

# Waitsia Gas Project Stage 2 - Xyris West Remnant Vegetation

## Flora and Vegetation Desktop Review

MITSUI E&P AUSTRALIA PTY LTD

JUNE 2019



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# 1. INTRODUCTION

## 1.1 Project Overview

The Mitsui E&P Australia (MEPAU) Waitsia Gas Field project area is located south-east of Dongara in Western Australia (WA), in the Shire of Irwin. The project area is located on titles L2 R1, L1 R1 and EP 320 R4 in the Lesueur Sandplain subregion of the Geraldton Sandplains bioregion in Western Australia (WA).

MEPAU are seeking approvals to construct a gas pipeline to transport the produced gas to a new gas plant (close to the existing Xyris Gas Plant) from the Waitsia Gas Field. A section of remnant vegetation along the proposed pipeline and flowline easement has not been previously surveyed.

MEPAU have requested Woodman Environmental Consulting Pty Ltd (Woodman Environmental) to undertake a desktop review to detail known flora and vegetation characteristics and significant features of the project area and surrounds, to provide the background information necessary to determine if field surveys are required for Spring 2019.

## 1.2 Project Area Definition

The Waitsia Gas Project - Stage 2 Project Area (the Project Area) is located within the Shire of Irwin, approximately 19 km south-east of Dongara (Figure 1). The Project Area is located on freehold land, and consists largely of remnant vegetation which has been heavily grazed (Xyris West). The Project Area consists of three areas, these being:

- Area 1 – Expected Impacted Vegetation Area (0.42 hectares);
- Area 2 – Maximum Impacted Vegetation Area (0.74 hectares); and
- Area 3 – Eastern Buffer (3.05 hectares).

## 1.3 Aim and Objectives




The aim of this desktop review is to present data in relation to potential significant environmental factors which may require survey prior to direct or indirect impacts through proposed pipeline easement activities which may be undertaken by MEPAU within the Project Area.



A desktop review is required as per Section 3.0 *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a). As per this guidance, the objective of the desktop review is to provide sufficient information to identify the potential range of flora and vegetation that may be affected by the proposal, and their distribution in relation to the project area.

The data presented in this desktop review will be utilised to inform forward field planning to ensure that the information required during the environmental impact assessment process is available.



**Legend**

-  Expected Impacted Vegetation Area
-  Maximum Impacted Vegetation Area
-  Eastern Buffer

<p><b>Project Area Location</b></p>	Author: Kim Kershaw	
	WEC Ref: MEPAU19-25-01	
 <p><b>WOODMAN</b> ENVIRONMENTAL</p> <p><small>This map should only be used in conjunction with WEC report MEPAU19-25-01.</small></p>	Filename: MEPAU19-25-01-f01.mxd	<p><b>Figure</b></p> <p><b>1</b></p>
	Scale: 1:2,500 (A4)	
	Projection: GDA 1994 MGA Zone 50	
	Revision: A - 13 June 2019	

## 2. BACKGROUND

### 2.1 Climate

The Project Area is located within the Northern Sandplains region in the South-west Province of WA. The Northern Sandplains region is characterised by a dry, warm Mediterranean climate with winter precipitation. There are seven to eight dry months per year, with the region generally receiving between 300 - 500 mm of precipitation annually (Beard 1990). Figure 2 displays average monthly maximum and minimum temperatures for Mingenew (the nearest meteorological station to the Project Area with temperature data), and average monthly rainfall recorded for Dongara (the nearest long-term meteorological station to the Project Area with rainfall data) (Bureau of Meteorology 2019).

The highest average daily maximum temperature at Mingenew occurs in January (36.4°C) with the lowest average minimum temperature experienced in August (6.9°C). The average annual rainfall for Dongara station is 450.3 mm (data from 1884-2019). Average monthly rainfall peaks from late autumn to winter (May - August), with the highest rainfall on average received in June (108 mm). Rainfall received at Dongara prior to survey being conducted over the winter period in 2018 (May - August), was below the long-term average, with 278.3 mm received compared to the average of 370.4 mm (Bureau of Meteorology 2019).

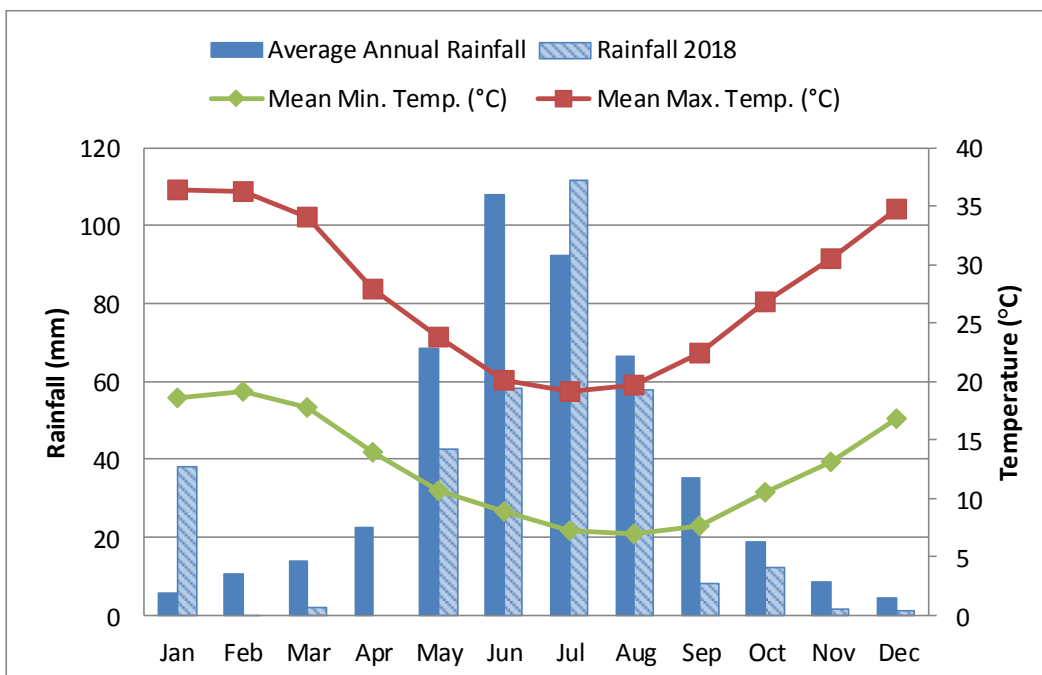


Figure 2: Mean Maximum and Minimum Temperatures (o Celsius) for Mingenew and Mean Rainfall (mm) for Dongara (Bureau of Meteorology 2019)

## 2.2 Geology, Landforms and Soils

The Project Area is located in the Northern Sandplains Region (Irwin Botanical District) which is somewhat equivalent to the Geraldton Sandplains IBRA (Interim Biogeographic Regionalisation for Australia) Bioregion (Commonwealth of Australia 2012). Beard (1990) describes the Northern Sandplains Region geology as consisting of mainly sedimentary basins exposing Permian to Cretaceous sediments with horsts of Proterozoic rocks. The prior land surface forms extensive lateritic sandplain which is locally dissected, particularly near the coast. The sandplain soils consist of leached sandy soils near the coast and yellow sands with an earthy fabric further inland, both overlying laterite (Beard 1990).

The Project Area occurs specifically within the Geraldton Sandplains 3 (Lesueur Sandplain) subregion. The subregion consists of coastal Aeolian and limestones, Jurassic siltstones and sandstones (often heavily lateritised) of the central Perth Basin, as well as alluvials associated with drainage systems. Extensive yellow sandplains occur in south-eastern parts of the subregion, especially where the subregions overlaps the western edge of the Pilbara Craton, and lateritised sandplains occur along the north-eastern margins (Desmond and Chant 2001).

Soil-landscape mapping of WA shows the Project Area consists of one unit, the Tamala South 3 Subsystem – which consists of Low hills with relict dunes and some limestone outcrop, deep and shallow yellow sand over limestone (sourced from Government of Western Australia 2017).

## 3. METHODS

A review of all publicly available flora and vegetation data relevant to the Project Area was undertaken. This included review of the regional and local context of the flora and vegetation, through review of previous biological surveys carried out within the vicinity of the Project Area and interrogation of relevant databases and other sources as listed in Table 1.

**Table 1: Searches Undertaken for the Flora and Vegetation Desktop Study of the Project Area**

Source	Search Attributes	Search Purpose
DBCA (Western Australian Herbarium) (WAHerb) Specimen Database search (DBCA 2019a) Ref: 11-0519FL	Database interrogated using Desktop Study Area boundary and 20km buffer Performed 10 <sup>th</sup> May 2019	Review of significant flora taxa known through collections held at the WAHerb
DBCA (Threatened (Declared Rare) and Priority Flora Database search (DBCA 2019a) Ref: 11-0519FL	Database interrogated using Desktop Study Area boundary and 20km buffer Performed 10th May 2019	Review of TPFL records with regards to listed significant flora taxa
FloraBase (WA Herbarium 1998-)	Known habitat and flowering attributes of significant flora taxa	Obtain records of listed significant flora and introduced flora as lodged at the WAHerb



Source	Search Attributes	Search Purpose
NatureMap (DBCA 2007-)	Known distribution attributes of significant flora taxa	Obtain records of listed significant flora and introduced flora within the Desktop Project Area
NatureMap (DBCA 2019c)	All flora taxa Buffer of 5km surrounding central point coordinates - 115° 05' 18" E 29° 18' 28"S	Obtain listing of all flora taxa known within the search area
DoEE Species Profile and Threats (SPRAT) Database (interrogated using the Protected Matters Search Tool (DoEE 2019a)	Matters of National Environmental Significance (MNES) protected under the EPBC Act Buffer of 5km surrounding central point -29.30694 115.08944 Requested 13 <sup>th</sup> June 2019	Listing of MNES, including likelihood of presence of MNES or suitable habitat for MNES (where applicable) as well as threatening processes
DBCA Threatened and Priority Ecological Communities Database (DBCA 2019b) Ref: 03-0519EC	Database interrogated using Desktop Project Area boundary and 15km buffer	Obtain records of DBCA-classified TECs and/or DBCA-classified PECs within the Desktop Project Area
2017 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Government of Western Australia 2018)	Project Area	Identify extent of Vegetation System Associations within the Project Area
Interim Biogeographic Regionalisation for Australia, Version 7 (Commonwealth of Australia 2012)	Project Area	Identify IBRA and associated information within the Project Area

## 4. RESULTS

### 4.1 Regional Vegetation

The Project Area is located in the Northern Sandplains Region (Irwin Botanical District) which is somewhat equivalent to the Geraldton Sandplains IBRA (Interim Biogeographic Regionalisation for Australia) Bioregion (Commonwealth of Australia 2012). The vegetation of this region is described as scrub heath on sandplains near the coast, composed mainly of proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, lateritic sandplain (Beard 1990; Desmond and Chant 2001).

The Project Area occurs specifically within the Geraldton Sandplains 3 (Lesueur Sandplain) subregion. The subregion contains shrub-heaths rich in endemics occurring on a mosaic of lateritic mesas, sandplains, coastal sands and limestones, with heath on lateritised sandplains occurring along the subregions north-eastern margins (Desmond and Chant 2001).

Beard (1976) mapped the vegetation of the Dongara area (including the Project Area) related to physiognomy, at a scale of 1:250,000. The Project Area coincides with one vegetation system, Eridoon, as described by Beard (1976). The vegetation mapping by Beard (1976) was used by Shepherd et al. (2002) to describe vegetation system associations. Vegetation system associations were also described at a scale of 1:250,000. One vegetation system association occurs in the Project Area (Table 2).

Table 2 presents the current extent of the vegetation system association in relation to its pre-European extent (Government of Western Australia 2018), and the percentage of the current extent of the vegetation system association currently protected for conservation (in DBCA-managed land). Eridoon\_378 is relatively well represented, with 65 % of the pre-European extent remaining of which 21.9 % is reserved.

**Table 2: Extent of the Vegetation System Association of the Project Area (Government of Western Australia 2018)**

Vegetation System Association	Description	Current Extent (ha)	Percentage of Pre-European Extent Remaining	Percentage of Current Extent Reserved for Conservation *
Eridoon_378	Shrublands; scrub-heath with scattered <i>Banksia</i> spp., <i>Eucalyptus todtiana</i> and <i>Xylomelum angustifolium</i> on deep sandy flats in the Geraldton Sandplain Region	60,826.7	65.0	21.9

\*Note: proportion of current extent reserved in IUCN classified reserves I - IV

#### 4.1.1 Conservation Significant Vegetation

A search of the Commonwealth Department of the Environment and Energy (DoEE) database with regard to MNES listed under the EPBC Act was performed for a central point

in the Project Area, with a 5 km buffer (DoEE 2019a). There were no TECs returned from the search. The results of this search are presented in Appendix A.

An interrogation of DBCA's Threatened and Priority Ecological Communities (TEC/PEC) Database was undertaken to determine known locations of TECs and PECs within the vicinity of the Project Area (DBCA 2019b). The search was undertaken an area encompassing the Project Area with a 15 km buffer. No significant vegetation communities were returned from the search.

## 4.2 Regional Flora

### 4.2.1 Biodiversity Assessment

The DBCA *NatureMap* database (DBCA 2019c) was investigated to identify records of flora taxa and Threatened and Priority flora taxa that may occur within or in close proximity to, or may be relevant to the Project Area. The search was performed for a central point (coordinates -115° 05' 18" E 29° 18' 28"S) in the Project Area, with a 5 km buffer. A total of 38 flora taxa were returned from the search which included six Priority flora taxa and four introduced taxa and is presented in Appendix B. Table 3 presents the Priority Flora known to occur within 5km of the Project area. No Threatened flora taxa were returned from the search. Appendix C presents the conservation codes for Western Australian flora and fauna (DBCA 2019d).

**Table 3: Priority Flora Taxa Known from the Vicinity of Project Area (DBCA 2019c)**

Taxon	Status
<i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176)	P3
<i>Baeckea</i> sp. Walkaway (A.S. George 11249)	P3
<i>Banksia elegans</i>	P4
<i>Comesperma griffinii</i>	P2
<i>Stawellia dimorphantha</i>	P4
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3

### 4.2.2 Conservation Significant Flora

DBCA's flora databases, including the Western Australian Herbarium (WAHerb) Specimen Database, Threatened and Priority Flora (TPFL) Database, and Threatened and Priority Flora List (TP List), were interrogated for information regarding listed significant taxa known from within and in the vicinity of the Project Area (DBCA 2019a). This search was conducted with a 20 km buffer around the Project Area (Database Search Area).

A total of 48 taxa were returned from the database search including 43 Priority taxa and five Threatened flora taxa. These taxa are presented in Table 4. Of the 43 taxa returned from the DBCA search, 13 Priority taxa have locations within 5 km of the Project Area. These are presented on Figure 3.

**Table 4: Significant Flora Taxa Known from the Vicinity of Project Area (DoEE 2019a; DBCA 2019a)**

Taxon	Status	Source	
		DBCA (2019a)	DoEE (2019a)
<i>Acacia isoneura</i> subsp. <i>isoneura</i>	P3	X	
<i>Acacia lanceolata</i>	P3	X	
<i>Acacia telmica</i>	P3	X	
<i>Anthocercis intricata</i>	P3	X	
<i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176)	P3	X	
<i>Baeckea</i> sp. Walkaway (A.S. George 11249)	P3	X	
<i>Banksia elegans</i>	P4	X	
<i>Banksia fraseri</i> var. <i>crebra</i>	P3	X	
<i>Banksia scabrella</i>	P4	X	
<i>Beyeria gardneri</i>	P3	X	
<i>Calytrix chrysantha</i>	P4	X	
<i>Calytrix eneabbensis</i>	P4	X	
<i>Comesperma griffinii</i>	P2	X	
<i>Comesperma rhadinocarpum</i>	P3	X	
<i>Conostylis dielsii</i> subsp. <i>teres</i>	T	X	X
<i>Conostylis micrantha</i>	T	X	X
<i>Dampiera tephrea</i>	P2	X	
<i>Daviesia speciosa</i>	T	X	
<i>Drosera pedicellaris</i>	P1	X	
<i>Eucalyptus crispata</i>	T		X
<i>Eucalyptus ebbanoensis</i> subsp. <i>photina</i>	P4	X	
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4	X	
<i>Eucalyptus impensa</i>	T		X
<i>Eucalyptus leprophloia</i>	T		X
<i>Eucalyptus x balanites</i>	T		X
<i>Eucalyptus zopherophloia</i>	P4	X	
<i>Grevillea hirtella</i>	P3	X	
<i>Guichenotia alba</i>	P3	X	
<i>Haloragis foliosa</i>	P3	X	
<i>Hemiandra gardneri</i>	T		X
<i>Hemiandra</i> sp. Eneabba (H. Demarz 3687)	P3	X	
<i>Hopkinsia anoectocolea</i>	P3	X	
<i>Hypocalymma gardneri</i>	P3	X	
<i>Hypocalymma longifolium</i>	T		X
<i>Lasiopetalum ogilvieanum</i>	P1	X	
<i>Mesomelaena stygia</i> subsp. <i>deflexa</i>	P3	X	
<i>Micromyrtus rogeri</i>	P1	X	
<i>Paracaleana dixonii</i>	T	X	X
<i>Persoonia filiformis</i>	P3	X	
<i>Persoonia rudis</i>	P3	X	
<i>Schoenus badius</i>	P2	X	
<i>Schoenus griffinianus</i>	P4	X	
<i>Schoenus</i> sp. Eneabba (F. Obbens & C. Godden I154)	P2	X	
<i>Scholtzia</i> sp. Dongara (R. Hart 8401)	P2	X	
<i>Stawellia dimorphantha</i>	P4	X	
<i>Stylidium drummondianum</i>	P3	X	
<i>Stylidium</i> sp. Three Springs (J.A. Wege & C. Wilkins JAW 600)	P2	X	
<i>Synaphea sparsiflora</i>	P2	X	
<i>Tetralochea nephelioides</i>	T		X

Taxon	Status	Source	
		DBCA (2019a)	DoEE (2019a)
<i>Thryptomene nitida</i>	P3	X	
<i>Thryptomene</i> sp. Lancelin (M.E. Trudgen 14000)	P3	X	
<i>Thysanotus glaucus</i>	P3	X	
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3	X	
<i>Verticordia luteola</i> var. <i>luteola</i>	P3	X	
<i>Wurmbea tubulosa</i>	T	X	X

The search of the DoEE Species Profile and Threats Database (DoEE 2019a) with regard to MNES listed under the EPBC Act (Appendix A) returned 11 Threatened flora taxa which may occur, or habitat may occur within the area (Table 5). The presence of any of these within the Project Area is unlikely due to the distance to nearest record, habitat preference and the poor condition of the vegetation (DBCA 2007-).

**Table 5: Significant Flora Taxa Returned from the DoEE Database Search (DoEE 2019a)**

Taxon	Status	Closest Record to the Study Area (DBCA 2007-)	Flowering Period (WAHerb 1998-)	Habitat (WAHerb 1998-)	Likelihood of Occurrence with the Study Area
<i>Conostylis dielsii</i> subsp. <i>teres</i>	Threatened – Endangered	Approximately 13 km to the north	Jul to Aug	White, grey or yellow sand, gravel. Low open woodland	Unlikely as no records within 10 km of the Study Area
<i>Conostylis micrantha</i>	Threatened – Endangered	Approximately 14 km to the north	Jul to Aug	White or grey sand. Sandplains	Unlikely as no records within 10 km of the Study Area
<i>Eucalyptus crispata</i>	Threatened – Vulnerable	Approximately 12 km to the east	Mar to Jun	Sand, loam with lateritic gravel. Lateritic breakaways	Unlikely given distribution of this taxon is to the south-east in a different land/soil system and preferred habitat
<i>Eucalyptus impensa</i>	Threatened – Endangered	Approximately 63 km to the south	Jun to Jul	Yellow sand. Lateritic hills	Unlikely given the distance of nearest record and preferred habitat
<i>Eucalyptus leprophloia</i>	Threatened – Endangered	Approximately 10 km to the east	Aug to Oct	White or grey sand over laterite. Valley slopes. On or near laterite breakaways	Unlikely given the preferred habitat
<i>Eucalyptus x balanites</i>	Threatened – Endangered	Over 110 km to the SSE	Oct to Dec or Jan to Feb	Sandy soils with lateritic gravel	Unlikely given the distance of nearest record and preferred habitat
<i>Hemiandra gardneri</i>	Threatened – Endangered	Approximately 83 km to the south and SE	Aug to Oct	Grey or yellow sand, clayey sand. Sandplains	Unlikely given the distance of nearest record
<i>Hypocalymma longifolium</i>	Threatened – Vulnerable	Over 150 km to the NNW	Aug to Sep	Grey sand or clay, sandstone. Rocky breakaways, swampland	Unlikely given the distance of nearest record and preferred habitat
<i>Paracaleana dixonii</i>	Threatened – Endangered	Approximately 5 km to the east and south	Oct to Dec or Jan	Sand over laterite, heath to Banksia woodland (on eastern margin of Geraldton Sandplain and (northern) Swan Coastal Plain)	Unlikely due to poor condition of the vegetation and distance to closest population
<i>Tetratheca nephelioides</i>	Threatened – Critically Endangered	Approximately 70 km to the south	Sep	White-grey sand, yellow-brown clayey sand, gravel, laterite. Outcrops, undulating hills, ridges	Unlikely given the distance of nearest record and preferred habitat
<i>Wurmbea tubulosa</i>	Threatened – Endangered	Approximately 17 km to the NW	Jun to Aug	Clay, loam. River banks, seasonally-wet places	Unlikely given the distance of nearest record and preferred habitat

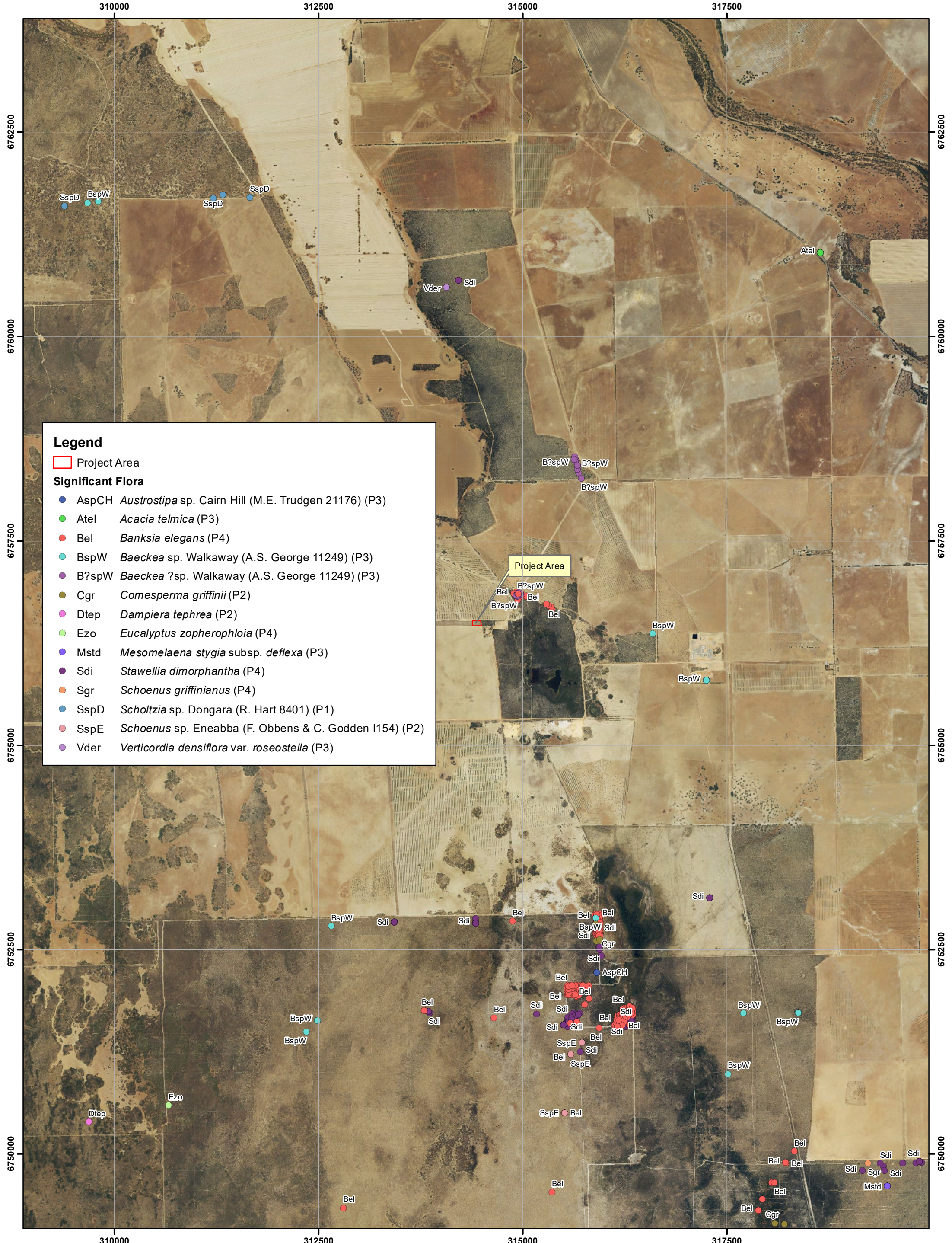
### 4.2.3 Introduced Flora

The DBCA *NatureMap* database search identified a total of four introduced flora taxa known from the vicinity of the Project Area as presented in Table 6. Table 6 also presents the ratings for each introduced taxon under the then-Department of Conservation and Land Management's (CALM) (now DBCA) Environmental Weed Strategy for Western Australia (CALM 1999). This strategy assessed and rated environmental weeds in terms of their environmental impact on biodiversity according to invasiveness, distribution and environmental impact, and assigned a score of 'High', 'Moderate', 'Mild' or 'Low'.

The search of the DoEE Species Profile and Threats Database (DoEE 2019a) (Appendix A) also identified four significant invasive flora taxa or habitat for such taxa, that may occur within the Project Area and surrounds; *\*Asparagus asparagoides* (Bridal Creeper), *\*Cenchrus ciliaris* (Buffel Grass), *\*Lycium ferocissimum* (African Boxthorn) and *\*Tamarix aphylla* (Athel Pine). Of these taxa, it is considered possible that *\*Cenchrus ciliaris* and *\*Lycium ferocissimum* may occur in the Project Area, as they are known from within the vicinity (<20 km) of the Study Area (DBCA 2007-). *\*Asparagus asparagoides* and *\*Tamarix aphylla* do not have records within 60 km of the Project Area, and are considered unlikely to occur in the Project Area. None of these are listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) (Department of Primary Industries and Regional Development (DPIRD) 2019).

**Table 6: Introduced Flora Taxa Known from the Vicinity of Project Area (DoEE 2019a; DBCA 2019c)**

Taxon	Common Name	Source		Comments
		DBCA (2019c)	DoEE (2019a)	
<i>Asparagus asparagoides</i>	Bridal Creeper		X	Environmental impact 'High' (CALM 1999)
<i>Cenchrus ciliaris</i>	Buffel-grass		X	Environmental impact 'High' (CALM 1999)
<i>Centaureum tenuiflorum</i>	-	X		Environmental impact 'Low' (CALM 1999)
<i>Euphorbia terracina</i>	Geraldton Carnation Weed	X		Environmental impact 'High' (CALM 1999)
<i>Lycium ferocissimum</i>	African Boxthorn		X	Environmental impact 'High' (CALM 1999)
<i>Solanum nigrum</i>	Black Berry Nightshade	X		Environmental impact 'Moderate' (CALM 1999)
<i>Sonchus oleraceus</i>	Common Sowthistle	X		Environmental impact 'Moderate' (CALM 1999)
<i>Tamarix aphylla</i>	Athel Pine		X	Environmental impact 'Moderate' (CALM 1999)



This map should only be used in conjunction with WEC report MEPAU19-25-01.

**Significant Flora Known from the Vicinity of the Project Area**

Revision: A - 23 Oct 2017

Scale: 1:40,000 (A3)

Author: Kim Kershaw

WEC Ref: MEPAU19-25-01

Filename: MEPAU19-25-01-f03.mxd

Projection: GDA 1994 MGA Zone 50

**Figure**

**3**



### 4.3 Local Flora and Vegetation Studies Review

Several flora and vegetation surveys have been conducted within the vicinity of the Project Area, the results of which are reviewed below and relevant flora and vegetation information for each of these surveys presented in Table 7.

Woodman Environmental undertook a flora and vegetation assessment of a proposed pipeline (PL64) connecting the Xyris Production Facility to the Parmelia pipeline (Woodman Environmental 2004a). The proposed route was located entirely within cleared paddock, with heavily disturbed vegetation located at the point of contact with the Parmelia pipeline. This disturbed vegetation consisted of *Acacia scirpifolia*, *Acacia saligna* and *Banksia menziesii* individuals, with occasional understorey species such as *Blancoa canescens* and *Cryptandra myriantha*, as well as weed species. It was noted that the vegetation of the adjacent remnant vegetation block was in better condition, and consisted of a low woodland of *Banksia menziesii* and *Banksia attenuata*, with an intact although weed infested low heath understorey, on yellow sand. The understorey was noted to be dominated by *Corynotheca micrantha* var. *micrantha*, *Mesomelaena pseudostygia*, *Petrophile macrostachya*, *Leptospermum erubescens*, *Melaleuca leuropoma* and *Ecdeiocolea monostachya*. This area had been grazed, and weeds such as *Arctotheca calendula*, *Lupinus* spp. and pasture grasses were present (Woodman Environmental 2004a). No Declared Rare or Priority Flora taxa were recorded during this assessment.

Woodman Environmental undertook a flora and vegetation assessment of the Denison 3D survey area, located to the south, west and north of the Project Area (Woodman Environmental 2004b). The survey area was large (39,400 ha), incorporating several nature reserves as well as private property. A total of 515 vascular plant taxa were recorded, belonging to 81 plant families, with the most common families being Myrtaceae and Proteaceae. One Declared Rare Plant taxa was recorded (*Stawellia dimorphantha*), which has since been downgraded to P4 status (WAHerb 1998-). A total of eight Priority flora taxa were recorded, one of which has been removed from the Priority list (*Hakea polyanthema*):

- *Anthocercis intricata* (P3)
- *Baeckea* sp. Walkaway (A.S. George 11249) (P3)
- *Banksia elegans* (P3),
- *Dampiera tephrea* (P2),
- *Eucalyptus zopherophloia* (P4),
- *Hemigenia saligna* (P3) and
- *Schoenus* sp. Eneabba (F.Obbens & C.Godden 1154) (P2)

A total of 34 plant communities, 7 disturbed communities and 7 mosaic units were mapped over the Denison 3D survey area in 2004, consisting of Forests, Woodlands, Thickets, Scrub, Shrublands and Heaths. This study found that the condition of vegetation within the survey area varied between Very Poor and Excellent. None of the plant communities were representative of TECs.

Woodman Environmental Consulting undertook a flora and vegetation assessment of the proposed Xyris Area Gas Gathering System (XAGGS) route, linking the existing Xyris Processing Facility (XPF) to the Xyris-South-01, Apium-02 and Hovea-02 Wellheads and Hovea Production Facility (Woodman Environmental 2004c). Approximately 90% of the survey area was in cleared paddocks, with the majority of the native vegetation in a degraded state.

A total of 89 vascular plant species composed of 79 native plant taxa and 10 introduced taxa were recorded within native vegetation areas on the proposed flowline route during the survey, with the relatively high proportion of introduced species reflecting the general degraded nature of the vegetation on the route. The most well represented families were Proteaceae (16 native plant taxa), Myrtaceae (nine native plant taxa) and Papilionaceae (six native plant taxa). No Threatened taxa, as listed under the WC Act or EPBC were recorded during the survey. One Priority Flora species *Hakea polyanthema* was recorded in the survey area (Woodman Environmental 2004c) however this taxon has since been removed from the Priority flora listing. The Declared Pest *Echium plantagineum* (Paterson's Curse) was recorded.

No Threatened Ecological Communities (TECs) were identified in the survey area. A total of two plant communities and one disturbance community were mapped in the survey area. Overall, the vegetation was described as being in a disturbed state, with a high level of weed invasion, predominantly pasture grasses. The three plant communities were:

**H1:** Heath of *Dryandra sessilis* and *Melaleuca ?systema*, over a Low Heath dominated by *Hibbertia hypericoides* on brown sand over limestone on crests;

**H1d:** Degraded areas of plant community H1; and

**W1:** Low Woodland of *Banksia attenuata* and *Banksia menziesii* over degraded heath dominated by *Eremaea beaufortioides* on brown sand on mid-slope (Woodman Environmental 2004c).

Maia Environmental Consultancy (Maia) undertook a Level 1 flora and vegetation reconnaissance and targeted flora survey along an existing pipeline corridor in AWE's Waitsia Gas Project area in 2015 (Maia 2015). The Southern Survey Area of that study occurs in close proximity to the Project Area. A total of five relevés were undertaken for the study, three of which are located within the Study Area.

A total of three vegetation associations were mapped in the Southern Survey Area (described below) with the majority of the Southern Survey Area mapped as BSL:

- **ASL:** Tall Shrubland of *Acacia scirpifolia* with Isolated Sedges of *Mesomelaena pseudostygia*;
- **BSL:** Tall to Mid Open Shrubland of *Banksia attenuata* and / or *B. hookeriana* with a mixed Low Sparse Shrubland (*Melaleuca systema*, *Pileanthus filifolius* and *Baeckea ?sp.*

Walkaway (A.S. George 11249) (?P3)) and an Open mixed Sedgeland (*Mesomelaena pseudostygia*, *Chordifex sinuosus* and *Lyginia imberbis*); and

- DIS: Disturbed areas with regrowth of a mixed Open Mid Shrubland of (*Grevillea leucopteris*, *Calothamnus glaber* and *Baeckea* ?sp. Walkaway (A.S. George 11249) (?P3)) a mixed Low Sparse Shrubland (*Persoonia acicularis*, *Calytrix strigosa* and *Melaleuca systema*) and a Sparse Sedgeland of *Mesomelaena pseudostygia*.

A total of 67 taxa from 54 genera and 19 families were recorded during the survey by Maia (2015). There were two significant flora taxa recorded during the survey:

- *Baeckea* ?sp. Walkaway (A.S. George 11249) (?P3); and
- *Banksia elegans* (P4).

*Baeckea* ?sp. Walkaway (A.S. George 11249) (?P3) was recorded at a number of locations within undisturbed vegetation as well as in regrowth areas, whilst *Banksia elegans* (P4) was recorded at one location within remnant vegetation during this survey (Maia 2015).

A total of six introduced flora taxa were recorded during the survey including *Avena barbata*, *Ehrharta calycina*, *Lupinus cosentinii*, *Rumex hypogaeus*, *Trifolium arvense* var. *arvense* and *Ursinia anthemoides*. Of these, *Rumex hypogaeus* is a declared pest under the BAM Act in for the South West Land Division but is not declared for the Midwest region (Maia 2015).

The flora and vegetation reconnaissance survey and targeted flora survey undertaken by Maia (2016) in the Waitsia-04 Well Area south of the project area recorded a total of 95 taxa from 67 genera and 28 families, with most common families being Myrtaceae (20 taxa), Proteaceae (15 taxa) and Fabaceae (eight taxa). Three Priority species were recorded in the Survey Area including:

- *Baeckea* sp. Walkaway (A.S. George 11249) (P3);
- *Banksia elegans* (P4); and
- *Stawellia dimorphantha* (P4).

No Threatened flora taxa were recorded during the survey. A total of eight weed species were recorded in the survey area including \**Avena barbata*, \**Chenopodium murale*, \**Pentameris airoides*, \**Polypogon maritimus*, \**Solanum nigrum*, \**Sonchus oleraceus*, \**Centaureum tenuifolium* and \**Ehrharta longiflora*. No Declared Pests or Weeds of National Significance (WoNS) were recorded during the survey.

The Xyris Lateral flowline easement flora and vegetation survey by Woodman Environmental recorded a total of 97 discrete native vascular flora taxa, belonging to 35 families and 80 genera (Woodman Environmental 2018a). The most well-represented families were Myrtaceae, Poaceae and Proteaceae. A total of two significant flora taxa were recorded within the Study Area as listed below:

- *Banksia elegans* (P4); and

- *Baeckea* sp. Walkaway (A.S. George 11249) (P3).

A total of 21 introduced flora taxa were recorded during the survey of the Study Area. Of these, one taxon currently listed as a Declared Pest (BAM Act) was recorded during the survey (*\*Echium plantagineum*).

A Targeted Survey and a Detailed Survey was undertaken by Woodman Environmental (2018b) to assess the flora and vegetation components of the Study Area for Waitsia-03. A total of 173 discrete vascular flora taxa were recorded within the Study Area, of which 157 were native taxa and 16 introduced (weed) taxa. No Threatened flora taxa were recorded in the Study Area. Five significant flora taxa listed as Priority flora by the Department of Biodiversity Conservation and Attractions (DBCA), were recorded within the Study Area, these were:

- *Austrostipa* sp. Cairn Hill (M.E. Trudgen 21176) (P3);
- *Baeckea* sp. Walkaway (A.S. George 11249) (P3);
- *Banksia elegans* (P4);
- *Comesperma griffinii* (P4); and
- *Stawellia dimorphantha* (P4).

Of the 16 introduced flora taxa that were recorded during this survey in the Study Area, no Declared Weeds or Weeds of National Significance were recorded within the Study Area. A total of three taxa have ratings of High ecological impact ratings for the Midwest including *\*Aira cupaniana*, *\*Centaurea melitensis* and *\*Ursinia anthemoides* (DPaW 2014).

Four vegetation types (VTs) were defined and mapped in the Study Area, consisting of:

- Vegetation predominantly on yellow to grey sandy soils, on slopes and dunes (VT1 to 3); and
- Vegetation predominantly on grey light clay to brown loamy clay in association with limestone subsoils, on simple slopes or in basins (VT4).

No occurrences of riparian vegetation, Threatened Ecological Communities listed under the EPBC Act or by DBCA, or Priority Ecological Communities as classified by DBCA, were recorded within the Study Area.

**Table 7: Summary of Flora and Vegetation Surveys Previously Conducted in the Vicinity of the Project Area**

Project	Location	Level of Survey	Parameters of Survey	Number of Taxa	Vegetation	Significant Flora Taxa	Introduced Taxa
Woodman Environmental (2004a)	Proposed Xyris Pipeline, linking the existing Xyris well to the Parmelia Pipeline. In close proximity to project area – approximately 450m south	Level 1		12 native flora taxa	No TECs or PECs. Two disturbed structural vegetation associations	No Declared Rare or Priority Flora was recorded during this assessment.	Three Introduced taxa: <i>Arctotheca calendula</i> <i>Chamaecytisus palmensis</i> <i>Lupinus</i> spp.
Woodman Environmental (2004b)	Survey Area; encompasses an area of approximately 39,400ha, Survey area was to the west, north and south of the project area	Detailed flora and vegetation survey	257 detailed recording sites were surveyed	515 vascular plant taxa belonging to 81 plant families. The dominant families recorded within the Denison 3D survey area are listed below:  Myrtaceae (55 taxa) Proteaceae (38 taxa) Asteraceae (25 taxa) Cyperaceae (23 taxa) Papilionaceae (19 taxa) Orchidaceae (16 taxa)	No TECs or PECs. A total of 34 plant communities, seven disturbed communities and seven mosaic units were mapped	One Declared Rare Plant taxa was recorded ( <i>Stawellia dimorphantha</i> ), which has since been downgraded to P4 status. A total of eight Priority flora taxa were recorded, one of which has been removed from the Priority list ( <i>Hakea polyanthema</i> ):  <i>Anthocercis intricata</i> (P3) <i>Baeckea</i> sp. Walkaway (A.S. George 11249) (P3) <i>Banksia elegans</i> (P3), <i>Dampiera tephrea</i> (P2), <i>Eucalyptus zopherophloia</i> (P4), <i>Hemigenia saligna</i> (P3) and <i>Schoenus</i> sp. Eneabba (F.Obbens & C.Godden 1154) (P2)	68 weed species were recorded within the survey area

Project	Location	Level of Survey	Parameters of Survey	Number of Taxa	Vegetation	Significant Flora Taxa	Introduced Taxa
Woodman Environmental (2004c)	Proposed Xyris area gas gathering system – in close proximity to project area	Level 1		89 vascular plant species composed of 79 native plant taxa and 10 introduced (weed) plant taxa were recorded	No TECs or PECs. Two plant communities and one disturbance community were identified on the survey area	No Declared Rare Flora was recorded during this assessment. One Priority Flora species was recorded in the survey area, <i>Hakea polyanthema</i> (Priority 3), but has since been delisted.	Ten weed species – not included in report (apart from recording Declared Weed - <i>Echium plantagineum</i> ).
Maia (2015)	Level 1 flora and vegetation reconnaissance and targeted flora survey over two small areas in AWE's Waitsia Gas Field – in close proximity to the project area	Level 1	Five relevé sites were sampled	67 taxa were recorded from 54 genera and 19 families. Six of the 67 taxa were weed species	No TECs or PECs. Two intact vegetation associations and one disturbed association were recorded in the Survey Area	No Declared Rare Flora was recorded during this assessment. Two priority species were recorded in the Survey Area: <i>Baeckea</i> sp. ?Walkaway (A.S. George 11249) (?P3) and <i>Banksia elegans</i> (P4).	No weeds on any of the national weeds lists were located in the Survey Area. Weeds recorded were; <i>Ehrharta calycina</i> , <i>Avena barbata</i> , <i>Emex australis</i> , <i>Lupinus cosentinii</i> , <i>Trifolium arvense</i> var. <i>arvense</i> , <i>Ursinia anthemoides</i>
Maia (2016)	Level 1 flora and vegetation reconnaissance and targeted flora survey – Waitsia Well 04 Area, south of the project area	Level 1	Seven relevé sites were sampled	95 taxa were recorded from 67 genera and 28 families. Eight of the 95 taxa were weed species	No TECs or PECs. Three vegetation types were recorded - Allocasuarina Forest, <i>Banksia</i> Shrubland and Melaleuca Shrubland	No Declared Rare Flora was recorded during this assessment. Three priority (P) species were recorded in the Survey Area - <i>Baeckea</i> sp. Walkaway (A.S. George 11249) (P3), <i>Banksia elegans</i> and <i>Stawellia dimorphantha</i> (both P4).	No weeds on any of the national weeds lists were located in the Survey Area. Eight weed species were located in the Survey Area: <i>Avena barbata</i> , <i>Chenopodium murale</i> , <i>Pentameris airoides</i> , <i>Polypogon maritimus</i> , <i>Solanum nigrum</i> , <i>Sonchus oleraceus</i> , <i>Centaurium tenuifolium</i> and <i>Ehrharta longiflora</i>

Project	Location	Level of Survey	Parameters of Survey	Number of Taxa	Vegetation	Significant Flora Taxa	Introduced Taxa
Woodman Environmental (2018a)	Xyris Lateral – in close proximity to project area to the northeast and east	Level 1 reconnaissance/targeted survey	Five non-permanent relevés were assessed	97 discrete native vascular flora taxa, including 76 native taxa, and 21 introduced taxa.	No TECs or PECs. Three VTs were described and mapped within the Study Area	No Declared Rare Flora was recorded during this assessment. Two priority (P) species were recorded in the Survey Area - <i>Baeckea</i> sp. Walkaway (A.S. George 11249) (P3) and <i>Banksia elegans</i> (P4).	Two Declared Pests under the BAM Act (WA) were recorded within the Study Area. Although <i>Echium plantagineum</i> (Patersons Curse) and <i>Rumex hypogaeus</i> (Doublegee) are Declared Pests, there are no applicable control management requirements within the Shire of Irwin (DAF 2019). 21 introduced flora taxa were recorded
Woodman Environmental (2018b)	Waitsia-03 – Flowline Corridor – south of the project area	Targeted Survey and a Detailed Survey	29 non-permanent flora survey quadrats measuring 10 m x 10 m were established	173 discrete vascular flora taxa representing 50 families and 124 genera were recorded	No TECs or PECs. Four VTs were described and mapped within the Study Area	No Declared Rare Flora was recorded during this assessment. Five priority (P) species were recorded in the Survey Area - <i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176 (P3), <i>Baeckea</i> sp. Walkaway (A.S. George 11249) (P3), <i>Banksia elegans</i> (P4), <i>Comesperma griffinii</i> (P2), <i>Stawellia dimorphantha</i> (P4)	No Declared weeds or Weeds of National Significance were recorded within the Study Area. 16 introduced flora taxa were recorded. Three taxa have ratings of High ecological impact for the Midwest including <i>Aira cupaniana</i> , <i>Centaurea melitensis</i> and <i>Ursinia anthemoides</i>

## 5. SUMMARY OF FLORA AND VEGETATION FACTORS

### 5.1 Significant Flora

No Threatened Flora taxa, listed under the BC Act or the EPBC Act, are known to occur within or in the vicinity of the Project Area. The search of the DoEE Species Profile and Threats Database (DoEE 2019a) with regard to MNES listed under the EPBC Act (Appendix A) returned 11 Threatened flora taxa which may occur, or habitat may occur within the area (Table 5). None of these are considered to have a possible likelihood of occurrence within the Project Area based on location of nearest record, poor vegetation condition and/or habitat preference.

A total of 13 Priority taxa are known from within or in the vicinity of the Project Area, with the locations of these taxa presented in Figure 3 and habitat and flowering period presenting in Table 8.

**Table 8: Significant Flora Taxa Known from the Vicinity of the Project Area**

Taxon	Status	Source*	Flowering Period (WAHerb 1998-)	Habitat (WAHerb 1998-)
<i>Acacia telmica</i>	P3	DBCA 2019a	Jul to Sep	Sand, loam or loamy clay. Low-lying seasonally moist areas
<i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176)	P3	WEC 2018b	Sep - Nov	Slopes and flats on yellow or brown sands
<i>Baeckea</i> sp. Walkaway (A.S. George 11249)	P3	DBCA (2019a) Maia (2015, 2016) WEC (2004, 2009, 2018a, 2018b)	Dec or Jan	Yellow/brown or white sand. Undulating plains, hillslope
<i>Banksia elegans</i>	P4	DBCA (2019a) Maia (2015, 2016) WEC (2004, 2009, 2012, 2018a, 2018b)	Oct to Nov	Yellow, white or red sand. Sandplains, low consolidated dunes
<i>Comesperma griffinii</i>	P2	DBCA (2019a) WEC (2012)	Oct	Yellow or grey sand Plains
<i>Dampiera tephrea</i>	P2	WEC (2004)	Jul	Sand, gravelly loam
<i>Eucalyptus zopherophloia</i>	P4	WEC (2004)	Oct to Dec or Jan	Grey/white sand with limestone rubble. Coastal areas
<i>Hemiandra</i> sp. Eneabba (H. Demarz 3687)	P3	DBCA (2019a) WEC (2012)	Feb	Sand. Disturbed sites
<i>Mesomelaena stygia</i> subsp. <i>deflexa</i>	P3	DBCA (2019a) WEC (2012)	Mar to Oct	White, grey or lateritic sand, clay, gravel
<i>Schoenus griffinianus</i>	P4	WEC (2009, 2012)	Sep to Oct	White sand
<i>Schoenus</i> sp. Eneabba (F. Obbens & C. Godden 1154)	P2	DBCA (2019a) WEC (2004)	Dec	Grey, yellow or white sand. Undulating sandplains, mid slopes, tops of rises
<i>Stawellia dimorphantha</i>	P4	DBCA (2019a) Maia (2016) WEC (2004, 2009, 2012, 2018b)	Jun to Nov	White, grey, yellow sand
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3	DBCA (2019a)	Sep to Dec	Sandy gravelly soils.



## 5.2 Significant Vegetation

No TECs or PECs are known to occur within or nearby the Project Area based on the results of the database searches, or review of current TECs or PECs listings. No vegetation associations as described by previous surveys in the vicinity of the project area as presented in Table 7 were classified as representing any of the listed State or Commonwealth TECs or PECs.

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## Appendix A: Search Results for EPBC Protected Matters Search (DoEE 2019a)



# 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: 13/06/19 12:50:49

[Summary](#)

[Details](#)

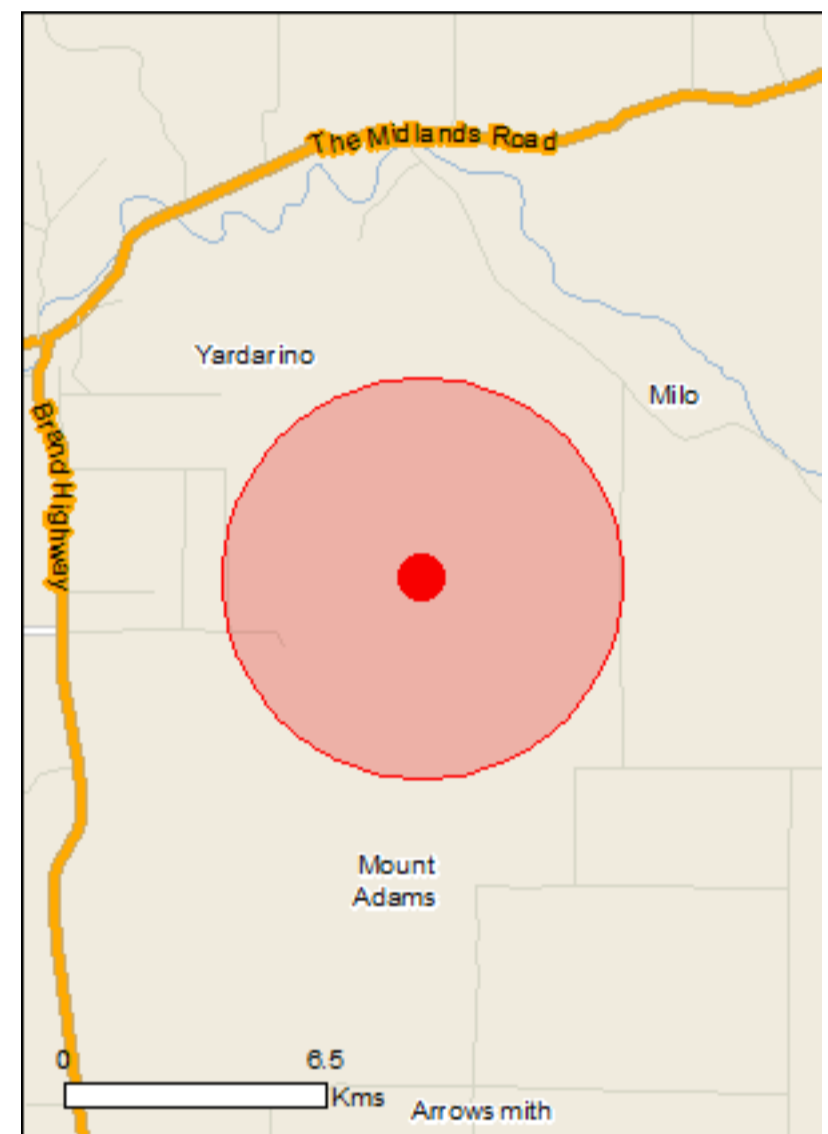
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

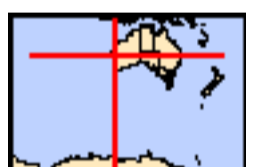
[Acknowledgements](#)



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[Coordinates](#)

Buffer: 5.0Km



# Summary

## Matters of National Environmental Significance

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

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	19
<a href="#">Listed Migratory Species:</a>	9

## Other Matters Protected by the EPBC Act

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

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

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

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	14
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	1
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	12
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

Listed Threatened Species		[ Resource Information ]
Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calyptorhynchus latirostris</a> Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Parantechinus apicalis</a> Dibbler [313]	Endangered	Species or species habitat may occur within area
<b>Plants</b>		
<a href="#">Conostylis dielsii subsp. teres</a> Irwin's Conostylis [3614]	Endangered	Species or species habitat likely to occur within area
<a href="#">Conostylis micrantha</a> Small-flowered Conostylis [17635]	Endangered	Species or species habitat may occur within area
<a href="#">Eucalyptus crispata</a> Yandanooka Mallee [24268]	Vulnerable	Species or species habitat may occur within area
<a href="#">Eucalyptus impensa</a> Eneabba Mallee [56711]	Endangered	Species or species habitat may occur within area
<a href="#">Eucalyptus leprophloia</a> Scaly Butt Mallee, Scaly-butt Mallee [56712]	Endangered	Species or species habitat may occur within area



Name	Status	Type of Presence
<a href="#">Eucalyptus x balanites</a> Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
<a href="#">Hemiandra gardneri</a> Red Snakebush [7945]	Endangered	Species or species habitat may occur within area
<a href="#">Hypocalymma longifolium</a> Long-leaved Myrtle [8081]	Vulnerable	Species or species habitat may occur within area
<a href="#">Paracaleana dixonii</a> Sandplain Duck Orchid [86882]	Endangered	Species or species habitat likely to occur within area
<a href="#">Tetratheca nephelioides</a> [83217]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Wurmbea tubulosa</a> Long-flowered Nancy [12739]	Endangered	Species or species habitat may occur within area

## Reptiles

<a href="#">Egernia stokesii badia</a> Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat may occur within area
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## 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
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area

## 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="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area

## Other Matters Protected by the EPBC Act

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

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

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat likely 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="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area

## Extra Information

### State and Territory Reserves [\[ Resource Information \]](#)

Name	State
Yardanogo	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
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#### Birds

Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
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Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
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Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
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#### Mammals

Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
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Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
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Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
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Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
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Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
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#### Plants

Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
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Name	Status	Type of Presence
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		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

# Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

# Coordinates

-29.30694 115.08944

# Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact Us](#) page.

## Appendix B: Search Results for Naturemap Search (DBCA 2019c)

# NatureMap Species Report

Created By Guest user on 21/03/2019

Current Names Only Yes  
Core Datasets Only Yes  
Method 'By Circle'  
Centre 115° 05' 18" E, 29° 18' 28" S  
Buffer 5km  
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	34	34
Priority 2	1	1
Priority 3	3	3
Priority 4	3	9
Rare or likely to become extinct	1	4
<b>TOTAL</b>	<b>42</b>	<b>51</b>

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Rare or likely to become extinct</b>				
1.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)		T	
<b>Priority 2</b>				
2.	14663 <i>Comesperma griffinii</i>		P2	
<b>Priority 3</b>				
3.	19959 <i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176)		P3	
4.	14476 <i>Baeckea</i> sp. Walkaway (A.S. George 11249)		P3	
5.	12413 <i>Verticordia densiflora</i> var. <i>roseostella</i>		P3	
<b>Priority 4</b>				
6.	1816 <i>Banksia elegans</i> (Elegant Banksia)		P4	
7.	24215 <i>Hydromys chrysogaster</i> (Water-rat, Rakali)		P4	
8.	1314 <i>Stawellia dimorphantha</i> (Arrowsmith Stilt-lily)		P4	
<b>Non-conservation taxon</b>				
9.	13908 <i>Allocasuarina lehmanniana</i> subsp. <i>lehmanniana</i>			
10.	1264 <i>Arnocrinum preissii</i>			
11.	11386 <i>Banksia leptophylla</i> var. <i>melletica</i>			
12.	5411 <i>Calothamnus hirsutus</i>			
13.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
14.	24732 <i>Calyptorhynchus banksii</i> subsp. <i>samueli</i> (Red-tailed Black-Cockatoo)			
15.	5476 <i>Calytrix sapphirina</i>			
16.	2956 <i>Cassytha pomiformis</i> (Dodder Laurel)			
17.	6542 <i>Centaurium tenuiflorum</i>	Y		
18.	1448 <i>Conostylis resinosa</i>			
19.	1285 <i>Corynotheca micrantha</i> (Sand Lily)			
20.	6218 <i>Daucus glochidiatus</i> (Australian Carrot)			
21.	15273 <i>Diplolaena leemaniana</i>			
22.	13955 <i>Eremaea ectadioclada</i>			
23.	5543 <i>Eremaea violacea</i> (Violet Eremaea)			
24.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
25.	2784 <i>Gyrostemon ramulosus</i> (Corkybark)			
26.	2175 <i>Hakea lissocarpha</i> (Honey Bush)			
27.	17726 <i>Hakea polyanthema</i>			
28.	6842 <i>Hemigenia barbata</i>			
29.	6430 <i>Leucopogon planifolius</i>			
30.	17982 <i>Melaleuca carrii</i>			
31.	18256 <i>Opercularia spermacocea</i>			
32.	2294 <i>Petrophile drummondii</i>			
33.	7614 <i>Scaevola globulifera</i>			
34.	16838 <i>Scholtzia</i> sp. <i>Eneabba</i> (S. Maley 8)			
35.	7022 <i>Solanum nigrum</i> (Black Berry Nightshade)	Y		



	Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
36.	8231	<i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
37.	15065	<i>Stenanthemum notiale</i> subsp. <i>notiale</i>			
38.	1361	<i>Tricoryne elatior</i> (Yellow Autumn Lily)			
39.	1363	<i>Tricoryne tenella</i>			
40.	12411	<i>Verticordia densiflora</i> var. <i>cespitosa</i>			
41.	12414	<i>Verticordia densiflora</i> var. <i>stelluligera</i>			
42.	12072	<i>Wurmbea dioica</i> subsp. <i>alba</i>			

**Conservation Codes**

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

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

## Appendix C: Conservation Codes for Western Australian Flora and Fauna (DBCA 2019d)

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

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

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

### **T Threatened species**

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

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

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

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

### **CR Critically endangered species**

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

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

### **EN Endangered species**

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

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

#### **VU Vulnerable species**

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

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

#### **Extinct species**

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

#### **EX Extinct species**

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

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

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

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

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

#### **Specially protected species**

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest;

migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

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

### **MI Migratory species**

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

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

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

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

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

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

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

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

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

### **P Priority species**

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of

conservation status so that consideration can be given to their declaration as threatened fauna or flora.

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

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

**Priority 1: Poorly-known species**

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

**Priority 2: Poorly-known species**

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

**Priority 3: Poorly-known species**

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

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

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

- (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.
- (c) (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Notes:

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

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