

# Byford Solar Farm

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## Level 1 Flora, Vegetation and Fauna Assessment



**Prepared for Griffiths Environmental on behalf  
of WestGen Pty Ltd**

**JANUARY 2017**





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## 1.0 PROJECT

WestGen Pty Ltd proposes to build a solar power station in Oakford, Western Australia in the Shire of Serpentine-Jarrahdale.

### 1.1 LOCATION

The proposed project is to be located on Lot 1001 Peverett Lane Oakford and Lots 200 and 210. Thomas Road forms the northern boundary of the project area and Abernethy Road the southern boundary (Figure 1). The project area is approximately 75.7 hectares in size.

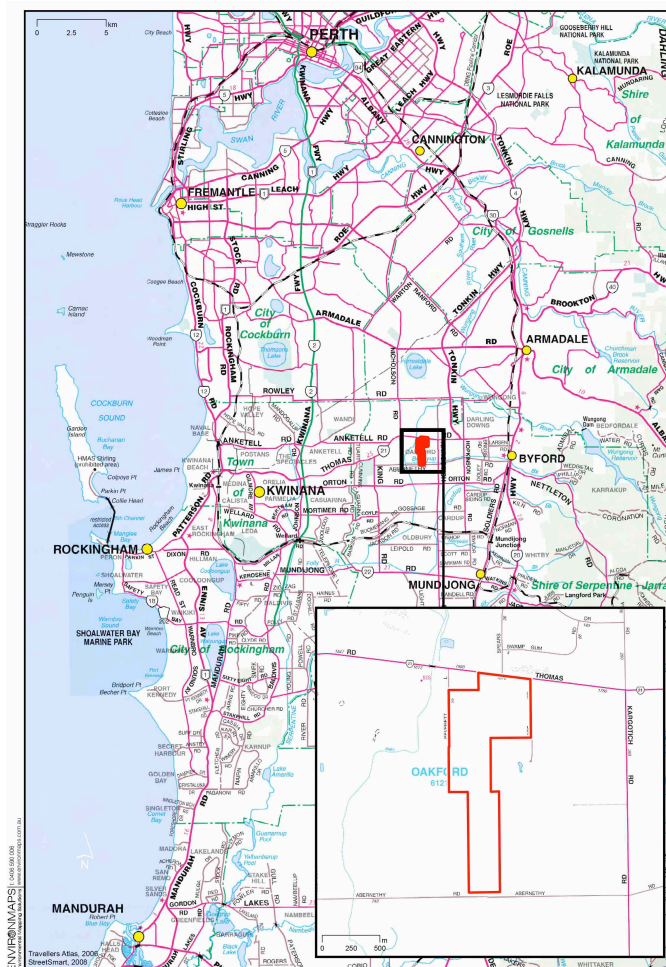


Figure 1: Location of Byford Solar Farm Project

### 1.2 SCOPE

Based on Scope of Works Document (No. WG 1/2016), this report presents the findings of biological assessments that are consistent with a:

- Level 1 Flora and Vegetation (Reconnaissance and Desktop) Survey and Assessment according to EPA (2004a); and a

- Level 1 Fauna Assessment (Desktop) according to EPA (2004b).

## **2.0 BACKGROUND**

### **2.1 GEOLOGY LANDFORMS AND SOIL**

The project area is located on the Guildford Formation, which is layered beds of sand, clay and conglomerate of fluvial origin (Biggs and Wilde, 1980).

It is on the Beermullah soil and landform unit, which are alluvial soils on the eastern side of the Swan Coastal Plain. It is differentiated from other alluvial soils in the area by age and solonetzic (saline) features in the soil (Churchward and McArthur, 1980).

### **2.2 WETLANDS**

The Geomorphic Wetlands of the Swan Coastal Plain dataset mapped the project area as being within a wetland called the Armadale Palusplain (Resource Enhancement) (Hill *et al.*, 1996). Palusplain are seasonally waterlogged flats. Resource Enhancement wetlands are those that have been modified but still support 'attributes and functions'.

### **2.3 LAND USE HISTORY**

The project area and surrounds were historically heavily cleared for agriculture. The eastern side of the Swan Coastal Plain in general was cleared extensively during the early years of settlement, as it was the best land for irrigation and pasture (Beard, 1979).

### **2.4 SEASONAL CONDITIONS**

Rainfall for the months leading up to the botanical field survey was 680mm (April to September 2016), compared to the long-term average for the same period of 733mm. This represented a rainfall anomaly of 7%.

### **2.5 PREVIOUS STUDIES**

#### **2.5.1 Vegetation**

##### **2.5.1.1 IBRA Region**

The project area is in the Interim Biogeographical Regionalisation of Australia (IBRA) region of the Swan Coastal Plain (SCP) in sub-region SWA2: Swan Coastal Plain (Thackway and Cresswell, 1995, as amended) (DEH, 2000).



### 2.5.1.2 Vegetation Complexes

According to 1:250,000-scale vegetation mapping by Heddle *et al.* (1980), the project area is in the Beermullah vegetation complex.

The original extent of Beermullah was 6707.21 hectares, of which 463.53 hectares or 6.91% remains (Local Biodiversity Programme, 2013).

### 2.5.1.3 Vegetation Survey of Western Australia (Beard, 1979)

Beard (1979) mapped the project area as Vegetation Association 968: '*Jarrah, marri and wandoo Eucalyptus marginata, Corymbia calophylla, E. wandoo*'. This is inaccurate, however Beard's description of the broader Pinjarra Plain System of which Vegetation Association 968 is a part of, states that Flooded Gum *Eucalyptus rudis* would have occurred on low-lying heavy soils. Beard in 1979 describes the Pinjarra Plain as having no vegetation remaining. Shepherd *et al.* (2002) states that the original extent of Vegetation Association 968 was 200,651 hectares of which 78,150 hectares or 38.9% remains (part of which must occur outside of the Pinjarra Plain).

## 2.6 LEGISLATION AND GUIDELINES

### 2.6.1 ***Environmental Protection Act 1986***

The *Environmental Protection (EP) Act 1986* is the guiding legislation for environmental impact assessment in Western Australia.

#### 2.6.1.1 *Environmental Protection Act 1986 (Clearance of Native Vegetation Regulations 2004)*

Clearing of native vegetation in Western Australia requires a permit. Permits are obtained from the Western Australian Department of Environmental Regulation (DER). The supporting information required for this process is as per EPA guidance under the *EP Act 1986*.

### 2.6.2 ***Wildlife Conservation Act 1950***

This is the principal guiding legislation for protection of flora and fauna in Western Australia. All native species are protected under the *Wildlife Conservation Act 1950*. Additionally, Threatened Flora and Fauna are provided an extra degree of protection and there are fines of \$10,000 for 'taking' these species.

### 2.6.3 ***Biodiversity Conservation Act 2016***

The purpose of this act is to replace the *Wildlife Conservation Act 1950* in Western Australia. However both acts are currently in force. The new act is not yet functional, with regulations outlining such matters as terminology and the administrative arrangements not yet established. According to DPW (2016) components of the new act will become active at the end of 2016, with the regulations to be finalised by the end of 2017.

What is known about the new act is that it will include ecological communities as well as species. There will be substantially higher fines, for example ‘modifying’ a Critically Endangered Ecological Community will attract a \$500,000 fine, the ‘taking’ of rare flora a fine of \$200,000 and ‘interfering with’ rare fauna a fine of \$500,000. There are also substantial fines to individuals and organisations for not reporting matters of environmental significance.

#### 2.6.4 Environmental Protection Biodiversity Conservation Act 1999

Species and ecosystems listed as Matters of National Environmental Significance (MNES) are protected under the Commonwealth *Environmental Protection Biodiversity Conservation (EPBC) Act 1999*.

## 2.7 DEFINITIONS AND CRITERIA

### 2.7.1 Flora

All native flora species are protected under the Western Australian *Wildlife Conservation Act 1950*. Flora cannot be taken without a permit from the Department of Parks and Wildlife (DPW).

Additionally, the Minister for Environment can declare any species thought ‘rare’ an extra level of protection. Species on this list are referred to as Threatened Flora (TF) (Table 1)(also sometimes referred to as DRF or Declared Rare Flora).

#### 2.7.1.1 Threatened Flora (Western Australia)

Each TF species is also given a rank consistent with IUCN Red List criteria (Table 2). The TF list is periodically updated under the *Wildlife Conservation Act 1950* and updated lists are published in the Government Gazette. TF status of individual species are also listed on the DPW’s Western Australian Herbarium (WAH) website, Florabase (Western Australian Herbarium, 1998-).

According to Florabase, there are 396 TF (T) currently listed for the southwest of Western Australia and seven species which are thought to be extinct (X).

**Table 1:** Definition of Threatened Flora under the *Wildlife Conservation Act 1950* (DPW, 2013).

<b>T:</b>	<b>Threatened species</b>
Specially protected under the <i>Wildlife Conservation Act 1950</i> , listed under Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora). Species which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.	
<b>X:</b>	<b>Presumed extinct species</b>
Specially protected under the <i>Wildlife Conservation Act 1950</i> , listed under Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora (which may also be referred to as Declared Rare Flora). Species which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.	

**Table 2:** IUCN-Equivalent Status of Threatened Flora under *Wildlife Conservation Act 1950* (DPW, 2013).

<b>CR</b>	<b>Critically Endangered</b>	Considered to be facing an extremely high risk of extinction in the wild.
<b>EN</b>	<b>Endangered</b>	Considered to be facing a very high risk of extinction in the wild.
<b>VU</b>	<b>Vulnerable</b>	Considered to be facing a high risk of extinction in the wild.

2.7.1.2 Priority Flora

A supplementary Priority Flora (PF) list is maintained by DPW, which contains flora species that are in need of further study before being assessed for Threatened Flora (TF) status. It also includes species that have been adequately surveyed, but which require close monitoring to prevent their decline. Species on the PF list are not specifically protected under current legislation, however they are closely considered in environmental impact assessment processes. There are four categories of PF (Table 3). The status of PF are regularly updated and published on Florabase (Western Australian Herbarium, 1998-).

**Table 3:** Priority Flora Criteria and Definitions (DPW, 2015).

<b>P1: Priority One: Poorly-known species</b>
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.
<b>P2: Priority Two: Poorly-known species</b>
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.
<b>P3: Priority Three: Poorly-known species</b>
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.
<b>P4: Priority Four: Rare, Near Threatened and other species in need of monitoring</b>
(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.

### 2.7.1.3 Threatened Flora (Federal) (*EPBC Act*)

Some flora species have additional protection under the *Commonwealth Environmental Protection Biodiversity Conservation Act, 1999 (EPBC Act)*. There is significant overlap in that state-listed TF are largely the same species as TF listed under the federal *EPBC Act*.

There are six categories of Threatened Flora under the *EPBC Act* (Table 4).

**Table 4:** Categories of Threatened Flora Species under the *EPBC Act 1999* (IUCN-Equivalent Status).

<b>EX:</b>	<b>Extinct</b>
No reasonable doubt that the last member of the species has died.	
<b>EW:</b>	<b>Extinct in the Wild</b>
Species known only to survive in cultivation, in captivity or as a naturalised population well outside its past range or it has not been recorded in its known habitat in an appropriate season anywhere in its past range despite exhaustive surveys.	
<b>CR:</b>	<b>Critically Endangered</b>
Species is considered to be facing an extremely high risk of extinction in the wild.	
<b>EN:</b>	<b>Endangered</b>
Species is not critically endangered; and it is facing a very high risk of extinction in the wild in the near future.	
<b>VU:</b>	<b>Vulnerable</b>
Species is not critically endangered or endangered; and it is facing a high risk of extinction in the wild in the medium-term future.	
<b>CD:</b>	<b>Conservation Dependent</b>
Species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered.	

### 2.7.1.4 Flora of 'Other' Conservation Significance - Guidance Statement 51 (EPA, 2004)

Species other than those listed under state and federal legislation and guidelines may have conservation significance. These are defined by GS51 (EPA, 2004a p. 29) as those that may include, but not be limited to species that have:

- A keystone role;
- Relictual status;
- Anomalous features indicating a potential new discovery;
- Representation of a species range (extensions, extremes or an outlier population);
- Status as a restricted subspecies, variety or naturally occurring hybrid;
- Poor reservation; or
- Status as a local endemic or has a restricted distribution.

**2.7.2 Weeds**

**2.7.2.1 Environmental Weeds**

There is currently no coordinated approach to prioritising and managing environmental weeds in Western Australia.

Under the Western Australian *Conservation and Land Management Act 1984*, the Department of Parks and Wildlife (DPW) is required to monitor and manage weeds. As a part of this responsibility, the Western Australian Environmental Weed Strategy (WAEWS) (CALM, 1999) was developed. This programme rated environmental weed species on their invasiveness, distribution and environmental impact. The purpose of this publication was also to eventually tie into the Weeds of National Significance (WONS) project (CALM, 1999 p58), enabling a compatible rating system to be applied to Western Australian environmental weed species. The idea was also to eventually provide a regionally based rating system, based on Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell, 1995) regions. While this publication has been superseded in some regions, including the DPW Swan Region of which the project area is a part, it is often still used where no other prioritisation exists.

Since the WAEWS (CALM, 1999) was published, DPW has moved towards a regionally prioritised process, called An Integrated Approach to Weed Management on DPW-managed Lands in Western Australia (DPW, 2013a). Contrary to the direction outlined in WAEWS (CALM, 1999) to use IBRA regions, the new prioritisation has been based on DPW management regions.

The main difference in the new process is that it prioritises species on not just their ecological impact, but on species that are *‘considered to be high impact, rapidly invasive and still at a population size which is feasible to eradicate or control’* (DPW, 2013a). This means that some highly invasive and high impact species identified in the WAEWS (CALM, 1999) were not rated highly in the new process, as control was considered not feasible.

The Integrated Approach to Weed Management (DPW, 2013a) categorises weeds based on a ranking (Table 5), which is then further refined by adding one or more management actions (Table 6).

**Table 5:** Weed Species Ranking for the DPW Swan Region (DPW, 2013a).

VH	<b>Very High</b>	Objective is eradication.
H	<b>High</b>	Objective is eradication or control to reduce.
M	<b>Medium</b>	Objective is control to reduce or containment.
L	<b>Low</b>	Objective is containment at key sites only.
N	<b>Negligible</b>	No action to be undertaken, but may include monitoring only.
FAR	<b>Further Assessment Required</b>	Will not proceed to ranking till more information available, however this species may require monitoring.

**Table 6:** Management Actions for each Ranking for the DPW Swan Region (DPW, 2013a).

A	<b>No Action</b>	The weed species ranking is so low as to not warrant any investment in regional strategic management action.
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B	<b>Monitor Only</b>	Aims to detect any significant changes in the species weed risk or management opportunity.
C	<b>Improve Weed Management</b>	Aims to minimise weed impact and maintain the overall biodiversity, social, cultural and economic values in the region through improved general weed management.
D	<b>Protect Priority Sites</b>	Aims to prevent spread of weed species to key sites/assets of high bio-diversity, social, cultural or economic value.
E	<b>Targeted Control</b>	To reduce infestations at priority sites. Aims to reduce the impact of a weed species on key sites of high biodiversity, social, cultural or economic value through targeted management.
F	<b>Contain Regional Spread</b>	Will not proceed to ranking till more information available, however this species may require monitoring.
G	<b>Reduce Regional Infestations</b>	Aims to significantly reduce the extent of the weed species in the region.
H	<b>Regional Eradication</b>	Aims to remove the species from the region.
I	<b>Statewide Eradication</b>	Aims to remove the weed from the state.

The project area is in the DPW management region of Swan. As of January 4<sup>th</sup> 2017, the environmental weed priority list for Swan was unavailable as it is being revised (Danielle Wiseman DPW Weeds Programme pers. comm.). However the process is still described here, as these rankings may be useful to apply against weed species recorded for the project area in the future, if a weed management plan is ever required.

#### 2.7.2.2 *Biosecurity and Agriculture Management (BAM) Act 2007*

This act replaces amongst other related legislation, the *Agriculture and Related Resources Protection Act 1976*, which legislated for the control of Declared Plants in Western Australia (Sandy Lloyd DAFWA, pers. comm.). The Declared Plants list under old legislation has been replaced by the Western Australian Organism List (WAOL) under the *BAM Act*. The WAOL is administered by the Western Australian Department of Agriculture and Food (DAFWA, 2013). The *BAM Act* represents the only legally binding requirement for weed control and/or eradication in Western Australia. There are three categories of Declared Pest (Table 7).

**Table 7:** Declared Pest Categories *Biosecurity and Agriculture Management Act 2007* (DAFWA, 2013).

<b>The C1 category</b> (Exclusion)
Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
<b>The C2 category</b> (Eradication)
Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
<b>The C3 category</b> (Management)
Pests will be assigned to this category if they 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, which currently is free of that pest.

2.7.2.3 Weeds of National Significance (WONS)

The Weeds of National Significance (WoNS) project is an initiative of the Commonwealth in collaboration with state governments aimed at establishing a national prioritisation process for environmental weeds. Thirty-two species of WONS have currently been prioritised, based on invasiveness, potential for spread and environmental, social and economic impacts. Their ability to be managed was also taken into account. This programme is in the early stages of development and is a work in progress. It only provides a limited prioritisation of environmental weeds.

2.7.3 **Vegetation**

2.7.3.1 Threatened Ecological Communities (TECs) (Western Australia)

In Western Australia, Threatened Ecological Communities (TECs) are not currently specifically protected under state legislation. In spite of this Western Australian TECs are still closely considered in environmental impact assessment processes. There are four criteria for state listed TECs (Table 8). Currently there are 69 TECs that have been endorsed by the Western Australian Minister for Environment.

**Table 8:** Criteria for Western Australian Threatened Ecological Communities (TECs) (DPW, 2013b).

<b>Presumed Totally Destroyed (PD)</b>
<p>An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.</p> <p>Three communities are currently listed in this category for WA.</p>
<b>Critically Endangered (CR)</b>
<p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.</p> <p>Twenty-one communities are currently listed in this category for WA.</p>
<b>Endangered (EN)</b>
<p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.</p> <p>Seventeen communities are currently listed in this category for WA.</p>
<b>Vulnerable (VU)</b>
<p>An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.</p> <p>Twenty-eight communities are currently listed in this category for WA.</p>

2.7.3.2 Priority Ecological Communities (PECs)

In Western Australia, potential TECs that do not meet criteria or that are not adequately defined or do not have adequate information are added to the Priority Ecological Community (PEC) List as Priority 1, 2 or 3 (Table 9). Communities that are rare but not threatened and are adequately known, or that have been recently removed from the threatened list, are placed in Priority 4 for regular monitoring purposes. Conservation dependent communities are placed in Priority 5 (DPW, 2013b). As of November 2016 there were 384 PECs listed by the DPW Threatened Species and Communities Branch (DPW, 2016a).

**Table 9:** Priority Ecological Communities (PECs) Definitions and Criteria (DPW, 2013b).

<b>Priority One:</b> Poorly-known ecological communities
Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
<b>Priority Two:</b> Poorly-known ecological communities
Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
<b>Priority Three:</b> Poorly known ecological communities
(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) Communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
<b>Priority Four:</b> Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
(i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
<b>Priority Five:</b> Conservation Dependent ecological communities
Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.



### 2.7.3.3 Threatened Ecological Communities (TECs) (Federal) (EPBC Act)

The *Environmental Protection Biodiversity Conservation Act 1999 (EPBC Act)* provides legislative protection for Threatened Ecological Communities (TECs). The criteria for listing of TECs under the *EPBC Act* are presented in Table 10.

**Table 10:** Threatened Ecological Communities (TECs) Definitions and Criteria (EPBC Act Regulations, 2013).

<b>Critically Endangered (CR)</b>
If, at that time, 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).
<b>Endangered (EN)</b>
If, at that time, 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).
<b>Vulnerable (VU)</b>
If, at that time, 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).

### 2.7.3.4 Conservation Significant Vegetation - Guidance Statement 51 (EPA, 2004a)

Vegetation other than that listed under state and federal legislation and guidelines may still have conservation significance, and these are defined by Guidance Statement 51 (GS51) (EPA, 2004a p. 30) as those that may include, but not be limited to vegetation that has:

- Scarcity;
- Unusual species;
- A novel combination of species;
- A role as a refuge;
- A role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species;
- Being representative of the range of a unit (particularly a good local and/or regional example of a unit in 'prime' habitat, at the extremes of range, recently discovered range extension, or isolated outliers off the main range); or
- Has a restricted distribution.

### 2.7.3.5 Vegetation Condition

EPA and DPW (2015) provide a standardised condition scale for use in EIA for the South West Botanical Province (Table 11).

**Table 11:** Vegetation Condition Rating Scale for the South West Botanical Province (EPA and DPW, 2015).

RATING		DESCRIPTION
P	<b>Pristine</b>	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
E	<b>Excellent</b>	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.
VG	<b>Very Good</b>	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.
G	<b>Good</b>	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.
D	<b>Degraded</b>	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.
CD	<b>Completely Degraded</b>	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.

## 2.7.4 Fauna

### 2.7.4.1 Western Australian Wildlife Conservation Act (1950) Threatened Fauna Categories

Threatened Fauna are published as Specially Protected under the *Wildlife Conservation (WC) Act 1950*, and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation. The *WC Act* provides for species or subspecies of native animals (fauna) to be specially protected and listed as 'threatened' in Western Australia because they are 'under identifiable threat of extinction, rare or otherwise in need of special protection'. 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 equivalent categories and criteria (Table 12).

**Table 12:** Threatened Fauna Categories Western Australian *Wildlife Conservation Act (1950)*.

<b>CR:</b>	<b>Critically Endangered (Schedule 1)</b>
Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the <i>Wildlife Conservation Act 1950</i> , in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.	
<b>EN:</b>	<b>Endangered (Schedule 2) (Previously Schedule 1)</b>
Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the <i>Wildlife Conservation Act 1950</i> , in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.	
<b>VU:</b>	<b>Vulnerable (Schedule 3) (Previously Schedule 1)</b>
Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the <i>Wildlife Conservation Act 1950</i> , in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened	

Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.	
<b>EX:</b>	<b>Presumed Extinct (Schedule 4)</b> (Previously Schedule 2)
Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the <i>Wildlife Conservation Act 1950</i> , in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.	
<b>IA:</b>	<b>Migratory Species (Schedule 5)</b> (Previously Schedule 3)
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 the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the <i>Wildlife Conservation Act 1950</i> , in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.	
<b>CD:</b>	<b>Conservation Dependent (Schedule 6)</b> (Previously Schedule 4)
Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the <i>Wildlife Conservation Act 1950</i> , in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.	
<b>OS:</b>	<b>Other specially protected fauna (Schedule 7)</b> (Previously Schedule 4)
Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the <i>Wildlife Conservation Act 1950</i> , in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.	

2.7.4.2 Priority Fauna

A supplementary Priority Fauna (PF) list is maintained by DPW, which contains species that are in need of further study before being assessed for Threatened Fauna (TF) status. It also includes species that have been adequately surveyed, but which require close monitoring to prevent their decline. Species on the PF list are not specifically protected under current legislation, however they are closely considered in environmental impact assessment processes. There are four categories of PF (Table 13).

**Table 13:** Priority Fauna Definitions and Criteria (DPW, 2015).

<b>P1:</b>	<b>Priority One:</b> 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.	
<b>P2:</b>	<b>Priority Two:</b> 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.	
<b>P3:</b>	<b>Priority Three:</b> 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.
<b>P4: Priority Four: Rare, Near Threatened and other species in need of monitoring</b>
(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.

**2.7.4.3 EPBC Act (1999) Threatened Fauna Categories**

Some Threatened Fauna (TF) species have additional protection under the *Commonwealth Environmental Protection Biodiversity Conservation (EPBC) Act 1999*. The first six categories in Table 14 (EX to CD) are TF under the *EPBC Act*. Migratory and Marine fauna species are also protected as separate matters under the *EPBC Act*.

**Table 14:** Threatened Fauna Categories *EPBC Act (1999)*.

<b>EX: Extinct</b>
There is no reasonable doubt that the last member of the species has died.
<b>EW: Extinct in the Wild</b>
A species that is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range or has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
<b>CR: Critically Endangered</b>
A species is facing an extremely high risk of extinction in the wild in the immediate future.
<b>EN: Endangered</b>
A species that is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
<b>VU: Vulnerable</b>
A species that is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future.
<b>CD: Conservation Dependent</b>
A species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered.
<b>1A: Migratory Species</b>
All migratory species that are native species and from time to time included in the appendices to the Bonn Convention and all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA and all native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
<b>Ma: Marine</b>
Species in the list established under s248 of the <i>EPBC Act</i> .

## 3.0 FLORA

### 3.1 METHODS

Survey methods for flora was based on the following as outlined in the Scope of Works Document (No. WG 1/2016):

- Complete a Level 1 Flora and Vegetation (Reconnaissance and Desktop) Survey and Assessment according to EPA (2004a);
- Survey the lots to compile an inventory of all flora species present in the project area, in particular noting the presence of any Threatened (TF) or Priority (PF) Flora;
- Complete a search of Department of Parks and Wildlife (DPW) Species and Communities Branch database to identify any listed Threatened Flora species previously identified as occurring or potentially occurring;
- Report on the conservation status of flora species identified in the desktop review (from literature and database searches) and species identified during the field survey using DPW, *WC Act 1950* and *EPBC Act 1999* species classifications (see Section 2.6 and 2.7);
- Present findings of the database searches (presented in tables);
- Complete an assessment of the likelihood of occurrence of all listed TF and PF species identified from database searches as potentially occurring (known to occur, likely to occur, possible and unlikely to occur). This assessment should be based on proximity to known locations, habitat preference and the results of the vegetation survey in terms of suitable habitat; and
- Provide an assessment against the ten clearing principles under the *EP Act 1986* to support a clearing permit application.

A field survey was completed of the project area on the 19<sup>th</sup> October 2016. Familiarisation with potential TF and PF was completed prior to the survey. The survey included opportunistic collections of flora species present at the time of the survey (54 collections). If the identity of the species was certain, then observational records were taken only. UTM coordinates were taken for each collection and observational record in WGS84/GDA94 datum. Botanist Kelli McCreery completed the field survey under Scientific Licence No. SL011602.

A flora inventory was compiled from all observational and collection records.

Taxonomy and nomenclature was based on the database of the Western Australian Herbarium (WAH) (Western Australian Herbarium, 1998-). All taxa were checked against Florabase to ensure that names were current at the time of publication.

Assessment of conservation significance of flora involved cross-referencing all taxa recorded in the project area against current state and federal legislation and guidelines (Sections 2.6 and 2.7). Geographic distribution was assessed using the map-based resources the Australian Virtual Herbarium (Council of Heads of Australasian Herbaria, 2013) and Florabase (Western Australian Herbarium, 1998-).

### 3.2 RESULTS

Seventy-three flora species were recorded from the project area. Of these, 62 species were introduced flora and 11 were native flora. Additionally, three native shrub species were recorded from the Abernethy Road Reserve just outside of the project boundary. A full species list is presented in Appendix A.

The native flora species recorded included remnant overstorey trees such as Flooded Gum *Eucalyptus rudis* subsp. *rudis*, Swamp Sheoak *Casuarina obesa*, Freshwater Paperbark *Melaleuca raphiophylla* and Orange Wattle *Acacia saligna*. There were also some disturbance-tolerant native herbs present including *Drosera glanduligera* and Waterwort *Elatine gratioloides* and the sedges Pale Rush *Juncus pallidus* and Nodding Club-rush *Isolepis cernua* var. *setiformis*.

#### 3.2.1 Threatened Flora (TF) and Priority Flora (PF)

No Priority Flora (PF), or Threatened Flora (TF) as listed under the *Wildlife Conservation (WC) Act 1950* were recorded from the project area during the field survey. No TF under the *Environmental Protection Biodiversity Conservation Act 1999* were recorded from within the project area during the field survey.

DPW database searches revealed that no known records of state listed PF or TF as listed under the *WC Act 1950* have previously been recorded from within the project area. A search of the *EPBC Act* Protected Matters Report (Appendix D) listed 14 TF as potentially occurring in the region. None of these records were from within the project area.

Table 15 summarises the search results from the DPW TF and PF database search and the *EPBC Act* Protected Matters Report. It also provides an indication of how likely each species is to occur within the project area.

**Table 15:** Threatened and Priority Flora Database Search Results (DPW databases and EPBC Act Protected Matters Report).

WESTERN AUSTRALIA	CONSERVATION STATUS*			OCCURRENCE Known/Likely/Possible/Unlikely
	WC Act	DPW	EPBC Act	
<i>Acacia horridula</i>		P3		Unlikely. Granite.
<i>Acacia lasiocarpa</i> var. <i>bracteolata</i> long peduncle variant (G.J. Keighery 5026)		P1		Unlikely. Winter-wet flats. Shrub. Not seen.
<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>		P3		Unlikely. Granite.
<i>Amanita carneiphylla</i>		P3		Unknown. Fungi.
<i>Amanita fibrilloses</i>		P3		Unknown. Fungi.
<i>Amanita kalamundae</i>		P3		Unknown. Fungi.
<i>Andersonia gracilis</i>			EN	Unlikely. Winter-wet flats. Shrub. Not seen.

WESTERN AUSTRALIA	CONSERVATION STATUS*			OCCURRENCE Known/Likely/Possible/Unlikely
	WC Act	DPW	EPBC Act	
<i>Andersonia</i> sp. Audax (F. Hort, B. Hort & J. Hort 3179)		P3		Unlikely. Darling Range.
<i>Andersonia</i> sp. Saxatilis (F. & J. Hort 3324)		P1		Unlikely. Darling Range.
<i>Aponogeton hexatepalus</i>		P4		<b>Possible.</b> Aquatic herb. Not seen.
<i>Babingtonia urbana</i>		P3		Unlikely. Winter-wet depressions. Not seen.
<i>Caladenia huegelii</i>	T		EN	Unlikely. Sand (drier areas).
<i>Centrolepis caespitosa</i>		P4		<b>Possible.</b> Wet sand, clay flats. Not seen.
<i>Cyathochaeta teretifolia</i>		P3		Unlikely. Swamps and creeks. Not seen.
<i>Dillwynia dillwynioides</i>		P3		Unlikely. Winter-wet depressions. Not seen.
<i>Diuris micrantha</i>			VU	Unlikely. Winter-wet depressions. Not seen.
<i>Diuris purdiei</i>	T		EN	Unlikely. Winter-wet depressions. Not seen.
<i>Drakaea elastica</i>	T			Unlikely. Adjacent to winter-wet depressions. Not seen.
<i>Drakaea elastica</i>			EN	Unlikely. Low lying near wetlands, sand.
<i>Drakaea micrantha</i>	T		VU	Unlikely. White-grey sand. Not seen.
<i>Drosera occidentalis</i> subsp. <i>occidentalis</i>		P4		<b>Possible.</b> Wet depressions sand, clay. Small annual herb. Not seen.
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)		P3		Unlikely. Dry sandy flats.
<i>Eucalyptus balanites</i>			EN	Unlikely. Laterite.
<i>Eucalyptus rudis</i> subsp. <i>cratyantha</i>		P4		<b>Possible.</b> Low lying flats. Large tree. Not seen in spite of intensive survey effort.
<i>Grevillea crowleyae</i>		P2		Unlikely. Gravel.
<i>Grevillea curviloba</i> subsp. <i>incurva</i>			EN	Unlikely. Winter wet, sand. Outside range.
<i>Grevillea manglesii</i> subsp. <i>ornithopoda</i>		P2		Unlikely. No information. Shrub. Not seen.
<i>Isopogon drummondii</i>		P3		Unlikely. Colluvial slope, sand.
<i>Jacksonia gracillima</i>		P3		Unlikely. Seasonally wet flats. Not seen.
<i>Johnsonia pubescens</i> subsp. <i>cygnorum</i>		P2		Unlikely. Seasonally wet flats. Not seen.
<i>Lasiopetalum glutinosum</i> subsp. <i>glutinosum</i>		P3		Unlikely. No information. Shrub. Not seen.
<i>Lasiopetalum pterocarpum</i>	T		EN	Unlikely. Darling Range.
<i>Lepidosperma rostratum</i>	T		EN	<b>Possible.</b> Peaty sand, clay. Perennial sedge. Not seen.
<i>Ornduffia submersa</i>		P4		<b>Possible.</b> Aquatic herb. Not seen.
<i>Paracaleana gracilicordata</i>		P1		Unlikely. Darling Range.
<i>Paracaleana granitica</i>		P1		Unlikely. Darling Range.
<i>Parsonsia diaphanophleba</i>		P4		<b>Possible.</b> Alluvial soils, along rivers. Perennial climber. Not seen.
<i>Schoenus pennisetis</i>		P3		<b>Possible.</b> Winter wet sand, clay. Small annual sedge. Not seen.
<i>Senecio leucoglossus</i>		P4		Unlikely. Darling Range.
<i>Stachystemon</i> sp. Keysbrook (R. Archer 17/11/99)		P1		Unlikely. No information. Shrub. Not seen.
<i>Stylidium ireneae</i>		P4		Unlikely. Woodland, near creeks.
<i>Stylidium longitubum</i>		P4		<b>Possible.</b> Seasonal wetlands, sandy clay. Small annual herb. Not seen.
<i>Synaphea odocoileops</i>		P1		Unlikely. Swamps. Not seen.
<i>Synaphea</i> sp. Fairbridge Farm (D.	T		CR	Unlikely. Sand with laterite, near wetlands,

WESTERN AUSTRALIA	CONSERVATION STATUS*			OCCURRENCE Known/Likely/Possible/Unlikely
	WC Act	DPW	EPBC Act	
Papenfus 696)				low woodland. Shrub. Not seen.
<i>Synaphea</i> sp. Pinjarra Plain (A.S. George 17182)	T			Unlikely. Sand to clay, wet depressions. Shrub. Not seen.
<i>Synaphea</i> sp. Serpentine (G.R. Brand 103)	T			Unlikely. Clay, wet depressions. Shrub. Not seen.
<i>Synaphea stenoloba</i>			EN	Unlikely. Granite, winter wet.
<i>Tetraria australiensis</i>	T		VU	Unlikely. Sand over clay, seasonally wet. Not seen.
<i>Tetradlea</i> sp. Granite (S. Patrick SP1224)		P3		Unlikely. Granite.
<i>Thelymitra stellata</i>			EN	Unlikely. Dry sand, gravel, loam.
<i>Thysanotus glaucus</i>		P4		Unlikely. Sand, sandy gravel.
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>		P4		<b>Possible.</b> Winter-wet depressions. Shrub. Not seen.
<i>Verticordia plumosa</i> var. <i>ananeotes</i>	T			<b>Possible.</b> Seasonally inundated plains. Shrub. Not seen.

\* See Section 2.7.1 for definitions of conservation status codes. Habitat preference information from WA Government (1998-) and DPW search results.

### 3.2.2 Species of Other Conservation Significance

See Section 2.7.1.4 for a definition of species of 'other' conservation significance.

#### Waterwort *Elatine gratioloides* – Poorly Collected

This species is an aquatic to semi-aquatic herb that is known from freshwater across Australia. It roots at the nodes, creeping over mud and/or submerged in standing or flowing water (Sainty and Jacobs, 1994). This species is poorly collected in the Perth Metropolitan Region with only three records in the Western Australian Herbarium (WAH). It is also poorly collected in the Swan Coastal Plain IBRA region (Thackway and Cresswell, 1995) with only six records in the WAH. In the project area this species was recorded from open water and mud in the main east-west drain in the centre of the project area (Figure 2).

### 3.2.3 Weeds

#### 3.2.3.1 Environmental Weeds

The checklist for environmental weeds in the Swan Region is currently under review and is unavailable (Danielle Wiseman, DPW Weeds Programme pers. comm.) (See Section 2.7.2). The weed species recorded during this survey may be compared to this checklist at a later date, once the updated version is available and if it is required e.g. for a weed management plan.

#### 3.2.3.2 Declared Pest Plants (*BAM Act 2007*)

Four Declared Pests under the *Biosecurity and Agriculture Management Act 2007* were recorded from the project area. These were:

- Paterson's Curse \**Echium plantagineum*.



- Narrowleaf Cottonbush \**Gomphocarpus fruticosus*.
- One-leaf Cape Tulip \**Moraea flaccida*.
- Arum Lily \**Zantedeschia aethiopica*.

All four species are in the C3 category (Management) (see Section 2.7.2.2), which means that they are established in Western Australia but it is feasible or desirable to manage them in order to limit their damage. Measures may include preventing a C3 pest from increasing in population size or density or spreading to an area that currently is free of that pest (DAFWA, 2013).

### 3.2.3.3 Weeds of National Significance

No Weeds of National Significance (WONS) (See Section 2.7.2.3) were recorded in the project area.

## 4.0 VEGETATION

### 4.1 METHODS

Survey methods for vegetation were based on the following as outlined in the Scope of Works Document (No. WG 1/2016):

- Complete a Level 1 Flora and Vegetation (Reconnaissance and Desktop) Survey and Assessment according to EPA (2004a);
- Provide sufficient background information on the existing environment of the project area;
- Complete a search of Department of Parks and Wildlife (DPW) Species and Communities Branch database to identify any Threatened (TECs) or Priority Ecological Communities (PECs) previously identified as occurring or potentially occurring within the project area;
- Present findings of the database searches, if any (presented in tables);
- Survey the lots to compile an inventory of all vegetation communities present in the project area;
- Report on the conservation status of any PECs or TECs identified in the desktop review (from literature and database searches) and/or during the field survey;
- Classify the condition of vegetation; and
- Provide an assessment against the ten clearing principles under the *EP Act 1986* to support a clearing permit application.

Vegetation types were described using the National Vegetation Information System (NVIS) structural formation categories and terminology (ESCAVI, 2003 p. 12). GPS coordinates and photographs were taken at each location where vegetation was described. Vegetation condition was assessed using the condition scale in EPA and DPW (2015)(see Section 2.7.3.5).

## 4.2 RESULTS

### 4.2.1 Condition

The project area was in Completely Degraded condition (Figure 2) on the EPA and DPW (2015) condition scale (see Section 2.7.3.5). The entire project area represents 'parkland cleared' or remnant native overstorey over cleared land (pasture).

The remnant native overstorey consisted of Flooded Gum *Eucalyptus rudis* subsp. *rudis* (Plate 3) in the northern portion of the project area and Swamp Sheoak *Casuarina obesa* (Plate 4) in the south (Figure 2). Localised areas were pasture with no overstorey.

Lot 1001 (Figure 2) showed substantial regrowth of Flooded Gum, with saplings between one and three metres tall. According to historical aerial photography, this is recent and perhaps a response to de-stocking.

Open drains were present (Figure 2) and these were also in Completely Degraded condition, supporting pasture weeds as well as some native aquatic flora including Waterwort *Elatine gratioloides* and Waterbuttons *\*Cotula coronopifolia* (Plate 1).



**Plate 1:** Open drain east-west in centre of project area. Completely Degraded with pasture weeds and aquatics Waterwort *Elatine gratioloides* and Waterbuttons *\*Cotula coronopifolia*.

There were two homestead sites present in the project area, one active and the other historical. These were also in Completely Degraded condition. A number of exotic garden species were recorded from these areas including palms and fruit trees.

### 4.2.2 Description

Prior to clearing it appeared that there would have been two major vegetation types present. All that remains of these are remnant overstorey trees.

**Vegetation Type A:** Isolated Trees to Open Woodland of Flooded Gum *Eucalyptus rudis* subsp. *rudis* over pasture on low lying sandy flats (Plate 3).

This vegetation type was present in the northern half of the project area (Figure 2). It typically consisted of Isolated Trees to Open Woodland of *Eucalyptus rudis* subsp. *rudis* over pasture of Closed Forbland and Open Tussock Grassland with areas of Sparse Sedgeland. Isolated Trees of Swamp Paperbark *Melaleuca raphiophylla* were present but only in the central part of this vegetation type. The pasture consisted of closed forbs, sedges and grasses. Forbs typically consisted of the weeds Alsike Clover *\*Trifolium hybridum* var. *hybridum*, Narrowleaf Trefoil *\*Lotus angustissimus*, Capeweed *\*Arctotheca calendula*, Flatweeds *\*Hypochaeris* spp. and Sorrel *\*Rumex acetosella*. Scattered disturbance tolerant native species occurred occasionally and included Nodding Club-rush *Isolepis cernua* var. *setiformis*, Pimpernel Sundew *Drosera glanduligera* and the Stonecrops *Crassula closiana* and *Crassula decumbens* var. *decumbens*. Grass weeds typically consisted of Perennial Ryegrass *\*Lolium perenne*, Winter Grass *\*Poa annua*, Wild Oats *\*Avena fatua/barbata* and Rat's Tail Fescue *\*Vulpia myuros* forma *megalura*. The Sparse Sedgeland consisted of the weeds Toad Rush *\*Juncus bufonius* and Tiny Flat Sedge *\*Cyperus tenellus*.

**Vegetation Type B:** Isolated Trees of Swamp Sheoak *Casuarina obesa* over pasture on low lying sandy flats interspersed with scattered small clay pans (Plate 3).

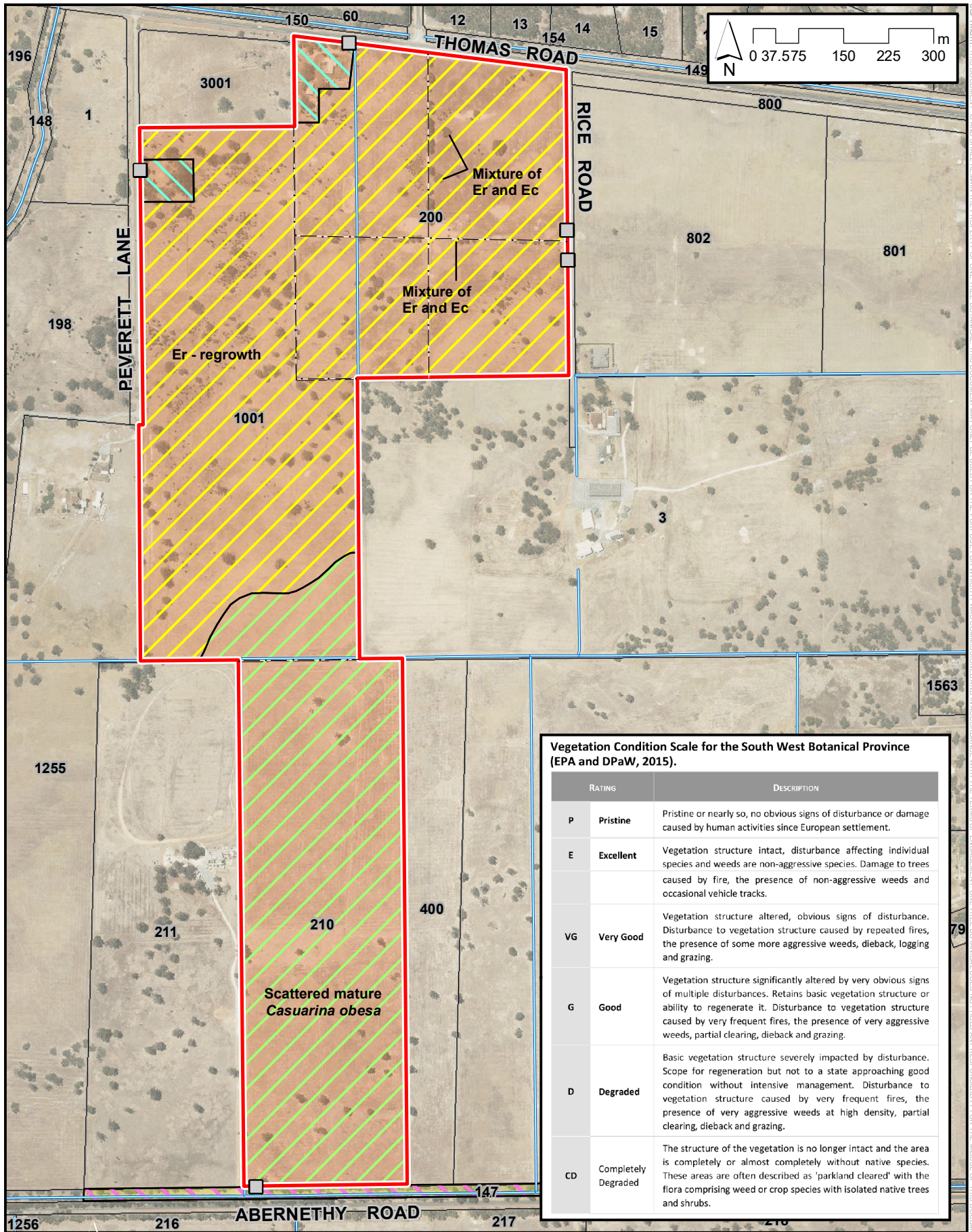
This vegetation was present in the southern half of the project area (Figure 2). It typically consisted of Isolated Trees of *Casuarina obesa* over pasture weedy grasses and forbs (herbs). Grass weeds were dominated by Perennial Ryegrass *\*Lolium perenne* but also included Winter Grass *\*Poa annua*, and Rat's Tail Fescue *\*Vulpia myuros* forma *megalura*. Forbs typically consisted of the weeds Alsike Clover *Trifolium hybridum* var. *hybridum*, Narrow-leaf Trefoil *\*Lotus angustissimus*, Capeweed *\*Arctotheca calendula* *\*Hypochaeris* spp. and Sorrel *\*Rumex acetosella*. There were scattered small clay pans approximately one to two metres across, which were typically bare but some supported the native sedges Pale Rush *Juncus pallidus* and Nodding Club-rush *Isolepis cernua* var. *setiformis* or the grass Annual Fog *\*Holcus setiger*.



**Plate 2: Vegetation Type A:** Isolated Trees to Open Woodland of Flooded Gum *Eucalyptus rudis* subsp. *rudis* over pasture (Lot 1001).



**Plate 3: Vegetation Type B:** Isolated Trees of Swamp Sheoak *Casuarina obesa* over pasture (Lot 210).



**Vegetation Condition Scale for the South West Botanical Province (EPA and DPaW, 2015).**

RATING		DESCRIPTION
P	Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
E	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.
VG	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.
G	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.
D	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.
CD	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.

- Project Boundary
- Cadastre
- Fenceline
- External Gate
- Watercourse
- Vegetation Condition**
- Degraded
- Completely Degraded

- Vegetation Type**
- Vegetation Type A: Isolated Trees to Open Woodland of Flooded Gum *Eucalyptus rudis* subsp. *rudis* over pasture on low lying sandy flats.
- Vegetation Type B: Isolated Trees of Swamp Sheoak *Casuarina obesa* over pasture on low lying sandy flats with scattered small claypans.
- Homestead: Mix of *Eucalyptus rudis* subsp. *rudis*, horticultural species and weeds.
- PEC: *Casuarina obesa* Association (Swan 4) (Priority 1) (outside project area boundary)

**Figure 2**

**Vegetation Type and Condition**

### 4.2.3 Threatened (TECs) and Priority (PECs) Ecological Communities

DPW database searches identified no known records of state listed Threatened (TECs) or Priority Ecological Communities (PECs) for the project area. No federally listed TECs under the *EPBC Act 1999* have previously been recorded. Table 16 presents the results of database searches for PECs and TECs occurring nearby and their likelihood of occurring within the project area.

**Table 16:** Threatened and Priority Ecological Communities Database Search Results (DPW Species and Communities database and *EPBC Act 1999* Protected Matters Database).

WESTERN AUSTRALIA	COMMONWEALTH EQUIVALENT	CONSERVATION STATUS*			OCCURRENCE Known/Likely/Possible/Unlikely
		WC Act	DPW	EPBC Act	
<i>Eucalyptus calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils, Swan Coastal Plain (SCP3a)	<i>Corymbia calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils of the SCP	CR		EN	Unlikely.
<i>Eucalyptus calophylla</i> - <i>Eucalyptus marginata</i> woodlands on sandy clay soils of the southern SCP (SCP3b)	-	VU			Unlikely.
<i>Eucalyptus calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands, SCP (SCP3c)	<i>Corymbia calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands of the SCP	CR		EN	Unlikely.
Herb rich saline shrublands in clay pans (SCP07)	Clay Pans of the SCP	VU		CR	Unlikely.
Herb rich shrublands in clay pans (SCP08)	Clay Pans of the SCP	VU		CR	Unlikely.
Shrublands on dry clay flats (SCP10a)	Clay Pans of SCP	EN		CR	Unlikely.
<i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the SCP (SCP20b)	( <i>Banksia</i> Woodlands of the SCP)	EN		EN	Unlikely.
Low lying <i>Banksia attenuata</i> woodlands or shrublands (SCP21C)	( <i>Banksia</i> Woodlands of the SCP)		P3	EN	Unlikely.
Communities of Tumulus Springs (Organic Mound Springs, SCP)	Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the SCP	CR		EN	Unlikely.
<i>Casuarina obesa</i> Association	-		P1		Likely but Completely Degraded.
-	<i>Banksia</i> Woodlands of the SCP			EN	Unlikely.

\* See Section 2.7.3 for definitions of conservation status codes.

Prior to clearing **Vegetation Type B: *Casuarina obesa*** over pasture (Figure 2)(Plate 3) was likely to have represented PEC Swan 4: *Casuarina obesa* Association (Priority 1). This PEC is described as occurring between Thomas Road and the Serpentine River on the Swan Coastal Plain (DPW, 2016a). DPW (2016a) also describes this community as having not enough detailed information to assess if distinct. The reason for this is likely to be that there are no intact examples remaining.

Five records of PEC Swan 4: *Casuarina obesa* Association were identified in the DPW TEC database search area, none of which are within or adjacent to the project area.

The Abernethy Road reserve adjacent to the southern boundary of the project area supported what appeared to be a slightly more intact example of PEC: *Casuarina obesa* Association (Figure 2)(Plate 4). The vegetation was an Open Forest of *Casuarina obesa* over Closed Grassland and/or Closed Forbland of introduced flora (weeds). Scattered native shrubs included Mohan *Melaleuca viminea*, Spearwood *Kunzea glabrescens* and Variable Hakea *H. varia*. This is likely to represent a previously undocumented occurrence of this PEC. While the vegetation was in Degraded Condition, this is typical of this PEC, as no intact examples are thought to remain. This was outside of the project area boundary but immediately adjacent to the southern boundary.



**Plate 4:** Occurrence of PEC: *Casuarina Obesa* Association on Abernethy Road Reserve.

## 5.0 FAUNA

### 5.1 METHODS

Survey method scope for fauna was based on the following as outlined in the Scope of Works Document (No. WG 1/2016):

- To complete a Level 1 Fauna Assessment (Desktop) according to EPA (2004b);
- Provide sufficient background information on the existing environment of the project area;
- Undertake a database search of threatened fauna species previously identified as occurring or potentially occurring within the project area or surrounds;
- List any threatened fauna species known to occur in the project area;
- Based on the results of the database search results, identify habitat areas within the project area that have the potential to support listed threatened fauna species or species of Black Cockatoos;
- Report on the conservation status of any species previously recorded from the project area, as identified in literature and database searches using the DPW and EPBC Act conservation status categories;
- Present findings of the database searches in a table including an assessment of the likelihood of occurrence of all listed threatened fauna species identified in the database search as potentially occurring (known to occur, likely to occur, possibly occurring and unlikely to occur); and
- Provide an assessment against the ten clearing principles under the *EP Act 1986* to support a clearing permit application.

Background information on the fauna assemblages and conservation significant species known from the vicinity of the project area was accessed through three main databases. These were:

- DPW Species and Communities Database for Threatened or Priority Fauna. A request was made to DPW in October 2016 for historical fauna records recorded in the vicinity of the project area. The search area was a 5 km buffer from the centre point 400200 E 6436100 S (WGS84).
- WA Museum records and DPW Databases via NatureMap (DPW, 2007-). A centre point (115° 56' 27" E, 32° 12' 54" S) with a 5km buffer zone was searched for all known fauna records in October 2016.
- EPBC Act list of protected species using the Protected Matters Search Tool (DotE, 2016). A centre point (-32.21496 115.94072) with a 5km buffer was searched for known Threatened Fauna records in October 2016.

These sources generated a list of species that have been previously recorded in the vicinity of the project area, including species of conservation significance (see Table 17).

During the flora and vegetation survey, any opportunistic sightings of fauna species observed were noted. Opportunistic fauna species observations are provided in Appendix B. This did not represent a comprehensive fauna field survey.

### 5.1.1 Habitat Assessment

The results of the vegetation survey were interpreted in the context of potential fauna habitats. The main objective of this assessment was to determine the likelihood of any species of conservation significance that may be utilising the remaining habitat. Aerial photography also assisted in gaining an understanding of the fauna habitat present in the project area.

#### 5.1.1.1 Black Cockatoos

Black Cockatoos refer collectively to three species; Carnaby's Black Cockatoo *Calyptorhynchus latirostris*, Baudin's Black Cockatoo *Calyptorhynchus baudinii* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*.

A desktop assessment was completed to assess the likelihood of the presence of nesting, foraging or roosting habitat. Target trees included any *Eucalyptus* or *Corymbia* species that had the potential to develop hollows for Black Cockatoos. During the field survey (flora and vegetation) observations were made as to whether tree hollows suitable for Black Cockatoos may be present in the project area. This was a preliminary and partial and non-systematic assessment only.

## 5.2 RESULTS

### 5.2.1 Desktop Study

The various database search results identified 40 species of conservation significance previously recorded from the vicinity of the project area. An assessment of the likelihood or otherwise of each species occurring within the project area was completed, based on species biology, habitat requirements and the quality and availability of suitable habitat. Table 17 provides a summary of the findings.

**Table 17:** Threatened and Priority Fauna Database Search Results (DPW databases and EPBC Act Protected Matters Report).

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			OCCURRENCE Known/Likely/Possible/Unlikely
		EPBC Act	WC Act	DPW	
<b>Birds</b>					
Curlew Sandpiper	<i>Calidris ferruginea</i>	CR, M	S3, S5		Unlikely. Preferred habitat not available.
Forest Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii naso</i>	VU	S3		<b>Possible.</b>
Baudin's Black-Cockatoo	<i>Calyptorhynchus baudinii</i>	EN	S2		<b>Possible.</b>



COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			OCCURRENCE Known/Likely/Possible/Unlikely
		EPBC Act	WC Act	DPW	
Carnaby's Black-Cockatoo	<i>Calyptorhynchus latirostris</i>	EN	S2		<b>Possible.</b>
Malleefowl	<i>Leipoa ocellata</i>	VU	S3		Unlikely. Locally extinct, preferred habitat not available.
Eastern Curlew	<i>Numenius madagascariensis</i>	CR, M	S3, S5		Unlikely. PA does not meet habitat requirements.
Australian Painted Snipe	<i>Rostratula benghalensis australis</i>	EN	S2		Unlikely. Preferred habitat not available.
Fork-tailed Swift	<i>Apus pacificus pacificus</i>	M	S5		Unlikely. Preferred habitat not available.
Grey Wagtail	<i>Motacilla cinerea</i>	M	S5		Unlikely. Rare vagrant, preferred habitat not available.
Common Greenshank	<i>Tringa nebularia</i>	M	S5		<b>Possible.</b>
Cattle egret	<i>Ardea ibis</i>	M	S5		<b>Possible.</b>
Glossy Ibis	<i>Plegadis falcinellus</i>	M	S5		<b>Possible.</b>
Great Egret	<i>Ardea modesta</i>	M	S5		<b>Possible.</b>
Peregrine Falcon	<i>Falco peregrinus</i>		S7		<b>Possible.</b>
Rainbow Bee-eater	<i>Merops ornatus</i>	M	S5		<b>Possible.</b>
Osprey	<i>Pandion haliaetus</i>	M	S5		<b>Possible.</b>
Hooded Plover	<i>Charadrius rubricollis</i>			P4	<b>Possible.</b>
Blue-billed Duck	<i>Oxyura australis</i>			P4	Unlikely. Preferred habitat not available.
Black-tailed Godwit	<i>Limosa limosa</i>	M	S5		Unlikely. Preferred habitat not available.
Australasian Bittern	<i>Botaurus poiciloptilus</i>	EN	S2		Unlikely. Preferred habitat not available.
Greater Sand Plover	<i>Charadrius leschenaultii</i>	M	S5		Unlikely. Preferred habitat not available.
Grey Plover	<i>Pluvialis squatarola</i>	M	S5		Unlikely. Preferred habitat not available.
Long-tailed Jaeger	<i>Stercorarius longicaudus</i>	M	S5		Unlikely. Rare vagrant, preferred habitat not available.
Long-toed Stint	<i>Calidris subminuta</i>	M	S5		Unlikely. Preferred habitat not available.
Marsh Sandpiper	<i>Tringa stagnatilis</i>	M	S5		Unlikely. Preferred habitat not available.
Pacific Golden Plover	<i>Pluvialis fulva</i>	M	S5		Unlikely. Preferred habitat not available.
Pectoral Sandpiper	<i>Calidris melanotos</i>	M	S5		<b>Possible.</b>
Red-necked Stint	<i>Calidris ruficollis</i>	M	S5		Unlikely. Preferred habitat not available.
Ruddy Turnstone	<i>Arenaria interpres interpres</i>	M	S5		Unlikely. Preferred habitat not available.
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	M	S5		<b>Possible.</b>
Wood Sandpiper	<i>Tringa glareola</i>	M	S5		Unlikely. Preferred habitat not available.
Mammals					
Quenda, Southern Brown Bandicoot	<i>Isodon obesulus</i>			P4	Unlikely. Preferred habitat not available.
Chuditch, Western Quoll	<i>Dasyurus geoffroii</i>	VU	S3		Unlikely. Preferred habitat not available.
Western Ringtail	<i>Pseudocheirus</i>	VU	S2		Unlikely. Preferred habitat not available.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			OCCURRENCE Known/Likely/Possible/Unlikely
		EPBC Act	WC Act	DPW	
Possum	<i>occidentalis</i>				available.
Quokka	<i>Setonix brachyurus</i>	VU	S3		Unlikely. Preferred habitat not available.
Numbat	<i>Myrmecobius fasciatus</i>	VU	S2		Unlikely. Locally extinct, preferred habitat not available.
Reptiles					
Lined Skink	<i>Lerista lineata</i>			P3	Unlikely. Preferred habitat not available.

EPBC Act: CR= Critically Endangered, EN= Endangered, VU= Vulnerable, M= Listed Migratory Species

WC Act: S2= Schedule 2, S3= Schedule 3, S5= Schedule 5, S7= Schedule 7

DPW: P3=Priority 3, P4= Priority 4. See Section 2.7.4 for full definitions.

### 5.2.2 Field Survey

During the October 2016 field survey, 22 common avian fauna typical of disturbed areas were recorded opportunistically. None of these were conservation significant fauna species. A species list is presented in Appendix B.

### 5.2.3 Habitat Assessment

The condition of the fauna habitat in the project area was severely degraded due to extensive clearing and a long history of livestock grazing and weed infestation. The understorey is absent throughout the site.

There were minimal resources for fauna species present in the southern half of the project area and it is most likely only utilized by common fauna species with non-specific requirements. The northern half of the project area does provide some limited value for fauna. While there was a significant level of habitat degradation and fragmentation, there were mature Flooded Gum *Eucalyptus rudis*, Blue Gum *E. globulus* and River Red Gum *E. camaldulensis*. There were some patches of Eucalypts (2-6 trees in clusters) that provided canopy connectivity, which may provide some habitat value for Black Cockatoo species, however most trees were isolated.

#### 5.2.3.1 Carnaby's Black Cockatoo

The project area was found to contain possible breeding habitat for the Carnaby's Black Cockatoo. Ninety-two large, mature Flooded Gum *Eucalyptus rudis* located in the northern section of the project area may have potential as nesting trees. The locations of these trees are shown in Figure 2 and the associated coordinates are presented in Appendix C. Other Eucalypt species present in the project area (*E. camaldulensis* and *E. globulus*) are not listed as suitable for nesting Carnaby's Black Cockatoos (SEWPaC 2012).

During the limited assessment of potential nesting trees completed during the flora and vegetation survey, one Flooded Gum *Eucalyptus rudis* (Plate 5) was found to contain a hollow possibly suitable for nesting. It was assessed using the Department of Environment and Energy (DoEE) referral guidelines for assessing Black Cockatoo habitat (SEWPaC 2012) of >12cm hollow entrance and a potential inner cavity diameter of >25cm, excluding downward facing hollows. However it is likely that few suitable trees are present onsite,

with most hollows observed being much smaller. The lack of supporting foraging resources in the vicinity of the project area also means that the project area is unlikely to represent suitable breeding habitat.



**Plate 5:** Possible nest-sized hollow for Carnaby's Cockatoo.

The vegetation present within the project area does not provide foraging value for Carnaby's Black Cockatoo. Flooded Gum *Eucalyptus rudis*, River Red Gum *\*E. camaldulensis* and Blue Gum *\*E. globulus* are not identified as potential foraging species (Groom, 2010). The main food sources for Carnaby's Black Cockatoos are proteaceous plant species (*Banksia*, *Hakea*), selected Eucalyptus/Corymbia in particular Marri and Jarrah, and introduced Pines (SEWPaC 2012). None of these were present in the project area.

The project area may provide a roosting site for Carnaby's Black Cockatoo. Roosting value may be limited, given the lack of foraging habitat locally.

#### 5.2.3.2 Baudin's Black Cockatoo

The project area is outside of the known breeding range for Baudin's Black Cockatoo and suitable nesting trees do not occur on site for this species (SEWPaC 2012). The floral components of vegetation present do not represent suitable foraging habitat, however insect larvae and insects from under bark, from wood of live and dead trees are consumed by Baudin's Black Cockatoo (Johnstone *et al* n.d.), which the Eucalypt trees present in the project area may provide. The project area may provide a roosting site in the non-breeding season.

#### 5.2.3.3 Forest Red-tail Black Cockatoo

The project area is within the distribution and breeding range for the Forest Red-tailed Black Cockatoo (SEWPaC, 2012). However the Eucalypt species present were not suitable. The vegetation does provide a small fragment of foraging value due to the occurrence of River Red Gum *\*Eucalyptus camaldulensis*. The presence of mature Flooded Gum *Eucalyptus rudis*, River Red Gum *\*E. camaldulensis* and Blue Gum *\*E. globulus* means the project area may provide a roosting site.

## 6.0 DISCUSSION AND RECOMMENDATIONS

### 6.1 FLORA

The conservation significance of flora in the project area is very low. The project area is extensively cleared and very little floristic diversity remains. Only 11 native flora species were recorded (Appendix A) from a 75.7 hectare area. These were widespread common species, either remnant trees or disturbance tolerant herbs and sedges. Weeds dominated the understorey, while the overstorey consisted of remnant trees only. No native shrubs were recorded.

One native flora species of 'other conservation significance' (EPA, 2004a) was recorded, Waterwort *Elatine gratioloides*, on the basis that it was poorly collected both in the Perth Metropolitan Region and the Swan Coastal Plain. It was present in constructed drains in the project area. Quality plant material was collected for this species and it is recommended that it be submitted to the Western Australian Herbarium.

### 6.2 VEGETATION

The vegetation across the project area was in Completely Degraded condition.

While Vegetation Type B (Figure 2) is likely to have represented PEC: *Casuarina obesa* Association prior to clearing, it is currently in Completely Degraded condition with none of the original understorey remaining. The remnant *Casuarina obesa* trees do have value in that they provide contextual information about the landscape, as an indicator of the extent of a plant community that is now thought to be extinct. It is recommended that this report be lodged with the Department of Parks and Wildlife Conservation Library, to ensure that a record of this occurrence is maintained.

The road reserve between Abernethy Road and the southern boundary of the project area supports a slightly more intact example of PEC: *Casuarina obesa* Association. It is recommended that measures be taken to avoid disturbance to this area during project construction and operation.

### 6.3 FAUNA

The fauna recorded opportunistically in the project area (Appendix B) represented common avian fauna adapted to disturbed landscapes.

Database searches indicated that 22 migratory species are known to frequent the region. Fourteen of these were classified as unlikely with eight possibly occurring. Approval is required under the *EPBC Act* if an action has, will have, or is likely to have, a significant impact on a listed migratory species. The project area however was in Completely Degraded condition and the habitat value for these species therefore likely to be limited.

SEWPaC (2012) indicates that the project area is within the breeding range of the Forest Red-tailed Black-Cockatoo *Calyptorhynchus banksii naso* (Vulnerable) and Carnaby's Black-Cockatoo *Calyptorhynchus latirostris* (Endangered) and the non-breeding range of Baudin's Black-Cockatoo *Calyptorhynchus baudinii* (Vulnerable). The populations for all three Black Cockatoo species are in decline (Peck *et al.*, 2016), due to loss of habitat attributable to clearing for agricultural and urban purposes. Black Cockatoos breed in

hollows of long-lived trees, usually more than 200 years old (Johnstone and Storr, 1998). Mature tree species that have or are on the way to developing suitable breeding hollows are of vital importance. These species may periodically utilise the mature trees present in the study area, however this would most likely be for roosting rather than foraging or nesting.

The project area has limited potential foraging value for Forest Red-tailed Black Cockatoo due to the presence of planted River Red Gum *Eucalyptus camaldulensis*. However the numbers of trees within the study area are small and their loss is unlikely to represent a significant impact.

The project area is on the boundary of the breeding range for Carnaby's Black-Cockatoo *Calyptrorhynchus latirostris*. SEWPaC (2012) implies that Flooded Gum *Eucalyptus rudis* is used as a nesting tree, however DPW (2013) states that it is a roosting tree only. Ron Johnstone (Curator Ornithology WA Museum, pers. comm.) stated that Tuart *E. gomphocephala* was more commonly used on the SCP for nesting and that Flooded Gum was rarely used.

Breeding success of Carnaby's Black Cockatoo is also dependent on suitable feeding habitat occurring adjacent to the nest site, to provide food for the survival of the chick (Johnstone and Storr, 1998). Foraging habitat surrounding the project area consists of small remnant patches of bushland in a matrix of agricultural and urban environments. The nearest significant bushland areas are Jandakot Regional Park (2.0 km to the west), Forrestdale Lake Nature Reserve (3.1 km to the north) and vegetation associated with the Darling Scarp (7 km to the east). Access to adequate food resources is likely to represent a barrier to viability of the site as potential breeding habitat.

Approximately 1.8 hectares of tree canopy is present in the project area. It is recommended that large trees be retained where possible. A vegetation buffer has been proposed on visual amenity grounds. It is recommended that this buffer include local flora species appropriate to the habitat (palusplain) that have forage value for Black Cockatoos.

## 6.4 ASSESSMENT AGAINST THE CLEARING PRINCIPLES

**Table 18:** Assessment Against the Ten Clearing Principles under the *EP Act 1986*.

NATIVE VEGETATION SHOULD NOT BE CLEARED IF:	BYFORD SOLAR FARM PROJECT AREA
(a) It comprises a high level of biological diversity; or	Not at variance. Project area is heavily cleared and supports very low levels of biodiversity.
(b) It comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia; or	May be slightly at variance. Clearing of vegetation for agriculture historically and livestock grazing has destroyed all of the understory and most of the canopy required for native fauna. What remains are isolated and/or clumped mature trees. These may provide some limited habitat value for Black Cockatoos (roosting). There are conflicting opinions on whether Flooded Gum <i>Eucalyptus rudis</i> provides nesting value to Carnaby's Black Cockatoo, however the consensus is that it is unlikely. A small number of planted River Red Gum <i>Eucalyptus camaldulensis</i> may provide very limited foraging value to Red-tailed Black Cockatoo.

NATIVE VEGETATION SHOULD NOT BE CLEARED IF:	BYFORD SOLAR FARM PROJECT AREA
(c) It includes, or is necessary for the continued existence of rare flora; or	Unlikely to be at variance. Project area is heavily cleared and is highly unlikely to provide habitat for Threatened Flora (TF). No TF have been recorded historically from the project area and none were recorded during the field survey.
(d) It comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community; or	Unlikely to be at variance. Vegetation Type B (Figure 2) would have represented PEC: <i>Casuarina obesa</i> Association prior to clearing, however it is now in Completely Degraded condition with no realistic chance of restoration.
(e) It is significant as a remnant of native vegetation in an area that has been extensively cleared; or	Not at variance. While Beermullah is one of the most heavily cleared vegetation complexes on the SCP, the vegetation in the project area is Completely Degraded.
(f) It is growing in, or in association with, an environment associated with a watercourse or wetland; or	May be at variance. The project area is located on a Geomorphic Wetland (Armadale Palusplain). This wetland covers an extensive area between Cardup, Oakford and Armadale. It is a Resource Enhancement wetland. The project area has been historically drained for agriculture. Open drains are present across the project area. The native vegetation in the project area was Completely Degraded.
(g) The clearing of the vegetation is likely to cause appreciable land degradation; or	Not likely to be at variance. Somewhat outside the scope of this report. The effect of removing mature trees from the project area is unknown however the project area is already Completely Degraded. Water erosion unlikely to be a major factor as the land is flat. If the water table rises as a result of removing trees, the area has an extensive drainage system.
(h) The clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area; or	Not at variance. The project area is not adjacent to a conservation area. The closest conservation area is Jandakot Regional Park, which is approximately 2km to the WNW. There is very little native vegetation in the vicinity.
(i) The clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water; or	Water quality is outside the scope of this report. The effect of removing mature trees from the project area on water quality is unknown.
(j) The clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	Surface and groundwater modelling is outside the scope of this report. The effect of removal of mature trees from the project area is unknown.

## 7.0 LIMITATIONS

Guidance Statement 51 (EPA 2004a) and Guidance Statement 56 (EPA 2004b) provide a framework for identifying the limitations that may arise during a survey.

**Table 19:** Limitations of the Assessment (EPA 2004a and EPA 2004b).

LIMITATION	COMMENT
Competency/experience of the consultant carrying out the survey e.g. degree of expertise in plant identification to taxon level.	Kelli McCreery ( <i>M Env Mgt Natural Systems</i> ) has 20 years experience completing baseline botanical surveys for EIA on the Swan Coastal Plain. Andrew McCreery ( <i>BSc Environmental Science &amp; Conservation &amp; Wildlife Biology</i> ) has participated in multiple baseline fauna assessments for EIA.

LIMITATION	COMMENT
Scope (what flora and faunal groups were sampled and were some sampling methods not able to be employed because of constraints).	All vascular flora encountered at the time of the field survey (19 <sup>th</sup> October 2016) were sampled including introduced flora. The fauna assessment was a Level 1 Desktop Assessment only. Opportunistic fauna observations were made during the Level 1 Flora and Vegetation Reconnaissance Survey, these consisted of common avian fauna only.
Proportion of flora collected and identified (based on sampling, timing and intensity).	Always difficult to estimate. The project area historically cleared for agriculture, with the only native flora species present were remnant overstorey species and a small number of disturbance-tolerant annual herbs and sedges. Pasture was very thick at time of survey, other native species may have been present but not visible at the time of the survey.
Mapping reliability.	Reliable. Vegetation types and condition were not complex and the survey area was Completely Degraded or 'Parkland Cleared'.
Proportion of fauna identified, recorded and/or collected.	Difficult to estimate. Opportunistic fauna observations were made during the Level 1 Flora and Vegetation Reconnaissance Survey, these consisted of common avian fauna. Fauna involved a Level 1 Desktop Assessment only, which is a risk-based assessment of the likelihood of rare fauna.
The proportion of the task achieved and further work which might be needed.	The project area was Completely Degraded; the value of further flora and vegetation survey work would be limited. The field survey identified potential Black Cockatoo habitat, most likely for roosting only, however a systematic habitat tree assessment may have been of use.
Timing/weather/season/cycle.	No constraints. The Level 1 Flora and Vegetation Reconnaissance Survey was completed at an optimum time for low-lying areas on the Swan Coastal Plain (19 <sup>th</sup> October) after close to average seasonal rainfall.
Disturbances (e.g. fire, flood, accidental human intervention etc.) that affected survey results.	No constraints.
Resources (e.g. degree of expertise available in plant and animal identification to taxon level).	No constraints. A botanist with 20 years experience completed the flora identifications using the resources of the Western Australian Herbarium. A Level 1 Desktop Assessment only was completed for fauna and therefore no sampling was completed.
Completeness (e.g. was relevant area fully surveyed). Remoteness and/or access issues. Intensity (in retrospect, was the intensity adequate).	During the flora and vegetation survey, two small paddocks could not be accessed due to the presence of horses. These contained cleared pasture. The project area was in Completely Degraded condition with thick pasture throughout. The survey effort was appropriate for the condition and size of the project area. Fauna was subject to a Level 1 Desktop Assessment. A systematic habitat tree assessment may have been of use.
Availability of contextual (e.g. biogeographic) information on the region i.e. pre-existing background versus new material and sources of information.	Regional vegetation mapping was used to provide regional context for representation of ecosystems (Beard, 1979 and Hedde <i>et al.</i> , 1980). Substantial regional contextual information was available for fauna, sources included information from databases NatureMap, DPW, EPBC Act Protected Matters Search Tool.

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## APPENDIX A

## Field Survey Species List – Flora

FAMILY		SPECIES		COMMON NAME
082	ARACEAE	*	<i>Zantedeschia aethiopica</i>	Arum Lily
124	IRIDACEAE	*	<i>Moraea flaccida</i>	One-leaf Cape Tulip
		*	<i>Romulea rosea</i> var. <i>rosea</i>	Guildford Grass
		*	<i>Watsonia meriana</i> var. <i>meriana</i>	Bulbil Watsonia
133	ARECACEAE	*	<i>Washingtonia filifera</i>	Cotton Palm
155	JUNCACEAE	*	<i>Juncus bufonius</i>	Toad Rush
			<i>Juncus pallidus</i>	Pale Rush
156	CYPERACEAE	*	<i>Cyperus tenellus</i>	Tiny Flatsedge
			<i>Isolepis cernua</i> var. <i>setiformis</i>	Nodding Club-rush
			<i>Isolepis ?cernua</i> var. <i>setiformis</i> (immat.)	Nodding Club-rush
163	POACEAE	*	<i>Avena barbata/fatua</i>	Wild Oats
		*	<i>Briza maxima</i>	Blowfly Grass
		*	<i>Briza minor</i>	Shivery Grass
		*	<i>Bromus diandrus</i>	Great Brome
		*	<i>Bromus hordeaceus</i>	Soft Brome
		*	<i>Cynodon dactylon</i>	Couch Grass
		*	<i>Eragrostis curvula</i>	African Lovegrass
		*	<i>Ehrharta calycinus</i>	Perennial Veldt Grass
		*	<i>Ehrharta longifolia</i>	Annual Veldt Grass
		*	<i>Glyceria declinata</i>	-
		*	<i>Holcus setiger</i>	Annual Fog
		*	<i>Hordeum leporinum</i>	Barley Grass
		*	<i>Lolium perenne</i>	Perennial Ryegrass
		*	<i>Phalaris minor</i>	Lesser Canary Grass
		*	<i>Poa annua</i>	Winter Grass
		*	<i>Stenotaphrum secundatum</i>	Buffalo Grass
		*	<i>Vulpia myuros</i> forma <i>megalura</i>	Rat's Tail Fescue
171	RANUNCULACEAE	*	<i>Ranunculus trilobus</i>	Buttercup
175	PROTEACEAE		<i>Hakea varia</i> †	Variable-leaved Hakea
192	CRASSULACEAE		<i>Crassula closiana</i>	-
			<i>Crassula decumbens</i> var. <i>decumbens</i>	Rufus Stonecrop
		*	<i>Crassula natans</i> var. <i>minus</i>	-
201	FABACEAE		<i>Acacia saligna</i>	Orange Wattle
		*	<i>Lotus angustissimus</i>	Narrowleaf Trefoil
		*	<i>Lupinus cosentinii</i>	Blue Lupin
		*	<i>Trifolium campestre</i>	Hop Clover
		*	<i>Trifolium hybridum</i> var. <i>hybridum</i>	Alsike Clover
204	ROSACEAE	*	<i>Pyrus</i> sp.	Pear
211	MORACEAE	*	<i>Morus</i> sp.	Mulberry
217	CASUARINACEAE		<i>Casuarina obesa</i>	Swamp Sheoak
232	OXALIDACEAE	*	<i>Oxalis pes-caprae</i>	Soursob
242	EUPHORBIACEAE	*	<i>Euphorbia peplus</i>	Petty Spurge
		*	<i>Euphorbia terracina</i>	Geraldton Carnation Weed
248	ELATINACEAE		<i>Elatine gratioloides</i>	Waterwort

FAMILY		SPECIES		COMMON NAME
274	GERANIACEAE	*	<i>Pelargonium capitatum</i>	Rose Geranium
278	LYTHRACEAE	*	<i>Lythrum hyssopifolia</i>	Lesser Loosestrife
281	MYRTACEAE	*	<i>Callistemon viminalis</i> X	Bottlebrush
		*	<i>Eucalyptus camaldulensis</i> var. <i>obtusata</i>	River Red Gum
		*	<i>Eucalyptus globulus</i>	Blue Gum
			<i>Eucalyptus rudis</i> subsp. <i>rudis</i>	Flooded Gum
			<i>Kunzea glabrescens</i> †	Spearwood
		*	<i>Melaleuca quinquenervia</i>	Broadleaf Paperbark
			<i>Melaleuca raphiophylla</i>	Swamp Paperbark
			<i>Melaleuca viminea</i> †	Mohan
302	MELIACEAE	*	<i>Melia azedarach</i>	White Cedar
309	MALVACEAE	*	<i>Malva parviflora</i>	Marshmallow
345	POLYGONACEAE	*	<i>Rumex acetosella</i>	Sorrel
		*	<i>Rumex crispus</i>	Curled Dock
		*	<i>Rumex pulcher</i>	Fiddle Dock
346	DROSERACEAE		<i>Drosera glanduligera</i>	Pimpernel Sundew
355	CARYOPHYLLACEAE	*	<i>Spergula arvensis</i>	Corn Spurry
413	APOCYNACEAE	*	<i>Gomphocarpus fruticosus</i>	Narrowleaf Cottonbush
		*	<i>Nerium oleander</i>	Oleander
415	BORAGINACEAE	*	<i>Echium plantagineum</i>	Patterson's Curse
417	SOLANACEAE	*	<i>Solanum nigrum</i>	Black Berry Nightshade
428	SCROPHULARIACEAE	*	<i>Monopsis debilis</i>	-
432	LAMIACEAE	*	<i>Mentha pulegium</i>	Pennyroyal
435	OROBANCHACEAE	*	<i>Orobanche minor</i>	Lesser Broomrape
460	ASTERACEAE	*	<i>Arctotheca calendula</i>	Capeweed
		*	<i>Cotula coronopifolia</i>	Waterbuttons
		*	<i>Cotula turbinata</i>	Funnel Weed
		*	<i>Hypochaeris glabra</i>	Flatweed
		*	<i>Hypochaeris radicata</i>	Flatweed
		*	<i>Lactuca serriola</i>	Prickly Lettuce
			<i>Senecio pinnatifolius</i> var. <i>latilobus</i>	-
		*	<i>Sonchus oleraceus</i>	Common Sowthistle
		*	<i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Ursinia

\* = Introduced flora (weeds)

† = Adjacent to southern project area boundary only (Abernethy Road Reserve)(outside project boundary).

**APPENDIX B****Field Survey Species List – Opportunistic Fauna**

SCIENTIFIC NAME	COMMON NAME
<i>Cracticus torquatu</i>	Grey Butcherbird
<i>Ocyphaps lophotes</i>	Crested Pigeon
<i>Eolophus roseicapillus</i>	Galah
<i>Cracticus tibicen</i>	Australian Magpie
<i>Anas superciliosa</i>	Pacific Black Duck
<i>Smicronis brevirostris</i>	Weebill
<i>Corvus coronoides</i>	Australian Raven
<i>Polytelis anthopeplus</i>	Regent Parrot
<i>Barnardius zonarius</i>	Australian Ringneck
<i>Aquila audax</i>	Wedge-tail Eagle
<i>Hirundo neoxena</i>	Welcome Swallow
<i>Rhipidura leucophrys</i>	Willie Wagtail
<i>Purpureicephalus spurius</i>	Red-capped Parrot
<i>Pardalotus striatus</i>	Stiated Pardalote
<i>Threskiornis spinicollis</i>	Straw-necked Ibis
<i>Anthochaera carunculata</i>	Red Wattlebird
<i>Grallina cyanoleuca</i>	Magpie Lark
<i>Petrochelidon nivicans</i>	Tree Martin
<i>Anthus novaeseelandiae</i>	Australasian Pipit
<i>Gerygone fusca</i>	Western Gerygone
<i>Lichenostomus virescens</i>	Singing Honeyeater
<i>Ardea novaehollandiae</i>	White-faced Heron



**APPENDIX C****Location Data for Mature Trees**

DATUM	ZONE	EASTINGS	NORTHINGS
WGS84	50H	400122	6436115
WGS84	50H	400108	6436105
WGS84	50H	400284	6436134
WGS84	50H	400311	6436088
WGS84	50H	400396	6436062
WGS84	50H	400299	6436009
WGS84	50H	400333	6435908
WGS84	50H	400457	6435905
WGS84	50H	400397	6435850
WGS84	50H	400463	6435821
WGS84	50H	400400	6435801
WGS84	50H	400487	6435772
WGS84	50H	400217	6435808
WGS84	50H	400198	6435816
WGS84	50H	400183	6435817
WGS84	50H	400188	6435845
WGS84	50H	400146	6435774
WGS84	50H	400105	6435750
WGS84	50H	400134	6435718
WGS84	50H	399902	6436055
WGS84	50H	399955	6436063
WGS84	50H	399921	6436041
WGS84	50H	399944	6436043
WGS84	50H	399974	6436045
WGS84	50H	399959	6436043
WGS84	50H	399931	6436043
WGS84	50H	399892	6435992
WGS84	50H	399872	6435955
WGS84	50H	399833	6435969
WGS84	50H	399836	6435949
WGS84	50H	399820	6435934
WGS84	50H	399964	6435888
WGS84	50H	399953	6435855
WGS84	50H	399977	6435939
WGS84	50H	400018	6435848
WGS84	50H	399994	6435817
WGS84	50H	400011	6435822
WGS84	50H	400027	6435799
WGS84	50H	400046	6435833
WGS84	50H	400046	6435817
WGS84	50H	400065	6435811
WGS84	50H	400086	6435795
WGS84	50H	400037	6435753
WGS84	50H	400057	6435715

DATUM	ZONE	EASTINGS	NORTHINGS
WGS84	50H	400020	6435688
WGS84	50H	400069	6435662
WGS84	50H	400142	6435648
WGS84	50H	400156	6435668
WGS84	50H	400159	6435637
WGS84	50H	400122	6435614
WGS84	50H	400110	6435595
WGS84	50H	400150	6435584
WGS84	50H	400091	6435648
WGS84	50H	400165	6435588
WGS84	50H	400111	6435544
WGS84	50H	400081	6435547
WGS84	50H	400046	6435540
WGS84	50H	400017	6435539
WGS84	50H	399995	6435622
WGS84	50H	399977	6435641
WGS84	50H	399900	6435675
WGS84	50H	399875	6435688
WGS84	50H	399853	6435695
WGS84	50H	399835	6435666
WGS84	50H	400000	6435683
WGS84	50H	399973	6435757
WGS84	50H	399920	6435759
WGS84	50H	399915	6435744
WGS84	50H	399897	6435791
WGS84	50H	399833	6435591
WGS84	50H	399841	6435557
WGS84	50H	399924	6435537
WGS84	50H	399938	6435488
WGS84	50H	400132	6435489
WGS84	50H	400058	6435457
WGS84	50H	400153	6435464
WGS84	50H	399848	6435484
WGS84	50H	399818	6435517
WGS84	50H	399816	6435492
WGS84	50H	399822	6435456
WGS84	50H	399829	6435438
WGS84	50H	399846	6435406
WGS84	50H	399854	6435382
WGS84	50H	399844	6435358
WGS84	50H	399846	6435308
WGS84	50H	399838	6435287
WGS84	50H	399847	6435346
WGS84	50H	399848	6435336
WGS84	50H	399948	6435377
WGS84	50H	400036	6435365
WGS84	50H	399810	6436023
WGS84	50H	*399815	*6435479





## **APPENDIX D**

### **EPBC Act Protected Matters Search**



# 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: 22/11/16 17:58:33

[Summary](#)

[Details](#)

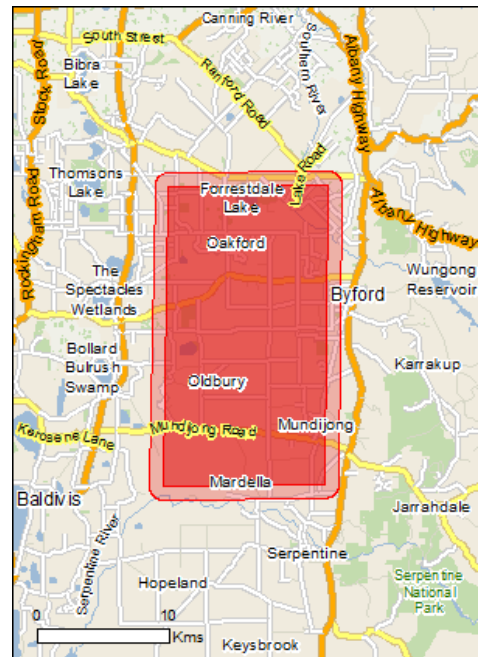
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

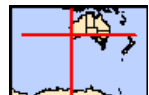
[Acknowledgements](#)



This map may contain data which are  
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[Coordinates](#)

Buffer: 1.0Km



# 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>	4
<a href="#">Listed Threatened Species:</a>	29
<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>	1
<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="#">Commonwealth Reserves Marine:</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>	9
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	46
<a href="#">Nationally Important Wetlands:</a>	2
<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>	Within Ramsar site
<a href="#">Peel-yalgorup system</a>	20 - 30km 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</a>	Endangered	Community likely to occur within area
<a href="#">Claypans of the Swan Coastal Plain</a>	Critically Endangered	Community likely to occur within area
<a href="#">Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain</a>	Endangered	Community known to occur within area
<a href="#">Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain</a>	Endangered	Community known 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	Roosting known 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, Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Roosting known to occur within area
<a href="#">Calyptorhynchus latirostris</a> Carnaby's Black-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 [77037]	Endangered	Species or species

Name	Status	Type of Presence habitat may occur within area
<b>Insects</b>		
<a href="#">Leioproctus douglasiellus</a> a short-tongued bee [66756]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Neopasiphae simplicior</a> A native bee [66821]	Critically Endangered	Species or species habitat likely to occur within area
<b>Mammals</b>		
<a href="#">Bettongia penicillata</a> Brush-tailed Bettong, Woylie [213]	Endangered	Species or species habitat may occur within area
<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, Ngor, Ngoolangit [25911]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Setonix brachyurus</a> Quokka [229]	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 known 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 likely to occur within area
<a href="#">Drakaea micrantha</a> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Eucalyptus balanites</a> Cadda Road Mallee, Cadda Mallee [24264]	Endangered	Species or species habitat likely to occur within area
<a href="#">Grevillea curviloba subsp. incurva</a> Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat may occur within area
<a href="#">Lasiopetalum pterocarpum</a> Wing-fruited Lasiopetalum [64922]	Endangered	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
<a href="#">Synaphea sp. Fairbridge Farm (D.Papenfus 696)</a> Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<a href="#">Synaphea stenoloba</a> Dwellingup Synaphea [66311]	Endangered	Species or species habitat may occur within area
<a href="#">Tetraria australiensis</a> Southern Tetraria [10137]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Thelymitra stellata</a> Star Sun-orchid [7060]	Endangered	Species or species habitat likely to occur within area

#### Listed Migratory Species [ [Resource Information](#) ]

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

Name	Threatened	Type of Presence
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##### Migratory Marine Birds

<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
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##### Migratory Terrestrial Species

<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
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##### Migratory Wetlands Species

<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Roosting known to occur within area
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<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Roosting known to occur within area
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<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
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<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Roosting known to occur within area
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<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Roosting known to occur within area
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<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Roosting known to occur within area
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<a href="#">Charadrius dubius</a> Little Ringed Plover [896]		Roosting known to occur within area
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<a href="#">Gallinago megala</a> Swinhoe's Snipe [864]		Roosting likely to occur within area
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<a href="#">Gallinago stenura</a> Pin-tailed Snipe [841]		Roosting likely to occur within area
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<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Roosting known to occur within area
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<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
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<a href="#">Numenius minutus</a> Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
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<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
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<a href="#">Philomachus pugnax</a> Ruff (Reeve) [850]		Roosting known to occur within area
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Name	Threatened	Type of Presence
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Roosting 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]		Roosting known to occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Land [\[ Resource Information \]](#)

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

Name
Commonwealth Land -

### Listed Marine Species [\[ Resource Information \]](#)

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

Name	Threatened	Type of Presence
<b>Birds</b>		
<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]		Roosting known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Roosting known 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]		Roosting known to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Roosting known to occur within area
<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Roosting known to occur within area
<a href="#">Charadrius dubius</a> Little Ringed Plover [896]		Roosting known to occur within area

Name	Threatened	Type of Presence
<a href="#">Charadrius ruficapillus</a> Red-capped Plover [881]		Roosting known to occur within area
<a href="#">Gallinago megala</a> Swinhoe's Snipe [864]		Roosting likely to occur within area
<a href="#">Gallinago stenura</a> Pin-tailed Snipe [841]		Roosting likely 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> Black-winged Stilt [870]		Roosting known to occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Roosting known to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<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="#">Numenius minutus</a> Little Curlew, Little Whimbrel [848]		Roosting likely to 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]		Roosting known to occur within area
<a href="#">Recurvirostra novaehollandiae</a> Red-necked Avocet [871]		Roosting known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Thinornis rubricollis</a> Hooded Plover [59510]		Species or species habitat may occur within area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Roosting 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]		Roosting known to occur within area



## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Banksia	WA
Cardup	WA
Forrestdale Lake	WA
Gibbs Road	WA
Modong	WA
Piara	WA
Unnamed WA46818	WA
Wandi	WA
Watkins Road	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 habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species

Name	Status	Type of Presence
Capra hircus Goat [2]		habitat likely to occur within area  Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

## Plants

Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species 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		Species or species

Name	Status	Type of Presence
Broom [2800]		habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		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
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		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
<b>Reptiles</b>		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

## Nationally Important Wetlands

Name

[ [Resource Information](#) ]

State

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