma fraseri</i> (Fraser's Legless Lizard)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
102.	25296 <i>Demansia psammophis</i> subsp. <i>reticulata</i> (Yellow-faced Whipsnake)			
103.	25100 <i>Egernia napoleonis</i>			
104.	<i>Egretta novaehollandiae</i>			
105.	<i>Elanus axillaris</i>			
106.	47937 <i>Eiseyornis melanops</i> (Black-fronted Dotterel)			
107.	<i>Eolophus roseicapillus</i>			
108.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
109.	<i>Eriophora biapicata</i>			
110.	24379 <i>Erythronyctes cinctus</i> (Red-kneed Dotterel)			
111.	25621 <i>Falco berigora</i> (Brown Falcon)			
112.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
113.	25623 <i>Falco longipennis</i> (Australian Hobby)			
114.	24041 <i>Felis catus</i> (Cat)	Y		
115.	25727 <i>Fulica atra</i> (Eurasian Coot)			
116.	24761 <i>Fulica atra</i> subsp. <i>australis</i> (Eurasian Coot)			
117.	25729 <i>Gallinula tenebrosa</i> (Dusky Moorhen)			
118.	24763 <i>Gallinula tenebrosa</i> subsp. <i>tenebrosa</i> (Dusky Moorhen)			
119.	25730 <i>Gallirallus philippensis</i> (Buff-banded Rail)			
120.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
121.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
122.	24293 <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
123.	24295 <i>Haliaastur sphenurus</i> (Whistling Kite)			
124.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
125.	25119 <i>Hemiergis quadrilineata</i>			
126.	<i>Heurodes turritus</i>			
127.	47965 <i>Hieraaetus morphnoides</i> (Little Eagle)			
128.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
129.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
130.	<i>Holoplatys dejongi</i>			
131.	<i>Idiomata blackwalli</i>			
132.	<i>Isopeda leishmanni</i>			
133.	<i>Lampona cylindrata</i>			
134.	24511 <i>Larus novaehollandiae</i> subsp. <i>novaehollandiae</i> (Silver Gull)			
135.	<i>Latrodectus hasseltii</i>			
136.	25133 <i>Lerista elegans</i>			
137.	25005 <i>Lialis burtonis</i>			
138.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
139.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
140.	25378 <i>Litoria adelaidensis</i> (Slender Tree Frog)			
141.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
142.	<i>Lycosa ariadnae</i>			
143.	24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo)			
144.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
145.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
146.	<i>Maratus pavonis</i>			
147.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
148.	25184 <i>Menetia greyii</i>			
149.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
150.	<i>Microcarbo melanoleucos</i>			
151.	25693 <i>Microeca fascians</i> (Jacky Winter)			
152.	25191 <i>Morethia lineocellata</i>			
153.	25192 <i>Morethia obscura</i>			
154.	24223 <i>Mus musculus</i> (House Mouse)	Y		
155.	25420 <i>Myobatrachus gouldii</i> (Turtle Frog)			
156.	<i>Nanometa gentilis</i>			
157.	25248 <i>Neelaps bimaculatus</i> (Black-naped Snake)			
158.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
159.	<i>Nephila edulis</i>			
160.	25252 <i>Notechis scutatus</i> (Tiger Snake)			
161.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
162.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
163.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
164.	<i>Ommatoiulus moreletii</i>			
165.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
166.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
167.	25253 <i>Parasuta gouldii</i>			
168.	25681 <i>Pardalotus punctatus</i> (Spotted Pardalote)			
169.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
170.	24642 <i>Passer montanus</i> (Eurasian Tree Sparrow)	Y		
171.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
172.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
173.	48066 <i>Petroica boodang</i> (Scarlet Robin)			
174.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
175.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			
176.	25698 <i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
177.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
178.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
179.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
180.	48071 <i>Phylidonyris niger</i> (White-cheeked Honeyeater)			
181.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
182.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
183.	24842 <i>Platalea regia</i> (Royal Spoonbill)			
184.	25720 <i>Platycercus icterotis</i> (Western Rosella)			
185.	25509 <i>Pletholax gracilis</i> (Keeled Legless Lizard)			
186.	25007 <i>Pletholax gracilis</i> subsp. <i>gracilis</i> (Keeled Legless Lizard)			
187.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
188.	25704 <i>Podiceps cristatus</i> (Great Crested Grebe)			
189.	25510 <i>Pogona minor</i> (Dwarf Bearded Dragon)			
190.	24907 <i>Pogona minor</i> subsp. <i>minor</i> (Dwarf Bearded Dragon)			
191.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
192.	25722 <i>Polytelis anthopeplus</i> (Regent Parrot)			
193.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
194.	24767 <i>Porphyrio porphyrio</i> subsp. <i>bellus</i> (Purple Swamphen)			
195.	24769 <i>Porzana fluminea</i> (Australian Spotted Crane)			
196.	25732 <i>Porzana pusilla</i> (Baillon's Crane)			
197.	24771 <i>Porzana tabuensis</i> (Spotless Crane)			
198.	25511 <i>Pseudonaja affinis</i> (Dugite)			
199.	25259 <i>Pseudonaja affinis</i> subsp. <i>affinis</i> (Dugite)			
200.	<i>Purpureicephalus spurius</i>			
201.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
202.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
203.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
204.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
205.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			
206.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
207.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
208.	<i>Servaea melaina</i>			
209.	<i>Servaea spinibarbis</i>			
210.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
211.	30948 <i>Smicromis brevirostris</i> (Weebill)			
212.	<i>Steatoda grossa</i>			
213.	24329 <i>Stictonetta naevosa</i> (Freckled Duck)			
214.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
215.	25589 <i>Streptopelia chinensis</i> (Spotted Turtle-Dove)	Y		
216.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
217.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
218.	24682 <i>Tachybaptus novaehollandiae</i> subsp. <i>novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
219.	24207 <i>Tachyglossus aculeatus</i> (Short-beaked Echidna)			
220.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
221.	<i>Tamopsis perthensis</i>			
222.	24167 <i>Tarsipes rostratus</i> (Honey Possum, Noolbenger)			
223.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
224.	25519 <i>Tiliqua rugosa</i>			
225.	25204 <i>Tiliqua rugosa</i> subsp. <i>aspera</i>			
226.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
227.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
228.	25723 <i>Trichoglossus haematodus</i> (Rainbow Lorikeet)			
229.	25521 <i>Trichosurus vulpecula</i> (Common Brushtail Possum)			
230.	24158 <i>Trichosurus vulpecula</i> subsp. <i>vulpecula</i> (Common Brushtail Possum)			
231.	<i>Urodacus novaehollandiae</i>			
232.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
233.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
234.	<i>Venator immansueta</i>			
235.	<i>Venatrix pullastra</i>			
236.	24206 <i>Vespadelus regulus</i> (Southern Forest Bat)			
237.	24040 <i>Vulpes vulpes</i> (Red Fox)	Y		
238.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silvereye)			

Name	ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
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**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

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



# EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 10/10/19 20:42:06

[Summary](#)

[Details](#)

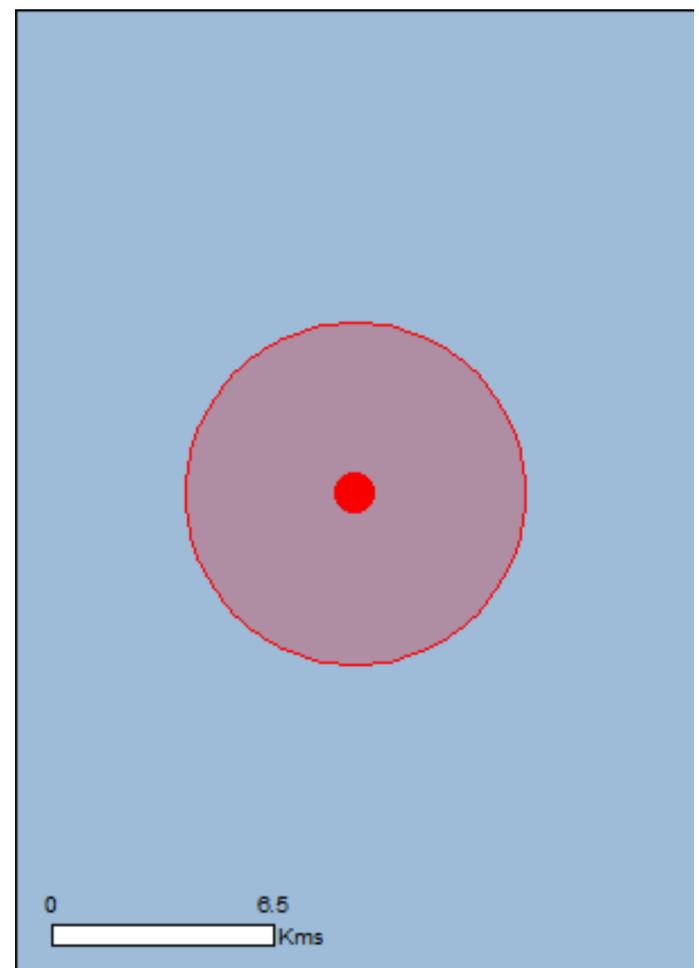
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

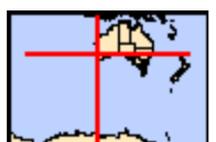
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 5.0Km



# 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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	2
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	2
<a href="#">Listed Threatened Species:</a>	21
<a href="#">Listed Migratory Species:</a>	19

## 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.

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	28
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	5
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	40
<a href="#">Nationally Important Wetlands:</a>	3
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

### Wetlands of International Importance (Ramsar)

[\[ Resource Information \]](#)

Name	Proximity
<a href="#">Forrestdale and thomsons lakes</a> <a href="#">Peel-yalgorup system</a>	Within Ramsar site 30 - 40km upstream

### 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
<a href="#">Banksia Woodlands of the Swan Coastal Plain ecological community</a>	Endangered	Community likely to occur within area
<a href="#">Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community</a>	Critically Endangered	Community likely to occur within area

### Listed Threatened Species

[\[ Resource Information \]](#)

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calyptorhynchus banksii naso</a> Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Calyptorhynchus baudinii</a> Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calyptorhynchus latirostris</a> Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pseudocheirus occidentalis</a> Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area
<b>Other</b>		
<a href="#">Westralunio carteri</a> Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area
<b>Plants</b>		
<a href="#">Andersonia gracilis</a> Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
<a href="#">Caladenia huegelii</a> King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
<a href="#">Diuris micrantha</a> Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Diuris purdiei</a> Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
<a href="#">Drakaea elastica</a> Glossy-leaved Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area
<a href="#">Drakaea micrantha</a> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eleocharis keigheryi</a> Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area
<a href="#">Lepidosperma rostratum</a> Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
<b>Listed Migratory Species</b>		<a href="#">[ Resource Information ]</a>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardenna carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Species or species habitat known to occur within area
<a href="#">Charadrius dubius</a> Little Ringed Plover [896]		Species or species habitat known to occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
<a href="#">Philomachus pugnax</a> Ruff (Reeve) [850]		Species or species habitat known to occur within area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

## Other Matters Protected by the EPBC Act

### 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
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a>		
Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Apus pacificus</a>		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a>		
Great Egret, White Egret [59541]		Breeding known to occur within area
<a href="#">Ardea ibis</a>		
Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a>		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a>		
Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a>		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a>		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a>		
Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Calidris subminuta</a>		
Long-toed Stint [861]		Species or species habitat known to occur within area
<a href="#">Charadrius dubius</a>		
Little Ringed Plover [896]		Species or species habitat known to occur within area
<a href="#">Charadrius ruficapillus</a>		
Red-capped Plover [881]		Species or species habitat known to occur within area
<a href="#">Haliaeetus leucogaster</a>		
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Himantopus himantopus</a>		
Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
<a href="#">Limosa limosa</a>		
Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Merops ornatus</a>		
Rainbow Bee-eater [670]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
<a href="#">Philomachus pugnax</a> Ruff (Reeve) [850]		Species or species habitat known to occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
<a href="#">Recurvirostra novaehollandiae</a> Red-necked Avocet [871]		Species or species habitat known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thinornis rubricollis</a> Hooded Plover [59510]		Species or species habitat known to occur within area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Harry Waring Marsupial Reserve	WA
Thomsons Lake	WA
Unnamed WA48291	WA
Unnamed WA49561	WA
Wandi	WA

## Invasive Species [ Resource Information ]

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

Name	Status	Type of Presence
<b>Birds</b>		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species

Name	Status	Type of Presence
<p>Anas platyrhynchos Mallard [974]</p>		<p>habitat likely to occur within area</p> <p>Species or species habitat likely to occur within area</p>
<p>Carduelis carduelis European Goldfinch [403]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Passer domesticus House Sparrow [405]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Passer montanus Eurasian Tree Sparrow [406]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Streptopelia chinensis Spotted Turtle-Dove [780]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Sturnus vulgaris Common Starling [389]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Turdus merula Common Blackbird, Eurasian Blackbird [596]</p>		<p>Species or species habitat likely to occur within area</p>
<b>Mammals</b>		
<p>Bos taurus Domestic Cattle [16]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Canis lupus familiaris Domestic Dog [82654]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Felis catus Cat, House Cat, Domestic Cat [19]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Mus musculus House Mouse [120]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Oryctolagus cuniculus Rabbit, European Rabbit [128]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Rattus norvegicus Brown Rat, Norway Rat [83]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Rattus rattus Black Rat, Ship Rat [84]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Vulpes vulpes Red Fox, Fox [18]</p>		<p>Species or species</p>

Name	Status	Type of Presence
habitat likely to occur within area		
<b>Plants</b>		
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 habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista 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
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
---	--	--

#### Nationally Important Wetlands

[ [Resource Information](#) ]

Name	State
<a href="#">Gibbs Road Swamp System</a>	WA
<a href="#">Spectacles Swamp</a>	WA
<a href="#">Thomsons Lake</a>	WA

# 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

-32.19018 115.84266

# 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.

## Appendix B Flora, Vegetation and Black Cockatoo Habitat Assessment

Department of Planning, Lands and Heritage  
Mandogalup Improvement Plan 47  
Flora, Vegetation and Black Cockatoo Habitat  
Assessment

18 December 2020

57020-124835 (Rev 1)

JBS&G Australia Pty Ltd T/A Strategen-JBS&G

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Appendix B	Desktop assessment results (DBCA 2019; DoEE 2019)
Appendix C	Native plant taxa recorded within the Survey Area

## 1. Introduction

### 1.1 Background

Improvement Plan 47: Mandogalup was gazetted on 12 April 2019, for the purpose of enabling the Western Australian Planning Commission (WAPC) to advance the planning of and development of the plan area (including authorising the preparation of an improvement scheme). The Improvement Plan affects approximately 330 ha of land in the Mandogalup locality in the City of Kwinana, and is bound by Rowley Road to the north and Anketell Road to the south, with Kwinana Freeway to the east and the Alcoa residue storage area to the west (Figure 1.1). The Department of Planning, Lands and Heritage (DPLH) is now preparing a draft Improvement Scheme (IS), for the same area (the subject area).

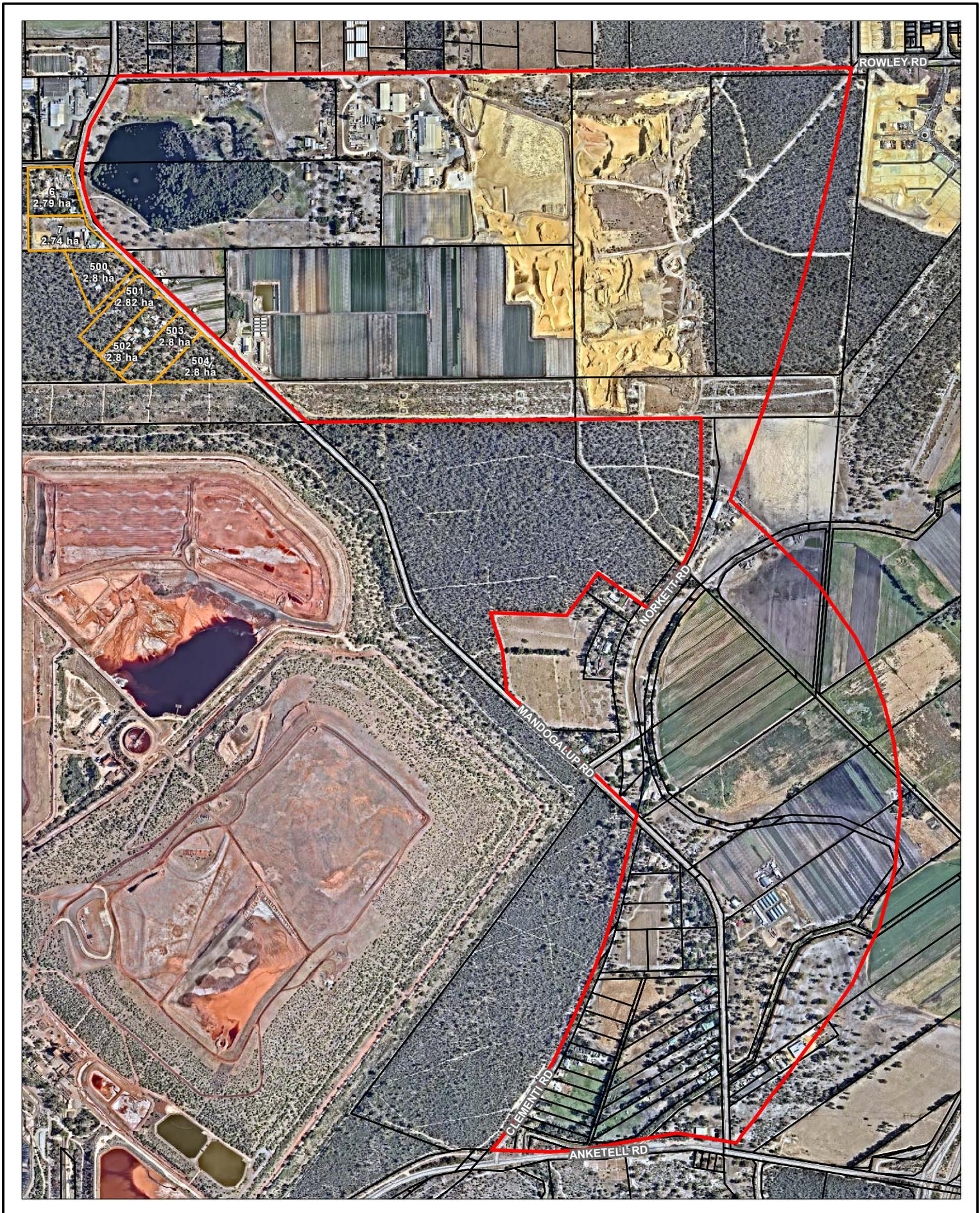
In support of the Improvement Scheme DPLH commissioned Strategen-JBS&G to undertake a flora, vegetation and black cockatoo habitat assessment for those parts of the subject area that have not been studied within the previous 10 years (the Survey Area; Figure 1.1). The Survey Area encompasses a total area of 19.6 ha.

### 1.2 Scope

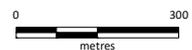
The scope of this flora, vegetation and black cockatoo habitat survey was to undertake a desktop assessment and field assessment within the Survey Area consistent with the requirements of *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) and *EPBC Act referral guidelines for three threatened black cockatoo species* (DSEWPac 2012).

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
- Determine whether vegetation communities within the Survey Area are suitable as black cockatoo habitat, and describe and map the quality of each area of habitat
- Search for any potential nesting habitat trees for any of the threatened black cockatoo species (Eucalypts with a diameter at breast height [DBH]>500 mm)
- Record and map locations of potential nesting habitat trees
- Prepare a report summarising the findings.



- Legend:**
- Mandogalup IS boundary (331.2 ha)
  - Sandwich lots (19.56 ha)
  - Cadastral boundary
  - Roads (MRWA)



Mandogalup, WA

**MANDOGALUP IS SURVEY AREA**

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: cthatcher

Checked By: CT

Version: A

Date: 18-Dec-2020

**FIGURE: 1.1**

## 2. Context

### 2.1 Legislative context

Flora and fauna in Western Australia (WA) is protected formally and informally by various legislative and non-legislative measures, which are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – Australian Government
- *Biodiversity Conservation Act 2016* (BC Act) – State
- *Biosecurity and Agriculture Management Act 2007* (BAM Act) – State.

Non-legislative measures:

- WA Department of Biodiversity, Conservation and Attractions (DBCA) Priority lists for flora, ecological communities and fauna
- Weeds of National Significance
- Recognition of locally significant populations by the DBCA.

A short description of each legislative measure is given below. Other definitions, including species conservation categories, are provided in Appendix A.

#### 2.1.1 EPBC Act

The EPBC Act aims to protect matters of national environmental significance, which are detailed in Appendix A. Under the EPBC Act, the Commonwealth Department of the Environment and Energy (DEE) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are conservation significant if they are listed as Threatened (i.e. Critically Endangered, Endangered and Vulnerable) or Migratory.

Bird species protected as Migratory under the EPBC Act include those listed under international migratory bird agreements relating to the protection of birds which migrate between Australia and other countries, for which Australia has agreed. This includes the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Some marine fauna or terrestrial fauna that use marine habitats are listed as Marine under the EPBC Act. These species are only considered conservation significant when a proposed development occurs in a Commonwealth marine area (i.e. any Commonwealth Waters or Commonwealth Marine Protected Area). Outside of such areas, the EPBC Act does not consider these species to be matters of national environmental significance so are not protected under the Act.

#### 2.1.2 BC Act

DBCA lists taxa (flora and fauna) under the provisions of the BC Act as protected and classifies these taxa according to their need for protection (see Appendix A). The BC Act makes it an offence to 'take' Threatened species without an appropriate licence. There are financial penalties for contravening the BC Act.

#### 2.1.3 BAM Act

The BAM Act provides for management and control of listed organisms, including introduced flora species (weeds). Species listed as declared pests under the BAM Act are classified under three categories:

- C1 Exclusion: Pests assigned under this category are not established in Western Australia, and control measures are to be taken to prevent them entering and establishing in the State

- C2 Eradication: Pests assigned under this category are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility
- C3 Management: Pests assigned under this category are established in Western Australia, but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area that is currently free of that pest.

Under the BAM Act, land managers are required to manage populations of declared pests as outlined under the relevant category.

## 2.2 Environmental setting

### 2.2.1 Geomorphology

The survey area is located within the Swan Coastal Plain 2 (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). The Survey Area is located within the Bassendean Dune system (Churchward & McArthur 1980).

### 2.2.2 Climate

The Mandogalup locality experiences a Mediterranean climate characterised by mild, wet winters and warm to hot, dry summers. The nearest Bureau of Meteorology (BoM) weather station at Medina Research Centre (Station No. 009194; now closed) provides average monthly climate statistics for the Mandogalup locality (Figure 2.1). Average annual rainfall recorded at Medina Research Centre since 1983 is 746 mm (BoM 2019). Rainfall may occur at any time of year; however, most occurs in winter in association with cold fronts from the southwest. Highest temperatures occur between January and February, with average monthly maximums ranging from 18.3°C in July to 31.5°C in February (BoM 2019). Lowest temperatures occur in July and August, with average monthly minimums ranging from 8.2°C in July and August to 17.6°C in February (BoM 2019).

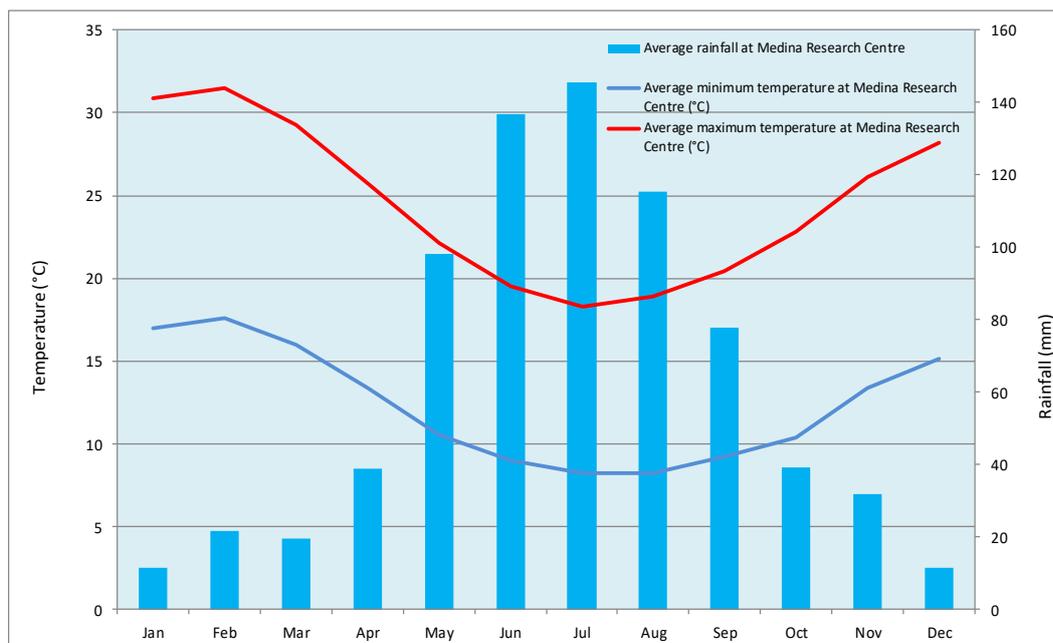


Figure 2.1: Mean monthly climatic data (temperature and rainfall) for Medina Research Centre

### 2.2.3 Regional vegetation

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) which led to the delineation of botanical districts as described in Beard (1990); the biogeographical region dataset (Interim Biogeographic Regionalisation for Australia, IBRA) for Western Australia (DoEE 2017a) and System 6 Vegetation Complex mapping undertaken by Heddle *et al.* (1980).

#### 2.2.3.1 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).

#### 2.2.3.2 IBRA subregion

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).

#### 2.2.3.3 Vegetation association and System 6 mapping

Vegetation associations (Beard 1990) that fall within the Survey Area are outlined in Table 2.1 and shown in Figure 2.2.

**Table 2.1: Vegetation associations within Survey Area**

Identifier	Description	Percent of pre-European extent remaining (%) (as at 2019)	% Current Extent Protected (IUCN I - IV) for Conservation (proportion of Pre-European Extent)
6	medium woodland; tuart & jarrah	23.72	3.3
1001	medium very sparse woodland; jarrah, with low woodland; banksia & casuarina	22.05	2.8

System 6 mapping refers to vegetation mapping undertaken at a Vegetation Complex scale by Heddle *et al.* (1980). This is the primary source of information used to calculate potential impacts of proposals to clear native vegetation on the Swan Coastal Plain. The Survey Area occurs within the following vegetation complexes, which are outlined in Table 2.2 and illustrated in Figure 2.2.

**Table 2.2: Vegetation complexes within the Survey Area**

Complex name	Description	Percentage remaining (%)	Current percentage remaining within lands Protected (IUCN I-IV) for Conservation (%)
Karrakatta Complex-Central and South	Predominantly open forest of <i>Eucalyptus gomphocephala</i> (Tuart) - <i>Eucalyptus marginata</i> (Jarrah) - <i>Corymbia calophylla</i> (Marri) and woodland of <i>Eucalyptus marginata</i> (Jarrah) - Banksia species. <i>Agonis flexuosa</i> (Peppermint) is co-dominant south of the Capel River.	23.49	3.87
Bassendean Complex Central and South	Vegetation ranges from woodland of <i>Eucalyptus marginata</i> (Jarrah) - <i>Allocasuarina fraseriana</i> (Sheoak) - Banksia species to low woodland of Melaleuca species, and sedgeland on the moister sites. This area includes the transition of	26.87	1.86

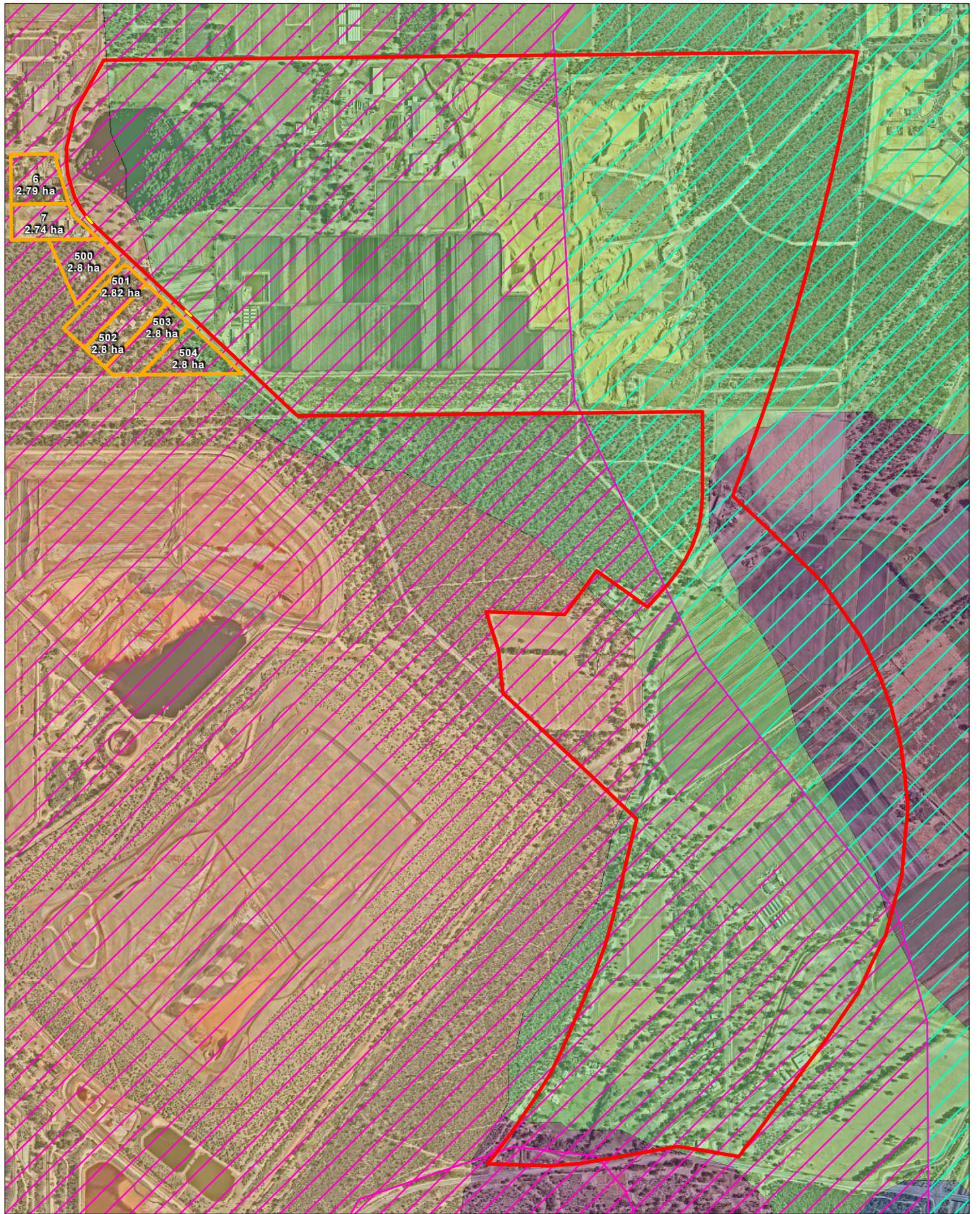
Complex name	Description	Percentage remaining (%)	Current percentage remaining within lands Protected (IUCN I-IV) for Conservation (%)
	<i>Eucalyptus marginata</i> (Jarrah) to <i>Eucalyptus tottiana</i> (Pricklybark) in the vicinity of Perth.		
Herdsman Complex	Sedgeland and fringing woodland of <i>Eucalyptus rudis</i> (Flooded Gum) - <i>Melaleuca</i> species.	32.11	10.83

#### 2.2.4 Black cockatoo habitat

*Calyptorhynchus latirostris* (Carnaby's Black-Cockatoos; CBC), listed as Endangered under the EPBC Act, feed on the seeds, nuts and flowers, of a variety of native and introduced plant species and insect larvae (DSEWPaC 2012). Food plants generally occur within proteaceous genera such as *Banksia*, *Hakea* and *Grevillea*, though are known to forage on eucalypt species in woodland areas. CBC have also adapted to feeding on exotic species such as pines and cape lilac and weeds such as wild radish and wild geranium (DSEWPaC 2012). CBC usually breed between July and December in the hollows of live or dead eucalypts; primarily in Salmon Gum and Wandoo, but also within Jarrah, Marri and other eucalypt species (Johnstone 2010). Hollows are usually at least 2 m above ground, sometimes over 10 m and the depth of the hollow varies from 0.25 m to 6 m (DSEWPaC 2012). Mapping of Carnaby's Black Cockatoo distribution (Johnstone and Kirkby undated) identifies the Survey Area as occurring within the range of the species.

*Calyptorhynchus banksii naso* (Forest Red-tailed Black-Cockatoos; FRTBC), listed as Vulnerable under the EPBC Act, depend primarily on Marri and Jarrah trees for both foraging and nesting. The seeds of both eucalypts are the favoured food source of the birds and hollows within live or dead individual trees are utilised for nesting purposes (Johnstone 2010b). Breeding varies between years and occurs at times of Jarrah and Marri fruiting. These black cockatoos breed in woodland, forest or artificial nest boxes, but may also breed in former woodland or forest that has been reduced to isolated trees (DSEWPaC 2012). Mapping of the FRTBC distribution (Johnstone and Kirkby undated) identifies the species as likely to occur within the Survey Area.

Baudin's Black-Cockatoos primarily occur in eucalypt forests and forage at all strata levels within the forests with a tendency to favour areas containing Marri (Johnstone and Kirkby 2008, DSEWPaC 2012). Breeding generally occurs in the Jarrah, Marri and Karri forests of the southwest of Western Australia in areas averaging more than 750 mm of rainfall annually (DSEWPaC 2012). As with the other two species of Threatened black cockatoos in Western Australia, breeding habitat also occurs in former woodland or forest that has been reduced to isolated trees (DSEWPaC 2012). Mapping of the Baudin's Black-Cockatoos distribution (Johnstone and Kirkby undated; DoEE 2017) identifies the species as unlikely to occur in the Survey Area and are therefore not discussed further.



- Legend:**
- Mandagalup IS boundary (331.2 ha)
  - Sandwich lots (19.56 ha)
  - Bassendeans
  - Spearwood
  - Vegetation complex (Heddele) - DBCA  
Bassendeans Complex-Central and South
  - Cottesloe Complex-Central and South
  - Herdsman Complex
  - Karrakatta Complex-Central and South
- Vegetation system (Beard) - DPIRD

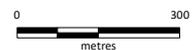


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Coord. Sys. GDA 1994 MGA Zone 50

Version: A

Date: 31-Jan-2020

Mandagalup, WA

REGIONAL VEGETATION MAPPING

FIGURE: 2.2

### 3. Methods

#### 3.1 Desktop assessment

A desktop assessment was conducted using DBCA and Department of the Environment and Energy (DoEE) databases to identify the possible occurrence of TECs, PECs and Threatened and Priority flora potentially occurring within the Survey Area. These databases included NatureMap (DBCA 2019) and the Commonwealth Protected Matters Search Tool (DoEE 2019) as well as requesting data from the Threatened Species and Communities branches of DBCA.

Reports that document regional flora, vegetation and fauna within the surrounds of the Survey Area were also reviewed prior to the field assessment.

#### 3.2 Field assessment

##### 3.2.1 Flora and vegetation

The field survey was conducted according to standards set out in *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). The assessment of flora and vegetation within the Survey Area was undertaken by three ecologists from Strategen-JBS&G on 24 October and 14 November 2019, and 30 September and 1 October 2020. Table 3.1 identifies the staff involved in the assessment, their role and qualifications.

**Table 3.1: Personnel involved in survey**

Name	Role	Flora collection permit
Tristan Sleight Strategen-JBS&G (Senior Ecologist)	Survey planning, fieldwork, plant identification, data interpretation and report preparation.	FB62000128
Robyn Chesney Strategen-JBS&G (Senior Ecologist)	Survey planning, fieldwork, plant identification, data interpretation and report preparation.	FB62000123
Jenna Hyatt Strategen-JBS&G (Environmental Scientist)	Survey planning, fieldwork	n/a

The Survey Area was traversed on foot and relevés were placed where native vegetation was encountered. Flora and vegetation was described and sampled systematically at each quadrat and additional opportunistic collecting was undertaken wherever previously unrecorded plants were observed. At each site the following floristic and environmental parameters were noted:

- GPS location
- Topography
- Soil type and colour
- Outcropping rocks and their type
- Percentage cover and average height of each vegetation stratum
- Vegetation condition

For each vascular plant species, the average height and percent cover were recorded. Vegetation condition was rated according to the scale of Keighery (1994) (Table 3.2).

**Table 3.2: Vegetation condition scale for South West and Interzone Botanical Provinces (EPA 2016)**

Condition rating	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.

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

All plant specimens collected during the field surveys were identified using appropriate reference material or through comparisons with pressed specimens housed at the Western Australian Herbarium where necessary. Nomenclature of the species recorded is in accordance with Western Australian Herbarium (1998-).

### 3.2.1.1 Data analysis and vegetation mapping

Vegetation types (VT) were delineated using a combination of results, site observations and cluster analysis. Aerial photography interpretation and field notes taken during the survey were then used to develop VT mapping polygon boundaries over the Survey Area. These polygon boundaries were then digitised using the Geographic Information System (GIS) software.

VT descriptions (through floristic in origin) have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 6.0 (ESCAVI 2003), a system of describing structural vegetation units (based on dominant taxa). This model follows nationally-agreed guidelines to describe and represent VTs, so that comparable and consistent data is produced nation-wide. For the purposes of this report, a VT is considered equivalent to a NVIS sub-association as described in ESCAVI (2003).

### 3.2.2 Black cockatoo habitat assessment

The Survey Area was inspected on 24 October and 14 November 2019 by Strategen-JBS&G personnel with relevant experience as specified by the *EPBC Act Referral guidelines for three threatened black cockatoo species* (DSEWPaC 2012). The inspection included:

- A vegetation assessment to identify vegetation communities and potential black cockatoo foraging species
- A significant tree assessment to identify any trees with the potential to be utilised by black cockatoos for breeding.

#### 3.2.2.1 Vegetation and foraging assessment

The Survey Area was traversed on foot to record any flora species with the potential to provide a food source for black cockatoos. Following the assessment, vegetation units defined as part of the flora and vegetation survey were assigned a foraging value based on the presence and quantity of potential food species and any evidence of foraging by black cockatoos.

#### 3.2.2.2 Significant tree assessment

Significant trees are defined as trees of suitable species with a diameter at breast height (DBH) greater than 500 mm (> 300 mm for salmon gum and wandoo) (DSEWPaC 2012). Tree species which are considered to be potential breeding or roosting trees are outlined in Table 3.3. Trees with a DBH greater than 500 mm (or >300 mm for salmon gum and wandoo) are large enough to potentially contain hollows suitable for nesting black cockatoos, or have the potential to develop suitable

hollows over the next 50 years. Trees of this size may also be large enough to provide roosting habitat (i.e. trees which provide a roost or rest area for the birds). The locations of such trees within the Survey Area were recorded using a GPS. In addition to the location and DBH, the species of each tree was also recorded. The survey of significant trees was not able to be completed within 297 Mandogalup Road, due to access constraints. All other properties within the survey area were surveyed.

**Table 3.3: Black cockatoo potential breeding and roosting tree species (Groom 2011, DSEWPac 2012)**

Scientific name	Common name	Breeding	Roosting
<i>Corymbia calophylla</i>	Marri	Yes	Yes
<i>Corymbia maculate</i>	Spotted Gum		Yes
<i>Eucalyptus accedens</i>	Powderbark	Yes	
<i>Eucalyptus camaldulensis</i>	River Red Gum		Yes
<i>Eucalyptus citriodora</i>	Lemon Scented Gum		Yes
<i>Eucalyptus diversicolor</i>	Karri	Yes	
<i>Eucalyptus globulus</i>	Tasmania Blue Gum		Yes
<i>Eucalyptus gomphocephala</i>	Tuart	Yes	Yes
<i>Eucalyptus grandis</i>	Flooded Gum, Rose Gum		Yes
<i>Eucalyptus longicornis</i>	Red Morrell	Yes	
<i>Eucalyptus loxophleba</i>	York Gum	Yes	Yes
<i>Eucalyptus marginata</i>	Jarrah	Yes	Yes
<i>Eucalyptus megacarpa</i>	Bullich	Yes	Yes
<i>Eucalyptus occidentalis</i>	Swamp Yate	Yes	
<i>Eucalyptus patens</i>	Blackbutt	Yes	Yes
<i>Eucalyptus robusta</i>	Swamp Mahogany		Yes
<i>Eucalyptus rudis</i>	Flooded Gum	Yes	Yes
<i>Eucalyptus salmonophloia</i>	Salmon Gum	Yes	
<i>Eucalyptus salubris</i>	Gimlet	Yes	
<i>Eucalyptus wandoo</i>	Wandoo	Yes	Yes
<i>Pinus pinaster</i>	Pinaster, Maritime Pine		Yes
<i>Pinus radiata</i>	Monterey, Radiata Pine		Yes

### 3.3 Survey limitations and constraints

Table 3.4 displays the evaluation of the flora and vegetation assessment against a range of potential limitations that may have an effect on that assessment. Based on this evaluation, the assessment has not been subject to limitations or constraints that have affected the thoroughness of the assessment and the conclusions reached.

**Table 3.4: Flora and vegetation survey potential limitations and constraints**

Potential limitation	Impact on assessment	Comment
Sources of information and availability of contextual information (i.e. pre-existing background versus new material).	<b>Not a constraint.</b>	The survey has been undertaken in the Drummond Botanical Subdistrict on the Swan Coastal Plain which has been well studied and documented with ample literature available (Beard 1990).
Scope (i.e. what life forms, etc., were sampled).	<b>Not a constraint.</b>	Number of species recorded, number of sites sampled and timing of the survey (i.e. spring) were adequate for this level of survey.
Proportion of flora/fauna collected and identified (based on sampling, timing and intensity).	<b>Not a constraint.</b>	The proportion of flora surveyed was adequate. All areas of remnant vegetation within the survey area were traversed and flora species were recorded systematically.
Completeness and further work which might be needed (i.e. was the relevant Survey Area fully surveyed).	<b>Not a constraint.</b>	The information collected during the survey was sufficient to assess the vegetation that was present during the time of the survey.
Mapping reliability.	<b>Not a constraint.</b>	Aerial photography of a suitable scale was used to map the project area. Sites were chosen from these aerials to reflect changes in community structure. Vegetation types were assigned to each site based on topography,

		soil type and presence/absence and percent foliage cover of vegetation.
Timing, weather, season, cycle.	<b>Not a constraint.</b>	Flora and vegetation surveys are normally conducted following winter rainfall in the South-West Province, ideally during spring (EPA 2016). The field assessment was conducted in October and November (i.e. spring) in fine weather conditions and therefore these factors are not deemed to be constraints for the spring survey.
Disturbances (fire flood, accidental human intervention, etc.).	<b>Not a constraint.</b>	The project area and regional surrounds have been subject to disturbance over a significant period of time. Given the wide range of this disturbance, this is not considered to be a limitation within the project area.
Intensity (in retrospect, was the intensity adequate).	<b>Not a constraint.</b>	The project area was traversed on foot and all differences in vegetation structure were recorded appropriately.
Resources (i.e. were there adequate resources to complete the survey to the required standard).	<b>Not a constraint.</b>	The available resources were adequate to complete the survey.
Access problems (i.e. ability to access Survey Area).	<b>Not a constraint.</b>	The project area was easily traversed on foot enabling adequate access to survey the vegetation within the project area.
Experience levels (e.g. degree of expertise in species identification to taxon level).	<b>Not a constraint.</b>	All survey personnel have the appropriate training in sampling and identifying the flora of the region.

## 4. Results

### 4.1 Desktop assessment results

#### 4.1.1 Threatened and Priority flora

The desktop assessment identified a total of eight threatened and five priority flora species as having been previously recorded, or with potentially suitable habitat occurring within 5 km of the centre-point of the Survey Area (Appendix B). Of these species, based on general habitat requirements (Table 4.1), three Threatened and one Priority flora species were considered to have the potential to occur within the subject area and sandwich lots, as follows:

- *Caladenia huegelii* (Threatened – Endangered [EPBC Act]; Threatened [BC Act])
- *Drakaea elastica* (Threatened – Endangered [EPBC Act]; Threatened [BC Act])
- *Drakaea micrantha* (Threatened – Vulnerable [EPBC Act]; Threatened [BC Act])

The potential for these species to occur within the Survey Area is discussed further in Table 4.1. The Likelihood of each species is based on the following criteria:

- Recorded: Recorded during the field survey or site reconnaissance
- Likely: Suitable habitat is present in the Survey area and the Survey area is in the species' known distribution
- Possible: Limited or no suitable habitat is present in Survey area, but is nearby. The species has good dispersal abilities and is known from the general area
- Unlikely: No suitable habitat is present in Survey area but is nearby, the species has poor dispersal abilities, but is known from the general area; or suitable habitat is present, however the Survey area is outside of the species' known distribution; or suitable habitat is present, however these species was not recorded during targeted surveys.

**Table 4.1: Threatened and Priority flora potentially occurring within the Survey Area**

Species	Conservation status		Description	Potential to occur
	EPBC Act	BC Act/ DBCAs listing		
<i>Andersonia gracilis</i>	Threatened – Endangered	Threatened	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 <i>Calothamnus hirsutus</i> (hairy clawflower), <i>Verticordia densiflora</i> (compact featherflower), <i>Kunzea recurva</i> (recurved kunzea) and <i>Banksia telmatiaea</i> over sedges (Western Australian Herbarium 1998-, DEE 2019a).	<b>Unlikely</b> due to absence of preferred habitat. While wetlands are present within the Survey Area, these are heavily degraded, with understorey species largely displaced by weeds and ornamental species. None of the associated species were recorded within the Survey Area.
<i>Caladenia huegelii</i>	Threatened – Endangered	Threatened	A slender orchid from 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 <i>Banksia</i> , <i>Allocasuarina</i> and Jarrah woodlands (Western Australian Herbarium 1998-, DEE 2019a).	<b>Possible</b> . Potential habitat is present within VT6, VT7, and VT9.
<i>Cyathochaeta teretifolia</i>	-	P3	A rhizomatous, clumped, robust perennial, grass-like or herb (sedge), to 2 m high and to 1.0 m wide. Flowers are brown. Habitat for this species includes grey sand or sandy clay within swamps or creek edges (Western Australian Herbarium 1998-).	<b>Unlikely</b> due to absence of preferred habitat. While wetlands are present within the Survey Area, these are heavily degraded, with understorey species largely displaced by weeds and ornamental species.
<i>Diuris micrantha</i>	Threatened – Vulnerable	Threatened	A slender orchid to 60 cm tall. Yellow flowers with reddish-brown markings measuring 1.3 cm across. Habitat for this species occurs within clay-loam substrates in winter-wet depressions or swamps.	<b>Unlikely</b> due to absence of preferred habitat. While wetlands / winter-wet depressions are present within the Survey Area, these are heavily degraded, with understorey species largely displaced by weeds and ornamental species.
<i>Diuris purdiei</i>	Threatened – Endangered	Threatened	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-). <i>Diuris purdiei</i> 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 <i>Melaleuca preissiana</i> , <i>Corymbia calophylla</i> , <i>E. marginata</i> and <i>Nuytsia floribunda</i> (DEE 2019a).	<b>Unlikely</b> due to absence of preferred habitat. No areas comprising an intact understorey of dense heath or sedges with key emergent species were recorded within the Survey Area.

Species	Conservation status		Description	Potential to occur
	EPBC Act	BC Act/ DBCA listing		
<i>Dodonaea hackettiana</i>	-	P4	An erect shrub or tree, 100 to 500 cm tall. Flowers are yellow to green/red and occur mainly from July to October. Habitat for this species occurs in sand and outcropping limestone (Western Australian Herbarium 1998-).	<b>Present.</b> Species was recorded within VT7, in remnant vegetation alongside Norkett Road.
<i>Drakaea elastica</i>	Threatened – Endangered	Threatened	A slender orchid to 30 cm tall with a prostrate, round to heart shaped leaf. Singular, bright green, glossy flower. The species grows on bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps, typically in banksia ( <i>Banksia menziesii</i> , <i>B. attenuata</i> and <i>B. ilicifolia</i> ) woodland or spearwood ( <i>Kunzea glabrescens</i> ) thicket vegetation. <i>D. elastica</i> often occurs with other orchid species (DEE 2019a).	<b>Possible</b> due to presence of preferred habitat in VT1 and VT7, i.e. banksia woodland alongside swamps.
<i>Drakaea micrantha</i>	Threatened – Vulnerable	Threatened	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 from 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 2019a).	<b>Possible</b> due to presence of preferred habitat. Potential habitat is located within firebreaks near tracts of remnant bushland, e.g. around sandwich lots and lots adjacent to Bush Forever sites.
<i>Eleocharis keigheryi</i>	Threatened – Vulnerable	Threatened	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 ( <i>Casuarina obesa</i> ), Flooded Gum ( <i>Eucalyptus rudis</i> ), Red Robin Bush ( <i>Melaleuca lateritia</i> ), Swamp Paperbark ( <i>M. raphiophylla</i> ), Common Spike-sedge ( <i>Eleocharis acuta</i> ), <i>Aponogeton hexatepalus</i> , Veined Swamp Wallaby Grass ( <i>Amphibromus nervosus</i> ) and herbs such as <i>Wurmbea</i> , <i>Tribonanthes</i> and <i>Leptocarpus</i> spp. (Western Australian Herbarium 1998-, DEE 2019a).	<b>Unlikely</b> due to absence of preferred habitat. While VT4 contained vegetation within and adjacent to standing water associated with a drainage channel, this water was deeper than 15 cm.
<i>Lepidosperma rostratum</i>	Threatened – Endangered	-	A rhizomatous sedge to 30 cm in diameter. Stems are circular in cross section and flowers are spike-like and up to 4 cm long. Habitat for this species occurs in sandy soils among low heath comprised of <i>Banksia telmatiaea</i> and <i>Calothamnus hirsutus</i> in winter-wet swamps (Western Australian Herbarium 1998-, DEE 2017a).	<b>Unlikely</b> due to absence of preferred habitat and associated species.

Species	Conservation status		Description	Potential to occur
	EPBC Act	BC Act/ DBCAs listing		
<i>Pimelea calcicola</i>	-	P3	An erect to spreading shrub to 1 m tall. Flowers are pink and visible between September to November. Habitat for this species occurs in sand on coastal limestone ridges (Western Australian Herbarium 1998-).	<b>Unlikely</b> due to absence of preferred habitat.
<i>Pithocarpa corymbulosa</i>	-	P3	An erect to scrambling perennial herb 50 to 100 cm tall. Flowers are white and are present from January to April. Habitat for this species occurs within gravelly or sandy loam amongst granite outcrops (Western Australian Herbarium 1998-, DEE 2019a).	<b>Unlikely</b> due to absence of preferred habitat.
<i>Stylidium paludicola</i>	-	P3	Reed-like perennial, herb, 35 to 100 cm tall. Leaves are tufted, linear or subulate or narrowly oblanceolate. Flowers are pink and occur in October to December. Habitat for this species occurs in peaty sand over clay and winter wet areas, often in Marri and Melaleuca woodland or Melaleuca shrubland (Western Australian Herbarium 1998-).	<b>Unlikely</b> due to absence of preferred habitat. While winter-wet areas are present within the Survey Area, the majority of these have been severely disturbed and understorey replaced with no-native species, or completely cleared for market gardens.

#### 4.1.2 Threatened and Priority Ecological Communities

A TEC is defined under the EP Act as an ecological community listed, designated or declared under a written law or a law of the Australian Government as Threatened, Endangered or Vulnerable. There are four State categories of TECs (DEC 2010)

- presumed totally destroyed (PD)
- critically endangered (CR)
- endangered (EN)
- vulnerable (VU)

A description of each of these TECs is presented in Appendix A. TECs are gazetted as such by DBCA (2019) and some Western Australian TECs listed by DBCA are also listed as Threatened under the EPBC Act.

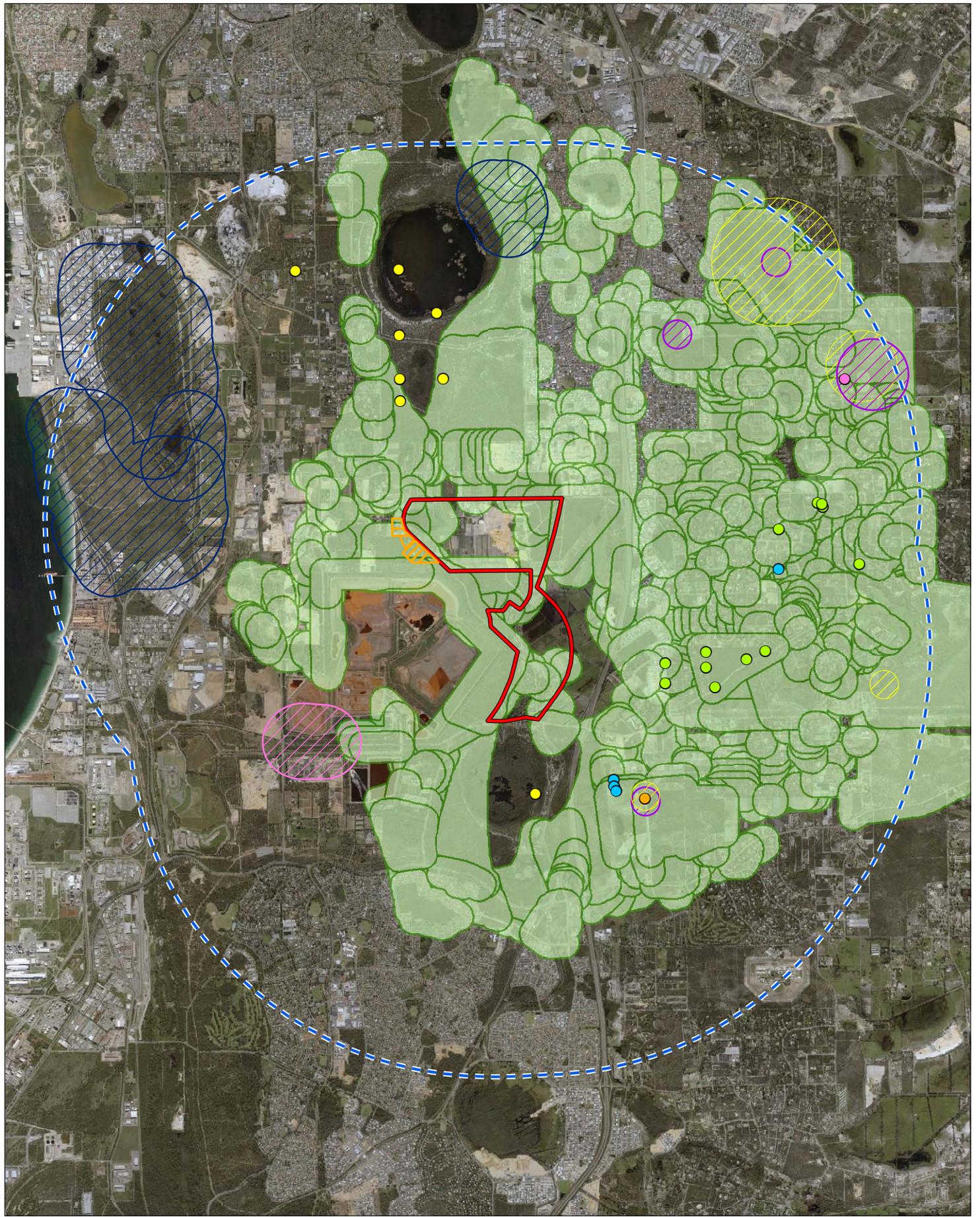
Under the EPBC Act, a person must not undertake an action that has or will have a significant impact on a listed TEC without approval from the Australian Government Minister for the Environment, unless those actions are not prohibited under the EPBC Act. A description of each of these categories of TECs is presented in Appendix A. The current EPBC Act list of TECs can be located on the DoEE (2019) website.

Ecological communities identified as Threatened, but not listed as TECs, are classified as Priority Ecological Communities (PECs). These communities are under threat, but there is insufficient information available concerning their distribution to make a proper evaluation of their conservation status. DBCA categorises PECs according to their conservation priority, using five categories; P1 (highest conservation significance) to P5 (lowest conservation significance), to denote the conservation priority status of such ecological communities. Appendix A defines PECs (DEC 2010). DBCA (2019) contains a list of current PECs.

One TEC listed under the BC Act, three PECs listed by DBCA and one TEC listed under the EPBC Act were identified within 5 km of the Survey Area (Figure 4.1); however, it is worth noting that these mapped boundaries do not necessarily represent the actual extent of their respective communities and are rather a broad scale indication of where the communities have been previously mapped plus an additional buffer.

**Table 4.2: Mapped TECs identified within 5 km of the Survey Area**

Community identifier	Community name	Listing under the BC Act	Listing under the EPBC Act
Various floristic community types (FCTs)	Banksia woodlands of the Swan Coastal Plain	Various listings; encompasses multiple state-listed TECs and PECs	Endangered
Limestone ridges (SCP 26a)	<i>Melaleuca huegelii</i> - <i>Melaleuca systema</i> shrublands on limestone ridges	Endangered	NA
SCP21c	Low lying <i>Banksia attenuata</i> woodlands or shrublands	Priority 3	Endangered
SCP22	<i>Banksia ilicifolia</i> woodlands, southern Swan Coastal Plain	Priority 3	Endangered
SCP24	Northern Spearwood shrublands and woodlands	Priority 3	Endangered



- Legend**
- Mandogalup IS boundary (331.2 ha)
  - 5km buffer
  - Sandwich lots (19.56 ha)
- TECs/PECs**
- Banksia Woodlands of the Swan Coastal Plain
  - SCP21c

- SCP22
  - SCP24
  - Limestone ridges (SCP 26a)
- Threatened and Priority Flora species**
- *Caladenia huegelii* (T)
  - *Cyathochaeta teretifolia* (P3)
  - *Dodonaea hackettiana* (P4)
  - *Drakaea elastica* (T)
  - *Verticordia lindleyi* subsp. *lindleyi* (P4)

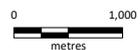


Job No: 57020

Client: Taylor Burrell Barnett

Drawn By: hsullivan

Checked By: CT



Scale 1:70,000 at A4

Coord. Sys. GDA 1994 MGA Zone 50

Version: A

Date: 31-Jan-2020

Mandogalup, WA

**LOCATION OF THREATENED AND PRIORITY FLORA AND ECOLOGICAL COMMUNITIES WITHIN 5KM OF THE SURVEY AREA**

**FIGURE 4.1**

### 4.1.3 Wetlands

The nature of the protection and management that Swan Coastal Plain wetlands should be afforded is guided by the appropriate management category they have been assigned. These management categories are listed below in Table 4.3.

**Table 4.3: Wetland management categories and management objectives**

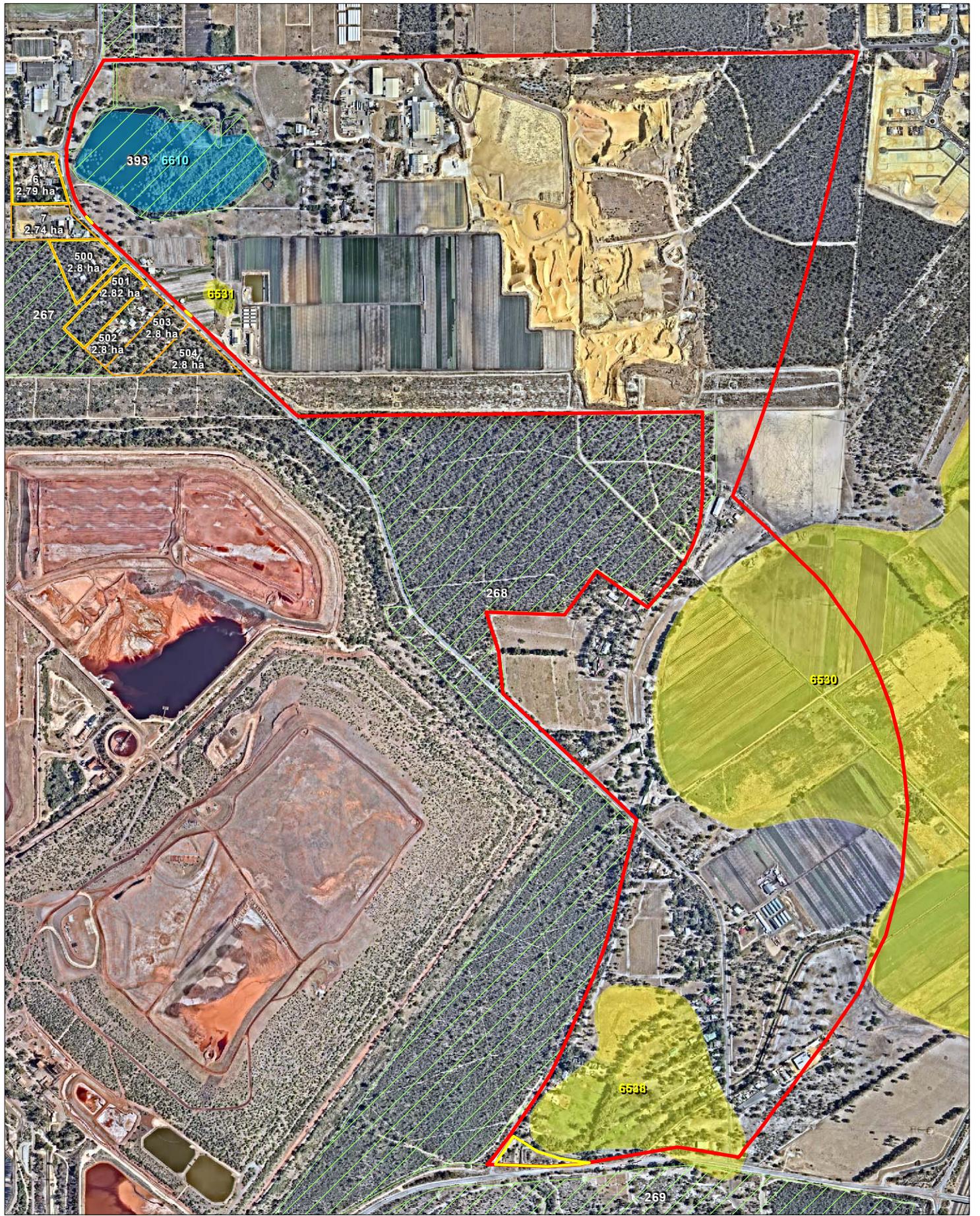
Category	Objective
Conservation Category Wetlands (CCW)	To preserve wetland (natural) attributes and functions
Resource Enhancement Wetlands (REW)	To restore wetlands through maintenance and enhancement of wetland functions and attributes
Multiple Use Wetlands (MUW)	To use, develop and manage wetlands in the context of water, town and environmental planning

No CCWs are present within the Survey Area, or within the wider Improvement Plan area (Figure 4.2). One REW is located within the north west of the wider Improvement Plan area (UFI: 6610) in association with Wattleup Lake. This wetland covers a total area of approximately 15.27 ha (Figure 4.2). One MUW is located within the Survey Area: a portion of UFI 6538 (28.15ha). Two other MUW's are mapped within the wider Improvement Plan area (UFI 6530 and UFI 6531) covering areas of 301.66 ha and 0.94 ha respectively.

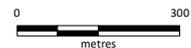
### 4.1.4 Bush Forever

*State Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region (SPP 2.8)* aims to provide a policy and implementation framework that ensures bushland protection and management issues throughout the Perth Metropolitan Region are adequately addressed and integrated with broader land use planning and decision-making (WAPC 2010).

No Bush Forever sites are located within the Survey Area. Three Bush Forever Sites (393, 267 and 268) are located directly adjacent to the Survey Area.



- Legend:**
- ▭ Mandagalup IS boundary (331.2 ha)
  - ▭ Sandwich lots (19.56 ha)
  - ▭ Geomorphic Wetlands (DBCA)
  - ▭ Bush Forever site (DOP)
  - ▭ Resource Enhancement
  - ▭ Multiple Use



Mandagalup, WA

**WETLANDS AND BUSH FOREVER SITES  
WITHIN 5KM OF THE SURVEY AREA**

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: hsullivan

Checked By: CT

Version: A

Date: 31-Jan-2020

**FIGURE: 4.2**

## 4.2 Field survey results

### 4.2.1 Native flora

A total of 50 native vascular plant taxa from 21 families and 39 genera were recorded within the Survey Area (Appendix C).

### 4.2.2 Threatened and Priority flora

No Threatened flora species as listed under section 178 of the EPBC Act or section 19(1) of the BC Act were recorded within the Survey Area. One Priority flora species, *Dodonaea hackettiana* (P4), was recorded within roadside vegetation mapped as VT7, at the northern end of Norkett Road.

The survey was conducted during the main flowering season for flora of the southwest botanical region (i.e. spring), including the Threatened and Priority species with potential to occur within the Survey Area. As such, this is the optimal time to detect the majority of species present.

### 4.2.3 Introduced (exotic) taxa

A total of 33 introduced (exotic) taxa were recorded within the Survey Area, as follows:

- *\*Arctotheca calendula*
- *\*Asparagus asparagoides*
- *\*Avena barbata*
- *\*Brassica sp.*
- *\*Briza maxima*
- *\*Bromus diandrus*
- *\*Carpobrotus edulis*
- *\*Cenchrus clandestinus*
- *\*Disa bracteata*
- *\*Ehrharta calycina*
- *\*Eragrostis curvula*
- *\*Eucalyptus grandis*
- *\*Euphorbia peplus*
- *\*Ficus carica*
- *\*Fumaria capreolata*
- *\*Gladiolus caryophyllaceus*
- *\*Gladiolus undulatus*
- *\*Hypochaeris glabra*
- *\*Lagurus ovatus*
- *\*Leptospermum laevigatum*
- *\*Lolium perenne*
- *\*Lupinus cosentinii*
- *\*Lysimachia arvensis*
- *\*Opuntia stricta*
- *\*Pelargonium capitatum*
- *\*Ricinus communis*
- *\*Schinus terebinthifolia*
- *\*Solanum nigrum*
- *\*Sonchus oleraceus*
- *\*Trifolium arvense var. arvense*
- *\*Ursinia anthemoides*
- *\*Wahlenbergia capensis*
- *\*Zantedeschia aethiopica.*

It should be noted that introduced species were only recorded in areas where native vegetation occurred, i.e., within quadrats or where notes were taken on the suite of species present in an area. Introduced species were not recorded in areas that were fully cleared such as paddocks or road verges. As such, this list should not be considered a full inventory of introduced species within the Survey Area.

Three declared pest plant species pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM ACT) were recorded in the Survey Area; namely, *\*Asparagus asparagoides* (Bridal Creeper), *\*Opuntia stricta* (Prickly pear) and *\*Zantedeschia aethiopica* (Arum Lily).

#### 4.2.4 Vegetation types

Nine vegetation types (VTs) were defined and mapped within the Survey Area (Figure 4.3). Areas containing vegetation in parkland cleared or highly degraded states have not been counted as unique native VTs but have been included in Table 4.4 for area calculation purposes. Total areas within the Survey Area by each of the identified VTs are set out in Table 4.4.

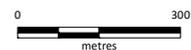
The total area mapped within the Survey Area was 345.48 ha which includes completely degraded areas.

**Table 4.4: Vegetation types recorded within the Survey Area**

Vegetation type	Description	Area (ha)	Percentage of the Survey Area
1	Woodland of <i>Corymbia calophylla</i> , <i>Allocasuarina fraseriana</i> and <i>Banksia attenuata</i> over open heath of <i>Xanthorrhoea preissii</i> , <i>Hibbertia hypericoides</i> and <i>Macrozamia riedlei</i> mixed native and introduced species.	0.97	0.28
2	Open woodland of <i>Eucalyptus marginata</i> and <i>Allocasuarina fraseriana</i> and occasionally <i>Banksia grandis</i> over open heath of <i>Xanthorrhoea preissii</i> , <i>Macrozamia riedlei</i> over introduced species.	0.75	0.22
3	Open woodland of <i>Eucalyptus rudis</i> , <i>Melaleuca raphiophylla</i> and <i>Eucalyptus marginata</i> over introduced species .	0.92	0.27
4	Woodland of <i>Eucalyptus rudis</i> , <i>Melaleuca raphiophylla</i> , <i>Agonis flexuosa</i> over mixed in.	12.55	3.63
5	Open woodland of <i>Eucalyptus gomphocephala</i> , <i>Eucalyptus rudis</i> and occasionally <i>Corymbia maculata</i> , <i>Allocasuarina fraseriana</i> and <i>Banksia menziesii</i> over isolated shrubs of <i>Xanthorrhoea preissii</i> and other native species over introduced grasses.	4.99	1.44
6	Woodland of <i>Eucalyptus gomphocephala</i> , <i>Banksia menziesii</i> , <i>Melaleuca raphiophylla</i> , and <i>Melaleuca preissiana</i> over shrubland of <i>Acacia pulchella</i> , <i>Macrozamia riedlei</i> , <i>Hibbertia hypericoides</i> and mixed introduced species.	1.23	0.36
7	Woodland of <i>Eucalyptus gomphocephala</i> , <i>Allocasuarina fraseriana</i> and <i>Banksia attenuata</i> over shrubland of <i>Xanthorrhoea preissii</i> and <i>Macrozamia riedlei</i> over mixed native and introduced herbs and shrubs .	1.44	0.42
8	Woodland of <i>Eucalyptus marginata</i> , <i>Banksia attenuata</i> and <i>Allocasuarina fraseriana</i> over isolated shrubs to open shrubland of <i>Jacksonia sternbergiana</i> , <i>Acacia saligna</i> , and <i>Xanthorrhoea preissii</i> over mixed introduced species .	2.72	0.79
9	Open woodland of <i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia attenuata</i> and <i>Banksia menziesii</i> over shrubland of <i>Hibbertia hypericoides</i> , <i>Acacia pulchella</i> , <i>Macrozamia riedlei</i> over herbland of <i>Burchardia</i> sp., <i>Tetraria octandra</i> and mixed introduced species .	33.11	9.58
Revegetation	Mixed shrubland regrowth within powerline corridor.	10.95	3.17
Planted - pines	Plant <i>Pinus</i> sp.	2.44	0.71
Parkland Cleared	Open woodland of native tree species over non-native understorey	8.34	2.41
C	Cleared - varies between completely cleared for hardstand, housing or infrastructure, paddocks comprising introduced grass and herb species, and residential gardens planted with ornamental species. (Not considered to be native vegetation)	265.07	76.73
<b>Total</b>		<b>345.48</b>	<b>100</b>



Legend:			
	Mandogalup IS boundary (331.2ha)		VT3
	Sandwich lots (19.56ha)		Cleared
	Roads (MRWA)		Parkland cleared
			Planted - Pines
			Revegetation
			VT1
			VT2
			VT4
			VT5
			VT6
			VT7
			VT8
			VT9



Mandogalup, WA

VEGETATION TYPES (VTS) MAPPED WITHIN THE SURVEY AREA

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: cthatcher

Checked By: TS

Version: A

Date: 02-Dec-2020

FIGURE: 4.3

#### 4.2.5 Threatened and Priority Ecological Communities

The following TECs are present or possibly occur within the Survey Area (based on vegetation surveys conducted):

- *Banksia* woodlands of the Swan Coastal Plain (TEC under EPBC Act; Priority 3 PEC listed by DBCA)
- Tuart woodlands and forests of the Swan Coastal Plain (TEC under EPBC Act; Priority 3 PEC listed by DBCA).

##### 4.2.5.1 Banksia woodlands of the Swan Coastal Plain TEC

An analysis of the relevé data was undertaken to determine the extent of the Banksia Woodlands of the Swan Coastal Plain TEC. The determination of patches was made using the key diagnostic criteria as per the *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community* (TSSC 2016). Four patches were considered for assessment. All four patches met the diagnostic criteria and are therefore considered to form the Banksia Woodlands of the Swan Coastal Plain TEC (Table 4.5). The distribution of this community is shown in Figure 4.4.

##### **Banksia woodlands of the Swan Coastal Plain PEC**

The description, area and condition thresholds that apply to the EPBC-listed TEC of the same name, also apply to this Priority ecological community. Given this, the occurrences of the Banksia woodlands of the Swan Coastal Plain TEC are considered to also represent the Banksia woodlands of the Swan Coastal Plain PEC.

**Table 4.5: Assessment of vegetation against key diagnostic criteria for *Banksia* Woodlands of the Swan Coastal Plain TEC**

Key diagnostic criteria (TSSC 2019)	Patch 1	Patch 2	Patch 3	Patch 4
<b>Location:</b> Occurs in the Swan Coastal Plain or Jarrah Forest IBRA bioregions.	<b>Yes.</b> Patch within the Survey Area occurs on the Swan Coastal Plain.	<b>Yes.</b> Patch within the Survey Area occurs on the Swan Coastal Plain.	<b>Yes.</b> Patch within the Survey Area occurs on the Swan Coastal Plain.	<b>Yes.</b> Patch within the Survey Area occurs on the Swan Coastal Plain.
<b>Soils and landform:</b> Occurs on: well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands, sandy colluviums and aeolian sands of the Ridge Hill Shelf, Whicher Scarp and Dandaragan Plateau transitional substrates and sandflats.	<b>Yes.</b> Patch within the Survey Area occur on Bassendean sands.	<b>Yes.</b> Patch within the Survey Area occur on Bassendean sands.	<b>Yes.</b> Patch within the Survey Area occur on Bassendean sands.	<b>Yes.</b> Patch within the Survey Area occur on Bassendean sands.
<b>Structure:</b> Low woodland to forest with: a distinctive upper sclerophyllous layer of low trees (occasionally large shrubs more than 2 m tall), typically dominated or co-dominated by one or more of the <i>Banksia</i> species identified below emergent trees of medium or tall (>10 m) height. <i>Eucalyptus</i> or <i>Allocasuarina</i> species may sometimes be present above the <i>Banksia</i> canopy an often highly species-rich understorey.	<b>Yes.</b> Patch occurs within VTs 1,7,8 and 9 which occur as low woodlands with wither <i>Banksia attenuata</i> or <i>Banksia menziesii</i> within the upper layer.	<b>Yes.</b> Patch occurs within VT9 which is described as an Open woodland of <i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia attenuata</i> and <i>Banksia menziesii</i>	<b>Yes.</b> Patch occurs within VT9 which is described as an Open woodland of <i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia attenuata</i> and <i>Banksia menziesii</i>	<b>Yes.</b> Patch occurs within VT6 which is described as a Woodland of <i>Eucalyptus gomphocephala</i> , <i>Banksia menziesii</i> , <i>Melaleuca raphiophylla</i> , and <i>Melaleuca preissiana</i> .
<b>Composition:</b> Contains at least one of the following species: <i>Banksia attenuata</i> <i>Banksia menziesii</i> <i>Banksia prionotes</i> <i>Banksia ilicifolia</i> .	<b>Yes.</b> Patch within the Survey Area contains <i>Banksia attenuata</i> and <i>Banksia menziesii</i> .	<b>Yes.</b> Patch within the Survey Area contains <i>Banksia attenuata</i> and <i>Banksia menziesii</i> .	<b>Yes.</b> Patch within the Survey Area contains <i>Banksia menziesii</i> .	<b>Yes.</b> Patch within the Survey Area contains <i>Banksia menziesii</i> .
<b>Condition (Keighery 1994):</b> 'Pristine': no minimum patch size 'Excellent': 0.5 ha 'Very Good': 1 ha 'Good': 2 ha.	<b>Yes.</b> Patch of 'Good - Very Good' covers an area of 5.38 ha within the Survey Area. This patch extends outside the survey area to a total area of approximately 20 ha.	<b>Yes.</b> Patch of 'Good to Very Good' covers an area of 29.8 ha. This patch extends outside the survey area to a total area of approximately 36 ha.	<b>Yes.</b> Patch of 'Very Good' covers an area of 0.63 ha. This patch extends outside the survey area to a total area of approximately 60 ha.	<b>Yes.</b> Patch of 'Good - Very Good' covers an area of 1.23 ha. This patch extends outside the survey area to a total area of approximately 36 ha.
<b>Result</b>	TEC present	TEC present	TEC present	TEC present

#### 4.2.5.2 Tuart woodlands and forests of the Swan Coastal Plain TEC

Given the location of the Survey Area, the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC, listed under the EPBC Act on 4 July 2019, was considered to have the potential to occur. Given this, vegetation within the Survey Area was assessed against the diagnostic criteria in the Approved Conservation Advice (incorporating listing advice) for the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community (TSSC 2019, Table 4.6; Table 4.7). Tuart woodlands are present within the Survey Area, occurring across one patch (Figure 4.4 Table 4.7).

**Table 4.6: Assessment of vegetation within the Survey Area against key diagnostic criteria for Tuart Woodlands of the Swan Coastal Plain TEC**

Key diagnostic criteria (TSSC 2019)	Assessment of vegetation within the Survey Area
<p><u>Location:</u> Occurs in the Swan Coastal Plain Bioregion, Western Australia (IBRA v7. Department of the Environment 2012).</p>	<p><b>Yes.</b> The Survey Area is located within the Swan Coastal Plain Bioregion.</p>
<p><u>Soils and landform:</u> Primarily occurs on the Spearwood and Quindalup dune systems, but can also occur on the Bassendean dunes and Pinjarra Plain. It can occur on the banks of rivers and wetlands.</p>	<p><b>Yes.</b> The Survey Area occurs on Spearwood and Quindalup dune systems.</p>
<p><u>Structure and composition:</u> Defining features include: the presence of at least two living established <i>Eucalyptus gomphocephala</i> (Tuart) trees in the uppermost canopy layer, although they may co-occur with trees of other species. a gap of no more than 60 m between the outer edges of the canopies of adjacent Tuart trees. These trees may occur either as single stemmed trees or as a mallee growth form. woodland structure, or other structural forms such as forest, open forest, woodland, open woodland, and various mallee forms an understorey of native plants which may include grasses, herbs and shrubs; though this is typically present, it is often modified by disturbance other tree species may be present in the canopy or sub-canopy, commonly including: <i>Agonis flexuosa</i> (Peppermint) and <i>Banksia grandis</i> (Bull Banksia) (both in the southern part of the range), <i>Banksia attenuata</i> (Candlestick Banksia), <i>Eucalyptus marginata</i> (Jarrah); and less commonly, <i>Corymbia calophylla</i> (Marri), <i>Banksia menziesii</i> (Firewood Banksia) and <i>Banksia prionotes</i> (Acorn Banksia).</p>	<p><b>Yes.</b> Vegetation within this patch occurs as a woodland to open woodland with <i>Eucalyptus gomphocephala</i>.</p>

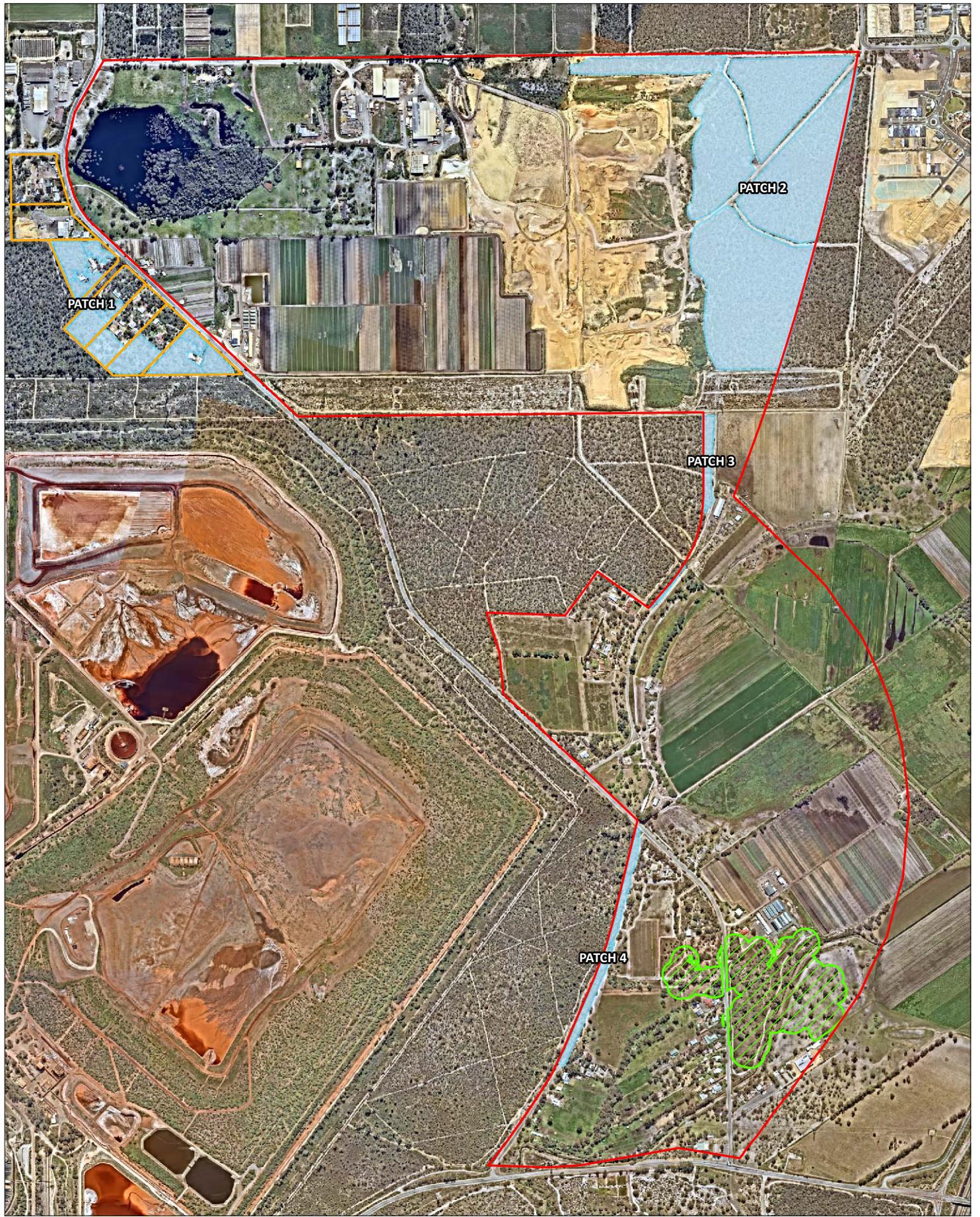
**Table 4.7: Assessment of Tuart Woodlands patches against condition thresholds**

Criteria	Patch
	1
Area (ha)	10.62 ha
Native Species Richness per 0.01ha	<4
Proportion of native understorey cover per 0.01 ha	<50%
Density of very large trees per 0.5ha	4.8
Condition (TSSC 2019)*	Moderate
Mean Vegetation Condition (EPA 2016)	Degraded
Result	<b>TEC present.</b> Patch >5 ha.

\* Condition is based on criteria set out in Table 2 of Approved Conservation Advice (incorporating listing advice) for the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community (TSSC 2019)

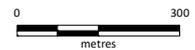
#### **Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC**

The description, area and condition thresholds that apply to the EPBC-listed TEC of the same name, also apply to this Priority ecological community. Given this, the occurrences of the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain TEC are considered to also represent the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC.



**Legend:**

- MIP 47 boundary
- Sandwich lots
- Possible TEC/PECs
- Banksia woodlands of the SCP
- Tuart woodlands and forests of the SCP



Mandagalup, WA

FCTS, PECs AND TECs  
MAPPED WITHIN THE SURVEY AREA

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: cthatcher

Checked By: TS

Version: A

Date: 18-Dec-2020

FIGURE: 4.4

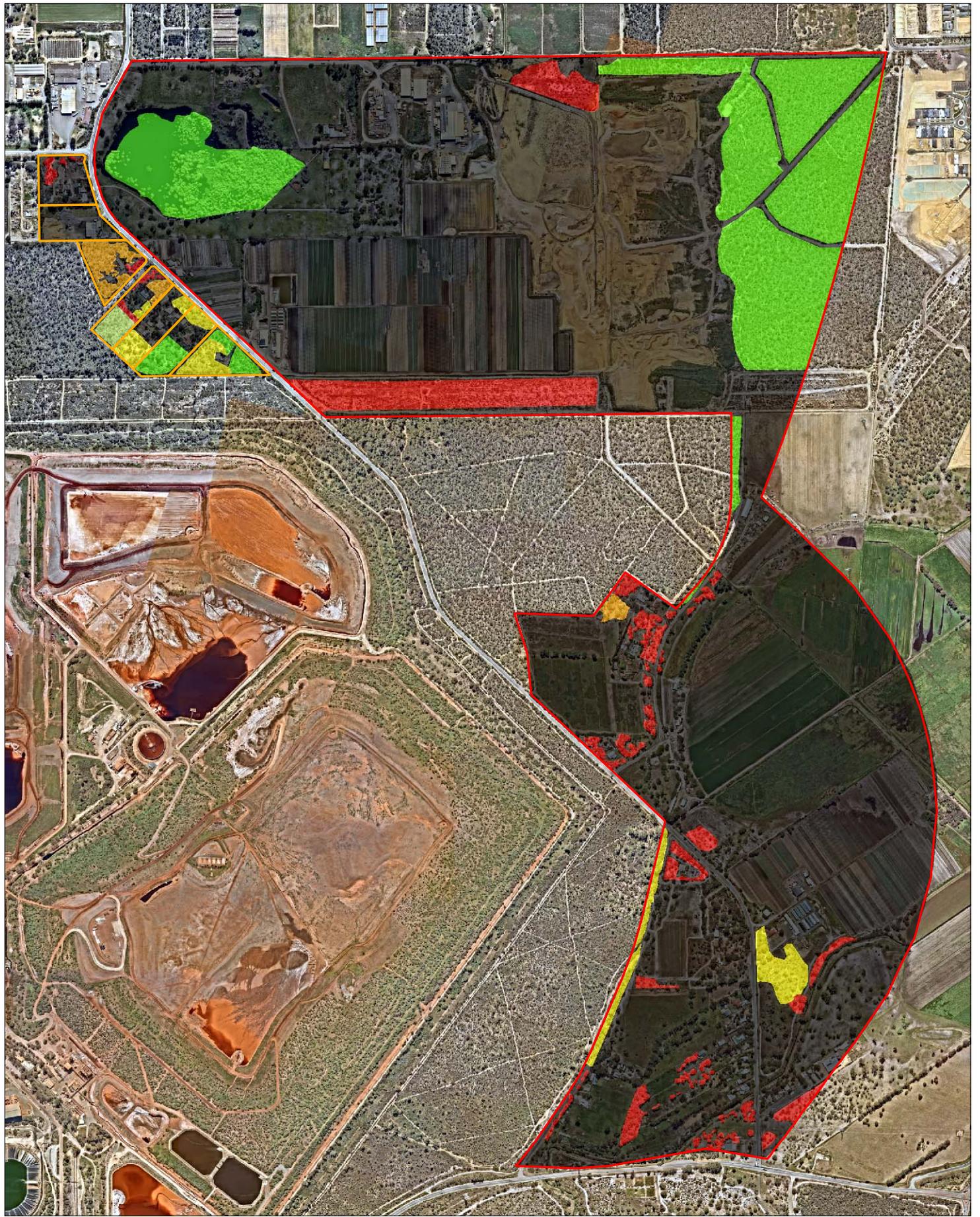
#### 4.2.6 Vegetation Condition

Vegetation condition within the areas surveyed, has been described in Table 3.2. A breakdown of vegetation condition within the areas surveyed is provided in Table 4.8.

A large portion of the unsurveyed areas are cleared and occupied by market gardening land uses. These areas are anticipated to be Completely Degraded in native vegetation condition. However, some unsurveyed areas contain vegetation and should be surveyed prior to any clearing or development.

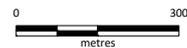
**Table 4.8: Area (ha) covered by each vegetation condition category within the Survey Area**

Vegetation Condition	Area (ha)	Percentage of the site (%)
Very Good	42.05	12.17
Good – Very Good	0.72	0.21
Good	5.17	1.50
Degraded - Good	2.03	0.59
Degraded	15.43	4.47
Completely Degraded	280.00	81.07
<b>Total</b>	<b>345.48</b>	<b>100</b>



**Legend:**

- Mandagalup IS boundary
- Sandwich lots
- Very good
- Good - very good
- Good
- Degraded - good
- Degraded
- Completely degraded



Mandagalup, WA

**VEGETATION CONDITION WITHIN THE SURVEY AREA**

Job No: 57020

Scale 1:14,000 at A4



Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: cthatcher

Checked By: TS

Version: A

Date: 02-Dec-2020

**FIGURE: 4.5**

#### 4.2.7 Black cockatoo habitat

A review of the modelled distribution of FRTBC and CBC (DoEE 2017) identifies the Survey Area to be within the non-breeding range of CBC and within the potential breeding range of FRTBC.

Broadly mapped potential feeding areas for CBC (DBCA *et. al* 2011) identify large intact areas of potential CBC foraging habitat within the north-eastern portion of the subject area and within the sandwich lots. Several smaller pockets of potential CBC foraging habitat occur adjacent to the REW in the north-western portion of the subject area, adjacent to Bush Forever site 268 and in the southern portion of the subject area.

Known and potential breeding sites have been mapped by DBCA *et. al* (2011). This mapping does not identify any known or potential breeding sites for CBC within or adjacent to the subject area and sandwich lots. As outlined above, the subject area and sandwich lots are not within the known breeding range of CBC or BC. The nearest confirmed breeding site for CBC is located approximately 10.5 km to the north east of the subject area.

A search of the Great Cocky Count data set prepared by Birdlife WA (2018) identified one known roosting site within 2 km of the subject area and sandwich lots (site code: KWIWANR002). The roosting site is located to the east of the subject area. Five CBC were recorded at the roosting site between 2010 and 2018, and no FRTBC were recorded from this roosting site.

No roosting sites were identified within the proposal area Birdlife WA (2018).

##### 4.2.7.1 Site survey

A total of 410 potential nesting trees were identified within the Survey area (Figure 4.6; species including *Eucalyptus marginata*, *Eucalyptus gomphocephala*, *Eucalyptus rudis*, *Corymbia calophylla*). Of these, 43 trees contained visible hollows of at least 10 cm diameter.

Habitat foraging quality of each vegetation type is shown in Table 4.10 and was determined using the scale described in Table 4.9.

Each vegetation type recorded during the surveys identified in Table 4.4 was assessed for suitability for CBC and FRTBC as outlined in Table 4.10.

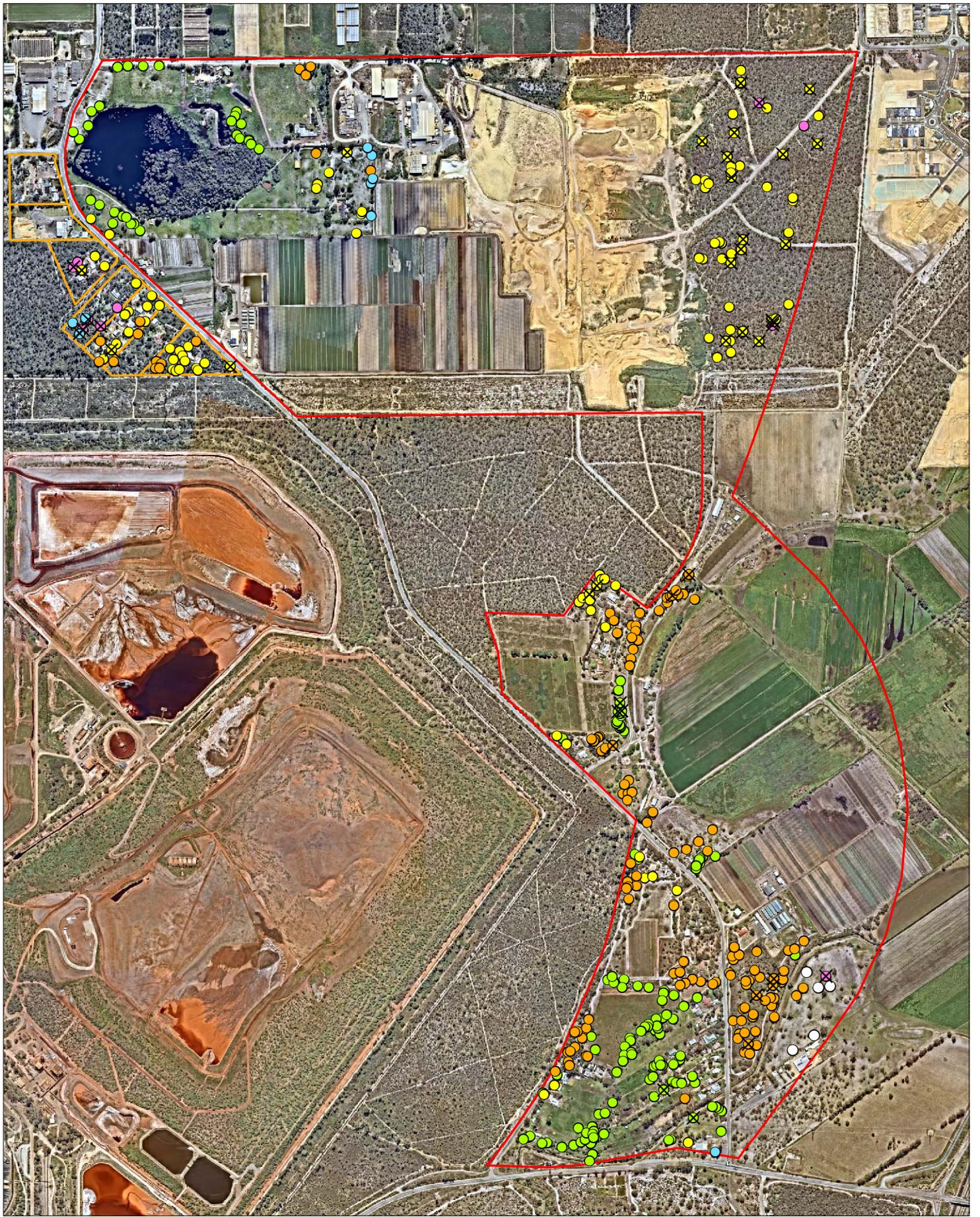
**Table 4.9: Definitions of black cockatoo foraging habitat quality**

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 4.10: Black cockatoo foraging species (by VT) recorded within the Survey Area**

Vegetation type	Black cockatoo foraging species	Foraging quality	Area (ha)
Within Scheme (IS 47) site boundary			
3	CBC - <i>Eucalyptus rudis</i> , <i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> FRTBC - <i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i>	<ul style="list-style-type: none"> <li>Moderate (CBC)</li> <li>Very poor (FRTBC)</li> </ul>	0.92

Vegetation type	Black cockatoo foraging species	Foraging quality	Area (ha)
4	CC - <i>Eucalyptus rudis</i> , <i>Agonis flexuosa</i> FRTBC - Nil	<ul style="list-style-type: none"> <li>Moderate (CBC)</li> <li>Nil (FRTBC)</li> </ul>	12.55
5	CBC – <i>Eucalyptus gomphocephala</i> , <i>Eucalyptus rudis</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia menziesii</i> , <i>Xanthorrhoea preissii</i> , * <i>Corymbia maculata</i> FRTBC – Nil	<ul style="list-style-type: none"> <li>Poor – Moderate (CBC)</li> <li>Nil (FRTBC)</li> </ul>	4.99
6	CBC – <i>Banksia attenuata</i> , <i>Xanthorrhoea preissii</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia menziesii</i> FRTBC – <i>Allocasuarina fraseriana</i>	<ul style="list-style-type: none"> <li>Moderate (CBC)</li> <li>Very poor (FRTBC)</li> </ul>	1.23
7	CBC - <i>Eucalyptus gomphocephala</i> , <i>Allocasuarina fraseriana</i> , <i>Banksia attenuata</i> , <i>Xanthorrhoea preissii</i> FRTBC - Nil	<ul style="list-style-type: none"> <li>Good (CBC)</li> <li>Nil (FRTBC)</li> </ul>	1.44
8	CBC – <i>Eucalyptus marginata</i> , <i>Xanthorrhoea preissii</i> , * <i>Corymbia maculata</i> , <i>Banksia attenuata</i> , <i>Allocasuarina fraseriana</i> , * <i>Pinus sp.</i> FRTBC - <i>Eucalyptus marginata</i> , <i>Allocasuarina fraseriana</i>	<ul style="list-style-type: none"> <li>Poor (CBC)</li> <li>Very poor (FRTBC)</li> </ul>	2.72
9	CBC – <i>Eucalyptus marginata</i> , <i>Banksia menziesii</i> , <i>Xanthorrhoea preissii</i> , * <i>Corymbia maculata</i> , <i>Jacksonia furcellata</i> , <i>Hakea prostrata</i> FRTBC - <i>Eucalyptus marginata</i>	<ul style="list-style-type: none"> <li>Moderate (CBC)</li> <li>Poor (FRTBC)</li> </ul>	33.11
Planted - Pines		<ul style="list-style-type: none"> <li>Moderate (CBC)</li> </ul>	2.44
Parkland Cleared		<ul style="list-style-type: none"> <li>Poor (CBC and FRTBC)</li> </ul>	8.34
Cleared		<ul style="list-style-type: none"> <li>nil</li> </ul>	-

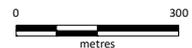


**Legend:**

- Sandwich lots
- Mandogalup IS boundary
- X Hollow present - potentially suitable

Significant Black Cockatoo habitat trees

- *Corymbia calophylla*
- *Eucalyptus gomphocephala*
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- *Eucalyptus* sp.
- N/A



Mandogalup, WA

**BLACK COCKATOO HABITAT**

Job No: 57020

Scale 1:14,000 at A4

Client: Taylor Burrell Barnett

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: cthatcher

Checked By: TS

Version: A

Date: 19-Oct-2020

**FIGURE: 4.6**

## 5. Discussion and Conclusion

### 5.1 Flora and vegetation

The flora and vegetation assessment of the Survey Area was conducted during October and November 2019, which was prime flowering time for a majority of species within the region. A total of 42 native vascular plant taxa from 18 families were recorded within the Survey Area (Appendix C).

A desktop assessment based on general habitat requirements and distribution indicated three Threatened and one Priority flora species were considered to have potential to occur within the Survey Area; as follows:

- *Caladenia huegelii* (Threatened – Endangered [EPBC Act]; Threatened [BC Act])
- *Drakaea elastica* (Threatened – Endangered [EPBC Act]; Threatened [BC Act])
- *Drakaea micrantha* (Threatened – Vulnerable [EPBC Act]; Threatened [BC Act]).

No Threatened species were recorded within the Survey Area. One Priority flora species, *Dodonea hackettiana* (P4), was recorded within the Survey Area in remnant vegetation alongside Norkett Rd.

During the vegetation assessment, marginal habitat for *D. elastica* was identified within VT1, VT7 and VT9. Further targeted surveys are required during June, July and early August which is the optimal survey timing to determine presence.

Possible habitat for *C. huegelii* was also identified within VT6, VT7 and VT9; however, VT7 contained heavy grass weed infestations which may result in small herbaceous species being outcompeted.. Further targeted surveys of these VTs in spring would be required to assess the presence of this species.

*D. micrantha* has the potential to occur in areas where competition by other species has been removed including firebreaks. Cleared areas including firebreaks near tracts of remnant native vegetation (e.g. firebreaks in sandwich lots and near Bush Forever sites) should be subject to targeted surveys in spring to further assess whether this species is present.

A total of 33 introduced (exotic) taxa were recorded within the Survey Area. Three declared pest plant species pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM ACT) were recorded in the Survey Area; namely, *\*Asparagus asparagoides* and *\*Zantedeschia aethiopica*.

Nine vegetation types (VTs) were defined and mapped within the Survey Area.

Vegetation within the Survey Area was assessed against the key diagnostic criteria as per the Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community (TSSC 2016). Four patches of vegetation within the Survey Area met the diagnostic criteria required to form part of this TEC (Figure 4.4). As detailed above, the details of any planned development are required to determine the ecological significance of these patches of Banksia Woodland TEC. Additionally, this vegetation forms part of the *Banksia* woodlands of the Swan Coastal Plain PEC.

Vegetation within the Survey Area was also assessed against diagnostic criteria for Tuart Woodlands and Forests of the Swan Coastal Plain, an ecological community which has recently been listed as a TEC under the EPBC Act. One patch of vegetation within the Survey Area contained tuarts; with an assessment of the patch against detailed diagnostic criteria (TSSC 2019) indicated that it formed part of the TEC (Figure 4.4). Additionally, this vegetation forms part of the Tuart Woodlands and Forests of the Swan Coastal Plain PEC.

## 5.2 Black cockatoo habitat

A total of 410 significant trees were recorded within the Survey Area (species including *Eucalyptus marginata*, *Eucalyptus gomphocephala*, *Eucalyptus rudis*, *Corymbia calophylla*). Of these, 43 trees contained visible hollows of at least 10 cm diameter. A detailed inspection of these hollows is likely to be required should clearing of these trees be required.

A total of 67.74 ha of potential foraging habitat for both species of Black Cockatoo was recorded within the Survey Area.

Based on density of suitable species present and presence of foraging species within each stratum, foraging habitat quality was rated from Very Poor to Moderate. The remainder of the Survey Area was rated as poor foraging habitat and nil foraging habitat based on the presence and density of suitable species. The foraging habitat present within the Survey Area is considered to be consistent with other local examples of remnant woodland vegetation.

## 6. Limitations

### Scope of services

This report ("the report") has been prepared by Strategen-JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Strategen-JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

### Reliance on data

In preparing the report, Strategen-JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, Strategen-JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Strategen-JBS&G has also not attempted to determine whether any material matter has been omitted from the data. Strategen-JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Strategen-JBS&G. The making of any assumption does not imply that Strategen-JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. Strategen-JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

### Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

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## **Appendix A Conservation significant flora and ecological community definitions**



# CONSERVATION CODES

## For Western Australian Flora and Fauna

Threatened, Extinct and Specially Protected fauna or flora<sup>1</sup> are species<sup>2</sup> which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

**The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.**

Categories of Threatened, Extinct and Specially Protected fauna and flora are:

### **T**     **Threatened species**

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

**Threatened fauna** is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

**Threatened flora** is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

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

### **CR**     **Critically endangered species**

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered 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 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

### **EN**     **Endangered species**

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

### **VU**     **Vulnerable species**

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable 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 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

## **Extinct species**

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

### **EX Extinct species**

Species where “*there is no reasonable doubt that the last member of the species has died*”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

### **EW Extinct in the wild species**

Species that “*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora 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(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

### **MI Migratory species**

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

### **CD Species of special conservation interest (conservation dependent fauna)**

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

### **OS Other specially protected species**

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

**P Priority species**

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 fauna or flora.

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

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

**1 Priority 1: 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.

**2 Priority 2: 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 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.

**3 Priority 3: 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 are in need of further survey.

**4 Priority 4: Rare, Near Threatened and other species in need of monitoring**

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

<sup>1</sup> The definition of flora includes algae, fungi and lichens

<sup>2</sup> Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

## ***Definition of Threatened Ecological Communities -EPBC Act***

### **Critically endangered**

An ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).

### **Endangered**

An ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).

### **Vulnerable**

An ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium-term future (indicative timeframe being the next 50 years).

## Appendix B Desktop assessment results (DBCA 2019; DoEE 2019)

# NatureMap Species Report

Created By Guest user on 10/10/2019

**Kingdom** Plantae  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Method** 'By Circle'  
**Centre** 115° 50' 32" E, 32° 11' 37" S  
**Buffer** 5km  
**Group By** Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	452	1913
Priority 3	4	6
Priority 4	1	9
Rare or likely to become extinct	3	20
<b>TOTAL</b>	<b>460</b>	<b>1948</b>

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Rare or likely to become extinct</b>				
1.	1596 <i>Caladenia huegelii</i> (Grand Spider Orchid)		T	
2.	12938 <i>Diuris micrantha</i>		T	
3.	1639 <i>Drakaea elastica</i> (Glossy-leaved Hammer Orchid)		T	
<b>Priority 3</b>				
4.	16245 <i>Cyathochaeta teretifolia</i>		P3	
5.	5237 <i>Pimelea calcicola</i>		P3	
6.	8163 <i>Pithocarpa corymbulosa</i> (Corymbose Pithocarpa)		P3	
7.	25800 <i>Stylidium paludicola</i>		P3	
<b>Priority 4</b>				
8.	4763 <i>Dodonaea hackettiana</i> (Hackett's Hopbush)		P4	
<b>Non-conservation taxon</b>				
9.	? <i>Anigozanthos humilis</i>			
10.	? <i>Arnocrinum preissii</i>			
11.	? <i>Austrostipa compressa</i>			
12.	? <i>Austrostipa semibarbata</i>			Y
13.	? <i>Burchardia congesta</i>			
14.	? <i>Hovea pungens</i>			Y
15.	? <i>Hovea trisperma</i> var. <i>trisperma</i>			
16.	? <i>Hybanthus calycinus</i>			Y
17.	? <i>Kunzea glabrescens</i>			
18.	? <i>Lepidosperma squamatum</i> s.l.			
19.	? <i>Lomandra caespitosa</i>			
20.	? <i>Lotus subbiflorus</i>			
21.	? <i>Lysimachia arvensis</i>			
22.	? <i>Mesomelaena pseudostygia</i>			Y
23.	? <i>Microlaena stipoides</i>			
24.	? <i>Phlebocarya ciliata</i>			
25.	? <i>Phyllanthus calycinus</i>			Y
26.	? <i>Pterostylis sanguinea</i>			
27.	? <i>Rytidosperma occidentalis</i>			
28.	? <i>Sowerbaea laxiflora</i>			
29.	? <i>Vicia sativa</i>			Y
30.	3262 <i>Acacia cochlearis</i> (Rigid Wattle)			
31.	3282 <i>Acacia cyclops</i> (Coastal Wattle)			
32.	3374 <i>Acacia huegelii</i>			
33.	3502 <i>Acacia pulchella</i> (Prickly Moses)			
34.	30032 <i>Acacia saligna</i> subsp. <i>saligna</i>			
35.	3557 <i>Acacia stenoptera</i> (Narrow Winged Wattle)			
36.	3602 <i>Acacia willdenowiana</i> (Grass Wattle)			
37.	6203 <i>Actinotus glomeratus</i>			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
38.	1775 <i>Adenanthos cygnorum</i> (Common Woollybush)			
39.	11837 <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> (Common Woollybush)			
40.	1791 <i>Adenanthos obovatus</i> (Basket Flower)			
41.	17202 <i>Agonis flexuosa</i> var. <i>flexuosa</i>			
42.	184 <i>Aira caryophyllea</i> (Silvery Hairgrass)	Y		
43.	<i>Aira caryophyllea</i> / <i>cupaniana</i> group			
44.	185 <i>Aira cupaniana</i> (Silvery Hairgrass)	Y		
45.	187 <i>Aira praecox</i> (Early Hairgrass)	Y		
46.	1728 <i>Allocasuarina fraseriana</i> (Sheoak, Kondil)			
47.	1732 <i>Allocasuarina humilis</i> (Dwarf Sheoak)			
48.	198 <i>Amphipogon laguroides</i>			
49.	20184 <i>Amphipogon laguroides</i> subsp. <i>laguroides</i>			
50.	200 <i>Amphipogon turbinatus</i>			
51.	7833 <i>Angianthus preissianus</i>			
52.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
53.	1411 <i>Anigozanthos manglesii</i> (Mangles Kangaroo Paw, Kurulbrang)			
54.	11261 <i>Anigozanthos manglesii</i> subsp. <i>manglesii</i>			
55.	3688 <i>Aotus gracillima</i>			
56.	3692 <i>Aotus procumbens</i>			
57.	1264 <i>Arnocrinum preissii</i>			
58.	8779 <i>Asparagus asparagoides</i> (Bridal Creeper)	Y		
59.	20283 <i>Astartea scoparia</i> (Common Astartea)			
60.	<i>Asterella drummondii</i>			
61.	6334 <i>Astroloma pallidum</i> (Kick Bush)			
62.	<i>Austrostipa</i> ? <i>semibarbata</i>			Y
63.	17234 <i>Austrostipa compressa</i>			
64.	17240 <i>Austrostipa flavescens</i>			
65.	17245 <i>Austrostipa mollis</i>			
66.	17253 <i>Austrostipa semibarbata</i>			
67.	<i>Austrostipa</i> sp.			
68.	37421 <i>Austrostipa</i> sp. <i>Marchagee</i> (B.R. Maslin 1407)			
69.	233 <i>Avena barbata</i> (Bearded Oat)	Y		
70.	36441 <i>Babingtonia camphorosmae</i> (Camphor Myrtle)			
71.	1800 <i>Banksia attenuata</i> (Slender Banksia, Piara)			
72.	32580 <i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> var. <i>dallanneyi</i>			
73.	1822 <i>Banksia ilicifolia</i> (Holly-leaved Banksia)			
74.	1830 <i>Banksia littoralis</i> (Swamp Banksia, Pungura)			
75.	1834 <i>Banksia menziesii</i> (Firewood Banksia)			
76.	32077 <i>Banksia sessilis</i> var. <i>cygnorum</i>			
77.	1852 <i>Banksia telmatiaea</i> (Swamp Fox Banksia)			
78.	741 <i>Baumea articulata</i> (Jointed Rush)			
79.	743 <i>Baumea juncea</i> (Bare Twigrush)			
80.	5382 <i>Beaufortia elegans</i> (Elegant Beaufortia)			
81.	48868 <i>Bellardia viscosa</i>	Y		
82.	749 <i>Bolboschoenus caldwellii</i> (Marsh Club-rush)			
83.	4413 <i>Boronia crenulata</i> (Aniseed Boronia)			
84.	11503 <i>Boronia crenulata</i> subsp. <i>crenulata</i> var. <i>crenulata</i>			
85.	16636 <i>Boronia crenulata</i> subsp. <i>viminea</i>			
86.	4417 <i>Boronia dichotoma</i>			
87.	3710 <i>Bossiaea eriocarpa</i> (Common Brown Pea)			
88.	6341 <i>Brachyloma preissii</i> (Globe Heath)			
89.	8661 <i>Brachypodium distachyon</i> (False Brome)	Y		
90.	3000 <i>Brassica tournefortii</i> (Mediterranean Turnip)	Y		
91.	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
92.	245 <i>Briza minor</i> (Shivery Grass)	Y		
93.	<i>Briza</i> sp.			
94.	249 <i>Bromus diandrus</i> (Great Brome)	Y		
95.	12770 <i>Burchardia congesta</i>			
96.	1276 <i>Caesia micrantha</i> (Pale Grass Lily)			
97.	1277 <i>Caesia occidentalis</i>			
98.	<i>Caladenia</i> ? <i>flava</i>			
99.	1586 <i>Caladenia discoidea</i> (Dancing Orchid)			
100.	1592 <i>Caladenia flava</i> (Cowslip Orchid)			
101.	1599 <i>Caladenia latifolia</i> (Pink Fairy Orchid)			
102.	15361 <i>Caladenia longicauda</i> subsp. <i>calcigena</i>			
103.	17760 <i>Caladenia nobilis</i>			
104.	<i>Caladenia</i> sp.			
105.	2848 <i>Calandrinia corrigioloides</i> (Strap Purslane)			
106.	19309 <i>Calectasia narragara</i>			
107.	34942 <i>Callitriche brutia</i> subsp. <i>brutia</i>	Y		

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
108.	36600 <i>Callitris pyramidalis</i> (Swamp Cypress)			
109.	5411 <i>Calothamnus hirsutus</i>			
110.	5415 <i>Calothamnus lateralis</i>			
111.	5439 <i>Calytrix angulata</i> (Yellow Starflower)			
112.	5458 <i>Calytrix flavescens</i> (Summer Starflower)			
113.	5460 <i>Calytrix fraseri</i> (Pink Summer Calytrix)			
114.	5476 <i>Calytrix sapphirina</i>			
115.	2795 <i>Carpobrotus edulis</i> (Hottentot Fig)	Y		
116.	1162 <i>Cartonema philydroides</i>			
117.	2951 <i>Cassytha flava</i> (Dodder Laurel)			
118.	2957 <i>Cassytha racemosa</i> (Dodder Laurel)			
119.	11799 <i>Cassytha racemosa forma racemosa</i>			
120.	41568 <i>Cenchrus setaceus</i> (Fountain Grass)	Y		
121.	6542 <i>Centaurium tenuiflorum</i>	Y		
122.	1125 <i>Centrolepis drummondiana</i>			
123.	1134 <i>Centrolepis polygyna</i> (Wiry Centrolepis)			
124.	2889 <i>Cerastium glomeratum</i> (Mouse Ear Chickweed)	Y		
125.	18156 <i>Chamaecytisus palmensis</i> (Tagasaste)	Y		
126.	1280 <i>Chamaescilla corymbosa</i> (Blue Squill)			
127.	11299 <i>Chamaescilla corymbosa var. corymbosa</i>			
128.	7937 <i>Cirsium vulgare</i> (Spear Thistle, Scotch Thistle)	Y		
129.	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
130.	4555 <i>Comesperma integerrimum</i>			
131.	15611 <i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> (Common Smokebush)			
132.	6348 <i>Conostephium pendulum</i> (Pearl Flower)			
133.	6349 <i>Conostephium preissii</i>			
134.	1418 <i>Conostylis aculeata</i> (Prickly Conostylis)			
135.	11826 <i>Conostylis aculeata</i> subsp. <i>aculeata</i>			
136.	1436 <i>Conostylis juncea</i>			
137.	1454 <i>Conostylis setigera</i> (Bristly Cottonhead)			
138.	11597 <i>Conostylis setigera</i> subsp. <i>setigera</i>			
139.	<i>Conyza ?bonariensis</i>			
140.	7939 <i>Conyza bonariensis</i> (Flaxleaf Fleabane)	Y		
141.	<i>Conyza</i> sp.			
142.	20074 <i>Conyza sumatrensis</i>	Y		
143.	48259 <i>Cortaderia selloana</i> subsp. <i>selloana</i>	Y		
144.	1285 <i>Corynotheca micrantha</i> (Sand Lily)			
145.	7945 <i>Cotula coronopifolia</i> (Waterbuttons)	Y		
146.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
147.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
148.	19625 <i>Cymbalaria muralis</i> subsp. <i>muralis</i>	Y		
149.	806 <i>Cyperus polystachyos</i> (Bunchy Sedge)			
150.	816 <i>Cyperus tenuiflorus</i> (Scaly Sedge)	Y		
151.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
152.	35618 <i>Darwinia</i> sp. <i>Karonie</i> (K. Newbey 8503)			
153.	1218 <i>Dasypogon bromeliifolius</i> (Pineapple Bush)			
154.	3807 <i>Daviesia divaricata</i> (Marno)			
155.	3832 <i>Daviesia physodes</i>			
156.	3845 <i>Daviesia triflora</i>			
157.	16595 <i>Desmocladus flexuosus</i>			
158.	299 <i>Deyeuxia quadriseta</i> (Reed Bentgrass)			
159.	1259 <i>Dianella revoluta</i> (Blueberry Lily)			
160.	11636 <i>Dianella revoluta</i> var. <i>divaricata</i>			
161.	17838 <i>Dielsia stenostachya</i>			
162.	9027 <i>Diplolaena drummondii</i>			
163.	19649 <i>Disa bracteata</i>	Y		
164.	7054 <i>Dischisma arenarium</i>	Y		
165.	<i>Diuris corymbosa/magnifica</i>			
166.	1634 <i>Diuris laxiflora</i> (Bee Orchid)			
167.	12939 <i>Diuris magnifica</i>			
168.	3095 <i>Drosera erythrorhiza</i> (Red Ink Sundew)			
169.	3106 <i>Drosera macrantha</i> (Bridal Rainbow)			
170.	3109 <i>Drosera menziesii</i> (Pink Rainbow)			
171.	48710 <i>Drosera micrantha</i>			
172.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
173.	29178 <i>Drosera porrecta</i>			
174.	<i>Drosera</i> sp. "climbing"			
175.	3135 <i>Drosera zonaria</i> (Painted Sundew)			
176.	<i>Ehrharta ?longiflora</i>			Y
177.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		

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178.	349 <i>Ehrharta longiflora</i> (Annual Veldt Grass)	Y		
179.	<i>Ehrharta</i> sp.			
180.	1645 <i>Epiblema grandiflorum</i> (Babe-in-a-cradle)			
181.	6133 <i>Epilobium hirtigerum</i> (Hairy Willow Herb)			
182.	13949 <i>Eremaea asterocarpa</i>			
183.	13950 <i>Eremaea asterocarpa</i> subsp. <i>asterocarpa</i>			
184.	5541 <i>Eremaea pauciflora</i>			
185.	14104 <i>Eremaea pauciflora</i> var. <i>pauciflora</i>			
186.	15446 <i>Eryngium pinnatifidum</i> subsp. <i>pinnatifidum</i>			
187.	5615 <i>Eucalyptus decipiens</i> (Limestone Marlock, Moit)			
188.	5708 <i>Eucalyptus marginata</i> (Jarrah, Djara)			
189.	13547 <i>Eucalyptus marginata</i> subsp. <i>marginata</i> (Jarrah)			
190.	5763 <i>Eucalyptus rudis</i> (Flooded Gum, Kulurda)			
191.	13511 <i>Eucalyptus rudis</i> subsp. <i>rudis</i>			
192.	5790 <i>Eucalyptus todtiana</i> (Coastal Blackbutt)			
193.	3872 <i>Euchilopsis linearis</i> (Swamp Pea)			
194.	20014 <i>Euphorbia hyssopifolia</i>	Y		
195.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
196.	3880 <i>Eutaxia virgata</i>			
197.	1747 <i>Ficus carica</i> (Common Fig)	Y		
198.	2969 <i>Fumaria capreolata</i> (Whiteflower Fumitory)	Y		
199.	<i>Fumaria</i> sp.			
200.	907 <i>Gahnia trifida</i> (Coast Saw-sedge)			
201.	20247 <i>Gamochaeta calviceps</i>	Y		
202.	20475 <i>Gastrobium capitatum</i>			
203.	20473 <i>Gastrobium ebracteolatum</i>			
204.	20483 <i>Gastrobium linearifolium</i>			
205.	1520 <i>Gladiolus caryophyllaceus</i> (Wild Gladiolus)	Y		
206.	6587 <i>Gomphocarpus fruticosus</i> (Narrowleaf Cottonbush)	Y		
207.	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
208.	6161 <i>Gonocarpus pithyoides</i>			
209.	7538 <i>Goodenia pulchella</i>			
210.	14282 <i>Gratiola pubescens</i>			
211.	12824 <i>Grevillea vestita</i> subsp. <i>vestita</i>			
212.	<i>Haemodorum</i> sp.			
213.	1475 <i>Haemodorum spicatum</i> (Mardja)			
214.	2197 <i>Hakea prostrata</i> (Harsh Hakea)			
215.	2214 <i>Hakea trifurcata</i> (Two-leaf Hakea)			
216.	2216 <i>Hakea varia</i> (Variable-leaved Hakea)			
217.	3961 <i>Hardenbergia comptoniana</i> (Native Wisteria)			
218.	6839 <i>Hemiandra pungens</i> (Snakebush)			
219.	38320 <i>Hemiandra</i> sp. <i>Jurien</i> (B.J. Conn & M.E. Tozer BJC 3885)			
220.	1293 <i>Hensmania turbinata</i>			
221.	5134 <i>Hibbertia huegelii</i>			
222.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
223.	45534 <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i>			
224.	5162 <i>Hibbertia racemosa</i> (Stalked Guinea Flower)			
225.	48381 <i>Hibbertia striata</i>			
226.	5173 <i>Hibbertia subvaginata</i>			
227.	5176 <i>Hibbertia vaginata</i>			
228.	444 <i>Holcus lanatus</i> (Yorkshire Fog)	Y		
229.	6222 <i>Homalosciadium homalocarpum</i>			
230.	3966 <i>Hovea pungens</i> (Devil's Pins, Puyenak)			
231.	3968 <i>Hovea trisperma</i> (Common Hovea)			
232.	12859 <i>Hovea trisperma</i> var. <i>trisperma</i>			
233.	12741 <i>Hyalosperma cotula</i>			
234.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
235.	6224 <i>Hydrocotyle blepharocarpa</i>			
236.	6240 <i>Hydrocotyle scutellifera</i>			
237.	5817 <i>Hypocalymma angustifolium</i> (White Myrtle, Kudjid)			
238.	35070 <i>Hypocalymma angustifolium</i> subsp. <i>Swan Coastal Plain</i> (G.J. Keighery 16777)			
239.	5825 <i>Hypocalymma robustum</i> (Swan River Myrtle)			
240.	8086 <i>Hypochaeris glabra</i> (Smooth Catsear)	Y		
241.	9352 <i>Hypochaeris radicata</i> (Flat Weed, Cats-ear)	Y		
242.	1070 <i>Hypolaena exsulca</i>			
243.	17841 <i>Hypolaena pubescens</i>			
244.	<i>Iridaceae</i> sp.			Y
245.	20200 <i>Isolepis cernua</i> var. <i>setiformis</i>			
246.	917 <i>Isolepis marginata</i> (Coarse Club-rush)			
247.	19700 <i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			

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248.	4012 <i>Jacksonia furcellata</i> (Grey Stinkwood)			
249.	4029 <i>Jacksonia sternbergiana</i> (Stinkwood, Kapur)			
250.	1178 <i>Juncus bufonius</i> (Toad Rush)	Y		
251.	1186 <i>Juncus microcephalus</i>	Y		
252.	1188 <i>Juncus pallidus</i> (Pale Rush)			
253.	1190 <i>Juncus planifolius</i> (Broadleaf Rush)			
254.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
255.	5832 <i>Kunzea ericifolia</i> (Spearwood, Pondil)			
256.	15498 <i>Kunzea glabrescens</i> (Spearwood)			
257.	20019 <i>Lachnagrostis filiformis</i>			
258.	8096 <i>Lactuca serriola</i> (Prickly Lettuce)	Y		
259.	18585 <i>Lagenophora huegelii</i>			
260.	467 <i>Lagurus ovatus</i> (Hare's Tail Grass)	Y		
261.	4052 <i>Latrobea tenella</i>			
262.	1307 <i>Laxmannia ramosa</i> (Branching Lily)			
263.	11911 <i>Laxmannia ramosa</i> subsp. <i>ramosa</i>			
264.	1309 <i>Laxmannia squarrosa</i>			
265.	7572 <i>Lechenaultia expansa</i>			
266.	7574 <i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia)			
267.	44490 <i>Leontodon rhagadioloides</i>	Y		
268.	<i>Lepidosperma</i> ?aff. <i>costale</i>			Y
269.	925 <i>Lepidosperma angustatum</i>			
270.	937 <i>Lepidosperma longitudinale</i> (Pithy Sword-sedge)			
271.	940 <i>Lepidosperma pubisquamum</i>			
272.	944 <i>Lepidosperma scabrum</i>			
273.	<i>Lepidosperma scabrum</i> (inland form)			Y
274.	<i>Lepidosperma</i> sp.			
275.	<i>Lepidosperma</i> sp. Brixton Street broad inflorescence			
276.	<i>Lepidosperma</i> sp. Brixton Street broadish inflorescence			Y
277.	<i>Lepidosperma</i> sp. Brixton Street narrow inflorescence			
278.	945 <i>Lepidosperma squamatum</i>			
279.	<i>Lepidosperma squamatum</i> s.l.			
280.	946 <i>Lepidosperma striatum</i>			
281.	1653 <i>Leporella fimbriata</i> (Hare Orchid)			
282.	1077 <i>Leptocarpus canus</i> (Hoary Twine-rush)			
283.	1080 <i>Leptocarpus scariosus</i>			
284.	2342 <i>Leptomeria cunninghamii</i>			
285.	2344 <i>Leptomeria empetriformis</i>			
286.	2350 <i>Leptomeria pauciflora</i> (Sparse-flowered Currant Bush)			
287.	5850 <i>Leptospermum laevigatum</i> (Coast Teatree)	Y		
288.	6360 <i>Leucopogon australis</i> (Spiked Beard-heath)			
289.	6374 <i>Leucopogon conostephioides</i>			
290.	6436 <i>Leucopogon propinquus</i>			
291.	7676 <i>Levenhookia pusilla</i> (Midget Stylewort)			
292.	<i>Levenhookia pusilla</i> /stipitata			
293.	7677 <i>Levenhookia stipitata</i> (Common Stylewort)			
294.	9289 <i>Lobelia anceps</i> (Angled Lobelia)			
295.	7408 <i>Lobelia tenuior</i> (Slender Lobelia)			
296.	6515 <i>Logania vaginalis</i> (White Spray)			
297.	478 <i>Lolium rigidum</i> (Wimmera Ryegrass)	Y		
298.	<i>Lolium</i> sp. (annual)			
299.	<i>Lomandra</i> ?caespitosa			
300.	<i>Lomandra</i> ?preissii			
301.	1223 <i>Lomandra caespitosa</i> (Tufted Mat Rush)			
302.	1228 <i>Lomandra hermaphrodita</i>			
303.	14542 <i>Lomandra micrantha</i> subsp. <i>micrantha</i>			
304.	1234 <i>Lomandra nigricans</i>			
305.	1239 <i>Lomandra preissii</i>			
306.	1246 <i>Lomandra suaveolens</i>			
307.	8564 <i>Lotus subbiflorus</i>	Y		
308.	1198 <i>Luzula meridionalis</i> (Field Woodrush)			
309.	1097 <i>Lyginia barbata</i>			
310.	18049 <i>Lyginia imberbis</i>			
311.	1656 <i>Lyperanthus serratus</i> (Rattle Beak Orchid)			
312.	36375 <i>Lysimachia arvensis</i> (Pimpernel)	Y		
313.	6456 <i>Lysinema ciliatum</i> (Curry Flower)			
314.	5281 <i>Lythrum hyssopifolia</i> (Lesser Loosestrife)	Y		
315.	2839 <i>Macarthuria australis</i>			
316.	18119 <i>Macrozamia fraseri</i>			
317.	85 <i>Macrozamia riedlei</i> ( <i>Zamia</i> , Djiridji)			

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318.	4079 <i>Medicago polymorpha</i> (Burr Medic)	Y		
319.	5900 <i>Melaleuca cuticularis</i> (Saltwater Paperbark)			
320.	13271 <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>			
321.	13273 <i>Melaleuca incana</i> subsp. <i>incana</i>			
322.	5926 <i>Melaleuca lateritia</i> (Robin Redbreast Bush)			
323.	5946 <i>Melaleuca pauciflora</i>			
324.	5952 <i>Melaleuca preissiana</i> (Moonah)			
325.	5959 <i>Melaleuca raphiophylla</i> (Swamp Paperbark)			
326.	5964 <i>Melaleuca seriata</i>			
327.	18598 <i>Melaleuca systema</i>			
328.	5978 <i>Melaleuca teretifolia</i> (Banbar)			
329.	5980 <i>Melaleuca thymoides</i>			
330.	4085 <i>Melilotus indicus</i>	Y		
331.	955 <i>Mesomelaena pseudostygia</i>			
332.	957 <i>Mesomelaena tetragona</i> (Semaphore Sedge)			
333.	485 <i>Microlaena stipoides</i> (Weeping Grass)			
334.	1658 <i>Microtis atrata</i> (Swamp Mignonette Orchid)			
335.	15419 <i>Microtis media</i> subsp. <i>media</i>			
336.	6189 <i>Myriophyllum crispatum</i>			
337.	6199 <i>Myriophyllum tillaeoides</i>			
338.	492 <i>Neurachne alopecuroidea</i> (Foxtail Mulga Grass)			
339.	6974 <i>Nicotiana glauca</i> (Tree Tobacco)	Y		
340.	12782 <i>Ophioglossum gramineum</i>			
341.	36177 <i>Ornduffia albiflora</i>			
342.	4113 <i>Ornithopus compressus</i> (Yellow Serradella)	Y		
343.	4358 <i>Oxalis purpurea</i> (Largeflower Wood Sorrel)	Y		
344.	527 <i>Paspalum dilatatum</i>	Y		
345.	1550 <i>Patersonia occidentalis</i> (Purple Flag, Koma)			
346.	30471 <i>Patersonia occidentalis</i> var. <i>angustifolia</i>			
347.	30472 <i>Patersonia occidentalis</i> var. <i>occidentalis</i>			
348.	4343 <i>Pelargonium capitatum</i> (Rose Pelargonium)	Y		
349.	40423 <i>Pentameris airoides</i> (False Hairgrass)	Y		
350.	6006 <i>Pericalymma ellipticum</i> (Swamp Teatree)			
351.	16477 <i>Pericalymma ellipticum</i> var. <i>ellipticum</i>			
352.	2273 <i>Persoonia saccata</i> (Snottygobble)			
353.	2299 <i>Petrophile linearis</i> (Pixie Mops)			
354.	2301 <i>Petrophile macrostachya</i>			
355.	2312 <i>Petrophile striata</i>			
356.	19825 <i>Petrorhagia dubia</i>	Y		
357.	552 <i>Phalaris paradoxa</i> (Paradoxa Grass)	Y		
358.	1478 <i>Phlebocarya ciliata</i>			
359.	16177 <i>Phyllangium paradoxum</i>			
360.	4675 <i>Phyllanthus calycinus</i> (False Boronia)			
361.	2793 <i>Phytolacca octandra</i> (Red Ink Plant)	Y		
362.	18117 <i>Pimelea rosea</i> subsp. <i>rosea</i>			
363.	6249 <i>Platysace compressa</i> (Tapeworm Plant)			
364.	6253 <i>Platysace filiformis</i>			
365.	4524 <i>Platytheca galioides</i>			
366.	<i>Poaceae</i> sp.			
367.	8175 <i>Podolepis gracilis</i> (Slender Podolepis)			
368.	8182 <i>Podotheca angustifolia</i> (Sticky Longheads)			
369.	8183 <i>Podotheca chrysantha</i> (Yellow Podotheca)			
370.	8184 <i>Podotheca gnaphalioides</i> (Golden Long-heads)			
371.	582 <i>Polypogon monspeliensis</i> (Annual Beardgrass)	Y		
372.	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
373.	<i>Poranthera microphylla</i> /moorokatta			
374.	1670 <i>Prasophyllum drummondii</i> (Swamp Leek Orchid)			
375.	10853 <i>Prasophyllum plumiforme</i>			
376.	8189 <i>Pseudognaphalium luteoalbum</i> (Jersey Cudweed)			
377.	15426 <i>Pterostylis aspera</i>			
378.	44723 <i>Pterostylis glebosa</i>			
379.	1693 <i>Pterostylis recurva</i> (Jug Orchid)			
380.	12217 <i>Pterostylis sanguinea</i>			
381.	<i>Pterostylis</i> sp.			
382.	2718 <i>Ptilotus drummondii</i> (Narrowleaf Mulla Mulla)			
383.	11260 <i>Ptilotus drummondii</i> var. <i>drummondii</i> (Pussytail)			
384.	4181 <i>Pultenaea reticulata</i>			
385.	16367 <i>Pyrorchis nigricans</i> (Red beaks, Elephants ears)			
386.	8195 <i>Quinetia urvillei</i>			
387.	6012 <i>Regelia ciliata</i>			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
388.	3085 <i>Reseda luteola</i> (Wild Mingnonette)	Y		
389.	13300 <i>Rhodanthe citrina</i>			
390.	14485 <i>Romulea flava</i> var. <i>minor</i>	Y		
391.	1556 <i>Romulea rosea</i> (Guildford Grass)	Y		
392.	14924 <i>Romulea rosea</i> var. <i>communis</i>	Y		
393.	40426 <i>Rytidosperma occidentale</i>			
394.	6483 <i>Samolus junceus</i>			
395.	11647 <i>Samolus repens</i> var. <i>repens</i>			
396.	7603 <i>Scaevola canescens</i> (Grey Scaevola)			
397.	978 <i>Schoenus brevisetis</i>			
398.	982 <i>Schoenus clandestinus</i>			
399.	984 <i>Schoenus curvifolius</i>			
400.	986 <i>Schoenus efoliatus</i>			
401.	992 <i>Schoenus grandiflorus</i> (Large Flowered Bogrue)			
402.	6033 <i>Scholtzia involucrata</i> (Spiked Scholtzia)			
403.	2909 <i>Silene gallica</i> (French Catchfly)	Y		
404.	15972 <i>Silene gallica</i> var. <i>gallica</i>	Y		
405.	8225 <i>Siloxerus humifusus</i> (Procumbent Siloxerus)			
406.	7020 <i>Solanum linnaeanum</i> (Apple of Sodom)	Y		
407.	7022 <i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
408.	9367 <i>Sonchus hydrophilus</i> (Native Sowthistle)			
409.	8231 <i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
410.	1312 <i>Sowerbaea laxiflora</i> (Purple Tassels)			
411.	4211 <i>Sphaerolobium vimineum</i> (Leafless Globe Pea)			
412.	2316 <i>Stirlingia latifolia</i> (Blueboy)			
413.	7693 <i>Stylidium brunonianum</i> (Pink Fountain Triggerplant)			
414.	7774 <i>Stylidium piliferum</i> (Common Butterfly Triggerplant)			
415.	7785 <i>Stylidium repens</i> (Matted Triggerplant)			
416.	25806 <i>Stylidium scarosum</i>			
417.	7798 <i>Stylidium schoenoides</i> (Cow Kicks)			
418.	1260 <i>Stypania glauca</i> (Blind Grass)			
419.	2329 <i>Synaphea spinulosa</i>			
420.	15532 <i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
421.	11143 <i>Thelymitra graminea</i>			
422.	20731 <i>Thelymitra vulgaris</i>			
423.	20728 <i>Thelymitra xanthotricha</i>			
424.	<i>Thysanotus ?thyrsoides</i>			
425.	1318 <i>Thysanotus arbuscula</i>			
426.	1319 <i>Thysanotus arenarius</i>			
427.	1338 <i>Thysanotus manglesianus</i> (Fringed Lily)			
428.	<i>Thysanotus manglesianus/patersonii</i> complex			
429.	1339 <i>Thysanotus multiflorus</i> (Many-flowered Fringe Lily)			
430.	1343 <i>Thysanotus patersonii</i>			
431.	<i>Thysanotus</i> sp.			
432.	1351 <i>Thysanotus sparteus</i>			
433.	1357 <i>Thysanotus thyrsoides</i>			
434.	1358 <i>Thysanotus triandrus</i>			
435.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
436.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			
437.	1363 <i>Tricoryne tenella</i>			
438.	1038 <i>Tricostularia neesii</i>			
439.	17145 <i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Y		
440.	<i>Trifolium campestre/dubium</i>			
441.	14738 <i>Trifolium resupinatum</i> var. <i>resupinatum</i>	Y		
442.	4360 <i>Tropaeolum majus</i> (Garden Nasturtium)	Y		
443.	8254 <i>Urospermum picroides</i> (False Hawkbit)	Y		
444.	8255 <i>Ursinia anthemoides</i> (Ursinia)	Y		
445.	38388 <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Y		
446.	15725 <i>Verbesina encelioides</i>	Y		
447.	15432 <i>Verticordia densiflora</i> var. <i>densiflora</i>			
448.	4320 <i>Vicia hirsuta</i> (Hairy Vetch)	Y		
449.	11474 <i>Vicia sativa</i> subsp. <i>nigra</i>	Y		
450.	722 <i>Vulpia bromoides</i> (Squirrel Tail Fescue)	Y		
451.	<i>Vulpia</i> sp.			
452.	7384 <i>Wahlenbergia capensis</i> (Cape Bluebell)	Y		
453.	7389 <i>Wahlenbergia preissii</i>			
454.	8282 <i>Waitzia suaveolens</i> (Fragrant Waitzia)			
455.	12072 <i>Wurmbea dioica</i> subsp. <i>alba</i>			
456.	1256 <i>Xanthorrhoea preissii</i> (Grass tree, Palga)			
457.	<i>Xanthorrhoea</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
458.	6289 <i>Xanthosia huegelii</i>			
459.	2331 <i>Xylomelum occidentale</i> (Woody Pear, Djandin)			
460.	1049 <i>Zantedeschia aethiopica</i> (Arum Lily)	Y		

**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

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



# EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 10/10/19 20:42:06

[Summary](#)

[Details](#)

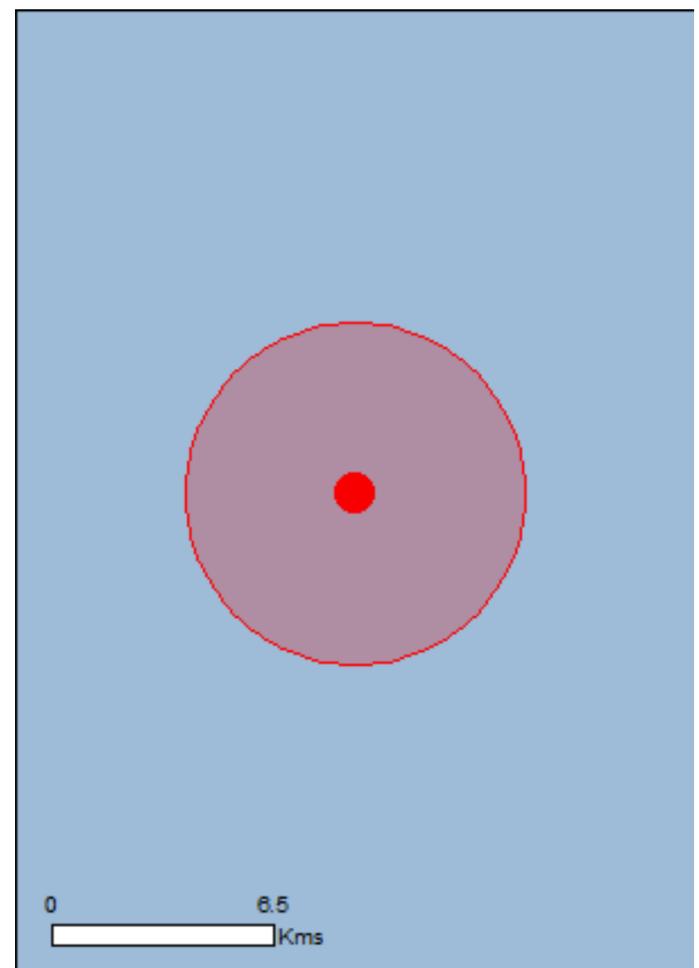
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

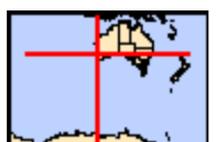
[Acknowledgements](#)



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[Coordinates](#)

Buffer: 5.0Km



# 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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	2
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	2
<a href="#">Listed Threatened Species:</a>	21
<a href="#">Listed Migratory Species:</a>	19

## 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.

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	28
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	5
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	40
<a href="#">Nationally Important Wetlands:</a>	3
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

### Wetlands of International Importance (Ramsar)

[\[ Resource Information \]](#)

Name	Proximity
<a href="#">Forrestdale and thomsons lakes</a> <a href="#">Peel-yalgorup system</a>	Within Ramsar site 30 - 40km upstream

### 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
<a href="#">Banksia Woodlands of the Swan Coastal Plain ecological community</a>	Endangered	Community likely to occur within area
<a href="#">Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community</a>	Critically Endangered	Community likely to occur within area

### Listed Threatened Species

[\[ Resource Information \]](#)

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calyptorhynchus banksii naso</a> Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Calyptorhynchus baudinii</a> Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calyptorhynchus latirostris</a> Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pseudocheirus occidentalis</a> Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area
<b>Other</b>		
<a href="#">Westralunio carteri</a> Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area
<b>Plants</b>		
<a href="#">Andersonia gracilis</a> Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
<a href="#">Caladenia huegelii</a> King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
<a href="#">Diuris micrantha</a> Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Diuris purdiei</a> Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
<a href="#">Drakaea elastica</a> Glossy-leaved Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area
<a href="#">Drakaea micrantha</a> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eleocharis keigheryi</a> Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area
<a href="#">Lepidosperma rostratum</a> Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
<b>Listed Migratory Species</b>		<b>[ Resource Information ]</b>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardenna carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Species or species habitat known to occur within area
<a href="#">Charadrius dubius</a> Little Ringed Plover [896]		Species or species habitat known to occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
<a href="#">Philomachus pugnax</a> Ruff (Reeve) [850]		Species or species habitat known to occur within area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

## Other Matters Protected by the EPBC Act

### 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
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a>		
Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Apus pacificus</a>		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a>		
Great Egret, White Egret [59541]		Breeding known to occur within area
<a href="#">Ardea ibis</a>		
Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a>		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a>		
Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a>		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a>		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a>		
Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Calidris subminuta</a>		
Long-toed Stint [861]		Species or species habitat known to occur within area
<a href="#">Charadrius dubius</a>		
Little Ringed Plover [896]		Species or species habitat known to occur within area
<a href="#">Charadrius ruficapillus</a>		
Red-capped Plover [881]		Species or species habitat known to occur within area
<a href="#">Haliaeetus leucogaster</a>		
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Himantopus himantopus</a>		
Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
<a href="#">Limosa limosa</a>		
Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Merops ornatus</a>		
Rainbow Bee-eater [670]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
<a href="#">Philomachus pugnax</a> Ruff (Reeve) [850]		Species or species habitat known to occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
<a href="#">Recurvirostra novaehollandiae</a> Red-necked Avocet [871]		Species or species habitat known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thinornis rubricollis</a> Hooded Plover [59510]		Species or species habitat known to occur within area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Harry Waring Marsupial Reserve	WA
Thomsons Lake	WA
Unnamed WA48291	WA
Unnamed WA49561	WA
Wandi	WA

## Invasive Species [ Resource Information ]

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

Name	Status	Type of Presence
<b>Birds</b>		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species

Name	Status	Type of Presence
<p>Anas platyrhynchos Mallard [974]</p>		<p>habitat likely to occur within area</p> <p>Species or species habitat likely to occur within area</p>
<p>Carduelis carduelis European Goldfinch [403]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Passer domesticus House Sparrow [405]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Passer montanus Eurasian Tree Sparrow [406]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Streptopelia chinensis Spotted Turtle-Dove [780]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Sturnus vulgaris Common Starling [389]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Turdus merula Common Blackbird, Eurasian Blackbird [596]</p>		<p>Species or species habitat likely to occur within area</p>
<b>Mammals</b>		
<p>Bos taurus Domestic Cattle [16]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Canis lupus familiaris Domestic Dog [82654]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Felis catus Cat, House Cat, Domestic Cat [19]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Mus musculus House Mouse [120]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Oryctolagus cuniculus Rabbit, European Rabbit [128]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Rattus norvegicus Brown Rat, Norway Rat [83]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Rattus rattus Black Rat, Ship Rat [84]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Vulpes vulpes Red Fox, Fox [18]</p>		<p>Species or species</p>

Name	Status	Type of Presence
habitat likely to occur within area		
<b>Plants</b>		
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 habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista 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
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
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#### Nationally Important Wetlands

[ [Resource Information](#) ]

Name	State
<a href="#">Gibbs Road Swamp System</a>	WA
<a href="#">Spectacles Swamp</a>	WA
<a href="#">Thomsons Lake</a>	WA

# 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

-32.19018 115.84266

# 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.

## Appendix C Native plant taxa recorded within the Survey Area

Table C-1: Native plant taxa recorded within the Survey Area

Family	Taxa
Asparagaceae	<i>Sowerbaea laxiflora</i>
Casuarinaceae	<i>Allocasuarina fraseriana</i>
	<i>Allocasuarina humilis</i>
	<i>Casuarina ?obesa</i>
Colchicaceae	<i>Burchardia congesta</i>
Cyperaceae	<i>Leucopogon propinquus</i>
	<i>Mesomelaena pseudostygia</i>
	<i>Tetraria octandra</i>
Dennstaedtiaceae	<i>Pteridium esculentum</i>
Dilleniaceae	<i>Hibbertia hypericoides</i>
Ericaceae	<i>Astroloma macrocalyx</i>
Fabaceae	<i>Acacia pulchella</i>
	<i>Acacia rostellifera</i>
	<i>Acacia saligna</i>
	<i>Acacia willdenowiana</i>
	<i>Gompholobium tomentosum</i>
	<i>Hardenbergia comptoniana</i>
	<i>Kennedia prostrata</i>
Goodeniaceae	<i>Scaevola repens</i>
Haemodoraceae	<i>Conostylis aculeata</i>
Hemerocallidaceae	<i>Corynotheca micrantha</i>
	<i>Dianella revoluta</i>
Myrtaceae	<i>Agonis flexuosa</i>
	<i>Chamelaucium uncinatum</i>
	<i>Corymbia calophylla</i>
	<i>Eucalyptus gomphocephala</i>
	<i>Eucalyptus marginata</i>
	<i>Eucalyptus rudis</i>
	<i>Hypocalymma angustifolium</i>
	<i>Kunzea recurva</i>
	<i>Melaleuca preissiana</i>
	<i>Melaleuca raphiophylla</i>
	<i>Taxandria linearifolia</i>
	Phyllanthaceae
Poaceae	<i>Jacksonia furcellata</i>
	<i>Jacksonia sternbergiana</i>
	<i>Poaceae</i> sp.
Proteaceae	<i>Banksia attenuata</i>
	<i>Banksia grandis</i>
	<i>Banksia ilicifolia</i>
	<i>Banksia menziesii</i>
	<i>Hakea prostrata</i>
	<i>Petrophile linearis</i>
	<i>Stirlingia latifolia</i>
Ranunculaceae	<i>Clematis pubescens</i>
Restionaceae	<i>Desmocladus flexuosus</i>
Sapindaceae	<i>Dodonaea hackettiana</i> (P4)
Typhaceae	<i>Typha orientalis</i>
Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i>
Zamiaceae	<i>Macrozamia riedlei</i>

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## Appendix C Basic Summary of Records (Alcoa landholding)



## Contaminated Sites Act 2003 Basic Summary of Records Search Response

Report generated at 02:58:29PM, 18/12/2019

Receipt No:

ID No: 74385

### Search Results

This response relates to a search request received for:

Lot 501 On Plan 72707  
Hope Valley, WA, 6165

This parcel belongs to a site that contains 1 parcel(s).

According to Department of Water and Environmental Regulation records, this land has been reported as a known or suspected contaminated site.

<b>Address</b>	Lot 501 On Plan 72707 Hope Valley, WA, 6165
<b>Lot on Plan Address</b>	Lot 501 On Plan 72707
<b>Parcel Status</b>	<p><b>Classification:</b> 06/03/2009 - Contaminated - remediation required</p> <p><b>Nature and Extent of Contamination:</b></p> <p>Alkali groundwater plumes are present beneath the Source Site.</p> <p><b>Restrictions on Use:</b></p> <p>Abstraction of groundwater at the Source Site is restricted to remediation of contamination and industrial refinery purposes.</p> <p>The land use of the Source Site is restricted to non-sensitive commercial/industrial use.</p> <p><b>Reason for Classification:</b></p> <p>This Site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of the 'Contaminated Sites Act 2003'. The Site classification is based on information submitted to DEC by 31 May 2007.</p> <p>The Site operates as part of an alumina refining operation. The Site infrastructure includes alumina refinery residue storage and disposal areas, cooling ponds, pipelines and a network of groundwater recovery and monitoring bores. These are land uses that have the potential to cause contamination, as specified in the guideline 'Potentially Contaminating Activities, Industries and Land uses' (Department of Environment, 2004).</p> <p>This Site comprises a source of alkali groundwater contamination that has migrated to affect a parcel of land to the east. The Affected Site has been classified separately.</p> <p>The Source Site is Lot 100 Anketell Road, Hope Valley. The Affected Site is Lot 89 Mandogalup Road, Mandogalup.</p> <p>Periodic groundwater investigations are undertaken at the Source Site as a condition of the licence for the Source Site under the Environmental Protection Act 1986. Groundwater investigations</p>

### Disclaimer

This Summary of Records has been prepared by Department of Water and Environmental Regulation (DWER) as a requirement of the Contaminated Sites Act 2003. DWER makes every effort to ensure the accuracy, currency and reliability of this information at the time it was prepared, however advises that due to the ability of contamination to potentially change in nature and extent over time, circumstances may have changed since the information was originally provided. Users must exercise their own skill and care when interpreting the information contained within this Summary of Records and, where applicable, obtain independent professional advice appropriate to their circumstances. In no event will DWER, its agents or employees be held responsible for any loss or damage arising from any use of or reliance on this information. Additionally, the Summary of Records must not be reproduced or supplied to third parties except in full and unabridged form.



## **Contaminated Sites Act 2003** **Basic Summary of Records Search Response**

Report generated at 02:58:29PM, 18/12/2019

conducted in 2006 identified the presence of elevated pH, alkalinity, electrical conductivity and salinity. The investigations found that this poor groundwater quality was caused by leaking of sodium carbonate and sodium hydroxide from refinery residue storage ponds. The groundwater investigations were limited in nature and did not meet the standards set out in DEC's "Contaminated Sites Management Series" of guidelines and the extent of the groundwater contamination beneath the Source Site has not been accurately delineated.

Groundwater contamination plumes at the Source Site are being actively managed by means of recovery bores, natural attenuation and periodic monitoring.

The Source Site has only been partially investigated and reported to Contaminated Sites Branch of DEC; as such a comment cannot be made on the suitability of the Source Site as a whole for a land use.

As remedial works are in progress but not yet completed, the Source Site is classified as 'contaminated - remediation required'.

As the alumina refinery residue area site is a Source Site, future reports on investigation, assessment, monitoring or remediation of the Source and Affected Sites which are submitted to DEC will need to be accompanied by a Mandatory Auditor's Report, in accordance with regulation 31(1)(b) of the Contaminated Sites Regulations 2006.

DEC, in consultation with Department of Health, has classified this Source Site based on the information available to DEC at the time of classification. It is acknowledged that the contamination status of the Source Site may have changed since the information was collated and/or submitted to DEC, and as such, the usefulness of this information may be limited.

**Certificate of Title Memorial**

Under the Contaminated Sites Act 2003, this Site has been classified as "Contaminated - remediation required". An instrument affecting land which comprises all, or part of, this Site will not be registered or accepted for registration, unless the CEO of the Department of Environment & Conservation consents to the registration in writing. For further information on the contamination status of this Site, or this restriction, please contact the Contaminated Sites section of the Department of Environment & Conservation.

**Current Regulatory Notice Issued**

**Type of Regulatory Notice:** *Nil*

**Date Issued:** *Nil*

**General**

No other information relating to this parcel.

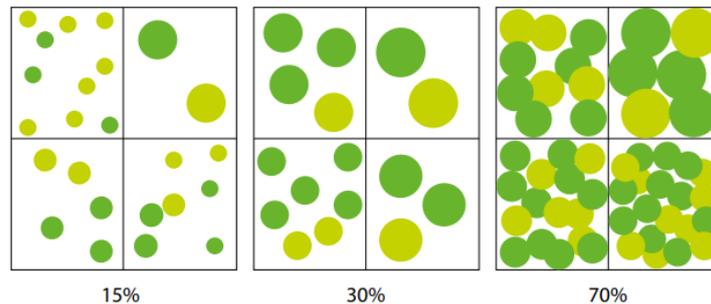
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## Appendix D APZ standards

### Schedule 1: Standards for Asset Protection Zones

- **Fences:** within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used.
- **Objects:** within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors.
- **Fine Fuel load:** combustible dead vegetation matter less than 6 millimetres in thickness reduced to and maintained at an average of two tonnes per hectare.
- **Trees (> 5 metres in height):** trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy.



- **Shrubs (0.5 metres to 5 metres in height):** should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m<sup>2</sup> in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.
- **Ground covers (<0.5 metres in height):** can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 millimetres in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs.
- **Grass:** should be managed to maintain a height of 100 millimetres or less.

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