Munglinup Graphite Project

Detailed Flora and Vegetation Assessment

MRC GRAPHITE PTY LTD

OCTOBER 2020 (MRC19-48-02 REV 1)

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Munglinup Graphite Project Flora and Vegetation Assessment

Prepared for: MRC Graphite Pty Ltd

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Cover Photograph: Area of 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia' Threatened Ecological Community on the eastern edge of the Study Area, looking south-west towards Munglinup. Greyish bands in the background are large stands of relatively recently burnt mallets (*Eucalyptus platypus* subsp. *platypus*, *Eucalyptus dielsii*, *Eucalyptus extensa*).

DOCUMENT REVISION AND STATUS

Revision	Status	Originator	Internal Reviewer	Internal Review Date	Client Reviewer	Client Review Date
MRC18-54-02 Rev A	Draft Report	DC/AS	DC/CG	20/02/2019	BB/SM/SS	28/02/2019
MRC18-54-02 Rev 0	Client comments incorporated	DC	DW	19/03/2019		
MRC19-48-02 Rev A	Draft updated report – additional survey data	LF/DC	GW/CG	23/4/2020	MRC/ ISPL	19/5/2020
MRC19-48-02 Rev 0	Final updated report with additional survey data	LF/DC	CG/GW	29/5/2020	MRC/ EPA / Other DMA	8/9/2020
MRC19-48-02 Rev 0	Final updated report with EPA requests	LF/DC	CG/AS	30/10/2020		

DISCLAIMER

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EXECUTIVE SUMMARY

MRC Graphite Pty Ltd (MRCG) are proposing to mine graphite as part of the Munglinup Graphite Project (the Project) located approximately 2.5 kilometres (km) north of the township of Munglinup and 95 km west north-west of Esperance in the south-west of Western Australia (Figure 1). To inform the environmental impact assessment (EIA) process, MRCG commissioned Woodman Environmental Consulting Pty Ltd (Woodman Environmental) to undertake a detailed flora and vegetation survey to identify the key flora and vegetation values associated with the Project, and their potential sensitivity to impact.

For the purposes of flora and vegetation survey, the Project Study Area (the Study Area) has been defined, as shown on Figure 1. The Study Area is approximately 1,673 hectares (ha) in size and is larger than the proposed Project Area. For the desktop study component of this survey, including interrogation of databases and searches for relevant literature, a Desktop Study Area has also been defined; this encompasses the Study Area with a 40 km buffer, as shown on Figure 1.

The flora and vegetation component of the biological survey of the Study Area involved a Desktop Study, followed by a Detailed Survey and Targeted Survey as defined in Sections 4.1 and 4.2 of the 'Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment' (EPA 2016a). The Study Area was visited from the 11th – 21st September 2018 to conduct the field survey. A total of 60 non-permanent flora survey quadrats were surveyed in the Study Area. Targeted survey for significant flora and vegetation was also conducted over preliminary potential areas of development. Further targeted surveys were also undertaken for significant flora taxa from 17th – 20th September 2019 and 11th – 15th November 2019, primarily within an updated Development Envelope polygon provided prior to this survey, but also in the wider Study Area. Targeted survey in the region surrounding the Study Area for Vegetation Units (VUs) defined and mapped within the Study Area, including areas immediately adjacent to the Study Area, was conducted after the primary field survey. The survey was conducted from the 3rd – 6th March 2020.

A total of 529 discrete vascular flora taxa and 1 known hybrid were recorded in the Study Area. The taxa and hybrid represent 67 families and 227 genera. The most well-represented families were Myrtaceae (77 taxa), Fabaceae (55 taxa), Proteaceae (48 taxa), Cyperaceae (39 taxa) and Orchidaceae (33 taxa and one known hybrid). Eighteen of the taxa recorded are introduced taxa.

Twelve significant flora taxa were recorded in the Study Area, including one Threatened taxon, seven Priority flora taxa, and four taxa considered to be significant for other reasons:

- *Conostylis lepidospermoides* (Threatened);
- *Lepidosperma* sp. Mt Chester (S. Kern et al. LCH 16596) (P1);
- *Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1)
- *Leucopogon* sp. Cascades (M. Hislop (3693) (P1);
- *Commersonia rotundifolia* (P3);

- *Dampiera* sp. Ravensthorpe (G.F. Craig 8277) (P3);
- *Pultenaea calycina* subsp. *proxena* (P4);
- *Stachystemon vinosus* (P4);
- *Acacia spongolitica* (unusual variant, range outlier);
- *Leucopogon* aff. *Canaliculatus* (potential new taxon)*;*
- *Synaphea* aff. *drummondii* (potential new taxon); and
- *Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200) (potential new taxon).

Seventeen VUs were described in the Study Area; the majority of vegetation units are mallee woodlands. The VUs belong to two broad vegetation groups:

- Mallee woodlands or tall and mid shrublands on elevated plains with predominantly sandy soils and laterite at or near the surface (VUs 16 and 17);
- Mallee woodlands, woodlands or tall to mid shrublands on eroded valley slopes and floors with predominantly clay soils (VUs 1-15)

One listed significant community was recorded within the Study Area, this being the Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC (Endangered – EPBC Act). The extent of the TEC in the Study Area is considered to align with VUs 16 and 17. A total of 316.2 ha of the TEC occur in the Study Area, representing 18.9 % of the Study Area.

The remaining VUs are potentially regionally significant, because of the amount of historical clearing that has been undertaken in the vicinity of Munglinup, with vegetation restricted to isolated remnants. It is also noted that most of the mapped vegetation units do not appear to be represented in the Ravensthorpe Range regional vegetation dataset; however, one VU (VU 15) is considered analogous to Ravensthorpe Range Community 11 in a regional context, with VU 15 and Community 11 considered to represent forms of a single regional vegetation type. Regional targeted survey for Study Area VUs resulted in areas of several VUs being mapped immediately adjacent to the Study Area via extrapolation (many via the extension of Study Area VU polygons), as well as the identification of potential occurrences of these VUs in the wider region. Collection and analysis of data as per EPA (2016a) is required to accurately determine the if the VUs of the Study Area occur in these wider regional occurrences.

1. INTRODUCTION

1.1 Project Overview

MRC Graphite Pty Ltd (MRCG) are proposing to mine graphite as part of the Munglinup Graphite Project (the Project) located approximately 2.5 kilometres (km) north of the township of Munglinup and 95 km west north-west of Esperance in the south-west of Western Australia (Figure 1).

To inform the environmental impact assessment (EIA) process, MRCG commissioned Woodman Environmental Consulting Pty Ltd (Woodman Environmental) to undertake a detailed flora and vegetation survey to identify the key flora and vegetation values associated with the Project, and their potential sensitivity to impact.

1.2 Study Area Definition

For the purposes of flora and vegetation survey, the Project Study Area (the Study Area) has been defined, as shown on Figure 1. The Study Area is approximately 1,673 hectares (ha) in size. A separate Extrapolated Study Area, immediately to the west of the Study Area, was subject to a brief reconnaissance survey for the purposes of defining potential extent of VUs immediately outside of the Study Area. The Extrapolated Study Area was 336 ha in size; the Combined Study Area being 2, 009 ha in size.

For the purposes of elements of the desktop study for the Project, including interrogation of databases and searches for relevant literature, a Desktop Study Area has also been defined; this encompasses the Study Area with a 40 km buffer, as shown on Figure 1.

Additionally, MRCG provided a Project Development Envelope; in the context of flora and vegetation survey, the Development Envelope was the area of focus for targeted survey for significant flora and vegetation (see Sections 1.3 and 3.9). The Development Envelope is shown on Figure 4.

Study Area and Desktop Study Area Location	Author: Leah Firth	
	WEC Ref: MRC19-48-02	
WOODMAN ENVIRONMENTAL	Filename: MRC19-48-02-f01.mxd	**Figure**
	Scale: 1:500,000 (A4)	1
	Projection: GDA 1994 MGA Zone 51	
This map should only be used in conjunction with WEC report MRC19-48-02.	Revision: 1 - 27 October 2020	

1.3 Aim and Objectives

The aim of the survey is to characterise the flora and vegetation values of the Study Area to current regulatory and technical guidance standard, for use in the approvals process for the Project.

The overall objectives of the assessment were to:

- Compile an inventory of vascular flora taxa that occur in the Study Area, building on the results of previous studies conducted in the Study Area;
- Identify locations and determine the extent of populations of vascular flora taxa occurring within the Study Area that are one of the following (hereafter referred to as significant flora taxa), to provide context for impact assessment:
    - Listed Threatened Species (T) under the *Environment Protection and Biodiversity Conservation* Act *1999* (EPBC Act) (Commonwealth);
    - Threatened Flora (T) under the *Biodiversity Conservation Act 2016* (BC Act) (WA);
    - Priority Flora taxa as classified by the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA); and
    - Other significant flora taxa as defined by the Environmental Protection Authority (EPA) (2016a; b).
- Identify locations and determine the extent of introduced vascular flora taxa, with particular focus on those that are Weeds of National Significance (WoNS), or Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act);
- Identify, map and describe Vegetation Units (VUs) that occur within the Study Area, superseding previous studies;
- Identify, map and describe vegetation that occurs within the Study Area that is one of the following (hereafter referred to as significant vegetation), to provide context for impact assessment:
    - Threatened Ecological Community (TEC) under the EPBC Act;
    - TEC under the BC Act;
    - Priority Ecological Communities (PEC) as classified by DBCA;
    - Other significant vegetation as defined by EPA (2016a; b); and
    - Wetland or riparian vegetation that is ground or surface water-dependent.

The survey and reporting works comply with the following documents:

- Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a); and
- Environmental Factor Guideline – Flora and Vegetation (EPA 2016b).

1.4 Level of Assessment

The flora and vegetation survey of the Study Area involved a Targeted Survey and Detailed Survey as defined in Sections 4.2 and 4.3 of the 'Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment' (EPA 2016a). This is considered appropriate for the Study Area, as it is likely to support a high diversity of flora and vegetation, may comprise restricted landforms or vegetation units, and is likely to support significant flora or vegetation, as outlined in Section 4.3 of the 'Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment' (EPA 2016a).

It should be noted that this survey builds on previous work conducted to inform the EIA process for the Project, with a flora and vegetation assessment that considered much of the Study Area being conducted in 2014 (Ecologia 2015).

2. BACKGROUND

2.1 Climate

The Study Area is located within the Esperance Plains region in the Southwest Province of Western Australia (Beard 1990). The Esperance Plains region is characterised by a warm Mediterranean climate with winter precipitation. There are 5-6 dry months per year (where evaporation exceeds precipitation), with the region generally receiving between 500-700 mm of precipitation annually (Beard 1990). Figure 2 displays monthly long-term and 2018 precipitation totals and average maximum temperature for 2018. Precipitation record data is from Munglinup Station (years 1970 – 2019); temperature data is sourced from the Munglinup West Station (years 2002 – 2019), the nearest stations to the Study Area recording the relevant data (Bureau of Meterology 2020). Figure 3 displays the equivalent information for the year 2019. These years of data are equivalent to the years in which the field surveys were conducted (section 3.4).

Long term monthly maximum temperatures at Munglinup West peak in January and February (28.9°C) (data from 2002-2019). Long-term average monthly rainfall at Munglinup peaks from late autumn to early spring (May-September), with the highest rainfall on average received in August (62.8 mm). This period is considered to be the most relevant in terms of promoting plant growth and flowering in the Esperance Plains region, particularly in the context of ephemeral and geophytic taxa. Rainfall received at Munglinup from May – August 2018 was above the long term average (249.8 mm compared to the long term average of 230.6 mm), which was largely a result of significant rainfall received in August 2018 (150.6 mm compared to the long-term average of 63.6 mm); all other months were below-average, with only 8.4 mm received in May compared to the long-term average of 56.4 mm. Average monthly maximum temperatures recorded for 2018 were relatively consistent with the long term monthly averages, with slightly above (1.5° or less) long-term averages recorded for April to July.

Rainfall received at Munglinup from May – August 2019 was below the long term average (201.8 mm compared to the long term average of 230.6 mm), which was largely a result of lower than average rainfall received in May, June and July 2019 (115.8 mm compared to the long-term average of 167.0 mm); with only August receiving above-average rainfall of 86.0 mm compared to the long-term average of 63.6 mm. Average monthly maximum temperatures recorded for 2019 were relatively consistent with the long term monthly averages, with temperatures slightly below (0.6°) or above (0.7°) long-term averages recorded for April to July.

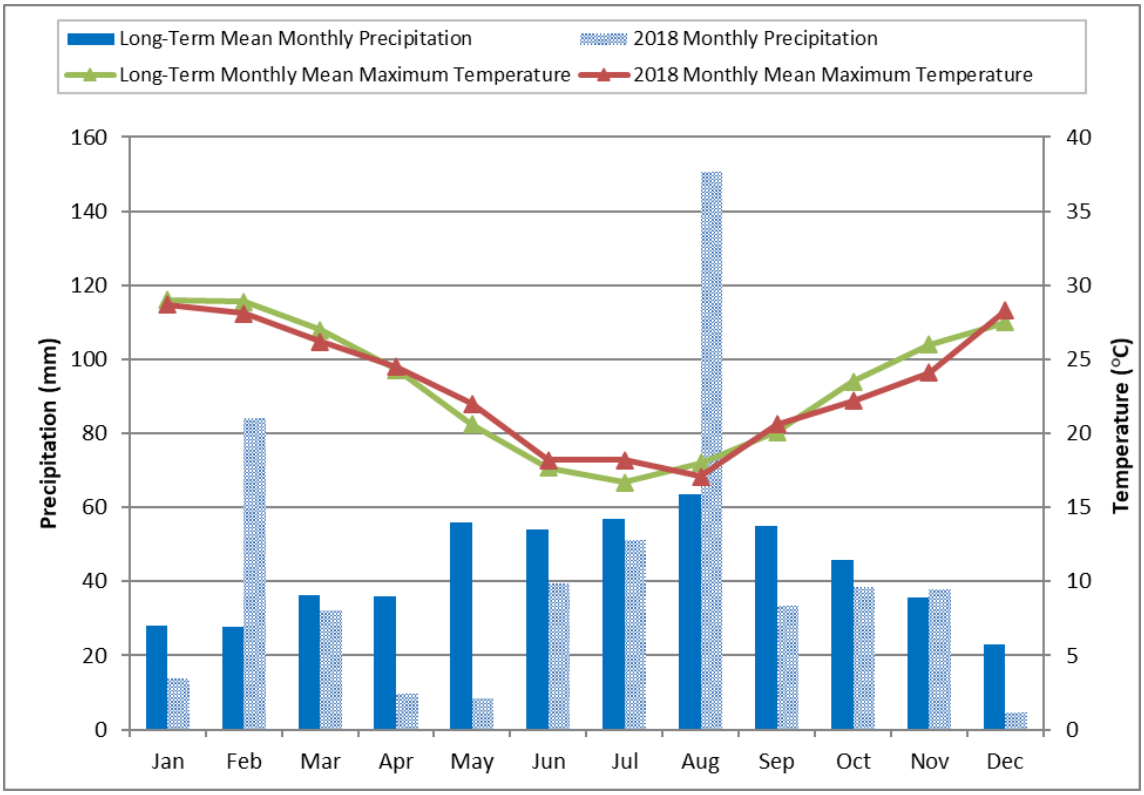


Figure 2: **Average Daily Maximum Temperature and Total Precipitation for January–December 2018 (Bureau of Meteorology 2019)**

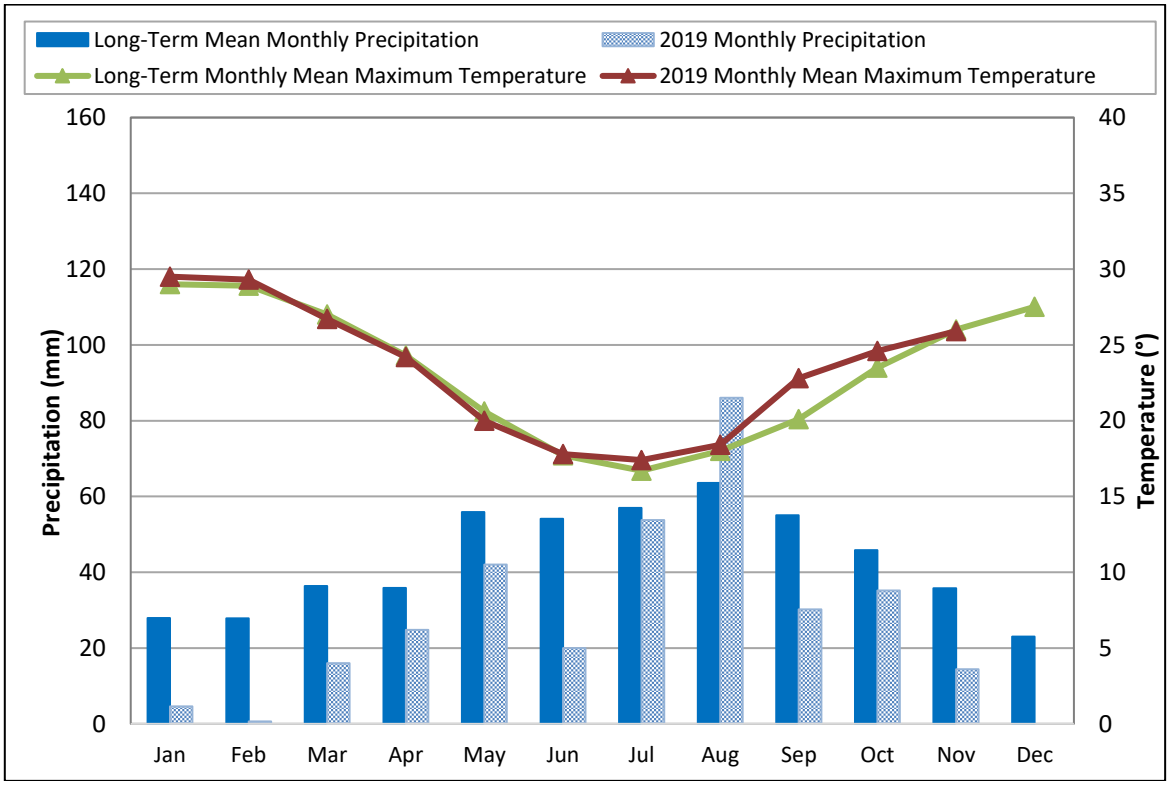


Figure 3: **Average Daily Maximum Temperature and Total Precipitation for January–December 2019 (Bureau of Meteorology 2019)**

2.2 Geology, Landforms and Soils

The Eyre Botanical District as defined by Beard (1990) is equivalent to the Esperance Plains Interim Biogeographic Regionalisation for Australia (IBRA) region (Commonwealth of Australia 2012). The Esperance Plains region consists of a relatively flat and monotonous plain rising gently from near sea level at the coast to about 100 m, which is broken by quartzite ranges and granite domes. The plain is formed from Tertiary sediments from the Plantagenet Group, which are Eocene sands and siltstones (Beard 1990). There are numerous granite bosses and hills, particularly along the coast, and several significant ranges, including the quartzite Stirling Range, Barren Ranges and Russell Range, and the Ravensthorpe Range, which is a greenstone belt. Soils are chiefly sandy neutral yellow-mottled soils containing variable amounts of ironstone gravel, alternating with leached sands that sometimes contain ironstone gravel and are underlain by a clay substrate. Valleys have hard alkaline and neutral yellow-mottled soils.

The Study Area traverses one IBRA subregion, being the Recherche subregion (Commonwealth of Australia 2012). The Recherche IBRA subregion has variable relief, comprising the Quaternary coastal sandplains and dunes overlying Proterozoic gneiss and granite as well as Eocene and more recent coastal limestones (Comer *et al* 2001).

Part of the Study Area is traversed by the Munglinup River, as well as a large tributary creek (Clayhole Creek), which joins the river to the south of the Study Area.

2.3 Land Tenure

The majority of the Study Area is located in the Shire of Esperance, with a small part of the far south-western section located within the Shire of Ravensthorpe. The tenure of the Study Area is predominantly Mining Reserve (R24814), with small portions being road reserve (Reynolds and Clayhole Roads), Parklands Reserve (R30869) and Mining Timber Reserve (R23924).

3. METHODS

3.1 Desktop Study Methods

Prior to commencement of the field survey, a review of all publicly available flora and vegetation data relevant to the Study Area was undertaken. This included obtaining and reviewing copies of reports of previous biological surveys carried out within the vicinity of the Study Area (where available) and interrogation of relevant databases and other sources as listed in Table 1.

Table 1: Searches Undertaken for the Desktop Study of the Study Area

Source	Search Attributes	Search Purpose
DBCA Threatened and Priority Ecological Communities Database	Database interrogated using Study Area boundary with a 40 km buffer (DBCA 2018b)	Obtain records of DBCA-classified TECs and/or DBCA-classified PECs within the Desktop Study Area

Source	Search Attributes	Search Purpose
DBCA TEC and PEC lists	Review of current DBCA TEC and PEC lists (DBCA 2018a; DBCA 2019b)	Identify whether there are any additional DBCA listed TECs or PECs which could occur within the Desktop Study Area
DBCA Significant Flora Databases (WA Herbarium specimen database and Threatened and Priority Flora (TPFL) database)	Database interrogated using Desktop Study Area boundary (DBCA 2019c)	Obtain records of listed significant flora within the Desktop Study Area
DoEE Species Profile and Threats (SPRAT) Database (interrogated using the Protected Matters Search Tool (DoEE 2019a))	Database interrogated using approximate Desktop Study Area boundary (exact boundary cannot be used); search performed prior to survey, updated 21/01/2019	Identify Matters of National Environmental Significance (MNES), including Threatened flora and TECs, listed under the EPBC Act, that occur or have the potential to occur within the Desktop Study Area
DBCA NatureMap (WA Herbarium and TPFL records) (DBCA 2007-)	Database interrogated using approximate Desktop Study Area boundary (exact boundary cannot be used); search performed prior to surveys, updated 20/01/2020	Obtain records of listed significant flora and introduced flora within the Desktop Study Area
2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Government of Western Australia 2019)	Study Area	Identify extent of Vegetation System Associations within the Study Area

3.2 Personnel and Licensing

Table 2 lists the personnel involved in both fieldwork and plant identifications for the survey. The field team leaders have had extensive previous experience (>10 years) in conducting flora and vegetation surveys in the south-west and have conducted numerous flora and vegetation surveys within the Esperance Plains bioregion. Emalyn Loudon and Marlee Starcevich also have previous experience in assisting with flora and vegetation surveys in the region. All plant material was collected under the scientific licences pursuant to the *Wildlife Conservation Act 1950* (WC Act) Section 23C and 23F and the *Flora Taking (Biological Assessment) licences* and *Authorisation to Take or Disturb Threatened Species* pursuant to the *Biodiversity Conservation Act 2016* (BC Act), sections 40, 274 and 275 as listed in Table 2. Personnel involved in plant identifications have had extensive previous experience in plant identifications for flora of the south-west as well as several years of experience in plant identifications for flora of the Esperance Plains bioregion.

Table 2: Personnel and Licensing Information

Personnel	Role	Qualifications	Flora Collecting Permits (WC Act; BC Act) (WA)
David Coultas	Primary field survey, targeted flora and vegetation surveys (manager/team leader); plant identifications	BSc (Environmental Biology) (Hons)	SL012319 (Section 23C) 141-1718 (Section 23F) FB62000051 TFL 23-1819

Personnel	Role	Qualifications	Flora Collecting Permits (WC Act; BC Act) (WA)
Bethea Loudon	Primary field survey (team leader)	BSc (Biology)	SL012318 (Section 23C) 143-1718 (Section 23F)
Leah Firth	Targeted flora survey	BSc (Conservation Biology)	FB62000055
Kim Kershaw	Targeted flora survey	BSc (Biology)	SL012065 (Section 23C) 116-1617 (Section 23F)
Nathan McQuoid	Targeted flora survey	Dip (Wildlife and Park Management)	-
Brian Morgan	Targeted flora survey	BSc (Biology) (Hons)	FB62000075
Emalyn Loudon	Primary field survey	BAgrib (Agriculture) (Hons)	-
Marlee Starcevich	Primary field survey	BSc (Environmental Science) (Hons)	SL012321 (Section 23C) FB62000057
Will White	Targeted flora survey	BSc (Ecology) (Hons)	-
Greg Woodman	Targeted flora survey	BSc (Biology) (Hons)	SL012314 (Section 23C) 138-1718 (Section 23F) FB62000053 TFL 19-1819
Emma Marsh	Targeted vegetation survey	Bsc (Biological Science and Conservation and Wildlife Science)	-

3.3 Aerial Photography Interpretation and Survey Design

Initial interpretation of ortho-rectified aerial photography at a scale of 1:10,000 was conducted to determine preliminary vegetation patterns present within the Study Area, with quadrats allocated based on these patterns. A minimum of three quadrats were allocated to each major discernible vegetation pattern where possible; for smaller patterns, fewer quadrats were allocated based on the size of the pattern.

3.4 Field Survey Methods

3.4.1 Primary Field Survey

The primary field survey, during which all quadrats were surveyed, and part of the targeted survey for significant flora and vegetation was undertaken, occurred from the 11th – 21st September 2018. The timing of the survey was selected to coincide with the most appropriate time to survey in the Esperance Plains Bioregion; considered to be Spring, as the majority of taxa in this region flower at this time. This includes the majority of significant taxa that potentially occur in the Study Area (see Section 5.1.5).

The Study Area was accessed by vehicle using existing access tracks, and via foot transects. A total of 60 non-permanent flora survey quadrats were surveyed in the Study Area; the quadrats covered an area of 100 m^2 for understorey, and 400 m^2 for upper storey when a

Eucalyptus canopy was present. Quadrats usually took the form of a 10 m x 10 m (20 x 20 m for upper storey) square, however this was modified as appropriate when quadrats were located in narrow areas of vegetation such as along creeks. The quadrat size used is the indicative size for flora and vegetation surveys in the Esperance Bioregion, as outlined in Table 1 of the Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a); the inclusion of a 400 m^2 area to assess *Eucalyptus* canopy follows the methods of Markey *et al.* (2012), the most relevant regional vegetation study to this survey that has been undertaken to date, located in the Ravensthorpe Range approximately 45 km west of the Study Area. Quadrat locations were selected to ensure that, where possible, at least three quadrats were surveyed within each vegetation pattern initially identified from aerial photography interpretation (as per Section 3.1.3).

All vascular flora taxa that were visually identifiable within each quadrat were recorded. At least one reference specimen of most taxa (excluding common, distinctive taxa) encountered was collected for verification and identification purposes.

The following information was recorded at each quadrat:

- Personnel;
- Unique quadrat number;
- Date of survey;
- GPS (Global Positioning System) coordinates at start corner of quadrat;
- Site photograph, taken diagonally from start corner;
- Compass bearing for two sides of quadrat that commence at start corner of quadrat;
- Topography (including landform type and aspect);
- Soil colour and type (including the presence of any rock outcropping and surface stones);
- Vegetation condition (EPA 2016a; scale presented in Appendix A);
- Approximate time since fire;
- Presence and type of disturbance (if any);
- Percentage foliage cover (for each taxon, including cover within the quadrat of individuals rooted outside of the quadrat);
- Height (m) (average for each taxon, excluding climbers/aerial shrubs); and
- Additional flora taxa present immediately outside of the quadrat.

Additionally, two relevés were surveyed in areas of vegetation that were considered likely to represent the Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC (see Section 5.1.7) but were not large enough to allow for a quadrat. The relevés were sampled from a central point to a radius of 10 m. All data recorded for quadrats was also recorded for the relevés, however only total foliage cover and proteaceous taxa and their foliage covers were recorded. The relevés were not permanently marked.

Notes on vegetation pattern boundaries and distribution were also taken while traversing the Study Area on foot. These notes included a GPS location at the point that the notes were taken, and a brief description of the vegetation, including dominant and characteristic taxa. The notes were used to aid in mapping polygons of vegetation patterns that were not allocated quadrats; additional flora taxa were also recorded during this process. Not all

vegetation pattern polygons received quadrats because of time constraints, however many polygons could be confidently allocated to a final VU using a combination of mapping notes and aerial photograph interpretation. Additional flora taxa were also recorded opportunistically in the Study Area during traverses on foot between quadrats, with GPS locations of such taxa recorded.

Targeted survey for significant flora taxa was undertaken as part of the survey, with a list of significant flora taxa likely to be encountered compiled as part of the desktop study. It should be noted that the Development Envelope was not provided prior to the primary field survey with a smaller indicative mine site layout provided for the purposes of the targeted survey. Appropriate habitat for such taxa primarily in the now-superseded indicative mine site layout, as well as elsewhere in the Study Area (time permitting), was transected on foot, with spacing of personnel while searching no greater than approximately 30 m. If populations of known significant flora taxa were identified, a representative collection of material was made, and the abundance and spatial distribution (using GPS coordinates) of individuals within each population was recorded.

Targeted survey was also undertaken for listed significant vegetation, with a list of significant vegetation likely to be encountered compiled as part of the desktop study. If any occurrences of such significant vegetation were encountered, the boundary of the significant vegetation was recorded where possible, either via walking the boundary and recording the GPS track log, or by recording GPS waypoints. This allowed for the accurate calculation of the spatial areas of occurrences of significant vegetation.

Locations of any introduced flora taxa encountered while traversing between quadrats, and while conducting targeted searching for significant flora taxa, were also recorded using the same method as for significant flora taxa.

All traverses made during this survey are mapped as track logs on Figure 4, along with quadrat and relevé locations.

3.4.2 Targeted Survey for *Rhizanthella johnstonii* (Threatened)

Targeted Survey specifically for *Rhizanthella johnstonii* (Threatened) was undertaken, as this species was identified as potentially occurring in the Study Area by previous work (Ecologia 2015). This survey was undertaken over two field visits. The first, undertaken from the 7th – 10th May 2018, was to determine the presence and distribution of potential habitat for this species. Prior to this visit, a habitat description for *Rhizanthella johnstonii* was compiled from existing literature relevant to this species (Dixon and Christenhusz 2018). Consultation with DBCA and also Andrew Brown, formerly Threatened Species Coordinator with DBCA and an expert in W.A. orchids, was also conducted in the context of habitat identification, previous surveys for the taxon within and in the vicinity of the Study Area, and survey methodology. A review of the previous flora and vegetation assessment undertaken for the Project (Ecologia 2015) was then undertaken, to determine whether any of the vegetation types described, or individual quadrat records, constituted potential habitat. This provided the focus for the field survey.

Areas identified as possible habitat prior to survey were inspected on foot to verify their suitability, with any areas considered to possibly host *Rhizanthella johnstonii* (T) recorded using a GPS.

A follow-up visit was conducted from the 23rd – 26th July 2018, to search for individuals of *Rhizanthella johnstonii* (T) in any areas identified as potentially suitable habitat during the previous visit. Prior to this visit, a known location of *Rhizanthella johnstonii* located adjacent to the Oldfield River in the vicinity of the Study Area (30 km west north-west) was visited, so that personnel could familiarise themselves with the species if possible.

Within each area of potential habitat, the survey for *Rhizanthella johnstonii* (T) involved the brushing aside of litter and mulch from around the bases and out to a distance of approximately 500 mm of *Melaleuca hamata* individuals (a known host species of *Rhizanthella johnstonii* (T)), to attempt to locate emergent individuals. Any individuals located were recorded as per significant flora taxa in Section 3.4.1 above.

3.4.3 Further Targeted Survey of the Development Envelope and Study Area

Further targeted survey, primarily within the Development Envelope but also within the wider Study Area (time permitting), was conducted subsequent to the primary field survey. These surveys targeted significant taxa recorded within the Study Area during the primary field survey, as well as other taxa known from the Desktop Study Area that could potentially occur within the Study Area based on habitat requirements and proximity of known records (see Section 5.2.4).

An initial visit was made to the Development Envelope to specifically target two orchid taxa, *Caladenia longifimbriata* (P1) and *Pterostylis faceta* (P3), which can only be identified when flowering; the latter was recorded in the Study Area during the primary field survey. The survey was undertaken from the 17th to 20th September 2019. All areas within the development envelope identified as potentially suitable habitat during initial surveys were transected on foot as per Section 3.4.1. Further targeted survey for the remaining significant flora taxa was conducted from 11th to 15th November 2019, with methods the same as outlined above. The timing of this survey was chosen as two of the target taxa that require flowering for identification, *Thysanotus brachiatus* (P2) and *Thysanotus parviflorus* (P4), flower at this time.

The Study Area was accessed by vehicle using existing access tracks, with survey undertaken via transects on foot. All suitable habitat for all significant taxa listed as potentially occurring within the Development Envelope was surveyed using the method described below, regardless of previous searching efforts.

Targeted searching was conducted within the wider Study Area during the second visit outlined above, focussing on those taxa that were recorded within the Development Envelope; however, the extent of survey in the wider Study Area was limited by dense vegetation and access. The methods outlined above were also employed for this survey.

All traverses during the above visits are mapped as track logs on Figure 4.1.

3.4.4 Regional Targeted Survey for Study Area Vegetation Units

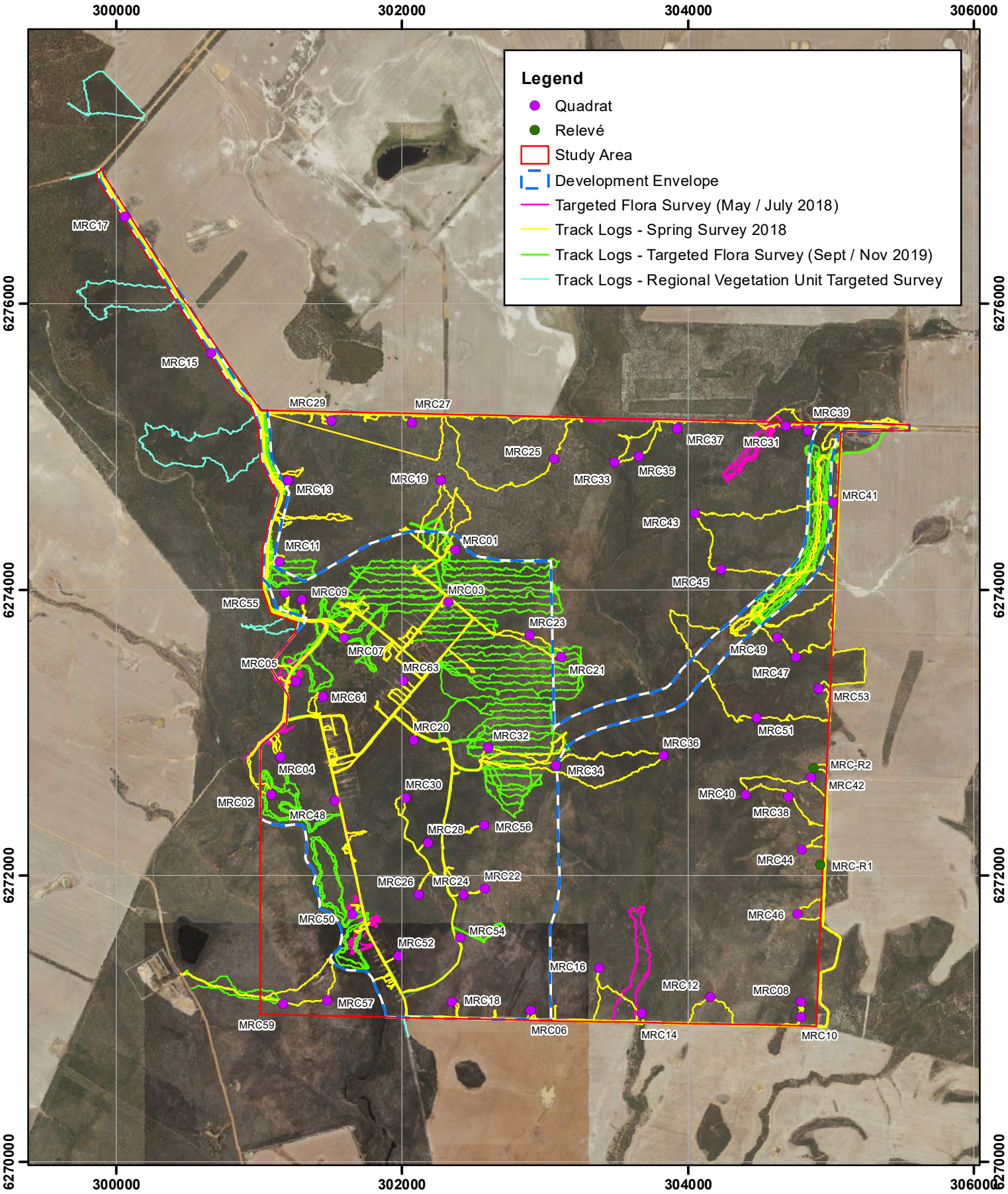
Targeted survey in the region surrounding the Study Area were undertaken to identify VUs defined and mapped within the Study Area. Some locations were immediately adjacent to the Study Area; these were conducted subsequent to the primary field survey. The aim of this survey was to extend the mapping of VU polygons beyond the core study area and to locate probable occurrences of specific VUs within the wider region. The extension of VU mapping polygons into areas immediately adjacent to the Study Area considered all Study Area VUs, while targeted survey in the wider region considered only specific VUs whose occurrences were primarily located within the Development Envelope.

Prior to the targeted survey being conducted, a stand-alone desktop review was conducted to identify potential areas of vegetation that may contain occurrences of specific VUs defined within the Study Area (Woodman Environmental 2019). The desktop review considered a number of factors, including Vegetation System Association mapping (Beard *et al.* 2013), current extent of vegetation, and land tenure. A review of aerial photography of vegetation within the region was also conducted in conjunction with the findings of the desktop review (Woodman Environmental 2019), to identify similar areas to known occurrences of VUs for field investigation.

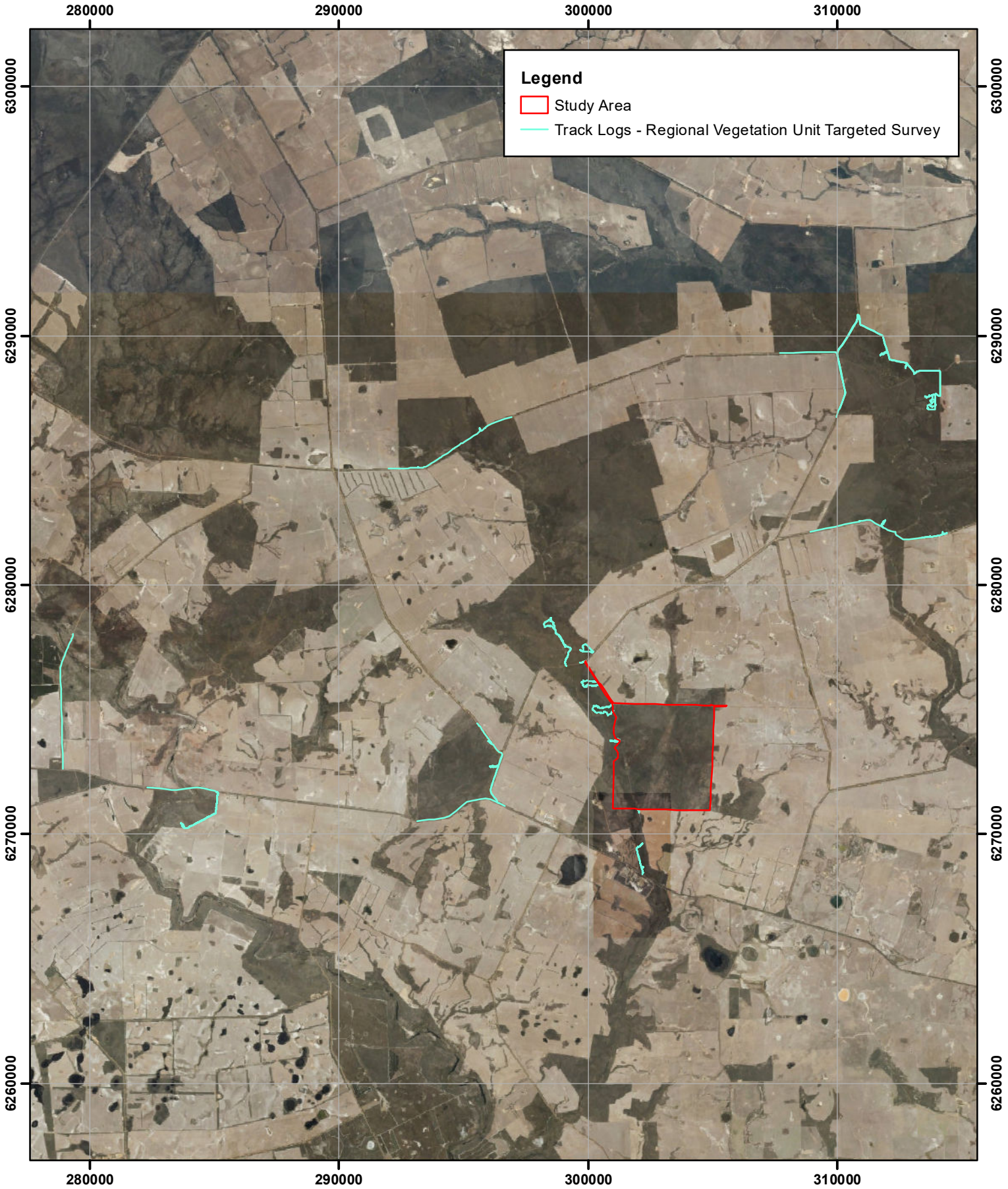
The survey was conducted from the 3rd – 6th March 2020. Prior to the survey, the descriptions of each VU were reviewed, along with indicator and common taxa, to allow for occurrences of VUs to be confidently diagnosed in the field. Initially, the Study Area was visited, with a number of transects walked, which commenced within polygons of particular VUs, and extended into immediately adjacent areas. Notes on floristic composition and photographs were taken in polygons of vegetation encountered, with boundaries between such polygons also noted via recording of GPS waypoints. This allowed for the extrapolation of Study Area VU mapping polygon boundaries over these areas (see Section 3.7). No quadrats were established or assessed during this survey.

Following this, a number of areas in the broader region identified as potential occurrences of key VUs were visited in the field. If any areas of vegetation were encountered that likely represented occurrences of such VUs, the location was recorded, and notes on floristic composition and photographs were taken. Observations on the possible spatial extent of these areas were also made, however, no attempt was made to define mapping polygons.

All traverses during the above survey are presented as track logs on Figure 4.1 (Extrapolated Study Area adjacent to the Study Area) and Figure 4.2 (regional targeted vegetation survey).



Study Area Track Logs, Quadrat and Relevé Locations	Author: Leah Firth	
	WEC Ref: MRC19-48-02	
WOODMAN ENVIRONMENTAL	Filename: MRC19-48-02-f04a.mxd	**Figure**
	Scale: 1:35,000 (A4)	4a
	Projection: GDA 1994 MGA Zone 51	
This map should only be used in conjunction with WEC report MRC19-48-02.	Revision: 1 - 27 October 2020	



Regional Vegetation Unit Targeted Survey Track Logs	Author: Leah Firth	N
	WEC Ref: MRC19-48-02	
WOODMAN ENVIRONMENTAL	Filename: MRC19-48-02-f04b.mxd	**Figure**
	Scale: 1:200,000 (A4)	4b
	Projection: GDA 1994 MGA Zone 51	
This map should only be used in conjunction with WEC report MRC19-48-02.	Revision: 1 - 27 October 2020	

3.5 Plant Collection and Identification

Specimens of any unknown taxa that were collected were pressed for later identification at the WA Herbarium. External experts of particular families or genera were consulted for any specimens considered to be difficult to identify or of taxonomic interest, including botanists at the WA Herbarium. Identification of *Lepidosperma* specimens, which are particularly problematic (see Section 5.2.1), were identified by Woodman Environmental as Dr Russell Barrett, the authority on WA *Lepidosperma*, was not available to identify specimens. The identification of *Lepidosperma* used a combination of reference specimens previously identified by Dr Russell Barrett on behalf of Woodman Environmental, reference specimens identified by Dr Russell Barrett and lodged at the WA Herbarium, and taxonomic information presented in Barrett *et al.* (2009).

Taxon nomenclature generally follows FloraBase (WA Herbarium 1998-) with all names checked against the current DBCA Max database to ensure their validity. However, in cases where names of plant taxa have been published recently in scientific literature but have not yet been adopted on FloraBase because of time constraints (WA Herbarium 1998-), nomenclature in the published literature is followed. The conservation status of each taxon was checked against FloraBase, which provides the most up-to-date information regarding the conservation status of flora taxa in Western Australia.

Specimens of interest, including significant flora taxa, range extensions of taxa and potential new taxa, will be sent to the WA Herbarium for consideration for vouchering as soon as practicable. However, this process is via donation, and the WA Herbarium may not voucher all specimens, in accordance with its own requirements. The specimen vouchering will be supported by completed Threatened and Priority Flora Report Forms submitted to DBCA (Species and Communities Branch) in the case of listed significant flora (e.g. Threatened and Priority flora taxa).

3.6 Floristic Classification Analysis

Classification analysis of floristic data from the Study Area was conducted using 60 quadrats established in the Study Area. Quadrats established by Ecologia (2015) were not used; these were established at a time of year (December) that is outside the EPA Guidance (2016a) recommendations for the region within which the Study Area is located; this is considered to have greatly affected the results of the survey, such that the data is not compatible with that from the current survey. The quadrat size used also differed slightly.

The analysis used 327 taxa, with taxa belonging to several categories removed prior to analysis, as listed below:

- Introduced taxa – introduced taxa were removed as their distributions are often defined by the presence of disturbance (e.g. clearing, animal movement) rather than natural habitat types;
- Taxa where identification was unclear – taxa were removed from the analysis where identification was unclear due to poor available material in the field. However, if such a taxon was known to be unique within the dataset, it was included in the analysis.

All taxa removed from the classification analysis are presented in Appendix B.

A single-layer data matrix (i.e. presence/absence data only) was used in the classification analysis. PATN (V3.12) (Belbin and Collins 2009) was utilised to perform the classification and ordination analysis of the data matrix. The Bray-Curtis coefficient was used to generate an association matrix for the classification analysis. This association matrix consisted of pairwise coefficients of similarities between quadrats based on floristic data. Agglomerative hierarchical clustering, using flexible Unweighted Pair Group Method with Arithmetic Mean (UPGMA) (ß=-0.1), was used to generate a quadrat classification dendrogram (Sneath and Sokal 1973).

3.7 Vegetation Unit Definition, Mapping and Description

The classification analysis of Study Area floristic data aggregated quadrats into a group classification. The resulting dendrogram and taxon group matrix were initially examined at a group level determined by PATN as potentially appropriate for the dataset, to determine the plausibility of groups with regard to taxon groups, as well as field observations and indicator taxon analysis. This process determined a final number of clusters, which were considered to represent VUs.

VU descriptions have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 6.0 (Executive Steering Committee for Australian Vegetation Information (ESCAVI) 2003), as stipulated by EPA (2016a). This model follows nationally-agreed guidelines to describe and represent VUs, so that comparable and consistent data are produced nation-wide. It should be noted that the NVIS system utilises vegetation descriptions derived from structural characteristics of the individual community units, while the VUs presented in this report are defined based on the results of a floristic classification analysis, excluding any structural data. VUs therefore may include multiple structural types. Considering the effect of disturbance factors such as fire on vegetation structure, this approach is designed to provide a map of VUs that reflect taxon composition and the influences of the physical and chemical environment rather than disturbance history.

It should also be noted that this report describes VUs at the NVIS Sub-Association level, rather than the Association level as stipulated by EPA (2016a). This level is considered more appropriate for the vegetation of the Study Area, as often the vegetation possessed one or more additional strata to the traditional three-stratum classification system used at the Association level.

For each VU, indicator taxa were defined via Indicator Taxon Analysis. This was conducted using PC-Ord (V6.08) (McCune and Mefford 2011) via the method of Dufrene and Legendre (1997). This generates INDVAL values (a measure of taxon fidelity to a given VU), which range from 0 to 100; an INDVAL value of 100 indicates that a taxon is present in all quadrats within a particular VU, and absent from all other quadrats included in the analysis. The INDVAL values were then tested for significance of the indicator taxa using a Monte Carlo permutation test. Indicator taxa were defined as taxa with an INDVAL value > 20, and a significance Þ value of either <0.05, <0.01 or <0.001.

The locations of quadrats and/or relevés within each VU were used in conjunction with aerial photograph interpretation and field notes taken during survey to develop VU mapping polygon boundaries. These VU mapping polygon boundaries were then digitised using Geographic Information System (GIS) software.

3.8 Vegetation Condition Mapping

Vegetation condition was described using the vegetation condition scale presented in EPA (2016a) for the South West and Interzone Botanical Province (see Appendix A). Notes on vegetation condition were taken during the field survey via vehicle traverses along access tracks, and during foot traverses undertaken within the Study Area. Vegetation condition was also recorded at all quadrats. Vegetation condition category polygon boundaries were developed using this information and were digitised using GIS software as for VU polygon boundaries.

3.9 Significant Flora and Vegetation

3.9.1 Significant Flora

As per EPA (2016b), flora taxa may be significant for a range of reasons, including, but not limited to the following:

- Being identified as a Threatened or Priority species (formally listed significant taxa – includes taxa listed under both State and Commonwealth legislation, and classified as Priority by DBCA);
- Locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- New species or anomalous features that indicate a potential new species;
- Representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- Unusual species, including restricted subspecies, varieties or naturally occurring hybrids;
- Relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Significant flora taxa recorded within the Study Area are discussed in Section 5.2.2 with reference to the above categories. Point locations, individuals and populations of significant flora known from the Study Area are presented in this section. It is worthy of note that a population in the context of this survey is defined as a discrete group of individuals of a taxon separated by more than 500 m from the nearest discrete group of individuals (DBCA 2017); however, this definition can only be tentatively applied if the intervening 500 m has not been surveyed.

3.9.2 Significant Vegetation

As per EPA (2016b), vegetation may be significant for a range of reasons, including, but not limited to the following:

- Being identified as a TEC or PEC (formally listed significant vegetation – includes vegetation listed under Commonwealth or State legislation, or classified as a PEC by DBCA);
- Having restricted distribution;
- Degree of historical impact from threatening processes;
- A role as a refuge;
- Providing an important function required to maintain ecological integrity of a significant ecosystem.

With regard to TECs and PECs listed in Western Australia, only broad descriptions generally are provided in the respective lists to allow for diagnosis. The vegetation of the Study Area was therefore manually compared to such descriptions to determine whether any vegetation may represent a TEC or PEC.

With regard to TECs listed under the EPBC Act, the vegetation of the Study Area was assessed against the appropriate listing and conservation advice for any TECs likely to occur in the Study Area.

The remaining significant vegetation criteria listed above other than "being identified as a TEC and PEC" were applied to VUs mapped in the Study Area, to determine whether a VU is significant in a local or regional context. In a regional context, limited information is available for comparison with VUs in the Study Area; this is discussed further in Section 5.2.9.

4. ADEQUACY AND LIMITATIONS OF SURVEY

4.1 Adequacy of Survey

The Study Area covers 1,673 ha, with 60 quadrats established within it during this survey. Quadrats were established in all preliminary vegetation patterns discernable by initial aerial photograph interpretation (see Sections 3.3 and 3.4), both to adequately sample variation in vegetation throughout the Study Area, and to ensure adequacy of sampling for vascular plant taxa. The number of quadrats established in the Study Area is considered to be an acceptable number given the diversity of topography and soil types noted in the Study Area.

To provide an indication of the adequacy of this survey, a taxon accumulation curve was produced using PC-Ord (V 6) (McCune and Mefford 2011). Taxon accumulation curves represent a theoretical model of the relationship between sampling intensity and taxon accumulation; when sampling intensity is increased, taxon accumulation is reduced, and a taxon accumulation curve becomes asymptotic.

The taxon accumulation curve for quadrat data from the Study Area was generated using all native taxa (both annual and perennial) recorded within each quadrat. Taxon accumulation calculations for the Study Area were then undertaken via PC-Ord, utilising the Chao-2 estimator for species richness (Chao 1987) and compared to the actual number of taxa recorded in the Study Area. This gives some indication as to whether sufficient quadrats have been surveyed to adequately sample the species richness in the Study Area. As the generation

of species accumulation curves includes quadrat data only, and not opportunistically-recorded taxa, the indication of adequacy of survey provided is considered to be conservative.

Figure 5 presents the species accumulation curve generated from quadrat data from the Study Area. Using the Chao-2 estimator, the recorded number of taxa within quadrats (453 taxa) is equivalent to 83.5 % of the estimated taxon richness in the Study Area (542 estimated to occur). Sampling was therefore considered to be adequate using this estimation measure. It is of interest that the estimated number of taxa in the Study Area from quadrats only using Chao-2 was 542; when opportunistic records of taxa are included, 529 taxa were recorded in the Study Area (see Section 5.2.1), providing an indication that the Study Area was relatively well-sampled.

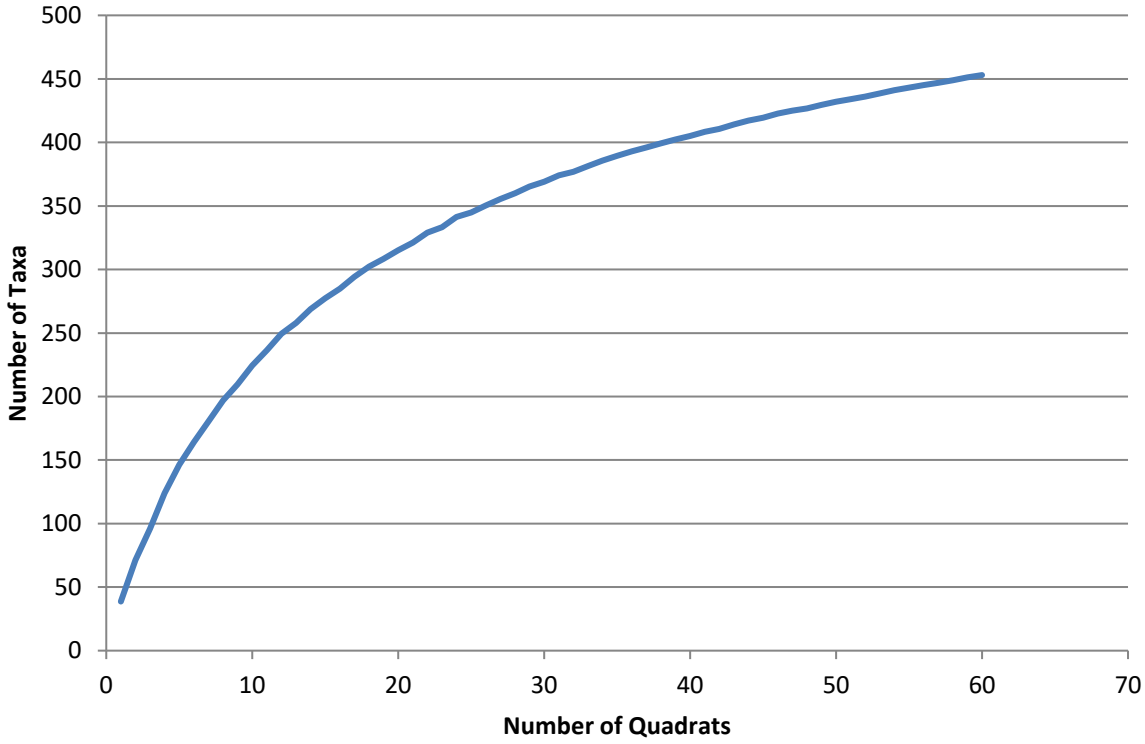


Figure 5: Study Area Species Accumulation Curve

Another adequacy of survey measure is that developed by Mueller-Dombois and Ellenberg (1974), who suggest that a cut-off point might be when a 10 % increase in quadrats surveyed results in a 5 % (or less) increase in taxa recorded. This measure was also calculated using all native taxa recorded within each quadrat. The number of quadrats established in the Study Area satisfies this adequacy measure suggested by Mueller-Dombois and Ellenberg (1974), with the final taxon increase value of 2.43 % recorded following a 10 % increase in quadrats.

4.2 Limitations of Assessment

Table 3 presents the limitations of the flora and vegetation survey of the Study Area in accordance with EPA (2016a).

Table 3: Limitations of the Flora and Vegetation Survey of the Study Area

Limitation	Limitation of Survey	Comment
Effort and Extent	No	A Detailed Survey was undertaken in September 2018, within the peak flowering season in the Esperance Plains region. Quadrats were established in each vegetation pattern identified in the Study Area. It is considered that the survey being conducted in the peak flowering season only is appropriate, as it is likely that most taxa that flower outside the peak flowering season could be identified during the surveys. *Rhizanthella johnstonii* (Threatened) (previously identified as potentially occurring in the Study Area), which is only visible from June-July, was specifically searched for during a separate visit (undertaken in July 2018). Targeted survey for significant flora taxa identified from the desktop study within appropriate habitat in the Development Envelope, as well as the wider Study Area, was undertaken at times of year appropriate for target taxa. No constraints prevented appropriate sampling techniques (quadrat establishment, foot transects) being employed.
Competency /experience of the team carrying out the survey	No	Team leaders have had extensive experience (>10 years) in conducting similar assessments in the south-west and have conducted numerous flora and vegetation surveys within the Esperance Plains bioregion. Other field team members also have previous experience in assisting with flora and vegetation surveys in the region. Personnel conducting plant identifications have had >10 years' experience in plant identification in the south-west as well as five years' experience in plant identification in the Esperance Plains bioregion.
Proportion of flora identified, recorded and/or collected.	Partial	All vascular groups that were present in the Study Area were sampled. A high proportion of perennial vascular taxa were recorded based on the intensity and method of survey, and almost all could be positively identified. A high proportion of annual vascular taxa were recorded based on the timing, intensity and method of survey, and above average rainfall prior to survey (see timing/weather/season/cycle below). Some annual taxa, as well as perennial taxa with annual above-ground parts, could not be detected because of the timing of survey; however, the number of such taxa is likely to be small. Unknown vascular taxa were collected, with specimens identified at the WA Herbarium. Adequacy of survey measures indicate a high percentage (83.5) of taxa expected to occur in the Study Area was recorded (Chao-2 estimator), and the number of quadrats established in the Study Area satisfies the criterion suggested by Mueller-Dombois and Ellenberg (1974), with a final increase of 2.43 % in species recorded per increase of 10 % of quadrats.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data	No	Reasonable contextual information for the Study Area was available prior to the survey. Sources of information used included government databases (DBCA), which are known to have been extensively populated with data from numerous surveys conducted in the general vicinity of the Study Area, as well as numerous general sources pertaining to the climate, geomorphology, flora and vegetation of the region, and several surveys conducted in the local area, including two that overlapped the Study Area.

Limitation	Limitation of Survey	Comment
Timing/weather/season/cycle	No	The field survey was conducted in early Spring, corresponding with what is considered the optimum flowering period for the Esperance Plains region. The 2018 and 2019 flowering periods were considered by Woodman Environmental to be good, with slightly above-average rainfall received from May - August in 2018 (249.8 mm compared to the long-term average of 230.6 mm), and slightly below-average rainfall received during the same period in 2019 (201.8 mm) (Bureau of Meteorology 2019). However, the months of September and October 2019 were warmer and drier than average, which may have affected the longevity of the flowering season for many species, and affected flowering of late-spring flowering species to some extent. A small number of taxa may not have been identified during the survey because they were not detectable or identifiable because of their flowering time, however, no such taxa are likely to be significant taxa. *Rhizanthella johnstonii* (T), which was considered to potentially occur in the Study Area by previous surveys, is only identifiable in winter; however, a separate visit to search for this taxon was undertaken. Several Priority flora taxa known from the Desktop Study Area are only identifiable during particular times in spring, however, separate visits in September and November 2019 were undertaken to target such taxa. Regional targeted survey for significant vegetation was undertaken in early Autumn 2020, when annual taxa were not present; however, it is considered that this did not have a significant impact on the results of the survey.
Disturbances (e.g. fire, flood, accidental human intervention etc.), which affected results of survey	No	Some historical disturbances associated with exploration were apparent; however, these did not appear to have significantly impacted the flora taxa present and are therefore not considered to have affected the results of the survey. A large proportion of the Study Area has been recently burnt; however, this also does not appear to have significantly impacted the results of relevant aspects of the survey, including vegetation mapping and floristic classification.
Remoteness and/or access problems	Partial	Vehicle access to the Study Area was somewhat limited, particularly in the central and eastern part; this affected the intensity of sampling in this area to an extent, as it took a significant amount of time to access this part of the Study Area on foot. Large portions of the recently burnt areas of the Study Area were also exceptionally thick, and foot traverses through such areas were very difficult; this also affected sampling locations and intensity to an extent. However, neither of these issues are considered to have had a significant bearing on the results of the survey. Similar issues were encountered during the regional targeted survey for significant vegetation, which affected the amount of vegetation that could be assessed during the survey.

5. RESULTS

5.1 Desktop Study

5.1.1 Regional Biodiversity Conservation and Linkages

There is no land reserved for conservation located adjacent to the Study Area; two conservation reserves are within 5 km of the Study Area (East Naemup and Munglinup Nature Reserves (Figure 1)), while there are several other areas approximately 20 km from the Study Area (Cheadanup, Cascade and Lake Shaster Nature Reserves, and Stokes National Park).

The Study Area forms part of the Munglinup River Macro Corridor, as defined by a joint South Coast Natural Resource Management Inc (as South Coast Regional Initiative Planning Team) and DBCA (as Department of Conservation and Land Management) report (Wilkins *et al.* 2006). The Munglinup River Macro Corridor is one of a number of macro corridors defined in the South Coast Macro Corridor Network (Wilkins *et al.* 2006). The recognition of macro corridors is based on the theory of landscape connectivity, which is recognised as an important factor in abating the decline in biodiversity through habitat fragmentation (Wilkins *et al.* 2006). Isolated conservation reserves such as national parks are often inadequate for the purposes of the long-term conservation of many species; consequently, great importance is now placed on conservation of off-reserve areas that connect reserves, which facilitate movement of species, and allow continuity of populations and ecological processes. The Munglinup River Macro Corridor is recognised as a near-continuous corridor of vegetation that links vegetation on the coast, including Lake Shaster Nature Reserve, to Cheadanup Nature Reserve and the adjacent Greater Western Woodlands (Wilkins *et al.* 2006).

5.1.2 Regional Flora

The interrogation of the DBCA WA Herbarium specimen database and TPFL database (DBCA 2019c) returned a total of 101 significant flora taxa that have records in the Desktop Study Area. This includes 12 Threatened taxa (listed under the BC Act) and 89 DBCA-classified Priority flora. These are presented in Table 4.

A search of these databases using NatureMap (DBCA 2007-) was also undertaken as part of the Desktop Study, to check for any recently added records and confirm the records returned from the DBCA WA Herbarium specimen database and TPFL database search. The NatureMap search returned two additional Priority flora taxa; a total of 103 significant flora taxa therefore have records in the Desktop Study Area (Table 4). Appendix C presents conservation codes for Western Australia flora (DBCA 2019c).

Table 4: Significant Flora Returned from DBCA Database Searches

Taxon	Status	Source
Acacia amyctica	P2	DBCA (2019c); NatureMap
Acacia bartlei	P3	DBCA (2019c); NatureMap
Acacia diminuta	P1	DBCA (2019c)
Acacia improcera	P3	DBCA (2019c); NatureMap
Acacia singula	P3	DBCA (2019c); NatureMap
Acrotriche orbicularis	T	DBCA (2019c)

Taxon	Status	Source
Allocasuarina hystricosa	P4	DBCA (2019c)
Anigozanthos bicolor subsp. *minor*	T	DBCA (2019c); NatureMap
Astartea reticulata	P3	DBCA (2019c); NatureMap
Astroloma sp. Grass Patch (A.J.G. Wilson 110)	P2	DBCA (2019c); NatureMap
Banksia lullfitzii	P3	DBCA (2019c); NatureMap
Banksia prolata subsp. *calcicola*	P4	DBCA (2019c); NatureMap
Banksia xylothemelia	P3	DBCA (2019c); NatureMap
Bentleya diminuta	P2	DBCA (2019c); NatureMap
Beyeria cockertonii	T	DBCA (2019c)
Beyeria villosa	P4	DBCA (2019c)
Bossiaea flexuosa	P3	DBCA (2019c); NatureMap
Brachyloma nguba	P1	DBCA (2019c); NatureMap
Caesia viscida	P2	DBCA (2019c)
Caladenia longifimbriata	P1	DBCA (2019c)
Chorizema circinale	P3	DBCA (2019c)
Commersonia rotundifolia	P3	DBCA (2019c); NatureMap
Conostephium sp. Cascades (R. Bruhn 24/899 CAS)	P1	DBCA (2019c); NatureMap
Conostylis lepidospermoides	T	DBCA (2019c); NatureMap
Corybas limpidus	P4	DBCA (2019c); NatureMap
Cryptandra polyclada subsp. *polyclada*	P3	DBCA (2019c); NatureMap
Cyanicula sp. Esperance (G. Brockman 735)	P1	DBCA (2019c); NatureMap
Dampiera deltoidea	P4	DBCA (2019c)
Dampiera orchardii	P2	DBCA (2019c); NatureMap
Dampiera sericantha	P3	DBCA (2019c); NatureMap
Daviesia pauciflora	P3	DBCA (2019c); NatureMap
Drosera grievei	P1	DBCA (2019c)
Eremophila chamaephila	P3	DBCA (2019c); NatureMap
Eremophila compressa	P3	DBCA (2019c); NatureMap
Eremophila denticulata subsp. *denticulata*	T	DBCA (2019c); NatureMap
Eremophila serpens	P4	DBCA (2019c); NatureMap
Eremophila subteretifolia	T	DBCA (2019c); NatureMap
Eucalyptus dielsii x *platypus*	P1	DBCA (2019c); NatureMap
Eucalyptus litorea	P2	DBCA (2019c); NatureMap
Eucalyptus preissiana subsp. *lobata*	P4	DBCA (2019c); NatureMap
Eucalyptus purpurata	T	DBCA (2019c)
Eucalyptus semiglobosa	P3	DBCA (2019c); NatureMap
Eucalyptus stoatei	P4	DBCA (2019c); NatureMap
Eucalyptus x *missilis*	P4	DBCA (2019c); NatureMap
Gastrolobium cruciatum	P3	DBCA (2019c)
Goodenia laevis subsp. *laevis*	P3	DBCA (2019c); NatureMap
Goodenia phillipsiae	P4	DBCA (2019c); NatureMap
Grevillea aneura	P4	DBCA (2019c); NatureMap
Grevillea fastigiata	P4	DBCA (2019c); NatureMap
Grevillea punctata	P3	DBCA (2019c)
Gyrostemon ditrigynus	P4	DBCA (2019c); NatureMap
Hibbertia abyssus	T	DBCA (2019c)
Hibbertia carinata	P1	DBCA (2019c)
Hopkinsia adscendens	P3	DBCA (2019c); NatureMap
Hydrocotyle eichleri	P3	DBCA (2019c)
Hydrocotyle papilionella	P2	DBCA (2019c); NatureMap
Hydrocotyle tuberculata	P2	DBCA (2019c)

Taxon	Status	Source
Hypocalymma sp. Cascade (R. Bruhn 20896)	T	DBCA (2019c); NatureMap
Isolepis australiensis	P3	DBCA (2019c)
Kunzea similis subsp. *mediterranea*	T	DBCA (2019c)
Lasiopetalum parvuliflorum	P3	DBCA (2019c); NatureMap
Lepidium pseudotasmanicum	P4	DBCA (2019c); NatureMap
Lepidosperma sp. Hopetoun Road (S. Kern et al. LCH 16552)	P1	DBCA (2019c); NatureMap
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596)	P1	DBCA (2019c)
Lepidosperma sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764)	P1	DBCA (2019c)
Leucopogon blepharolepis	P4	DBCA (2019c); NatureMap
Leucopogon sp. Cascades (M. Hislop 3693)	P1	NatureMap
Leucopogon sp. Lake Magenta (K.R. Newbey 3387)	P1	DBCA (2019c)
Leucopogon sp. Lake Tay (W.R. Archer 2104138)	P1	DBCA (2019c)
Levenhookia pulcherrima	P3	DBCA (2019c); NatureMap
Melaleuca dempta	P3	DBCA (2019c); NatureMap
Melaleuca fissurata	P4	DBCA (2019c)
Melaleuca penicula	P4	DBCA (2019c)
Melaleuca similis	P1	DBCA (2019c); NatureMap
Microcybe pauciflora subsp. *grandis*	P1	DBCA (2019c)
Micromyrtus navicularis	P3	DBCA (2019c)
Mirbelia densiflora	P3	DBCA (2019c); NatureMap
Opercularia acolytantha	P3	DBCA (2019c); NatureMap
Patersonia inaequalis	P2	DBCA (2019c)
Persoonia brevirhachis	P3	DBCA (2019c); NatureMap
Persoonia flexifolia	P1	DBCA (2019c); NatureMap
Persoonia scabra	P3	DBCA (2019c); NatureMap
Philotheca gardneri subsp. *globosa*	P1	DBCA (2019c)
Prostanthera splendens	P1	DBCA (2019c)
Pultenaea adunca	P3	DBCA (2019c); NatureMap
Pultenaea calycina subsp. *proxena*	P4	DBCA (2019c); NatureMap
Pultenaea craigiana	P3	NatureMap
Pultenaea daena	P3	DBCA (2019c); NatureMap
Rhizanthella johnstonii	T	DBCA (2019c); NatureMap
Ricinocarpos trichophorus	T	DBCA (2019c); NatureMap
Scaevola archeriana	P1	DBCA (2019c); NatureMap
Scaevola paludosa	P2	DBCA (2019c)
Scaevola tortuosa	P1	DBCA (2019c); NatureMap
Sphaerolobium validum	P3	DBCA (2019c)
Stachystemon vinosus	P4	DBCA (2019c); NatureMap
Stylidium pulviniforme	P3	DBCA (2019c); NatureMap
Stylidium thylax	P2	DBCA (2019c)
Synaphea platyphylla	P3	DBCA (2019c); NatureMap
Thomasia pygmaea	P3	DBCA (2019c); NatureMap
Thysanotus brachiatus	P2	DBCA (2019c); NatureMap
Thysanotus parviflorus	P4	DBCA (2019c); NatureMap
Tricostularia sp. Lake King (A.M. Coates 2298)	P2	DBCA (2019c)
Velleia exigua	P2	DBCA (2019c); NatureMap

The search of the DoEE SPRAT database (DoEE 2019a) with regard to MNES listed under the EPBC Act returned nine flora taxa listed as Threatened Species, or habitat for Threatened Species, that are likely to occur in the Desktop Study Area, as listed below:

- *Anigozanthos bicolor* subsp. *minor*;
- *Conostylis lepidospermoides*;
- *Eremophila denticulata* subsp. *denticulata*;
- *Eremophila lactea*;
- *Eremophila subteretifolia*;
- *Kennedia glabrata*;
- *Lambertia echinata* subsp. *echinata*;
- *Ricinocarpos trichophorus*; and
- *Roycea pycnophylloides*.

The search of the DoEE SPRAT database with regard to MNES listed under the EPBC Act identified four significant invasive introduced flora taxa, or habitat for these taxa, is likely to or may occur within the Desktop Study Area including *Asparagus asparagoides*, *Carrichtera annua*, *Lycium ferocissimum* and *Tamarix aphylla* (DoEE 2019a). The full results of the DoEE database search are presented in Appendix D.

A search of the WA Herbarium specimen database for records of introduced taxa within the Desktop Study Area was performed using NatureMap (DBCA 2007-). A total of 49 introduced taxa that have records in the Desktop Study Area were returned. These taxa are presented in Section 5.1.6. No Declared Pests listed under the BAM Act (Department of Primary Industries and Regional Development (DPIRD) 2018) and no listed Weeds of National Significance (WoNS) (Australian Weeds Committee (AWC) 2018) were returned by the search.

An assessment of the taxonomic and conservation status of *Lepidosperma* taxa from the Ravensthorpe Range area has previously been undertaken (Barrett *et al.* 2009). *Lepidosperma* has been under revision for some time, however there are many putative new taxa that require taxonomic resolution, and therefore identification of collections is difficult. This assessment identified 42 putative taxa in the Ravensthorpe Range area, however many taxa are not yet formally listed on the Census of Vascular Plant Taxa in Western Australia (WA Herbarium 1998-), as they require further study. Thirteen taxa identified by Barrett *et al.* 2009) are considered to be of significance; eight of these are Priority flora taxa, with the remainder having no formal ranking, as they are not listed on the Census of Vascular Plant Taxa in Western Australia. These taxa were:

- *Lepidosperma* sp. Archer Drive (S. Kern & R. Jasper LCH 18300) (P1);
- *Lepidosperma* sp. Elverdton (R. Jasper et al. LCH 16844) (P1);
- *Lepidosperma* sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844) (P1);
- *Lepidosperma* sp. Mt Chester (S. Kern et al. LCH 16596) (P1);
- *Lepidosperma* sp. Mt Short (S. Kern et al. LCH 17510) (P1);
- *Lepidosperma* sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764) (P1);
- *Lepidosperma* sp. Hopetoun Road (S. Kern et al. LCH 16552) (P3);
- *Lepidosperma* sp. Shoemaker Levy (L. Ang & O. Davies 10815) (P3);
- *Lepidosperma* sp. 'Fitzgerald River (A.S. George 9935)';
- *Lepidosperma* sp. 'Floater Road (R.L. Barrett RLB 2765)';

- *Lepidosperma* sp. 'Pallerup Rocks (R.L. Barrett RLB 3449)';
- *Lepidosperma* sp. 'Ravensthorpe Range (R.L. Barrett RLB 2766)'; and
- *Lepidosperma* sp. 'Tamarine Road (S. Kern et al. LCH 16711)'.

5.1.3 Regional Vegetation

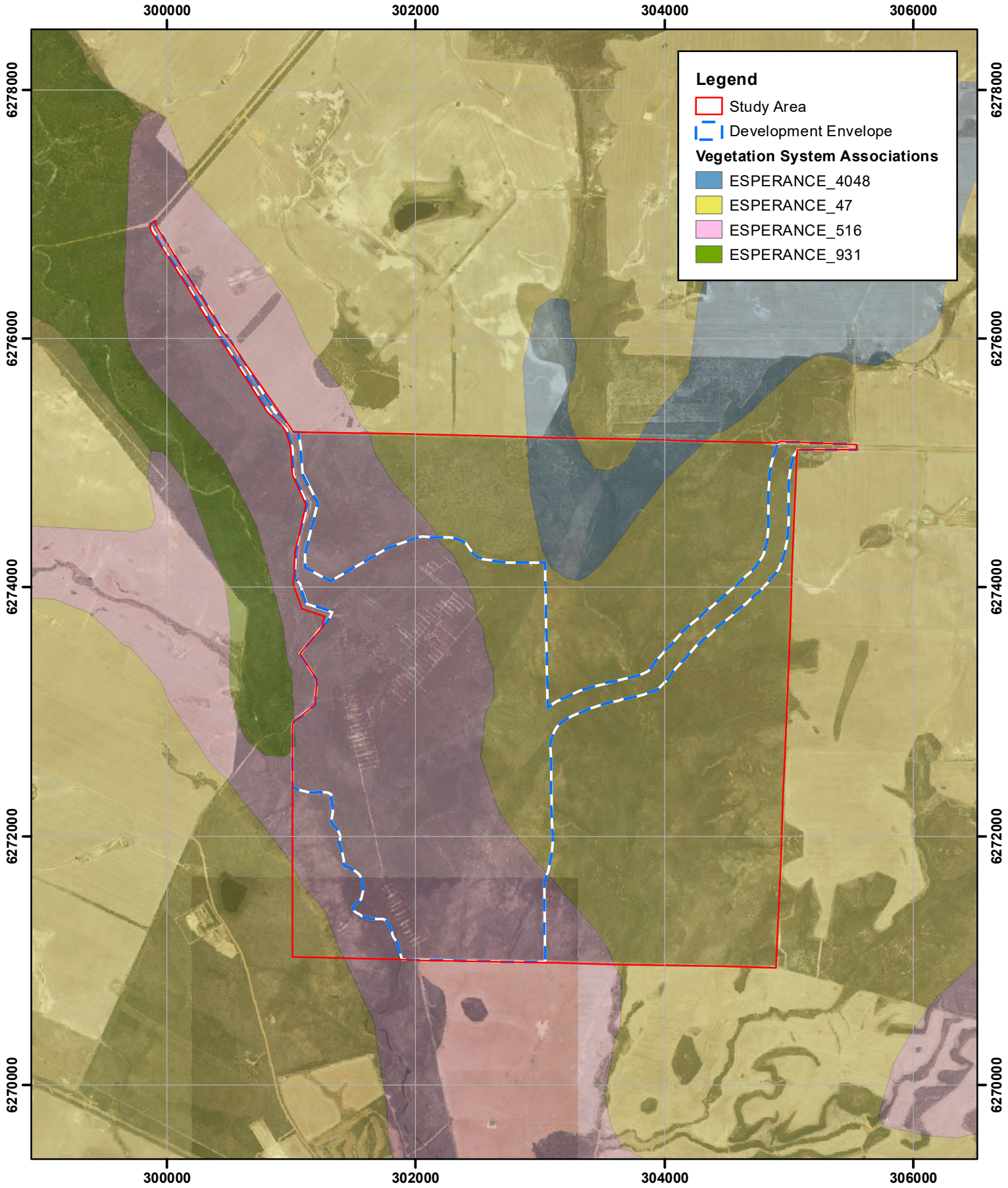
As previously mentioned, the Study Area is located in the Esperance Plains Interim Biogeographic Regionalisation for Australia (IBRA) region (Commonwealth of Australia 2012). The Esperance Plains IBRA region is equivalent to the Eyre Botanical District as defined by Beard (1990). The vegetation of this IBRA region is characterised by a mallee-heath formation on the predominant sand plains, with the most dominant mallee species being *Eucalyptus pleurocarpa* (Tallerack), and the heath understorey dominated by proteaceous and myrtaceous shrubs (Beard 1990; Comer *et al.* 2001). Herbfields and heaths occur on granite tors and quartzite ranges that rise from the plains, while Eucalypt mallee and woodlands occur in gullies and alluvial foot-slopes (Beard 1990; Comer *et al.* 2001). Thickets and scrub occur on dunes close to the coast, with thickets and heaths occurring in swampy areas. There are several large salt lakes on the plain (Beard 1990).

Within this IBRA region, the Study Area is located within the Recherche IBRA subregion, (Commonwealth of Australia 2012). The vegetation of the Recherche subregion comprises heath, coastal dune scrub, mallee, mallee-heath and granite heath (Comer *et al.* 2001).

The vegetation of Western Australia as it was presumed to have existed prior to European settlement has been mapped at a scale of 1:250,000 as vegetation system associations, with the Pre-European Vegetation spatial database created (Beard *et al.* 2013). Four vegetation system associations occur in the Study Area, as summarised in Table 5 and presented on Figure 6. Table 5 also presents the current extent of each vegetation system association in relation to its pre-European extent and the percentage of the current extent of each vegetation system association currently protected for conservation (Government of Western Australia 2019). Of the four vegetation system associations that occur within the Study Area, two (Esperance 47 and Esperance 4048) have around 15 % of their pre-European extent remaining, with the remaining two vegetation system associations being relatively well-represent compared to pre-European extent (about 40 %). None of the vegetation system associations occurring in the Study Area are particularly well-represented in lands protected for conservation (all less than 15 % of their current extents).

Table 5: Vegetation System Associations Occurring in the Study Area

Vegetation System Association	Description	Current Extent (ha)	Percentage of Pre-European Extent Remaining	Percentage of Current Extent Protected for Conservation
Esperance 47	Shrublands; tallerack (*Eucalyptus pleurocarpa*) mallee-heath	61,386	14.9	11.2
Esperance 516	Shrublands; mallee scrub, black marlock (*Eucalyptus redunca* and allies)	46,651	40.7	9.7
Esperance 931	Medium woodland; yate (*Eucalyptus occidentalis*)	2,745	39.0	4.7
Esperance 4048	Shrublands; scrub-heath in the Esperence Plains including Mt Ragged scrub-heath	2,927	15.9	12.9



Vegetation System Associations of the Study Area	Author: Leah Firth	N
	WEC Ref: MRC19-48-02	
WOODMAN ENVIRONMENTAL	Filename: MRC19-48-02-f06.mxd	**Figure**
	Scale: 1:40,000 (A4)	6
	Projection: GDA 1994 MGA Zone 51	
This map should only be used in conjunction with WEC report MRC19-48-02.	Revision: 1 - 27 October 2020	

The interrogation of the DBCA TEC and PEC database (DBCA 2018b as per Section 3.1) returned two significant communities that have records (represented by buffer polygons) within the Desktop Study Area, being:

- Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia: TEC (Endangered) – EPBC Act; PEC (P3) –DBCA-classified; and
- Subtropical and Temperate Coastal Saltmarsh: TEC (Vulnerable) – EPBC Act; PEC (P3) –DBCA-classified.

The search returned numerous records of the Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC within both the Desktop Study Area and the Study Area. The Subtropical and Temperate Coastal Saltmarsh TEC is represented by one record within the Desktop Study Area, located approximately 28 km south-east of the Study Area on the coast.

Appendix E presents definitions, categories and criteria for TECs and PECs (DBCA 2013).

The search of the DoEE SPRAT database with regard to MNES listed under the EPBC Act (DoEE 2019a) returned two TECs listed under the EPBC Act, being:

- Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC (Endangered); and
- Eucalypt Woodlands of the Western Australian Wheatbelt TEC (Critically Endangered).

The Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC is discussed above. The Eucalypt Woodlands of the Western Australian Wheatbelt TEC 'may occur within the search area' according to the search results. However, the Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt TEC stipulates that the distribution of this TEC is limited to the AVW1 Merriden, AVW2 Katanning and MAL2 Western Mallee IBRA Subregions, and some eastern parts of the JAF1 Northern Jarrah Forest and JAF2 Southern Jarrah Forest Subregions (Threatened Species Scientific Committee 2015). As the Study Area is located in ESP2 Recherche IBRA Subregion, the Eucalypt Woodlands of the Western Australian Wheatbelt TEC cannot occur in the Study Area. It is therefore not discussed further in this report.

The results of this search are presented in Appendix D.

5.1.4 Local Flora and Vegetation Surveys

5.1.4.1 Previous Surveys Conducted for the Project

As mentioned in Section 1.4, Ecologia Environment (Ecologia) undertook a Level 2 Flora and Vegetation Assessment of the Munglinup Graphite Project, which considered most of the Study Area (Ecologia 2015). A total of 310 plant taxa were recorded during the survey including three current significant taxa as listed below:

- *Commersonia rotundifolia* (P3);
- *Lasiopetalum* ?*parviuliflorum* (P3); and
- *Pultenaea calycina* subsp. *proxena* (P4).

The pre-survey desktop review component of the report also indicated that a number of other significant taxa were likely to occur in the area surveyed, including the Threatened taxon *Rhizanthella gardneri* (now known to be *Rhizanthella johnstonii* (Threatened)), however this was not addressed further in Ecologia's report. However, it should be noted that the rating of the potential occurrence of *Rhizanthella johnstonii* in the Study Area as "likely" by Ecologia (2015), based on records being within 2 km of the Study Area, appears incorrect; further investigation of the records within 2 km of the Study Area indicates that these records have erroneous coordinates, with their geographic locality descriptions all placing them at the same known population, located approximately 15 km north-west of the Study Area. It should have been rated as "possible" under the rating system provided in the Ecologia (2015) report.

A total of 15 introduced species were recorded during the survey (including taxa recorded from the wider vicinity), none of which are listed as Declared Plants (Table 7).

A total of five vegetation units were mapped within the survey area (including the study area and wider remnant vegetation block that the study area is located within). Of these, the vegetation unit *EpleBaMt* was considered to be associated with the Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC. The extent of the TEC in the study area was described as likely to be scattered patches associated with vegetation unit *EpleBaMt*, however no attempt was made to address the spatial distribution of the TEC (Ecologia 2015).

5.1.4.2 Previous Surveys Conducted in the Vicinity of the Study Area

One further flora and vegetation survey is known to have been conducted in the general vicinity of the Study Area. GHD Pty Ltd (GHD) (2006) undertook a flora and vegetation survey of South Coast Highway Passing Lanes 3 and 4, located approximately 4.4 km south-west and 1.9 km south of the Study Area respectively. This survey recorded 235 plant taxa. No flora taxa currently listed significant taxa were recorded during the survey. A total of 40 introduced species were recorded, none of which are listed as Declared Plants (Table 7).

One vegetation unit was identified within the area surveyed, described as Tallerack Mallee-heath. The vegetation was not described as having any affiliation with any listed TECs (GHD 2006).

5.1.5 Summary of Significant Flora

A list of significant flora taxa known from within the Desktop Study Area is presented in Table 6. This list has been compiled from the results of searches of DBCA's Threatened Flora Databases, DoEE's SPRAT Database, and the results of local surveys as outlined in Section 5.1.4. Table 6 also presents the flowering period and habitat for each taxon (WA Herbarium 2018).

A total of 107 significant taxa are known from within the Desktop Study Area; including 16 Threatened taxa and 91 DBCA-classified Priority flora. These are presented on Figure 7.1, with the legend presented on Figure 7.2. Of these, there are two confirmed taxa that have records within the Study Area (highlighted in yellow in Table 6). Ecologia (2015) recorded *Lasiopetalum* ?*parvuliflorum* within the Study Area (also highlighted in yellow in Table 6).

However, the identification was not confirmed due to lack of flowering material (see Section 5.1.4).

Table 6: Significant Flora Taxa Known from Within the Desktop Study Area

Taxon	Status	Source*	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)
Acacia amyctica	P2	DBCA	August - September	Sandy loam or clay. Flats.
Acacia bartlei	P3	DBCA	August - September	Sandy loam. Undulating plains, depressions.
Acacia diminuta	P1	DBCA	October - November	Sandy clay, sandy loam.
Acacia improcera	P3	DBCA	August	Sand, loamy clay, clay. Undulating plains, flats.
Acacia singula	P3	DBCA	August - October	Gravelly sand over laterite, white or yellow sand. Rises, hilltops.
Acrotriche orbicularis	T	DBCA	July, October.	Grey to brown clay loam. Magnesite. Hill slopes and rises.
Allocasuarina hystricosa	P4	DBCA	February, May	Orange, red or brown loam with limestone or granite outcropping. Plains, lower slopes, hilltops.
Anigozanthos bicolor subsp. *minor*	T	DBCA; DoEE	August - October	Sand, often with granite. Well-watered sites. Sandplains, hills.
Astartea reticulata	P3	DBCA	October, December, January - February,	Sand, sandy loam. Drainage lines, winter wet flats.
Astroloma sp. Grass Patch (A.J.G. Wilson 110)	P2	DBCA	June - August	White/grey sand. Edge of salt lakes.
Banksia lullfitzii	P3	DBCA	March - May	Yellow sand. Flat to undulating sandplains.
Banksia prolata subsp. *calcicola*	P4	DBCA	July - September	White sand over limestone. Coastal areas.
Banksia xylothemelia	P3	DBCA	September - October	Sandy loam, usually over laterite. Sandplains.
Bentleya diminuta	P2	DBCA	September - November	Sandy clay or loam. Undulating plains and slopes.
Beyeria cockertonii	T	DBCA	May, October	Clay with komatiite fragments. Hills and slopes.
Beyeria villosa	P4	DBCA	March, May	Brown sandy clay loam or calcareous loam, often with magnesite fragments. Low undulating hills.
Bossiaea flexuosa	P3	DBCA	September - November	Sandy soil. Sandplains, saline areas, low rises
Brachyloma nguba	P1	DBCA	April - May	Sand, sandy clay or loam. Plains, upper slopes, flats.
Caesia viscida	P2	DBCA	November	Grey sand. Low dunes.
Caladenia longifimbriata	P1	DBCA	September - October	Seasonal creeks.
Chorizema circinale	P3	DBCA	September - December	Yellow sand, sandy clay with gravel. Flats, plains.
Commersonia rotundifolia	P3	DBCA; Ecologia	August -November	Grey clay loam or clay. Hills, slopes.
Conostephium sp. Cascades (R. Bruhn 24/899 CAS)	P1	DBCA	August	Yellow to brown sandy loam. Low plains, flats.

Taxon	Status	Source*	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)
Conostylis lepidospermoides	T	DBCA; DoEE	September - October	Grey or yellow-brown sand over laterite. Undulating plains.
Corybas limpidus	P4	DBCA	August -September	Coastal dunes.
Cryptandra polyclada subsp. *polyclada*	P3	DBCA	January – May, August - October	Sand. Sandplains.
Cyanicula sp. Esperance (G. Brockman 735)	P1	DBCA	September	Sandy heathlands.
Dampiera deltoidea	P4	DBCA	September - November	Sand, sandy clay, loam often with laterite. Hills, slopes.
Dampiera orchardii	P2	DBCA	Not specified	Sand. Salt lakes.
Dampiera sericantha	P3	DBCA	May, August - December	Grey-white or yellow sand. Plains, flats.
Daviesia pauciflora	P3	DBCA	October – December, January.	White or grey sand over laterite or limestone. Flats, plains.
Drosera grievei	P1	DBCA	September	Sandy clay or sand, often with laterite gravel. Undulating plains
Eremophila chamaephila	P3	DBCA	November - December	Clay, sandy clay. Plains, flats, wetlands.
Eremophila compressa	P3	DBCA	October – December, March.	Red brown clay or clay loam, sandy loam. Undulating plains, flats.
Eremophila denticulata subsp. *denticulata*	T	DBCA; DoEE	August – December, January - February	Alluvium, sand, sandy clay loam. River beds and plains, laterite breakaways.
Eremophila lactea	T	DoEE	September - November	White sandy clay loam often with limestone. Flats and undulating plains.
Eremophila serpens	P4	DBCA	September – December, March - May	White/grey sand, alluvium, loam. Winter-wet depressions, sub-saline flats, drainage lines, salt lakes.
Eremophila subteretifolia	T	DBCA; DoEE	November - December	Grey sand, loam. Edges of salt lakes, sub-saline flats.
Eucalyptus dielsii x *platypus*	P1	DBCA	Not specified	Moderately-drained clay loam. Moderately exposed, almost flat plains, gilgai plains.
Eucalyptus litorea	P2	DBCA	March	Sand, sandy clay loam. Coastal dunes, salt lakes.
Eucalyptus preissiana subsp. *lobata*	P4	DBCA	November	Sand. Coastal limestone rises and sand dunes.
Eucalyptus purpurata	T	DBCA	November	White powdery loam, magnesite. Eastern and north-eastern slopes of ridges.
Eucalyptus semiglobosa	P3	DBCA	May, October – December, January	White sand over laterite, silty sand on edge of granite shelf, limestone. Hillslopes, gullies, cliffs.
Eucalyptus stoatei	P4	DBCA	July – August, October – December, January - February	Gravelly sand or clay, sandy loam. Flats, rises.
Eucalyptus x *missilis*	P4	DBCA	January - April	Sand over limestone or granite. Coastal sites.
Gastrolobium cruciatum	P3	DBCA	September	Sand and clayey sand with gravel, rocky loams, laterite. Flats, gently undulating areas.

Taxon	Status	Source*	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)
Goodenia laevis subsp. *laevis*	P3	DBCA	August - December	Sandy loam, clay. Sometimes with laterite or limestone. Flats, plains.
Goodenia phillipsiae	P4	DBCA	November	Clay loam or clay often with laterite or quartz fragments. Undulating plains and hills.
Grevillea aneura	P4	DBCA	June, August – December, January.	Sand, sandy clay, gravel. Undulating plains, low rises.
Grevillea fastigiata	P4	DBCA	January	Red to brown clay, magnesite/ komatiite fragments, granite. Hills, slopes
Grevillea punctata	P3	DBCA	April – May, November	Stony red loam, red clay. Low undulating hills
Gyrostemon ditrigynus	P4	DBCA	October - November	Sand, sandy clay, loam. Plains, low ironstone ridges.
Hibbertia abyssus	T	DBCA	September - November	Sandy loam/clay with laterite. Rocky hills and breakaways.
Hibbertia carinata	P1	DBCA	August - September	Well-drained gravelly sand, yellow sand with gravel. Undulating plains.
Hopkinsia adscendens	P3	DBCA	October	Sand. Drainage line/lake edges, sandplains, saline areas.
Hydrocotyle eichleri	P3	DBCA	September	Grey to brown sand. Salt lake margins.
Hydrocotyle papilionella	P2	DBCA	September	Grey to brown sand. Salt lake edges, flats, granite outcrops.
Hydrocotyle tuberculata	P2	DBCA	October	Loamy sand/loam. Salt lake edges, drainage lines.
Hypocalymma sp. Cascade (R. Bruhn 20896)	T	DBCA	August	Sandy loam sometimes with granite. Undulating plains and gentle slopes.
Isolepis australiensis	P3	DBCA	June or September	Silty sand, sandy clay. Lake margins, pools.
Kennedia glabrata	T	DoEE	August - November	Soil pockets, sandy soils. Granite outcrops.
Kunzea similis subsp. *mediterranea*	T	DBCA	September - October	Grey loamy sand over laterite. Ridge tops.
Lambertia echinata subsp. *echinata*	T	DoEE	September - October	Gravelly sandy loam, brown sandy loam, white-grey sand, granite, laterite. Below and between rock outcrops, slopes, hill crests.
Lasiopetalum parvuliflorum / Lasiopetalum ?parvuliflorum	P3	DBCA; Ecologia	September - October	Sand, gravelly loam. Along creeks, seasonal swamps.
Lepidium pseudotasmanicum	P4	DBCA	February, December	Loam or sand, often with granite. Hillslopes, creek edges and flats.
Lepidosperma sp. Hopetoun Road (S. Kern et al. LCH 16552)	P1	DBCA	Not known	Clayey sand, clay loam. Lower slopes to hill crests.
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596)	P1	DBCA	Not known	Undulating plains, lower slopes to crests. Clay and clay loam, with quartz/ironstone/mafic gravel.

Taxon	Status	Source*	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)
Lepidosperma sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764)	P1	DBCA	Not known	Lower to upper slopes of hills. Clayey sand or clay loam with silcrete or laterite fragments.
Leucopogon blepharolepis	P4	DBCA	August - December	White/grey sand, calcareous sand, sandy clay over quartzite. Sandy ridges, sandplains, hills.
Leucopogon sp. Cascades (M. Hislop 3693)	P1	DBCA	April – September	Sandy loam soils, sometimes over laterite. Plains, valley slopes.
Leucopogon sp. Lake Magenta (K.R. Newbey 3387)	P1	DBCA	November	Undulating plains and slopes. Sand and loamy sand, sometimes over laterite.
Leucopogon sp. Lake Tay (W.R. Archer 2104138)	P1	DBCA	August	Deep white/grey sand.
Levenhookia pulcherrima	P3	DBCA	October - November	White/grey sand. Plains and hill slopes.
Melaleuca dempta	P3	DBCA	August - October	White to brown clayey sand or clay. Salt lake edges, flats and plains.
Melaleuca fissurata	P4	DBCA	July - August	White/grey sand, sandy loam. Samphire flats, salt pans.
Melaleuca penicula	P4	DBCA	January - February	Red/brown loamy sand or red sandy clay. Granite outcrops, valley slopes.
Melaleuca similis	P1	DBCA	November	Grey sand. Margins of saline drainage lines.
Microcybe pauciflora subsp. *grandis*	P1	DBCA	October	Clay-loam or loam sometimes with saprolite/ magnesite fragments. Upper slopes.
Micromyrtus navicularis	P3	DBCA	April – May, September - October	Sand with gravel, laterite, granite. Hill slopes.
Mirbelia densiflora	P3	DBCA	October, January	Stony loam, loamy sand. Small ridges, breakaways, undulating plains.
Opercularia acolytantha	P3	DBCA	October - November	White/grey or yellow sandy loam/sand often over laterite. Plains and flats.
Patersonia inaequalis	P2	DBCA	August - October	Sandy clay, lateritic or granitic sand. Hills, slopes and ridges with granite outcropping.
Persoonia brevirhachis	P3	DBCA	August - October	White or yellow sand, gravelly sandy soils. Hilltops, slopes and flats.
Persoonia flexifolia	P1	DBCA	December, January	Lateritic soils with granitic rock. River banks.
Persoonia scabra	P3	DBCA	November – December, January	White sand or sandy loam. Lower slopes, plains and consolidated dunes.
Philotheca gardneri subsp. *globosa*	P1	DBCA	May - July	Sandy loam or sandy clay. Undulating plains, flats.
Prostanthera splendens	P1	DBCA	August - October	Stony loam, shallow soils with ironstone pebbles. Breakaways.
Pultenaea adunca	P3	DBCA	March, October	White/grey sand. Slopes, ridges and plains.

Taxon	Status	Source*	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)
Pultenaea calycina subsp. *proxena*	P4	DBCA; Ecologia	September - October	Sand, clay, sandy clay or loam, with gravel, often with magnesite outcropping. Slopes of hills and rises.
Pultenaea craigiana	P3	DBCA	August – November	Calcareous loam, often over schist or quartz. Low hills.
Pultenaea daena	P3	DBCA	March, November	White/yellow sand or sandy loam, sometimes with limestone and laterite gravel. Gently undulating plains, flats, salt lake edges.
Rhizanthella johnstonii	T	DBCA	June - July	Under *Melaleuca uncinata*/ *hamata* mallee heath (DBCA 2010) in sandy clay soil.
Ricinocarpos trichophorus	T	DBCA; DoEE	May, August - September	Sandy clay, loam. Breakaways, among sandstone rocks.
Roycea pycnophylloides	T	DoEE	September	Sandy soils, clay. Saline flats.
Scaevola archeriana	P1	DBCA	January, December	Sandy and sandy-clay loam soils. Sandplains, adjacent to salt lakes.
Scaevola paludosa	P2	DBCA	September December	Peat or sand. Plains and flats.
Scaevola tortuosa	P1	DBCA	October	Sandy clay. Margins of salt lakes.
Sphaerolobium validum	P3	DBCA	September	White-grey sand, red-brown clayey sand, laterite gravel and quartz pebbles. Gently undulating areas, flats.
Stachystemon vinosus	P4	DBCA	September - November	Fine loamy sand, stony soils. Sandplains, rock crevices on breakaways.
Stylidium pulviniforme	P3	DBCA	September - November	White sand. Winter-wet areas and edges of salt lakes.
Stylidium thylax	P2	DBCA	October	Sand. Gentle slopes and plains. Heath, mallee shrubland.
Synaphea platyphylla	P3	DBCA	September - October	Sandy loam and sand sometimes with laterite gravel. Plains and flats.
Thomasia pygmaea	P3	DBCA	August - October	Stony sandy loam, clayey sand. Flats, marine plains.
Thysanotus brachiatus	P2	DBCA	November - December	Grey sand. Sandplains.
Thysanotus parviflorus	P4	DBCA	October - November	Sandy silcrete soils, sand or sandy loam. Hillslopes, flats.
Tricostularia sp. Lake King (A.M. Coates 2298)	P2	DBCA	June, October - November	Sandy soils, sometimes with laterite gravel. Undulating plains
Velleia exigua	P2	DBCA	October	Grey sandy clay or sand. Salt lake edges.

*Sources are:
DBCA – DBCA (2007-; 2019c) (see Section 3.1);
DoEE – SPRAT Database (DoEE 2019a) (see Section 3.1)
Ecologia – Ecologia (2015)

260000 280000 300000 320000 340000

6320000 6280000 6260000 6240000 6220000

Aba Bxy Gane Scpa Pgag Gane Bng GditAam Aam Glal Lpu Msin Cpop Asi Asi Gane Bdim Gdit HsCa HsCa HsCa Gane Ech Ech Esto Esub Cle Mden Gane Cle Psc Crot Dor Esto Cle Esto Cle Esto Rjo Edxp Ese Esto Oac CspC Msi Msi AspGP AspGP Sarc Dpa CspC Dpa Mdem Oac Eded Eded Eded Dor Eded Cle Cle Eded Esto Dpa Esto Svi Cle Svi Cle Ech Eded Pda Cle Cle Cle Rjo Rjo Svi Svi Eded Eded Aim Stor Cle Cle Rjo Rjo Rjo Rjo Cle Rjo Rjo Lpse Dpa Cle Cle Cle Hpap Tbra Cle Cle Bfl Dse Spul Msi Msi Edxp Tpar Cle Cle Eco Blu Gphi Cle Cle Cle Cle Cle Pcap Crot Tpy Eco Msi Spl Esto Msi Esto Esem Cle Cle Had Rtr Rtr Cle Lpa Had Pbr Spl Cle Cle Spl Spl Pad Svi Rjo Cle Dpa Gfa Dse Had Cle Dpa Dse LspHR Had Pfl Tpy Cle Cle Tpy Dse Eprl Esem Lbl Vex Lbl Bprc Eprl Eli Aret Exmi Exmi Vex Abim Dse Aret Aret Aret Eprl Lbl Lbl Lbl Lbl Bprc Eli Dse CsEs Eli Eli Abim Abim Abim Abim Eli Eli Eli Eli Cli Dse Eprl Eprl Eli Eli Eprl

Legend

Study Area

Desktop Study Area

Significant Flora

- Aam *Acacia amyctica* (P2)
- Aba *Acacia bartlei* (P3)
- Aim *Acacia improcera* (P3)
- Asi *Acacia singula* (P3)
- Abim *Anigozanthos bicolor* subsp. *minor* (T)
- Aret *Astartea reticulata* (P3)
- AspGP *Astroloma* sp. Grass Patch (A.J.G. Wilson 110)
- Blu *Banksia lullfitzii* (P3)
- Bprc *Banksia prolata* subsp. *calcicola* (P4)
- Bxy *Banksia xylothemelia* (P3)
- Bdim *Bentleya diminuta* (P2)
- Bfl *Bossiaea flexuosa* (P3)
- Bng *Brachyloma nguba* (P1)
- Crot *Commersonia rotundifolia* (P3)
- CspC *Conostephium* sp. Cascades (R. Bruhn 24/899 CAS) (P1)
- Cle *Conostylis lepidospermoides* (T)
- Cli *Corybas limpidus* (P4)
- Cpop *Cryptandra polyclada* subsp. *polyclada* (P3)
- CsEs *Cyanicula* sp. Esperance (G. Brockman 735) (P1)
- Dor *Dampiera orchardii* (P2)
- Dse *Dampiera sericantha* (P3)
- Dpa *Daviesia pauciflora* (P3)
- Ech *Eremophila chamaephila* (P3)
- Eco *Eremophila compressa* (P3)
- Eded *Eremophila denticulata* subsp. *denticulata* (T)
- Ese *Eremophila serpens* (P4)
- Esub *Eremophila subteretifolia* (T)
- Edxp *Eucalyptus dielsii x platypus* (P1)
- Eli *Eucalyptus litorea* (P2)
- Eprl *Eucalyptus preissiana* subsp. *lobata* (P4)
- Esem *Eucalyptus semiglobosa* (P3)
- Esto *Eucalyptus stoatei* (P4)
- Exmi *Eucalyptus x missilis* (P4)
- Glal *Goodenia laevis* subsp. *laevis* (P3)
- Gphi *Goodenia phillipsiae* (P4)
- Gane *Grevillea aneura* (P4)
- Gfa *Grevillea fastigiata* (P4)
- Gdit *Gyrostemon ditrigynus* (P4)
- Had *Hopkinsia adscendens* (P3)
- Hpap *Hydrocotyle papilionella* (P2)
- HsCa *Hypocalymma* sp. Cascade (R. Bruhn 20896) (T)
- Lpa *Lasiopetalum parvuliflorum* (P3)
- Lpse *Lepidium pseudotasmanicum* (P4)
- LspHR *Lepidosperma* sp. Hopetoun Road (S. Kern et al. LCH 16552) (P1)
- Lbl *Leucopogon blepharolepis* (P4)
- Lpu *Levenhookia pulcherrima* (P3)
- Mdem *Melaleuca dempta* (P3)
- Msi *Melaleuca similis* (P1)
- Mden *Mirbelia densiflora* (P3)
- Oac *Opercularia acolytantha* (P3)
- Pbr *Persoonia brevirhachis* (P3)
- Pfl *Persoonia flexifolia* (P1)
- Psc *Persoonia scabra* (P3)
- Pgag *Philotheca gardneri* subsp. *globosa* (P1)
- Pad *Pultenaea aduncа* (P3)
- Pcap *Pultenaea calycina* subsp. *proxena* (P4)
- Pda *Pultenaea daena* (P3)
- Rjo *Rhizanthella johnstonii* (T)
- Rtr *Ricinocarpos trichophorus* (T)
- Sarc *Scaevola archeriana* (P1)
- Scpa *Scaevola paludosa* (P2)
- Stor *Scaevola tortuosa* (P1)
- Svi *Stachystemon vinosus* (P4)
- Spul *Stylidium pulviniforme* (P3)
- Spl *Synaphea platyphylla* (P3)
- Tpy *Thomasia pygmaea* (P3)
- Tbra *Thysanotus brachiatus* (P2)
- Tpar *Thysanotus parviflorus* (P4)
- Vex *Velleia exigua* (P2)

Existing Significant Flora Records Legend

Author: Leah Firth

WEC Ref: MRC19-48-02

WOODMAN ENVIRONMENTAL

Filename: MRC19-48-02-f07-2.mxd

Scale: 1:35,000 (A4)

Projection: GDA 1994 MGA Zone 51

Revision: 1 - 27 October 2020

Figure 7.2

This map should only be used in conjunction with WEC report MRC19-48-02.

5.1.6 Summary of Introduced Flora

A list of introduced flora taxa known to occur or potentially occur within the Desktop Study Area is presented in Table 7. This has been compiled from WA Herbarium specimen data, DoEE's SPRAT Database, and from local flora surveys (Section 5.1.4). A total of 77 introduced taxa are known to occur, or habitat occurs, in the Desktop Study Area. Of these, *Asparagus asparagoides* and *Tamarix aphylla* are Declared Pests and WoNS, and *Lycium ferocissimum* is a WoNS.

Table 7: Introduced Flora Taxa Known from Within the Desktop Study Area

Taxon	Common Name	Source*	Comments
Acacia pycnantha	Golden Wattle	GHD	
Aira caryophyllea	Silvery Hairgrass	DBCA	
Aira cupaniana	Silvery Hairgrass	DBCA; Ecologia	
Arctotheca calendula	Cape Weed	DBCA; GHD	
Asparagus asparagoides	Bridal Creeper	DoEE	Declared Pest; WoNS
Asphodelus fistulosus	Onion weed	GHD	
Avena barbata	Bearded Oat	DBCA; Ecologia; GHD	
Avena sativa	Common Oat	DBCA; GHD	
Brassica napus	Canola	GHD	
Bellardia trixago	Bellardia	GHD	
Briza maxima	Blowfly Grass	GHD	
Briza minor	Shivery Grass	DBCA; GHD	
Bromus diandrus	Great Brome	DBCA	
Bromus rubens / Bromus ?rubens	Red Brome	DBCA; GHD	
Cakile maritima	Sea Rocket	DBCA	
Carduus nutans	Nodding Thistle	Ecologia	
Carduus pycnocephalus / Carduus ?pycnocephalus	Slender Thistle	DBCA; Ecologia	
Carrichtera annua	Ward's Weed	DoEE	
Centaurea melitensis	Maltese Cockspur	DBCA	
Centaurium tenuiflorum	Branched Centaury	Ecologia	
Chenopodium glaucum	Glaucous Goosefoot	DBCA	
Cirsium vulgare	Spear Thistle	DBCA	
Conyza sumatrensis	Fleabane	DBCA; Ecologia	
Cotula coronopifolia	Waterbuttons	DBCA; Ecologia	
Crassula natans var. *minus*	Floating Pigmyweed	DBCA	
Cynodon dactylon	Couch	GHD	
Disa bracteata	South African Orchid	GHD	
Dittrichia graveolens	Stinkwort	DBCA	
Ehrharta calycina	Perennial Veldt Grass	DBCA; GHD	
Ehrharta longiflora	Annual Veldt Grass	DBCA; Ecologia; GHD	
Eragrostis cilianensis	Stinkgrass	DBCA; GHD	
Eragrostis curvula	African Lovegrass	GHD	
Erodium aureum	-	DBCA	
Erodium moschatum	Musky Crowfoot	DBCA	
Euphorbia maculata	Spotted Spurge	DBCA	
Euphorbia paralias	Sea Spurge	DBCA	
Euphorbia peplus	Petty Spurge	DBCA	

Taxon	Common Name	Source*	Comments
Galium murale	Small Goosegrass	DBCA	
Holcus setiger	Annual Fog	GHD	
Hordeum leporinum	Barley Grass	DBCA	
Hornungia procumbens	Slenderweed	DBCA	
Hyparrhenia hirta	Tambookie Grass	DBCA	
Hypochaeris glabra	Smooth Catsear	DBCA; Ecologia; GHD	
Hypochaeris radicata	Flat Weed	Ecologia	
Juncus bufonius	Toad Rush	DBCA	
Lepidium africanum	Rubble Peppercress	Ecologia	
Limonium lobatum	Winged Sea-lavender	DBCA	
Lolium rigidum	Wimmera Ryegrass	DBCA; GHD	
Lycium ferocissimum	African Boxthorn	DoEE	WoNS
Lysimachia arvensis	Pimpernel	DBCA; GHD	
Malva parviflora	Marshmallow	GHD	
Medicago ?polymorpha	Medic Burr	GHD	
Moraea setifolia	Thread Iris	GHD	
Oenothera ?stricta	Evening Primrose	GHD	
Opuntia monacantha	Barbary Fig	DBCA	
Ornithopus compressus	Yellow Serradella	GHD	
Orobanche minor	Lesser Broomrape	GHD	
Parapholis incurva	Coast Barbgrass	DBCA	
Pentameris airoides subsp. *airoides*	False Hairgrass	DBCA; Ecologia; GHD	
Polycarpon tetraphyllum	Fourleaf Allseed	DBCA; GHD	
Polypogon monspeliensis	Annual Beardgrass	DBCA	
Raphanus raphanistrum	Wild Radish	GHD	
Romulea rosea	Guildford Grass	GHD	
Rumex crispus	Curled Dock	DBCA	
Sagina Apetala	Pearlwort	GHD	
Solanum nigrum	Black Berry Nightshade	DBCA; GHD	
Sonchus asper	Rough Sowthistle	DBCA	
Sonchus oleraceus	Common Sowthistle	DBCA; Ecologia; GHD	
Tamarix aphylla	Athel Tree	DoEE	Declared Pest; WoNS
Trifolium hirtum	Rose Clover	GHD	
Trifolium subterraneum	Subterranean Clover	DBCA	
Triticum aestivum	Wheat	GHD	
Ursinia anthemoides subsp. *anthemoides*	Ursinia	DBCA; GHD	
Vellereophyton dealbatum	White Cudweed	DBCA; Ecologia	
Vulpia muralis	-	DBCA; Ecologia	
Vulpia myuros forma *megalura*	Fox Tail Fescue	DBCA	
Vulpia myuros forma *myuros*	Rat's Tail Fescue	DBCA	

*Sources are:
DBCA – WA Herbarium Specimen Database, data provided by Naturemap (DBCA 2007-) (see Section 3.1);
DoEE – SPRAT Database (DoEE 2019a) (see Section 3.1)
Ecologia – Ecologia (2015)
GHD – GHD (2006)

5.1.7 Summary of Significant Vegetation

A list of significant vegetation known from within the Desktop Study Area is presented in Table 8. This list has been compiled from the results of searches of DBCA's TEC and PEC Database, DoEE's SPRAT Database, and the results of local surveys as outlined in Section 5.1.4.

Two significant vegetation types are known from within the Desktop Study Area. The locations of significant vegetation are presented on Figure 8. As previously mentioned, the Subtropical and Temperate Coastal Saltmarsh TEC is represented by one record located approximately 28 km south-east of the Study Area on the coast (Figure 8). The physical environment for this community is described as coastal areas under regular or intermittent tidal influence (DoEE 2013). As the Study Area is not located within, or in close proximity to a coastal area, this community cannot occur in the Study Area. It is therefore not discussed further in this report.

Table 8: Significant Vegetation Known from Within the Desktop Study Area

Community	Conservation Status (WA)	EPBC Act ranking	Source
Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia	PEC - Priority 3	Endangered	DBCA; DoEE; Ecologia; Woodman Environmental
Subtropical and Temperate Coastal Saltmarsh	PEC - Priority 3	Vulnerable	DBCA; DoEE

*Sources are:
DBCA –DBCA (2018b) (see Section 3.1)
DoEE – SPRAT Database (DoEE 2019a) (see Section 3.1)
Ecologia – Ecologia (2015)
Woodman Environmental – Woodman Environmental (2018)

260000 280000 300000 320000 340000

6340000 6320000 6300000 6280000 6260000 6240000 6220000 6200000

Legend

- Study Area
- Desktop Study Area

Threatened & Priority Ecological Communities

- Subtropical and Temperate Coastal Saltmarsh (Priority 3 - W.A.; Vulnerable - EPBC Act)
- Proteaceae Dominated Kwongkan Shrubland (Priority 3 - W.A.; Threatened - EPBC Act)

WOODMAN ENVIRONMENTAL

N

This map should only be used in conjunction with WEC report MRC19-48-02.

Existing Significant Vegetation Records

Revision: 1 - 27 October 2020 Scale: 1:400,000 (A3)

Author: Leah Firth

WEC Ref: MRC19-48-02

Filename: MRC19-48-02-f08.mxd

Projection: GDA 1994 MGA Zone 51

Figure

8

5.2 Field Survey Results

5.2.1 Vascular Flora Census

A total of 529 discrete vascular flora taxa and one known hybrid (as per WA Herbarium (1998-)) were recorded in the Study Area by this assessment. The taxa and hybrid represent 67 families and 227 genera. The most well-represented families were Myrtaceae (77 taxa), Fabaceae (55 taxa), Proteaceae (48 taxa), Cyperaceae (39 taxa) and Orchidaceae (33 taxa and one known hybrid). Forty-four taxa are considered to be annual taxa. Eighteen of the total taxa recorded are introduced taxa (see Section 5.2.5).

Average taxon (excluding hybrids) richness per quadrat was 38.7 (± 16.5), with the greatest number of taxa recorded in a single quadrat being 70, and the lowest number being 6. A full list of taxa is presented in Appendix F, with raw quadrat data and parameters presented in Appendix G.

Several collections could not be identified to species level because of poor material. Some are known to be distinct taxa relative to other taxa recorded by the survey – these are included in the totals presented above, and in Appendix F (e.g. *Carpobrotus* sp., *Microtis* sp., *Thelymitra* ?*petrophila*. Other collections may represent distinct taxa relative to other taxa recorded by the survey; however it is also possible that they represent taxa already recorded elsewhere, with the quality of the material such that this distinction cannot be made (e.g. *Lepidosperma* ?*fairallianum*, *Conyza* sp., *Cyperaceae* sp.). Such collections are not included in the totals above, but are presented in the raw quadrat data in Appendix G.

It should be noted that the genus *Lepidosperma* is currently in the early stages of revision by Dr Russell Barrett, however this revision is not actively being undertaken at this time. So far, very narrow species concepts have been adopted, and in addition to formally published taxa and formally recognised phrase-named taxa, there are many others yet to be formally recognised. Unfortunately, there is no detailed documentation available to allow for confident identification of specimens, even if they are of good quality. This extends to the WA Herbarium, which is currently unable to provide authoritative identifications in the genus in many instances (M. Hislop *pers. comm.*).

As noted in Section 3.5, the assessment of the taxonomic status of *Lepidosperma* from the greater Ravensthorpe Range (Barrett *et al.* 2009) provides some detailed information on distinguishing particular taxa from this area, and Woodman Environmental have a field herbarium of *Lepidosperma* specimens from the Ravensthorpe area with specimens identified by Dr Russell Barrett. This has allowed for many of the *Lepidosperma* specimens to be identified with a relatively high degree of confidence, including collections of the Priority taxon *Lepidosperma* sp. Mt Chester (S. Kern et al. LCH 16596) (P1). However, there is still a degree of uncertainty with a number of identifications, including the collection identified as *Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1). This is discussed further in Sections 5.2.2 and 5.2.3 below.

5.2.2 Significant Flora Taxa

Table 9 presents a summary of data relating to significant flora taxa recorded in the Study Area. A total of 12 significant flora taxa were recorded during this survey of the Study Area; this includes one Threatened taxon, seven Priority flora taxa (one of which is an uncertain identification), and four taxa that are considered significant because they either potentially represent undescribed taxa, are known from very few records, or are outliers of the main range of the taxon (as per EPA 2016b). Three of these taxa (two Priority flora taxa and one potentially undescribed taxon) were previously recorded in the Study Area by Ecologia (2015). A detailed summary of information for each taxon is provided in Section 5.1.4.2.

Locations of significant flora taxa are presented in Appendix H, and on Figure 9.

Figure 10 presents the potential habitat for significant flora. This includes:

- Potential *Rhizanthella johnstonii* (T) habitat identified in the May 2018 survey;
- VU 16 which is potential habitat for a number of significant taxa including *Conostylis lepidospermoides* (T), *Leucopogon* sp. Cascades (M. Hislop 3693) (P1), *Stachystemon vinosus* (P4), *Leucopogon* aff. *canaliculatus* , *Synaphea* aff. *drummondii* and *Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher *et. al* RB200));
- VU 15 which includes potential habitat for *Pultenaea calycina* subsp. *proxena* (P4); and
- VU 1 which includes potential habitat for *Leucopogon* aff. *canaliculatus* and *Pultenaea calycina* subsp. *proxena* (P4).

In cases where significant flora taxa were recorded from a limited number of locations within a VU, that VU was not included as potential habitat, in accordance with lack of data to provide a strong association with the habitat of those taxa and the VU. The potential habitat mapping presented on Figure 10 is based on associations between VU mapping and available significant flora locations and the entire extent of that VU may not provide specific habitat for individual significant flora taxa. For example, there are areas of potential habitat for *Pultenaea calycina* subsp. *proxena* (P4) within VU 1, however there are also extensive areas of VU 1 (which have been gridded) where no *Pultenaea calycina* subsp. *proxena* (P4) were recorded.

Ecologia (2015) also recorded *Lasiopetalum* ?*parvuliflorum* (P3) at two locations in the Study Area (*Lasiopetalum parvuliflorum* is a Priority 3 taxon). One of these locations (the eastern location) was re-visited during the current survey to collect material for identification, however only the superficially similar *Lasiopetalum rosmarinifolium* was present.

One of the collections identified by Ecologia (2015) as *Lasiopetalum parvuliflorum* (P3) has recently been determined as *Lasiopetalum* ?*parvuliflorum / rosmarinifolium* by expert Carol Wilkins (WA Herbarium 1998-); a recently published key to *Lasiopetalum* taxa in WA (Shepherd and Wilkins 2018) only separates *Lasiopetalum parvuliflorum* (P3) from *Lasiopetalum rosmarinifolium* by flower size and number of flowers per inflorescence, indicating that determination of specimens when sterile is problematic. However, *Lasiopetalum parvuliflorum* (P3) was not recorded by this current survey despite relatively intensive sampling, including targeted searches; in contrast, *Lasiopetalum rosmarinifolium*

was recorded widely and frequently by the current survey (formally recorded in 16 quadrats, observed informally at many other locations), as well as by Ecologia (2015) (four quadrats). There are also no recent records of *Lasiopetalum parvuliflorum* (P3) from the region surrounding the Study Area; a historical collection (1965) is labelled "Oldfield River" and therefore may have been made within 15 km of the Study Area, however the specific locality information is unclear (WA Herbarium 1998-). Therefore, based on current available information, it is considered unlikely that *Lasiopetalum parvuliflorum* (P3) occurs in the Study Area, and it is not considered further in this report.

As mentioned in Section 5.2.1, several collections could not be identified to species level because of poor material; however, no such collections are considered likely to represent significant flora taxa.

Of note, a collection from the Study Area made during the primary field survey was identified by WA orchid experts Andrew Brown (formerly of the DBCA) and Garry Brockman as *Pterostylis faceta* (P3). This species has only recently been described (Jones and French 2017); it has previously been illustrated and informally referred to as *Pterostylis* sp. 'plumed' in the 'Orchids of South-West Australia' identification guides (Hoffman and Brown 2011). This species was therefore searched for during targeted significant flora survey within the Study Area and Development Envelope (see Section 3.4.3). However, WA orchid expert Garry Brockman, together with Chris French, the co-author of *Pterostylis faceta*, have recently (February 2020) changed the identification of the collection from the Study Area to *Pterostylis galgula*, a taxon not considered to be of conservation significance.

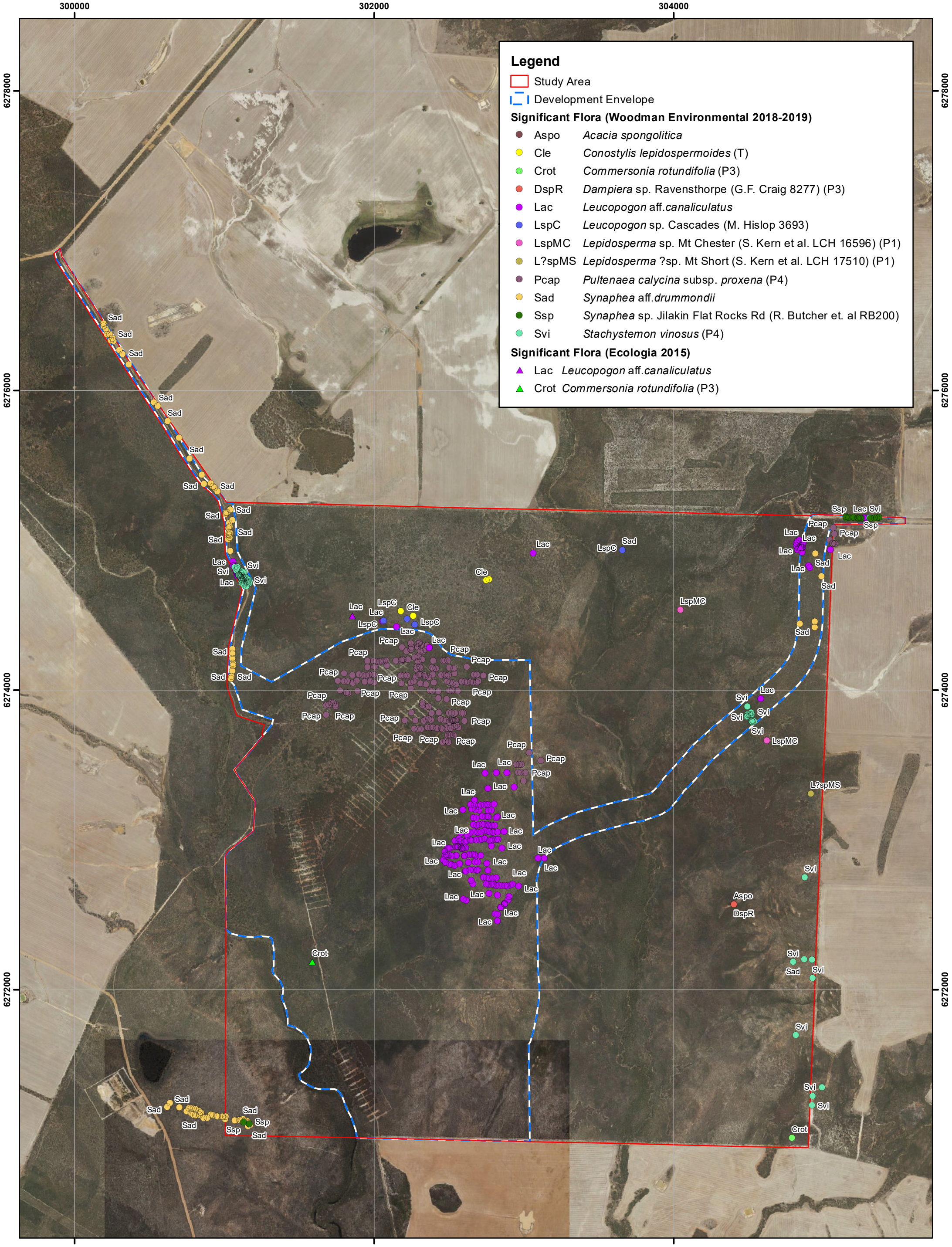
Although *Pterostylis galgula* and *Pterostylis faceta* are clearly superficially similar, apparently primarily differing only in dimensions of some floral parts and relative colouration of flowers, no discussion of their similarity is given in the protologues of either species (Jones and French 2017). This has likely added to the difficulty in assigning the specimen from the Study Area to one of these taxa. Additionally, the Study Area is not within the known range of either taxon; the collection from the Study Area represents a large range extension for *Pterostylis galgula* (see Section 5.2.3).

Table 9: Summary of Significant Flora Taxa Recorded within the Study Area

Taxon	Status	Number of Locations Recorded				Number of Individuals Recorded				Number of Populations[$] Recorded				Vegetation Units
		Inside Study Area		Outside Study Area	Total	Inside Study Area		Outside Study Area[%]	Total	Inside Study Area		Outside Study Area	Total	
		This Survey	Previous Surveys			This Survey	Previous Surveys			This Survey	Previous Surveys			
Conostylis lepidospermoides	T (VU)	4	0	0	4	67	0	0	67	2	0	0	2	16
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596)	P1	2	0	0	2	35	0	0	35	2	0	0	2	1, 2
Lepidosperma ?sp. Mt Short (S. Kern et al. LCH 17510)	P1	1	0	0	1	Not counted	0	0	-	1	0	0	1	6
Leucopogon sp. Cascades (M. Hislop (3693)	P1	5	0	0	5	35	0	0	35	2	0	0	2	16
Commersonia rotundifolia	P3	1	1	0	2	5	30	0	35	1	1	0	2	14
Dampiera sp. Ravensthorpe (G.F. Craig 8277)	P3	1	0	0	1	200	0	0	200	1	0	0	1	4
Pultenaea calycina subsp. *proxena*	P4	185	1*	5	190	1372	5*	34	1406	3	1*	1^	3	1, 2, 9, 14, 15
Stachystemon vinosus	P4	50	0	3	53	292	0	4	296	5	0	1^	5	1, 16
Acacia spongolitica	Unusual variant, range outlier	1	0	0	1	Not counted	0	0	Not counted	1	0	0	1	4
Leucopogon aff. *canaliculatus*	Potential new taxon	184	2*	0	185	2,009	Not counted	0	2,009	6	2*	0	6	1, 2, 14, 16
Synaphea aff. *drummondii*	Potential new taxon[#]	62	0	24	86	147	0	103	250	6	0	1^	6	1, 10, 16
Synaphea sp. Jilakin Flat Rocks	Potential new taxon	13	0	0	13	92	0	0	92	2	0	0	2	2, 16

Taxon	Status	Number of Locations Recorded				Number of Individuals Recorded				Number of Populations[$] Recorded				Vegetation Units
		Inside Study Area		Outside Study Area	Total	Inside Study Area		Outside Study Area[%]	Total	Inside Study Area		Outside Study Area	Total	
		This Survey	Previous Surveys			This Survey	Previous Surveys			This Survey	Previous Surveys			
Rd (R. Butcher et. al RB200).														

Note:
[$]numbers of populations are based on the definition of a population provided in Section 3.9.1.
[*]The previously recorded location of *Pultenaea calycina* subsp. *proxena* and the locations of *Leucopogon* aff. *canaliculatus* was revisited by this survey; therefore, associated data (Ecologia 2015) has been superseded by data recorded by this survey.
^Population comprises locations and individuals from both inside and outside Study Area.
[%]Outside Study Area refers to locations, individuals and populations recorded by this survey and Ecologia (2015) only.



This map should only be used in conjunction with WEC report MRC19-48-02.

N

Significant Flora	Author: Leah Firth	**Figure** 9
	WEC Ref: MRC19-48-02	
	Filename: MRC19-48-02-f09.mxd	
Revision: 1 - 27 October 2020 Scale: 1:22,000 (A3)	Projection: GDA 1994 MGA Zone 51	

300000 302000 304000

6278000 6276000 6274000 6272000

Legend

Study Area

Development Envelope

Significant Flora (Woodman Environmental 2018-2019)

- Aspo *Acacia spongolitica*
- Cle *Conostylis lepidospermoides* (T)
- Crot *Commersonia rotundifolia* (P3)
- DspR *Dampiera* sp. Ravensthorpe (G.F. Craig 8277) (P3)
- Lac *Leucopogon* aff.*canaliculatus*
- LspC *Leucopogon* sp. Cascades (M. Hislop 3693)
- LspMC *Lepidosperma* sp. Mt Chester (S. Kern et al. LCH 16596) (P1)
- L?spMS *Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1)
- Pcap *Pultenaea calycina* subsp. *proxena* (P4)
- Sad *Synaphea* aff.*drummondii*
- Ssp *Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)
- Svi *Stachystemon vinosus* (P4)

Significant Flora (Ecologia 2015)

- Lac *Leucopogon* aff.*canaliculatus*
- Crot *Commersonia rotundifolia* (P3)

Potential Habitat

- Potential habitat for *Rhizanthella johnstonii* (T)
- Potential Habitat for *Leucopogon* aff. *canaliculatus* and *Pultenaea calycina* subsp. *proxena* (P4) (VU 1)
- Potential habitat for *Pultenaea calycina* subsp. *proxena* (P4) (VU 15)
- Potential habitat for *Conostylis lepidospermoides* (T), *Leucopogon* sp. Cascades (M. Hislop 3693) (P1), *Stachystemon vinosus* (P4), *Leucopogon* aff. *canaliculatus, Synaphea* aff. *drummondii* and *Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200) (VU 16)

WOODMAN ENVIRONMENTAL

This map should only be used in conjunction with WEC report MRC19-48-02.

N

Potential Habitat for Significant Flora

Revision: 1 - 27 October 2020 Scale: 1:22,000 (A3)

Author: Leah Firth

WEC Ref: MRC19-48-02

Filename: MRC19-48-02-f10.mxd

Projection: GDA 1994 MGA Zone 51

Figure 10

5.2.2.1 Listed Significant Flora Taxa

***Rhizanthella johnstonii* (T)**

Rhizanthella johnstonii (T) is an underground orchid which flowers from late June to mid-July occurring within thickets of *Melaleuca hamata*, *M. uncinata* and an unnamed *Melaleuca* species of the *M. uncinata* complex in coarse sandy clay or sandy loam with a thin layer of surface leaf litter (Threatened Species Scientific Committee 2020). This taxon is listed as Critically Endangered under the BC Act and the EPBC Act (DBCA 2018c, DAWE 2020). It is known to occur over a range of 15 km in Western Australia (where it is endemic), consisting of just two subpopulations (Threatened Species Scientific Committee 2020).

The targeted survey for *Rhizanthella johnstonii* (T) located what was considered to be potential habitat for this species, based on the presence of relatively dense stands of *Melaleuca hamata*, a known host species. However, it was noted that the habitat differed significantly from nearby known habitat adjacent to the Oldfield River, particularly in the presence of a dense sedge layer (absent at known habitat), and a relatively heavy clay soil profile (the known habitat is coarse sandy loam or sandy clay (Dixon and Christenhusz 2018)). The known host species *Melaleuca hamata* also never formed thickets such as those that occur at the nearby known location of this species. *Melaleuca uncinata*, another known host species, was also recorded in the Study Area, however the habitat that it occurred in was not considered to be suitable, as it occurred on the edge of granite outcrops. Potential habitat for this taxon is presented on Figure 9.

Searching of the identified potential habitat at a time when *Rhizanthella johnstonii* plants are visible above-ground (July) located no plants. Based on this, and the apparently limited suitability of the potential habitat mentioned above, it is considered very unlikely that this taxon occurs in the Study Area.

***Conostylis lepidospermoides* (T)**

Conostylis lepidospermoides (T) is a rhizomatous, tufted perennial herb growing up to approximately 0.4 m high (Plate 1), and occurs on undulating plains on grey or yellow-brown sand, sometimes with laterite gravel (WA Herbarium 1998-). This taxon is listed as Vulnerable under the BC Act and Endangered under the EPBC Act (DBCA 2018c, DAWE 2020). It is known to occur over a range of approximately 240 km in Western Australia (where it is endemic), from near Frank Hann National Park in the north-west and Ravensthorpe in the west to near Cape Le Grand National Park in the east (DPaW 2007-). This taxon is known from 61 records that represent approximately 25 populations, three of which occur within DBCA-managed tenure including Frank Hann National Park and Cheadanup Nature Reserve (DBCA 2007-). The closest this taxon is known to occur to the Study Area is 15 km south-west; a record approximately 5 km south-west of the Study Area has erroneous coordinates (WA Herbarium 1998-).

Conostylis lepidospermoides (T) was recorded at four locations in the Study Area with a total of 67 individuals recorded; these represent 2 populations (Figure 9). These locations were in the central northern part of the Study Area in an area mapped as VU 16; the soils where this taxon was located were sandier than typical for this VU. Specific searching of VU 16 that was mapped in the Development Envelope was undertaken, with no locations recorded; it is

unlikely to occur within the Development Envelope, with most of the areas of VU 16 considered too clayey and gravelly to support this species. However, several locations are immediately north of the northern boundary of the Development Envelope (Figure 9). It is possible there are further individuals in the Study Area; however, field observations indicate they will likely only occur in the vicinity of recorded locations.

Plate 1: *Conostylis lepidospermoides* (T) (Photo: Woodman Environmental)

***Lepidosperma* sp. Mt Chester (S. Kern et al. LCH 16596) (P1)**

Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596) (P1) is a tufted sedge growing to 0.35 m high (Plate 2), and occurs on stony undulating plains and lower slopes to crests on red to brown clay loam, sometimes with rocky outcropping (WA Herbarium 1998-). This taxon is not listed under the EPBC Act or BC Act, however, is classified as P1 by the DBCA (2018c). This taxon is known to occur over a range of approximately 50 km in Western Australia (where it is endemic), from north of Fitzgerald River National Park in the west to north of Jerdacuttup in the east (DPaW 2007-). However, Barrett *et al.* (2009) notes that this taxon is also known from south-east of Lake King, which would extend its distribution north by approximately 50 km. This taxon is known from eight records that represent approximately six populations (excluding the record south-east of Lake King noted by Barrett *et al.* (2009)), none of which occur within DBCA-managed tenure (DBCA 2007-); however, Barrett *et al.* (2009) noted it was probably not threatened. This data suggests that its Priority status should be downgraded.

As noted in Section 5.2.1, identification of *Lepidosperma* taxa is currently difficult, however this taxon is relatively distinctive, and therefore there is a relatively high degree of confidence that the collections have been correctly identified. Collection of further flowering material would be beneficial to clarify this with further certainty. The collection of this taxon represents a range extension of approximately 45 km to the east; however, *Lepidosperma* taxa are poorly collected, and therefore this range extension is not considered to be particularly significant.

Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596) (P1) was recorded at two locations in the Study Area (Figure 9), with a total of 35 individuals recorded; these represent two populations. These locations were in the north-eastern section of the Study Area in areas mapped as VUs 1 and 2. This taxon was not expected to occur in the Study Area based on the results of the desktop survey (see Section 5.1.5), and was only identified following the primary field survey; therefore, suitable habitat was specifically searched during survey in 2019 no locations were recorded within the Development Envelope; however, this taxon is particularly cryptic, and it is possible that individuals were overlooked. It is considered likely that there are additional locations of this taxon in the wider Study Area.

Plate 2: Specimen of *Lepidosperma* sp. Mt Chester (S. Kern *et al*. LCH 16596) (P1), collected by Woodman Environmental (2018)

***Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1)**

Lepidosperma ?sp. Mt Short (S. Kern et al. LCH 17510) (P1) is a sedge growing to 0.45 m high (Plate 3) WA Herbarium 1998-). This taxon is not listed under the EPBC Act or BC Act, however, is classified as P1 by the DBCA (2018c). This taxon has a known range in Western Australia of approximately 45 km (where it is endemic), from north of Kundip Nature Reserve in the east

(south-east of Ravensthorpe) to Fitzgerald River National Park in the west (DBCA 2007-), however Barrett *et al.* (2009) also report that this taxon occurs near Bandalup Hill, extending its distribution by about 15 km further east. This taxon is known from 12 records that represent approximately 11 populations, one of which occurs within DBCA-managed tenure, being Fitzgerald River National Park (DBCA 2007-). It is primarily known to occur on gentle lower to mid slopes on sandy loam or clayey sand on rocky outcrops (WA Herbarium 1998-).

As noted in Section 5.2.1, identification of *Lepidosperma* taxa is currently difficult; *Lepidosperma* sp. Mt Short (S. Kern et al. LCH 17510) (P1) is similar to a number of other taxa in the Ravensthorpe area, and discriminating characters are unclear. Material suspected to represent this taxon was sent to the WA Herbarium for confirmation, but an authoritative identification could not be provided – it is therefore considered that the collection from the Study Area may represent this taxon. The collection would represent a range extension of approximately 55 km to the east; however, *Lepidosperma* taxa are poorly collected, and therefore this range extension is not considered to be particularly significant.

This taxon was not expected to occur in the Study Area based on the results of the desktop survey (see Section 5.1.5) and was only identified following the primary field survey. *Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1) was recorded at 1 location in the Study Area on the central eastern boundary (Figure 9), on a sandstone breakaway mapped as VU 6. This taxon was not counted in the field; however, it was noted as being common at the recorded location. The habitat it was found in is very restricted in the Study Area and is not known to occur in the Development Envelope based on field observations; no locations of this taxon were recorded in the Development Envelope. As such, this taxon is considered unlikely to occur within the Development Envelope. There may be further occurrences of this taxon in the vicinity of the recorded location in the wider Study Area.

Plate 3: **Specimen of *Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1), collected by Woodman Environmental (2018)**

***Leucopogon* sp. Cascades (M. Hislop 3693) (P1)**

A collection from the Study Area was initially identified by *Leucopogon* expert Mike Hislop from the WA Herbarium as *Leucopogon* aff. *lloydiorum*. *Leucopogon lloydiorum* is only known from near and in Fitzgerald River National Park and belongs to a taxonomically difficult group of *Leucopogon* (M. Hislop *pers. comm.*). However, a thorough review of material of *Leucopogon lloydiorum* and the entity collected from the Study Area, which has also been collected from several other locations in the Cascade-Munglinup area, determined that this entity was distinct from *Leucopogon lloydiorum*. This material has been segregated at the WA Herbarium as *Leucopogon* sp. Cascades (M. Hislop 3693). This taxon has recently been classified by DBCA as P1 following its formal listing on WA's vascular plants census (Plate 4).

Leucopogon sp. Cascades (M. Hislop 3693) is known from four collections (WA Herbarium 1998-) outside the Study Area, which represent three populations (M. Hislop *pers. comm.*); These are all located in the same general area between 16 and 26 km east of the Study Area, giving this taxon a total range of approximately 26 km; the Study Area is the western-most known population of the species.

This taxon was only identified following the primary field survey; therefore, targeted searching was undertaken during survey in 2019. *Leucopogon* sp. Cascades (M. Hislop 3693) was recorded at five locations during this survey; 35 individuals were recorded, which represent two populations. The locations are in areas mapped as VU 16. Searching within VU 16 that was mapped in the Development Envelope was undertaken, with no locations recorded; this species is therefore unlikely to occur within the Development Envelope. However, several locations are immediately north of the northern boundary of the Development Envelope (Figure 9). It is possible there are further individuals in the Study Area; however, field observations indicate they will likely only occur in the vicinity of recorded locations.

Plate 4: Specimen of *Leucopogon* sp. Cascades (M. Hislop 3693) (P1) collected by Woodman Environmental (2018)

***Commersonia rotundifolia* (P3)**

Commersonia rotundifolia (P3) is a straggly, semi-prostrate to erect shrub to 1.5 m high (Plate 5) (WA Herbarium 1998-). This taxon is not listed under the EPBC Act or BC Act, however is classified as P3 by the DBCA (2018c). This taxon is endemic to the south coast of Western Australia, and has a known range in Western Australia of approximately 310 km, from near Ongerup in the west to north-west of Esperance in the east (DBCA 2007-). This taxon is known from 16 records that represent approximately 12 populations, five of which occur within DBCA-managed tenure including Fitzgerald River National Park, Lake Magenta Nature Reserve and Warperup East Nature Reserve (DBCA 2007-). This taxon is primarily known to occur on ridgetops and hill slopes on sandy clay to clay (WA Herbarium 1998-). The protologue of this taxon indicates it is observable only in recently burnt areas (Wilkins and Whitlock 2011), indicating it is short-lived.

Commersonia rotundifolia (P3) was recorded at a single point location in the Study Area by this survey (Figure 9), with a total of five live individuals recorded; of interest, however, was the presence of numerous recently dead individuals at this location, as indicated on Plate 5.

This location was in the south-west corner of the Study Area in an area mapped as VU 14 that had been relatively recently burnt. This taxon was also recorded in the Study Area at one location in a recently burnt area of VU 14 by Ecologia (2015) (Figure 9), who estimated 30 individuals at this location; however, when this location was revisited during the current survey, no individuals could be located. One of the locations is within the Development Envelope.

The recording of this taxon in only recently burnt vegetation, and its apparent near-complete senescence at one location, and presumed complete senescence at a second location, supports the observations made in the protologue of this species that it (usually) can only be observed in recently burnt areas. The fire that affected the Study Area occurred close to 10 years prior to this survey; the results of this survey indicate that the taxon may have already disappeared from some areas of the Study Area and is close to doing so in others. This species was targeted while traversing the Study Area to establish quadrats; despite a number of transects being undertaken in recently burnt areas of VU 14, no other individuals were located. Based on this, it was considered that further targeted searching in the Development Envelope would not serve to provide an appropriate indication of the actual distribution and abundance of this taxon in the Study Area and may not yield any additional individuals at all. Further targeted searching was therefore not undertaken. It is possible that this taxon is common and occurs widely in the Study Area post-fire, including within the Development Envelope, as VU 14 was mapped widely in the Study Area. However, this could only be ascertained through further survey in the first few years post-fire.

Plate 5: ***Commersonia rotundifolia*** **(P3), with inset showing close-up of closed flowers. Grey arrow indicates adjacent dead individuals (Photos: Woodman Environmental)**

Dampiera sp. Ravensthorpe (G.F. Craig 8277) (P3)

Dampiera sp. Ravensthorpe (G.F. Craig 8277) (P3) is a reed-like perennial herb growing to 0.5 m high (Plate 6), and occurs on rocky outcrops and ridges, often on brown to red loam or clay (WA Herbarium 1998-). This taxon is not listed under the EPBC Act or BC Act, however, is classified as P3 by the DBCA (2018c). This taxon is restricted to the vicinity of Ravensthorpe over a range of approximately 25 km (DPaW 2007-). It is known from 13 records that represent approximately 10 populations, one of which occurs within DBCA-managed tenure, being unnamed Reserve 2597/896 (DBCA 2007-).

Dampiera sp. Ravensthorpe (G.F. Craig 8277) (P3) was recorded at one location in the Study Area in the central eastern part (Figure 9), on a steep rocky sandstone ridge mapped as VU 4. It was very common at this location, with 200 individuals estimated. This record represents a significant range extension (approximately 52 km) for this taxon. This taxon was not expected to occur in the Study Area based on the results of the desktop survey (see Section 5.1.5) and was only identified following the primary field survey; therefore, it was not specifically searched for during the primary field survey. The habitat it was found in is very restricted in the Study Area and is not known to occur in the Development Envelope based on field observations; no locations were recorded within the Development Envelope during targeted searching in 2019. As such, it is unlikely to occur within the Development Envelope. It is possible that there are further occurrences in the vicinity of the recorded location.

Plate 6: Specimen of _Dampiera_ sp. Ravensthorpe (G.F. Craig 8277) (P3)

***Pultenaea calycina* subsp. *proxena* (P4)**

Pultenaea calycina subsp. *proxena* (P4) is a many-branched, compact shrub growing to approximately 1 m high (Plate 7) (WA Herbarium 1998-). This taxon is not listed under the EPBC Act or BC Act, however is classified as P4 by the DBCA (2018c). This taxon has a known range in Western Australia of approximately 75 km (where it is endemic), from south-west of Ravensthorpe in the west to the Study Area in the east (DBCA 2007-). This taxon is known from 41 records that represent approximately 20 populations, none of which occur within DBCA-managed tenure (DBCA 2007-). It is primarily known to occur on slopes of hills and rises on clay or loam often with magnesite outcropping (WA Herbarium 1998-).

Pultenaea calycina subsp. *proxena* (P4) was recorded at 185 locations in the Study Area (Figure 9), with a total of 1,372 individuals recorded; these represent 3 populations. These locations were in the northern half of the Study Area, primarily in areas mapped as VU 15 and adjacent areas of VU 1, with one population occurring in VU 2. The largest population also just extends into areas mapped as VU 9 and 14. In addition, part of the population in the north-east corner of the Study Area extends outside the Study Area, with a total of five point locations comprised of 34 individuals recorded outside the Study Area.

This taxon was previously recorded in the Study Area by Ecologia (2015); the location recorded was re-surveyed by this current survey, and therefore data from Ecologia (2015) is considered to have been superseded. The collection of this taxon by Ecologia (2015) represented a significant range extension to the east; until recently, the populations in the Study Area were quite disjunct from the main area of occurrence for this taxon, representing the only known occurrences of this taxon outside the Ravensthorpe area (DBCA 2007-). However, a population of this taxon consisting of at least 300 individuals (Appendix was found during the regional targeted vegetation survey (see Section 3.4.4) approximately 15 km north-east of the Study Area, which extends its range to approximately 85 km. The discovery of this population now indicates that the general region surrounding the Study Area represents a second area of occurrence for this taxon, rather than a single, disjunct population. It is also considered likely that there are further, undiscovered populations in this area.

Specific searching of suitable habitat for this taxon that was mapped in the Development Envelope was undertaken during both the primary field survey and during targeted survey in 2019. The majority of locations and individuals (178 locations and 1,287 individuals) of this taxon in the Study Area are located within the Development Envelope. Field observations indicate that it is unlikely that there are further locations of this taxon in the Study Area.

Plate 7: ***Pultenaea calycina*** **subsp.** ***proxena*** **(P4), with inset showing close-up of flower (Photos: Woodman Environmental 2018)**

Stachystemon vinosus **(P4)**

Stachystemon vinosus (P4) is a small, compact shrub growing to 0.2 m high (Plate 8), and usually occurs on sandy or clay loam soils with lateritic or ironstone gravel (WA Herbarium 1998-). This taxon is not listed under the EPBC Act or BC Act, however is classified as P4 by the DBCA (2018c). This taxon has a known range in Western Australia of approximately 312 km (where it is endemic), from north of Ravensthorpe in the west to north of Esperance in the east (DBCA 2007-). This taxon is known from 51 records that represent approximately 17 populations, three of which occur within DBCA-managed tenure including Cape Arid National Park, Jerdacuttup Lakes Nature Reserve and unnamed Reserve R 49742 (DBCA 2007-). The closest this taxon is known to occur to the Study Area is 15 km north-west; a record approximately 2.5 km south of the Study Area has erroneous coordinates (WA Herbarium 1998-).

Stachystemon vinosus (P4) was recorded at 50 point locations in the Study Area (Figure 9) with a total of 292 individuals recorded across these locations; these represent 5 populations. These locations were disjunctly distributed, with a cluster in the north-west, and clusters in the north-east and south east parts. The locations were all at the very top of the Munglinup River and Clay Hole Creek valleys, on gravelly (laterite or ironstone) clay loam soils in areas mapped as VUs 1 and 16. In addition, a total of three point locations comprised of four individuals were recorded outside the Study Area in similar habitat; these locations and individuals comprise part of one of the populations recorded inside the Study Area.

Specific searching of appropriate habitat for this taxon that was mapped in the Development Envelope was undertaken during both the primary field survey and during targeted survey in 2019, with 44 locations and 142 individuals recorded. Although this species is quite distinctive, it is exceptionally cryptic because of its small size and drab-coloured foliage and flowers; it was usually found hidden under other, much larger shrubs, and was therefore difficult to locate. It is therefore possible that a small number of additional locations of this taxon are present within the Development Envelope. It is also considered likely that there are further individuals in the Study Area, as there are relatively large areas of suitable habitat (areas of VU 1 and VU 16).

Plate 8: ***Stachystemon vinosus*** **(P4) (Photo: Woodman Environmental 2018)**

5.2.2.2 Other Significant Flora Taxa

Acacia spongolitica

A collection from the Study Area was identified by the WA Herbarium as *Acacia spongolitica* (Plate 9), however it was noted that the collection represented a rather anomalous variant of this taxon (M. Hislop *pers. comm*.), with very small phyllodes and very short peduncles relative to typical occurrences of this taxon. The collection from the Study Area appears to match a single other collection lodged as *Acacia spongolitica* from the Ongerup area; this collection was also noted in the protologue of this taxon (Cowan and Maslin 1990). It is possible that this and the collection from the Study Area represent a new taxon, with further study required to ascertain whether this is the case. Notwithstanding this, the Study Area represents a significantly disjunct collection for this taxon, with the nearest record being approximately 55 km west (DBCA 2007-). As a precaution, it is therefore considered to be a significant taxon, as per EPA guidance (EPA 2016b).

Acacia spongolitica was recorded at one location in the Study Area in the central eastern part (Figure 9), on the top of a steep rocky sandstone ridge mapped as VU 4. Individuals were not counted at this location, however it was noted as being uncommon. This taxon was only identified following the primary field survey; therefore, it was not specifically searched for during the primary field survey. The habitat it was found in is very restricted in the Study Area and is not known to occur in the Development Envelope based on field observations; no locations were recorded in the Development Envelope during searching in 2019. As such, it is unlikely to occur within the Development Envelope. It is possible that there are further occurrences in the vicinity of the recorded location.

Plate 9: Specimen of *Acacia spongolitica* collected by Woodman Environmental (2018)

Leucopogon* aff. *canaliculatus

A collection from the Study Area was initially identified by *Leucopogon* expert Mike Hislop from the WA Herbarium as *Leucopogon* aff. *diversifolius*; however, after submission of further material collected during the primary field survey, the material was identified as *Leucopogon* aff. *canaliculatus* (Plate 10). *Leucopogon canaliculatus* belongs to the *Leucopogon bossiaea* subgroup of species, a taxonomically problematic subgroup that was relatively recently

revised (Hislop 2009). The entity from the Study Area identified as *Leucopogon* aff. *canaliculatus* matches two anomalous specimens (M. Hislop 3623; M. Hislop 3708) currently included under *Leucopogon canaliculatus* at the WA Herbarium (Hislop 2009). One of these collections (M. Hislop 3623) represented the western-most collection of *Leucopogon canaliculatus*, and was disjunct from all other records of this species by a distance of 45 km; the collection of similar material from the Study Area extends the range of this taxon (including anomalous material) west by a further 25 km. Further review of this taxon, as well as others in this subgroup, is required to resolve the taxonomy of a number of anomalous collections; however, this is not likely to occur in the near term (M. Hislop *pers. comm.* 2019). Until this review is complete, it is regarded as a taxon of significance as a precaution, as per EPA guidance (EPA 2016), given that it is anomalous for *Leucopogon canaliculatus*, and represents the western-most known collection of this species.

This taxon was only identified following the primary field survey; therefore, targeted searching was undertaken during survey in 2019. *Leucopogon* aff. *canaliculatus* was recorded at 185 locations within the Study Area; with a total of 2,009 individuals recorded across these locations. These locations were in the northern and central parts of the Study Area primarily within areas mapped as VU 1 and VU16; one population just extends into areas mapped as VUs 2 and 14, however, this is most likely related to the scale of vegetation mapping. This taxon was recorded by Ecologia (2015) as *Leucopogon* aff. *heterophyllus* (*Leucopogon heterophyllus* is synonymous with *Leucopogon diversifolius*) at 2 point locations; this was confirmed via a visit to one of these point locations during targeted survey in 2019. The locations from these surveys represent six populations. The largest population in terms of point locations contains a disproportionately high number of individuals relative to other populations; the area this population occurs in was burnt approximately 10 years ago, indicating that this taxon establishes in large numbers following fire, and appears to decline significantly in numbers with time since fire.

Searching within all suitable habitat that was mapped in the Development Envelope was undertaken; the majority of locations and individuals (171 locations and 1,885 individuals) of this taxon recorded in the Study Area were recorded within the Development Envelope. However, it is worthy of note that individuals at several recorded locations outside the Development Envelope were not counted because of time constraints; time constraints also meant that several populations that extended outside the Development Envelope could not be fully censused. There are also large areas of suitable habitat in the Study Area outside the Development Envelope that were not searched. It is therefore considered likely that there are reasonable numbers of individuals present elsewhere in the Study Area. Additionally, the numbers of individuals recorded in the largest population in the Study Area, which is almost entirely contained in the Development Envelope, are much higher than other populations because this population has been relatively recently burnt, as outlined above.

Plate 10: Specimen of *Leucopogon* aff. *canaliculatus* collected by Woodman Environmental (2018)

Synaphea* aff. *drummondii

A collection from the Study Area was identified by *Synaphea* expert Ryonen Butcher from the WA Herbarium as *Synaphea* aff. *drummondii* (Plate 11). *Synaphea drummondii* is listed as P3; however, typical *Synaphea drummondii* is generally accepted to occur in the central wheatbelt of W.A (George 1995). The herbarium holds a number of collections that are treated as *Synaphea* aff. *drummondii* or *Synaphea* ?*drummondii* from an area stretching from Cranbrook to the Study Area; the collection from the Study Area appears to match one such collection made from 4 km south of the Study Area. As it is possible that this and the collection from the Study Area may represent an undescribed taxon, and these are the eastern-most collections of material resembling *Synaphea drummondii*, it is considered appropriate to treat the taxon from the Study Area as significant as per EPA guidance (EPA 2016b).

This taxon was only identified following the primary field survey; therefore, targeted searching was undertaken during survey in 2019. *Synaphea* aff. *drummondii* was recorded at 62 locations within the Study Area during this survey, with a total of 147 individuals recorded

across these locations; these represent 6 populations. These locations were scattered across the Study Area in areas mapped as VU 16; one population just extends into areas mapped as VUs 1 and 10, however, this is most likely related to the scale of vegetation mapping. Additionally, one population extended outside the Study Area, with 103 individuals recorded across 24 point locations. Almost all locations were in recently disturbed areas, including recently burnt and recently chained vegetation, and it was far more abundant at these locations compared to undisturbed locations. This is a common syndrome for a number of other *Synaphea* taxa, which appear to establish in large numbers following fire, and are apparently relatively short-lived, being almost absent from adjacent undisturbed areas (Woodman Environmental field observations).

Searching within all suitable habitat that was mapped in the Development Envelope was undertaken, with 49 locations and 112 individuals recorded within the Development Envelope. However, it is worthy of note that individuals at several recorded locations outside the Development Envelope were not counted because of time constraints; time constraints also meant that several populations that extended outside the Development Envelope could not be fully censused. There are also large areas of suitable habitat in the Study Area outside the Development Envelope that were not searched. It is therefore considered likely that there are reasonable numbers of individuals present elsewhere in the Study Area. Additionally, the numbers of individuals recorded in the Development Envelope, are much higher than most other populations because this population has been relatively recently disturbed through vegetation chaining, as outlined above.

Plate 11: Specimen of *Synaphea* aff. *drummondii* collected by Woodman Environmental (2018)

***Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)**

A collection from the Study Area was identified by *Synaphea* expert Ryonen Butcher from the WA Herbarium as *Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200) (Plate 12). This collection does not fit well within the current taxonomic framework of the genus and has not been seen before by Ryonen Butcher (M. Hislop *pers. comm.*). As this collection potentially represents an undescribed taxon, it is considered appropriate to treat it as significant as per EPA guidance (EPA 2016b).

This taxon was only identified following the primary field survey; therefore, targeted searching was undertaken during survey in 2019. *Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200) was recorded at 13 locations during this survey with a total of 92 individuals recorded across these locations; these represent 2 populations. The populations were in the north-east and south-west corners of the Study Area in areas mapped as VU 16; the north-eastern population just extends into an area mapped as VU 2; however, this is most likely related to the scale of vegetation mapping. Both were in recently disturbed areas,

including recently burnt and recently chained vegetation; as noted under *Synaphea* aff. *drummondii*, this is a common syndrome for a number of other *Synaphea* taxa, which appear to establish in large numbers following disturbance such as fire, and are relatively short-lived, being almost absent from adjacent undisturbed areas (Woodman Environmental field observations).

Searching within all suitable habitat that was mapped in the Development Envelope was undertaken; the majority of locations and individuals (11 and 90 respectively) were recorded within the Development Envelope. However, it is worthy of note that there are also large areas of suitable habitat in the Study Area outside the Development Envelope that were not searched. It is therefore possible that there are reasonable numbers of individuals present elsewhere in the Study Area. However, as such potential habitat is mostly unburnt at present, and this species appears to establish following disturbance such as fire and may only persist for a relatively short period of time, it is likely that only a survey post-fire could locate additional individuals. Only two individuals were recorded in the relatively recently-burnt south-western population; it is possible that individuals may have already disappeared from this area.

Plate 12: **Specimen of *Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200) collected by Woodman Environmental (2018)**

5.2.3 Other Flora Taxa of Interest

The following putative *Lepidosperma* taxa reported by Barrett *et al.* (2009) as occurring in the Ravensthorpe area were recorded in the Study Area by this survey:

- *Lepidosperma* sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)';
- *Lepidosperma* sp. 'Dunns Swamp (R. Davis 724)'; and
- *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'.

Although these putative taxa are of taxonomic interest, Barrett *et al.* (2009) did not consider any of them to be of conservation significance. They are therefore not considered to be significant taxa as per EPA (2016b).

The hybrid taxon *Caladenia x ericksoniae* was collected in the Study Area. This is a known hybrid that is listed on the Census of Western Australian Plants (WA Herbarium 1998-), and is considered to be a hybrid between *Caladenia cairnsiana* and *Caladenia horistes* in the case of the collection in the Study Area, both of which were observed within the immediate vicinity of the collection location. It is a commonly encountered hybrid, with the exact parentage of the type collection not known; it is presumed to be infertile, and therefore is not considered to be a significant taxon as per EPA (2016b).

The mallet *Eucalyptus dielsii* was recorded relatively widely in the Study Area; however, for apparently the first time (M. French *pers. comm*.), red-flowered individuals were observed and collected, with these individuals co-occurring with green-yellow flowering individuals, which is typical of the species. In all other aspects these individuals appeared typical of this species, which is very distinctive amongst *Eucalyptus* taxa. *Eucalyptus* expert Malcolm French also visited the Study Area to assess these individuals and has lodged his material under *Eucalyptus dielsii*; while the documentation of red flowers in this taxon is of general morphological interest in the context of this taxon, there appear to be no other discernible morphological characteristics present to suggest that such individuals should be considered taxonomically distinct.

No taxa recorded in the Study Area are considered to be short-range endemics, other than the potentially undescribed taxa discussed in Section 5.2.2.2.

Table 10 presents taxa where the collections from the Study Area represent extensions to the known distribution of such taxa, or otherwise fill gaps within their known distributions, according to NatureMap (DBCA 2007-). A total of 31 taxa recorded during the survey represent range extensions or fill gaps within their known distributions.

Although collections of taxa that are 'representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)' could be considered significant taxa as per EPA (2016b), none of the taxa listed in Table 10 are considered to be significant taxa in this context. The Study Area is within a part of Western Australia that has been poorly explored in a botanical context, owing to its remoteness, and in many cases inaccessibility (the vegetation is often exceptionally thick and difficult to traverse). Significant range extensions are commonly recorded in this area of Western Australia; surveys for the proposed State Barrier Fence extension by Ecoscape

(2017), which assessed the southern edge of a large area of uncleared vegetation between Jerdacuttup and Cape Arid that is 25 km north-west of the Study Area at its closest, recorded over 25 taxa that were considered to be range extensions or at the edge of their known ranges. Of these, five of these were extensions of between 140 and 200 km (Ecoscape 2017). All of the taxa listed in Table 10 (excluding those considered significant for other reasons) are common or relatively common taxa that have large ranges in WA, and many are relatively poorly collected because of this. Some of the taxa that represent significant range extensions are also exceptionally cryptic and are consequently very poorly collected across their ranges. This includes three of the most significant range extensions recorded, being *Isotropis juncea*, *Pterostylis galgula* and *Caladenia sigmoidea*; these taxa are very small (often a few cm high), and can only be readily identified during their short flowering periods.

Table 10: Taxa Where Collections Represent Significant Range Extensions to the Known Ranges of these Taxa, or Fill Distribution Gaps (DBCA 2007-)

Taxon	Description
Acacia lachnophylla	Fills gap in known distribution
Acacia lasiocarpa var. *bracteolata*	Fills gap in known distribution
Acacia latipes subsp. *latipes*	Fills gap in known distribution
Acacia spongolitica	Extension of known distribution approximately 55 km to the east
Banksia baxteri	Extension of known distribution approximately 20 km to the north
Caladenia sigmoidea	Extension of known distribution approximately 45 km to the south
Calothamnus villosus	Fills gap in known distribution
Dampiera sp. Ravensthorpe (G.F. Craig 8277) (P3)	Extension of known distribution approximately 52 km to the east
Dodonaea stenozyga	Fills gap in known distribution
Eucalyptus indurata	Fills gap in known distribution
Hydrocotyle pilifera var. *glabrata*	Fills gap in known distribution
Hypolaena fastigiata	Fills gap in known distribution
Isotropis juncea	Extension of known distribution approximately 215 km to the east
Jacksonia racemosa	Fills gap in known distribution
Lepidosperma gracile	Fills gap in known distribution
Lepidosperma sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738)	Extension of known distribution approximately 50 km to the east
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	Extension of known distribution approximately 45 km to the east
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596) (P1)	Extension of known distribution approximately 45 km to the east
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	Extension of known distribution approximately 45 km to the east
Leptospermum sp. Bandalup Hill (G. Cockerton 11001)	Extension of known distribution approximately 40 km to the east
Olearia exiguifolia	Fills gap in known distribution
Pimelea pendens	Fills gap in known distribution
Pterostylis galgula	Extension of known distribution approximately 85 km to the south-east
Pultenaea calycina subsp. *proxena* (P4)	Extension of known distribution approximately 10 km to the east
Rhodanthe laevis	Fills gap in known distribution

Taxon	Description
Stylidium albomontis	Fills gap in known distribution
Suaeda australis	Fills gap in known distribution
Tricostularia exsul	Extension of known distribution approximately 85 km to the east
Tricostularia neesii	Extension of known distribution approximately 80 km to the east
Vittadinia australasica var. *australasica*	Fills gap in known distribution
Waitzia ?nitida	Extension of known distribution approximately 100 km to the south-east (if identification confirmed)

5.2.4 Likelihood of Occurrence of Further Significant Flora Taxa

As detailed in Section 5.1.5, a total of 107 listed significant flora taxa were identified as occurring within the Desktop Study Area prior to survey. Of these, six were recorded within the Study Area by this survey, three of which were also recorded within the Development Envelope (Table 9). A further six significant taxa were recorded in the Study Area, three of which were recorded in the Development Envelope. Table 11 presents an assessment of the likelihood of significant flora taxa occurring in the Development Envelope and Study Area. This assessment considered whether a taxon was identifiable at the time of survey, the known range of the taxon, proximity of known records to the Study Area, and survey effort in the Development Envelope and Study Area, when determining the potential for a taxon to occur in the Development Envelope or Study Area. It is worthy of note that suitable habitat has been determined using details recorded at known locations. However, for many of the taxa known from the general vicinity of the Study Area, suitable habitat is difficult to define, as habitat information is often vague or very broad and difficult to interpret; for example an area described as a flat with brown clay loam could feasibly occur almost anywhere in Western Australia. A precautionary approach has been adopted when assessing whether suitable habitat for a species is present in the Study Area.

Of the taxa known to occur in the Desktop Study Area all were considered to be identifiable during the survey periods, either because the survey period coincided with the taxon's flowering period, or the taxon can be identified reliably when in fruit or when sterile. In the context of the wider Study Area, it is considered that a further 15 taxa could potentially still occur, even though they were identifiable at the time of survey. This is based on suitable habitat potentially occurring in the wider Study Area that has not yet been surveyed intensively, and known records being within the distribution of the taxon and generally within close proximity to the Study Area (Table 11). However, the fact that these taxa were identifiable and were not recorded, despite the extent of undertaken of relatively intensive survey, reduces the probability of occurrence. The remaining taxa are considered unlikely to occur in the Study Area; in some cases, no suitable habitat is present, while in others, although potentially suitable habitat may be present, the Study Area is not within the known range of the taxon, and the nearest records are not within close proximity to the Study Area.

Of these 15 significant taxa that could potentially still occur in the Study Area, it is considered that only one could potentially still occur in the Development Envelope, being *Eucalyptus dielsii x platypus* (P1). This is discussed further below. The remaining 14 taxa are considered unlikely to occur within the Development Envelope, as it is considered that all potential habitat for significant flora taxa has now been surveyed at an appropriate time.

Eucalyptus dielsii x platypus (P1) is known from 2 collections made by the same collector on the same day in relatively close (20 km) proximity to each other. Both were collected from woodland areas dominated by *Eucalyptus dielsii*; no other habitat information was provided (W.A. Herbarium 1998), however presumably *E. platypus* occurs in the vicinity of these locations. Both taxa are relatively common in the general vicinity of the Study Area, and field observations suggest they often occupy similar habitats; however, based on the number of collections made, hybridisation events appear to be rare. There are large areas of VU 14 (see Section 5.2.7), both in the Development Envelope and in the wider Study Area, that are dominated by one or both parents of this taxon; it is therefore possible that this taxon could occur in such areas; although it was not observed during surveys. No specific searching for this taxon was conducted, as this would have required a significant amount of time to cover the potential habitat for this taxon, and there was no evidence to suggest that any individuals of this hybrid occur in the Study Area other than the presence of the two parent species.

It should be noted that it is unclear as to why this taxon was listed as a Priority taxon; most named hybrids, although represented by few collections, are not listed under any conservation category (W.A. Herbarium 1998-). Hybrids are apparently only considered of conservation significance if they are able to continue breeding (Kern 2010; Nicolle and French 2012). Although the potential for individuals of *Eucalyptus dielsii x platypus* (P1) to breed is unknown, the paucity of collections of this taxon could indicate that breeding is unlikely. Therefore, there is the potential that this taxon should not be listed as a taxon of conservation significance.

Table 11: Likelihood of Occurrence of Further Significant Flora Taxa in the Study Area

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Acrotriche orbicularis	T	July, October.	Grey to brown clay loam. Magnesite. Hill slopes and rises.	Yes	Unlikely (both): habitat present, however all potential habitat inspected during survey.
Anigozanthos bicolor subsp. *minor*	T	August - October	Sand, often with granite. Winter-wet sandy sites, sandy sites near granite outcrops.	Yes	Unlikely (both): habitat not considered to be present.
Beyeria cockertonii	T	May, October	Clay with komatiite fragments. Hills and slopes.	Yes	Unlikely (both): habitat not considered to be present.
Conostylis lepidospermoides	T	September - October	Grey or yellow-brown sand over laterite. Undulating plains.	Yes	Recorded in Study Area; Unlikely in Development Envelope: all potential habitat surveyed.
Eremophila denticulata subsp. *denticulata*	T	August – December, January - February	Alluvium, sand, sandy clay loam. River beds and plains, laterite breakaways.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north-west of the Study Area, nearest record 20 km from Study Area
Eremophila lactea	T	September - November	White sandy clay loam often with limestone. Calcareous flats	Yes	Unlikely (both): habitat not considered to be present.
Eremophila subteretifolia	T	November - December	Grey sand, loam. Edges of salt lakes, sub-saline flats.	Yes	Unlikely (both): habitat not considered to be present.
Eucalyptus purpurata	T	November	White powdery loam, magnesite. Ridges.	Yes	Unlikely (both): habitat present, however all potential habitat inspected during survey
Hibbertia abyssus	T	September - November	Sandy loam/clay with siltstone. Rocky hills and breakaways.	Yes	Unlikely (both): habitat not considered to be present.
Hypocalymma sp. Cascade (R. Bruhn 20896)	T	August	Sandy loam with granite. Granite outcrops	Yes	Unlikely (both): habitat not considered to be present.
Kennedia glabrata	T	August - November	Soil pockets, sandy soils. Granite outcrops.	Yes	Unlikely (both): habitat not considered to be present.
Kunzea similis subsp. *mediterranea*	T	September - October	Grey loamy sand over laterite. Ridge tops.	Yes	Unlikely (both): habitat not considered to be present.

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Lambertia echinata subsp. *echinata*	T	September - October	Gravelly sandy loam, brown sandy loam, white-grey sand, granite, laterite. Below and between rock outcrops, slopes, hill crests.	Yes	Unlikely (both): habitat not considered to be present.
Rhizanthella johnstonii	T	June - July	Under *Melaleuca uncinata*/ *hamata* mallee heath (DBCA 2010) in sandy clay soil.	No	Unlikely (both): habitat not considered to be present
Ricinocarpos trichophorus	T	May, August - September	Sandy clay, loam. Breakaways, among sandstone rocks.	Yes	Unlikely (both): habitat possibly present, but all habitat considered to have been inspected by survey
Roycea pycnophylloides	T	September	Sandy soils, clay. Saline flats.	Yes	Unlikely (both): habitat not considered to be present.
Brachyloma nguba	P1	April - May	Sand, sandy clay or loam. Plains, upper slopes, flats.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 35 km from Study Area
Caladenia longifimbriata	P1	September - October	Seasonal creeks.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 40 km from Study Area.
Conostephium sp. Cascades (R. Bruhn 24/899 CAS)	P1	August	Yellow to brown sandy loam. Low plains, flats.	Yes	Unlikely (both): habitat possibly present, but has restricted distribution to the north-east of the Study Area, nearest record 25 km from Study Area.
Cyanicula sp. Esperance (G. Brockman 735)	P1	September	Sandy heathlands.	Yes	Unlikely (both): habitat possibly present, but has restricted distribution to the south-west of the Study Area, nearest record 20 km from Study Area.
Drosera grievei	P1	September	Sandy clay or sand, often with laterite gravel. Undulating plains	Yes	Unlikely (both): habitat possibly present, but distribution is to the west of the Study Area, nearest record 40 km from Study Area

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Eucalyptus dielsii x *platypus*	P1	Not specified	Moderately-drained clay loam. Moderately exposed, almost flat plains, gilgai plains.	Yes	**Possible (both)**: both parent species recorded, nearest record 25 km from Study Area.
Hibbertia carinata	P1	August - September	Well-drained gravelly sand, yellow sand with gravel. Undulating plains.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and west of the Study Area, nearest record 40 km from Study Area
Lepidosperma sp. Hopetoun Road (S. Kern et al. LCH 16552)	P1	Not known	Clayey sand, clay loam. Lower slopes to hill crests.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 30 km from Study Area.
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596)	P1	Not known	Undulating plains, lower slopes to crests. Clay and clay loam, with quartz/ironstone/mafic gravel.	Yes	Recorded in Study Area; Unlikely in Development Envelope: all potential habitat surveyed.
Lepidosperma ?sp. Mt Short (S. Kern et al. LCH 17510)	P1	Not known	Rocky hills.	Yes	Recorded in Study Area; Unlikely in Development Envelope: all potential habitat surveyed.
Lepidosperma sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764)	P1	Not known	Lower to upper slopes of ranges. Clayey sand or clay loam with silcrete or laterite fragments.	Yes	Unlikely (both): habitat not considered to be present.
Leucopogon sp. Cascades (M. Hislop (3693)	P1	April – September	Sandy loam soils, sometimes over laterite. Plains, valley slopes.	Yes	Recorded in Study Area; Unlikely in Development Envelope: all potential habitat surveyed.
Leucopogon sp. Lake Magenta (K.R. Newbey 3387)	P1	November	Undulating plains and slopes. Sand and loamy sand, sometimes over laterite.	Yes	Unlikely (both): habitat possibly present, but distribution is to the south and west of the Study Area, nearest record 40 km from Study Area

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Leucopogon sp. Lake Tay (W.R. Archer 2104138)	P1	August	Deep white/grey sand on flats	Yes	Unlikely (both): habitat not considered to be present.
Melaleuca similis	P1	November	Grey sand. Margins of saline areas.	Yes	Unlikely (both): habitat not considered to be present.
Microcybe pauciflora subsp. *grandis*	P1	October	Clay-loam or loam sometimes with saprolite/ magnesite fragments. Upper slopes.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and west of the Study Area, nearest record 40 km from Study Area
Persoonia flexifolia	P1	December, January	Lateritic soils with granitic rock. River banks.	Yes	Unlikely (both): habitat possibly present, but has vey distribution to the east of the Study Area, nearest record 30 km from Study Area.
Philotheca gardneri subsp. *globosa*	P1	May - July	Sandy loam or sandy clay. Undulating plains, flats.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 35 km from Study Area
Prostanthera splendens	P1	August - October	Stony loam, shallow soils with ironstone pebbles. Breakaways.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 40 km from Study Area
Scaevola archeriana	P1	January, December	Sandy and sandy-clay loam soils. Sandplains, adjacent to salt lakes.	Yes	Unlikely (both): habitat not considered to be present.
Scaevola tortuosa	P1	October	Sandy clay. Slopes, margins of salt lakes.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and west of the Study Area, nearest record 30 km from Study Area
Acacia amyctica	P2	August - September	Sandy loam or clay. Flats.	Yes	Unlikely (both): habitat possibly present, but has restricted distribution to the north-east of the Study Area, nearest record 40 km from Study Area.
Astroloma sp. Grass Patch (A.J.G. Wilson 110)	P2	June - August	White/grey sand. Edge of salt lakes.	Yes	Unlikely (both): habitat not considered to be present.
Bentleya diminuta	P2	September - November	Sandy clay or loam. Undulating plains and slopes.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 35 km from Study Area.

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Caesia viscida	P2	September-November	Grey sand. Low dunes.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and east of the Study Area, nearest record 40 km from Study Area
Dampiera orchardii	P2	Not specified	Sand. Sometimes near salt lakes.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and west of the Study Area, nearest record 40 km from Study Area
Eucalyptus litorea	P2	March	Sand, sandy clay loam. Coastal dunes, salt lakes.	Yes	Unlikely (both): habitat not considered to be present.
Hydrocotyle papilionella	P2	September	Grey to brown sand. Salt lake edges, flats, granite outcrops.	Yes	Unlikely (both): habitat not considered to be present.
Hydrocotyle tuberculata	P2	October	Loamy sand/loam. Salt lake edges, drainage lines.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 40 km from Study Area.
Levenhookia pulcherrima	P2	September - November	White/grey sand. Plains and hill slopes.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and west of the Study Area, nearest record 35 km from Study Area
Patersonia inaequalis	P2	August - October	Sandy clay, lateritic or granitic sand. Hills, slopes and ridges with granite outcropping.	Yes	Unlikely (both): habitat possibly present, but distribution is to the east of the Study Area, nearest record 40 km from Study Area
Scaevola paludosa	P2	September December	Peat or sand. Wet flats	Yes	Unlikely (both): habitat not considered to be present.
Stylidium thylax	P2	October	Sand. Gentle slopes and plains. Heath, mallee shrubland.	Yes	Unlikely (both): habitat possibly present, but record in Desktop Study Area is unverified, nearest verified records are over 100 km north-west of Study Area, distribution is to the north-west of the Study Area.

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Thysanotus brachiatus	P2	November - December	Grey sand. Sandplains.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 30 km from Study Area.
Tricostularia sp. Lake King (A.M. Coates 2298)	P2	June, October - November	Sandy soils, sometimes with laterite gravel. Undulating plains	Yes	Unlikely (both): habitat possibly present, but distribution is to the west of the Study Area, nearest record 40 km from Study Area.
Velleia exigua	P2	October	Grey sandy clay or sand. Salt lake edges.	Yes	Unlikely (both): habitat not considered to be present.
Acacia bartlei	P3	August - September	Sandy loam. Undulating plains near lakes and swamps, depressions.	Yes	Unlikely (both): habitat not considered to be present, has restricted distribution to the north-east of the Study Area, nearest record 40 km from Study Area.
Acacia improcera	P3	August	Sand, loamy clay, clay. Undulating plains, flats.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 20 km from Study Area.
Acacia singula	P3	August - October	Gravelly sand over laterite, white or yellow sand. Rises, hilltops.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 30 km from Study Area.
Astartea reticulata	P3	October, December, January - February,	Sand, sandy loam. Near-coastal swamps, drainage lines, winter wet flats.	Yes	Unlikely (both): habitat not considered to be present, nearest record 20 km from Study Area.
Banksia lullfitzii	P3	March - May	Yellow sand. Flat to undulating yellow sandplains.	Yes	Unlikely (both): habitat not considered to be present.

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Banksia xylothemelia	P3	September - October	Sandy loam, usually over laterite. Sandplains.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and west of the Study Area, nearest record 40 km from Study Area, but may be erroneous, as locality description vague
Bossiaea flexuosa	P3	September - November	Sandy soil. Sandplains, saline areas, low rises	Yes	Unlikely (both): habitat possibly present, but distribution is to the east of the Study Area, nearest record 30 km from Study Area
Chorizema circinale	P3	September - December	Yellow sand, sandy clay with gravel. Flats, plains.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and west of the Study Area, does not occur in the Desktop Study Area - nearest record is at least 50 km away (record in Desktop Study Area has erroneous coordinates)
Commersonia rotundifolia	P3	August - November	Grey clay loam or clay. Hills, slopes.	Yes	Recorded in Development Envelope and Study Area
Cryptandra polyclada subsp. *polyclada*	P3	January – May, August - October	Sand. Sandplains.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and west of the Study Area, nearest record 30 km from Study Area
Dampiera sericantha	P3	May, August - December	Grey-white or yellow sand. Plains, flats.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 5 km from Study Area.
Dampiera sp. Ravensthorpe (G.F. Craig 8277)	P3	July – December	Rocky outcrops (sandstone, granite, laterite).	Yes	Recorded in Study Area; Unlikely in Development Envelope: all potential habitat surveyed.

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Daviesia pauciflora	P3	October – December, January.	White or grey sand over laterite or limestone. Flats, plains.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 5 km from Study Area.
Eremophila chamaephila	P3	November - December	Clay, sandy clay. Plains, flats, wetlands.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 25 km from Study Area
Eremophila compressa	P3	October – December, March.	Red brown clay or clay loam, sandy loam. Undulating plains, flats.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 25 km from Study Area
Eucalyptus semiglobosa	P3	May, October – December, January	White sand over laterite, silty sand on edge of granite shelf, limestone. Hillslopes, gullies, cliffs.	Yes	Unlikely (both): habitat not considered to be present.
Gastrolobium cruciatum	P3	September	Sand and clayey sand with gravel, rocky loams, laterite. Flats, gently undulating areas.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north-west of the Study Area, nearest record 20 km from Study Area
Goodenia laevis subsp. *laevis*	P3	August - December	Sandy loam, clay. Sometimes with laterite or limestone. Flats, plains.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and east of the Study Area, nearest record 35 km from Study Area
Grevillea punctata	P3	April – May, November	Stony red loam, red clay. Low undulating hills	Yes	Unlikely (both): habitat not considered to be present.
Hopkinsia adscendens	P3	October	Sand. Drainage line/lake edges, sandplains, saline areas.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 15 km from Study Area.

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Hydrocotyle eichleri	P3	September	Grey to brown sand. Salt lake margins.	Yes	Unlikely (both): habitat not considered to be present.
Isolepis australiensis	P3	June or September	Silty sand, sandy clay. Lake margins, pools.	Yes	Unlikely (both): habitat not considered to be present.
Lasiopetalum parvuliflorum	P3	September - October	Sand, gravelly loam. Along creeks, seasonal swamps.	Yes	Unlikely (both): habitat possibly present, but no records apparently in vicinity of Study Area, record in Desktop Study Area has vague locality information and may not be in Desktop Study Area
Melaleuca dempta	P3	August - October	White to brown clayey sand or clay. Salt lake edges.	Yes	Unlikely (both): habitat not considered to be present.
Micromyrtus navicularis	P3	April – May, September - October	Sand with gravel, laterite, granite. Hill slopes.	Yes	Unlikely (both): habitat possibly present, but distribution is to the west of the Study Area, nearest record 40 km from Study Area
Mirbelia densiflora	P3	October, January	Stony loam, loamy sand. Small ridges, breakaways, undulating plains.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 30 km from Study Area
Opercularia acolytantha	P3	October - November	White/grey or yellow sandy loam/sand often over laterite. Plains and flats.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 35 km from Study Area.
Persoonia brevirhachis	P3	August - October	White or yellow sand, gravelly sandy soils. Hilltops, slopes and flats.	Yes	Unlikely (both): habitat possibly present, but distribution is to the west of the Study Area, nearest record to Study Area (6 km west) has erroneous coordinates and is doubtful
Persoonia scabra	P3	November – December, January	White sand or sandy loam. Lower slopes, plains and consolidated dunes.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north and east of the Study Area, nearest record 40 km from Study Area

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Pultenaea adunca	P3	March, October	White/grey sand. Slopes, ridges and plains.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 25 km from Study Area.
Pultenaea craigiana	P3	August – November	Calcareous loam, often over schist or quartz. Low hills.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 30 km from Study Area
Pultenaea daena	P3	March, November	White/yellow sand or sandy loam, sometimes with limestone and laterite gravel. Gently undulating plains, flats, salt lake edges.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 30 km from Study Area
Sphaerolobium validum	P3	September	White-grey sand, red-brown clayey sand, laterite gravel and quartz pebbles. Gently undulating areas, flats.	Yes	Unlikely (both): habitat possibly present, but distribution is to the west of the Study Area, nearest record 40 km from Study Area
Stylidium pulviniforme	P3	September - November	White sand. Winter-wet areas and edges of salt lakes.	Yes	Unlikely (both): habitat not considered to be present.
Synaphea platyphylla	P3	September - October	Sandy loam and sand sometimes with laterite gravel. Plains and flats.	Yes	Unlikely (both): habitat possibly present, but distribution is to the west of the Study Area, nearest record 25 km from Study Area
Thomasia pygmaea	P3	August - October	Stony sandy loam, clayey sand. Flats, plains.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 20 km from Study Area.

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Allocasuarina hystricosa	P4	February, May	Orange, red or brown loam with limestone or granite outcropping. Plains, lower slopes, hilltops.	Yes	Unlikely (both): habitat possibly present, but distribution is to the west of the Study Area, nearest record 40 km from Study Area.
Banksia prolata subsp. *calcicola*	P4	July - September	White sand over limestone. Coastal areas.	Yes	Unlikely (both): habitat not considered to be present.
Beyeria villosa	P4	March, May	Brown sandy clay loam or calcareous loam, with magnesite fragments. Low undulating hills.	Yes	Unlikely (both): habitat present, however all potential habitat inspected during survey.
Corybas limpidus	P4	August - September	Coastal dunes.	Yes	Unlikely (both): habitat not considered to be present
Dampiera deltoidea	P4	September - November	Sand, sandy clay, loam often with laterite. Hills, slopes.	Yes	Unlikely (both): habitat possibly present, but distribution is to the west of the Study Area, nearest record 40 km from Study Area
Eremophila serpens	P4	September – December, March - May	White/grey sand, alluvium, loam. Winter-wet depressions, sub-saline flats, drainage lines, salt lakes.	Yes	Unlikely (both): habitat not considered to be present.
Eucalyptus preissiana subsp. *lobata*	P4	November	Sand. Coastal limestone rises and sand dunes.	Yes	Unlikely (both): habitat not considered to be present.
Eucalyptus stoatei	P4	July – August, October – December, January - February	Gravelly sand or clay, sandy loam. Flats, rises.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 20 km from Study Area.
Eucalyptus x *missilis*	P4	January - April	Sand over limestone or granite. Coastal sites.	Yes	Unlikely (both): habitat not considered to be present.

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Goodenia phillipsiae	P4	November	Clay loam or clay often with laterite or quartz fragments. Undulating plains and hills.	Yes	Unlikely (both): habitat possibly present, but distribution is to the west of the Study Area, nearest record 40 km from Study Area
Grevillea aneura	P4	June, August – December, January.	Sand, sandy clay, gravel. Undulating plains, low rises.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 30 km from Study Area
Grevillea fastigiata	P4	January	Red to brown clay, magnesite/ komatiite fragments. Hills, slopes	Yes	Unlikely (both): habitat not considered to be present.
Gyrostemon ditrigynus	P4	October - November	Sand, sandy clay, loam. Plains, low ironstone ridges.	Yes	Unlikely (both): habitat possibly present, but distribution is to the north of the Study Area, nearest record 30 km from Study Area
Lepidium pseudotasmanicum	P4	Various, September-February mainly	Loam or sand, often with granite. Hillslopes, creek edges and flats.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 15 km from Study Area.
Leucopogon blepharolepis	P4	August - December	White/grey sand, calcareous sand, sandy clay over quartzite. Sandy ridges, consolidated coastal dunes, hills.	Yes	Unlikely (both): habitat not considered to be present.
Melaleuca fissurata	P4	July - August	White/grey sand, sandy loam. Samphire flats, salt pans.	Yes	Unlikely (both): habitat not considered to be present.
Melaleuca penicula	P4	January - February	Red/brown loamy sand or red sandy clay. Granite outcrops and valley slopes on hills	Yes	Unlikely (both): habitat not considered to be present.

Taxon	Status	Flowering Period (WA Herbarium 2018)	Habitat (WA Herbarium 1998-)	Identifiable During Survey?	Likelihood of Occurrence in Development Envelope and Study Area
Pultenaea calycina subsp. *proxena*	P4	September - October	Sand, clay, sandy clay or loam, with gravel, often with magnesite outcropping. Slopes of hills and rises.	Yes	Recorded in Development Envelope and Study Area
Stachystemon vinosus	P4	September - November	Fine loamy sand, stony soils. Sandplains, rock crevices on breakaways.	Yes	Recorded in Development Envelope and Study Area
Thysanotus parviflorus	P4	October - November	Sandy silcrete soils, sand or sandy loam. Hillslopes, flats.	Yes	Unlikely in Development Envelope: habitat possibly present, but all habitat considered to have been inspected by survey; **Possible in Study Area**: habitat possibly present, Study Area within range of taxon, nearest record 35 km from Study Area.
Leucopogon aff. *canaliculatus*	Potential new taxon	September - October	Sandy loam over laterite. Undulating plains	Yes	Recorded in Development Envelope and Study Area
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)	Potential new taxon	September - October	Sandy loam over laterite. Undulating plains	Yes	Recorded in Development Envelope and Study Area
Synaphea aff. *drummondii*	Potential new taxon[#]	September - October	Sandy loam over laterite. Undulating plains	Yes	Recorded in Development Envelope and Study Area
Acacia spongolitica	Unusual variant, range outlier	September - October	Sandstone outcrops	Yes	Recorded in Development Envelope and Study Area

5.2.5 Introduced Taxa

A total of 18 introduced flora taxa were recorded by this survey of the Study Area. These are listed in Table 12, together with location information, and comments regarding the significance of such taxa, including ecological impact and invasiveness ratings for each introduced taxon under the *Invasive Plant Prioritization Process for the DBCA* for the South Coast Region (DBCA 2016). No Declared Pests under the BAM Act or Weeds of National Significance were recorded in the Study Area; however, *Cirsium vulgare* is considered to be a particularly serious weed. Locations of introduced flora taxa are presented on Figure 11, and in Appendix I. The majority of weed taxa were recorded in VUs mapped in or adjacent to drainage lines (VUs 8, 12 and 13).

Table 12: Summary of Introduced Flora Taxa Recorded within the Study Area

Taxon	Common Name	Number of Locations Recorded	VUs	Comments
Briza minor	Blowfly Grass	1	8	Ecological impact Low, invasiveness rated Moderate (DBCA 2016)
Cirsium vulgare	Spear Thistle	2	12, 13	Ecological impact High, invasiveness rated Rapid (DBCA 2016)
Conyza bonariensis	Flaxleaf Fleabane	1 confirmed; 1 unconfirmed (poor material)	12, 13	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)
Cotula coronopifolia	Waterbuttons	2	12, 12	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)
Ehrharta longiflora	Annual Veldt Grass	10	2, 4, 8, 10, 11, 13, C	Ecological impact High, invasiveness rated Moderate (DBCA 2016)
Galium murale	Small Goosegrass	1	13	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)
Hypochaeris glabra	Flatweed	11	1, 5, 8, 11, 13, 14	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)
Lepidium africanum	Rubble Peppercress	1	12	Ecological impact Low, invasiveness Unknown (DBCA 2016)
Lysimachia arvensis	Pimpernel	5	8, 9, 13	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)
Parapholis incurva	Coast Barbgrass	1	12	Ecological impact Unknown, invasiveness Unknown (DBCA 2016)
Parentucellia latifolia	Common Bartsia	1	11	Ecological impact Unknown, invasiveness Unknown (DBCA 2016)
Pentameris airoides subsp. *airoides*	False Hairgrass	1 confirmed; 1 unconfirmed (poor material)	8; 13	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)
Rumex crispus	Curled Dock	1	12	Ecological impact Unknown, invasiveness Unknown (DBCA 2016)
Solanum nigrum	Black Berry Nightshade	2	12, 13	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)
Sonchus oleraceus	Common Sowthistle	5	12, 13, 14	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)

Taxon	Common Name	Number of Locations Recorded	VUs	Comments
Ursinia anthemoides subsp. *anthemoides*	Ursinia	4	8, 11, 13	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)
Vellereophyton dealbatum	White Cudweed	2	12, 13	Ecological impact Unknown, invasiveness rated Rapid (DBCA 2016)
Vulpia myuros	Rat's Tail Fescue	1	10	Ecological impact Unknown, invasiveness Unknown (DBCA 2016)

300000 302000 304000

6276000 6274000 6272000 6270000

Lea Csp Ehl
Coc Ehl Pai Sol
Lya
Ehl Vum Lya
Hyg
Hyg
Lya ?Peaa Ehl
Ehl Sol Hyg
Ehl Pal Uraa Hyg
Uraa Ehl Hyg
Brmi Hyg Ehl
Hyg
Cam Ehl Son
Hyg Sol

Legend

- Study Area
- Development Envelope

Introduced Flora

Brmi	*?Pentameris airoides subsp. airoides	Ehl	*Conyza sp.	?Peaa	*Pentameris airoides subsp. airoides
Civ	*Briza minor	Gam	*Ehrharta longiflora	Ruc	*Rumex crispus
Cob	*Cirsium vulgare	Hyg	*Galium murale	Sol	*Sonchus oleraceus
Coc	*Conyza bonariensis	Lea	*Hypochaeris glabra	Son	*Solanum nigrum
Csp	*Cotula coronopifolia	Lya	*Lepidium africanum	Uraa	*Ursinia anthemoides subsp. anthemoides
		Pai	*Lysimachia arvensis	Ved	*Vellereophyton dealbatum
		Pal	*Parapholis incurva	Vum	*Vulpia myuros
		Peaa	*Parentucellia latifolia		

300000 302000 304000

WOODMAN ENVIRONMENTAL

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This map should only be used in conjunction with WEC report MRC19-48-02.

Introduced Flora

Revision: 1 - 27 October 2020 Scale: 1:22,500 (A3)

Author: Leah Firth

WEC Ref: MRC19-48-02

Filename: MRC19-48-02-f11.mxd

Projection: GDA 1994 MGA Zone 51

Figure 11

5.2.6 Floristic Classification Results

The PATN software package (Belbin and Collins 2009) initially suggested that an eight-group classification of quadrats may be appropriate for the data analysed. The resulting dendrogram (see Appendix J) and taxon group matrix were therefore initially examined at this level, to determine the plausibility of groups with regard to taxon groups and also field observations. This process determined that there were 17 plausible groups which are considered to represent VUs in the Study Area; these groups were resolved at differing levels of similarity. These clusters are ordered from 1 to 17 from top to bottom in the dendrogram in Appendix J. The initial eight clusters are also indicated on the dendrogram by the colour of each individual quadrat stem.

The above examination of the classification analysis result indicated that two groups of quadrats were misclassified. These quadrats were found to be spatially located within the interface of two VUs, and therefore possessed taxa common to both. Manual reassigning of these quadrats to appropriate VUs was therefore undertaken, following detailed investigation of individual quadrat data, and examination of field notes. Those manually reassigned are discussed in Table 13 below.

5.2.7 Vegetation Units

Seventeen vegetation units (VUs) were described in the Study Area; the majority of vegetation units are mallee woodlands. The VUs belong to two broad vegetation groups:

- Group 1: Mallee woodlands or tall and mid shrublands on elevated plains with predominantly sandy soils and laterite at or near the surface (VUs 16 and 17);
- Group 2: Mallee woodlands, woodlands or tall to mid shrublands on eroded valley slopes and floors with predominantly clay soils (VUs 1-15).

The VUs described in the Study Area are summarised in Tables 13, 14 and 15. Table 13 includes the general description of the VU (as per Section 3.7), a short descriptive code, relationships to other VUs, and documented variation of the VU across its mapped occurrences. Table 14 presents the quadrats established in the VU, taxon richness of the VU, significant flora taxa present in the VU, indicator taxa and photographic examples. The spatial extent of the VUs in the Study Area and Extrapolated Study Area is summarised in Table 15 and presented on Figure 12.1; the VU legend is presented on Figure 12.2. Appendix K presents a taxon-VU matrix, compiled from quadrat data and Appendix L presents the indicator taxon analysis.

It is noted that the descriptions of VUs follow the NVIS system, which does not include the term ‘mallet’ as a growth form type. This term is specifically used to describe a form of many Western Australian *Eucalyptus* taxa; this includes several taxa recorded in the Study Area. For the purposes of the VU descriptions, these terms have been included under the term ‘mallee’. Although mallets differ from mallees and trees in the absence of a lignotuber and epicormic buds (i.e. they are killed by fire) as well as their general structure and branching pattern (slender erect trunks and usually steeply angled branches), it is considered more appropriate to include them under the term mallee than under the term ‘tree’ in the context of the Study Area, as true tree taxa are generally uncommon in the Study Area and are restricted to drainage lines.

It is worthy to note that a number of VUs mapped in the Study Area occur on small, sedimentary outcrops (referred to as 'sandstone'), and are represented by only one or a few quadrats (VUs 3, 4, 6 and 7). Although some of these VUs are similar to each other according to the classification analysis, and could arguably be combined into fewer, more broadly-defined VUs, the differences in composition are considered significant, and it is therefore considered appropriate to recognise them as distinct VUs as a precaution. However, it is acknowledged that the number of quadrats located in these VUs is currently very limited because of the limited number of such outcrops in the Study Area, and the decision to recognise these VUs is supported by a very small sample of quadrats. Further sampling of such areas both in the Study Area and in the wider region may serve to resolve the status of these VUs.

As outlined in Section 3.4.4, subsequent to the primary field survey, further field survey was conducted to facilitate the extrapolation of VU mapping polygons over areas immediately adjacent to the Study Area. This resulted in a number of Study Area VUs being mapped outside the Study Area. The spatial extent of the extrapolated polygons of the VUs is presented in Table 15, and on Figure 12. Appendix M presents notes on and photographs of occurrences of specific VUs recorded during the field survey.

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WOODMAN ENVIRONMENTAL

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This map should only be used in conjunction with WEC report MRC19-48-02.

Vegetation Units

Revision: 1 - 27 October 2020 Scale: 1:22,000 (A3)

Author: Leah Firth

WEC Ref: MRC19-48-02

Filename: MRC19-48-02-f12-1.mxd

Projection: GDA 1994 MGA Zone 51

Figure

12.1

Legend

Study Area

Development Envelope

Vegetation Mapping

1 Low mallee woodland to open woodland of mixed species including *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus uncinata*, *Eucalyptus suggrandis* subsp. *suggrandis* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland of mixed species usually dominated by *Melaleuca rigidifolia* and occasionally *Melaleuca subfalcata*, *Melaleuca calycina* and *Melaleuca lateriflora* over low open to sparse shrubland of mixed species including *Grevillea oligantha*, *Daviesia articulata*, *Daviesia lancifolia*, *Hibbertia pungens* and *Grevillea pectinata* over low sparse sedgeland of mixed species dominated by *Gahnia ancistrophylla*, *Gahnia aristata* and *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897) on red-brown, orange-brown or grey-brown clay loam, usually with ironstone, sandstone or mixed colluvial gravel, on upper to mid slopes of valleys and low hills.

2 Low mallee woodland to open woodland of mixed species including *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus suggrandis* subsp. *suggrandis*, *Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland to open shrubland of mixed species dominated by *Melaleuca hamata*, *Melaleuca sapientes*, *Melaleuca lateriflora*, *Daviesia aphylla* and *Melaleuca undulata* over low open to sparse shrubland of mixed species including *Acacia ingrata*, *Grevillea pectinata*, *Aotus* sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412), *Hibbertia psilocarpa* and *Chorizema nervosum* over low open sedgeland of mixed species dominated by *Gahnia ancistrophylla*, *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Gahnia aristata* and *Lepidosperma gahnioides* on red-brown to brown clay loam, usually with ironstone, sandstone or mixed colluvial gravel, on slopes valleys and low hills.

3 Low mallee woodland dominated by *Eucalyptus densa* subsp. *densa* over tall shrubland dominated by *Melaleuca pentagona* var. *pentagona* and *Banksia media* over low sparse shrubland dominated by *Hibbertia pungens* on skeletal light brown clay loam with sandstone stones over sandstone outcropping on breakaways and ridges.

4 Low mallee woodland of *Eucalyptus densa* subsp. *densa* over tall sparse shrubland dominated by *Acacia harveyi* and *Hakea laurina* over mid shrubland dominated by *Gastrolobium parviflorum* and *Melaleuca thapsina* over low shrubland dominated by *Dampiera* sp. Ravensthorpe (G.F. Craig 8277) (P3) on skeletal brown sandy loam with sandstone stones over sandstone outcropping on breakaways and ridges.

5 Low isolated mallees of mixed species including *Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall shrubland dominated by *Melaleuca hamata*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Melaleuca elliptica* and occasionally *Allocasuarina campestris* over mid to low open shrubland of mixed species dominated by *Astus tetragonus*, *Leucopogon cuneifolius*, *Philotheca gardneri* subsp. *gardneri* and occasionally *Hybanthus floribundus* subsp. *adpressus* and *Grevillea anethifolia* over low open sedgeland of mixed species dominated by *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma sanguinolentum*, *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' and *Gahnia aristata* on dark brown to brown clay loam with dolerite gravel and dolerite outcropping on upper and mid slopes of valleys.

6 Low open mallee woodland of mixed species dominated by *Eucalyptus ecostata* and *Eucalyptus pleurocarpa* over tall to mid shrubland of mixed species dominated by *Calothamnus villosus*, *Melaleuca hamata*, *Kunzea affinis*, *Acacia sulcata* var. *platyphylla* and *Melaleuca rigidifolia* over low sparse shrubland of mixed species dominated by *Darwinia* sp. Lake Cobham (K. Newbey 3262), *Leucopogon* sp. Newdegate (M. Hislop 3585), *Hemigenia teretiuscula*, *Philotheca gardneri* subsp. *gardneri* and *Calytrix leschenaultii* over low open sedgeland of mixed species dominated by *Lepidosperma sanguinolentum*, *Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1), *Lepidosperma rigidulum* and *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' on brown sandy loam with sandstone gravel and stones and occasional sandstone outcropping on breakaways and ridges.

7 Low mallee woodland to open forest dominated by *Eucalyptus densa* subsp. *densa* and occasionally *Eucalyptus flocktoniae* subsp. *flocktoniae* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid open shrubland of mixed species dominated by *Gastrolobium parviflorum*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Hakea lissocarpha* and occasionally *Melaleuca hamata* over low sparse shrubland of mixed species including *Hibbertia pungens*, *Hibbertia gracilipes* and *Lasiopetalum rosmarinifolium* over low sedgeland and forbland of mixed species including *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798), *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' and *Stylidium albomontis* on red-brown or light brown sandy loam with sandstone gravel and sandstone outcropping on breakaways and ridges.

8 Low woodland of *Eucalyptus occidentalis* over tall open to sparse shrubland dominated by *Melaleuca hamata* and *Acacia cyclops* over mid open to sparse shrubland of mixed species including *Hakea lissocarpha*, *Melaleuca glaberrima* and *Hakea nitida* over low sparse shrubland of mixed species including *Lasiopetalum rosmarinifolium*, *Hibbertia gracilipes*, *Dodonaea caespitosa* and *Thomasia angustifolia* over low open to sparse sedgeland and rushland of mixed species dominated by *Gahnia ancistrophylla*, *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798), *Lepidobolus preissianus*, *Lomandra micrantha* subsp. *teretifolia* and *Lepidosperma sanguinolentum* over low sparse forbland and grassland of mixed species including *Neurachne alopecuroidea*, *Chamaescilla corymbosa* var. *corymbosa*, *Goodenia affinis*, *Oxalis exilis* and *Lagenophora huegelii* on orange-brown clay loam or sandy loam on river flats.

9 Low woodland of *Eucalyptus occidentalis* over low open mallee woodland of *Eucalyptus quadrans* over tall to mid open to sparse shrubland of mixed species including *Acacia glaucoptera*, *Hakea lissocarpha*, *Acacia cyclops*, *Melaleuca acuminata* subsp. *acuminata* and *Acacia verriculum* over low sparse shrubland of mixed species including *Thomasia foliosa* , *Dodonaea caespitosa* and *Phyllanthus calycinus* over low open to sparse sedgeland of mixed species dominated by *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897) and *Lomandra effusa* over low sparse forbland of mixed species including *Lysimachia arvensis*, *Chamaescilla corymbosa* var. *corymbosa*, *Goodenia affinis*, *Oxalis exilis* and *Plantago hispida* on brown clay loam with quartz gravel on valley slopes.

10 Low open mallee woodland dominated by *Eucalyptus conglobata* subsp. *conglobata* and occasionally *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland to open shrubland of mixed species dominated by *Melaleuca hamata* and *Melaleuca lateriflora*, and occasionally *Melaleuca glaberrima*, *Santalum acuminatum* and *Acacia cyclops*, over low sparse shrubland of mixed species including *Lasiopetalum rosmarinifolium*, *Dodonaea caespitosa* and *Hakea lissocarpha* over low open to sparse sedgeland, forbland and rushland of mixed species dominated by *Gahnia ancistrophylla*, *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma* sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738), *Lepidobolus preissianus* and *Opercularia vaginata* on red-brown or brown clay loam with dolerite and occasionally quartz stones on valley flats and slopes.

11 Tall to mid open to sparse shrubland dominated by *Melaleuca uncinata* over mid to low shrubland to open shrubland of mixed species dominated by *Acacia sulcata* var. *platyphylla*, *Melaleuca elliptica* and *Astus tetragonus* over low sparse shrubland of mixed species including *Leptospermum oligandrum* and *Styphelia* sp. Cascades (R. Davis 11037) on brown clayey sand or clay loam with granite and quartz stones and often granite outcropping on low rises and slopes.

12 Low woodland to open forest dominated by *Eucalyptus occidentalis* and *Melaleuca cuticularis* over tall open shrubland of mixed species dominated by *Acacia cyclops*, *Acacia saligna* subsp. *lindleyi* ms and *Labichea lanceolata* subsp. *brevifolia* over low open to sparse sedgeland of mixed species including *Chorizandra enodis*, *Gahnia trifida* and *Juncus pallidus* over occasional low sparse chenopod shrubland dominated by *Salicornia quinqueflora* subsp. *quinqueflora*, *Suaeda australis* and *Disphyma crassifolium* subsp. *clavellatum* over low sparse forbland of mixed species including *Cotula australis* and **Cotula coronopifolia* on grey-brown to clay or clay loam in narrow drainage line channels.

13 Low woodland dominated by *Eucalyptus occidentalis* over tall to mid shrubland to closed shrubland of mixed species dominated by *Labichea lanceolata* subsp. *brevifolia*, *Acacia cyclops*, *Acacia sulcata* var. *platyphylla* and *Grevillea anethifolia* over low sparse shrubland of mixed species including *Thomasia angustifolia* and *Thomasia foliosa* over low sparse sedgeland dominated by *Lepidosperma fimbriatum* and *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798) over low sparse forbland of mixed species including *Dichondra repens*, *Cotula australis* and *Oxalis exilis* on yellow-brown to light brown sand or sandy clay in broad drainage lines and adjacent flats.

14 Low open mallee forest dominated by *Eucalyptus platypus* subsp. *platypus* and occasionally *Eucalyptus dielsii* and *Eucalyptus extensa* over tall sparse shrubland of mixed species dominated by *Melaleuca torquata*, *Melaleuca cucullata*, *Melaleuca acuminata* subsp. *acuminata*, *Acacia cyclops* and *Exocarpos sparteus* over low sparse shrubland of mixed species dominated by *Acacia glaucoptera* and *Exocarpos aphyllus* over low sparse grassland dominated by *Rytidosperma setaceum* on grey, light brown or brown clay, clay loam or sandy clay with colluvial stones (frequently sandstone, quartz, irostone and laterite) on valley slopes and flats and undulating plains.

15 Low mallee woodland dominated by *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus indurata* over tall to mid shrubland dominated by *Melaleuca pauperiflora* subsp. *pauperiflora* and occasionally *Choretrum glomeratum*, *Dodonaea stenozyga* and *Pultenaea calycina* subsp. *proxena* (P4) over low shrubland dominated by *Boronia inornata* subsp. *inornata* on grey or grey-brown clay loam with calcareous stones on low rises on undulating plains.

16 Low mallee woodland dominated by *Eucalyptus pleurocarpa* and occasionally *Eucalyptus uncinata* over mid to low shrubland of mixed species dominated by *Banksia armata* var. *ignicida, Banksia alliacea*, *Banksia obovata, Beaufortia micrantha* and *Leucopogon* sp. Newdegate (M. Hislop 3585) over low open to sparse sedgeland of mixed species dominated by *Mesomelaena stygia* subsp. *stygia*, *Lepidosperma* sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)', *Caustis dioica*, *Lepidosperma carphoides* and *Lepidobolus chaetocephalus* on grey-yellow, yellow-brown or grey-brown sandy or clay loam with lateritic gravel on undulating plains.

17 Tall open to sparse shrubland dominated by *Lambertia inermis* var. *inermis* and occasionally *Nuytsia floribunda* over mid shrubland to open shrubland of mixed species dominated by *Adenanthos cuneatus*, *Allocasuarina humilis*, *Banksia baueri*, *Taxandria spathulata* and *Chamelaucium megalopetalum* over low shrubland of mixed species including *Conothamnus aureus*, *Petrophile teretifolia, Eutaxia inuncta*, *Jacksonia viscosa* and *Hibbertia gracilipes* over low sedgeland and rushland of mixed species dominated by *Caustis dioica*, *Chordifex sphacelatus, Hypolaena fastigiata, Lepidobolus chaetocephalus* and *Lyginia imberbis* on grey-brown sand, occasionally with laterite gravel, on undulating plains.

C Cleared land (roads and permanent tracks)

WOODMAN ENVIRONMENTAL

This map should only be used in conjunction with WEC report MRC19-48-02.

N

Vegetation Units - LEGEND

Revision: 1 - 27 October 2020 Scale: 1:17,500 (A3)

Author: Leah Firth

WEC Ref: MRC19-48-02

Filename: MRC19-48-02-12-2.mxd

Projection: GDA 1994 MGA Zone 51

Figure

12.2

Table 13: Description of Vegetation Units Mapped in the Study Area

VU	Code	Description	Similar VUs and Variation
1	LWEsppMr	Low mallee woodland to open woodland of mixed species including *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus uncinata*, *Eucalyptus suggrandis* subsp. *suggrandis* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland of mixed species usually dominated by *Melaleuca rigidifolia* and occasionally *Melaleuca subfalcata*, *Melaleuca calycina* and *Melaleuca lateriflora* over low open to sparse shrubland of mixed species including *Grevillea oligantha*, *Daviesia articulata*, *Daviesia lancifolia*, *Hibbertia pungens* and *Grevillea pectinata* over low sparse sedgeland of mixed species dominated by *Gahnia ancistrophylla*, *Gahnia aristata* and *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897) on red-brown, orange-brown or grey-brown clay loam, usually with ironstone, sandstone or mixed colluvial gravel, on upper to mid slopes of valleys and low hills.	Most similar to VUs 16 and 2. In the context of landform transition in the Study Area, this VU generally occurred on erosional surfaces downslope from the lateritic plain where VU 16 generally occurred, but upslope from the heavy clay areas where VU 2 generally occurred. In this respect this could be viewed as transitional vegetation between these 2 VUs. However it was observed as occurring over large areas, and was generally easily distinguished from these VUs, especially VU 16, by the dominance of *Melaleuca rigidifolia*, *Melaleuca calycina*, *Grevillea oligantha*, *Daviesia articulata* and *Daviesia lancifolia*, and the presence of several other taxa including *Banksia media* and *Spyridium* sp. Jerdacuttup (A. Williams 332), in the understorey, and the presence of numerous mallee species in the upper storey. It is also generally more species-rich than VU 2. It is therefore considered appropriate to recognise this vegetation as a discrete VU. There are areas where these VUs grade into each other and some quadrats have likely been established in these areas (see variation). This VU was fairly uniform, although relatively recently burnt areas tended to be more species-rich. Several areas were somewhat unusual in that *Melaleuca rigidifolia* was absent or only occurred as isolated plants, and other *Melaleuca* species dominated; as outlined above, it is likely such areas are somewhat transitional between this VU and VU 2. Conversely, some areas contained a relatively high number of proteaceous species more commonly found in VU 16 (e.g. *Banksia alliacea*, *Banksia armata* var. *ignicida*); these areas are likely transitional between these VUs. One such area was where quadrat MRC12 was established; this quadrat was not classified with the main group of quadrats that VU 1 is based on, instead being classified in what is considered to be an artificial group of transitional quadrats (see Appendix J). This misclassified quadrat was manually allocated to VU 1.
2	LWEsppMspp	Low mallee woodland to open woodland of mixed species including *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus suggrandis* subsp. *suggrandis*, *Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland to open shrubland of mixed species dominated by *Melaleuca hamata*, *Melaleuca sapientes*, *Melaleuca lateriflora*, *Daviesia aphylla* and *Melaleuca undulata* over low open to sparse shrubland of mixed species including *Acacia ingrata*, *Grevillea pectinata*, *Aotus* sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412), *Hibbertia psilocarpa* and *Chorizema nervosum* over low open sedgeland of mixed species dominated by *Gahnia ancistrophylla*, *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Gahnia aristata* and *Lepidosperma gahnioides* on red-brown to brown clay loam, usually with ironstone, sandstone or mixed colluvial gravel, on slopes valleys and low hills.	Most similar to VU 1 – see that VU for discussion. This VU was fairly uniform, although as noted under VU 1, there are some areas of this VU that appear transitional between VU 2 and VU 1, with *Melaleuca rigidifolia* somewhat prominent in the understorey, but together with species typical of VU 2. However, at one quadrat (MRC04), *Melaleuca rigidifolia* was prominent, and most of the typical understorey species of VU 2 were absent, but this quadrat still grouped more closely with those quadrats that VU 2 is based on. This quadrat is considered to have been misclassified, and was manually allocated to VU 1. Also as for VU 1, recently burnt areas of this VU were more species-rich than long unburnt areas.
3	LWEdMpHp	Low mallee woodland dominated by *Eucalyptus densa* over tall shrubland dominated by *Melaleuca pentagona* var. *pentagona* and *Banksia media* over low sparse shrubland dominated by *Hibbertia pungens* on skeletal light brown clay loam with sandstone stones over sandstone outcropping on breakaways and ridges.	Most similar to VUs 4 and 7 in that the mallet species *Eucalyptus densa* dominates the upper storey, however the understorey of VU 3 shows little similarity to these VUs. See text under Section 5.2.7 for discussion of vegetation on “sandstone” breakaways in the Study Area. No variation observed – single polygon mapped

VU	Code	Description	Similar VUs and Variation
4	LWEdAhGp	Low mallee woodland of *Eucalyptus densa* over tall sparse shrubland dominated by *Acacia harveyi* and *Hakea laurina* over mid shrubland dominated by *Gastrolobium parviflorum* and *Melaleuca thapsina* over low shrubland dominated by *Dampiera* sp. Ravensthorpe (G.F. Craig 8277) (P3) on skeletal brown sandy loam with sandstone stones over sandstone outcropping on breakaways and ridges	Most similar to VU 3 (see that VU for discussion). Also similar to VU 7 in the presence of *Eucalyptus densa* in the upper storey and *Gastrolobium parviflorum* in the understorey, however VU 7 contains other mallee species in the upper storey, and many different understorey species; it is also more species-rich, even though the single quadrat established in VU 7 is long-unburnt (all areas of VU 4 were recently burnt). This VU was mapped over 2 small polygons – one of the polygons apparently did not contain *Dampiera* sp. Ravensthorpe (G.F. Craig 8277) (P3) in the understorey, but was otherwise similar to the other polygon; however the former polygon was not assessed in detail.
5	LMEsppMh	Low isolated mallees of mixed species including *Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall shrubland dominated by *Melaleuca hamata*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Melaleuca elliptica* and occasionally *Allocasuarina campestris* over mid to low open shrubland of mixed species dominated by *Astus tetragonus*, *Leucopogon cuneifolius*, *Philotheca gardneri* subsp. *gardneri* and occasionally *Hybanthus floribundus* subsp. *adpressus* and *Grevillea anethifolia* over low open sedgeland of mixed species dominated by *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma sanguinolentum*, *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' and *Gahnia aristata* on dark brown to brown clay loam with dolerite gravel and dolerite outcropping on upper and mid slopes of valleys	Although the classification analysis indicates that this VU is most closely related to VUs 6 and 7, it is not especially similar to these VUs in any respect, other than the occurrence of several understorey taxa across these VUs (*Melaleuca hamata*, *Philotheca gardneri* subsp. *gardneri, Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'. VUs 6 and 7 also occur on a different substrate (sandstone). Somewhat variable in terms of composition, some of which appears to be related to the size of the dolerite outcrops that it occurs on. The 2 quadrats established in this VU are located on relatively large areas of dolerite, and have a relatively dense, species-rich understorey of shrubs and sedges. However, some smaller dolerite outcrops mapped as this VU had a dense but relatively species-poor understorey, with only *Melaleuca elliptica*, *Calothamnus quadrifidus* subsp. *quadrifidus* and *Lepidosperma sanguinolentum* being prominent. Mallees were usually absent from these areas. Even between the 2 larger areas of dolerite sampled there was obvious variation in composition; *Allocasuarina campestris* and *Melaleuca elliptica* were prominent at MRC31, however were only observed as isolated plants outside MRC47.
6	LOWEeCvDs	Low open mallee woodland of mixed species dominated by *Eucalyptus ecostata* and *Eucalyptus pleurocarpa* over tall to mid shrubland of mixed species dominated by *Calothamnus villosus*, *Melaleuca hamata*, *Kunzea affinis*, *Acacia sulcata* var. *platyphylla* and *Melaleuca rigidifolia* over low sparse shrubland of mixed species dominated by *Darwinia* sp. Lake Cobham (K. Newbey 3262), *Leucopogon* sp. Newdegate (M. Hislop 3585), *Hemigenia teretiuscula*, *Philotheca gardneri* subsp. *gardneri* and *Calytrix leschenaultii* over low open sedgeland of mixed species dominated by *Lepidosperma sanguinolentum*, *Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1), *Lepidosperma rigidulum* and *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' on brown sandy loam with sandstone gravel and stones and occasional sandstone outcropping on breakaways and ridges.	The floristic classification indicates that this VU is most similar to VU 7; while it shares a similar substrate (sandstone) and some similar understorey taxa, this VU is compositionally quite different to VU 7, with a number of different taxa in the upper storey and understorey compared to VU 7. See text under Section 5.2.7 for discussion of vegetation on "sandstone" breakaways in the Study Area. A small area of the larger polygon of this VU mapped has a very dense mid shrubland of species typical of this VU, with the low shrubland and sedgeland that is present elsewhere in the mapped area of this VU almost absent in this area.
7	LWEdGpHp	Low mallee woodland to open forest dominated by *Eucalyptus densa* and occasionally *Eucalyptus flocktoniae* subsp. *flocktoniae* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid open shrubland of mixed species dominated by *Gastrolobium parviflorum*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Hakea lissocarpha* and occasionally *Melaleuca hamata* over low sparse shrubland of mixed species including *Hibbertia pungens*, *Hibbertia gracilipes* and	Most similar to VU 6 in the context of the floristic classification – see VU 6 for discussion. Also somewhat similar to VUs 3 and 4 – see under these VUs for discussion. See text under Section 5.2.7 for discussion of vegetation on "sandstone" breakaways in the Study Area. This VU is fairly consistent, although the largest polygon mapped was somewhat different in terms of composition to the other polygons. The quadrat established in this polygon, MRC30, did not group with the only other quadrat established in this VU, MRC55, in the classification analysis dendrogram. However,

VU	Code	Description	Similar VUs and Variation
		Lasiopetalum rosmarinifolium over low sedgeland and forbland of mixed species including *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798), *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' and *Stylidium albomontis* on red-brown or light brown sandy loam with sandstone gravel and sandstone outcropping on breakaways and ridges.	it was noted during the establishment of MRC30 that the outcrop being targeted for quadrat establishment was very narrow, and it and other similar stony rises occurred in a mosaic with vegetation on clay soils typical of VU 14. It was therefore acknowledged that many of the species recorded in MRC30 were more typical of surrounding areas of VU 14, but could not be excluded because of the size and shape of the outcrops. Additionally, the particular outcrop targeted was somewhat unusual in having a small flow line at its base, which contained a significant amount of *Labichea lanceolata* subsp. *brevifolia*, a species only otherwise recorded in VUs associated with major drainage lines in the Study Area. This unusual combination of factors is believed to have led to this quadrat being misclassified. However the presence of a number of characteristic taxa on the outcrop itself, including *Eucalyptus densa*, *Gastrolobium parviflorum*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Hibbertia pungens* and *Hakea lissocarpha*, indicate that this quadrat is more appropriately placed with MRC55. Notwithstanding this, the vegetation in this polygon differed from other polygons in the limited representation of sedges in the understorey, as well as the presence of other mallees in the upper storey. It should also be noted, however, that the area where MRC30 was established had been burnt relatively recently, which made the area difficult to access, making a detailed assessment difficult.
8	LWEoMhGa	Low woodland of *Eucalyptus occidentalis* over tall open to sparse shrubland dominated by *Melaleuca hamata* and *Acacia cyclops* over mid open to sparse shrubland of mixed species including *Hakea lissocarpha*, *Melaleuca glaberrima* and *Hakea nitida* over low sparse shrubland of mixed species including *Lasiopetalum rosmarinifolium*, *Hibbertia gracilipes*, *Dodonaea caespitosa* and *Thomasia angustifolia* over low open to sparse sedgeland and rushland of mixed species dominated by *Gahnia ancistrophylla*, *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798), *Lepidobolus preissianus*, *Lomandra micrantha* subsp. *teretifolia* and *Lepidosperma sanguinolentum* over low sparse forbland and grassland of mixed species including *Neurachne alopecuroidea*, *Chamaescilla corymbosa* var. *corymbosa*, *Goodenia affinis*, *Oxalis exilis* and *Lagenophora huegelii* on orange-brown clay or sandy loam on river flats	Most similar to VU 9, and these VUs could possibly be viewed as clinal variants of the same VU. However, because of the differences in understorey composition, particularly in the tall and mid shrubland strata and the sedgeland strata, as well as species richness (higher in VU 8, primarily because of a greater number of annual species), and the landforms upon which these VUs occur, it was considered appropriate to describe discrete VUs. No notable variation was observed.
9	LWEoEqLs	Low woodland of *Eucalyptus occidentalis* over low open mallee woodland of *Eucalyptus quadrans* over tall to mid open to sparse shrubland of mixed species including *Acacia glaucoptera*, *Hakea lissocarpha*, *Acacia cyclops*, *Melaleuca acuminata* subsp. *acuminata* and *Acacia verriculum* over low sparse shrubland of mixed species including *Thomasia foliosa*, *Dodonaea caespitosa* and *Phyllanthus calycinus* over low open to sparse sedgeland of mixed species dominated by *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897) and *Lomandra effusa* over low sparse forbland of mixed species including *Lysimachia arvensis*, *Chamaescilla corymbosa* var. *corymbosa*, *Goodenia affinis*,	Most similar to VU 8; see under this VU for discussion. No notable variation was observed.

VU	Code	Description	Similar VUs and Variation
		Oxalis exilis and *Plantago hispida* on brown clay loam with quartz gravel on valley slopes	
10	LOWEcMsppGa	Low open mallee woodland dominated by *Eucalyptus conglobata* subsp. *conglobata* and occasionally *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland to open shrubland of mixed species dominated by *Melaleuca hamata* and *Melaleuca lateriflora*, and occasionally *Melaleuca glaberrima*, *Santalum acuminatum* and *Acacia cyclops*, over low sparse shrubland of mixed species including *Lasiopetalum rosmarinifolium*, *Dodonaea caespitosa* and *Hakea lissocarpha* over low open to sparse sedgeland, forbland and rushland of mixed species dominated by *Gahnia ancistrophylla*, *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma* sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738), *Lepidobolus preissianus* and *Opercularia vaginata* on red-brown or brown clay loam with dolerite and occasionally quartz stones on valley flats and slopes	Most similar to VUs 8 and 9, and appears to only occur in the vicinity of these VUs in heavy clay areas associated with the Munglinup River valley. However, the upper storey in particular is distinctly dissimilar. No notable variation was observed.
11	TSMuAs	Tall to mid open to sparse shrubland dominated by *Melaleuca uncinata* over mid to low shrubland to open shrubland of mixed species dominated by *Acacia sulcata* var. *platyphylla*, *Melaleuca elliptica* and *Astus tetragonus* over low sparse shrubland of mixed species including *Leptospermum oligandrum* and *Styphelia* sp. Cascades (R. Davis 11037) on brown clayey sand or clay loam with granite and quartz stones and often granite outcropping on low rises and slopes	Not similar to any other VUs. This VU was somewhat variable, with this variation considered to be related to the extent of granite outcropping present. Areas with significant outcropping tended to be uniform with vegetation as described above. However, the outcropping occurred in a mosaic pattern, and in intervening areas where there was limited or no outcropping, the vegetation became transitional between typical VU 11 and surrounding VUs. It is considered that quadrat MRC22 was established in such transitional vegetation; it was acknowledged during establishment of this quadrat that many of the species recorded in were more typical of surrounding areas of VUs 1 and 2, but could not be excluded because of the small size of the outcrops and their mosaic nature of occurrence. MRC22 did not group with the main group of quadrats that VU 11 is based on, instead grouping in what is considered to be an artificial group of transitional quadrats (see Appendix J). This misclassified quadrat was manually allocated to VU 11.
12	LWOFEoAc	Low woodland to open forest dominated by *Eucalyptus occidentalis* and *Melaleuca cuticularis* over tall open shrubland of mixed species dominated by *Acacia cyclops*, *Acacia saligna* subsp. *lindleyi* ms and *Labichea lanceolata* subsp. *brevifolia* over low open to sparse sedgeland of mixed species including *Chorizandra enodis*, *Gahnia trifida* and *Juncus pallidus* over occasional low sparse chenopod shrubland dominated by *Salicornia quinqueflora* subsp. *quinqueflora*, *Suaeda australis* and *Disphyma crassifolium* subsp. *clavellatum* over low sparse forbland of mixed species including *Cotula australis* and **Cotula coronopifolia* on grey-brown to clay or clay loam in narrow drainage line channels.	Most similar to VU 13, however the understorey is different; this appears to be primarily because of the somewhat saline nature of the water present in the drainage channels within which this VU occurs. This also likely accounts for the presence of *Melaleuca cuticularis* in the upper storey of VU 12. This VU also appears to be restricted to the channels of drainage lines, while VU 13 occurs on the adjacent flats. Most notable variation observed appears to be related to the size of the drainage channel. In areas where the drainage channel was very narrow, such as where quadrat MRC13 was established, the chenopod shrubland described above was absent, as well as some of the sedge and shrub species in the understorey. The understorey in these areas also tended to contain a greater number of species considered typical of surrounding VUs. However, as the drainage channel became wider downstream of MRC13, the vegetation gradually transitioned towards what is considered typical VU 12.
13	LWEoLlLf	Low woodland dominated by *Eucalyptus occidentalis* over tall to mid shrubland to closed shrubland of mixed species dominated by *Labichea lanceolata* subsp. *brevifolia*, *Acacia cyclops*, *Acacia sulcata* var. *platyphylla* and *Grevillea anethifolia* over low sparse shrubland of mixed species including *Thomasia angustifolia* and *Thomasia foliosa*	Similar to VU 12– see this VU for discussion Most notable variation was the absence of a sedge layer, or the presence of only isolated sedges, in some areas. However, the remaining strata in such areas were otherwise typical.

VU	Code	Description	Similar VUs and Variation
		over low sparse sedgeland dominated by *Lepidosperma fimbriatum* and *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798) over low sparse forbland of mixed species including *Dichondra repens*, *Cotula australis* and *Oxalis exilis* on yellow-brown to light brown sand or sandy clay in broad drainage lines and adjacent flats	
14	LFEpMtAg	Low open mallee forest dominated by *Eucalyptus platypus* subsp. *platypus* and occasionally *Eucalyptus dielsii* and *Eucalyptus extensa* over tall sparse shrubland of mixed species dominated by *Melaleuca torquata*, *Melaleuca cucullata*, *Melaleuca acuminata* subsp. *acuminata*, *Acacia cyclops* and *Exocarpos sparteus* over low sparse shrubland of mixed species dominated by *Acacia glaucoptera* and *Exocarpos aphyllus* over low sparse grassland dominated by *Rytidosperma setaceum* on grey, light brown or brown clay, clay loam or sandy clay with colluvial stones (frequently sandstone, quartz, ironstone and laterite) on valley slopes and flats and undulating plains	Not similar to any other VU. This VU was generally consistent and easily recognisable by its mallet-dominated upper storey and species-poor composition (on average the second-least species rich of all VUs); however, some notable variation was observed. Typically this VU had an upper storey dominated by *Eucalyptus platypus* subsp. *platypus*, which was usually very dense, and formed an open forest as a minimum; on some occasions stands were so dense that a closed forest was present, and this resulted in the understorey being reduced to isolated plants. In many areas, particularly in the northern parts of the distribution of this VU, *Eucalyptus platypus* subsp. *platypus* was the only taxon present in the upper storey. However, in large areas in the southern part of this VU's distribution, the upper storey was a mixture of *Eucalyptus platypus* subsp. *platypus*, *Eucalyptus dielsii*, and *Eucalyptus extensa*; usually the former was dominant, with the latter 2 species occasionally co-dominant or dominant. In some areas, only *Eucalyptus extensa* or *Eucalyptus dielsii* were present, however such areas were generally spatially small, and the understorey was typical. Fire has a marked effect on the structure of this VU. Long-unburnt areas almost always have a relatively species-poor sparse understorey, however in recently burnt areas, the understorey is much more dense and species-rich. It is also noteworthy that the general sparseness of the understorey in long unburnt areas, which is presumably related to the denseness of the canopy formed by the mallet species, results in the understorey appearing variable when small spatial areas such as quadrats are assessed. However, the understorey composition was fairly consistent on a broader scale.
15	LWEsppMpBi	Low mallee woodland dominated by *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus indurata* over tall to mid shrubland dominated by *Melaleuca pauperiflora* subsp. *pauperiflora* and occasionally *Choretrum glomeratum*, *Dodonaea stenozyga* and *Pultenaea calycina* subsp. *proxena* (P4) over low shrubland dominated by *Boronia inornata* subsp. *inornata* on grey or grey-brown clay loam with calcareous stones on low rises on undulating plains	Not similar to any other VU This VU was generally consistent and easily recognisable by its very species-poor composition (on average the least species-rich VU); in particular, on the smaller, steeper calcareous rises in the Study Area, the understorey was usually only *Melaleuca pauperiflora* subsp. *pauperiflora* and *Boronia inornata* subsp. *inornata*. In some areas on larger, broader calcareous rises, several other understorey taxa were present and occasionally co-dominated, but always with *Melaleuca pauperiflora* subsp. *pauperiflora* and *Boronia inornata* subsp. *inornata*. Interestingly, fire did not seem to have a noticeable effect on the species composition of this VU, with the recently burnt quadrat MRC21 being essentially as species-rich as the long-unburnt MRC03. This may reflect the especially harsh nature of the calcareous soils occupied by this VU. The mapped extent of VU 15 is similar to the known extent of magnesite in the Study Area, with reference to data provided by MRCG.
16	LWEpBaMs	Low mallee woodland dominated by *Eucalyptus pleurocarpa* and occasionally *Eucalyptus uncinata* over mid to low shrubland of mixed species dominated by *Banksia armata* var. *ignicida, Banksia alliacea*,	Most similar to VU 17, and while these VUs share many taxa in common and both occur on lateritic-derived plains, they are relatively compositionally distinct, and occur on different soil types.

VU	Code	Description	Similar VUs and Variation
		Banksia obovata, Beaufortia micrantha and *Leucopogon* sp. Newdegate (M. Hislop 3585) over low open to sparse sedgeland of mixed species dominated by *Mesomelaena stygia* subsp. *stygia*, *Lepidosperma* sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)', *Caustis dioica*, *Lepidosperma carphoides* and *Lepidobolus chaetocephalus* on grey-yellow, yellow-brown or grey-brown sandy or clay loam with lateritic gravel on undulating plains	Very species-rich (on average the second-most species-rich of all VUs), and readily diagnosed in the field by the dominance of *Banksia armata* var. *ignicida* in the understorey, with a number of other proteaceous species, especially *Banksia*, also prominent. However, there were some small areas where *Banksia armata* var. *ignicida* was sparse or almost absent, such as quadrat MRC15, and was replaced by other shrubs, particularly myrtaceous species and *Allocasuarina* species. In some (but not all) cases this coincided with the soils being sandier; such areas are probably somewhat transitional between VU 16 and VU 17. As noted under VU 1, there are some areas of VU 16 that are apparently transitional with VU 1. These areas contain the relatively high number of proteaceous species commonly found in VU 16 (e.g. *Banksia alliacea*, *Banksia armata* var. *ignicida*), however also contain a number of species in the understorey common to VU 1 (e.g. *Melaleuca rigidifolia*), and have a higher prevalence of mallees other than *Eucalyptus pleurocarpa* (particularly *Eucalyptus uncinata*) in the upper storey. Such areas include where quadrats MRC11 and MRC44 were established; these quadrats were not classified with the main group of quadrats that VU 16 is based on, instead being classified in what is considered to be an artificial group of transitional quadrats (see Appendix J). These misclassified quadrats were manually allocated to VU 16.
17	TSLiAcCd	Tall open to sparse shrubland dominated by *Lambertia inermis* var. *inermis* and occasionally *Nuytsia floribunda* over mid shrubland to open shrubland of mixed species dominated by *Adenanthos cuneatus*, *Allocasuarina humilis*, *Banksia baueri*, *Taxandria spathulata* and *Chamelaucium megalopetalum* over low shrubland of mixed species including *Conothamnus aureus*, *Petrophile teretifolia, Eutaxia inuncta*, *Jacksonia viscosa* and *Hibbertia gracilipes* over low sedgeland and rushland of mixed species dominated by *Caustis dioica*, *Chordifex sphacelatus, Hypolaena fastigiata, Lepidobolus chaetocephalus* and *Lyginia imberbis* on grey-brown sand, occasionally with laterite gravel, on undulating plains	Most similar to VU 16 – see this VU for discussion. Typically, this VU had an open to sparse tall shrubland stratum, with *Lambertia inermis* var. *inermis* always dominating or co-dominating; however, in some areas, this stratum graded to a shrubland, with *Lambertia inermis* var. *inermis* being very dense. Usually mallees were absent from this VU, the only such VU in the Study Area where this was the case, however some areas did contain isolated mallees of *Eucalyptus pleurocarpa* and *Eucalyptus ecostata*. Such areas may have been somewhat transitional with VU 16, where these mallees were more common. Typically the understorey of this VU was characteristically dominated or co-dominated by *Banksia baueri*. In some areas, including quadrat MRC19, this species was absent; but the understorey present was otherwise typical compositionally, albeit sparser than typical. It is unclear as to the drivers behind this variation.

Table 14: Key Characteristics of Vegetation Units in the Study Area

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
1 LWEsppMr	Group 2 **Significant Taxa:** *Lepidosperma* sp. Mt Chester (S. Kern et al. LCH 16596) (P1), *Leucopogon* aff. *canaliculatus*, *Pultenaea calycina* subsp. *proxena* (P4), *Stachystemon vinosus* (P4) **Indicator Taxa:** *Anthotium humile, Cassytha glabella* forma *dispar, Daviesia articulata, Daviesia lancifolia, Eucalyptus uncinata, Grevillea oligantha, Hibbertia pungens, Logania buxifolia, Melaleuca rigidifolia, Melaleuca subfalcata*	11 quadrats MRC01 MRC04 MRC06 MRC12 MRC23 MRC25 MRC32 MRC34 MRC42 MRC43 MRC57	445.1 ha (26.6 %)	52.7 ± 8.2	 **Plate 13:** Typical VU 1 (long-unburnt) (Quadrat MRC42)  **Plate 14:** Typical VU 1 (recently burnt) (Quadrat MRC06)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
2 LWEsppMspp	Group 2 **Significant Taxa:** *Lepidosperma* sp. Mt Chester (S. Kern et al. LCH 16596) (P1) **Indicator Taxa:** *Acacia ingrata, Chorizema nervosum, Coopernookia polygalacea, Eucalyptus leptocalyx* subsp. *leptocalyx, Grevillea pectinata, Lepidosperma gahnioides*	8 quadrats MRC18 MRC45 MRC46 MRC48 MRC49 MRC52 MRC54 MRC56	183.4 ha (11.0 %)	43 ± 6.3	 **Plate 15:** Typical VU 2 (long unburnt) (Quadrat MRC49)  **Plate 16:** Typical VU 2 (recently burnt) (Quadrat MRC48)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
3 LWEdMpHp	Group 2 **Significant Taxa:** No significant taxa **Indicator Taxa:** No indicator taxa (1 quadrat in VU)	1 quadrat MRC08	1.9 ha (0.1 %)	20	 **Plate 17:** VU 3 (long-unburnt) (Quadrat MRC08)
4 LWEdAhGp	Group 2 **Significant Taxa:** *Acacia spongolitica*, *Dampiera* sp. Ravensthorpe (G.F. Craig 8277) (P3) **Indicator Taxa:** No indicator taxa (1 quadrat in VU)	1 quadrat MRC40	7.2 ha (0.4 %)	27	 **Plate 18:** VU 4 (recently burnt) (Quadrat MRC40)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
5 LMEsppMh	Group 2 **Significant Taxa:** -No significant Taxa **Indicator Taxa:** *Astus tetragonus, Cyrtostylis huegelii, Lepidosperma sanguinolentum, Leucopogon cuneifolius, Philotheca gardneri* subsp. *gardneri*	2 quadrats MRC31 MRC47	7.5 ha (0.5 %)	32.5 ± 3.5	 **Plate 19:** Typical VU 5 (long-unburnt) (Quadrat MRC47)  **Plate 20:** Variant of VU 5 – dense, species-poor understorey (*Melaleuca elliptica*, *Calothamnus quadrifidus* subsp. *quadrifidus* and *Lepidosperma sanguinolentum* prominent) (long-unburnt)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
6 LOWEeCvDs	Group 2 **Significant Taxa:** *Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1) **Indicator Taxa:** No indicator taxa (1 quadrat in VU)	1 quadrat MRC53	4.6 ha (0.3 %)	37	 **Plate 21:** VU 6 (long-unburnt) (Quadrat MRC53)
7 LWEdGpHp	Group 2 **Significant Taxa:** -No significant taxa **Indicator Taxa:** *Eucalyptus densa*	2 quadrats MRC30 MRC55	19.9 ha (1.2 %)	32 ± 7.1	 **Plate 22:** Typical VU 7 (long-unburnt) (Quadrat MRC55)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
					 **Plate 23:** Variant of VU 7 (recently burnt) (Quadrat MRC30)
8 LWEoMhGa	Group 2 **Significant Taxa:** - No significant taxa **Indicator Taxa:** *Blennospora drummondii, Caladenia brevisura, Ceratogyne obionoides, Eucalyptus pleurocarpa, Lepidobolus preissianus, Lomandra micrantha* subsp. *teretifolia, Poranthera microphylla, Rhodanthe laevis, Stenanthemum intricatum, Waitzia suaveolens* var. *suaveolens*	2 quadrats MRC02 MRC50	42.7 ha (2.6 %)	60.5 ± 4.9	 **Plate 24:** VU 8 (long-unburnt) (Quadrat MRC02)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
9 LWEoEqLs	Group 2 **Significant Taxa:** *Pultenaea calycina* subsp. *proxena* (P4) **Indicator Taxa:** *Acacia glaucoptera, Calandrinia calyptrata, Eucalyptus quadrans, Exocarpos aphyllus, Isotropis juncea, Pauridia glabella* var. *glabella, Plantago hispida, Ptilotus spathulatus, Senecio glossanthus, Teucrium sessiliflorum*	2 quadrats MRC07 MRC61	32.0 ha (1.9 %)	42 ± 8.5	 **Plate 25:** VU 9 (long-unburnt) (Quadrat MRC61)
10 LOWEcMsppGa	Group 2 **Significant Taxa:** -No significant taxa **Indicator Taxa:** *Melaleuca lateriflora*	2 quadrats MRC05 MRC17	7.1 ha (0.4 %)	36.5 ± 0.7	 **Plate 26:** VU 10 (long-unburnt) (Quadrat MRC05)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
11 TSMuAs	Group 2 **Significant Taxa:** -No significant taxa **Indicator Taxa:** *Caladenia cairnsiana, Drosera glanduligera, Hydrocotyle callicarpa, Leptospermum oligandrum, Melaleuca elliptica, Melaleuca uncinata*	3 quadrats MRC22 MRC24 MRC38	26.4 ha (1.6 %)	36.7 ± 4.2	 **Plate 27:** Typical VU 11 (recently burnt) (Quadrat MRC24)  **Plate 28:** Variant of VU 11 – transitional area (recently burnt) (Quadrat MRC22)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
12 LWOFEoAc	Group 2 **Significant Taxa:** -No significant taxa **Indicator Taxa:** *Cotula australis*	2 quadrats MRC13 MRC33	26.9 ha (1.6 %)	21.5 ± 6.4	 **Plate 29:** Typical VU 12 (long-unburnt) (Quadrat MRC33)  **Plate 30:** Variant of VU 12 – minor drainage channel (long-unburnt) (Quadrat MRC13)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
13 LWEoLlLf	Group 2 **Significant Taxa: -**No significant taxa **Indicator Taxa:** *Acacia harveyi, Chamelaucium ciliatum, Grevillea anethifolia, Hakea laurina, Labichea lanceolata* subsp. *brevifolia, Macrozamia dyeri*	2 quadrats MRC14 MRC36	41.6 ha (2.5 %)	38.0 ± 5.7	 **Plate 31:** VU 13 (long-unburnt) (Quadrat MRC14)  **Plate 32:** VU 13 (recently burnt) (Quadrat MRC36)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
14 LFEpMtAg	Group 2 **Significant Taxa:** *Commersonia rotundifolia* (P3) **Indicator Taxa:** *Comesperma polygaloides, Eucalyptus dielsii, Eucalyptus platypus* subsp. *platypus, Melaleuca torquata*	8 quadrats MRC09 MRC10 MRC16 MRC20 MRC26 MRC28 MRC39 MRC51	465.3 ha (27.8 %)	17.5 ± 8.0	 **Plate 33:** Typical VU 14 (long-unburnt) (Quadrat MRC20)  **Plate 34:** Typical VU 14 (recently burnt) (Quadrat MRC28)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
					 **Plate 35:** Variant of VU 14 with very dense *Eucalyptus platypus* subsp. *platypus*, no understorey (long-burnt) (Quadrat MRC09)
15 LWEsppMpBi	Group 2 **Significant Taxa:** *Pultenaea calycina subsp. proxena* (P4) **Indicator Taxa:** *Boronia inornata* subsp. *inornata, Choretrum glomeratum, Dodonaea stenozyga, Eucalyptus flocktoniae* subsp. *flocktoniae, Eucalyptus indurata, Leptomeria pachyclada, Melaleuca pauperiflora* subsp. *pauperiflora, Pultenaea calycina* subsp. *proxena* (P4)	3 quadrats MRC03 MRC21 MRC63	40.2 ha (2.4 %)	11.0 ± 3.6	 **Plate 36:** Typical VU 15 (long-unburnt) (Quadrat MRC03)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
16 LWEpBaMs	Group 1 **Significant Taxa:** *Conostylis lepidospermoides* (Threatened), *Stachystemon vinosus* (P4), *Leucopogon* aff. *canaliculatus*, *Leucopogon* sp. Cascades (M. Hislop 3693) (P1), *Synaphea* aff. *drummondii*, *Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200) **Indicator Taxa:** *Allocasuarina microstachya, Amphipogon avenaceus, Banksia alliacea, Banksia armata* var. *ignicida, Banksia violacea, Beaufortia micrantha, Billardiera venusta, Conostylis argentea, Dampiera angulata* subsp. Peak Charles (K.R. Newbey 5402), *Daviesia teretifolia, Drosera scorpioides, Goodenia scapigera* subsp. *scapigera, Lepidosperma carphoides, Lepidosperma* sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)', *Leptospermum spinescens, Leucopogon* sp. Newdegate (M. Hislop 3585), *Mesomelaena stygia* subsp. *stygia, Microcorys subcanescens, Petrophile seminuda, Petrophile squamata* subsp. northern (J. Monks 40), *Schoenus subflavus* subsp. long leaves (K.L. Wilson 2865), *Schoenus subflavus* subsp. *subflavus, Stachystemon polyandrus, Verticordia chrysantha*	7 quadrats 2 relevès MRC11 MRC15 MRC27 MRC35 MRC41 MRC44 MRC59 MRC-R1 MRC-R2)	226.9 ha (13.6 %)	56.6 ± 4.6	 **Plate 37:** Typical VU 16 (long-unburnt) (Quadrat MRC27)  **Plate 38:** Typical VU 16 (recently burnt) (Quadrat MRC59)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
					 **Plate 39:** Variant of VU 16 – proteaceous species including *Banksia armata* var. *ignicida* less dominant, myrtaceous species and *Allocasuarina* species more dominant (long-unburnt) (Quadrat MRC15)
17 TSLiAcCd	Group 1 **Significant Taxa:** -No significant taxa **Indicator Taxa:** *Adenanthos cuneatus, Allocasuarina humilis, Allocasuarina thuyoides, Amphipogon turbinatus, Andersonia caerulea, Banksia baueri, Boronia ramosa* subsp. *anethifolia, Caustis dioica, Chamelaucium megalopetalum, Chordifex sphacelatus, Conothamnus aureus, Conostylis vaginata, Darwinia vestita, Eutaxia inuncta, Gompholobium confertum, Goodenia incana, Hibbertia acerosa, Hypolaena fastigiata, Isopogon trilobus,*	3 quadrats MRC19 MRC29 MRC37	89.3 ha (5.3 %)	54.0 ± 3.0	 **Plate 40:** Typical VU 17 (long unburnt) (Quadrat MRC29)

VU	Vegetation Group and Taxa	Sampling	Extent (Proportion of Study Area)	Average Taxon Richness per Quadrat	Photograph
	Jacksonia viscosa, Lambertia inermis var. *inermis, Lechenaultia tubiflora, Lepidobolus chaetocephalus, Leucopogon* sp. Coujinup (M.A. Burgman 1085), *Lyginia imberbis, Lysinema ciliatum, Mesomelaena tetragona, Micromyrtus elobata* subsp. *elobata, Nuytsia floribunda, Petrophile teretifolia, Schoenus curvifolius, Stylidium repens, Taxandria spathulata, Tricostularia neesii, Xanthosia huegelii*				 **Plate 41:** Variant of VU 17 – sparse understorey, *Banksia baueri* absent (long unburnt) (Quadrat MRC19)

Table 15: Areas of Vegetation Units Mapped Within the Study Area and Extrapolated Study Area

Vegetation Unit	Area Mapped in Study Area (ha)	Extrapolated Area (Mapped Outside Study Area) (ha)	Total
1	445.1	69.3	514.4
2	183.4	1.8	185.2
3	1.9	0.0	1.9
4	7.2	0.0	7.2
5	7.5	0.0	7.5
6	4.6	0.0	4.6
7	19.9	7.8	27.7
8	42.7	90.6	133.3
9	32.0	3.7	35.7
10	7.1	41.6	48.7
11	26.4	0.0	26.4
12	26.9	31.8	58.7
13	41.6	0.0	41.6
14	465.3	30.1	495.4
15	40.2	0.0	40.2
16	226.9	57.8	284.7
17	89.3	0.0	89.3

5.2.8 Other Areas Described

Areas where natural vegetation has been completely and apparently permanently removed, with no native taxa remaining, have been mapped as 'cleared land' (C). This includes major tracks. A total of 6.6 ha of 'Cleared Land' was mapped within the Combined Study Area (4.8 ha within the Study Area and 1.8 ha within the Extrapolated Area), representing 0.3 % of the Combined Study Area.

There are many exploration drill lines in the Study Area, some of which were observed to have been recently cleared or re-cleared, with many in various states of regeneration. These areas have been mapped as parts of the VUs within which they occur; it is considered that the status of these lines in the context of remnant vegetation is better assessed in an impact assessment context.

5.2.9 Significant Vegetation

5.2.9.1 Listed Significant Vegetation

One listed significant community was recorded by this survey of the Study Area, being the Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia. This community is listed as an Endangered TEC under the EPBC Act; it is also classified as a Priority 3 PEC by DBCA.

This community is described as being located within the Esperance Sandplains bioregion and adjacent parts of the Mallee and Jarrah Forest bioregions of south west Western Australia, and is described as generally kwongkan shrubland, ranging from sparse to dense, thicket-forming, where Proteaceous species form a significant component (DoEE 2014). To represent this TEC, vegetation must satisfy the following criteria as per the Approved Conservation Advice for this community (DoEE 2014):

1. Occurs within the Southeast Coastal Floristic Province; and

2a. Characterised by Proteaceae taxa having 30 % or greater cover across all layers where these shrubs occur;

or

2b. Two or more diagnostic Proteaceae taxa are present that are likely to form a significant vegetative component when regenerated. The use of diagnostic taxa is for situations in which the cover of Proteaceae taxa is reduced due to recent disturbance (e.g. fire).

Criterion 1 is met for all vegetation in the Study Area, as the Study Area is located within the Southeast Coastal Floristic Province. To determine whether Criterion 2 was satisfied by vegetation in the Study Area, it was considered appropriate to apply the criterion to individual VUs, by examining data recorded in their representative quadrats. Although it is acknowledged that an entire VU polygon may not necessarily reflect an individual quadrat in terms of taxon composition and structure, and the scale of VU mapping may include small patches of vegetation that do not satisfy Criterion 2, or exclude small patches that do satisfy Criterion 2, this method was considered to be the most practical method of determining the presence and extent of the TEC in the Study Area. It also reflects the fact that the vegetation of the Study Area and surrounds occurs as a mosaic, with fine-scale differences in substrate driving the distribution of different vegetation, including the TEC (DoEE 2014).

The application of Criterion 2 is dependent on the disturbance history of the vegetation. In the context of the Study Area, a significant part of the vegetation within the southern section of the Study Area was burnt by a wildfire approximately 10 years ago. Field observations indicate that foliage covers of many shrub and mallee taxa within these areas are below those observed in parts of the Study Area that were not burnt by this fire (see Tables 13 and 14); with observations indicating that the remainder of the Study Area has not been burnt for over 20 years.

To this end, all quadrats established during this survey were examined in the context of Criterion 2, using the following parameters:

- Quadrats in vegetation long unburnt (>20 years since fire) were only assessed using Criterion 2a;
- Quadrats in vegetation burnt approximately 10 years ago were assessed using Criterion 2a in the first instance; however, were also assessed using Criterion 2b if 2a was not satisfied;
- For Criterion 2b, diagnostic taxa are those presented in Table 1 of the Approved Conservation Advice for the community (DoEE 2014) for the both the Fitzgerald (central) and Esperance (east) districts;

- For Criterion 2b, a 'significant vegetative component' of diagnostic Proteaceae taxa was defined as being at least 10 % of the total relative foliage cover in the layers within which the diagnostic species occur recorded at the quadrat;
- The majority of quadrats established within a given VU must satisfy Criterion 2 for the VU to be considered as representing the TEC.

The assessment of quadrats against these criteria is presented in Appendix N.

The examination of quadrats using the above parameters determined that VUs 16 and 17 represented the TEC. A summary of the results is as follows:

- VU 16: 5 of 7 quadrats (71 %) represent the TEC (3 satisfy 2a, 2 satisfy 2b);
- VU 17: 2 of 3 quadrats (67 %) of quadrats represent the TEC (both satisfy 2a);
- No quadrats from any other VUs satisfied Criterion 2, although a number of quadrats, almost all within VU 1, contained diagnostic species as very small components.

The extent of the TEC in the Study Area is therefore considered to be the extent of VUs 16 and 17 in the Study Area. It is considered unlikely that there are occurrences of the TEC within any other VUs; as outlined above, although some quadrats within VU 1 contain diagnostic species as very small components, no quadrats from any other VUs were considered to represent the TEC. The extent of the TEC is presented in Figure 13. A total of 316.2 ha of the TEC occur in the Study Area, representing 18.9 % of the Study Area and additional 57.8ha (Figure 13), has been mapped in the Extrapolated Study Area resulting in 374ha of TEC being mapped. All extrapolated polygons of the TEC are extensions of polygons of VU 16 mapped in the Study Area. Photographic images of the TEC are presented in Table 14 under VUs 16 and 17.

This TEC is known to occur widely in the South Coast region, with some occurrences being large in size as for some occurrences mapped in the Study Area, however most are smaller than 10 ha (Threatened Species Scientific Committee 2015). It is not known whether there are extensive occurrences in the immediate vicinity of the Study Area, as no ground assessment of potential occurrences has been conducted.

As detailed in Section 5.1.4.1, Woodman Environmental (2018) previously conducted a targeted survey to determine the presence and distribution of the Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia TEC in the Study Area; the extent presented above and on Figure 13 supersedes data presented in that report.

It should be noted that, as per the Approved Conservation Advice for this TEC, patch size and condition thresholds have been considered when defining the occurrence of the TEC in the Study Area. This includes considering vegetation outside the Study Area when determining patch size, and also other factors outlined in the Approved Conservation Advice. All areas of VU 16 and VU 17 meet the condition thresholds in the Approved Conservation Advice. Of the patches mapped in the Study Area, several small (<1 ha) patches are either connected to larger areas of vegetation outside the Study Area that are also considered to represent the TEC, or are only separated from other patches of the TEC in the Study Area by relatively short distances of vegetation that does not represent the TEC. Almost all of the mapped area of the

TEC in the Study Area is in Pristine condition; only 3.9 % (11.7 ha) is considered to be in Good condition, all of which is vegetation that has been chained around the edge of the Study Area for fire control purposes. All of the TEC mapped outside the Study Area via extrapolation is considered to be in Pristine condition.

It also should be noted that the 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia' is already 'known' to occur in the Study Area based on records from DPaW's TEC and PEC database (see Section 5.1.7, Figure 8). However, the records provided by the search are buffer polygons around occurrences that were determined by overlaying vegetation associations defined by Beard (at a scale of 1:250,000) that were considered to most closely correspond with the description of the TEC, on Dieback (*Phytophthora cinnamomi*) landscape susceptibility mapping by South Coast NRM Inc. (DoEE 2014). No ground-truthing has been undertaken to confirm these occurrences, and they are therefore considered to be indicative only, with on-ground assessment required to determine the actual extent of the TEC (if it is present at all). Therefore, the TEC as presented in Figure 13 is considered to represent a more accurate extent than the occurrences contained in DBCA's TEC and PEC database. Consequently, no attempt has been made to correlate the extent of the TEC as defined above and presented in Figure 13 with these occurrences.

None of the other VUs mapped in the Study Area are considered to represent any listed TECs or PECs.

300000
302000
304000
6276000
6274000
6272000
6270000

Legend

- Study Area
- Development Envelope
- Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC (Endangered – EPBC Act)

WOODMAN ENVIRONMENTAL

N

This map should only be used in conjunction with WEC report MRC19-48-02.

Distribution of Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC in the Study Area

Revision: 1 - 27 October 2020 Scale: 1:22,500 (A3)

Author: Leah Firth

WEC Ref: MRC19-48-02

Filename: MRC19-48-02-f13.mxd

Projection: GDA 1994 MGA Zone 51

Figure

13

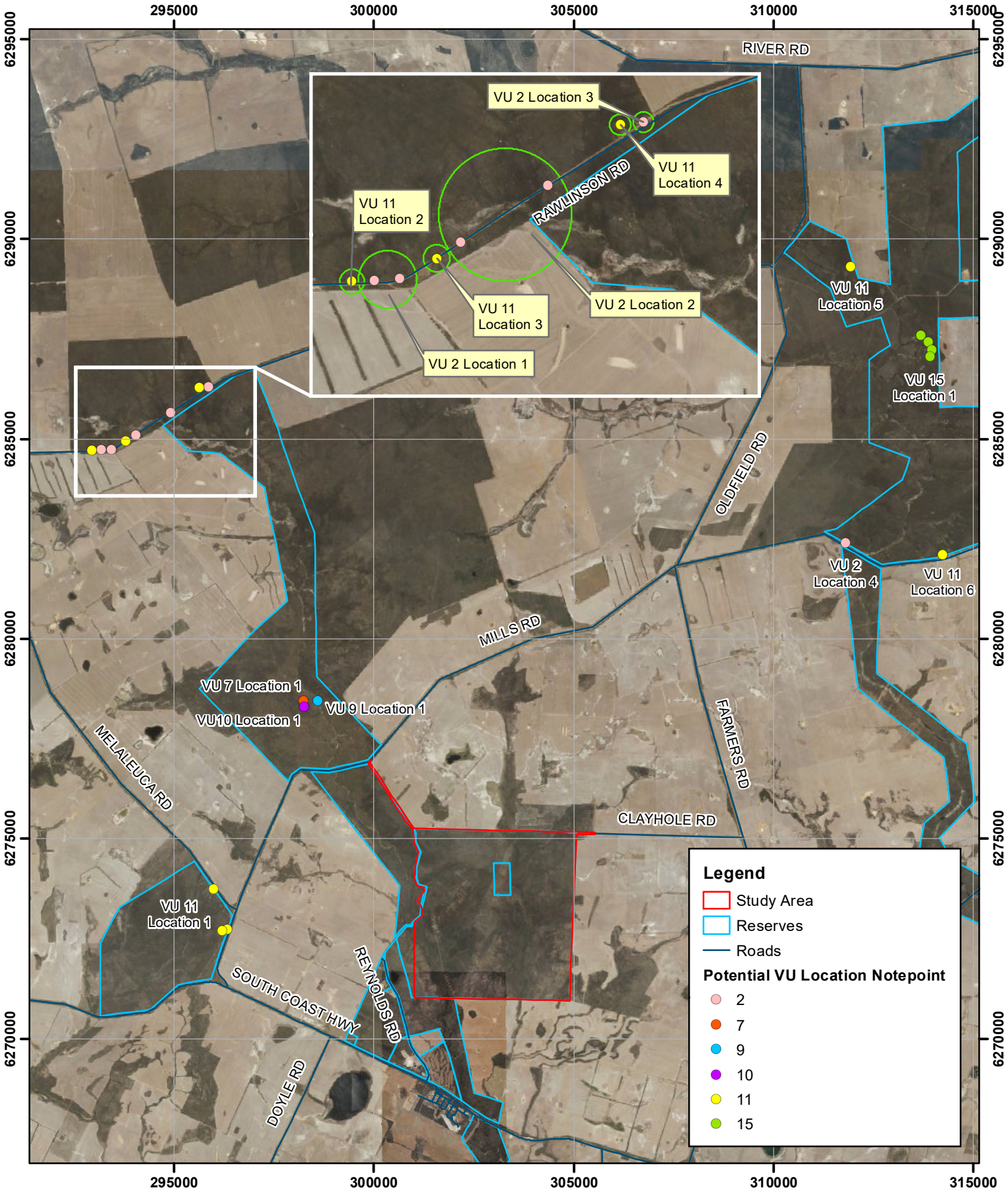
5.2.9.2 Other Significant Vegetation

In the context of vegetation that is significant for reasons other than formal listing (as per EPA 2016a, b), VUs 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 15 are all considered to be significant in a local context. All have restricted distributions in the Study Area (all occupy less than 3 % of the Study Area), as they occur on landforms that are uncommon in the Study Area (sandstone breakaways, dolerite and granite outcrops, drainage lines and associated flats); as 'restricted distribution' is one of the criteria that the EPA uses when determining whether vegetation is significant, this is in line with EPA guidance (EPA 2016b). The remaining VUs, 1, 2 and 14, are widespread in the Study Area, and are not considered to be locally significant.

In a regional context, as a precaution, it is considered that all of the above-listed VUs are potentially regionally significant. They all have potentially restricted distributions and have potentially been historically impacted by threatening processes; this is in line with EPA guidance (EPA 2016b). Their restricted distributions and degree of historical impact are a result of the significant amount of historical clearing for agriculture that has been undertaken in the vicinity of Munglinup, with vegetation restricted to isolated remnants; additionally, some of the VUs may potentially have had naturally restricted distributions. This inherently limits the potential extent of all VUs, as remnant vegetation as a whole is limited in extent. This is also reflected by the current extent of the vegetation system associations mapped over the Study Area, which have all been significantly reduced from their pre-European extent (see Section 5.1.3). The VUs that occur on restricted landforms in particular have an increased probability of being significant because of this factor, as they are inherently naturally rare.

As outlined in Section 3.4.4, targeted searching within the surrounding region was conducted for a number of VUs mapped in the Study Area whose occurrences were primarily located within the Development Envelope. These VUs are listed in Table 16 below. Several of the target VUs (2, 7, 8 and 9) were located immediately adjacent to the Study Area, with polygons of these VUs mapped via extrapolation (see Section 5.2.7). For the majority of target VUs, searching in the wider region surrounding the Study Area identified locations of vegetation that likely represent Study Area VUs in a regional context, and potentially are floristically similar enough to also represent Study Area VUs in a local context. In the case of VU 2, and to a lesser extent VU 11, these occurrences appear to be extensive. VU 2 occurs on landforms not considered to be regionally restricted (low hills and valley slopes) and was therefore expected to occur elsewhere in the region.

The targeted survey was unsuccessful in locating any further occurrences of vegetation that potentially represents VU 15 in a local context (high floristic similarity), with one area identified as potentially representing this VU in a regional context (similar landform and soil association and comprising similar dominant flora). This was not unexpected, given the unusual substrate and soils on which this VU occurs. Similarly, only one occurrence of vegetation that potentially represents VU 9 in a local context was located in the wider region; this occurrence likely represents this VU in a regional context. However, VU 9 was also mapped by extrapolation outside the Study Area, however, this was over a very small area. These VUs are discussed further below. The results of the targeted searching are summarised in Table 16 and presented in Figure 14, with raw data and photos presented in Appendix M. Appendix O presents the full Desktop Review of Potential Regional Extent of VUs report.



Potential Regional Locations of Study Area VUs	Author: Leah Firth	
	WEC Ref: MRC19-48-02	
WOODMAN ENVIRONMENTAL	Filename: MRC19-48-02-f14.mxd	**Figure**
	Scale: 1:125,000 (A4)	14
	Projection: GDA 1994 MGA Zone 51	
This map should only be used in conjunction with WEC report MRC19-48-02.	Revision: 1 - 27 October 2020	

Table 16: Summary of Results of Regional Targeted Survey for Study Area Vegetation Units

VU	Mapped Outside Study Area via Extrapolation?	Location (Including Tenure) of Potential Occurrences in Wider Region	Relationship of Regional Locations to VUs	Possible Extent of Occurrence
2	Yes – 1.8 ha (extension of Study Area VU polygon) Figure 12.1	Location 1 – Crown Land (Shire of Ravensthorpe) (Uncleared), Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area) Figure 14	Likely representative in a local and regional context: indicator taxa *Eucalyptus leptocalyx*, *Grevillea pectinata* and *Coopernookia polygalacea*, and characteristic taxa *Eucalyptus flocktoniae, Eucalyptus suggrandis, Daviesia aphylla*, *Melaleuca hamata*, *Melaleuca sapientes* and *Melaleuca lateriflora* widespread and relatively common at note points; soils and substrate (clay with mixed gravels) present.	Appears relatively extensive – present as two large patches that are approximately 150 m wide and extend approximately 300 m north of Rawlinson Road to the Munglinup River and apparently connect; further patches appear to be present in vicinity based on aerial photograph interpretation.
		Location 2 – Crown Land (Shire of Ravensthorpe) (Uncleared) and Parkland Reserve, Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area) Figure 14	Likely representative in a local and regional context: indicator taxa *Eucalyptus leptocalyx*, *Grevillea pectinata* and *Coopernookia polygalacea*, and characteristic taxa *Eucalyptus flocktoniae, Eucalyptus suggrandis, Daviesia aphylla*, *Melaleuca hamata*, *Melaleuca sapientes* and *Melaleuca lateriflora* widespread and relatively common at note points; soils and substrate (clay with mixed gravels) present.	Appears relatively extensive – present as two large patches that are broken by the Munglinup River, patches extend for several hundred metres either side of the river and at least 200 m north of Rawlinson Road. Further patches appear to be present in vicinity based on aerial photograph interpretation.
		Location 3 – Crown Land (Shire of Ravensthorpe) (Uncleared) and Parkland Reserve, Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area) Figure 14	Likely representative in a local and regional context: indicator taxa *Eucalyptus leptocalyx*, *Grevillea pectinata* and *Coopernookia polygalacea*, and characteristic taxa *Eucalyptus flocktoniae, Eucalyptus suggrandis, Daviesia aphylla*, *Melaleuca hamata*, *Melaleuca sapientes* and *Melaleuca lateriflora* widespread and relatively common at note point; soils and substrate (clay with mixed gravels) present.	Appears relatively extensive – extends for at least 200 m either side of Rawlinson Road, and appears to extend a relatively large distance further south.
		Location 4 –Parkland Reserve, Young River Corridor, near Mills Road crossing (10 km north-east of Study Area) Figure 14	Likely representative in a local and regional context: indicator taxa *Eucalyptus leptocalyx*, *Grevillea pectinata* and *Coopernookia polygalacea*, and characteristic taxa *Eucalyptus flocktoniae, Eucalyptus suggrandis, Daviesia aphylla*, *Melaleuca undulata*, *Melaleuca hamata* and *Gahnia ancistrophylla* widespread and relatively common at note point; soils and substrate (clay with mixed gravels) present.	Possibly extensive – occurs as a mosaic with vegetation that appears similar to VU 1, but unclear as to how far north and south of road this vegetation extends.

VU	Mapped Outside Study Area via Extrapolation?	Location (Including Tenure) of Potential Occurrences in Wider Region	Relationship of Regional Locations to VUs	Possible Extent of Occurrence
7	Yes – 7.8 ha (several small polygons) Figure 12.1	Location 1 –Parkland Reserve, Munglinup River Corridor, just north of Mills Road (2 km north-west of Study Area) Figure 14	Likely representative in a local and regional context: characteristic taxa *Eucalyptus flocktoniae*, *Eucalyptus conglobata*, *Gastrolobium parviflorum*, *Calothamnus quadrifidus*, *Hakea lissocarpha* and *Melaleuca hamata* widespread and relatively common at note point; soils and substrate (sandy loam with sandstone gravel over sandstone outcropping) present.	NA
8	Yes – 90.6 ha (mostly extensions of Study Area VU polygons) Figure 12.1	None located	NA	NA
9	Yes – 3.7 ha (extension of Study Area VU polygon) Figure 12.1	Location 1 –Parkland Reserve, Munglinup River Corridor, just north of Mills Road (2 km north-west of Study Area) Figure 14	Possibly representative in a local context; likely representative in a regional context: indicator taxon *Acacia glaucoptera*, and characteristic taxa *Eucalyptus occidentalis, Acacia cyclops*, *Phyllanthus calycinus*, *Lomandra effusa* and *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188) widespread and relatively common at note points; soils and substrate (clay) present. However, VU is very similar to VU 9 (both VUs likely represent the same vegetation type in a regional context), with some indicator and characteristic taxa from this VU present (*Lomandra micrantha* subsp. *teretifolia*, *Thomasia angustifolia*); many indicator taxa are also annual taxa which were not present because of survey timing.	Possibly extensive – appears to extend north from note point for at least several hundred metres
10	Yes – 41.6 ha (mostly extensions of Study Area VU polygons) Figure 12.1	Location 1 –Parkland Reserve, Munglinup River Corridor, just north of Mills Road (2 km north-west of Study Area) Figure 14	Likely representative in a local and regional context: characteristic taxa *Eucalyptus conglobata*, *Calothamnus quadrifidus*, *Hakea lissocarpha, Melaleuca hamata* and *Gahnia ancistrophylla* widespread and relatively common at note point; soils and substrate (clay loam with quartz gravel) present.	Possibly extensive – appears to extend north from note point for at least several hundred metres

VU	Mapped Outside Study Area via Extrapolation?	Location (Including Tenure) of Potential Occurrences in Wider Region	Relationship of Regional Locations to VUs	Possible Extent of Occurrence
11	No	Location 1 – East Naemup Nature Reserve (5 km west of Study Area) Figure 14	Likely representative in a local and regional context: indicator taxa *Melaleuca uncinata*, *Melaleuca elliptica* and *Leptospermum oligandrum*, and characteristic taxa *Acacia sulcata, Astus tetragonus* and *Calothamnus quadrifidus* widespread and relatively common at note points; soils and substrate (granite-derived over granite outcropping) present.	Appears relatively extensive – present as a linear band that occurs along the eastern boundary of the reserve for approximately 3 km, extending west approximately 300 m.
		Location 2 – Crown Land (Shire of Ravensthorpe) (Uncleared), Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area) Figure 14	Likely representative in a local and regional context: indicator taxa *Melaleuca uncinata*, and characteristic taxa *Acacia sulcata* and *Calothamnus quadrifidus* widespread and relatively common at note point; soils and substrate (granite-derived over granite outcropping) present.	Appears small – patch appears to be approximately 200 m by 100 m near Rawlinson Road
		Location 3 – Crown Land (Shire of Ravensthorpe) (Uncleared), Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area) Figure 14	Likely representative in a local and regional context: indicator taxa *Melaleuca uncinata*, and characteristic taxa *Acacia sulcata* and *Calothamnus quadrifidus* widespread and relatively common at note point; soils and substrate (granite-derived over granite outcropping) present.	Appears small – patch appears to be approximately 100 m by 100 m near Rawlinson Road
		Location 4 – Crown Land (Shire of Ravensthorpe) (Uncleared) and Parkland Reserve, Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area) Figure 14	Likely representative in a local and regional context: indicator taxa *Melaleuca uncinata*, and characteristic taxa *Acacia sulcata* and *Calothamnus quadrifidus* widespread and relatively common at note point; soils and substrate (granite-derived over granite outcropping) present.	Potentially extensive – appears to occur as a mosaic with a different vegetation type, but over a large area north and south
		Location 5 –Parkland Reserve, Young River Corridor, between Oldfield and Mills Roads (16 km north-east of Study Area) Figure 14	Likely representative in a local and regional context: indicator taxa *Melaleuca uncinata*, *Leptospermum oligandrum* and *Melaleuca elliptica*, and characteristic taxon *Acacia sulcata* widespread and relatively common at note point; soils and substrate (granite-derived over granite outcropping) present.	Appears small – patch appears to be approximately 150 m by 100 m

VU	Mapped Outside Study Area via Extrapolation?	Location (Including Tenure) of Potential Occurrences in Wider Region	Relationship of Regional Locations to VUs	Possible Extent of Occurrence
		Location 6 –Parkland Reserve, Young River Corridor, near Mills Road crossing (11 km north-east of Study Area) Figure 14	Possibly representative in a local and regional context: indicator taxa *Melaleuca uncinata* widespread and relatively common at note point; soils and substrate (granite-derived over granite outcropping) present. However, other indicator and characteristic taxa not seen, but may be present as area not thoroughly examined.	Possibly extensive – occurs as part of a mosaic with another vegetation type, mosaic appears to extend for approximately 1 km north and east of note point.
15	No	Location 1 –Parkland Reserve, Young River Corridor, between Oldfield and Mills Roads (15 km north-east of Study Area) Figure 14	Not representative in a local context; possibly representative in a regional context: indicator taxa *Eucalyptus indurata* and *Pultenaea calycina* subsp. *proxena* (P4), and characteristic taxon *Eucalyptus conglobata*, relatively widespread and occasionally common, however, indicator taxa *Boronia inornata* subsp. *inornata* and *Choretrum glomeratum* very rare, and indicator taxon *Melaleuca pauperiflora* subsp. *pauperiflora*, which dominates at all known occurrences of VU 15, completely absent.	Appears small – occurs as part of a mosaic of vegetation types in an area approximately 800 m by 350 m.

It should be noted that establishment of quadrats within potential occurrences of target VUs, and subsequent floristic analysis with Study Area quadrats, is required to confirm the assumptions of local or regional representation presented in Table 16.

To examine the similarity of vegetation in the Study Area to that of nearby regional areas, a supplementary floristic analysis was undertaken using quadrats established by Markey *et al.* (2012) across the Ravensthorpe Range. Analysis parameters used were as for the floristic analysis of Study Area quadrats only, with the same taxon amalgamations and deletions as for this analysis and that conducted by Markey *et al.* (2012); this includes the removal of introduced species and singletons. Additionally, quadrats considered to be located in transitional vegetation in the Study Area (MRC11, MRC12, MRC22, MRC30 and MRC44) were excluded from this analysis.

It is considered that the resultant dendrogram (presented in Appendix P) provides a strong indication that almost all VUs described in the Study Area are dissimilar to any of the communities described in the Ravensthorpe Range by Markey *et al.* (2012). All of the quadrats from the Study Area appear as discrete groups in the dendrogram, with these groups similar to those in the Study Area only classification dendrogram. The overwhelming majority of Markey *et al.* (2012) quadrats are not especially similar to any of these groups. This result was expected, given the distance between the Study Area and the Ravensthorpe Range, and the rapid species turnover known to occur across the Esperance Plains IBRA region, and in particular the Ravensthorpe Range (Markey *et al.* 2012).

It is worthy of note that the dendrogram does indicate a relatively close relationship between the Study Area quadrats that VU 15 is based on, and the quadrats that comprise Markey *et al.* (2012) Community 11. This was an expected result, as Woodman Environmental have previously visited a number of locations of Community 11 in the Ravensthorpe Range, and noted the similarities between Community 11 and VU 15 during the field visit to the Study Area. Both VU 15 and Community 11 characteristically occur on rocky, usually powdery calcareous clay soils resulting from weathering of ultramafic rocks (Markey *et al.* 2012); in the Ravensthorpe Range the rocks are magnesite; magnestite is also present in the Study Area, with mapped areas of magnesite provided by MRCG similar to the mapped area of VT 15. . Such soils appear to be regionally uncommon, but are visually distinctive, as is the vegetation that occupies these areas.

Community 11 and VU 15 are both characteristically species-poor (approximately 16 species per quadrat for Community 11, approximately 11 species per quadrat for VU 15), presumably because of the relatively chemically harsh nature of the soils. These communities share many taxa in common, particularly *Eucalyptus indurata*, *Melaleuca pauperiflora* subsp. *pauperiflora*, *Boronia inornata* subsp. *inornata* and *Pultenaea calycina* subsp. *proxena* (P4), all of which are indicator taxa for both communities; the latter was considered a short range endemic by Markey *et al.* (2012), so its discovery in the Study Area is of particular interest. Several of the indicator and common taxa for these communities (e.g. *Eucalyptus indurata*, *Pultenaea calycina* subsp. *proxena* (P4)) appear to be essentially endemic to these communities and their transitional zones.

Although the current available data suggests that Community 11 and VU 15 are not analogous in a local context, in a regional context, there is relatively strong evidence to suggest that these communities are analogous. The above floristic analysis results, whereby VU 15 quadrats were classified in a closely related but discrete group of quadrats in the dendrogram relative to Community 11 quadrats, coupled with the presence of very similar substrate and soil type, are considered to support this conclusion. The apparent geographic disjunction and floristic differences (many common species are shared by the communities, however, a number of short-range endemic species from the Ravensthorpe area are absent from VU 15) of VU 15 compared to Community 11 are considered to support the distinction of VU 15 as a localised form of a more widespread regional vegetation type. The vegetation identified by the regional targeted survey that potentially represents VU 15 (see Table 16 above) may also represent an additional, localised form of the same regional vegetation type; however, as noted above, establishment of quadrats within this vegetation, and subsequent floristic analysis with Study Area quadrats, is required to confirm this with certainty.

Study area VUs 8 and 9, which are both *Eucalyptus occidentalis* woodlands that occur within the Munglinup River valley near the river itself in the Study Area, also present a similar case to that of VU 15 and Markey *et al.* (2012) Community 11. These VUs are very closely related; the limited sampling of these VUs to date indicates that they are distinct within the Study Area, however, should be considered as localised forms of a single regional vegetation type. A single location of vegetation that potentially represents VU 9 was noted in the general vicinity of the Study Area, however, a number of taxa only recorded in VU 8 were noted in this area. Further sampling and floristic analysis would be required to resolve this issue with certainty, but it is possible that these VUs may be better treated as a single, more variable VU in a local context also.

5.2.10 Wetlands – Surface and Groundwater Relationships

Four VUs described in the Study Area, being VUs 8, 9, 12 and 13, occur within or in association with drainage lines that are considered to be wetlands in the broad sense. These drainage lines are likely subject to at least regular ephemeral flows, with the Munglinup River possibly flowing permanently. It is therefore considered that these VUs are likely dependent on surface water flows, including in the form of run-off from adjacent areas and potentially from more remote areas upstream. VU 8 in particular extends some way away from the river within a narrow valley.

It is considered possible that the above VUs may be dependent to an extent on groundwater where the inferred potential dependence is based on the occurrence of the tree species *Eucalyptus occidentalis* and *Melaleuca cuticularis* in these VUs. However, it should be noted that neither of these species appears to be an obligate phreatophyte based on the limited literature available, as well as field observations by Woodman Environmental. Both species have been observed growing in drainage lines high in the landscape near Ravensthorpe where the groundwater table is known to be inaccessible to vegetation, indicating a dependence on surface water. In the case of *Melaleuca cuticularis*, a requirement for permanent surface water appears probable, given that it only occurs in creeks and on lake and estuary edges, often in standing water. In the case study of a *Eucalyptus occidentalis* population at Yate Swamp near Lake Grace indicated that *Eucalyptus occidentalis* typically has a shallow root system with few sinker roots, and was likely using surface and sub-surface water rather than

groundwater; although at this particular site, the high salinity of the groundwater was thought to also contribute to this species preferentially using surface and sub-surface water, as opposed to root architecture alone (Boyd *et al.* 2008). However, the possibility that these species are facultative phreatophytes in some situations, potentially including the Study Area, cannot be ruled out at this stage; other sources indicate that *Eucalyptus occidentalis* can have a moderate to deep root system (Florabank 2019 and references cited within), indicating that it could potentially access groundwater at depth.

Rockwater (2019) have recently investigated the hydrogeology of the western part of the Study Area, with groundwater recorded within 10 m (as shallow as 3 m in places) of ground level at a number of bores along the Munglinup River. As it is generally accepted that vegetation can access groundwater up to this depth, the occurrences of VUs 8, 9 and 12 along the Munglinup River in the Study Area may be considered potentially groundwater-dependent where the groundwater is less than 10 m below the surface. However, the local groundwater was found to be highly saline with salinities of approximately 20,000 mg/L and above recorded within most bores making it unsuitable for use by most terrestrial species (in the context of *Eucalyptus occidentalis*, Barson & Barrett-Lennard (1995) (cited by DPIRD 2020) suggest that this species can occur in areas where soil salinity is up to 15,000 mg/L). The remaining areas of these VUs, as well as all occurrences of VU 13, occur away from the location of bores installed as part of this study where modelled depth to groundwater shows that the depth to groundwater rapidly rises to over 20 m within 500 m of the river and major creeks in response to topography.

Rockwater investigations indicated that soils of the Study Area above the water table are all saprolitic clays that are oxidised and commonly slightly ferruginous. They are of very low permeability and likely to support the larger mallee species that occur in these areas via stored soil water rather than the vegetation accessing the water table or freshwater lenses resting on denser saline water tables.

It therefore appears unlikely that any of the VUs recorded in the Study Area rely upon the local groundwater table for survival, rather utilising clay soil stored moisture from rainfall as their primary source of water during drier months. In particular those VUs that occur higher in the landscape (the majority of Study Area VUs, including VUs 16 and 17 which comprise the Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC (Endangered – EPBC Act)) are situated where the water table is located well in excess of 10 m from the ground surface and therefore are not groundwater dependent.

5.2.11 Vegetation Condition

Vegetation condition mapping polygons are displayed on Figure 15. The condition of the majority of the vegetation in the Study Area was rated Pristine. Generally, there was little evidence of unnatural disturbance, with weeds generally absent or at very low levels across the Study Area, and no evidence of *Phytophthora cinnamomi* (Dieback) impact. However, there were several areas mapped of poorer condition, as outlined below:

- A strip of vegetation that covers almost all of the eastern, northern and southern edges of the Study Area has been historically chained for fire control purposes, and has been mapped as Good condition; this area generally had a relatively high cover of weeds.
- All the major drainage channels in the Study Area were mapped as either Excellent or Very Good; these areas had relatively high weed cover, and numerous, relatively recent tree deaths were observed, which are potentially related to rising salinity in the drainage lines because of broad scale land clearing and resultant groundwater table rises. In particular, the narrow tributary of the Munglinup River that enters the Study Area on its north-western boundary has had a deep drain cut to it from a swamp in a nearby property (visible on Figure 15), which has undoubtedly resulted in higher volumes of saline water entering the tributary than normal; this appears to explain the particularly high weed levels and tree deaths in this area.
- A small area of VU 16 along the eastern edge of the Study Area was observed to have experienced significant recent death of mallees and shrubs (i.e. leaves still present on plants); this is clearly the result of a drain being cut from a neighbouring property to the edge of the Study Area (visible on Figure 15) that has allowed saline water to flow into the vegetation in the Study Area (see Plate 42). The soil has consequently become waterlogged and muddy. This area was mapped as Good.

Plate 42: Photographs of area along eastern boundary of VU 16 showing (clockwise from top left) drain extending from neighbouring property into the Study Area, waterlogged mud on surface and dead and dying vegetation.

As mentioned in Section 5.2.8, there are many exploration drill lines in the Study Area, some of which were observed to have been recently cleared or re-cleared, with many in various states of regeneration. These lines have been mapped as the same condition as their

surrounding VU, as their small size and dynamic state of use prevents them being assessed in detail in a vegetation condition context.

Additionally, some areas have been affected by fire in the past 10 years, however the condition of such vegetation in the context of the condition scale used (Appendix A) has not been affected.

Condition ratings have also been assigned to the VU polygons mapped outside the Study Area via extrapolation, with these polygons also shown on Figure 15. The condition of vegetation in the areas mapped was similar to that of the Study Area, with the vast majority rated as Pristine condition, except for the Munglinup River and one of its tributaries (as mentioned above), which were rated as Excellent and Very Good respectively. It should be noted that because of the timing of the survey within the extrapolated areas, ephemeral weeds were absent and therefore could not be considered when assigning ratings to polygons, however, the visual similarity of the vegetation to that within the Study Area indicates that such weeds are likely to be present in similar levels to that recorded within the Study Area.

Areas of each condition category mapped in the Study Area are presented in Table 17.

Table 17: Vegetation Condition Ratings Mapped in the Study Area

Condition Rating	Area Mapped in Study Area (ha)	Extrapolated Area Mapped Outside Study Area (ha)	Total
Pristine	1,579.2	302.7	1,881.9
Excellent	57.4	31.0	88.4
Very Good	10.4	0.9	11.3
Good	21.2	0.03	21.2
Completely Degraded	4.8	1.8	6.6

300000 302000 304000 306000

6278000 6276000 6274000 6272000 6270000 6268000

Legend

- Study Area
- Development Envelope
- Extrapolated Vegetation Mapping Area

Vegetation Condition

- Pristine
- Excellent
- Very Good
- Good
- Completely Degraded

N

WOODMAN ENVIRONMENTAL

This map should only be used in conjunction with WEC report MRC19-48-02.

Vegetation Condition

Revision: 1 - 27 October 2020 Scale: 1:27,500 (A3)

Author: Leah Firth

WEC Ref: MRC19-48-02

Filename: MRC19-48-02-f15.mxd

Projection: GDA 1994 MGA Zone 51

Figure

15

6. DISCUSSION AND CONCLUSIONS

Although the Study Area is relatively small (1,673 ha), it is considered highly diverse in terms of taxon richness, with 525 discrete taxa recorded. This was expected prior to survey, given that the Esperance Plains bioregion is known to be one of the richest places in the world for botanical diversity (Beard 1990; Comer *et al.* 2001; Markey *et al.* 2012). The relatively high number of collections that represent range extensions or fill gaps in the known distributions of taxa also provides an indication the complexity of local floristic composition, and the relative lack of botanical survey in the general area. The high diversity in the Study Area, as well as an observed rapid turnover of taxa that appears correlated with soil and substrate types within the Study Area, reflects the relatively complex surface geology and topography of the Study Area.

Comparison of the taxon total from this assessment to the estimate made using the Chao-2 estimator for taxon richness (from quadrat data only) indicates that the Study Area was well-sampled. The taxon total compares favourably with the Markey *et al.* (2012) study of the Ravensthorpe Range (697 taxa); it should be noted that the Markey *et al.* (2012) study sampled larger areas than the Study Area. It is considered that this assessment of the Study Area was conducted in a good flowering season; which is reflected in the number of ephemeral taxa recorded.

The taxon total recorded by this survey is significantly higher than that recorded by Ecologia (2015) in 2014; this highlights a number of limitations with the 2014 survey, including the timing of survey, the number of incomplete identifications, and the number of sample sites. It is noteworthy that the 2014 survey recorded a number of taxa not recorded by this current survey; this further increases the number of taxa known from the Study Area. However, the number of incomplete identifications, which are most likely the result of the timing of that survey (December), mean that it is difficult to be certain which taxa recorded in 2014 but not recorded in 2018/2019 survey are correct identifications.

A total of 12 taxa known to occur in the Study Area are considered to be significant flora taxa. This includes one taxon listed as Threatened under the BC Act and the EPBC Act, seven DBCA-classified Priority flora taxa, and four taxa considered significant for other reasons. There is the potential that a number of additional significant flora taxa may be present in the Study Area, however given the level of survey conducted in the Study Area, both by this assessment and previous assessments, it is considered that the majority of significant flora taxa present in the Study Area have been recorded.

All of the significant taxa recorded by this survey were also the subject of targeted searching in 2019 and have been adequately surveyed for in the Development Envelope. However, it is likely for most taxa that there are additional individuals elsewhere in the Study Area, as targeted searching has not been conducted across the entire Study Area.

The four taxa considered to be significant for other reasons require further investigation by relevant experts to determine their taxonomic status, which in turn will allow for their conservation significance to be appropriately assessed. In particular, *Leucopogon* aff. *canaliculatus*, *Synaphea* aff. *drummondii* and *Synaphea* sp. Jilakin Flat Rocks Rd (R. Butcher

et. al RB200) belong to groups of species that are well-known to be taxonomically problematic and require detailed assessment that may take some time. These potential taxa are therefore recognised as significant in the interim.

Eighteen introduced flora taxa were recorded by this survey of the Study Area. Most locations were within or adjacent to drainage lines. Most of the introduced flora taxa recorded in the Study Area are not considered to be especially serious and are unlikely to cause significant impacts to native vegetation. To date, the disturbance associated with mineral exploration activities does not appear to have encouraged invasion by introduced taxa.

The number of VUs occurring in the Study Area also compares favourably with the Markey *et al.* (2012) study of the Ravensthorpe Range (18 communities), which sampled a larger Study Area. The number of VUs described by this survey is much higher than that described by Ecologia (2015); this is considered to be a reflection of the number of sample sites established, which had resulted in distinct VUs being overlooked.

The Proteaceae dominated kwongkan shrublands of the southeast coastal floristic province of Western Australia TEC (Endangered – EPBC Act), is considered to occur in the Study Area. Based on assessment completed during this study, VUs 16 and 17 represent this TEC. These VUs occupy a relatively large proportion of the Study Area, with areas also mapped outside the Study Area via extrapolation. As discussed in Section 5.2.9, the decision to designate these VUs as being representative of this TEC was considered to be the most appropriate way of mapping the TEC over an area as large as the Study Area. It is considered highly unlikely that there are further occurrences of the TEC contained within other VUs; as per Appendix N, no quadrats from any VUs other than 16 or 17 satisfied diagnostic criterion 2 for the TEC.

This TEC is known to occur widely in the South Coast region, with some occurrences being large in size as for some occurrences mapped in the Study Area, however most are smaller than 10 ha (Threatened Species Scientific Committee 2015). It remains to be determined whether there are extensive occurrences in the immediate vicinity of the Study Area.

All of the VUs mapped in the Study Area are considered to potentially represent significant vegetation due to wide scale clearing in the region; as a result a supplementary classification analysis that considered all data from the Ravensthorpe Range study by Markey *et al.* (2012) was completed. That analysis indicates that vegetation within the Study Area VUs does not appear to occur in the Ravensthorpe Range study area. However, in the case of VU 15, although analogous vegetation does not occur in the Ravensthorpe Range study area, it is considered that in a regional context, VU 15 should be considered as a form of the same regional vegetation type as Community 11 (as described by Markey *et al.* 2012). This is supported by the results of the aforementioned classification analysis, with quadrats from VU 15 displaying a close relationship to quadrats from Community 11; quadrats from both these communities form an especially distinct group in the classification analysis dendrogram, reflecting the occurrence of these communities on unusual substrates and soils (calcareous rocky outcrops with powdery clay loam soils).

Additionally, a number of other VUs have been mapped outside the Study Area in areas immediately adjacent to the Study Area; although this mapping was extrapolated based on

aerial photography and relatively brief field survey, confidence in the accuracy of these polygons is relatively high, given the relatively high intensity of survey conducted in the Study Area itself. Likely occurrences (at least in a regional context) of a number of Study Area VUs have also been located in the wider region surrounding the Study Area during a regional targeted field survey in 2020; although establishment of quadrats and floristic analysis is required to confirm these occurrences with certainty, confidence in the likelihood of these locations representing Study Area VUs is also considered to be high.

Aside from major drainage lines and small areas associated with historical clearing and ongoing agricultural practice, most of the vegetation in the Study Area is in 'Pristine' condition, with weeds generally absent, and no evidence of Dieback (*Phytophthora cinnamomi*) observed. To date, the disturbance associated with mineral exploration activities does not appear to have significantly impacted the condition of the vegetation in the Study Area other than localised impacts.

It is unlikely that any of the VUs recorded in the Study Area represent GDE, with the vegetation reliant on clay soil stored moisture from rainfall during the dry months of the year rather than groundwater sources where present within 10m of the topographical surface. VUs 16 and 17, representing the Proteaceae Dominated Kwonkgan Shrublands of the Southeast Coastal Floristic Province of Western Australia TEC (Endangered – EPBC Act) do not represent GDE as they occur in areas of the landscape where the water table is located more than 10m from the surface.

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Appendix A: Vegetation Condition Scale for the South-West and Interzone Botanical Provinces (EPA 2016a)

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

Appendix B: Vascular Plant Taxa Amalgamated in or Omitted from the Classification Analysis

Description	Taxon	Reasoning
Omitted Taxa	*Austrostipa variabilis*, *Austrostipa ?variabilis*	Could not be consistently positively identified across Study Area because of inadequate material
	Caladenia sp.	Could not be positively identified because of inadequate material
	Calandrinia sp.	Could not be positively identified because of inadequate material
	Cyperaceae sp.	Could not be positively identified because of inadequate material
	Dicot sp.	Perennial grass that only produces annual flowering/fruiting parts during its flowering period
	Diuris decrementa, *Diuris littoralis*, *Diuris ?littoralis*, *Diuris* sp.	Could not be consistently positively identified across Study Area because of inadequate material
	Eriochilus dilatatus	Could not be consistently detected across Study Area because of inadequate material
	Lepidosperma ?fairallianum	Could not be positively identified because of inadequate material
	Pimelea ?pendens	Could not be positively identified because of inadequate material
	Pterostylis sp.	Could not be positively identified because of inadequate material
	Rytidosperma setaceum, *Rytidosperma ?setaceum*, *Rytidosperma* sp.	Could not be consistently positively identified across Study Area because of inadequate material
	Thelymitra ?petrophila, *Thelymitra* sp.	Could not be consistently positively identified across Study Area because of inadequate material
	Verticordia ?inclusa	Could not be positively identified because of inadequate material
	Waitzia ?nitida	Could not be positively identified because of inadequate material

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

Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] 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:
[1] The definition of flora includes algae, fungi and lichens
[2]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).

Last updated 3 January 2019

Appendix D: Results of Search of the Department of the Environment and Energy Species Profile and Threats (SPRAT) Database (DoEE 2019a)

Australian Government
Department of the Environment and Energy

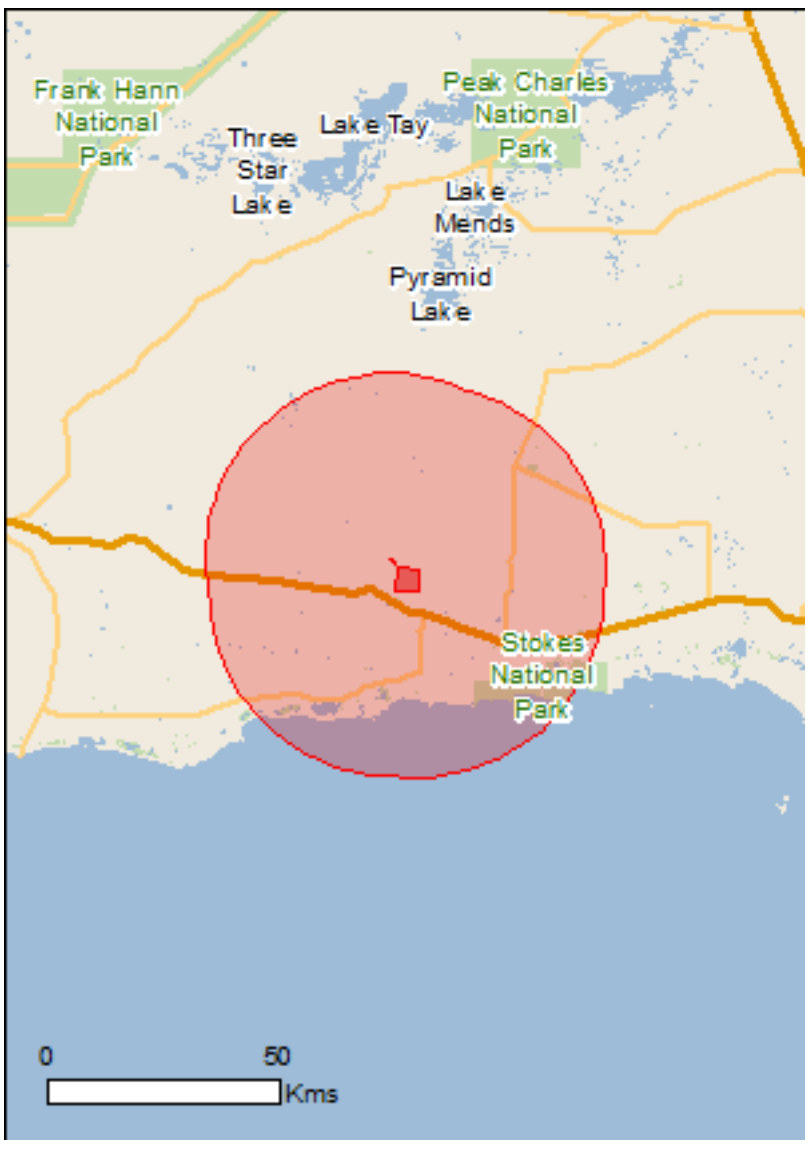
EPBC Act Protected Matters Report

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

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

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

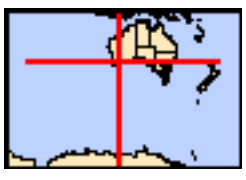
Report created: 21/01/19 12:19:44



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

Coordinates

Buffer: 40.0Km



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.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	52
Listed Migratory Species:	44

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	71
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	2

Extra Information

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

State and Territory Reserves:	20
Regional Forest Agreements:	None
Invasive Species:	15
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-west

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
Eucalypt Woodlands of the Western Australian Wheatbelt	Critically Endangered	Community may occur within area
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Thalassarche cauta steadi		
White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Breeding known to occur within area
Parantechinus apicalis		
Dibbler [313]	Endangered	Species or species habitat likely to occur within area
Phascogale calura		
Red-tailed Phascogale, Red-tailed Wambenger, Kenngoor [316]	Vulnerable	Species or species habitat known to occur within area
Pseudomys shortridgei		
Heath Mouse, Dayang, Heath Rat [77]	Endangered	Species or species habitat may occur within area
Plants		
Anigozanthos bicolor subsp. minor		
Little Kangaroo Paw, Two-coloured Kangaroo Paw, Small Two-colour Kangaroo Paw [21241]	Endangered	Species or species habitat known to occur within area
Conostylis lepidospermoides		
Sedge Conostylis [9254]	Endangered	Species or species habitat known to occur within area
Eremophila denticulata subsp. denticulata		
Fitzgerald Eremophila [64569]	Vulnerable	Species or species habitat known to occur within area
Eremophila lactea		
Milky Emu Bush [2416]	Endangered	Species or species habitat likely to occur within area
Eremophila subteretifolia		
Lake King Eremophila [56702]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Kennedia glabrata Northcliffe Kennedia [16452]	Vulnerable	Species or species habitat likely to occur within area
Lambertia echinata subsp. echinata Prickly Honeysuckle [56729]	Endangered	Species or species habitat may occur within area
Ricinocarpos trichophorus Barrens Wedding Bush [19931]	Endangered	Species or species habitat likely to occur within area
Roycea pycnophylloides Saltmat [21161]	Endangered	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Hydroprogne caspia		
Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus		
Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca		
Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta		
Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis		
Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding likely to occur

Name	Threatened	Type of Presence within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat likely to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Fish		

Name	Threatened	Type of Presence
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Breeding known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Breeding known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area

Name	Status	Type of Presence
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat may occur within area
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Australian Marine Parks	[Resource Information]
Name	Label
South-west Corner	National Park Zone (IUCN II)
South-west Corner	Special Purpose Zone (IUCN VI)

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Cascade	WA
Cascade Nature Reserve	WA
Cheadanup	WA
East Naernup	WA
Fields	WA
Griffiths	WA
Lake Shaster	WA
Munglinup	WA
NTWA Bushland covenant (0015A)	WA
NTWA Bushland covenant (0015B)	WA
NTWA Bushland covenant (0019)	WA
NTWA Bushland covenant (0034)	WA
NTWA Bushland covenant (0035)	WA
NTWA Bushland covenant (0043)	WA
NTWA Bushland covenant (0047)	WA
NTWA Bushland covenant (0053)	WA
Springdale	WA
Stokes	WA
Unnamed WA31745	WA
Unnamed WA32601	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 Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		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

Name	Status	Type of Presence
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		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
Feral deer Feral deer species in Australia [85733]		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
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		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		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

-33.628531 120.842695,-33.643966 120.854196,-33.645681 120.900202,-33.64711 120.900202,-33.64711 120.898142,-33.683686 120.895739,-33.682114 120.850592,-33.644824 120.854025,-33.628817 120.841494,-33.628674 120.842695,-33.628531 120.842695

Acknowledgements

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

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

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

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

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Appendix E: Definitions, Categories and Criteria for Threatened and Priority Ecological Communities (DBCA 2013)

1. GENERAL DEFINITIONS

Ecological Community: A naturally occurring biological assemblage that occurs in a particular type of habitat.

Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.

A **threatened ecological community** (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable".

Possible threatened ecological communities that do not meet survey criteria are added to DEC's Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An **assemblage** is a defined group of biological entities.

Habitat is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (eg. substrate and topography), and the biotic factors.

Occurrence: a discrete example of an ecological community, separated from other examples of the same community by more than 20 metres of a different ecological community, an artificial surface or a totally destroyed community.

By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.

Adequately Surveyed is defined as follows:
"An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts."

Community structure is defined as follows:
"The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage" (eg. *Eucalyptus salmonophloia* woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, eg. dominance by feeders on detritus as distinct from feeders on live plants).

Definitions of Modification and Destruction of an ecological community:
Modification: "changes to some or all of ecological processes (including abiotic processes such as hydrology), species composition and community structure as a direct or indirect result of human activities. The level of damage involved could be ameliorated naturally or by human intervention."

Destruction: "modification such that reestablishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future even with positive human intervention."

Note: Modification and destruction are difficult concepts to quantify, and their application will be determined by scientific judgement. Examples of modification and total destruction are cited below:

Modification of ecological processes: The hydrology of Toolibin Lake has been altered by clearing of the catchment such that death of some of the original flora has occurred due to dependence on fresh water. The system may be bought back to a semblance of the original state by redirecting saline runoff and pumping waters of the rising underground watertable away to restore the hydrological balance. Total destruction of downstream lakes has occurred due to hydrology being altered to the point that few of the original flora or fauna species are able to tolerate the level of salinity and/or water logging.

Modification of structure: The understorey of a plant community may be altered by weed invasion due to nutrient enrichment by addition of fertiliser. Should the additional nutrients be removed from the system the balance may be restored, and the original plant species better able to compete. Total destruction may occur if additional nutrients continue to be added to the system causing the understorey to be completely replaced by weed species, and death of overstorey species due to inability to tolerate high nutrient levels.

Modification of species composition: Pollution may cause alteration of the invertebrate species present in a freshwater lake. Removal of pollutants may allow the return of the original inhabitant species. Addition of residual highly toxic substances may cause permanent changes to water quality, and total destruction of the community.

Threatening processes are defined as follows:
"Any process or activity that threatens to destroy or significantly modify the ecological community and/or affect the continuing evolutionary processes within any ecological community."

Examples of some of the continuing threatening processes in Western Australia include: general pollution; competition, predation and change induced in ecological communities as a result of introduced animals; competition and displacement of native plants by introduced species; hydrological changes; inappropriate fire regimes; diseases resulting from introduced microorganisms; direct human exploitation and disturbance of ecological communities.

Restoration is defined as returning an ecological community to its pre-disturbance or natural state in terms of abiotic conditions, community structure and species composition.

Rehabilitation is defined as the re-establishment of ecological attributes in a damaged ecological community although the community will remain modified.

2. DEFINITIONS AND CRITERIA FOR PRESUMED TOTALLY DESTROYED, CRITICALLY ENDANGERED, ENDANGERED AND VULNERABLE ECOLOGICAL COMMUNITIES

Presumed Totally Destroyed (PD)
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.

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant **and either** of the following applies (A or B):

A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats **or**

B) All occurrences recorded within the last 50 years have since been destroyed

Critically Endangered (CR)
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.

An ecological community will be listed as **Critically Endangered** when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting **any one or more** of the following criteria (A, B or C):

A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% **and either or both** of the following apply (i or ii):

i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);

ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.

B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii):

i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);

ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;

iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.

C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Endangered (EN)
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.

An ecological community will be listed as **Endangered** when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting **any one or more** of the following criteria (A, B, or C):

A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement **and either or both** of the following apply (i or ii):

i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);

ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii):

i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);

ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;

iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.

C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Vulnerable (VU)
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.

An ecological community will be listed as **Vulnerable** when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future. This will be determined on the basis of the best available information by it meeting **any one or more** of the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.

B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

3. DEFINITIONS AND CRITERIA FOR PRIORITY ECOLOGICAL COMMUNITIES PRIORITY ECOLOGICAL COMMUNITY LIST

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: 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.

Priority Two: 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 (within approximately 10 years) 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.

Priority Three: 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 (within approximately 10 years), 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, inappropriate fire regimes, clearing, hydrological change etc.

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.

Priority Four: Ecological communities:

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 a higher threat category.

(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: 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.

Current as of January 2013

Appendix F: Vascular Plant Taxa Recorded in the Study Area

Family	Taxon
Aizoaceae	*Carpobrotus* sp.
	Disphyma crassifolium subsp. *clavellatum*
Amaranthaceae	*Ptilotus spathulatus*
Anarthriaceae	*Anarthria humilis*
	Lyginia imberbis
Apiaceae	*Apium annuum*
	Daucus glochidiatus
	Platysace deflexa
	Xanthosia huegelii
Araliaceae	*Hydrocotyle callicarpa*
	Hydrocotyle pilifera var. *glabrata*
	Hydrocotyle rugulosa
	Trachymene ornata
Asparagaceae	*Laxmannia brachyphylla*
	Laxmannia omnifertilis
	Laxmannia paleacea
	Laxmannia ramosa subsp. *deflexa*
	Lomandra effusa
	Lomandra micrantha subsp. *teretifolia*
	Lomandra mucronata
	Lomandra nigricans
	Thysanotus nudicaulis
	Thysanotus patersonii
	Thysanotus sparteus
Asteraceae	*Argentipallium niveum*
	Argentipallium tephrodes
	Blennospora drummondii
	Brachyscome ciliaris
	Brachyscome perpusilla
	Ceratogyne obionoides
	**Cirsium vulgare*
	**Conyza bonariensis*
	Cotula australis
	**Cotula coronopifolia*
	Craspedia variabilis
	Helichrysum leucopsideum
	**Hypochaeris glabra*
	Lagenophora huegelii
	Millotia tenuifolia var. *tenuifolia*
	Olearia ciliata
	Olearia exiguifolia
	Olearia imbricata
	Olearia passerinoides subsp. *passerinoides*
	Ozothamnus lepidophyllus

Family	Taxon
Asteraceae cont.	*Podotheca gnaphalioides*
	Rhodanthe laevis
	Senecio glossanthus
	**Sonchus oleraceus*
	**Ursinia anthemoides* subsp. *anthemoides*
	**Vellereophyton dealbatum*
	Vittadinia australasica var. *australasica*
	Waitzia ?nitida
	Waitzia suaveolens var. *suaveolens*
Boraginaceae	*Halgania andromedifolia*
Brassicaceae	**Lepidium africanum*
Campanulaceae	*Wahlenbergia gracilenta*
Casuarinaceae	*Allocasuarina campestris*
	Allocasuarina huegeliana
	Allocasuarina humilis
	Allocasuarina microstachya
	Allocasuarina thuyoides
Celastraceae	*Stackhousia monogyna*
	Stackhousia scoparia
Chenopodiaceae	*Enchylaena tomentosa* var. *tomentosa*
	Rhagodia preissii subsp. *preissii*
	Salicornia quinqueflora subsp. *quinqueflora*
	Suaeda australis
Colchicaceae	*Wurmbea sinora*
Convolvulaceae	*Dichondra repens*
	Wilsonia humilis
Crassulaceae	*Crassula closiana*
	Crassula colorata var. *colorata*
Cupressaceae	*Callitris roei*
Cyperaceae	*Caustis dioica*
	Chorizandra enodis
	Cyathochaeta equitans
	Gahnia ancistrophylla
	Gahnia aristata
	Gahnia sp. Ravensthorpe (G.F. Craig 5005)
	Gahnia trifida
	Lepidosperma carphoides
	Lepidosperma fairallianum
	Lepidosperma fimbriatum
	Lepidosperma gahnioides
	Lepidosperma gracile
	Lepidosperma rigidulum
	Lepidosperma sanguinolentum
	Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)

Family	Taxon
Cyperaceae cont.	*Lepidosperma* sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738)
	Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'
	Lepidosperma sp. 'Dunns Swamp (R. Davis 724)'
	Lepidosperma sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'
	Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596) (P1)
	Lepidosperma ?sp. Mt Short (S. Kern et al. LCH 17510) (P1)
	Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)
	Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)
	Mesomelaena stygia subsp. *stygia*
	Mesomelaena tetragona
	Schoenus breviculmis
	Schoenus brevisetis
	Schoenus caespititius
	Schoenus curvifolius
	Schoenus lanatus
	Schoenus obtusifolius
	Schoenus pleiostemoneus
	Schoenus sesquispiculus
	Schoenus subbarbatus
	Schoenus subflavus subsp. long leaves (K.L. Wilson 2865)
	Schoenus subflavus subsp. *subflavus*
	Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)
	Tricostularia exsul
	Tricostularia neesii
Dasypogonaceae	*Calectasia valida*
Dilleniaceae	*Hibbertia acerosa*
	Hibbertia gracilipes
	Hibbertia psilocarpa
	Hibbertia pungens
	Hibbertia rupicola
Droseraceae	*Drosera glanduligera*
	Drosera lowriei
	Drosera macrantha
	Drosera menziesii
	Drosera scorpioides
	Drosera trichocaulis
Ericaceae	*Acrotriche cordata*
	Acrotriche ramiflora
	Andersonia caerulea
	Andersonia macranthera
	Andersonia parvifolia
	Astroloma microphyllum
	Astroloma prostratum

Family	Taxon
Ericaceae cont.	*Astroloma serratifolium*
	Astroloma tectum
	Coleanthera myrtoides
	Conostephium drummondii
	Leucopogon breviflorus
	Leucopogon concinnus
	Leucopogon cuneifolius
	Leucopogon aff. *canaliculatus*
	Leucopogon fimbriatus
	Leucopogon opponens
	Leucopogon sp. Cascades (M.Hislop 3693) (P1)
	Leucopogon sp. Coujinup (M.A. Burgman 1085)
	Leucopogon sp. Newdegate (M. Hislop 3585)
	Lissanthe rubicunda
	Lysinema ciliatum
	Styphelia exserta
	Styphelia intertexta
	Styphelia sp. Cascades (R. Davis 11037)
	Styphelia sp. South Coast (J.M. Powell 3374)
Euphorbiaceae	*Beyeria lechenaultii*
	Monotaxis paxii
	Stachystemon polyandrus
	Stachystemon vinosus (P4)
	Stachystemon virgatus
Fabaceae	*Acacia assimilis* subsp. *atroviridis*
	Acacia brachyclada
	Acacia chrysocephala
	Acacia crispula
	Acacia curvata
	Acacia cyclops
	Acacia glaucoptera
	Acacia gonophylla
	Acacia harveyi
	Acacia ingrata
	Acacia lachnophylla
	Acacia lasiocarpa var. *bracteolata*
	Acacia latipes subsp. *latipes*
	Acacia myrtifolia
	Acacia pravifolia
	Acacia saligna subsp. *lindleyi* ms
	Acacia spongolitica
	Acacia sulcata var. *platyphylla*
	Acacia verriculum
	Aotus sp. Esperance (P.G. Wilson 7904)

Family	Taxon
Fabaceae cont.	*Aotus* sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)
	Chorizema aciculare subsp. *aciculare*
	Chorizema nervosum
	Daviesia aphylla
	Daviesia articulata
	Daviesia incrassata subsp. *reversifolia*
	Daviesia lancifolia
	Daviesia nematophylla
	Daviesia teretifolia
	Eutaxia cuneata
	Eutaxia inuncta
	Gastrolobium latifolium
	Gastrolobium parviflorum
	Gastrolobium spinosum
	Gompholobium baxteri
	Gompholobium confertum
	Gompholobium cyaninum
	Gompholobium knightianum
	Gompholobium marginatum
	Gompholobium scabrum
	Hovea pungens
	Isotropis juncea
	Jacksonia alata
	Jacksonia condensata
	Jacksonia racemosa
	Jacksonia viscosa
	Kennedia coccinea subsp. *esotera*
	Kennedia sp. South coast (T.R. Lally 1576 & I.P. Lally)
	Labichea lanceolata subsp. *brevifolia*
	Mirbelia ovata
	Pultenaea calycina subsp. *proxena* (P4)
	Pultenaea indira subsp. *indira*
	Senna sp. Pallinup River (J.W. Green 4847)
	Sphaerolobium daviesioides
	Templetonia neglecta
Geraniaceae	*Erodium crinitum*
Goodeniaceae	*Anthotium humile*
	Coopernookia polygalacea
	Coopernookia strophiolata
	Dampiera angulata subsp. *angulata*
	Dampiera angulata subsp. Peak Charles (K.R. Newbey 5402)
	Dampiera fasciculata
	Dampiera lavandulacea
	Dampiera sp. Ravensthorpe (G.F. Craig 8277) (P3)

Family	Taxon
Goodeniaceae cont.	*Goodenia affinis*
	Goodenia concinna
	Goodenia incana
	Goodenia scapigera subsp. *scapigera*
	Lechenaultia formosa
	Lechenaultia tubiflora
	Scaevola myrtifolia
	Velleia trinervis
Haemodoraceae	*Anigozanthos rufus*
	Conostylis argentea
	Conostylis lepidospermoides (T)
	Conostylis seorsiflora subsp. *seorsiflora*
	Conostylis vaginata
	Haemodorum sp.
Haloragaceae	*Glischrocaryon ?aureum*
	Glischrocaryon roei
	Gonocarpus nodulosus
Hemerocallidaceae	*Dianella brevicaulis*
	Dianella revoluta
	Johnsonia acaulis
	Stypandra glauca
	Tricoryne tenella
Hypoxidaceae	*Pauridia glabella* var. *glabella*
Iridaceae	*Patersonia lanata* forma *lanata*
	Patersonia occidentalis var. *occidentalis*
Juncaceae	*Juncus pallidus*
Lamiaceae	*Hemigenia teretiuscula*
	Microcorys barbata
	Microcorys glabra
	Microcorys subcanescens
	Prostanthera baxteri
	Prostanthera serpyllifolia subsp. *microphylla*
	Teucrium sessiliflorum
	Westringia dampieri
Lauraceae	*Cassytha flava*
	Cassytha glabella forma *dispar*
	Cassytha melantha
	Cassytha racemosa forma *pilosa*
Loganiaceae	*Logania buxifolia*
	Logania micrantha
	Orianthera callosa
	Phyllangium divergens
Loranthaceae	*Nuytsia floribunda*
Malvaceae	*Alyogyne* sp. Southern Coast (A.S. George 289)

Family	Taxon
Malvaceae cont.	*Androcalva crispa*
	Commersonia rotundifolia (P3)
	Guichenotia micrantha
	Lasiopetalum rosmarinifolium
	Thomasia angustifolia
	Thomasia foliosa
	Thomasia microphylla
Montiaceae	*Calandrinia calyptrata*
Myrtaceae	*Astus tetragonus*
	Baeckea latens
	Baeckea pachyphylla
	Beaufortia micrantha
	Beaufortia schaueri
	Calothamnus gracilis
	Calothamnus quadrifidus subsp. *quadrifidus*
	Calothamnus villosus
	Calytrix decandra
	Calytrix leschenaultii
	Calytrix tetragona
	Chamelaucium ciliatum
	Chamelaucium megalopetalum
	Conothamnus aureus
	Cyathostemon tenuifolius
	Darwinia sp. Lake Cobham (K. Newbey 3262)
	Darwinia sp. Ravensthorpe (G.J. Keighery 8030)
	Darwinia vestita
	Eucalyptus conglobata subsp. *conglobata*
	Eucalyptus densa
	Eucalyptus dielsii
	Eucalyptus ecostata
	Eucalyptus extensa
	Eucalyptus flocktoniae subsp. *flocktoniae*
	Eucalyptus incrassata
	Eucalyptus indurata
	Eucalyptus leptocalyx subsp. *leptocalyx*
	Eucalyptus occidentalis
	Eucalyptus perangusta
	Eucalyptus phaenophylla subsp. *interjacens*
	Eucalyptus pileata
	Eucalyptus platypus subsp. *platypus*
	Eucalyptus pleurocarpa
	Eucalyptus quadrans
	Eucalyptus suggrandis subsp. *suggrandis*
	Eucalyptus tetraptera

Family	Taxon
Myrtaceae cont.	*Eucalyptus uncinata*
	Kunzea affinis
	Kunzea micromera
	Kunzea preissiana
	Leptospermum maxwellii
	Leptospermum oligandrum
	Leptospermum sp. Bandalup Hill (G. Cockerton 11001)
	Leptospermum spinescens
	Melaleuca acuminata subsp. *acuminata*
	Melaleuca calycina
	Melaleuca carrii
	Melaleuca cucullata
	Melaleuca cuticularis
	Melaleuca elliptica
	Melaleuca eurystoma
	Melaleuca glaberrima
	Melaleuca hamata
	Melaleuca johnsonii
	Melaleuca lateriflora
	Melaleuca pauperiflora subsp. *pauperiflora*
	Melaleuca pentagona var. *pentagona*
	Melaleuca pulchella
	Melaleuca rigidifolia
	Melaleuca sapientes
	Melaleuca striata
	Melaleuca subfalcata
	Melaleuca thapsina
	Melaleuca torquata
	Melaleuca tuberculata var. *tuberculata*
	Melaleuca uncinata
	Melaleuca undulata
	Micromyrtus elobata subsp. *elobata*
	Phymatocarpus maxwellii
	Rinzia communis
	Taxandria spathulata
	Tetrapora preissiana
	Tetrapora verrucosa
	Verticordia acerosa var. *preissii*
	Verticordia chrysantha
	Verticordia densiflora var. *cespitosa*
	Verticordia inclusa
Olacaceae	*Olax benthamiana*
Ophioglossaceae	*Ophioglossum lusitanicum*
Orchidaceae	*Caladenia attingens* subsp. *gracillima*

Family	Taxon
Orchidaceae cont.	*Caladenia barbarossa*
	Caladenia brevisura
	Caladenia cairnsiana
	Caladenia discoidea
	Caladenia flava subsp. *flava*
	Caladenia hirta subsp. *rosea*
	Caladenia horistes
	Caladenia latifolia
	Caladenia longicauda subsp. *eminens*
	Caladenia sigmoidea
	Caladenia x ericksoniae
	Corunastylis fuscoviridis
	Cyanicula aperta
	Cyrtostylis huegelii
	Diuris decrementa
	Diuris littoralis
	Elythranthera brunonis
	Eriochilus dilatatus
	Leporella fimbriata
	Leptoceras menziesii
	Microtis sp.
	Prasophyllum sargentii
	Pterostylis galgula
	Pterostylis perculta
	Pterostylis recurva
	Pterostylis timothyi
	Pterostylis vittata
	Pyrorchis nigricans
	Thelymitra antennifera
	Thelymitra campanulata
	Thelymitra occidentalis
	Thelymitra ?petrophila
	Thelymitra villosa
Orobanchaceae	**Parentucellia latifolia*
Oxalidaceae	*Oxalis exilis*
Phyllanthaceae	*Phyllanthus calycinus*
	Phyllanthus scaber
	Poranthera microphylla
Pittosporaceae	*Billardiera coriacea*
	Billardiera fusiformis
	Billardiera venusta
	Cheiranthera brevifolia
Plantaginaceae	*Plantago hispida*
Poaceae	*Amphipogon avenaceus*

Family	Taxon
Poaceae cont.	*Amphipogon turbinatus*
	Austrostipa elegantissima
	Austrostipa variabilis
	**Briza minor*
	**Ehrharta longiflora*
	Neurachne alopecuroidea
	**Parapholis incurva*
	**Pentameris airoides* subsp. *airoides*
	Rytidosperma setaceum
	**Vulpia myuros*
Polygalaceae	*Comesperma ?acerosum*
	Comesperma calymega
	Comesperma polygaloides
	Comesperma spinosum
	Comesperma volubile
	Muehlenbeckia adpressa
	**Rumex crispus*
Primulaceae	**Lysimachia arvensis*
Proteaceae	*Adenanthos cuneatus*
	Banksia alliacea
	Banksia armata var. *ignicida*
	Banksia baueri
	Banksia baxteri
	Banksia media
	Banksia obovata
	Banksia obtusa
	Banksia repens
	Banksia speciosa
	Banksia tenuis var. *tenuis*
	Banksia violacea
	Grevillea anethifolia
	Grevillea concinna subsp. *lemanniana*
	Grevillea nudiflora
	Grevillea oligantha
	Grevillea pectinata
	Hakea cinerea
	Hakea corymbosa
	Hakea cygna subsp. *cygna*
	Hakea denticulata
	Hakea ferruginea
	Hakea ilicifolia
	Hakea laurina
	Hakea lissocarpha
	Hakea marginata

Family	Taxon
Proteaceae cont.	*Hakea nitida*
	Hakea obliqua subsp. *parviflora*
	Hakea pandanicarpa subsp. *pandanicarpa*
	Hakea prostrata
	Hakea trifurcata
	Isopogon polycephalus
	Isopogon sp. Fitzgerald River (D.B. Foreman 813)
	Isopogon trilobus
	Lambertia inermis var. *inermis*
	Persoonia helix
	Persoonia striata
	Persoonia teretifolia
	Petrophile fastigiata
	Petrophile seminuda
	Petrophile squamata subsp. northern (J. Monks 40)
	Petrophile teretifolia
	Synaphea divaricata
	Synaphea aff. *drummondii*
	Synaphea oligantha
	Synaphea petiolaris subsp. *petiolaris*
	Synaphea spinulosa subsp. *major*
	Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)
Pteridaceae	*Cheilanthes sieberi* subsp. *sieberi*
Ranunculaceae	*Clematis pubescens*
Restionaceae	*Chordifex sphacelatus*
	Desmocladus castaneus
	Desmocladus lateriflorus
	Hypolaena exsulca
	Hypolaena fastigiata
	Hypolaena humilis
	Lepidobolus chaetocephalus
	Lepidobolus preissianus
Rhamnaceae	*Cryptandra graniticola*
	Cryptandra myriantha
	Cryptandra nutans
	Cryptandra pungens
	Cryptandra wilsonii
	Pomaderris brevifolia
	Siegfriedia darwinioides
	Spyridium sp. Jerdacuttup (A. Williams 332)
	Stenanthemum intricatum
Rubiaceae	**Galium murale*
	Opercularia apiciflora
	Opercularia vaginata

Family	Taxon
Rutaceae	*Boronia crassifolia*
	Boronia inconspicua
	Boronia inornata subsp. *inornata*
	Boronia inornata subsp. *leptophylla*
	Boronia oxyantha var. *brevicalyx*
	Boronia ramosa subsp. *anethifolia*
	Boronia scabra subsp. *scabra*
	Boronia subsessilis
	Microcybe albiflora
	Microcybe pauciflora subsp. Grass Patch (A. Strid 21921)
	Nematolepis phebalioides
	Philotheca gardneri subsp. *gardneri*
Santalaceae	*Choretrum glomeratum*
	Exocarpos aphyllus
	Exocarpos sparteus
	Leptomeria pachyclada
	Santalum acuminatum
Sapindaceae	*Dodonaea caespitosa*
	Dodonaea ptarmicaefolia
	Dodonaea stenozyga
Scrophulariaceae	*Eremophila densifolia* subsp. *erecta*
	Eremophila lehmanniana
	Glycocystis beckeri
	Myoporum tetrandrum
Solanaceae	*Anthocercis genistoides*
	**Solanum nigrum*
Stylidiaceae	*Levenhookia pusilla*
	Stylidium albomontis
	Stylidium breviscapum
	Stylidium dichotomum
	Stylidium piliferum
	Stylidium repens
	Stylidium rupestre
	Stylidium schoenoides
	Stylidium turleyae
Thymelaeaceae	*Pimelea angustifolia*
	Pimelea argentea
	Pimelea brachyphylla
	Pimelea brevifolia subsp. *brevifolia*
	Pimelea cracens
	Pimelea imbricata var. *piligera*
	Pimelea pendens
Violaceae	*Hybanthus floribundus* subsp. *adpressus*
Xanthorrhoeaceae	*Chamaescilla corymbosa* var. *corymbosa*

Family	Taxon
Xanthorrhoeaceae cont.	*Chamaescilla spiralis*
	Xanthorrhoea platyphylla
Zamiaceae	*Macrozamia dyeri*

Appendix G: Raw Data Recorded within Quadrats and Relevés in the Study Area

Site Name:	MRC01
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	12/09/2018
GPS Location:	GDA94 Zone 51 302370.22E 6274284.58N
Community:	1
Landform Type:	Other, Undulating plain (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Magnesite, Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ingrata	0.3	0.2
Acrotriche cordata	0.3	0.2
Anthotium humile	0.1	0.1
Baeckea latens	0.4	0.2
Boronia inornata subsp. *inornata*	0.2	0.1
Callitris roei	2	1
Cassytha glabella forma *dispar*		0.1
Cassytha melantha		0.2
Chorizema nervosum	0.8	0.2
Coopernookia polygalacea	0.2	0.1
Cyanicula aperta	0.1	0.1
Cyathostemon tenuifolius	0.4	0.1
Daviesia aphylla	2	3
Daviesia articulata	0.4	0.1
Dianella brevicaulis	0.3	0.1
Eucalyptus flocktoniae subsp. *flocktoniae*	4	8
Eucalyptus leptocalyx subsp. *leptocalyx*	4	8
Eucalyptus suggrandis subsp. *suggrandis*	4	5
Eucalyptus uncinata	3	1

Gahnia ancistrophylla	0.5	3
Gahnia aristata	0.3	3
Grevillea oligantha	1	0.2
Hakea laurina	4	2
Halgania andromedifolia	1	0.3
Hibbertia psilocarpa	0.3	0.5
Hibbertia pungens	0.4	0.1
Lepidosperma gracile	0.3	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.4	0.1
Leptomeria pachyclada	1	1
Leucopogon aff. *diversifolius*	0.4	0.2
Lissanthe rubicunda	0.4	0.1
Logania buxifolia	0.5	0.1
Lomandra micrantha subsp. *teretifolia*	0.3	0.1
Melaleuca calycina	0.8	0.2
Melaleuca lateriflora	2	2
Melaleuca sapientes	2.5	3
Melaleuca subfalcata	2	8
Melaleuca torquata	2	10
Melaleuca undulata	2	10
Neurachne alopecuroidea	0.1	0.1
Pterostylis recurva	0.2	0.1
Pterostylis vittata	0.1	0.1
Pultenaea calycina subsp. *proxena* (P4)	0.8	1
Santalum acuminatum	2	0.3
Spyridium sp. Jerdacuttup (A. Williams 332)	1	0.2
Styphelia exserta	0.5	0.3
Styphelia intertexta	0.5	0.5
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.3
Westringia dampieri	0.4	0.1

PHOTO

Site Name:	MRC02
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	12/09/2018
GPS Location:	GDA94 Zone 51 301084.47919668E 6272572.7616222N
Community:	8
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Orange-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus occidentalis*
Upper Stratum 2:	*Acacia cyclops*, *Melaleuca hamata*
Mid Stratum 1:	*Lepidosperma sanguinolentum*
Lower Stratum 1:	*Lasiopetalum rosmarinifolium*, *Thomasia angustifolia*
Lower Stratum 2:	*Gahnia ancistrophylla*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	4	5
Acacia sulcata var. *platyphylla*	0.7	0.1
Allocasuarina huegeliana		
Astroloma microphyllum	0.2	0.1
Austrostipa elegantissima	0.3	0.1
Austrostipa variabilis	0.2	0.1
Austrostipa ?variabilis	0.3	0.1
Blennospora drummondii	0.1	0.1
Caladenia brevisura	0.2	0.1
Caladenia flava subsp. *flava*	0.1	0.1
Calandrinia calyptrata	0.1	0.1
Calandrinia sp.	0.1	0.1
Ceratogyne obionoides	0.1	0.1

Chamaescilla corymbosa var. *corymbosa*	0.1	0.5
Cheilanthes sieberi subsp. *sieberi*	0.1	0.1
Comesperma volubile	0.2	0.1
Crassula closiana	0.1	0.1
Crassula colorata var. *colorata*	0.1	0.1
Daucus glochidiatus	0.1	0.1
Dicot sp.	0.1	0.1
Dodonaea caespitosa	0.2	0.5
**Ehrharta longiflora*	0.2	0.1
Enchylaena tomentosa var. *tomentosa*	0.2	0.1
Erodium crinitum	0.1	0.1
Eucalyptus occidentalis	12	28
Eucalyptus pleurocarpa	2	1
Gahnia ancistrophylla	0.5	15
Gompholobium marginatum	0.2	0.1
Gonocarpus nodulosus	0.1	0.1
Goodenia affinis	0.1	0.1
Grevillea nudiflora		
Hakea laurina		
Hakea lissocarpha	1.2	1
Hakea nitida		
Hibbertia gracilipes	0.2	0.1
Hydrocotyle rugulosa	0.1	0.1
**Hypochaeris glabra*	0.1	0.1
Isotropis juncea	0.1	0.1
Lagenophora huegelii	0.1	0.1
Lasiopetalum rosmarinifolium	0.8	2.5
Lepidobolus preissianus	0.1	1
Lepidosperma sanguinolentum	1.2	4
Lomandra effusa	0.3	0.2
Lomandra micrantha subsp. *teretifolia*	0.5	0.5
**Lysimachia arvensis*	0.1	0.2
Melaleuca hamata	2	2
Millotia tenuifolia var. *tenuifolia*	0.1	0.1
Neurachne alopecuroidea	0.1	1
Opercularia vaginata	0.1	0.1
Oxalis exilis	0.1	0.1
*?*Pentameris airoides* subsp. *airoides*	0.1	0.1
Phyllanthus calycinus	0.2	0.1
Plantago hispida	0.1	0.1
Podotheca gnaphalioides	0.1	0.1
Poranthera microphylla	0.1	0.1
Pyrorchis nigricans	0.1	0.1
Rhodanthe laevis	0.1	0.1

Rytidosperma ?setaceum	0.1	0.1
Stenanthemum intricatum	0.2	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.4	0.1
Thelymitra ?petrophila	0.3	0.1
Thomasia angustifolia	0.5	3
Thysanotus patersonii		0.1
Trachymene ornata	0.1	0.1
**Ursinia anthemoides* subsp. *anthemoides*	0.1	0.1
Wahlenbergia gracilenta	0.1	0.1
Waitzia ?nitida	0.1	0.1
Waitzia suaveolens var. *suaveolens*	0.1	0.1

PHOTO

Site Name:	MRC03
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	12/09/2018
GPS Location:	GDA94 Zone 51 302324.51E 6273914.07N
Community:	15
Landform Type:	Other, Undulating plain (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Grey
Rock Outcrop:	No bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Magnesite (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ingrata	0.2	0.3
Boronia inornata subsp. *inornata*	0.5	4
Cassytha melantha		0.1
Choretrum glomeratum	1.5	0.5
Dodonaea stenozyga	2	0.5
Eucalyptus conglobata subsp. *conglobata*	4	3
Eucalyptus flocktoniae subsp. *flocktoniae*	4	25
Leptomeria pachyclada	1.8	0.5
Melaleuca cucullata		
Melaleuca pauperiflora subsp. *pauperiflora*	1.5	35
Nematolepis phebalioides	2	0.2
Pultenaea calycina subsp. *proxena* (P4)	1.5	0.2
Santalum acuminatum	1	0.1

PHOTO

Site Name:	MRC04
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	12/09/2018
GPS Location:	GDA94 Zone 51 301149.53198195E 6272830.8591823N
Community:	1
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	SW
Soil Type:	Clayey Sand
Soil Colour:	Yellow-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus conglobata* subsp. *conglobata*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus perangusta*, *Eucalyptus uncinata*
Mid Stratum 1:	*Hakea lissocarpha*, *Melaleuca rigidifolia*
Lower Stratum 1:	*Hibbertia pungens*
Lower Stratum 2:	*Gahnia ancistrophylla*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia gonophylla	1	0.1
Acacia latipes subsp. *latipes*		
Acacia pravifolia	0.6	0.2
Anthotium humile	0.1	0.1
Astroloma microphyllum	0.2	0.5
Baeckea latens	1	0.5
Banksia media		
Boronia inconspicua	0.2	0.1
Caladenia brevisura	0.1	0.1
Cassytha glabella forma *dispar*		0.1
Chamaescilla corymbosa var. *corymbosa*	0.2	0.1
Comesperma volubile	0.1	0.1
Coopernookia polygalacea	0.1	1

Cryptandra wilsonii	0.2	0.1
Cyathostemon tenuifolius	0.5	0.2
Daviesia aphylla	1.5	0.1
Desmocladus lateriflorus	0.2	0.1
Dianella brevicaulis	0.3	0.1
Dodonaea caespitosa	0.2	0.1
Drosera macrantha		0.1
Eriochilus dilatatus	0.1	0.1
Eucalyptus conglobata subsp. *conglobata*	4	3
Eucalyptus leptocalyx subsp. *leptocalyx*	4	20
Eucalyptus perangusta	4	1
Eucalyptus pleurocarpa		
Eucalyptus uncinata	3.5	1
Eutaxia cuneata	0.5	0.1
Gahnia ancistrophylla	0.5	5
Grevillea pectinata	1	0.1
Hakea lissocarpha	1.3	3
Hibbertia gracilipes	0.2	0.1
Hibbertia pungens	0.7	3
Hovea pungens		
**Hypochaeris glabra*	0.1	0.1
Lasiopetalum rosmarinifolium	1	2
Laxmannia ramosa subsp. *deflexa*	0.1	0.1
Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)	0.6	0.1
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)		
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.6	0.1
Lomandra micrantha subsp. *teretifolia*	0.4	0.1
Melaleuca glaberrima	1	1
Melaleuca hamata	2	0.2
Melaleuca lateriflora	0.6	2
Melaleuca rigidifolia	1.3	10
Microcorys glabra		
Mirbelia ovata	0.5	1
Neurachne alopecuroidea	0.1	2
Opercularia apiciflora	0.1	0.1
Pimelea brachyphylla	0.3	0.1
Pterostylis sp.	0.1	0.1
Rytidosperma ?setaceum	0.1	0.1
Styphelia intertexta	0.9	0.1
Templetonia neglecta	0.8	0.1

Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.2
Thysanotus patersonii		0.1

PHOTO

Site Name:	MRC05
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	12/09/2018
GPS Location:	GDA94 Zone 51 301259.85E 6273357.72N
Community:	10
Landform Type:	Other, Undulating plain (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Dolerite, Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	5	4
Acacia glaucoptera	0.5	0.2
Acacia pravifolia		
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.3	2
Billardiera fusiformis	2	0.1
Cassytha melantha		0.1
Chamaescilla corymbosa var. *corymbosa*	0.1	0.1
Cheiranthera brevifolia		0.1
Comesperma volubile		0.1
Dampiera lavandulacea	0.2	0.1
Daucus glochidiatus	0.1	0.1
Dianella brevicaulis	0.3	0.2
Dodonaea caespitosa	0.3	2
Drosera glanduligera	0.1	0.1
**Ehrharta longiflora*	0.3	0.1
Eucalyptus conglobata subsp. *conglobata*	4	5
Eucalyptus perangusta	4	1
Eutaxia cuneata	0.4	0.1

Gahnia ancistrophylla	0.5	25
Goodenia affinis	0.1	0.1
Helichrysum leucopsideum	0.1	0.1
Hibbertia rupicola	0.3	0.2
Lagenophora huegelii	0.1	0.1
Lasiopetalum rosmarinifolium	1	4
Lepidosperma sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738)	0.3	2
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.4	0.1
Lomandra effusa	0.3	0.2
Lomandra micrantha subsp. *teretifolia*	0.4	0.2
Melaleuca hamata	3	25
Melaleuca lateriflora	1.5	4
Neurachne alopecuroidea	0.1	0.1
Pimelea brachyphylla		
Pterostylis recurva	0.2	0.1
Santalum acuminatum	2.5	5
Senna sp. Pallinup River (J.W. Green 4847)	0.3	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.4	0.5
Thomasia angustifolia	0.4	0.1
Thomasia foliosa		
**Vulpia myuros*	0.1	0.1

PHOTO

Site Name:	MRC06
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	13/09/2018
GPS Location:	GDA94 Zone 51 302900.54E 6271058.8N
Community:	1
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	S
Soil Type:	Clayey Sand
Soil Colour:	Grey
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus conglobata* subsp. *conglobata*, *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus phaenophylla* subsp. *interjacens*, *Eucalyptus suggrandis* subsp. *suggrandis*
Mid Stratum 1:	*Acacia gonophylla*, *Daviesia articulata*, *Melaleuca rigidifolia*
Lower Stratum 1:	*Acacia chrysocephala*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia chrysocephala	0.4	3
Acacia curvata	0.7	1
Acacia gonophylla	1	8
Acacia sulcata var. *platyphylla*		
Anthotium humile	0.1	0.1
Banksia media	0.5	0.1
Billardiera coriacea		0.1
Cassytha glabella forma *dispar*		0.1
Chorizema nervosum		
Coopernookia polygalacea	0.1	0.1
Cryptandra wilsonii	0.2	0.1
Dampiera angulata subsp. *angulata*	0.3	0.1
Dampiera lavandulacea	0.2	0.1

Daviesia articulata	0.5	5
Dianella brevicaulis	0.4	0.1
Dodonaea caespitosa	0.2	0.1
Eucalyptus conglobata subsp. *conglobata*	1.8	2
Eucalyptus flocktoniae subsp. *flocktoniae*	1.6	4
Eucalyptus leptocalyx subsp. *leptocalyx*	2.2	15
Eucalyptus phaenophylla subsp. *interjacens*	2	6
Eucalyptus suggrandis subsp. *suggrandis*	1.5	3
Eutaxia cuneata	0.8	0.1
Exocarpos sparteus	1.7	0.5
Gahnia ancistrophylla	0.4	1
Gahnia sp. Ravensthorpe (G.F. Craig 5005)	0.1	0.1
Gompholobium marginatum	0.2	0.1
Grevillea nudiflora	0.4	1
Grevillea oligantha	0.4	0.1
Grevillea pectinata	0.9	1
Hakea laurina	0.6	0.1
Hibbertia gracilipes	0.3	0.1
Hibbertia psilocarpa	0.2	0.1
Hibbertia pungens	0.2	0.1
Lasiopetalum rosmarinifolium	0.6	0.1
Laxmannia omnifertilis	0.1	0.1
Lepidosperma fimbriatum	0.2	0.1
Lepidosperma sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'	0.4	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.6	0.1
Lomandra micrantha subsp. *teretifolia*	0.3	0.1
Melaleuca calycina	0.6	0.1
Melaleuca glaberrima	0.7	1
Melaleuca lateriflora	0.5	0.1
Melaleuca rigidifolia	0.9	40
Melaleuca sapientes	0.8	0.5
Melaleuca subfalcata	0.5	0.1
Melaleuca torquata	0.7	1
Microcorys glabra	0.3	0.1
Neurachne alopecuroidea	0.1	0.2
Opercularia apiciflora	0.1	0.1
Pimelea brachyphylla	0.3	0.1
Spyridium sp. Jerdacuttup (A. Williams 332)	0.1	0.1
Tetrapora verrucosa	0.6	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.2
Thomasia microphylla	0.3	1

Thysanotus patersonii		0.1

PHOTO

Site Name:	MRC07
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	13/09/2018
GPS Location:	GDA94 Zone 51 301596.79E 6273668.59N
Community:	9
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops		
Acacia glaucoptera	1.6	4
Acacia verriculum	2	1
Acrotriche ramiflora	0.3	0.3
Austrostipa elegantissima	0.6	0.2
Billardiera fusiformis		0.1
Caladenia horistes	0.1	0.1
Calandrinia calyptrata	0.1	0.1
Cassytha melantha		2
Chamaescilla corymbosa var. *corymbosa*	0.1	0.1
Daucus glochidiatus	0.2	0.1
Diuris littoralis	0.2	0.1
Dodonaea caespitosa	0.2	0.2
Eriochilus dilatatus	0.1	0.1
Eucalyptus occidentalis	10	25
Eucalyptus quadrans	7	1
Eutaxia cuneata	0.6	0.1
Exocarpos aphyllus	1.5	0.5
Goodenia affinis	0.1	0.1

Hakea laurina	0.6	0.1
Hakea lissocarpha	1.2	1
Hibbertia rupicola	0.4	0.5
Hydrocotyle pilifera var. *glabrata*	0.1	0.1
Hydrocotyle rugulosa	0.1	0.1
Isotropis juncea	0.1	0.1
Lagenophora huegelii	0.1	0.1
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	0.3	2
Lomandra effusa	0.3	0.3
**Lysimachia arvensis*	0.1	0.1
Melaleuca glaberrima		
Millotia tenuifolia var. *tenuifolia*	0.1	0.1
Neurachne alopecuroidea	0.1	0.1
Opercularia vaginata	0.1	0.1
Ophioglossum lusitanicum	0.1	0.1
Oxalis exilis	0.1	0.1
Pauridia glabella var. *glabella*	0.1	0.1
Phyllanthus calycinus	0.4	0.2
Plantago hispida	0.1	0.1
Pterostylis recurva	0.2	0.1
Ptilotus spathulatus	0.1	0.1
Rytidosperma sp.	0.1	0.1
Senecio glossanthus	0.1	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.3	10
Teucrium sessiliflorum	0.1	0.1
Thelymitra sp.	0.1	0.1
Thomasia foliosa	0.4	4
Thysanotus patersonii		0.1
Trachymene ornata	0.1	0.1
Wahlenbergia gracilenta	0.1	0.1
Wurmbea sinora	0.1	0.1

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Site Name:	MRC08
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	14/09/2018
GPS Location:	GDA94 Zone 51 304790.17998617E 6271119.49170536N
Community:	3
Landform Type:	Ridge
Slope Class:	Gently Inclined (3 degrees)
Aspect:	SW
Soil Type:	Loamy clay (other)
Soil Colour:	Light brown (other)
Rock Outcrop:	Sandstone (other), 20-50% bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus densa*
Mid Stratum 1:	*Banksia media*
Mid Stratum 2:	*Melaleuca pentagona* var. *pentagona*
Lower Stratum 1:	*Hibbertia pungens*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Banksia media	3	6
Cassytha melantha		0.1
Cyanicula aperta	0.1	0.1
Cyathostemon tenuifolius	0.6	0.1
Dampiera angulata subsp. *angulata*	0.3	0.1
Diuris ?littoralis	0.1	0.1
Eucalyptus densa	5.5	25
Eucalyptus ecostata	5	1
Eucalyptus platypus subsp. *platypus*	5	2
Hibbertia pungens	1	1.5
Lepidosperma ?fairallianum	0.2	0.1

Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.5	0.1
Leucopogon opponens	0.3	0.1
Lomandra micrantha subsp. *teretifolia*	0.4	0.1
Melaleuca glaberrima		
Melaleuca hamata	1.5	0.1
Melaleuca pentagona var. *pentagona*	2.5	30
Nematolepis phebalioides		
Pterostylis timothyi	0.1	0.1
Stylidium albomontis	0.2	0.1
Tetrapora verrucosa	1	0.1
Thysanotus patersonii	0.1	0.1

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Site Name:	MRC09
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	13/09/2018
GPS Location:	GDA94 Zone 51 301297.96E 6273931.79N
Community:	14
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Pinkish brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia glaucoptera	0.3	0.1
Daviesia aphylla	1.5	1
Eucalyptus platypus subsp. *platypus*	7	55
Exocarpos aphyllus	0.6	0.5
Gahnia aristata	0.1	0.1
Pterostylis timothyi	0.1	0.1

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Site Name:	MRC10
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	14/09/2018
GPS Location:	GDA94 Zone 51 304788.07E 6271013.71N
Community:	14
Landform Type:	Simple Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	S
Soil Type:	Light Clay
Soil Colour:	Grey
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus dielsii*, *Eucalyptus platypus* subsp. *platypus*
Mid Stratum 1:	*Acacia cyclops*
Mid Stratum 2:	*Acacia glaucoptera*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	2.5	2
Acacia glaucoptera	1.4	15
Acacia harveyi	2.5	0.1
Billardiera coriacea		0.1
Billardiera fusiformis		0.2
Cassytha melantha		10
Comesperma polygaloides	0.1	0.1
Commersonia rotundifolia (P3)	1	0.1
Daviesia nematophylla	0.3	0.1
Dianella brevicaulis	0.5	0.1
Dianella revoluta	1	0.1
Eucalyptus dielsii	2.5	3
Eucalyptus platypus subsp. *platypus*	4	88

Exocarpos aphyllus	0.5	1
Exocarpos sparteus	1.2	0.1
Hakea laurina	1.5	1
Hibbertia psilocarpa	0.3	0.1
**Hypochaeris glabra*	0.1	0.1
Lasiopetalum rosmarinifolium	0.4	0.1
Melaleuca cucullata		
Melaleuca torquata	1.2	0.1
Microtis sp.	0.3	0.1
Persoonia teretifolia	0.2	0.1
Pimelea cracens		
Rytidosperma ?setaceum	0.1	0.1
**Sonchus oleraceus*	0.1	0.1
Thelymitra sp.	0.4	0.1
Thysanotus patersonii		0.1

PHOTO

Site Name:	MRC11
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	13/09/2018
GPS Location:	GDA94 Zone 51 301147.21E 6274198.82N
Community:	16
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Yellow-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia gonophylla	1	0.5
Acacia ingrata	0.3	0.3
Amphipogon turbinatus	0.2	0.1
Anarthria humilis	0.1	0.1
Argentipallium niveum	0.2	0.1
Banksia alliacea	0.8	4
Billardiera venusta		0.1
Callitris roei	2	2
Calytrix leschenaultii	0.2	0.1
Cassytha glabella forma *dispar*		0.1
Chamaescilla spiralis	0.1	0.1
Cheiranthera brevifolia		0.1
Chorizema aciculare subsp. *aciculare*	0.2	0.1
Conostylis argentea	0.1	0.1
Cryptandra pungens	0.3	0.1
Dampiera angulata subsp. Peak Charles (K.R. Newbey 5402)	0.2	0.1

Dampiera lavandulacea	0.3	0.2
Desmocladus lateriflorus	0.1	0.1
Drosera macrantha	0.1	0.1
Eucalyptus leptocalyx subsp. *leptocalyx*	2	0.3
Eucalyptus pleurocarpa	5	3
Eucalyptus uncinata	4	3
Gahnia ancistrophylla	0.4	0.5
Gompholobium baxteri	0.5	0.1
Gompholobium marginatum	0.1	0.1
Grevillea nudiflora	0.5	0.5
Haemodorum sp.	0.3	0.1
Hakea ilicifolia	1	0.6
Hakea lissocarpha	1.6	3
Hakea prostrata	1	0.4
Hibbertia gracilipes	0.3	0.3
Hibbertia pungens	0.3	0.1
Laxmannia paleacea	0.1	0.1
Lepidobolus preissianus	0.2	0.2
Lepidosperma carphoides	0.3	0.1
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	0.3	2
Leucopogon concinnus	0.3	0.1
Leucopogon sp. Newdegate (M. Hislop 3585)	0.6	1
Lomandra micrantha subsp. *teretifolia*	0.4	0.1
Lomandra mucronata	0.2	0.1
Melaleuca carrii	0.5	2
Melaleuca rigidifolia	0.5	15
Mesomelaena stygia subsp. *stygia*	0.3	3
Micromyrtus elobata subsp. *elobata*	0.3	0.1
Neurachne alopecuroidea	0.1	0.1
Opercularia vaginata	0.1	0.1
Petrophile fastigiata	1.5	3
Platysace deflexa	0.4	0.1
Pterostylis recurva	0.3	0.1
Pyrorchis nigricans	0.1	0.1
Schoenus obtusifolius	0.2	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.1
Stylidium piliferum	0.1	0.1
Stylidium repens	0.1	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.4	0.2
Verticordia acerosa var. *preissii*	0.3	0.1

PHOTO

Site Name:	MRC12
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	14/09/2018
GPS Location:	GDA94 Zone 51 304156.23E 6271154.36N
Community:	1
Landform Type:	Other, Low rise (other)
Slope Class:	Gently Inclined (3 degrees)
Aspect:	S
Soil Type:	Loamy clay (other)
Soil Colour:	Red-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Ironstone
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus phaenophylla* subsp. *interjacens*, *Eucalyptus pleurocarpa*, *Eucalyptus uncinata*
Mid Stratum 1:	*Acacia gonophylla*, *Gastrolobium parviflorum*
Lower Stratum 1:	*Grevillea nudiflora*
Lower Stratum 2:	*Dampiera angulata* subsp. *angulata*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia gonophylla	1	3
Acacia ingrata	0.2	0.1
Amphipogon turbinatus	0.1	0.1
Banksia media	0.4	0.1
Billardiera coriacea		0.1
Calytrix leschenaultii	0.3	0.1
Comesperma volubile		0.1
Cryptandra wilsonii	0.2	0.1
Dampiera angulata subsp. *angulata*	0.4	4
Dampiera lavandulacea	0.2	0.1
Daviesia articulata	0.2	0.1

Drosera macrantha		0.1
Eucalyptus flocktoniae subsp. *flocktoniae*	1.6	0.5
Eucalyptus phaenophylla subsp. *interjacens*	1.8	15
Eucalyptus pleurocarpa	2.2	6
Eucalyptus uncinata	1.5	2
Eutaxia cuneata	0.2	0.1
Gahnia ancistrophylla	0.3	0.1
Gastrolobium parviflorum	0.9	27
Goodenia scapigera subsp. *scapigera*	0.2	0.1
Grevillea nudiflora	0.4	4
Grevillea oligantha	0.4	0.1
Hakea laurina	1.5	0.1
Hibbertia gracilipes	0.2	0.1
Hibbertia pungens	0.3	0.1
**Hypochaeris glabra*	0.1	0.1
Lasiopetalum rosmarinifolium	0.4	0.1
Laxmannia omnifertilis	0.1	0.1
Lechenaultia formosa		
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	0.3	0.1
Leucopogon concinnus	0.3	0.1
Leucopogon opponens	0.3	0.1
Logania buxifolia		
Lysinema ciliatum	0.2	0.1
Melaleuca carrii	0.3	0.1
Melaleuca rigidifolia	0.5	1
Melaleuca sapientes	0.2	0.1
Melaleuca subfalcata	0.2	0.1
Neurachne alopecuroidea	0.1	0.1
Olax benthamiana	0.4	0.1
Stylidium repens	0.1	0.1
Tetrapora verrucosa	0.1	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.1	0.1
Thomasia microphylla	0.2	0.1
Verticordia acerosa var. *preissii*	0.2	0.1

PHOTO

Site Name:	MRC13
Site Type:	QUADRAT
Dimensions:	5m x 20m
Survey Date:	13/09/2018
GPS Location:	GDA94 Zone 51 301205.37E 6274767.54N
Community:	12
Landform Type:	Drainage Line
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Light Clay
Soil Colour:	Dark brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 3 - Very Good
Disturbance:	Exotic Weeds - Weeds
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	2.5	6
Acacia latipes subsp. *latipes*	1.5	0.5
Alyogyne sp. Southern Coast (A.S. George 289)	3	0.2
Cassytha glabella forma *dispar*		0.1
Chamaescilla corymbosa var. *corymbosa*	0.1	0.1
Chorizandra enodis	0.6	40
**Cirsium vulgare*	0.8	0.1
**Conyza* sp.	0.8	0.2
Cotula australis	0.1	0.1
**Cotula coronopifolia*	0.2	0.2
Daucus glochidiatus	0.3	0.1
**Ehrharta longiflora*	0.3	0.3
Eucalyptus occidentalis	11	35
Gahnia aristata	0.4	0.3
Juncus pallidus	1	0.2
**Lepidium africanum*	0.3	0.1
Lepidosperma sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738)	0.3	0.2
Melaleuca calycina	2	2

Melaleuca glaberrima	1.5	1
Melaleuca undulata	2.5	6
Plantago hispida	0.2	0.1
**Rumex crispus*	0.4	0.1
**Solanum nigrum*	0.5	0.1
**Sonchus oleraceus*	0.3	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.3
**Vellereophyton dealbatum*	0.5	0.2

PHOTO

Site Name:	MRC14
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	15/09/2018
GPS Location:	GDA94 Zone 51 303673.00784932E 6271039.95437621N
Community:	13
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	S
Soil Type:	Sandy Clay
Soil Colour:	Light brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 3 - Very Good
Disturbance:	Exotic Weeds - Weeds
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus occidentalis*
Upper Stratum 2:	*Acacia cyclops*, *Grevillea anethifolia*, *Labichea lanceolata* subsp. *brevifolia*, *Melaleuca acuminata* subsp. *acuminata*
Mid Stratum 1:	*Acacia sulcata* var. *platyphylla*
Mid Stratum 2:	*Thomasia angustifolia*, *Thomasia foliosa*
Lower Stratum 1:	*Lepidosperma fimbriatum*, *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798)
Lower Stratum 2:	*Dichondra repens*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	4	2
Acacia harveyi	3	0.1
Acacia saligna subsp. *lindleyi* ms	1	0.1
Acacia sulcata var. *platyphylla*	1.6	5
Alyogyne sp. Southern Coast (A.S. George 289)	0.7	0.1
Billardiera fusiformis		3
Boronia scabra subsp. *scabra*		

Cassytha melantha		8
Chamelaucium ciliatum	0.8	0.1
Cheilanthes sieberi subsp. *sieberi*	0.1	0.1
**Cirsium vulgare*	0.1	0.1
Clematis pubescens		0.1
**Conyza bonariensis*	0.2	0.1
Cotula australis	0.1	0.1
Crassula closiana	0.1	0.1
Dianella revoluta	0.7	0.1
Dichondra repens	0.1	2
**Ehrharta longiflora*	0.2	5
Enchylaena tomentosa var. *tomentosa*	0.6	0.1
Erodium crinitum	0.2	0.1
Eucalyptus occidentalis	6	30
**Galium murale*	0.1	0.1
Grevillea anethifolia	3	6
Hakea laurina	1.5	0.1
**Hypochaeris glabra*	0.1	0.1
Labichea lanceolata subsp. *brevifolia*	2.5	40
Lepidosperma fimbriatum	0.4	2
Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)	0.7	2
**Lysimachia arvensis*	0.1	0.1
Macrozamia dyeri	1.5	0.5
Melaleuca acuminata subsp. *acuminata*	3	4
Muehlenbeckia adpressa		0.1
Oxalis exilis	0.1	0.1
Phyllanthus calycinus	0.2	0.1
Pimelea argentea	0.3	0.1
Pterostylis timothyi	0.1	0.1
Rytidosperma ?setaceum	0.2	0.1
Senna sp. Pallinup River (J.W. Green 4847)	1.2	1
**Solanum nigrum*	0.2	0.1
**Sonchus oleraceus*	0.1	0.2
Thomasia angustifolia	0.6	4
Thomasia foliosa	1	5
**Vellereophyton dealbatum*	0.2	0.1

PHOTO

Site Name:	MRC15
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	13/09/2018
GPS Location:	GDA94 Zone 51 300666.96E 6275657.26N
Community:	16
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Yellow-grey (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Allocasuarina humilis	1.2	8
Allocasuarina microstachya	0.3	0.2
Allocasuarina thuyoides	0.3	0.2
Amphipogon avenaceus	0.2	0.1
Amphipogon turbinatus	0.2	0.1
Anarthria humilis	0.2	0.1
Banksia armata var. *ignicida*	1.2	4
Beaufortia micrantha	0.6	1.5
Billardiera venusta		0.1
Calothamnus gracilis	0.8	0.5
Cassytha flava		0.1
Caustis dioica	0.6	5
Chamelaucium ciliatum		
Conothamnus aureus	0.6	3
Dampiera angulata subsp. Peak Charles (K.R. Newbey 5402)	0.3	0.1
Darwinia vestita	0.3	0.1
Daviesia teretifolia	0.4	0.1
Desmocladus lateriflorus	0.1	0.3

Eucalyptus pleurocarpa	5	12
Gompholobium knightianum	0.2	0.1
Goodenia incana	0.2	0.1
Grevillea nudiflora	0.4	0.2
Haemodorum sp.	0.5	0.1
Hakea corymbosa	1.5	0.3
Hibbertia gracilipes	0.3	1
Jacksonia condensata	0.3	0.1
Jacksonia viscosa	1.5	3
Lambertia inermis var. *inermis*		
Laxmannia omnifertilis	0.3	0.1
Laxmannia paleacea	0.2	0.1
Lepidobolus chaetocephalus	0.4	0.2
Lepidosperma carphoides	0.4	0.2
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	0.4	1
Leptospermum spinescens	0.8	0.3
Leucopogon breviflorus	0.8	0.3
Leucopogon sp. Newdegate (M. Hislop 3585)	0.5	3
Lomandra nigricans	0.4	0.1
Lysinema ciliatum		
Melaleuca rigidifolia	0.5	5
Mesomelaena stygia subsp. *stygia*	0.2	3
Micromyrtus elobata subsp. *elobata*	0.4	0.1
Neurachne alopecuroidea	0.1	0.1
Opercularia vaginata	0.1	0.1
Persoonia striata	0.2	0.1
Petrophile seminuda	0.6	0.4
Petrophile squamata subsp. northern (J. Monks 40)	1	0.5
Pyrorchis nigricans	0.1	0.1
Schoenus brevisetis	0.3	0.2
Schoenus obtusifolius	0.2	0.1
Schoenus pleiostemoneus	0.1	0.1
Schoenus subflavus subsp. long leaves (K.L. Wilson 2865)	0.1	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.1
Stylidium piliferum	0.1	0.1
Synaphea divaricata	0.5	0.1
Taxandria spathulata		
Thysanotus sparteus	0.1	0.1
Verticordia densiflora var. *cespitosa*	0.4	0.2
Xanthorrhoea platyphylla	0.8	0.3

Xanthosia huegelii	0.1	0.1

PHOTO

Site Name:	MRC16
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	15/09/2018
GPS Location:	GDA94 Zone 51 303377.03E 6271356.07N
Community:	14
Landform Type:	Simple Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	S
Soil Type:	Sandy Clay
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm
CF Types:	Ironstone, Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus dielsii*, *Eucalyptus platypus* subsp. *platypus*
Mid Stratum 1:	*Acacia glaucoptera*, *Exocarpos aphyllus*, *Melaleuca torquata*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	0.3	0.1
Acacia glaucoptera	1	15
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.2	0.1
Astroloma microphyllum	0.2	0.1
Billardiera coriacea	0.1	0.1
Billardiera fusiformis		0.1
Caladenia attingens subsp. *gracillima*	0.1	0.1
Cassytha melantha		5
Comesperma polygaloides	0.1	0.1
Cyanicula aperta	0.1	0.1
Daviesia aphylla	0.7	0.1
Dianella brevicaulis	0.3	0.1
Eriochilus dilatatus	0.1	0.1

Eucalyptus dielsii	4	88
Eucalyptus platypus subsp. *platypus*	3	2
Exocarpos aphyllus	1	6
Exocarpos sparteus	0.6	0.1
Grevillea pectinata	1	0.1
Hibbertia psilocarpa	0.4	0.1
Melaleuca acuminata subsp. *acuminata*	0.7	0.1
Melaleuca cucullata	0.6	0.1
Melaleuca rigidifolia	0.5	0.1
Melaleuca sapientes	0.8	0.1
Melaleuca torquata	1.2	2
Pterostylis recurva	0.1	0.1
Pterostylis sp.	0.1	0.1
Rytidosperma setaceum	0.1	0.1
Styphelia intertexta	0.2	0.1
Thysanotus patersonii		0.1

PHOTO

Site Name:	MRC17
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	14/09/2018
GPS Location:	GDA94 Zone 51 300059.97E 6276608.9N
Community:	10
Landform Type:	Other, Undulating plain (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Dolerite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ingrata	0.3	0.2
Acacia sulcata var. *platyphylla*	1.6	3
Allocasuarina huegeliana	2	0.2
Boronia scabra subsp. *scabra*		
Caladenia attingens subsp. *gracillima*		
Calothamnus quadrifidus subsp. *quadrifidus*	1.5	1.5
Calytrix tetragona	0.6	1
Cassytha glabella forma *dispar*		0.1
Comesperma volubile		0.1
Coopernookia polygalacea	0.3	0.1
Dampiera lavandulacea	0.1	0.1
Desmocladus lateriflorus	0.1	0.1
Dianella revoluta	0.5	0.2
Diuris decrementa		
Diuris sp.	0.1	0.1
Dodonaea caespitosa	0.3	0.2
Drosera macrantha		0.1
Eucalyptus conglobata subsp. *conglobata*	3.5	3
Eucalyptus phaenophylla subsp. *interjacens*	3.5	3

Gahnia ancistrophylla	0.5	5
Goodenia affinis	0.1	0.1
Haemodorum sp.	0.6	0.1
Hakea lissocarpha	2	3
Lepidobolus preissianus	0.3	2
Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)	0.6	0.1
Leporella fimbriata	0.1	0.1
Lomandra micrantha subsp. *teretifolia*	0.3	0.2
Melaleuca glaberrima	1.8	5
Melaleuca hamata	2.5	10
Melaleuca lateriflora	1.5	4
Neurachne alopecuroidea	0.1	1
Opercularia vaginata	0.1	3
Platysace deflexa	0.3	0.5
Pterostylis recurva	0.3	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.1
Stylidium dichotomum	0.1	0.3
Stypandra glauca	0.4	0.1
Styphelia intertexta	0.3	0.1
Styphelia sp. Cascades (R. Davis 11037)	0.3	1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	1

PHOTO

Site Name:	MRC18
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	15/09/2018
GPS Location:	GDA94 Zone 51 302350.54E 6271119.58N
Community:	2
Landform Type:	Simple Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	SW
Soil Type:	Sandy Clay
Soil Colour:	Orange-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterite, Ironstone, Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus conglobata* subsp. *conglobata*, *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus phaenophylla* subsp. *interjacens*
Mid Stratum 1:	*Melaleuca calycina*, *Melaleuca undulata*
Lower Stratum 1:	*Daviesia articulata*
Lower Stratum 2:	*Gahnia ancistrophylla*, *Gahnia aristata*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia curvata	0.8	0.1
Acacia glaucoptera	0.4	0.1
Acacia ingrata	0.3	0.2
Anthotium humile	0.1	0.1
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.3	0.1
Billardiera coriacea		0.1
Boronia inconspicua	0.2	0.1
Boronia inornata subsp. *inornata*	0.3	0.1
Cassytha glabella forma *dispar*		0.1

Chorizema nervosum	0.3	0.2
Coopernookia polygalacea	0.2	0.1
Corunastylis fuscoviridis	0.3	0.1
Cryptandra wilsonii	0.3	0.1
Cyanicula aperta	0.1	0.1
Daviesia articulata	0.4	3
Dodonaea caespitosa	0.2	0.1
Eriochilus dilatatus	0.1	0.1
Eucalyptus conglobata subsp. *conglobata*	2.2	3
Eucalyptus flocktoniae subsp. *flocktoniae*	4	5
Eucalyptus leptocalyx subsp. *leptocalyx*	2.2	20
Eucalyptus phaenophylla subsp. *interjacens*	1.6	2
Exocarpos aphyllus	1.7	0.1
Exocarpos sparteus	1	0.1
Gahnia ancistrophylla	0.5	3
Gahnia aristata	0.4	2
Grevillea oligantha	1	0.1
Grevillea pectinata	0.5	0.1
Hakea laurina	1.5	0.1
Hibbertia psilocarpa	0.4	1
Lepidosperma gahnioides	0.2	1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.4	0.1
Lomandra micrantha subsp. *teretifolia*	0.3	0.1
Melaleuca calycina	1.5	2
Melaleuca johnsonii	1	0.2
Melaleuca sapientes	1.7	0.2
Melaleuca undulata	1.5	25
Microcorys glabra	0.4	0.1
Olearia imbricata	0.4	0.2
Pterostylis recurva	0.3	0.1
Pterostylis timothyi	0.1	0.1
Santalum acuminatum	1.4	0.1
Templetonia neglecta	0.4	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.1
Thelymitra occidentalis	0.3	0.1
Thelymitra ?petrophila	0.2	0.1
Thysanotus patersonii		0.1
Wilsonia humilis		0.1

PHOTO

Site Name:	MRC19
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	14/09/2018
GPS Location:	GDA94 Zone 51 302268.9E 6274770.01N
Community:	17
Landform Type:	Plain
Slope Class:	Level (0 degrees)
Soil Type:	Sand
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Adenanthos cuneatus	1.3	7
Allocasuarina humilis	1	4
Allocasuarina thuyoides	0.4	0.1
Amphipogon turbinatus	0.1	0.1
Andersonia caerulea		
Andersonia macranthera	0.1	0.1
Andersonia parvifolia		
Banksia obovata	1	0.8
Boronia subsessilis	0.4	0.1
Cassytha glabella forma *dispar*		0.3
Caustis dioica	0.8	4
Chamaescilla spiralis	0.1	0.1
Chordifex sphacelatus	0.3	0.2
Conostylis vaginata	0.2	0.1
Conothamnus aureus	0.7	5
Darwinia vestita	0.3	0.1
Desmocladus lateriflorus	0.1	1
Drosera menziesii	0.1	0.1
Eutaxia inuncta	0.6	0.1
Goodenia incana	0.1	0.1
Hibbertia acerosa	0.3	0.1

Hibbertia gracilipes	0.2	0.1
Hypolaena fastigiata	0.3	2
Jacksonia viscosa	0.6	0.5
Lambertia inermis var. *inermis*	4.5	4
Laxmannia ramosa subsp. *deflexa*	0.2	0.1
Lepidobolus chaetocephalus	0.3	0.2
Leporella fimbriata	0.1	0.1
Leucopogon breviflorus	0.3	0.1
Leucopogon sp. Coujinup (M.A. Burgman 1085)	0.2	0.1
Lyginia imberbis	0.5	1
Lysinema ciliatum	0.4	0.1
Melaleuca carrii	0.8	0.1
Melaleuca tuberculata var. *tuberculata*	0.6	0.1
Mesomelaena stygia subsp. *stygia*	0.2	0.5
Mesomelaena tetragona	0.5	3
Micromyrtus elobata subsp. *elobata*	0.4	0.1
Neurachne alopecuroidea	0.1	0.1
Nuytsia floribunda	3	2
Petrophile teretifolia	0.6	0.5
Phymatocarpus maxwellii	1	1.5
Pterostylis recurva	0.2	0.1
Pyrorchis nigricans	0.1	0.1
Schoenus curvifolius	0.2	0.1
Schoenus obtusifolius	0.1	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.1
Stylidium repens	0.1	0.2
Stylidium rupestre	0.1	0.1
Styphelia sp. South Coast (J.M. Powell 3374)	0.6	0.1
Taxandria spathulata	1	5
Thelymitra villosa	0.1	0.1
Tricostularia neesii	0.2	0.1
Verticordia inclusa	0.3	0.1

PHOTO

Site Name:	MRC20
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	15/09/2018
GPS Location:	GDA94 Zone 51 302080.6557736E 6272949.21363378N
Community:	14
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	SW
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Laterite, Ironstone
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus dielsii*, *Eucalyptus extensa*, *Eucalyptus platypus* subsp. *platypus*
Mid Stratum 1:	*Melaleuca acuminata* subsp. *acuminata*, *Melaleuca torquata*
Lower Stratum 1:	*Acacia glaucoptera*
Lower Stratum 2:	*Austrostipa variabilis*, *Rytidosperma setaceum*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia glaucoptera	1.3	1.5
Austrostipa variabilis	0.1	1
Chamaescilla corymbosa var. *corymbosa*	0.2	0.1
Comesperma polygaloides	0.2	0.1
Cyanicula aperta	0.1	0.1
Eriochilus dilatatus	0.1	0.1
Eucalyptus dielsii	8	5
Eucalyptus extensa	8	10
Eucalyptus platypus subsp. *platypus*	7	25
Hibbertia psilocarpa	0.2	0.1
Hydrocotyle rugulosa	0.1	0.1

**Hypochaeris glabra*	0.1	0.1
Lagenophora huegelii	0.1	0.1
Melaleuca acuminata subsp. *acuminata*	2.8	2
Melaleuca torquata	2.5	4
Millotia tenuifolia var. *tenuifolia*	0.1	0.1
Oxalis exilis	0.1	0.1
Pterostylis recurva	0.2	0.1
Pterostylis sp.	0.1	0.1
Rytidosperma setaceum	0.2	0.2
Thysanotus patersonii		0.1

PHOTO

Site Name:	MRC21
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	14/09/2018
GPS Location:	GDA94 Zone 51 303113.2E 6273532.89N
Community:	15
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Magnesite (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia lachnophylla	0.6	1
Boronia inornata subsp. *inornata*	0.3	6
Choretrum glomeratum	1	0.5
Dodonaea stenozyga	1	0.5
Eucalyptus conglobata subsp. *conglobata*	2.5	8
Eucalyptus flocktoniae subsp. *flocktoniae*	2.5	8
Eucalyptus indurata	2.5	8
Exocarpos aphyllus	0.3	0.2
Exocarpos sparteus	2	0.5
Glycocystis beckeri	1.3	1
Leptomeria pachyclada	0.5	0.2
Melaleuca pauperiflora subsp. *pauperiflora*	0.8	10
Pultenaea calycina subsp. *proxena* (P4)	0.6	1
Westringia dampieri	0.2	0.1

PHOTO

Site Name:	MRC22
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 302579.84E 6271910.94N
Community:	11
Landform Type:	Hillock
Slope Class:	Gently Inclined (3 degrees)
Aspect:	SW
Soil Type:	Clayey Sand
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Granite, Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus pleurocarpa*
Mid Stratum 1:	*Melaleuca uncinata*
Lower Stratum 1:	*Acacia sulcata* var. *platyphylla*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Grevillea nudiflora*, *Hibbertia gracilipes*, *Melaleuca carrii*
Lower Stratum 2:	*Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Schoenus breviculmis*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia sulcata var. *platyphylla*	0.8	8
Astus tetragonus	0.3	1
Calothamnus quadrifidus subsp. *quadrifidus*	0.8	2
Calytrix leschenaultii	0.3	1
Cryptandra myriantha	0.2	0.1
Cryptandra pungens	0.2	0.1
Dampiera lavandulacea	0.2	0.1
Drosera glanduligera	0.1	0.1
Drosera macrantha		0.1
Drosera trichocaulis	0.1	0.1
Eucalyptus pleurocarpa	3	2

Eutaxia cuneata	0.6	0.1
Gahnia ancistrophylla	0.5	0.5
Gastrolobium parviflorum	1	1
Grevillea nudiflora	0.3	2
Grevillea oligantha	0.5	0.1
Hakea laurina	1.6	0.2
Hibbertia gracilipes	0.5	2
Lasiopetalum rosmarinifolium	0.5	0.1
Laxmannia ramosa subsp. *deflexa*	0.1	0.1
Lepidosperma sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'	0.4	0.1
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	0.3	5
Leptospermum oligandrum	1	0.1
Leucopogon concinnus	0.4	2
Leucopogon cuneifolius	0.2	0.1
Leucopogon sp. Coujinup (M.A. Burgman 1085)	0.2	0.1
Melaleuca carrii	0.4	2
Melaleuca uncinata	1.5	8
Micromyrtus elobata subsp. *elobata*	0.4	0.1
Neurachne alopecuroidea	0.1	1
Olax benthamiana	0.8	0.1
Petrophile fastigiata	0.5	0.1
Pimelea imbricata var. *piligera*	0.1	0.1
Santalum acuminatum	1.2	0.1
Schoenus breviculmis	0.1	6
Stenanthemum intricatum	0.1	0.1
Stylidium piliferum	0.1	0.1
Thysanotus patersonii		0.1
Verticordia acerosa var. *preissii*	0.3	1
Verticordia ?inclusa	0.3	1

PHOTO

Site Name:	MRC23
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	14/09/2018
GPS Location:	GDA94 Zone 51 302891.91E 6273682.01N
Community:	1
Landform Type:	Mid Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterised ironstone, Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia gonophylla	0.5	0.2
Acacia ingrata	0.2	0.2
Acacia latipes subsp. *latipes*	0.6	0.1
Acacia pravifolia	0.2	0.1
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.2	0.2
Astroloma microphyllum	0.1	0.1
Cassytha glabella forma *dispar*		0.1
Chorizema nervosum	0.4	0.1
Comesperma volubile		0.1
Conostephium drummondii	0.2	0.1
Coopernookia polygalacea	0.3	0.2
Dampiera angulata subsp. *angulata*	0.3	0.5
Daviesia articulata	0.2	0.2
Daviesia lancifolia	0.2	1
Dianella brevicaulis	0.4	0.1
Eucalyptus flocktoniae subsp. *flocktoniae*	2	3
Eucalyptus leptocalyx subsp. *leptocalyx*	2	3
Eucalyptus phaenophylla subsp. *interjacens*	2	9

Eucalyptus suggrandis subsp. *suggrandis*	2	5
Eutaxia cuneata	0.4	0.2
Exocarpos sparteus	0.4	0.1
Gahnia ancistrophylla	0.3	2
Gahnia aristata	0.3	1
Goodenia scapigera subsp. *scapigera*	0.2	0.1
Grevillea oligantha	0.3	0.1
Grevillea pectinata	0.5	2
Hakea laurina	0.3	0.1
Hakea marginata	0.6	0.3
Hibbertia psilocarpa	0.1	0.1
Hibbertia pungens	0.2	0.1
Hybanthus floribundus subsp. *adpressus*	0.3	0.3
Isopogon sp. Fitzgerald River (D.B. Foreman 813)	0.3	0.1
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	0.2	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.4	0.1
Lissanthe rubicunda	0.2	0.1
Lomandra micrantha subsp. *teretifolia*	0.3	0.1
Lysinema ciliatum	0.4	0.3
Melaleuca calycina	0.7	3
Melaleuca hamata	0.7	3
Melaleuca rigidifolia	0.5	12
Melaleuca subfalcata	0.4	1
Microcorys glabra	0.3	0.1
Neurachne alopecuroidea	0.1	0.1
Patersonia occidentalis var. *occidentalis*	0.2	0.1
Spyridium sp. Jerdacuttup (A. Williams 332)	0.3	0.1
Styphelia intertexta	0.2	0.3
Tetrapora verrucosa	0.3	1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.1
Thomasia microphylla	0.1	0.1

PHOTO

Site Name:	MRC24
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 302433.3E 6271873.86N
Community:	11
Landform Type:	Mid Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	S
Soil Type:	Clayey Sand
Soil Colour:	Brown
Rock Outcrop:	Granite, <2% bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Granite, Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Mid Stratum 1:	*Acacia sulcata* var. *platyphylla*, *Melaleuca elliptica*, *Melaleuca uncinata*
Lower Stratum 1:	*Baeckea pachyphylla*, *Boronia scabra* subsp. *scabra*, *Styphelia* sp. Cascades (R. Davis 11037)

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia sulcata var. *platyphylla*	1.6	65
Austrostipa elegantissima	0.9	0.1
Baeckea pachyphylla	0.7	15
Boronia scabra subsp. *scabra*	0.3	2
Caladenia attingens subsp. *gracillima*	0.3	0.1
Caladenia cairnsiana	0.3	0.1
Caladenia flava subsp. *flava*	0.1	0.1
Calandrinia calyptrata	0.1	0.1
Crassula closiana	0.1	0.1
Daucus glochidiatus	0.1	0.1
Dianella brevicaulis	0.4	0.1
Drosera glanduligera	0.1	0.1
Drosera macrantha		0.1

**Ehrharta longiflora*	0.1	0.1
Guichenotia micrantha	1	0.5
Hydrocotyle callicarpa	0.1	0.1
**Hypochaeris glabra*	0.1	0.1
Lagenophora huegelii	0.1	0.1
Leptospermum oligandrum	1.4	1
Melaleuca elliptica	1.6	6
Melaleuca uncinata	1.6	10
Microtis sp.	0.3	0.1
Millotia tenuifolia var. *tenuifolia*	0.1	0.1
Neurachne alopecuroidea	0.1	0.5
Pauridia glabella var. *glabella*	0.1	0.1
Phyllanthus calycinus	0.2	0.1
Plantago hispida	0.1	0.1
Poranthera microphylla	0.1	0.1
Pterostylis timothyi	0.1	0.1
Rytidosperma ?setaceum	0.3	0.1
Stenanthemum intricatum	0.2	0.1
Styphelia sp. Cascades (R. Davis 11037)	0.7	2
Thomasia foliosa	0.4	0.1
Thysanotus patersonii		0.1
Trachymene ornata	0.1	0.1
**Ursinia anthemoides* subsp. *anthemoides*	0.1	0.1
Wahlenbergia gracilenta	0.1	0.1
Waitzia ?nitida	0.1	0.1

PHOTO

Site Name:	MRC25
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	15/09/2018
GPS Location:	GDA94 Zone 51 303062.43E 6274915.04N
Community:	1
Landform Type:	Other, Undulating plain (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Light brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterised ironstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ingrata	0.3	0.2
Amphipogon turbinatus	0.1	0.1
Anthotium humile	0.1	0.1
Baeckea latens	1.5	2
Banksia media	2.5	3
Beaufortia schaueri	0.6	0.5
Billardiera venusta		0.1
Boronia inornata subsp. *inornata*	0.4	0.2
Cassytha glabella forma *dispar*		0.1
Coopernookia polygalacea	0.3	0.5
Cyathostemon tenuifolius	0.5	0.3
Dampiera angulata subsp. *angulata*	0.3	0.1
Dampiera lavandulacea	0.3	0.1
Daviesia lancifolia	0.3	0.3
Desmocladus lateriflorus	0.2	0.1
Eucalyptus flocktoniae subsp. *flocktoniae*	3.5	6
Eucalyptus incrassata	3.5	5
Eucalyptus leptocalyx subsp. *leptocalyx*	3.5	6
Eucalyptus phaenophylla subsp. *interjacens*	3.5	2

Eucalyptus suggrandis subsp. *suggrandis*	3.5	5
Eucalyptus tetraptera	1.5	0.2
Eucalyptus uncinata	3.5	3
Gahnia ancistrophylla	0.5	3
Gahnia aristata	0.3	0.3
Grevillea oligantha	0.4	0.3
Grevillea pectinata	1.5	0.5
Hakea lissocarpha	0.5	0.2
Hibbertia gracilipes	0.3	0.2
Hibbertia pungens	0.8	2
Hypolaena humilis	0.3	0.2
Lepidosperma carphoides	0.3	0.1
Lepidosperma fairallianum	0.4	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.5	0.1
Leucopogon aff. *diversifolius*	0.4	0.1
Logania buxifolia	1	0.3
Lomandra micrantha subsp. *teretifolia*	0.3	0.1
Melaleuca calycina	0.8	0.3
Melaleuca hamata	2	1
Melaleuca lateriflora	1.5	4
Melaleuca rigidifolia	0.5	8
Melaleuca subfalcata	1.5	2
Micromyrtus elobata subsp. *elobata*	0.8	0.2
Neurachne alopecuroidea	0.1	0.1
Platysace deflexa	0.5	0.1
Pterostylis recurva	0.2	0.1
Pultenaea indira subsp. *indira*	0.3	0.1
Schoenus obtusifolius	0.2	0.1
Spyridium sp. Jerdacuttup (A. Williams 332)	0.6	0.1
Thysanotus sparteus	0.1	0.1

PHOTO

Site Name:	MRC26
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 302116.25E 6271868.86N
Community:	14
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	W
Soil Type:	Clayey Sand
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Ironstone
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus platypus* subsp. *platypus*
Mid Stratum 1:	*Acacia cyclops*
Mid Stratum 2:	*Acacia glaucoptera*, *Melaleuca cucullata*
Lower Stratum 1:	*Exocarpos aphyllus*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	2	2
Acacia glaucoptera	1.2	2
Acacia harveyi		
Astroloma microphyllum	0.1	0.1
Austrostipa variabilis	0.1	0.1
Billardiera coriacea		0.1
Caladenia attingens subsp. *gracillima*	0.2	0.1
Cassytha melantha		0.1
Comesperma polygaloides	0.3	0.1
Dianella brevicaulis	0.4	0.1
Eucalyptus platypus subsp. *platypus*	2.5	90
Exocarpos aphyllus	0.6	1.5

Exocarpos sparteus	1.4	0.5
Hakea laurina	1.5	0.1
Melaleuca acuminata subsp. *acuminata*	0.4	0.1
Melaleuca cucullata	1.5	1
Melaleuca sapientes	0.5	0.1
Melaleuca torquata	0.8	0.1
Pimelea ?pendens	0.6	0.1
Pterostylis recurva	0.1	0.1
Rhagodia preissii subsp. *preissii*		

PHOTO

Site Name:	MRC27
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	15/09/2018
GPS Location:	GDA94 Zone 51 302068.69E 6275168.39N
Community:	16
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Allocasuarina humilis	0.6	5
Allocasuarina microstachya	0.4	0.1
Amphipogon avenaceus	0.3	0.1
Amphipogon turbinatus	0.1	0.1
Anarthria humilis	0.1	0.1
Andersonia macranthera	0.2	0.1
Astroloma tectum	0.2	0.1
Banksia alliacea	1	2
Banksia armata var. *ignicida*	1.5	10
Banksia violacea	1.2	2
Beaufortia micrantha	0.6	0.3
Boronia ramosa subsp. *anethifolia*	0.3	0.1
Calytrix decandra	0.4	0.1
Cassytha flava		0.1
Caustis dioica	0.4	0.2
Chamelaucium ciliatum	0.5	0.1
Chorizema aciculare subsp. *aciculare*	0.3	0.2
Comesperma ?acerosum	0.2	0.1

Dampiera angulata subsp. Peak Charles (K.R. Newbey 5402)	0.2	0.1
Dampiera lavandulacea	0.1	0.1
Daviesia incrassata subsp. *reversifolia*	0.6	0.5
Daviesia teretifolia	0.2	0.1
Desmocladus lateriflorus	0.1	0.1
Drosera scorpioides	0.1	0.1
Elythranthera brunonis	0.2	0.1
Eucalyptus pleurocarpa	4.5	8
Eucalyptus uncinata	3.5	2
Goodenia incana	0.1	0.1
Goodenia scapigera subsp. *scapigera*	0.5	0.1
Hakea corymbosa	1.5	0.2
Hakea cygna subsp. *cygna*	1.8	2
Hibbertia gracilipes	0.2	0.5
Laxmannia omnifertilis	0.2	0.1
Laxmannia paleacea	0.1	0.1
Lepidobolus chaetocephalus	0.3	0.1
Lepidosperma fairallianum	0.4	0.2
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	0.5	0.5
Leptospermum spinescens	1	1
Leucopogon sp. Newdegate (M. Hislop 3585)	0.5	4
Lysinema ciliatum	0.4	0.1
Melaleuca rigidifolia	0.4	1
Mesomelaena stygia subsp. *stygia*	0.3	2
Microcorys subcanescens	0.2	0.1
Micromyrtus elobata subsp. *elobata*	0.5	0.2
Neurachne alopecuroidea	0.1	0.1
Petrophile seminuda	0.5	1
Petrophile squamata subsp. northern (J. Monks 40)	0.8	0.2
Pterostylis galgula	0.1	0.1
Schoenus obtusifolius	0.2	0.1
Schoenus pleiostemoneus	0.1	0.1
Schoenus subflavus subsp. long leaves (K.L. Wilson 2865)	0.2	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.1
Stachystemon polyandrus	0.3	0.1
Styphelia sp. South Coast (J.M. Powell 3374)	0.5	0.1
Taxandria spathulata	1.5	4
Verticordia chrysantha	0.3	0.1
Verticordia densiflora var. *cespitosa*	0.6	0.2

Verticordia inclusa	0.6	0.1
Xanthorrhoea platyphylla	1.5	2

PHOTO

Site Name:	MRC28
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 302184.57E 6272234.86N
Community:	14
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	S
Soil Type:	Clayey Sand
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Granite, Laterite, Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus extensa*, *Eucalyptus platypus* subsp. *platypus*
Mid Stratum 1:	*Acacia cyclops*
Mid Stratum 2:	*Acacia glaucoptera*, *Melaleuca cucullata*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	2.2	1
Acacia glaucoptera	1.3	85
Billardiera fusiformis		0.1
Cassytha melantha		0.1
Dianella brevicaulis	0.8	0.1
Eucalyptus extensa	2.5	1
Eucalyptus platypus subsp. *platypus*	2.2	65
Exocarpos aphyllus	0.5	0.1
Exocarpos sparteus	1.5	0.1
Lasiopetalum rosmarinifolium	0.6	0.1
Melaleuca acuminata subsp. *acuminata*	1.6	1
Melaleuca cucullata	1.6	5
Melaleuca pauperiflora subsp. *pauperiflora*	1	0.1

Melaleuca torquata	1.2	0.1
Microtis sp.	0.2	0.1
Rytidosperma ?setaceum	0.2	0.1
Thomasia angustifolia	0.5	0.1

PHOTO

Site Name:	MRC29
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	15/09/2018
GPS Location:	GDA94 Zone 51 301504.79E 6275181.03N
Community:	17
Landform Type:	Other, Undulating plain (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Sand
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Adenanthos cuneatus	1.5	3
Allocasuarina humilis	1.5	5
Amphipogon turbinatus	0.1	0.1
Anarthria humilis	0.1	0.1
Andersonia caerulea	0.3	0.2
Banksia baueri	2	2
Banksia obovata	0.6	0.1
Boronia ramosa subsp. *anethifolia*	0.2	0.1
Caladenia discoidea	0.2	0.1
Cassytha flava		0.1
Caustis dioica	0.6	5
Chamelaucium megalopetalum	1	0.2
Chordifex sphacelatus	0.1	0.1
Conothamnus aureus	0.5	3
Darwinia vestita	0.4	0.1
Drosera lowriei	0.1	0.1
Drosera trichocaulis	0.1	0.1
Eucalyptus ecostata	6	1
Eucalyptus pleurocarpa	4.5	1

Eutaxia inuncta	0.5	0.2
Gompholobium confertum	1	0.1
Gompholobium knightianum	0.2	0.1
Goodenia incana	0.1	0.1
Hibbertia acerosa	0.2	0.1
Hibbertia gracilipes	0.4	0.2
Hypolaena fastigiata	0.2	2
Isopogon trilobus	0.6	0.1
Jacksonia viscosa	0.6	0.2
Lambertia inermis var. *inermis*	4	12
Laxmannia paleacea	0.1	0.1
Lechenaultia tubiflora	0.1	0.1
Lepidobolus chaetocephalus	0.3	0.2
Leporella fimbriata	0.1	0.1
Lyginia imberbis	0.4	0.2
Lysinema ciliatum	0.2	0.1
Melaleuca tuberculata var. *tuberculata*	0.4	0.2
Mesomelaena stygia subsp. *stygia*	0.2	0.3
Micromyrtus elobata subsp. *elobata*	0.3	0.1
Neurachne alopecuroidea	0.1	0.1
Nuytsia floribunda	3	1.5
Petrophile teretifolia	0.8	0.5
Phymatocarpus maxwellii		
Pyrorchis nigricans	0.1	0.1
Schoenus curvifolius	0.3	0.1
Schoenus obtusifolius	0.1	0.1
Schoenus pleiostemoneus	0.3	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.1
Stylidium piliferum	0.1	0.1
Stylidium repens	0.1	0.1
Taxandria spathulata	1.5	15
Tetrapora preissiana	0.5	0.1
Thysanotus sparteus	0.3	0.1
Tricostularia neesii	0.4	0.2
Xanthorrhoea platyphylla	1	2
Xanthosia huegelii	0.1	0.1

PHOTO

Site Name:	MRC30
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 302026.62E 6272547.57N
Community:	7
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	S
Soil Type:	Sandy Clay
Soil Colour:	Red-brown (other)
Rock Outcrop:	Laterite, 20-50% bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus densa*
Mid Stratum 1:	*Gastrolobium parviflorum*, *Labichea lanceolata* subsp. *brevifolia*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia assimilis subsp. *atroviridis*	1	0.1
Acacia cyclops	2.6	0.1
Acacia glaucoptera	1	0.1
Billardiera fusiformis		0.1
Caladenia cairnsiana	0.2	0.1
Caladenia flava subsp. *flava*	0.1	0.1
Calandrinia calyptrata	0.1	0.1
Calothamnus quadrifidus subsp. *quadrifidus*	1.8	1
Cyathostemon tenuifolius	0.9	0.1
Eucalyptus densa	4.5	55
Gastrolobium parviflorum	1.7	25
Hakea lissocarpha	1.5	0.1
Hibbertia gracilipes	0.3	0.1
Hydrocotyle rugulosa	0.1	0.1

Labichea lanceolata subsp. *brevifolia*	1.7	65
Leptospermum oligandrum	1	0.1
Leucopogon cuneifolius	1	0.1
Melaleuca acuminata subsp. *acuminata*	1.5	0.1
Microtis sp.	0.3	0.1
Muehlenbeckia adpressa		0.1
Phyllanthus calycinus	0.2	0.1
Pterostylis recurva	0.2	0.1
Pterostylis timothyi	0.1	0.1
Rytidosperma ?setaceum	0.2	0.1
Styphelia intertexta	0.3	0.1
Thysanotus patersonii		0.1
Wahlenbergia gracilenta	0.1	0.1

PHOTO

Site Name:	MRC31
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 304680.9E 6275147.08N
Community:	5
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Dark brown (other)
Rock Outcrop:	Dolerite, 2-10% bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Dolerite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Allocasuarina campestris	3	20
Astroloma microphyllum	0.3	0.1
Astus tetragonus	1	1
Beyeria lechenaultii		
Boronia scabra subsp. *scabra*	0.3	0.4
Caladenia attingens subsp. *gracillima*	0.1	0.1
Calothamnus quadrifidus subsp. *quadrifidus*	2.5	4
Chamaescilla corymbosa var. *corymbosa*	0.1	0.1
Chamelaucium ciliatum	0.8	0.2
Comesperma volubile		0.1
Cryptandra graniticola	0.6	0.5
Cyrtostylis huegelii	0.1	0.1
Dampiera lavandulacea	0.2	0.2
Dianella revoluta	0.5	0.1
Drosera macrantha	0.1	0.1
Eriochilus dilatatus	0.1	0.1
Eucalyptus conglobata subsp. *conglobata*	1.8	0.2
Gahnia aristata	0.4	2
Grevillea anethifolia	1.5	1

Guichenotia micrantha		
Hybanthus floribundus subsp. *adpressus*	1	4
Lepidosperma sanguinolentum	1	5
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	0.5	0.1
Leucopogon cuneifolius	0.8	1
Melaleuca elliptica	2.5	6
Melaleuca hamata	2	4
Neurachne alopecuroidea	0.1	3
Philotheca gardneri subsp. *gardneri*	1	1
Prostanthera baxteri		
Styphelia sp. Cascades (R. Davis 11037)	0.3	0.5
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	10
Thomasia foliosa	0.3	0.2
Thysanotus patersonii		0.1

PHOTO

Site Name:	MRC32
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	17/09/2018
GPS Location:	GDA94 Zone 51 302603.94E 6272893.33N
Community:	1
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	SE
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus phaenophylla* subsp. *interjacens*, *Eucalyptus pleurocarpa*, *Eucalyptus uncinata*
Lower Stratum 1:	*Daviesia lancifolia*, *Grevillea nudiflora*, *Logania buxifolia*, *Lysinema ciliatum*, *Melaleuca rigidifolia*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia chrysocephala	0.2	1
Acacia gonophylla	0.7	1
Acacia ingrata	0.3	0.1
Acrotriche cordata	0.2	0.1
Amphipogon turbinatus	0.1	0.1
Andersonia parvifolia	0.2	0.1
Anthotium humile	0.1	0.1
Banksia alliacea	0.4	1
Banksia armata var. *ignicida*	0.4	0.1
Banksia media	0.5	0.1
Banksia tenuis var. *tenuis*	0.3	0.1
Beaufortia schaueri	0.5	1
Callitris roei	0.1	0.1
Calytrix leschenaultii	0.2	0.1
Cassytha glabella forma *dispar*		0.1

Cryptandra nutans	0.1	0.1
Dampiera angulata subsp. *angulata*	0.3	0.1
Daviesia articulata	0.2	0.1
Daviesia lancifolia	0.3	3
Daviesia teretifolia	0.4	0.1
Dianella brevicaulis	0.4	0.1
Drosera macrantha		0.1
Eucalyptus leptocalyx subsp. *leptocalyx*	1.5	0.5
Eucalyptus phaenophylla subsp. *interjacens*	1.3	2
Eucalyptus pleurocarpa	2.2	2
Eucalyptus uncinata	1.5	3
Exocarpos aphyllus	0.5	0.1
Exocarpos sparteus	1.4	0.5
Gahnia ancistrophylla	0.3	0.2
Gahnia aristata	0.2	0.1
Gompholobium baxteri	0.2	0.1
Gompholobium knightianum	0.3	0.1
Gompholobium marginatum	0.2	0.1
Goodenia concinna	0.2	0.1
Goodenia scapigera subsp. *scapigera*	0.2	0.1
Grevillea nudiflora	0.6	3
Grevillea oligantha	0.4	1
Hakea laurina	0.7	0.1
Hibbertia psilocarpa	0.2	0.1
Hibbertia pungens	0.2	0.1
Hybanthus floribundus subsp. *adpressus*	0.5	0.1
Hypolaena humilis	0.3	0.1
Isopogon sp. Fitzgerald River (D.B. Foreman 813)	0.5	0.2
Lambertia inermis var. *inermis*	0.5	0.1
Laxmannia ramosa subsp. *deflexa*	0.1	0.1
Lechenaultia formosa	0.1	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.4	0.1
Leucopogon aff. *diversifolius*	0.2	0.1
Logania buxifolia	0.5	1.5
Lomandra micrantha subsp. *teretifolia*	0.4	0.1
Lysinema ciliatum	0.6	2
Melaleuca calycina	0.5	0.1
Melaleuca pulchella	0.4	0.1
Melaleuca rigidifolia	0.4	3
Melaleuca subfalcata	0.6	0.1
Microcorys glabra	0.3	0.1
Neurachne alopecuroidea	0.1	0.1

Olax benthamiana	0.6	0.1
Opercularia apiciflora	0.1	0.1
Petrophile squamata subsp. northern (J. Monks 40)	0.3	0.1
Petrophile teretifolia	0.3	0.1
Schoenus obtusifolius	0.1	0.1
Schoenus sesquispiculus	0.1	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.1
Sphaerolobium daviesioides	0.4	0.1
Stenanthemum intricatum	0.2	0.1
Stylidium turleyae	0.1	0.1
Taxandria spathulata	0.1	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.1	0.1
Tricoryne tenella	0.2	0.1

PHOTO

Site Name:	MRC33
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 303485.9E 6274894N
Community:	12
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 2 - Excellent
Disturbance:	Exotic Weeds - Some weeds
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia assimilis subsp. *atroviridis*		
Acacia cyclops	2.5	2
Acacia harveyi		
Acacia saligna subsp. *lindleyi* ms	3.5	3
Apium annuum	0.1	0.2
Carpobrotus sp.	0.1	0.1
Cotula australis	0.1	0.1
**Cotula coronopifolia*	0.2	0.5
Disphyma crassifolium subsp. *clavellatum*	0.1	3
**Ehrharta longiflora*	0.2	0.3
Eucalyptus occidentalis	6	3
Gahnia trifida	1	3
Labichea lanceolata subsp. *brevifolia*	0.8	0.2
Melaleuca cuticularis	5	18
Muehlenbeckia adpressa		
**Parapholis incurva*	0.2	1
Salicornia quinqueflora subsp. *quinqueflora*	0.3	25
Senecio glossanthus	0.1	0.1
**Sonchus oleraceus*	0.2	0.1
Suaeda australis	0.3	8

PHOTO

Site Name:	MRC34
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	17/09/2018
GPS Location:	GDA94 Zone 51 303077.63E 6272771.84N
Community:	1
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	N
Soil Type:	Clay Loam
Soil Colour:	Orange
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus suggrandis* subsp. *suggrandis*
Mid Stratum 1:	*Melaleuca calycina*, *Melaleuca rigidifolia*, *Melaleuca subfalcata*
Lower Stratum 1:	*Daviesia articulata*
Lower Stratum 2:	*Gahnia ancistrophylla*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ingrata	0.2	0.1
Acrotriche cordata	0.3	0.1
Anthotium humile	0.1	0.1
Argentipallium tephrodes	0.1	0.1
Baeckea latens	0.4	0.1
Boronia inornata subsp. *inornata*	0.5	1
Callitris roei	1	0.1
Cassytha glabella forma *dispar*		1
Chorizema nervosum	1	0.1
Comesperma spinosum	0.3	1
Coopernookia polygalacea	0.2	0.1

Cyanicula aperta	0.1	0.1
Cyathostemon tenuifolius	0.4	0.1
Daviesia articulata	0.7	10
Daviesia lancifolia	0.4	1
Eucalyptus flocktoniae subsp. *flocktoniae*	4	4
Eucalyptus leptocalyx subsp. *leptocalyx*	3.5	5
Eucalyptus platypus subsp. *platypus*	3.2	1
Eucalyptus suggrandis subsp. *suggrandis*	1.8	3
Eutaxia cuneata	1	0.1
Exocarpos aphyllus	0.7	1
Gahnia ancistrophylla	0.4	8
Grevillea oligantha	1.2	0.1
Grevillea pectinata	1	0.1
Hakea laurina	2.5	2
Hibbertia gracilipes	0.2	0.1
Hibbertia psilocarpa	0.4	0.5
Hibbertia pungens	0.6	0.1
Hybanthus floribundus subsp. *adpressus*	0.4	0.1
Lepidosperma fairallianum	0.2	0.1
Lissanthe rubicunda	1.3	0.1
Logania buxifolia	0.5	0.1
Lomandra micrantha subsp. *teretifolia*	0.5	0.1
Melaleuca calycina	1	2
Melaleuca cucullata	1.7	0.1
Melaleuca lateriflora	0.7	1
Melaleuca rigidifolia	1	70
Melaleuca subfalcata	1.4	15
Pterostylis recurva	0.2	0.1
Spyridium sp. Jerdacuttup (A. Williams 332)	0.1	0.1
Styphelia intertexta	0.5	0.2
Tetrapora verrucosa	0.6	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.1	0.1

PHOTO

Site Name:	MRC35
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 303658.75E 6274935.82N
Community:	16
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Orange-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia myrtifolia	1.4	0.2
Amphipogon turbinatus	0.1	0.1
Banksia alliacea	0.5	2
Banksia armata var. *ignicida*	1.5	12
Banksia obovata	1.5	8
Banksia violacea	0.4	0.2
Beaufortia micrantha	0.8	0.2
Beaufortia schaueri	1	8
Billardiera coriacea		0.1
Billardiera venusta		0.1
Boronia crassifolia		
Cassytha glabella forma *dispar*		0.1
Chamelaucium ciliatum	0.5	0.1
Chorizema aciculare subsp. *aciculare*	0.2	0.1
Dampiera angulata subsp. Peak Charles (K.R. Newbey 5402)	0.2	0.1
Daviesia lancifolia	0.5	1

Daviesia teretifolia	0.5	0.2
Drosera scorpioides	0.1	0.1
Eucalyptus ecostata	4	2
Eucalyptus pleurocarpa	6	4
Gastrolobium spinosum	1.6	0.5
Goodenia scapigera subsp. *scapigera*	0.1	0.1
Hakea pandanicarpa subsp. *pandanicarpa*	2	1.5
Hakea trifurcata	1	0.3
Hibbertia gracilipes	0.2	0.3
Isopogon polycephalus	0.5	0.1
Isopogon sp. Fitzgerald River (D.B. Foreman 813)	0.6	0.1
Jacksonia viscosa	1	0.3
Lambertia inermis var. *inermis*	4	1
Lepidosperma carphoides	0.3	0.1
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	0.5	1
Leptospermum spinescens	0.8	0.3
Leucopogon sp. Cascades (M. Hislop 3693)	0.6	0.2
Leucopogon sp. Newdegate (M. Hislop 3585)	0.6	5
Lomandra micrantha subsp. *teretifolia*	0.3	0.1
Lysinema ciliatum	0.8	0.2
Melaleuca tuberculata var. *tuberculata*	0.3	1
Mesomelaena stygia subsp. *stygia*	0.3	1
Microcorys subcanescens	0.2	0.1
Neurachne alopecuroidea	0.1	0.1
Persoonia helix	0.4	0.1
Petrophile seminuda	0.5	0.2
Schoenus subflavus subsp. *subflavus*	0.1	0.1
Spyridium sp. Jerdacuttup (A. Williams 332)	0.6	0.2
Stachystemon polyandrus	0.3	0.1
Stylidium piliferum	0.1	0.1
Styphelia sp. South Coast (J.M. Powell 3374)	1	0.2
Synaphea aff. *drummondii*	0.3	0.1
Verticordia chrysantha	0.5	0.2

PHOTO

Site Name:	MRC36
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	17/09/2018
GPS Location:	GDA94 Zone 51 303831.84E 6272840.45N
Community:	13
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	S
Soil Type:	Sand
Soil Colour:	Yellow-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 2 - Excellent
Disturbance:	Exotic Weeds - Minor weeds
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus occidentalis*
Mid Stratum 1:	*Acacia cyclops*, *Acacia sulcata* var. *platyphylla*, *Grevillea anethifolia*, *Labichea lanceolata* subsp. *brevifolia*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	4	4
Acacia harveyi	4	1
Acacia sulcata var. *platyphylla*	3	8
Billardiera fusiformis		0.1
Boronia scabra subsp. *scabra*	0.5	0.1
Caladenia brevisura	0.3	0.1
Caladenia flava subsp. *flava*	0.1	0.1
Chamelaucium ciliatum	1	0.1
Cotula australis	0.1	0.1
Dianella brevicaulis	0.2	0.1
Dodonaea ptarmicaefolia	1.5	0.2
**Ehrharta longiflora*	0.1	0.1

Eucalyptus leptocalyx subsp. *leptocalyx*	4	1
Eucalyptus occidentalis	6	27
Grevillea anethifolia	2.5	5
Hakea laurina	2	0.5
Hibbertia psilocarpa	0.4	0.1
Hydrocotyle rugulosa	0.1	0.1
**Hypochaeris glabra*	0.1	0.1
Labichea lanceolata subsp. *brevifolia*	3	75
**Lysimachia arvensis*	0.1	0.1
Macrozamia dyeri	1.5	1
Melaleuca acuminata subsp. *acuminata*	1.5	0.2
Oxalis exilis	0.1	0.1
**Pentameris airoides* subsp. *airoides*	0.1	0.1
Pimelea cracens	1	0.1
Pterostylis recurva	0.2	0.1
Pterostylis sp.	0.1	0.1
Rytidosperma ?setaceum	0.3	0.1
Senecio glossanthus	0.1	0.1
**Sonchus oleraceus*	0.1	0.1
Thysanotus patersonii		0.1
Trachymene ornata	0.1	0.1
**Ursinia anthemoides* subsp. *anthemoides*	0.1	0.1

PHOTO

Site Name:	MRC37
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 303923.37E 6275127.18N
Community:	17
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Sand
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Adenanthos cuneatus	2	10
Allocasuarina humilis	1	3
Allocasuarina thuyoides	1.5	0.2
Amphipogon turbinatus	0.1	0.1
Andersonia caerulea	0.6	0.2
Aotus sp. Esperance (P.G. Wilson 7904)	0.5	0.2
Banksia baueri	1.5	15
Banksia baxteri		
Banksia speciosa		
Boronia ramosa subsp. *anethifolia*	0.3	0.1
Calothamnus gracilis	0.6	0.3
Calytrix decandra	0.3	0.1
Caustis dioica	0.6	1
Chamelaucium megalopetalum	1.5	0.2
Chordifex sphacelatus	0.3	1
Comesperma calymega	0.1	0.1
Conostylis vaginata	0.1	0.1
Conothamnus aureus	0.5	3
Cyathochaeta equitans	1	0.5
Daviesia incrassata subsp. *reversifolia*	0.8	0.3
Desmocladus lateriflorus	0.1	0.1

Drosera lowriei	0.1	0.1
Gompholobium confertum	0.4	0.1
Gompholobium knightianum	0.1	0.1
Goodenia incana	0.1	0.1
Hakea corymbosa	2	0.5
Hakea trifurcata	1.5	0.5
Hibbertia acerosa	0.2	0.1
Hibbertia gracilipes	0.3	0.5
Hypolaena fastigiata	0.3	3
Isopogon trilobus	1.5	0.5
Jacksonia condensata	0.2	0.1
Jacksonia viscosa	0.8	1
Lambertia inermis var. *inermis*	3	12
Laxmannia ramosa subsp. *deflexa*	0.2	0.1
Lechenaultia tubiflora	0.1	0.1
Lepidobolus chaetocephalus	0.4	0.2
Leptospermum spinescens	1.8	0.2
Leucopogon sp. Coujinup (M.A. Burgman 1085)	0.2	0.1
Logania micrantha	0.2	0.2
Lomandra micrantha subsp. *teretifolia*	0.5	0.1
Lyginia imberbis	0.5	1
Lysinema ciliatum	1	0.2
Melaleuca striata	2	1.5
Mesomelaena tetragona	0.4	0.1
Micromyrtus elobata subsp. *elobata*	0.5	0.1
Patersonia lanata forma *lanata*	0.4	0.1
Petrophile teretifolia	0.6	0.2
Pyrorchis nigricans	0.1	0.1
Schoenus caespititius	0.8	0.2
Schoenus curvifolius	0.4	0.1
Schoenus pleiostemoneus	0.2	0.1
Stylidium piliferum	0.1	0.1
Stylidium repens	0.1	0.1
Styphelia sp. South Coast (J.M. Powell 3374)	1.3	0.2
Taxandria spathulata	2	8
Tricostularia exsul	1	0.5
Verticordia densiflora var. *cespitosa*	0.3	0.1
Xanthosia huegelii	0.1	0.1

PHOTO

Site Name:	MRC38
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	18/09/2018
GPS Location:	GDA94 Zone 51 304700.87E 6272551.55N
Community:	11
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	Granite, <2% bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Mid Stratum 1:	*Acacia sulcata* var. *platyphylla*, *Astus tetragonus*, *Melaleuca elliptica*, *Melaleuca uncinata*
Lower Stratum 1:	*Philotheca gardneri* subsp. *gardneri*, *Styphelia* sp. Cascades (R. Davis 11037)
Lower Stratum 2:	*Lepidosperma sanguinolentum*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia sulcata var. *platyphylla*	1.6	30
Astus tetragonus	1.5	30
Austrostipa elegantissima	0.4	0.1
Blennospora drummondii	0.1	0.1
Boronia scabra subsp. *scabra*	0.3	0.1
Brachyscome perpusilla	0.1	0.1
Caladenia cairnsiana	0.1	0.1
Chamaescilla corymbosa var. *corymbosa*	0.1	0.1
Chamelaucium ciliatum		
Crassula closiana	0.1	0.1
Dicot sp.	0.1	0.1
Diuris decrementa	0.1	0.1
Drosera glanduligera	0.1	0.1
Drosera macrantha		0.1

Eremophila lehmanniana	1	
Gonocarpus nodulosus	0.1	0.1
Hydrocotyle callicarpa	0.1	0.1
**Hypochaeris glabra*	0.1	0.1
Lepidosperma sanguinolentum	0.6	5
Leptospermum oligandrum	1.8	1
Melaleuca elliptica	1.8	25
Melaleuca uncinata	1.5	2
Microtis sp.	0.1	0.1
Millotia tenuifolia var. *tenuifolia*	0.1	0.1
Neurachne alopecuroidea	0.2	0.1
**Parentucellia latifolia*		
Philotheca gardneri subsp. *gardneri*	0.8	2
Phyllangium divergens		
Phyllanthus calycinus	0.5	0.1
Poranthera microphylla	0.1	0.1
Pterostylis sp.	0.1	0.1
Rytidosperma ?setaceum	0.2	0.2
Stackhousia monogyna		
Styphelia sp. Cascades (R. Davis 11037)	0.5	2
Thelymitra antennifera		
Thysanotus patersonii	0.2	0.1
Trachymene ornata	0.1	0.1
**Ursinia anthemoides* subsp. *anthemoides*	0.1	0.1

PHOTO

Site Name:	MRC39
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	16/09/2018
GPS Location:	GDA94 Zone 51 304839.14E 6275113.48N
Community:	14
Landform Type:	Upper Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia glaucoptera	0.7	0.1
Alyogyne sp. Southern Coast (A.S. George 289)	1	0.1
Eucalyptus platypus subsp. *platypus*	8	65
Exocarpos aphyllus	1.3	1
Melaleuca torquata	1.8	1
Pterostylis timothyi	0.1	0.1
Rytidosperma sp.	0.2	0.1
Senecio glossanthus	0.1	0.1
Wilsonia humilis	0.1	0.1

PHOTO

Site Name:	MRC40
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	18/09/2018
GPS Location:	GDA94 Zone 51 304401.36E 6272572.41N
Community:	4
Landform Type:	Ridge
Slope Class:	Steep (23 degrees)
Aspect:	SSE
Soil Type:	Sand
Soil Colour:	Brown
Rock Outcrop:	Sandstone (other), >50% bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus densa*
Upper Stratum 2:	*Acacia harveyi*, *Hakea laurina*
Mid Stratum 1:	*Gastrolobium parviflorum*, *Melaleuca thapsina*
Lower Stratum 1:	*Dampiera* sp. Ravensthorpe (G.F. Craig 8277)

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia harveyi	2	2
Acacia spongolitica	1.4	0.1
Billardiera coriacea		0.1
Boronia inconspicua	0.2	0.1
Boronia oxyantha var. *brevicalyx*	0.2	0.1
Caladenia longicauda subsp. *eminens*	0.4	0.1
Chamelaucium ciliatum	0.8	0.1
Dampiera angulata subsp. *angulata*	0.5	0.1
Dampiera sp. Ravensthorpe (G.F. Craig 8277) (P3)	0.5	80
Dodonaea ptarmicaefolia	1.2	0.1
Eriochilus dilatatus	0.1	0.1

Eucalyptus densa	3	5
Gastrolobium parviflorum	1.4	75
Goodenia scapigera subsp. *scapigera*	0.3	0.1
Hakea ilicifolia	1.3	0.1
Hakea laurina	2	1.5
Hibbertia pungens	0.3	0.1
Hibbertia rupicola	0.4	0.1
Macrozamia dyeri	1	0.1
Melaleuca acuminata subsp. *acuminata*	1.2	0.1
Melaleuca thapsina	1.3	5
Opercularia apiciflora	0.1	0.1
Pterostylis perculta	0.1	0.1
Senecio glossanthus	0.1	0.1
Stylidium albomontis	0.3	0.1
Tetrapora verrucosa	0.5	0.1
Wahlenbergia gracilenta	0.1	0.1

PHOTO

Site Name:	MRC41
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	17/09/2018
GPS Location:	GDA94 Zone 51 305012.51E 6274614.63N
Community:	16
Landform Type:	Other, Undulating plain (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Sandy Loam
Soil Colour:	Yellow-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Allocasuarina humilis	0.3	0.2
Allocasuarina microstachya	0.2	0.2
Allocasuarina thuyoides	0.3	0.1
Amphipogon avenaceus	0.2	0.1
Amphipogon turbinatus	0.1	0.1
Anarthria humilis	0.2	0.1
Andersonia caerulea	0.2	0.1
Argentipallium niveum	0.3	0.1
Banksia alliacea	0.8	2
Banksia armata var. *ignicida*	1.3	6
Banksia obovata	0.8	0.5
Banksia violacea	1.6	8
Beaufortia micrantha	0.6	4
Billardiera venusta		0.1
Calectasia valida	0.4	0.1
Callitris roei	3.5	1
Calothamnus gracilis	0.8	1
Cassytha flava		0.1
Caustis dioica	0.5	0.5

Chamaescilla spiralis	0.1	0.1
Chamelaucium ciliatum	0.3	0.1
Chordifex sphacelatus	0.2	1
Chorizema aciculare subsp. *aciculare*	0.3	0.1
Conostylis argentea	0.1	0.1
Conothamnus aureus	0.5	1
Dampiera angulata subsp. Peak Charles (K.R. Newbey 5402)	0.3	0.1
Dampiera lavandulacea	0.2	0.1
Darwinia sp. Ravensthorpe (G.J. Keighery 8030)	0.4	0.1
Eucalyptus pleurocarpa	4.5	12
Eucalyptus uncinata	3	4
Goodenia incana	0.2	0.1
Goodenia scapigera subsp. *scapigera*	0.3	0.1
Haemodorum sp.	0.4	0.1
Hakea cygna subsp. *cygna*	1.8	3
Hakea ferruginea		
Hakea ilicifolia	0.6	0.2
Hibbertia gracilipes	0.2	0.2
Lepidobolus chaetocephalus	0.3	0.3
Lepidosperma carphoides	0.3	0.5
Lepidosperma fairallianum	0.3	0.2
Lepidosperma sp. 'Dunns Swamp (R. Davis 724)'	0.4	1
Leptospermum spinescens	1	0.2
Leucopogon sp. Coujinup (M.A. Burgman 1085)	0.2	0.1
Lomandra micrantha subsp. *teretifolia*	0.3	0.1
Lysinema ciliatum	0.4	0.1
Melaleuca carrii	0.4	0.1
Melaleuca rigidifolia	0.5	2
Melaleuca tuberculata var. *tuberculata*	0.5	2
Mesomelaena stygia subsp. *stygia*	0.3	1
Micromyrtus elobata subsp. *elobata*	0.5	0.1
Neurachne alopecuroidea	0.1	0.1
Opercularia vaginata	0.2	0.1
Petrophile fastigiata	1.5	0.5
Petrophile seminuda	0.4	0.2
Petrophile squamata subsp. northern (J. Monks 40)	0.8	2
Pimelea angustifolia	0.3	0.1
Pultenaea indira subsp. *indira*	0.3	0.2
Pyrorchis nigricans	0.1	0.1

Schoenus subflavus subsp. *subflavus*	0.1	0.1
Stachystemon polyandrus	0.3	0.1
Stylidium piliferum	0.1	0.1
Styphelia sp. South Coast (J.M. Powell 3374)	0.8	0.2
Tetrapora preissiana	0.5	0.1
Verticordia chrysantha	0.4	0.1

PHOTO

Site Name:	MRC42
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	18/09/2018
GPS Location:	GDA94 Zone 51 304858.13122529E 6272687.01398561N
Community:	1
Landform Type:	Upper Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	NW
Soil Type:	Clayey Sand
Soil Colour:	Yellow
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus densa*, *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus phaenophylla* subsp. *interjacens*, *Eucalyptus pleurocarpa*, *Eucalyptus uncinata*
Mid Stratum 1:	*Hibbertia pungens*, *Melaleuca rigidifolia*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ingrata	0.3	0.2
Acrotriche cordata	0.3	0.2
Andersonia parvifolia	0.2	0.1
Anthotium humile	0.1	0.1
Baeckea pachyphylla	0.8	0.1
Banksia alliacea	0.5	0.1
Beaufortia schaueri	0.6	0.1
Boronia inconspicua	0.2	0.1
Boronia inornata subsp. *leptophylla*	0.3	0.1
Callitris roei	2.5	0.5
Cassytha glabella forma *dispar*		0.1
Cassytha melantha		0.1

Chorizema aciculare subsp. *aciculare*	0.2	0.1
Chorizema nervosum	0.7	0.1
Conostylis argentea		
Coopernookia polygalacea	0.3	0.1
Cyathostemon tenuifolius	0.5	0.1
Dampiera angulata subsp. *angulata*	0.3	0.1
Daviesia lancifolia	0.3	0.1
Dianella brevicaulis	0.4	0.1
Drosera macrantha		0.1
Eucalyptus densa	5	3
Eucalyptus flocktoniae subsp. *flocktoniae*	4	2
Eucalyptus incrassata	2.5	0.2
Eucalyptus leptocalyx subsp. *leptocalyx*	3.5	2
Eucalyptus phaenophylla subsp. *interjacens*	1.4	4
Eucalyptus pileata	3	1
Eucalyptus pleurocarpa	2	1
Eucalyptus uncinata	3.5	10
Eutaxia cuneata	0.5	0.1
Exocarpos aphyllus	1.5	1
Gahnia ancistrophylla	0.4	0.2
Gahnia aristata	0.3	0.1
Grevillea nudiflora	0.2	0.1
Grevillea oligantha	0.5	0.1
Hibbertia gracilipes	0.3	0.1
Hibbertia pungens	1	10
Isopogon sp. Fitzgerald River (D.B. Foreman 813)	0.5	0.1
Lasiopetalum rosmarinifolium	0.3	0.1
Lepidosperma carphoides	0.4	0.1
Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)	0.5	0.1
Lepidosperma sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738)	0.3	1
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	0.3	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.4	0.1
Leucopogon opponens	0.5	0.1
Leucopogon sp. Newdegate (M. Hislop 3585)	0.5	0.1
Logania buxifolia	0.6	0.1
Lomandra micrantha subsp. *teretifolia*	0.4	0.1
Lomandra mucronata	0.1	0.1
Lysinema ciliatum	0.5	0.1

Melaleuca glaberrima	1.3	0.2
Melaleuca hamata	1.2	0.1
Melaleuca lateriflora	1	1
Melaleuca rigidifolia	1.3	75
Microcorys glabra	0.4	0.1
Micromyrtus elobata subsp. *elobata*	0.4	0.1
Neurachne alopecuroidea	0.1	0.1
Pterostylis recurva	0.1	0.1
Pterostylis timothyi	0.1	0.1
Pultenaea indira subsp. *indira*	0.3	0.1
Schoenus obtusifolius	0.1	0.1
Schoenus sesquispiculus	0.1	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.1
Thomasia microphylla	0.2	0.1

PHOTO

Site Name:	MRC43
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	17/09/2018
GPS Location:	GDA94 Zone 51 304045.94E 6274537.56N
Community:	1
Landform Type:	Mid Slope
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	W
Soil Type:	Clay Loam
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia brachyclada	0.1	0.1
Acacia ingrata	0.2	0.1
Acrotriche cordata	0.3	0.1
Anthotium humile	0.1	0.1
Astroloma microphyllum	0.2	0.1
Banksia media	2	7
Boronia inconspicua	0.1	0.1
Cassytha glabella forma *dispar*		0.1
Cassytha racemosa forma *pilosa*		0.1
Cheiranthera brevifolia		0.1
Comesperma spinosum	0.6	0.1
Comesperma volubile		0.1
Coopernookia polygalacea	0.2	0.1
Cyanicula aperta	0.1	0.1
Cyathostemon tenuifolius	0.7	0.1
Dampiera angulata subsp. *angulata*	0.1	0.1
Dampiera lavandulacea	0.1	0.1

Daviesia articulata	0.6	3
Daviesia lancifolia	0.3	0.1
Dodonaea caespitosa	0.3	0.1
Drosera macrantha		0.1
Eucalyptus flocktoniae subsp. *flocktoniae*	2.5	8
Eucalyptus leptocalyx subsp. *leptocalyx*	2.5	5
Eucalyptus phaenophylla subsp. *interjacens*	2.5	3
Eucalyptus uncinata	2.5	0.5
Eutaxia cuneata	1	0.1
Gahnia ancistrophylla	0.4	0.2
Gahnia aristata	0.4	0.5
Gompholobium baxteri	0.1	0.1
Grevillea oligantha	0.8	1
Grevillea pectinata	0.8	0.2
Hakea ilicifolia	1	1
Hakea laurina	2.5	1
Hibbertia gracilipes	0.2	0.1
Hibbertia pungens	0.5	2
Hybanthus floribundus subsp. *adpressus*	0.8	0.1
Isopogon sp. Fitzgerald River (D.B. Foreman 813)	0.6	0.2
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596) (P1)	0.2	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.2	0.1
Leucopogon sp. Newdegate (M. Hislop 3585)	0.5	0.1
Lissanthe rubicunda	0.5	0.2
Logania buxifolia	0.8	0.2
Lomandra micrantha subsp. *teretifolia*	0.2	0.1
Lysinema ciliatum	0.5	0.1
Melaleuca hamata	1.2	1.5
Melaleuca lateriflora	0.6	0.5
Melaleuca rigidifolia	1	45
Melaleuca subfalcata	1.2	0.5
Neurachne alopecuroidea	0.1	0.1
Platysace deflexa	0.3	0.1
Pultenaea indira subsp. *indira*	0.3	0.2
Spyridium sp. Jerdacuttup (A. Williams 332)	0.3	0.1
Stylidium albomontis		
Tetrapora verrucosa	0.5	0.3
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.1	0.1

PHOTO

Site Name:	MRC44
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	19/09/2018
GPS Location:	GDA94 Zone 51 304795.61E 6272186.14N
Community:	16
Landform Type:	Mid Slope
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	WSW
Soil Type:	Sandy Clay
Soil Colour:	Orange
Rock Outcrop:	Laterite, <2% bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus pleurocarpa*
Mid Stratum 1:	*Acacia gonophylla*, *Gastrolobium spinosum*, *Melaleuca carrii*, *Xanthorrhoea platyphylla*
Lower Stratum 1:	*Calothamnus villosus*, *Grevillea concinna* subsp. *lemanniana*, *Leucopogon* sp. Newdegate (M. Hislop 3585)
Lower Stratum 2:	*Schoenus subflavus* subsp. *subflavus*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia chrysocephala	0.2	0.1
Acacia gonophylla	1	1.5
Banksia alliacea	0.5	0.1
Banksia armata var. *ignicida*	1	1
Banksia media	0.5	0.1
Beaufortia schaueri	0.4	0.1
Boronia subsessilis	0.2	0.1
Calothamnus villosus	0.5	1.5
Calytrix leschenaultii	0.2	0.1
Cassytha racemosa forma *pilosa*		0.1

Cyanicula aperta	0.1	0.1
Dampiera angulata subsp. *angulata*	0.4	0.1
Daviesia teretifolia	0.4	0.1
Drosera scorpioides	0.1	0.1
Eucalyptus pleurocarpa	3	8
Eutaxia cuneata	0.5	0.1
Gahnia ancistrophylla	0.3	0.1
Gastrolobium spinosum	1	10
Glischrocaryon roei	0.3	0.1
Gompholobium knightianum	0.1	0.1
Goodenia scapigera subsp. *scapigera*	0.1	0.1
Grevillea concinna subsp. *lemanniana*	0.6	3
Grevillea nudiflora	0.4	1
Grevillea oligantha	0.4	0.1
Hibbertia gracilipes	0.1	0.1
Hibbertia pungens	0.4	0.1
Isopogon sp. Fitzgerald River (D.B. Foreman 813)	0.4	0.1
Jacksonia alata	0.2	0.1
Lasiopetalum rosmarinifolium	0.3	0.1
Laxmannia omnifertilis	0.1	0.1
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	0.2	0.2
Lepidosperma sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'	0.4	0.1
Leptospermum sp. Bandalup Hill (G. Cockerton 11001)	0.5	0.1
Leucopogon concinnus	0.2	0.1
Leucopogon cuneifolius	0.4	0.1
Leucopogon opponens	0.4	0.5
Leucopogon sp. Newdegate (M. Hislop 3585)	0.2	2
Lomandra mucronata	0.2	0.1
Lysinema ciliatum	0.6	1
Melaleuca carrii	1.4	1.5
Melaleuca rigidifolia	0.4	0.2
Neurachne alopecuroidea	0.1	0.1
Petrophile fastigiata	0.3	0.1
Pterostylis recurva	0.2	0.1
Schoenus obtusifolius	0.1	0.1
Schoenus subbarbatus	0.1	0.1
Schoenus subflavus subsp. *subflavus*	0.1	2
Stachystemon vinosus (P4)	0.1	0.5
Stackhousia scoparia	0.2	0.1

Stylidium albomontis	0.2	0.1
Styphelia sp. South Coast (J.M. Powell 3374)	0.3	1
Synaphea divaricata	0.2	0.1
Synaphea aff. *drummondii*	0.3	0.1
Taxandria spathulata	0.3	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.1	0.1
Xanthorrhoea platyphylla	1	5

PHOTO

Site Name:	MRC45
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	17/09/2018
GPS Location:	GDA94 Zone 51 304235.13E 6274138.14N
Community:	2
Landform Type:	Lower Slope
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Red-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia glaucoptera	0.8	0.3
Acacia ingrata	0.3	0.2
Anthotium humile	0.1	0.1
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.4	2
Austrostipa elegantissima	0.8	0.1
Baeckea latens	0.8	0.1
Cassytha glabella forma *dispar*		0.1
Chorizema nervosum	0.8	0.5
Coopernookia polygalacea	0.2	0.1
Cyanicula aperta	0.1	0.1
Dampiera angulata subsp. *angulata*	0.3	0.1
Daviesia aphylla	2	10
Dodonaea caespitosa	0.3	0.1
Eucalyptus flocktoniae subsp. *flocktoniae*	3	6
Eucalyptus leptocalyx subsp. *leptocalyx*	3	2
Eucalyptus phaenophylla subsp. *interjacens*	3	1
Eucalyptus pileata	3	8
Eucalyptus suggrandis subsp. *suggrandis*	3	4

Eutaxia cuneata	1	0.2
Exocarpos aphyllus	0.3	0.3
Gahnia ancistrophylla	0.4	2
Gastrolobium parviflorum	1.5	1
Grevillea pectinata	0.8	1
Hibbertia psilocarpa	0.3	0.2
Hibbertia pungens	0.5	0.2
Lasiopetalum rosmarinifolium	0.8	0.2
Logania buxifolia	0.8	0.2
Lomandra micrantha subsp. *teretifolia*	0.3	0.2
Melaleuca glaberrima	0.8	0.2
Melaleuca hamata	1.8	0.5
Melaleuca rigidifolia	1.5	0.2
Melaleuca undulata	1.8	20
Neurachne alopecuroidea	0.1	0.1
Olearia exiguifolia	0.8	0.2
Pterostylis sp.	0.1	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.3
Thelymitra sp.	0.2	0.1
Thomasia microphylla	0.3	0.2
Thysanotus patersonii		0.1

PHOTO

Site Name:	MRC46
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	19/09/2018
GPS Location:	GDA94 Zone 51 304764.52E 6271736.28N
Community:	2
Landform Type:	Upper Slope
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	NW
Soil Type:	Clayey Sand
Soil Colour:	Orange
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus phaenophylla* subsp. *interjacens*, *Eucalyptus pileata*
Mid Stratum 1:	*Grevillea pectinata*, *Melaleuca calycina*
Lower Stratum 1:	*Acacia ingrata*, *Chorizema nervosum*, *Thomasia microphylla*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia curvata	0.8	1
Acacia ingrata	0.2	2
Anthotium humile	0.1	0.1
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.2	0.1
Astroloma microphyllum	0.2	0.2
Banksia media	0.2	0.1
Boronia inconspicua	0.1	0.1
Cassytha glabella forma *dispar*		0.1
Chorizema nervosum	0.5	2
Coopernookia polygalacea	0.2	0.1

Cyperaceae sp.	0.1	0.1
Dampiera angulata subsp. *angulata*	0.4	1
Daviesia aphylla	0.4	0.2
Eucalyptus flocktoniae subsp. *flocktoniae*	3	5
Eucalyptus leptocalyx subsp. *leptocalyx*	1.8	3
Eucalyptus phaenophylla subsp. *interjacens*	2	30
Eucalyptus pileata	2.2	2
Eutaxia cuneata	0.4	0.1
Exocarpos aphyllus	0.5	0.1
Exocarpos sparteus	1.7	0.1
Gahnia ancistrophylla	0.5	1
Gastrolobium parviflorum	1	0.2
Gastrolobium spinosum	0.5	0.1
Goodenia concinna	0.1	0.1
Goodenia scapigera subsp. *scapigera*	0.2	0.1
Grevillea oligantha	0.4	1
Grevillea pectinata	0.8	2
Hakea laurina	0.5	0.1
Hibbertia gracilipes	0.3	0.1
Hibbertia pungens	0.3	0.1
Lasiopetalum rosmarinifolium	0.4	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.4	0.1
Leucopogon opponens	0.4	0.1
Logania buxifolia	0.3	0.1
Lomandra micrantha subsp. *teretifolia*	0.5	0.1
Lysinema ciliatum	0.5	0.1
Melaleuca calycina	0.9	2
Melaleuca rigidifolia	0.4	0.2
Melaleuca subfalcata	0.5	0.1
Microcorys glabra	0.5	0.2
Nematolepis phebalioides	0.3	0.1
Neurachne alopecuroidea	0.1	0.1
Olax benthamiana	0.9	0.5
Opercularia apiciflora	0.1	0.1
Petrophile fastigiata	0.2	0.1
Philotheca gardneri subsp. *gardneri*	0.2	0.1
Pterostylis recurva	0.1	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.2
Stylidium turleyae	0.1	0.1
Styphelia intertexta	0.3	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.1
Thomasia microphylla	0.3	2

PHOTO

Site Name:	MRC47
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	18/09/2018
GPS Location:	GDA94 Zone 51 304753.41E 6273532.73N
Community:	5
Landform Type:	Mid Slope
Slope Class:	Moderately Inclined (10 degrees)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	Dolerite, 2-10% bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Dolerite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia sulcata var. *platyphylla*	1.8	0.5
Astus tetragonus	2	10
Austrostipa elegantissima	0.4	0.1
Boronia oxyantha var. *brevicalyx*	0.3	0.1
Caladenia sp.	0.1	0.1
Callitris roei	1	0.2
Calothamnus quadrifidus subsp. *quadrifidus*	2	3
Cassytha racemosa forma *pilosa*		0.1
Comesperma volubile		0.1
Cyanicula aperta	0.1	0.1
Cyrtostylis huegelii	0.1	0.1
Diuris sp.	0.1	0.1
Dodonaea caespitosa	0.1	0.1
Eriochilus dilatatus	0.1	0.1
Eucalyptus phaenophylla subsp. *interjacens*	4	0.5
Gastrolobium parviflorum	2	2
Guichenotia micrantha	1	0.2
Hydrocotyle rugulosa	0.1	0.1
**Hypochaeris glabra*	0.1	0.1

Lepidosperma sanguinolentum	0.6	4
Lepidosperma sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'	0.6	2
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	0.6	2
Leucopogon cuneifolius	1.2	1
Melaleuca glaberrima	1.5	1
Melaleuca hamata	4	50
Neurachne alopecuroidea	0.2	0.2
Opercularia apiciflora	0.1	0.1
Petrophile fastigiata	2.5	1
Philotheca gardneri subsp. *gardneri*	0.4	0.2
Phyllanthus calycinus	0.5	0.3
Prostanthera baxteri	1	0.5
Pterostylis sp.	0.1	0.1
Pterostylis timothyi	0.1	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	2
Thomasia angustifolia		
Thomasia foliosa	0.3	0.1

PHOTO

Site Name:	MRC48
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	20/09/2018
GPS Location:	GDA94 Zone 51 301528.39E 6272527.94N
Community:	2
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	SW
Soil Type:	Clayey Sand
Soil Colour:	Yellow
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Ironstone
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus perangusta*, *Eucalyptus phaenophylla* subsp. *interjacens*
Mid Stratum 1:	*Acacia gonophylla*, *Grevillea pectinata*, *Melaleuca lateriflora*
Lower Stratum 1:	*Aotus* sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)
Lower Stratum 2:	*Gahnia ancistrophylla*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	1.4	0.1
Acacia gonophylla	1	4
Acacia ingrata	0.2	0.2
Acacia sulcata var. *platyphylla*	0.6	0.1
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.3	4
Baeckea pachyphylla	0.4	0.1
Billardiera coriacea		0.1
Cassytha melantha		0.1
Chorizema nervosum	0.6	0.5
Coopernookia polygalacea	0.3	0.1

Cyathostemon tenuifolius	0.4	0.1
Dampiera lavandulacea	0.3	0.1
Dianella brevicaulis	0.3	0.1
Dodonaea caespitosa	0.2	0.1
Eucalyptus leptocalyx subsp. *leptocalyx*	2	15
Eucalyptus perangusta	1.5	1
Eucalyptus phaenophylla subsp. *interjacens*	1.4	1
Eucalyptus suggrandis subsp. *suggrandis*	1.6	1
Exocarpos aphyllus	0.4	0.1
Exocarpos sparteus	1.5	0.2
Gahnia ancistrophylla	0.4	1
Goodenia concinna	0.1	0.1
Grevillea nudiflora	0.3	0.1
Grevillea pectinata	0.9	5
Hakea laurina	0.9	0.1
Hakea lissocarpha	0.3	0.1
Hibbertia pungens	0.3	0.1
Lasiopetalum rosmarinifolium	0.2	0.1
Lepidosperma fairallianum	0.4	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.5	0.1
Lissanthe rubicunda	0.2	0.1
Lomandra micrantha subsp. *teretifolia*	0.4	0.1
Lomandra mucronata	0.1	0.1
Macrozamia dyeri	0.4	0.1
Melaleuca hamata	1	0.5
Melaleuca lateriflora	1	2
Melaleuca pauperiflora subsp. *pauperiflora*	0.3	0.1
Melaleuca rigidifolia	0.4	0.1
Melaleuca sapientes	1.3	0.1
Melaleuca subfalcata	0.3	0.1
Neurachne alopecuroidea	0.1	0.1
Opercularia apiciflora	0.1	0.1
Patersonia occidentalis var. *occidentalis*	0.1	0.1
Pimelea brachyphylla	0.3	0.1
Pimelea ?pendens	0.3	0.1
Styphelia intertexta	0.3	0.1
Templetonia neglecta	0.3	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.1
Thomasia microphylla	0.3	0.1

PHOTO


20/09/2018

Site Name:	MRC49
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	18/09/2018
GPS Location:	GDA94 Zone 51 304621.97E 6273663.52N
Community:	2
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Red-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Dolerite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia glaucoptera	0.5	0.3
Acacia ingrata	0.3	0.3
Acrotriche cordata	0.4	3
Anthotium humile	0.1	0.1
Boronia inconspicua	0.2	0.1
Boronia inornata subsp. *inornata*	0.4	1
Callitris roei	0.5	0.2
Cassytha glabella forma *dispar*		0.1
Cassytha racemosa forma *pilosa*		0.2
Choretrum glomeratum	1.2	0.5
Chorizema nervosum	0.8	0.1
Coopernookia polygalacea	0.3	0.1
Cryptandra wilsonii	1	0.3
Cyanicula aperta	0.1	0.1
Daviesia aphylla	2	4
Dianella brevicaulis	0.4	0.1
Dodonaea caespitosa	0.2	0.2
Dodonaea stenozyga	1.8	0.5
Eucalyptus conglobata subsp. *conglobata*	4.5	8

Eucalyptus flocktoniae subsp. *flocktoniae*	4.5	8
Eucalyptus leptocalyx subsp. *leptocalyx*	4.5	8
Eucalyptus platypus subsp. *platypus*	4.5	0.5
Exocarpos aphyllus	1.5	2
Gahnia aristata	0.5	5
Goodenia concinna	0.2	0.1
Grevillea pectinata	1	0.5
Hakea laurina	3	1.5
Hibbertia psilocarpa	0.4	0.5
Lepidosperma fimbriatum	0.3	0.3
Lepidosperma gahnioides	0.2	0.2
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596) (P1)	0.2	0.3
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.4	0.1
Logania buxifolia	0.6	0.2
Melaleuca calycina	0.5	0.1
Melaleuca cucullata	2.5	4
Melaleuca lateriflora	1.8	3
Melaleuca torquata	2	3
Melaleuca undulata	2	2
Nematolepis phebalioides	1.8	0.3
Pimelea ?pendens	0.2	0.1
Pomaderris brevifolia	1.5	1
Pterostylis sp.	0.1	0.1
Styphelia exserta	0.5	5
Templetonia neglecta	1	0.2
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.3	1
Thysanotus patersonii		0.1

PHOTO

Site Name:	MRC50
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	20/09/2018
GPS Location:	GDA94 Zone 51 301652.91914892E 6271729.02510876N
Community:	8
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	S
Soil Type:	Sand
Soil Colour:	Orange
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus occidentalis*
Mid Stratum 1:	*Melaleuca hamata*
Mid Stratum 2:	*Hakea lissocarpha*, *Lasiopetalum rosmarinifolium*, *Melaleuca glaberrima*
Lower Stratum 1:	*Dodonaea caespitosa*, *Hibbertia gracilipes*
Lower Stratum 2:	*Gahnia ancistrophylla*, *Lepidobolus preissianus*, *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798), *Schoenus subflavus* subsp. *subflavus*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops		
Acacia latipes subsp. *latipes*	1.3	1.5
Acacia sulcata var. *platyphylla*		
Allocasuarina huegeliana	3	0.1
Amphipogon turbinatus	0.1	0.1
Astroloma serratifolium	0.3	0.1
Billardiera fusiformis		0.1
Blennospora drummondii	0.1	0.1
**Briza minor*	0.1	0.1
Caladenia attingens subsp. *gracillima*	0.3	0.1
Caladenia brevisura	0.2	0.1

Caladenia flava subsp. *flava*	0.1	0.1
Ceratogyne obionoides	0.1	0.1
Chamaescilla corymbosa var. *corymbosa*	0.1	0.1
Chorizema aciculare subsp. *aciculare*	0.3	0.1
Desmocladus lateriflorus	0.1	0.1
Dicot sp.	0.1	0.1
Dodonaea caespitosa	0.2	2
Drosera lowriei	0.1	0.1
Drosera macrantha	0.2	0.1
Eucalyptus conglobata subsp. *conglobata*	1.5	0.2
Eucalyptus occidentalis	10	20
Eucalyptus platypus subsp. *platypus*	4	0.2
Eucalyptus pleurocarpa	4	1
Gahnia ancistrophylla	0.5	3
Goodenia affinis	0.1	0.1
Hakea lissocarpha	1.5	2
Hakea nitida	1.7	1
Hibbertia gracilipes	0.2	2
Hibbertia pungens	0.2	0.1
Hydrocotyle rugulosa	0.1	0.1
**Hypochaeris glabra*	0.1	0.1
Lagenophora huegelii	0.1	0.1
Lasiopetalum rosmarinifolium	1	1.5
Lepidobolus preissianus	0.3	2
Lepidosperma sanguinolentum		
Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)	0.6	10
Leporella fimbriata	0.1	0.1
Levenhookia pusilla	0.1	0.1
Lomandra effusa	0.4	0.1
Lomandra micrantha subsp. *teretifolia*	0.6	1.5
Lomandra mucronata	0.1	0.1
Melaleuca carrii	0.4	0.1
Melaleuca glaberrima	1.4	3
Melaleuca hamata	3	15
Melaleuca rigidifolia	1	0.5
Millotia tenuifolia var. *tenuifolia*	0.1	0.1
Neurachne alopecuroidea	0.1	0.2
Opercularia vaginata	0.1	0.1
Oxalis exilis	0.1	0.1
Poranthera microphylla	0.1	0.1
Pyrorchis nigricans	0.1	0.1
Rhodanthe laevis	0.1	0.1
Rytidosperma ?*setaceum*	0.2	0.1

Schoenus subflavus subsp. *subflavus*	0.4	3
Stenanthemum intricatum	0.2	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.1
Trachymene ornata	0.1	0.1
Wahlenbergia gracilenta	0.1	0.1
Waitzia suaveolens var. *suaveolens*	0.1	0.1

PHOTO

Site Name:	MRC51
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	18/09/2018
GPS Location:	GDA94 Zone 51 304481.13E 6273104.69N
Community:	14
Landform Type:	Other, Undulating plain (other)
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Light brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterised ironstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.2	2
Boronia inconspicua	0.2	0.1
Cassytha melantha		0.3
Cyanicula aperta	0.1	0.1
Eucalyptus dielsii	8	5
Eucalyptus platypus subsp. *platypus*	8	50
Melaleuca cucullata	5	7
Melaleuca sapientes	2	0.3
Melaleuca torquata	1	0.2
Melaleuca undulata	2	3
Pterostylis sp.	0.1	0.1
Rytidosperma setaceum	0.1	0.1
Thysanotus patersonii		0.1

PHOTO

Site Name:	MRC52
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	20/09/2018
GPS Location:	GDA94 Zone 51 301973.81305629E 6271440.54178296N
Community:	2
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	SE
Soil Type:	Sand
Soil Colour:	Yellow
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterite, Ironstone
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*
Mid Stratum 1:	*Melaleuca sapientes*
Mid Stratum 2:	*Melaleuca hamata*, *Melaleuca lateriflora*
Lower Stratum 1:	*Aotus* sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412), *Boronia inornata* subsp. *leptophylla*, *Styphelia intertexta*
Lower Stratum 2:	*Gahnia ancistrophylla*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia gonophylla	1.3	0.1
Acacia ingrata	0.4	1
Acacia pravifolia	0.2	0.1
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.4	3
Baeckea pachyphylla	1.3	0.1
Boronia inconspicua	0.2	0.1
Boronia inornata subsp. *leptophylla*	0.4	3

Cassytha glabella forma *dispar*		0.1
Cassytha melantha		1
Chorizema nervosum	0.5	0.1
Coopernookia polygalacea	0.2	0.1
Cyathostemon tenuifolius	0.5	0.1
Dianella brevicaulis	0.4	0.1
Dodonaea caespitosa	0.2	0.1
Eriochilus dilatatus	0.1	0.1
Eucalyptus flocktoniae subsp. *flocktoniae*	4.5	2
Eucalyptus leptocalyx subsp. *leptocalyx*	5	22
Eucalyptus perangusta	4	1
Gahnia ancistrophylla	0.5	5
Grevillea pectinata	1	2
Hakea laurina	2.5	1
Hibbertia psilocarpa	0.5	0.2
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.6	0.1
Lomandra micrantha subsp. *teretifolia*	0.4	0.1
Melaleuca glaberrima	1.5	1
Melaleuca hamata	1.6	2
Melaleuca lateriflora	1.4	4
Melaleuca sapientes	3.2	8
Neurachne alopecuroidea	0.1	0.1
Pimelea ?pendens	0.4	0.1
Prostanthera serpyllifolia subsp. *microphylla*	0.2	0.1
Pterostylis recurva	0.2	0.1
Styphelia intertexta	0.8	2
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.1	0.1
Thelymitra occidentalis	0.1	0.1

PHOTO


20/09/2018

Site Name:	MRC53
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	18/09/2018
GPS Location:	GDA94 Zone 51 304914.52E 6273311.46N
Community:	6
Landform Type:	Ridge
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Sandy Loam
Soil Colour:	Brown
Rock Outcrop:	Sandstone (other), <2% bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia sulcata var. *platyphylla*	1.5	2
Allocasuarina campestris	2	0.2
Astus tetragonus	1	1
Calothamnus quadrifidus subsp. *quadrifidus*	2	0.3
Calothamnus villosus	2	15
Calytrix leschenaultii	0.3	0.2
Cyanicula aperta	0.1	0.1
Dampiera angulata subsp. *angulata*	0.3	0.1
Dampiera lavandulacea	0.2	0.1
Darwinia sp. Lake Cobham (K. Newbey 3262)	0.8	6
Eucalyptus ecostata	5	8
Eucalyptus phaenophylla subsp. *interjacens*	2.5	1
Eucalyptus pleurocarpa	5	4
Gahnia aristata	0.3	0.1
Hemigenia teretiuscula	0.2	0.3
Hibbertia pungens	0.3	0.1
Kunzea affinis	1.5	2
Lasiopetalum rosmarinifolium	1	0.2

Lepidosperma rigidulum	0.3	0.2
Lepidosperma sanguinolentum	0.8	3
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	0.4	0.2
Lepidosperma sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'	0.2	0.2
Lepidosperma ?sp. Mt Short (S. Kern et al. LCH 17510) (P1)	0.5	2
Leucopogon sp. Newdegate (M. Hislop 3585)	1	2
Lomandra mucronata	0.1	0.1
Melaleuca glaberrima	1.5	0.5
Melaleuca hamata	2	8
Melaleuca rigidifolia	1.5	1
Micromyrtus elobata subsp. *elobata*	0.3	0.2
Neurachne alopecuroidea	0.1	0.1
Petrophile fastigiata	0.3	0.1
Philotheca gardneri subsp. *gardneri*	0.5	0.2
Poranthera microphylla	0.1	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.2
Stylidium dichotomum	0.1	0.1
Thysanotus patersonii		0.1
Verticordia chrysantha	0.4	0.2

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Site Name:	MRC54
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	20/09/2018
GPS Location:	GDA94 Zone 51 302408.04E 6271569.34N
Community:	2
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Aspect:	S
Soil Type:	Clayey Sand
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm
CF Types:	Ironstone, Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus suggrandis* subsp. *suggrandis*
Mid Stratum 1:	*Grevillea pectinata*, *Melaleuca calycina*
Lower Stratum 1:	*Acacia pravifolia*, *Aotus* sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)
Lower Stratum 2:	*Gahnia ancistrophylla*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia glaucoptera	0.5	0.1
Acacia ingrata	0.3	0.1
Acacia pravifolia	0.2	2
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.3	3
Baeckea pachyphylla	0.5	0.1
Boronia scabra subsp. *scabra*	0.2	0.1
Cassytha glabella forma *dispar*		0.1
Chorizema nervosum	0.5	0.1
Coopernookia polygalacea	0.2	0.1

Cryptandra wilsonii	0.2	0.1
Cyathostemon tenuifolius	0.3	0.1
Daviesia aphylla	0.4	0.1
Dodonaea caespitosa	0.2	0.1
Eucalyptus conglobata subsp. *conglobata*	1.5	1
Eucalyptus flocktoniae subsp. *flocktoniae*	1.6	2
Eucalyptus leptocalyx subsp. *leptocalyx*	1.7	24
Eucalyptus phaenophylla subsp. *interjacens*	1.6	0.5
Eucalyptus suggrandis subsp. *suggrandis*	1.6	18
Eutaxia cuneata	0.4	0.1
Exocarpos sparteus	1.6	0.1
Gahnia ancistrophylla	0.4	4
Goodenia concinna	0.1	0.1
Grevillea pectinata	0.7	3
Hakea laurina	0.4	0.1
Hibbertia psilocarpa	0.2	0.2
Hibbertia pungens	0.2	0.2
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	0.2	0.1
Lomandra micrantha subsp. *teretifolia*	0.4	0.1
Melaleuca calycina	0.8	2
Melaleuca glaberrima	0.4	0.1
Melaleuca hamata	0.8	0.1
Melaleuca lateriflora	0.6	1
Melaleuca rigidifolia	0.4	0.1
Microcorys glabra	0.4	0.1
Neurachne alopecuroidea	0.1	0.1
Olearia passerinoides subsp. *passerinoides*	0.6	0.1
Stylidium turleyae	0.1	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	0.1
Thomasia microphylla	0.2	0.1

PHOTO


20/09/2018

Site Name:	MRC55
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	19/09/2018
GPS Location:	GDA94 Zone 51 301182.05E 6273981.97N
Community:	7
Landform Type:	Ridge
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Sandy Loam
Soil Colour:	Light brown (other)
Rock Outcrop:	Sandstone (other), 2-10% bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acrotriche ramiflora	0.6	0.1
Boronia inconspicua	0.3	0.1
Calothamnus quadrifidus subsp. *quadrifidus*	3	15
Comesperma volubile		0.1
Coopernookia polygalacea	0.3	0.2
Cyanicula aperta	0.1	0.1
Dampiera angulata subsp. *angulata*	0.3	0.5
Dampiera lavandulacea	0.2	0.1
Dianella revoluta	0.5	0.2
Dodonaea caespitosa	0.2	0.1
Drosera macrantha		0.1
Eucalyptus densa	6	0.5
Eucalyptus flocktoniae subsp. *flocktoniae*	5	4
Eucalyptus phaenophylla subsp. *interjacens*	3.5	4
Gahnia ancistrophylla	0.5	2
Gastrolobium parviflorum	2.2	4
Hakea lissocarpha	2.5	3
Hibbertia gracilipes	0.4	0.3
Hibbertia pungens	0.8	5

Kunzea affinis	1	0.2
Lasiopetalum rosmarinifolium	0.8	0.3
Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)	0.4	0.5
Lepidosperma sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'	0.4	0.5
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	0.2	0.5
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.5	0.3
Leucopogon sp. Newdegate (M. Hislop 3585)	0.2	0.5
Lomandra mucronata	0.1	0.1
Melaleuca glaberrima	1.8	0.5
Melaleuca hamata	3	10
Neurachne alopecuroidea	0.1	0.1
Persoonia helix	1.6	0.2
Petrophile fastigiata	2	3
Rinzia communis	0.3	0.1
Stylidium albomontis	0.2	0.5
Stylidium piliferum	0.1	0.1
Tetrapora verrucosa	1.7	0.3
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.2	1

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Site Name:	MRC56
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	20/09/2018
GPS Location:	GDA94 Zone 51 302571.30886401E 6272356.55577888N
Community:	2
Landform Type:	Other, Low rise (other)
Slope Class:	Moderately Inclined (10 degrees)
Aspect:	SW
Soil Type:	Clayey Sand
Soil Colour:	Red
Rock Outcrop:	Laterite, 2-10% bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

Upper Stratum 1:	*Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*
Mid Stratum 1:	*Melaleuca hamata*, *Melaleuca sapientes*
Mid Stratum 2:	*Hibbertia pungens*
Lower Stratum 1:	*Boronia inornata* subsp. *leptophylla*, *Daviesia articulata*

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia gonophylla	0.7	0.1
Acacia ingrata	0.3	1
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.4	0.5
Boronia inornata subsp. *leptophylla*	0.5	2
Callitris roei	2.2	1
Cassytha glabella forma *dispar*		0.1
Chorizema nervosum	0.5	0.1
Coopernookia polygalacea	0.2	0.1
Cyanicula aperta	0.2	0.1
Cyathostemon tenuifolius	0.5	0.1

Dampiera angulata subsp. *angulata*	0.4	0.1
Daviesia articulata	0.5	2
Eucalyptus flocktoniae subsp. *flocktoniae*	5	10
Eucalyptus leptocalyx subsp. *leptocalyx*	4	10
Eucalyptus phaenophylla subsp. *interjacens*	2	1
Eucalyptus pileata	1.7	1
Eucalyptus pleurocarpa	1.5	0.5
Eucalyptus suggrandis subsp. *suggrandis*	3	2
Exocarpos aphyllus	1.4	1
Gahnia ancistrophylla	0.4	1
Gahnia aristata	0.3	0.1
Gastrolobium parviflorum	1.5	1
Hakea laurina	4	1
Hibbertia psilocarpa	0.5	0.1
Hibbertia pungens	1	3
Lepidosperma gahnioides	0.2	0.1
Lepidosperma gracile	0.3	0.1
Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)	0.5	0.1
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	0.5	0.1
Lissanthe rubicunda	0.9	0.1
Melaleuca hamata	3	8
Melaleuca lateriflora	1	0.5
Melaleuca sapientes	3	6
Microcorys glabra	0.4	0.1
Styphelia intertexta	0.4	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.1	0.1
Thomasia microphylla	0.2	0.1

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20/09/2018

Site Name:	MRC57
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	20/09/2018
GPS Location:	GDA94 Zone 51 301479.64E 6271129.63N
Community:	1
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Sandstone (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia brachyclada	0.3	0.1
Acacia chrysocephala	0.2	0.1
Acacia curvata	0.5	2
Acacia cyclops	0.5	0.1
Acacia gonophylla	0.5	0.2
Acacia ingrata	0.2	0.1
Acacia pravifolia	0.2	0.1
Acrotriche cordata	0.3	0.2
Argentipallium tephrodes	0.2	0.3
Banksia alliacea	0.1	0.1
Banksia media	0.1	0.1
Billardiera coriacea	0.2	0.1
Cassytha glabella forma *dispar*		0.1
Chorizema nervosum	0.2	0.2
Comesperma spinosum	0.3	0.5
Coopernookia polygalacea	0.3	0.5
Dampiera angulata subsp. *angulata*	0.3	0.1
Daviesia lancifolia	0.5	0.3
Dianella brevicaulis	0.3	0.1

Dianella revoluta	0.4	0.1
Dodonaea caespitosa	0.2	0.3
Eucalyptus conglobata subsp. *conglobata*	2	0.5
Eucalyptus flocktoniae subsp. *flocktoniae*	2	3
Eucalyptus leptocalyx subsp. *leptocalyx*	2	20
Eucalyptus suggrandis subsp. *suggrandis*	2	3
Eucalyptus uncinata	2	0.5
Exocarpos aphyllus	0.3	0.5
Exocarpos sparteus	1.8	1
Gahnia ancistrophylla	0.3	5
Gahnia aristata	0.2	3
Goodenia concinna	0.1	0.1
Grevillea oligantha	0.3	0.1
Grevillea pectinata	0.8	8
Hakea laurina	0.3	0.1
Hakea lissocarpha	0.1	0.1
Hibbertia psilocarpa	0.2	0.1
Hibbertia pungens	0.2	0.1
Hybanthus floribundus subsp. *adpressus*	0.2	0.1
Lepidosperma fairallianum	0.2	0.2
Leucopogon opponens	0.3	0.1
Logania buxifolia	0.3	0.2
Lomandra micrantha subsp. *teretifolia*	0.3	0.1
Melaleuca calycina	1	3
Melaleuca lateriflora	0.4	4
Melaleuca rigidifolia	0.3	0.2
Melaleuca sapientes	0.4	0.5
Melaleuca subfalcata	0.6	0.1
Melaleuca torquata	0.1	0.2
Microcorys glabra	0.3	0.1
Mirbelia ovata	0.4	0.3
Neurachne alopecuroidea	0.1	0.1
Olearia ciliata	0.3	0.1
Pimelea brachyphylla	0.3	0.1
Platysace deflexa	0.2	0.1
Styphelia intertexta	0.3	0.3
Templetonia neglecta	0.4	0.1
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	0.1	0.2
Wilsonia humilis	0.1	0.1

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Site Name:	MRC59
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	20/09/2018
GPS Location:	GDA94 Zone 51 301166.8E 6271105.94N
Community:	16
Landform Type:	Plain
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Sandy Loam
Soil Colour:	Grey-brown (other)
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Allocasuarina humilis	0.3	0.2
Allocasuarina microstachya	0.2	0.2
Amphipogon avenaceus	0.2	0.1
Amphipogon turbinatus	0.1	0.1
Banksia alliacea	0.4	0.2
Banksia armata var. *ignicida*	0.6	1.5
Banksia obovata	0.6	1.5
Banksia violacea	0.4	0.2
Beaufortia micrantha	0.3	1.5
Beaufortia schaueri	0.6	0.3
Calothamnus gracilis	0.5	6
Cassytha flava		0.2
Caustis dioica	0.2	0.1
Chorizema aciculare subsp. *aciculare*	0.2	0.1
Conostylis argentea	0.1	0.1
Cryptandra myriantha	0.1	0.1
Dampiera angulata subsp. Peak Charles (K.R. Newbey 5402)	0.3	0.1
Darwinia vestita	0.3	0.1

Daviesia lancifolia	0.2	0.2
Daviesia teretifolia	0.3	0.2
Drosera lowriei	0.1	0.1
Drosera scorpioides	0.1	0.1
Eucalyptus pleurocarpa	3	15
Gastrolobium spinosum	0.4	0.1
Gompholobium cyaninum	0.3	0.2
Gompholobium knightianum	0.2	0.1
Goodenia incana	0.1	0.1
Goodenia scapigera subsp. *scapigera*	0.4	0.1
Grevillea concinna subsp. *lemanniana*	0.5	1
Grevillea nudiflora	0.3	0.5
Hakea pandanicarpa subsp. *pandanicarpa*	1	0.6
Hibbertia gracilipes	0.3	1
Isopogon polycephalus	0.6	1.5
Jacksonia condensata	0.2	0.1
Jacksonia viscosa	0.6	5
Laxmannia omnifertilis	0.1	0.1
Lepidobolus chaetocephalus	0.2	0.1
Lepidosperma carphoides	0.3	2
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	0.3	3
Leptospermum spinescens	0.6	0.3
Leucopogon sp. Newdegate (M. Hislop 3585)	0.2	1
Lysinema ciliatum	0.4	0.1
Melaleuca tuberculata var. *tuberculata*	0.3	3
Mesomelaena stygia subsp. *stygia*	0.2	4
Microcorys subcanescens	0.1	0.1
Micromyrtus elobata subsp. *elobata*	0.1	0.1
Neurachne alopecuroidea	0.1	0.1
Petrophile seminuda	0.5	1
Petrophile teretifolia	0.3	0.1
Pimelea brevifolia subsp. *brevifolia*	0.4	0.2
Schoenus pleiostemoneus	0.1	0.1
Schoenus subflavus subsp. long leaves (K.L. Wilson 2865)	0.1	0.1
Schoenus subflavus subsp. *subflavus*	0.1	0.1
Spyridium sp. Jerdacuttup (A. Williams 332)	0.4	0.1
Stachystemon polyandrus	0.2	0.1
Stylidium schoenoides	0.1	0.1
Styphelia sp. South Coast (J.M. Powell 3374)	0.6	3
Synaphea aff. *drummondii*	0.3	0.1

Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)	0.3	0.1

PHOTO

Site Name:	MRC61
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	20/09/2018
GPS Location:	GDA94 Zone 51 301446.25E 6273254.4N
Community:	9
Landform Type:	Lower Slope
Slope Class:	Very Gently Inclined (1 degree)
Soil Type:	Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Quartz (other)
Vegetation Condition:	Southern Vegetation Condition - 2 - Excellent
Disturbance:	Exotic Weeds - Some weeds
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia cyclops	2.5	2
Acacia glaucoptera	1.3	6
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	0.1	0.1
Austrostipa elegantissima	0.5	0.1
Billardiera fusiformis		0.1
Brachyscome ciliaris		
Calandrinia calyptrata	0.1	0.1
Cassytha melantha		0.2
Chamaescilla corymbosa var. *corymbosa*	0.1	0.1
Daucus glochidiatus	0.1	0.1
Dodonaea caespitosa	0.3	2
Erodium crinitum	0.1	0.1
Eucalyptus occidentalis	13	25
Eucalyptus quadrans	5	1
Exocarpos aphyllus	0.3	0.1
Gahnia ancistrophylla	0.5	5

Goodenia affinis	0.1	0.1
Hakea lissocarpha		
Isotropis juncea	0.1	0.1
Lagenophora huegelii	0.1	0.1
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	0.3	2
Lomandra effusa	0.3	1
**Lysimachia arvensis*	0.1	0.2
Melaleuca acuminata subsp. *acuminata*	2.5	2
Millotia tenuifolia var. *tenuifolia*	0.1	0.1
Oxalis exilis	0.1	0.1
Pauridia glabella var. *glabella*	0.1	0.1
Phyllanthus calycinus	0.2	0.1
Pimelea argentea	1	0.1
Plantago hispida	0.1	0.1
Ptilotus spathulatus	0.1	0.1
Rhagodia preissii subsp. *preissii*	0.8	0.2
Rytidosperma sp.	0.1	0.1
Senecio glossanthus	0.1	0.1
Teucrium sessiliflorum	0.1	0.1
Thomasia foliosa	0.3	0.2
Thysanotus patersonii	0.1	0.1
Vittadinia australasica var. *australasica*	0.1	0.1

PHOTO

Site Name:	MRC63
Site Type:	QUADRAT
Dimensions:	10m x 10m
Survey Date:	20/09/2018
GPS Location:	GDA94 Zone 51 302010.89E 6273366.94N
Community:	15
Landform Type:	Other, Low rise (other)
Slope Class:	Gently Inclined (3 degrees)
Soil Type:	Clay Loam
Soil Colour:	Grey
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Magnesite (other)
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	> 20 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Boronia inornata subsp. *inornata*	1	10
Caladenia sigmoidea	0.1	0.1
Choretrum glomeratum	1.5	1
Eucalyptus conglobata subsp. *conglobata*	5	8
Eucalyptus flocktoniae subsp. *flocktoniae*	9	8
Eucalyptus indurata	9	8
Melaleuca pauperiflora subsp. *pauperiflora*	2.5	30

PHOTO

Site Name:	MRC-R1
Site Type:	RELEVE
Survey Date:	19/09/2018
GPS Location:	GDA94 Zone 51 304926.39E 6272077.74N
Landform Type:	Upper Slope
Soil Type:	Sandy Clay
Soil Colour:	Orange
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Banksia alliacea		
Banksia armata var. *ignicida*		
Banksia obovata		
Eucalyptus pleurocarpa		
Gastrolobium spinosum		
Grevillea concinna subsp. *lemanniana*		
Grevillea nudiflora		
Grevillea oligantha		
Hakea cygna subsp. *cygna*		
Isopogon sp. Fitzgerald River (D.B. Foreman 813)		
Petrophile fastigiata		
Xanthorrhoea platyphylla		

PHOTO


19/09/2018

Site Name:	MRC-R2
Site Type:	RELEVE
Survey Date:	19/09/2018
GPS Location:	GDA94 Zone 51 304875.8E 6272752.72N
Landform Type:	Upper Slope
Soil Type:	Sandy Clay
Soil Colour:	Orange
CF Types:	Laterite
Vegetation Condition:	Southern Vegetation Condition - 1 - Pristine
Fire:	~ 10 years

DOMINANT TAXA IN VEGETATION STRATA

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Banksia alliacea		
Banksia armata var. *ignicida*		
Eucalyptus pleurocarpa		
Gastrolobium spinosum		
Grevillea concinna subsp. *lemanniana*		
Grevillea nudiflora		
Grevillea oligantha		
Hakea cygna subsp. *cygna*		
Hakea ilicifolia		
Isopogon sp. Fitzgerald River (D.B. Foreman 813)		
Petrophile fastigiata		
Synaphea divaricata		

PHOTO


19/09/2018

Appendix H: Location Details of Significant Flora Recorded within the Study Area

Note: All locations are in datum GDA94, Zone 51

Taxon	Status	Count	Easting	Northing	Comments
Acacia spongolitica			304401	6272572	
Commersonia rotundifolia	P3	5	304788	6271014	
Conostylis lepidospermoides	T	2	302263	6274495	
Conostylis lepidospermoides	T	10	302180	6274529	
Conostylis lepidospermoides	T	15	302769	6274740	
Conostylis lepidospermoides	T	40	302750	6274734	
Dampiera sp. Ravensthorpe (G.F. Craig 8277)	P3	200	304401	6272572	
Lepidosperma ?sp. Mt Short (S. Kern et al. LCH 17510)	P1		304915	6273311	
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596)	P1	20	304622	6273664	
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596)	P1	15	304046	6274538	
Leucopogon aff. *canaliculatus*			303062	6274915	
Leucopogon aff. *canaliculatus*		1	302370	6274285	
Leucopogon aff. *canaliculatus*		15	302057	6274463	
Leucopogon aff. *canaliculatus*		30	305293	6275148	
Leucopogon aff. *canaliculatus*		25	305271	6275151	
Leucopogon aff. *canaliculatus*		50	305252	6275148	
Leucopogon aff. *canaliculatus*		20	305229	6275152	
Leucopogon aff. *canaliculatus*		2	304853	6274952	
Leucopogon aff. *canaliculatus*		10	304846	6274958	
Leucopogon aff. *canaliculatus*		30	304833	6274950	
Leucopogon aff. *canaliculatus*		30	304828	6274940	
Leucopogon aff. *canaliculatus*		20	304819	6274967	
Leucopogon aff. *canaliculatus*		3	304819	6274984	
Leucopogon aff. *canaliculatus*		3	304826	6274996	
Leucopogon aff. *canaliculatus*		5	304838	6275003	
Leucopogon aff. *canaliculatus*		1	304901	6274832	
Leucopogon aff. *canaliculatus*		3	304910	6274820	
Leucopogon aff. *canaliculatus*		4	304580	6273944	
Leucopogon aff. *canaliculatus*		50	305285	6275153	
Leucopogon aff. *canaliculatus*		5	302743	6273446	
Leucopogon aff. *canaliculatus*		5	302817	6273451	
Leucopogon aff. *canaliculatus*		2	302886	6273450	
Leucopogon aff. *canaliculatus*		10	302802	6273243	
Leucopogon aff. *canaliculatus*		10	302759	6273238	
Leucopogon aff. *canaliculatus*		5	302748	6273239	
Leucopogon aff. *canaliculatus*		25	302734	6273235	
Leucopogon aff. *canaliculatus*		50	302714	6273234	
Leucopogon aff. *canaliculatus*		5	302697	6273225	
Leucopogon aff. *canaliculatus*		20	302672	6273234	
Leucopogon aff. *canaliculatus*		20	302646	6273236	
Leucopogon aff. *canaliculatus*		50	302474	6272926	
Leucopogon aff. *canaliculatus*		20	302464	6272869	
Leucopogon aff. *canaliculatus*		10	302476	6272851	
Leucopogon aff. *canaliculatus*		15	302505	6272838	
Leucopogon aff. *canaliculatus*		10	302517	6272836	

Taxon	Status	Count	Easting	Northing	Comments
Leucopogon aff. *canaliculatus*		15	302536	6272832	
Leucopogon aff. *canaliculatus*		20	302571	6272843	
Leucopogon aff. *canaliculatus*		50	302630	6272850	
Leucopogon aff. *canaliculatus*		10	302676	6272853	
Leucopogon aff. *canaliculatus*		10	302693	6272852	
Leucopogon aff. *canaliculatus*		15	302752	6272847	
Leucopogon aff. *canaliculatus*		5	303094	6272880	
Leucopogon aff. *canaliculatus*		5	303137	6272878	
Leucopogon aff. *canaliculatus*		30	302867	6273058	
Leucopogon aff. *canaliculatus*		50	302822	6273053	
Leucopogon aff. *canaliculatus*		50	302795	6273049	
Leucopogon aff. *canaliculatus*		30	302772	6273056	
Leucopogon aff. *canaliculatus*		40	302759	6273059	
Leucopogon aff. *canaliculatus*		100	302742	6273061	
Leucopogon aff. *canaliculatus*		100	302715	6273055	
Leucopogon aff. *canaliculatus*		100	302691	6273050	
Leucopogon aff. *canaliculatus*		100	302666	6273055	
Leucopogon aff. *canaliculatus*		100	302642	6273048	
Leucopogon aff. *canaliculatus*		50	302623	6273030	
Leucopogon aff. *canaliculatus*		25	302580	6273049	
Leucopogon aff. *canaliculatus*		30	302567	6272989	
Leucopogon aff. *canaliculatus*		10	302769	6272644	
Leucopogon aff. *canaliculatus*		5	302822	6272632	
Leucopogon aff. *canaliculatus*		15	302902	6272623	
Leucopogon aff. *canaliculatus*		5	302871	6272575	
Leucopogon aff. *canaliculatus*		10	302845	6272550	
Leucopogon aff. *canaliculatus*		5	302822	6272462	
Leucopogon aff. *canaliculatus*		2	302614	6272597	
Leucopogon aff. *canaliculatus*		2	302596	6272609	
Leucopogon aff. *canaliculatus*		1	302148	6274425	
Leucopogon aff. *canaliculatus*		1	301089	6274763	
Leucopogon aff. *canaliculatus*		1	301078	6274801	
Leucopogon aff. *canaliculatus*		1	301057	6274832	
Leucopogon aff. *canaliculatus*		3	302671	6273267	
Leucopogon aff. *canaliculatus*		8	302475	6272898	
Leucopogon aff. *canaliculatus*		5	302485	6272902	
Leucopogon aff. *canaliculatus*		2	302488	6272896	
Leucopogon aff. *canaliculatus*		12	302499	6272902	
Leucopogon aff. *canaliculatus*		9	302520	6272896	
Leucopogon aff. *canaliculatus*		4	302549	6272898	
Leucopogon aff. *canaliculatus*		1	302604	6272899	
Leucopogon aff. *canaliculatus*		1	302632	6272902	
Leucopogon aff. *canaliculatus*		3	302656	6272903	
Leucopogon aff. *canaliculatus*		2	302671	6272901	
Leucopogon aff. *canaliculatus*		4	302678	6272896	
Leucopogon aff. *canaliculatus*		7	302711	6272898	
Leucopogon aff. *canaliculatus*		13	302807	6273101	
Leucopogon aff. *canaliculatus*		7	302788	6273100	
Leucopogon aff. *canaliculatus*		16	302769	6273099	
Leucopogon aff. *canaliculatus*		12	302755	6273105	
Leucopogon aff. *canaliculatus*		17	302736	6273105	

Taxon	Status	Count	Easting	Northing	Comments
Leucopogon aff. *canaliculatus*		8	302724	6273106	
Leucopogon aff. *canaliculatus*		8	302701	6273104	
Leucopogon aff. *canaliculatus*		15	302685	6273101	
Leucopogon aff. *canaliculatus*		4	302662	6273104	
Leucopogon aff. *canaliculatus*		12	302748	6272707	
Leucopogon aff. *canaliculatus*		10	302765	6272703	
Leucopogon aff. *canaliculatus*		9	302781	6272703	
Leucopogon aff. *canaliculatus*		19	302797	6272705	
Leucopogon aff. *canaliculatus*		3	302815	6272698	
Leucopogon aff. *canaliculatus*		17	302832	6272699	
Leucopogon aff. *canaliculatus*		15	302849	6272699	
Leucopogon aff. *canaliculatus*		3	302874	6272699	
Leucopogon aff. *canaliculatus*		11	302889	6272693	
Leucopogon aff. *canaliculatus*		2	302910	6272700	
Leucopogon aff. *canaliculatus*		1	302926	6272706	
Leucopogon aff. *canaliculatus*		12	302966	6272692	
Leucopogon aff. *canaliculatus*		2	302894	6272602	
Leucopogon aff. *canaliculatus*		2	302874	6272578	
Leucopogon aff. *canaliculatus*		1	302873	6272572	
Leucopogon aff. *canaliculatus*		1	302846	6272553	
Leucopogon aff. *canaliculatus*		7	302825	6272503	
Leucopogon aff. *canaliculatus*		2	302808	6272509	
Leucopogon aff. *canaliculatus*		2	302660	6272710	
Leucopogon aff. *canaliculatus*		2	302648	6272732	
Leucopogon aff. *canaliculatus*		1	301085	6274779	
Leucopogon aff. *canaliculatus*		1	301079	6274791	
Leucopogon aff. *canaliculatus*		1	301083	6274794	
Leucopogon aff. *canaliculatus*		1	301074	6274808	
Leucopogon aff. *canaliculatus*		1	301075	6274822	
Leucopogon aff. *canaliculatus*		1	301072	6274823	
Leucopogon aff. *canaliculatus*		1	301067	6274834	
Leucopogon aff. *canaliculatus*		1	301057	6274861	
Leucopogon aff. *canaliculatus*		2	302539	6272994	
Leucopogon aff. *canaliculatus*		1	302568	6273009	
Leucopogon aff. *canaliculatus*		10	302582	6272997	
Leucopogon aff. *canaliculatus*		1	302606	6272989	
Leucopogon aff. *canaliculatus*		1	302617	6272995	
Leucopogon aff. *canaliculatus*		2	302641	6273001	
Leucopogon aff. *canaliculatus*		1	302650	6272998	
Leucopogon aff. *canaliculatus*		2	302681	6273001	
Leucopogon aff. *canaliculatus*		2	302705	6273004	
Leucopogon aff. *canaliculatus*		3	302718	6273007	
Leucopogon aff. *canaliculatus*		6	302739	6273009	
Leucopogon aff. *canaliculatus*		3	302770	6272998	
Leucopogon aff. *canaliculatus*		1	302782	6272999	
Leucopogon aff. *canaliculatus*		3	302792	6273002	
Leucopogon aff. *canaliculatus*		3	302817	6273006	
Leucopogon aff. *canaliculatus*		1	302828	6273004	
Leucopogon aff. *canaliculatus*		1	302784	6273198	
Leucopogon aff. *canaliculatus*		2	302764	6273198	
Leucopogon aff. *canaliculatus*		6	302699	6273202	

Taxon	Status	Count	Easting	Northing	Comments
Leucopogon aff. *canaliculatus*		3	302679	6273205	
Leucopogon aff. *canaliculatus*		4	302651	6273208	
Leucopogon aff. *canaliculatus*		1	302594	6273205	
Leucopogon aff. *canaliculatus*		1	302610	6272796	
Leucopogon aff. *canaliculatus*		3	302639	6272800	
Leucopogon aff. *canaliculatus*		1	302665	6272800	
Leucopogon aff. *canaliculatus*		1	302685	6272798	
Leucopogon aff. *canaliculatus*		2	302694	6272800	
Leucopogon aff. *canaliculatus*		1	302760	6272800	
Leucopogon aff. *canaliculatus*		1	304848	6274965	
Leucopogon aff. *canaliculatus*		1	304865	6274983	
Leucopogon aff. *canaliculatus*		1	304861	6274969	
Leucopogon aff. *canaliculatus*		1	304859	6274956	
Leucopogon aff. *canaliculatus*		1	304857	6274951	
Leucopogon aff. *canaliculatus*		1	304856	6274920	
Leucopogon aff. *canaliculatus*		1	305048	6274938	
Leucopogon aff. *canaliculatus*		2	302934	6273353	
Leucopogon aff. *canaliculatus*		2	302759	6273345	
Leucopogon aff. *canaliculatus*		10	302491	6272946	
Leucopogon aff. *canaliculatus*		2	302499	6272945	
Leucopogon aff. *canaliculatus*		1	302507	6272945	
Leucopogon aff. *canaliculatus*		1	302545	6272953	
Leucopogon aff. *canaliculatus*		6	302548	6272953	
Leucopogon aff. *canaliculatus*		3	302557	6272953	
Leucopogon aff. *canaliculatus*		3	302560	6272953	
Leucopogon aff. *canaliculatus*		1	302564	6272952	
Leucopogon aff. *canaliculatus*		1	302577	6272956	
Leucopogon aff. *canaliculatus*		4	302580	6272949	
Leucopogon aff. *canaliculatus*		4	302584	6272944	
Leucopogon aff. *canaliculatus*		2	302590	6272944	
Leucopogon aff. *canaliculatus*		1	302601	6272945	
Leucopogon aff. *canaliculatus*		1	302610	6272951	
Leucopogon aff. *canaliculatus*		1	302782	6272962	
Leucopogon aff. *canaliculatus*		1	302855	6272946	
Leucopogon aff. *canaliculatus*		1	302825	6273155	
Leucopogon aff. *canaliculatus*		1	302816	6273152	
Leucopogon aff. *canaliculatus*		3	302766	6273156	
Leucopogon aff. *canaliculatus*		1	302757	6273159	
Leucopogon aff. *canaliculatus*		5	302744	6273156	
Leucopogon aff. *canaliculatus*		8	302721	6273161	
Leucopogon aff. *canaliculatus*		1	302681	6273148	
Leucopogon aff. *canaliculatus*		2	302664	6273152	
Leucopogon aff. *canaliculatus*		1	302729	6272754	
Leucopogon aff. *canaliculatus*		1	302748	6272749	
Leucopogon aff. *canaliculatus*		1	302768	6272745	
Leucopogon aff. *canaliculatus*		1	302792	6272746	
Leucopogon aff. *canaliculatus*		3	302815	6272749	
Leucopogon sp. Cascades (M. Hislop 3693)	P1	10	302220	6274477	
Leucopogon sp. Cascades (M. Hislop 3693)	P1	15	302063	6274465	

Taxon	Status	Count	Easting	Northing	Comments
Leucopogon sp. Cascades (M. Hislop 3693)	P1	10	302273	6274442	
Leucopogon sp. Cascades (M. Hislop 3693)	P1	2	302180	6274529	
Leucopogon sp. Cascades (M. Hislop 3693)	P1		303659	6274936	
Pultenaea calycina subsp. *proxena*	P4	1	305042	6275000	
Pultenaea calycina subsp. *proxena*	P4	5	302245	6274312	
Pultenaea calycina subsp. *proxena*	P4	3	302293	6274192	
Pultenaea calycina subsp. *proxena*	P4	8	302281	6274090	
Pultenaea calycina subsp. *proxena*	P4	1	302308	6274046	
Pultenaea calycina subsp. *proxena*	P4	1	302348	6274042	
Pultenaea calycina subsp. *proxena*	P4	3	302398	6274054	
Pultenaea calycina subsp. *proxena*	P4	5	302488	6274062	
Pultenaea calycina subsp. *proxena*	P4	1	302505	6274054	
Pultenaea calycina subsp. *proxena*	P4	2	302526	6274047	
Pultenaea calycina subsp. *proxena*	P4	2	302549	6274041	
Pultenaea calycina subsp. *proxena*	P4	5	302585	6274055	
Pultenaea calycina subsp. *proxena*	P4	15	302606	6274055	
Pultenaea calycina subsp. *proxena*	P4	1	302624	6274052	
Pultenaea calycina subsp. *proxena*	P4	5	302644	6274056	
Pultenaea calycina subsp. *proxena*	P4	8	302660	6274053	
Pultenaea calycina subsp. *proxena*	P4	15	302685	6274054	
Pultenaea calycina subsp. *proxena*	P4	10	302697	6274059	
Pultenaea calycina subsp. *proxena*	P4	4	302596	6273847	
Pultenaea calycina subsp. *proxena*	P4	20	302584	6273848	
Pultenaea calycina subsp. *proxena*	P4	2	302541	6273849	
Pultenaea calycina subsp. *proxena*	P4	50	302518	6273849	
Pultenaea calycina subsp. *proxena*	P4	50	302498	6273849	
Pultenaea calycina subsp. *proxena*	P4	5	302433	6273850	
Pultenaea calycina subsp. *proxena*	P4	1	302385	6273847	
Pultenaea calycina subsp. *proxena*	P4	3	302249	6273851	
Pultenaea calycina subsp. *proxena*	P4	5	302266	6274061	
Pultenaea calycina subsp. *proxena*	P4	4	302246	6274051	
Pultenaea calycina subsp. *proxena*	P4	30	302183	6274047	
Pultenaea calycina subsp. *proxena*	P4	6	301999	6274052	
Pultenaea calycina subsp. *proxena*	P4	10	301975	6274059	
Pultenaea calycina subsp. *proxena*	P4	8	301937	6274057	
Pultenaea calycina subsp. *proxena*	P4	30	301885	6274062	
Pultenaea calycina subsp. *proxena*	P4	30	301860	6274050	
Pultenaea calycina subsp. *proxena*	P4	5	301820	6274062	
Pultenaea calycina subsp. *proxena*	P4	20	301799	6274061	
Pultenaea calycina subsp. *proxena*	P4	5	301759	6274066	
Pultenaea calycina subsp. *proxena*	P4	1	301680	6273836	
Pultenaea calycina subsp. *proxena*	P4	3	302270	6273744	
Pultenaea calycina subsp. *proxena*	P4	10	302295	6273741	
Pultenaea calycina subsp. *proxena*	P4	15	302312	6273741	
Pultenaea calycina subsp. *proxena*	P4	5	302358	6273753	
Pultenaea calycina subsp. *proxena*	P4	8	302377	6273750	
Pultenaea calycina subsp. *proxena*	P4	8	302393	6273750	
Pultenaea calycina subsp. *proxena*	P4	5	302420	6273748	

Taxon	Status	Count	Easting	Northing	Comments
Pultenaea calycina subsp. *proxena*	P4	3	302450	6273747	
Pultenaea calycina subsp. *proxena*	P4	5	302459	6273741	
Pultenaea calycina subsp. *proxena*	P4	20	302482	6273746	
Pultenaea calycina subsp. *proxena*	P4	10	302512	6273746	
Pultenaea calycina subsp. *proxena*	P4	8	302538	6273760	
Pultenaea calycina subsp. *proxena*	P4	5	302564	6273752	
Pultenaea calycina subsp. *proxena*	P4	10	302497	6273653	
Pultenaea calycina subsp. *proxena*	P4	15	302477	6273657	
Pultenaea calycina subsp. *proxena*	P4	25	302460	6273655	
Pultenaea calycina subsp. *proxena*	P4	50	302961	6273455	
Pultenaea calycina subsp. *proxena*	P4	30	302981	6273452	
Pultenaea calycina subsp. *proxena*	P4	30	303008	6273448	
Pultenaea calycina subsp. *proxena*	P4	3	302287	6274157	
Pultenaea calycina subsp. *proxena*	P4	5	302284	6274141	
Pultenaea calycina subsp. *proxena*	P4	4	302300	6274105	
Pultenaea calycina subsp. *proxena*	P4	1	302306	6274104	
Pultenaea calycina subsp. *proxena*	P4	3	302314	6274102	
Pultenaea calycina subsp. *proxena*	P4	6	302336	6274101	
Pultenaea calycina subsp. *proxena*	P4	8	302342	6274093	
Pultenaea calycina subsp. *proxena*	P4	9	302364	6274088	
Pultenaea calycina subsp. *proxena*	P4	8	302391	6274104	
Pultenaea calycina subsp. *proxena*	P4	3	302446	6274103	
Pultenaea calycina subsp. *proxena*	P4	3	302473	6274106	
Pultenaea calycina subsp. *proxena*	P4	1	302485	6274098	
Pultenaea calycina subsp. *proxena*	P4	3	302497	6274101	
Pultenaea calycina subsp. *proxena*	P4	1	302536	6274111	
Pultenaea calycina subsp. *proxena*	P4	12	302668	6274105	
Pultenaea calycina subsp. *proxena*	P4	10	302685	6274106	
Pultenaea calycina subsp. *proxena*	P4	1	302730	6274096	
Pultenaea calycina subsp. *proxena*	P4	4	302364	6273893	
Pultenaea calycina subsp. *proxena*	P4	3	302348	6273889	
Pultenaea calycina subsp. *proxena*	P4	7	302219	6274098	
Pultenaea calycina subsp. *proxena*	P4	3	302201	6274097	
Pultenaea calycina subsp. *proxena*	P4	2	302178	6274097	
Pultenaea calycina subsp. *proxena*	P4	4	302000	6274103	
Pultenaea calycina subsp. *proxena*	P4	10	301989	6274109	
Pultenaea calycina subsp. *proxena*	P4	2	301966	6274103	
Pultenaea calycina subsp. *proxena*	P4	2	301948	6274099	
Pultenaea calycina subsp. *proxena*	P4	1	301926	6274102	
Pultenaea calycina subsp. *proxena*	P4	3	301900	6274108	
Pultenaea calycina subsp. *proxena*	P4	4	301855	6274102	
Pultenaea calycina subsp. *proxena*	P4	8	301798	6274112	
Pultenaea calycina subsp. *proxena*	P4	12	302948	6273503	
Pultenaea calycina subsp. *proxena*	P4	30	302968	6273504	
Pultenaea calycina subsp. *proxena*	P4	5	302982	6273506	
Pultenaea calycina subsp. *proxena*	P4	3	302303	6274321	
Pultenaea calycina subsp. *proxena*	P4	4	302304	6274313	
Pultenaea calycina subsp. *proxena*	P4	6	302294	6274310	
Pultenaea calycina subsp. *proxena*	P4	20	302289	6274289	
Pultenaea calycina subsp. *proxena*	P4	1	302296	6274226	
Pultenaea calycina subsp. *proxena*	P4	3	302320	6274205	

Taxon	Status	Count	Easting	Northing	Comments
Pultenaea calycina subsp. *proxena*	P4	2	302394	6274199	
Pultenaea calycina subsp. *proxena*	P4	2	302462	6274198	
Pultenaea calycina subsp. *proxena*	P4	2	302474	6274199	
Pultenaea calycina subsp. *proxena*	P4	1	302492	6274202	
Pultenaea calycina subsp. *proxena*	P4	3	302557	6273998	
Pultenaea calycina subsp. *proxena*	P4	2	302520	6273999	
Pultenaea calycina subsp. *proxena*	P4	2	302507	6273996	
Pultenaea calycina subsp. *proxena*	P4	7	302499	6274002	
Pultenaea calycina subsp. *proxena*	P4	6	302430	6273994	
Pultenaea calycina subsp. *proxena*	P4	5	302388	6273996	
Pultenaea calycina subsp. *proxena*	P4	3	302375	6274001	
Pultenaea calycina subsp. *proxena*	P4	1	302229	6274206	
Pultenaea calycina subsp. *proxena*	P4	3	302194	6274205	
Pultenaea calycina subsp. *proxena*	P4	1	302185	6274205	
Pultenaea calycina subsp. *proxena*	P4	1	302182	6274197	
Pultenaea calycina subsp. *proxena*	P4	1	302146	6274199	
Pultenaea calycina subsp. *proxena*	P4	4	302082	6274199	
Pultenaea calycina subsp. *proxena*	P4	6	302069	6274193	
Pultenaea calycina subsp. *proxena*	P4	1	302052	6274193	
Pultenaea calycina subsp. *proxena*	P4	1	302040	6274190	
Pultenaea calycina subsp. *proxena*	P4	5	302015	6274192	
Pultenaea calycina subsp. *proxena*	P4	9	301996	6274197	
Pultenaea calycina subsp. *proxena*	P4	2	301955	6274198	
Pultenaea calycina subsp. *proxena*	P4	1	301774	6273999	
Pultenaea calycina subsp. *proxena*	P4	2	301814	6273987	
Pultenaea calycina subsp. *proxena*	P4	4	301820	6273982	
Pultenaea calycina subsp. *proxena*	P4	15	301830	6273982	
Pultenaea calycina subsp. *proxena*	P4	1	301887	6273995	
Pultenaea calycina subsp. *proxena*	P4	10	303035	6273583	
Pultenaea calycina subsp. *proxena*	P4	30	302998	6273393	
Pultenaea calycina subsp. *proxena*	P4	1	302306	6274158	
Pultenaea calycina subsp. *proxena*	P4	1	302310	6274148	
Pultenaea calycina subsp. *proxena*	P4	1	302389	6274149	
Pultenaea calycina subsp. *proxena*	P4	1	302396	6274142	
Pultenaea calycina subsp. *proxena*	P4	1	302415	6274146	
Pultenaea calycina subsp. *proxena*	P4	1	302504	6274149	
Pultenaea calycina subsp. *proxena*	P4	1	302534	6274147	
Pultenaea calycina subsp. *proxena*	P4	1	302618	6274156	
Pultenaea calycina subsp. *proxena*	P4	1	302484	6273941	
Pultenaea calycina subsp. *proxena*	P4	1	302428	6273948	
Pultenaea calycina subsp. *proxena*	P4	11	302006	6274158	
Pultenaea calycina subsp. *proxena*	P4	8	302001	6274156	
Pultenaea calycina subsp. *proxena*	P4	6	301956	6274153	
Pultenaea calycina subsp. *proxena*	P4	8	302204	6273801	
Pultenaea calycina subsp. *proxena*	P4	2	302275	6273799	
Pultenaea calycina subsp. *proxena*	P4	3	302333	6273797	
Pultenaea calycina subsp. *proxena*	P4	1	302348	6273806	
Pultenaea calycina subsp. *proxena*	P4	1	302367	6273809	
Pultenaea calycina subsp. *proxena*	P4	3	302380	6273804	
Pultenaea calycina subsp. *proxena*	P4	1	302442	6273806	
Pultenaea calycina subsp. *proxena*	P4	1	302464	6273802	

Taxon	Status	Count	Easting	Northing	Comments
Pultenaea calycina subsp. *proxena*	P4	2	302481	6273799	
Pultenaea calycina subsp. *proxena*	P4	2	302517	6273802	
Pultenaea calycina subsp. *proxena*	P4	1	302522	6273800	
Pultenaea calycina subsp. *proxena*	P4	1	302525	6273800	
Pultenaea calycina subsp. *proxena*	P4	4	302532	6273799	
Pultenaea calycina subsp. *proxena*	P4	6	302534	6273797	
Pultenaea calycina subsp. *proxena*	P4	1	302543	6273804	
Pultenaea calycina subsp. *proxena*	P4	4	302549	6273802	
Pultenaea calycina subsp. *proxena*	P4	1	302604	6273794	
Pultenaea calycina subsp. *proxena*	P4	1	302533	6273698	
Pultenaea calycina subsp. *proxena*	P4	1	302517	6273702	
Pultenaea calycina subsp. *proxena*	P4	1	302509	6273701	
Pultenaea calycina subsp. *proxena*	P4	2	302504	6273702	
Pultenaea calycina subsp. *proxena*	P4	7	302493	6273701	
Pultenaea calycina subsp. *proxena*	P4	15	301715	6273913	
Pultenaea calycina subsp. *proxena*	P4	5	302246	6274017	
Pultenaea calycina subsp. *proxena*	P4	20	302218	6274260	
Pultenaea calycina subsp. *proxena*	P4	15	302187	6274289	
Pultenaea calycina subsp. *proxena*	P4	10	305076	6274980	
Pultenaea calycina subsp. *proxena*	P4	8	305061	6274984	
Pultenaea calycina subsp. *proxena*	P4	7	305065	6274979	
Pultenaea calycina subsp. *proxena*	P4	6	305071	6275044	
Pultenaea calycina subsp. *proxena*	P4	3	305067	6275083	
Pultenaea calycina subsp. *proxena*	P4	5	301745	6273891	
Pultenaea calycina subsp. *proxena*	P4	10	301743	6273902	
Pultenaea calycina subsp. *proxena*	P4	10	301730	6273914	
Pultenaea calycina subsp. *proxena*	P4	7	302370	6274285	
Pultenaea calycina subsp. *proxena*	P4	5	302325	6273914	
Pultenaea calycina subsp. *proxena*	P4	50	303113	6273533	
Pultenaea calycina subsp. *proxena*	P4	6	302084	6274164	
Pultenaea calycina subsp. *proxena*	P4	8	302271	6274221	
Pultenaea calycina subsp. *proxena*	P4	5	302311	6274260	
Pultenaea calycina subsp. *proxena*	P4	2	302328	6274263	
Pultenaea calycina subsp. *proxena*	P4	18	302342	6274274	
Pultenaea calycina subsp. *proxena*	P4	5	302355	6274298	
Pultenaea calycina subsp. *proxena*	P4	10	302317	6274302	
Pultenaea calycina subsp. *proxena*	P4	1	302326	6273902	
Pultenaea calycina subsp. *proxena*	P4	20	302250	6274289	
Pultenaea calycina subsp. *proxena*	P4	20	302246	6274273	
Pultenaea calycina subsp. *proxena*	P4	20	302504	6273790	
Pultenaea calycina subsp. *proxena*	P4	10	302550	6273766	
Pultenaea calycina subsp. *proxena*	P4	5	301681	6273900	
Pultenaea calycina subsp. *proxena*	P4	15	301697	6273905	
Pultenaea calycina subsp. *proxena*	P4	100	313689	6287592	From regional targeted vegetation survey
Pultenaea calycina subsp. *proxena*	P4	1	313830	6287452	From regional targeted vegetation survey
Pultenaea calycina subsp. *proxena*	P4	200	313956	6287228	From regional targeted vegetation survey
Pultenaea calycina subsp. *proxena*	P4	50	313915	6287074	From regional targeted vegetation survey

Taxon	Status	Count	Easting	Northing	Comments
Pultenaea calycina subsp. *proxena*	P4	5	313883	6287168	From regional targeted vegetation survey
Stachystemon vinosus	P4	1	301087	6274824	
Stachystemon vinosus	P4	1	301109	6274779	
Stachystemon vinosus	P4	1	301110	6274751	
Stachystemon vinosus	P4	5	301119	6274794	
Stachystemon vinosus	P4	2	301132	6274788	
Stachystemon vinosus	P4	2	301127	6274785	
Stachystemon vinosus	P4	5	301145	6274753	
Stachystemon vinosus	P4	2	301163	6274737	
Stachystemon vinosus	P4	1	301131	6274706	
Stachystemon vinosus	P4	1	304519	6273834	
Stachystemon vinosus	P4	1	304523	6273841	
Stachystemon vinosus	P4	1	305307	6275152	
Stachystemon vinosus	P4	68	304796	6272186	
Stachystemon vinosus	P4	2	304990	6271348	
Stachystemon vinosus	P4	9	304926	6272078	
Stachystemon vinosus	P4	7	304876	6272753	
Stachystemon vinosus	P4	30	304873	6272206	
Stachystemon vinosus	P4	35	304923	6272203	
Stachystemon vinosus	P4	1	304816	6271698	
Stachystemon vinosus	P4	1	304927	6271295	
Stachystemon vinosus	P4	1	304923	6271228	
Stachystemon vinosus	P4	7	301104	6274762	
Stachystemon vinosus	P4	2	301094	6274771	
Stachystemon vinosus	P4	2	301080	6274799	
Stachystemon vinosus	P4	2	301069	6274822	
Stachystemon vinosus	P4	4	304525	6273787	
Stachystemon vinosus	P4	6	301117	6274764	
Stachystemon vinosus	P4	1	301125	6274754	
Stachystemon vinosus	P4	4	301131	6274745	
Stachystemon vinosus	P4	4	301139	6274733	
Stachystemon vinosus	P4	2	301153	6274724	
Stachystemon vinosus	P4	2	301166	6274714	
Stachystemon vinosus	P4	2	301166	6274722	
Stachystemon vinosus	P4	7	301154	6274745	
Stachystemon vinosus	P4	3	301109	6274755	
Stachystemon vinosus	P4	1	301114	6274747	
Stachystemon vinosus	P4	5	301119	6274738	
Stachystemon vinosus	P4	2	301114	6274731	
Stachystemon vinosus	P4	2	301117	6274715	
Stachystemon vinosus	P4	2	301136	6274715	
Stachystemon vinosus	P4	2	301150	6274693	
Stachystemon vinosus	P4	1	301124	6274733	
Stachystemon vinosus	P4	1	301087	6274810	
Stachystemon vinosus	P4	8	304496	6273841	
Stachystemon vinosus	P4	10	304492	6273831	
Stachystemon vinosus	P4	5	304489	6273824	
Stachystemon vinosus	P4	2	304517	6273853	
Stachystemon vinosus	P4	3	304506	6273839	
Stachystemon vinosus	P4	4	304510	6273828	

Taxon	Status	Count	Easting	Northing	Comments
Stachystemon vinosus	P4	6	304528	6273801	
Stachystemon vinosus	P4	2	304536	6273791	
Stachystemon vinosus	P4	2	304492	6273894	
Stachystemon vinosus	P4	10	304521	6273791	
Synaphea aff. *drummondii*			303659	6274936	
Synaphea aff. *drummondii*		1	304796	6272186	
Synaphea aff. *drummondii*		1	304943	6274420	
Synaphea aff. *drummondii*		1	304942	6274457	
Synaphea aff. *drummondii*		1	304945	6274912	
Synaphea aff. *drummondii*		5	301045	6274078	
Synaphea aff. *drummondii*		2	300639	6271246	
Synaphea aff. *drummondii*		5	300765	6271213	
Synaphea aff. *drummondii*		2	300778	6271211	
Synaphea aff. *drummondii*		5	300793	6271208	
Synaphea aff. *drummondii*		5	300830	6271194	
Synaphea aff. *drummondii*		5	300846	6271181	
Synaphea aff. *drummondii*		3	300910	6271168	
Synaphea aff. *drummondii*		2	300924	6271163	
Synaphea aff. *drummondii*		5	300949	6271158	
Synaphea aff. *drummondii*		8	300989	6271154	
Synaphea aff. *drummondii*		10	301009	6271154	
Synaphea aff. *drummondii*		1	301103	6271131	
Synaphea aff. *drummondii*		4	301113	6271133	
Synaphea aff. *drummondii*		3	301152	6271125	
Synaphea aff. *drummondii*		4	301163	6271110	
Synaphea aff. *drummondii*		1	301137	6271121	
Synaphea aff. *drummondii*		5	301069	6271129	
Synaphea aff. *drummondii*		3	301006	6271137	
Synaphea aff. *drummondii*		5	300887	6271146	
Synaphea aff. *drummondii*		3	300863	6271148	
Synaphea aff. *drummondii*		7	300836	6271166	
Synaphea aff. *drummondii*		5	300809	6271165	
Synaphea aff. *drummondii*		3	300793	6271167	
Synaphea aff. *drummondii*		2	300781	6271178	
Synaphea aff. *drummondii*		10	300751	6271188	
Synaphea aff. *drummondii*		8	300700	6271216	
Synaphea aff. *drummondii*		5	300618	6271218	
Synaphea aff. *drummondii*		3	300195	6276445	
Synaphea aff. *drummondii*		5	300196	6276431	
Synaphea aff. *drummondii*		3	300237	6276376	
Synaphea aff. *drummondii*		5	300252	6276350	
Synaphea aff. *drummondii*		7	300263	6276333	
Synaphea aff. *drummondii*		7	300299	6276274	
Synaphea aff. *drummondii*		2	300320	6276248	
Synaphea aff. *drummondii*		4	300364	6276175	
Synaphea aff. *drummondii*		3	300623	6275795	
Synaphea aff. *drummondii*		1	300557	6275899	
Synaphea aff. *drummondii*		4	300529	6275921	
Synaphea aff. *drummondii*		3	301041	6275207	
Synaphea aff. *drummondii*		1	301054	6275137	
Synaphea aff. *drummondii*		2	300208	6276413	

Taxon	Status	Count	Easting	Northing	Comments
Synaphea aff. *drummondii*		1	300215	6276398	
Synaphea aff. *drummondii*		1	300218	6276378	
Synaphea aff. *drummondii*		1	300243	6276337	
Synaphea aff. *drummondii*		2	300697	6275688	
Synaphea aff. *drummondii*		1	300767	6275547	
Synaphea aff. *drummondii*		1	300851	6275439	
Synaphea aff. *drummondii*		1	300910	6275382	
Synaphea aff. *drummondii*		4	300923	6275360	
Synaphea aff. *drummondii*		2	300936	6275352	
Synaphea aff. *drummondii*		3	300953	6275330	
Synaphea aff. *drummondii*		1	300864	6275379	
Synaphea aff. *drummondii*		3	301019	6275185	
Synaphea aff. *drummondii*		2	301031	6275117	
Synaphea aff. *drummondii*		1	301037	6275091	
Synaphea aff. *drummondii*		2	301038	6275052	
Synaphea aff. *drummondii*		3	301037	6275037	
Synaphea aff. *drummondii*		1	301041	6274932	
Synaphea aff. *drummondii*		2	301027	6275010	
Synaphea aff. *drummondii*		2	301030	6275038	
Synaphea aff. *drummondii*		3	301031	6275053	
Synaphea aff. *drummondii*		1	301027	6275084	
Synaphea aff. *drummondii*		2	301010	6275176	
Synaphea aff. *drummondii*		1	301010	6275184	
Synaphea aff. *drummondii*		1	304843	6274444	
Synaphea aff. *drummondii*		2	304989	6274760	
Synaphea aff. *drummondii*		2	301054	6274276	
Synaphea aff. *drummondii*		1	301056	6274246	
Synaphea aff. *drummondii*		1	301055	6274214	
Synaphea aff. *drummondii*		1	301056	6274129	
Synaphea aff. *drummondii*		3	301049	6274093	
Synaphea aff. *drummondii*		2	301059	6274164	
Synaphea aff. *drummondii*		1	301058	6274181	
Synaphea aff. *drummondii*		6	300809	6271204	
Synaphea aff. *drummondii*		2	300839	6271187	
Synaphea aff. *drummondii*		1	300954	6271155	
Synaphea aff. *drummondii*		1	300992	6271152	
Synaphea aff. *drummondii*		1	301124	6271139	
Synaphea aff. *drummondii*		1	301174	6271098	
Synaphea aff. *drummondii*		3	301158	6271092	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		1	301167	6271106	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		4	305372	6275156	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		5	305340	6275152	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		3	305314	6275149	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		15	305252	6275148	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		15	305229	6275152	

Taxon	Status	Count	Easting	Northing	Comments
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		10	305200	6275154	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		15	305169	6275155	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		15	305149	6275159	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		1	301128	6271120	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		1	305235	6275148	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		6	305151	6275152	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)		1	305243	6275150	

Appendix I: Location Details of Introduced Flora Recorded within the Study Area

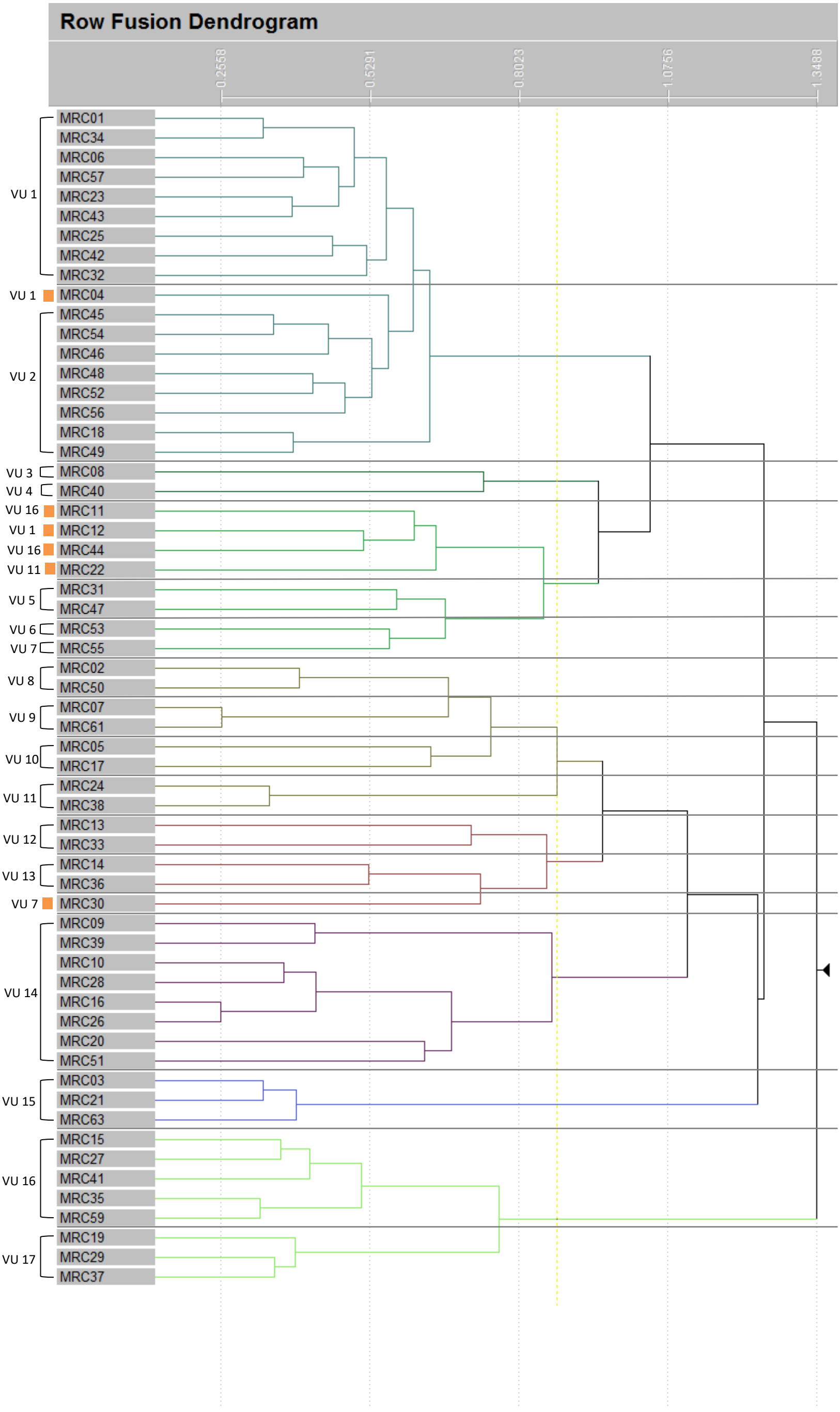
Note: All locations are in datum GDA94, Zone 51

Taxon	Count	Easting	Northing	Comments
Briza minor		301652.9	6271729	
Cirsium vulgare		301205.4	6274768	
Cirsium vulgare		303673	6271040	
Conyza bonariensis		303673	6271040	
Conyza sp.		301205.4	6274768	
Cotula coronopifolia		301205.4	6274768	
Cotula coronopifolia		303485.9	6274894	
Ehrharta longiflora		303485.9	6274894	
Ehrharta longiflora		303831.8	6272840	
Ehrharta longiflora		303673	6271040	
Ehrharta longiflora		302433.3	6271874	
Ehrharta longiflora		301205.4	6274768	
Ehrharta longiflora		301084.5	6272573	
Ehrharta longiflora		301259.9	6273358	
Ehrharta longiflora	50	303143.4	6272835	
Ehrharta longiflora	50	304397.5	6272575	
Ehrharta longiflora	100	301759.2	6271608	
Galium murale		303673	6271040	
Hypochaeris glabra		302433.3	6271874	
Hypochaeris glabra		302080.7	6272949	
Hypochaeris glabra		303673	6271040	
Hypochaeris glabra		303831.8	6272840	
Hypochaeris glabra		304753.4	6273533	
Hypochaeris glabra		304700.9	6272552	
Hypochaeris glabra		301652.9	6271729	
Hypochaeris glabra		301149.5	6272831	
Hypochaeris glabra		301084.5	6272573	
Hypochaeris glabra		304156.2	6271154	
Hypochaeris glabra		304788.1	6271014	
Lepidium africanum		301205.4	6274768	
Lysimachia arvensis		301084.5	6272573	
Lysimachia arvensis		301446.3	6273254	
Lysimachia arvensis		303673	6271040	
Lysimachia arvensis		303831.8	6272840	
Lysimachia arvensis		301596.8	6273669	
Parapholis incurva		303485.9	6274894	
Parentucellia latifolia		304700.9	6272552	
Pentameris airoides subsp. *airoides*		303831.8	6272840	
?*Pentameris airoides* subsp. *airoides*		301084.5	6272573	
Rumex crispus		301205.4	6274768	
Solanum nigrum		301205.4	6274768	
Solanum nigrum		303673	6271040	
Sonchus oleraceus		301205.4	6274768	
Sonchus oleraceus		303673	6271040	
Sonchus oleraceus		303485.9	6274894	
Sonchus oleraceus		303831.8	6272840	
Sonchus oleraceus		304788.1	6271014	
Ursinia anthemoides subsp. *anthemoides*		301084.5	6272573	
Ursinia anthemoides subsp. *anthemoides*		304700.9	6272552	

Taxon	Count	Easting	Northing	Comments
Ursinia anthemoides subsp. *anthemoides*		303831.8	6272840	
Ursinia anthemoides subsp. *anthemoides*		302433.3	6271874	
Vellereophyton dealbatum		303673	6271040	
Vellereophyton dealbatum		301205.4	6274768	
Vulpia myuros		301259.9	6273358	

Appendix J: Classification Analysis Dendrogram of Quadrats Established in the Study Area

Note: Quadrats shaded with orange have been manually reallocated to the VU as described



WOODMAN ENVIRONMENTAL

Appendix K: Matrix of Vascular Plant Taxa Recorded within Each Vegetation Unit Described in the Study Area

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Acacia assimilis subsp. *atroviridis*							X										
Acacia brachyclada	X																
Acacia chrysocephala	X															X	
Acacia curvata	X	X															
Acacia cyclops	X	X					X	X	X	X		X	X	X			
Acacia glaucoptera		X					X		X	X				X			
Acacia gonophylla	X	X														X	
Acacia harveyi				X									X	X			
Acacia ingrata	X	X								X					X	X	
Acacia lachnophylla															X		
Acacia latipes subsp. *latipes*	X							X				X					
Acacia myrtifolia																X	
Acacia pravifolia	X	X															
Acacia saligna subsp. *lindleyi* ms												X	X				
Acacia spongolitica				X													
Acacia sulcata var. *platyphylla*		X			X	X		X		X	X		X				
Acacia verriculum									X								
Acrotriche cordata	X	X															
Acrotriche ramiflora							X		X								
Adenanthos cuneatus																	X
Allocasuarina campestris					X	X											
Allocasuarina huegeliana								X		X							
Allocasuarina humilis																X	X
Allocasuarina microstachya																X	
Allocasuarina thuyoides																X	X
Alyogyne sp. Southern Coast (A.S. George 289)												X	X	X			
Amphipogon avenaceus																X	
Amphipogon turbinatus	X							X								X	X
Anarthria humilis																X	X
Andersonia caerulea																X	X
Andersonia macranthera																X	X
Andersonia parvifolia	X																

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Anthotium humile	X	X															
Aotus sp. Esperance (P.G. Wilson 7904)																	X
Aotus sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)	X	X							X	X				X			
Apium annuum												X					
Argentipallium niveum																X	
Argentipallium tephrodes	X																
Astroloma microphyllum	X	X			X			X						X			
Astroloma serratifolium								X									
Astroloma tectum																X	
Astus tetragonus					X	X					X						
Austrostipa elegantissima		X			X			X	X		X						
Austrostipa ?*variabilis*								X									
Austrostipa variabilis								X						X			
Baeckea latens	X	X															
Baeckea pachyphylla	X	X									X						
Banksia alliacea	X															X	
Banksia armata var. *ignicida*	X															X	
Banksia baueri																	X
Banksia media	X	X	X													X	
Banksia obovata																X	X
Banksia tenuis var. *tenuis*	X																
Banksia violacea																X	
Beaufortia micrantha																X	
Beaufortia schaueri	X															X	
Billardiera coriacea	X	X		X										X		X	
Billardiera fusiformis							X	X	X	X			X	X			
Billardiera venusta	X															X	
Blennospora drummondii								X			X						
Boronia inconspicua	X	X		X			X							X			
Boronia inornata subsp. *inornata*	X	X													X		
Boronia inornata subsp. *leptophylla*	X	X															
Boronia oxyantha var. *brevicalyx*				X	X												

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Boronia ramosa subsp. *anethifolia*																X	X
Boronia scabra subsp. *scabra*		X			X						X		X				
Boronia subsessilis																X	X
Brachyscome perpusilla											X						
**Briza minor*								X									
Caladenia attingens subsp. *gracillima*					X			X			X			X			
Caladenia brevisura	X							X					X				
Caladenia cairnsiana							X				X						
Caladenia discoidea																	X
Caladenia flava subsp. *flava*							X	X			X		X				
Caladenia horistes									X								
Caladenia longicauda subsp. *eminens*				X													
Caladenia sigmoidea															X		
Caladenia sp.					X												
Calandrinia calyptrata							X	X	X		X						
Calandrinia sp.								X									
Calectasia valida																X	
Callitris roei	X	X			X											X	
Calothamnus gracilis																X	X
Calothamnus quadrifidus subsp. *quadrifidus*					X	X	X			X	X						
Calothamnus villosus						X										X	
Calytrix decandra																X	X
Calytrix leschenaultii	X					X					X					X	
Calytrix tetragona										X							
Carpobrotus sp.												X					
Cassytha flava																X	X
Cassytha glabella forma *dispar*	X	X								X		X				X	X
Cassytha melantha	X	X	X						X	X			X	X	X		
Cassytha racemosa forma *pilosa*	X	X			X											X	
Caustis dioica																X	X
Ceratogyne obionoides								X									
Chamaescilla corymbosa var. *corymbosa*	X				X			X	X	X	X	X		X			

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Chamaescilla spiralis																X	X
Chamelaucium ciliatum				X	X								X			X	
Chamelaucium megalopetalum																	X
Cheilanthes sieberi subsp. *sieberi*								X					X				
Cheiranthera brevifolia	X									X						X	
Chordifex sphacelatus																X	X
Choretrum glomeratum		X													X		
Chorizandra enodis												X					
Chorizema aciculare subsp. *aciculare*	X							X								X	
Chorizema nervosum	X	X															
**Cirsium vulgare*												X	X				
Clematis pubescens													X				
Comesperma ?acerosum																X	
Comesperma calymega																	X
Comesperma polygaloides														X			
Comesperma spinosum	X																
Comesperma volubile	X				X		X	X		X							
Commersonia rotundifolia (P3)														X			
Conostephium drummondii	X																
Conostylis argentea																X	
Conostylis vaginata																	X
Conothamnus aureus																X	X
**Conyza bonariensis*													X				
**Conyza* sp.												X					
Coopernookia polygalacea	X	X					X			X							
Corunastylis fuscoviridis		X															
Cotula australis												X	X				
**Cotula coronopifolia*												X					
Crassula closiana								X			X		X				
Crassula colorata var. *colorata*								X									
Cryptandra graniticola					X												
Cryptandra myriantha											X					X	

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Cryptandra nutans	X																
Cryptandra pungens											X					X	
Cryptandra wilsonii	X	X															
Cyanicula aperta	X	X	X		X	X	X							X		X	
Cyathochaeta equitans																	X
Cyathostemon tenuifolius	X	X	X				X										
Cyperaceae sp.		X															
Cyrtostylis huegelii					X												
Dampiera angulata subsp. Peak Charles (K.R. Newbey 5402)																X	
Dampiera angulata subsp. *angulata*	X	X	X	X		X	X									X	
Dampiera lavandulacea	X	X			X	X	X			X	X					X	
Dampiera sp. Ravensthorpe (G.F. Craig 8277) (P3)				X													
Darwinia sp. Lake Cobham (K. Newbey 3262)						X											
Darwinia sp. Ravensthorpe (G.J. Keighery 8030)																X	
Darwinia vestita																X	X
Daucus glochidiatus								X	X	X	X	X					
Daviesia aphylla	X	X												X			
Daviesia articulata	X	X															
Daviesia incrassata subsp. *reversifolia*																X	X
Daviesia lancifolia	X															X	
Daviesia nematophylla														X			
Daviesia teretifolia	X															X	
Desmocladus lateriflorus	X							X		X						X	X
Dianella brevicaulis	X	X								X	X		X	X			
Dianella revoluta	X				X		X			X			X	X			
Dichondra repens													X				
Dicot sp.								X			X						
Disphyma crassifolium subsp. *clavellatum*												X					
Diuris decrementa											X						
Diuris ?*littoralis*			X														
Diuris littoralis									X								
Diuris sp.					X					X							

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Dodonaea caespitosa	X	X			X		X	X	X	X							
Dodonaea ptarmicaefolia				X									X				
Dodonaea stenozyga		X													X		
Drosera glanduligera										X	X						
Drosera lowriei								X								X	X
Drosera macrantha	X				X		X	X		X	X					X	
Drosera menziesii																	X
Drosera scorpioides																X	
Drosera trichocaulis											X						X
**Ehrharta longiflora*								X		X	X	X	X				
Elythranthera brunonis																X	
Enchylaena tomentosa var. *tomentosa*								X					X				
Eriochilus dilatatus	X	X		X	X				X					X			
Erodium crinitum								X	X				X				
Eucalyptus conglobata subsp. *conglobata*	X	X			X			X		X					X		
Eucalyptus densa	X		X	X			X										
Eucalyptus dielsii														X			
Eucalyptus ecostata			X			X										X	X
Eucalyptus extensa														X			
Eucalyptus flocktoniae subsp. *flocktoniae*	X	X					X								X		
Eucalyptus incrassata	X																
Eucalyptus indurata															X		
Eucalyptus leptocalyx subsp. *leptocalyx*	X	X											X			X	
Eucalyptus occidentalis								X	X			X	X				
Eucalyptus perangusta	X	X								X							
Eucalyptus phaenophylla subsp. *interjacens*	X	X			X	X	X			X							
Eucalyptus pileata	X	X															
Eucalyptus platypus subsp. *platypus*	X	X	X					X						X			
Eucalyptus pleurocarpa	X	X				X		X			X					X	X
Eucalyptus quadrans									X								
Eucalyptus suggrandis subsp. *suggrandis*	X	X															
Eucalyptus tetraptera	X																

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Eucalyptus uncinata	X															X	
Eutaxia cuneata	X	X							X	X	X					X	
Eutaxia inuncta																	X
Exocarpos aphyllus	X	X							X					X	X		
Exocarpos sparteus	X	X												X	X		
Gahnia ancistrophylla	X	X					X	X	X	X	X					X	
Gahnia aristata	X	X			X	X						X		X			
Gahnia sp. Ravensthorpe (G.F. Craig 5005)	X																
Gahnia trifida												X					
**Galium murale*													X				
Gastrolobium parviflorum	X	X		X	X		X				X						
Gastrolobium spinosum		X														X	
Glischrocaryon roei																X	
Glycocystis beckeri															X		
Gompholobium baxteri	X															X	
Gompholobium confertum																	X
Gompholobium cyaninum																X	
Gompholobium knightianum	X															X	X
Gompholobium marginatum	X							X								X	
Gonocarpus nodulosus								X			X						
Goodenia affinis								X	X	X							
Goodenia concinna	X	X															
Goodenia incana																X	X
Goodenia scapigera subsp. *scapigera*	X	X		X												X	
Grevillea anethifolia					X								X				
Grevillea concinna subsp. *lemanniana*																X	
Grevillea nudiflora	X	X									X					X	
Grevillea oligantha	X	X									X					X	
Grevillea pectinata	X	X												X			
Guichenotia micrantha					X						X						
Haemodorum sp.										X						X	
Hakea corymbosa																X	X

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Hakea cygna subsp. *cygna*																X	
Hakea ilicifolia	X			X												X	
Hakea laurina	X	X		X					X		X		X	X			
Hakea lissocarpha	X	X					X	X	X	X						X	
Hakea marginata	X																
Hakea nitida								X									
Hakea pandanicarpa subsp. *pandanicarpa*																X	
Hakea prostrata																X	
Hakea trifurcata																X	X
Halgania andromedifolia	X																
Helichrysum leucopsideum										X							
Hemigenia teretiuscula						X											
Hibbertia acerosa																	X
Hibbertia gracilipes	X	X					X	X			X					X	X
Hibbertia psilocarpa	X	X											X	X			
Hibbertia pungens	X	X	X	X		X	X	X								X	
Hibbertia rupicola				X					X	X							
Hybanthus floribundus subsp. *adpressus*	X				X												
Hydrocotyle callicarpa											X						
Hydrocotyle pilifera var. *glabrata*									X								
Hydrocotyle rugulosa					X		X	X	X				X	X			
**Hypochaeris glabra*	X				X			X			X		X	X			
Hypolaena fastigiata																	X
Hypolaena humilis	X																
Isopogon polycephalus																X	
Isopogon sp. Fitzgerald River (D.B. Foreman 813)	X															X	
Isopogon trilobus																	X
Isotropis juncea								X	X								
Jacksonia alata																X	
Jacksonia condensata																X	X
Jacksonia viscosa																X	X
Juncus pallidus												X					

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Kunzea affinis						X	X										
Labichea lanceolata subsp. *brevifolia*							X					X	X				
Lagenophora huegelii								X	X	X	X			X			
Lambertia inermis var. *inermis*	X															X	X
Lasiopetalum rosmarinifolium	X	X				X	X	X		X	X			X		X	
Laxmannia omnifertilis	X															X	
Laxmannia paleacea																X	X
Laxmannia ramosa subsp. *deflexa*	X										X						X
Lechenaultia formosa	X																
Lechenaultia tubiflora																	X
**Lepidium africanum*												X					
Lepidobolus chaetocephalus																X	X
Lepidobolus preissianus								X		X						X	
Lepidosperma carphoides	X															X	
Lepidosperma ?fairallianum			X														
Lepidosperma fairallianum	X	X														X	
Lepidosperma fimbriatum	X	X											X				
Lepidosperma gahnioides		X															
Lepidosperma gracile	X	X															
Lepidosperma rigidulum						X											
Lepidosperma sanguinolentum					X	X		X			X						
Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)	X	X					X	X		X			X				
Lepidosperma sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738)	X									X		X					
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'	X					X										X	
Lepidosperma sp. 'Dunns Swamp (R. Davis 724)'																X	
Lepidosperma sp. 'Jerdacuttup (R.L. Barrett RLB 2770)'	X				X	X	X				X					X	
Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596) (P1)	X	X															
Lepidosperma ?sp. Mt Short (S. Kern et al. LCH 17510)						X											
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	X	X			X		X		X		X						
Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)	X	X	X				X			X							
Leporella fimbriata								X		X							X

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Leptomeria pachyclada	X														X		
Leptospermum oligandrum							X				X						
Leptospermum sp. Bandalup Hill (G. Cockerton 11001)																X	
Leptospermum spinescens																X	X
Leucopogon breviflorus																X	X
Leucopogon concinnus	X										X					X	
Leucopogon cuneifolius					X		X				X					X	
Leucopogon aff. *diversifolius*	X																
Leucopogon opponens	X	X	X													X	
Leucopogon sp. Cascades (M. Hislop 3693)																X	
Leucopogon sp. Coujinup (M.A. Burgman 1085)											X					X	X
Leucopogon sp. Newdegate (M. Hislop 3585)	X					X	X									X	
Levenhookia pusilla								X									
Lissanthe rubicunda	X	X															
Logania buxifolia	X	X															
Logania micrantha																	X
Lomandra effusa								X	X	X							
Lomandra micrantha subsp. *teretifolia*	X	X	X					X		X						X	X
Lomandra mucronata	X	X				X	X	X								X	
Lomandra nigricans																X	
Lyginia imberbis																	X
**Lysimachia arvensis*								X	X				X				
Lysinema ciliatum	X	X														X	X
Macrozamia dyeri		X		X									X				
Melaleuca acuminata subsp. *acuminata*				X			X		X				X	X			
Melaleuca calycina	X	X										X					
Melaleuca carrii	X							X			X					X	X
Melaleuca cucullata	X	X												X			
Melaleuca cuticularis												X					
Melaleuca elliptica					X						X						
Melaleuca glaberrima	X	X			X	X	X	X		X		X					
Melaleuca hamata	X	X	X		X	X	X	X		X							

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Melaleuca johnsonii		X															
Melaleuca lateriflora	X	X								X							
Melaleuca pauperiflora subsp. *pauperiflora*		X												X	X		
Melaleuca pentagona var. *pentagona*			X														
Melaleuca pulchella	X																
Melaleuca rigidifolia	X	X				X		X						X		X	
Melaleuca sapientes	X	X												X			
Melaleuca striata																	X
Melaleuca subfalcata	X	X															
Melaleuca thapsina				X													
Melaleuca torquata	X	X												X			
Melaleuca tuberculata var. *tuberculata*																X	X
Melaleuca uncinata											X						
Melaleuca undulata	X	X										X		X			
Mesomelaena stygia subsp. *stygia*																X	X
Mesomelaena tetragona																	X
Microcorys glabra	X	X															
Microcorys subcanescens																X	
Micromyrtus elobata subsp. *elobata*	X					X					X					X	X
Microtis sp.							X				X			X			
Millotia tenuifolia var. *tenuifolia*								X	X		X			X			
Mirbelia ovata	X																
Muehlenbeckia adpressa							X						X				
Nematolepis phebalioides		X													X		
Neurachne alopecuroidea	X	X			X	X	X	X	X	X	X					X	X
Nuytsia floribunda																	X
Olax benthamiana	X	X									X						
Olearia ciliata	X																
Olearia exiguifolia		X															
Olearia imbricata		X															
Olearia passerinoides subsp. *passerinoides*		X															
Opercularia apiciflora	X	X		X	X												

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Opercularia vaginata								X	X	X						X	
Ophioglossum lusitanicum									X								
Oxalis exilis								X	X				X	X			
**Parapholis incurva*												X					
Patersonia lanata forma *lanata*																	X
Patersonia occidentalis var. *occidentalis*	X	X															
Pauridia glabella var. *glabella*									X		X						
*?*Pentameris airoides* subsp. *airoides*								X									
**Pentameris airoides* subsp. *airoides*													X				
Persoonia helix							X									X	
Persoonia striata																X	
Persoonia teretifolia														X			
Petrophile fastigiata		X			X	X	X				X					X	
Petrophile seminuda																X	
Petrophile squamata subsp. northern (J. Monks 40)	X															X	
Petrophile teretifolia	X															X	X
Philotheca gardneri subsp. *gardneri*		X			X	X					X						
Phyllanthus calycinus					X		X	X	X		X		X				
Phymatocarpus maxwellii																	X
Pimelea angustifolia																X	
Pimelea argentea									X				X				
Pimelea brachyphylla	X	X															
Pimelea brevifolia subsp. *brevifolia*																X	
Pimelea cracens													X				
Pimelea imbricata var. *piligera*											X						
Pimelea ?pendens		X												X			
Plantago hispida								X	X		X	X					
Platysace deflexa	X									X						X	
Podotheca gnaphalioides								X									
Pomaderris brevifolia		X															
Poranthera microphylla						X		X			X						
Prostanthera baxteri					X												

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Prostanthera serpyllifolia subsp. *microphylla*		X															
Pterostylis galgula																X	
Pterostylis perculta				X													
Pterostylis recurva	X	X					X		X	X			X	X		X	X
Pterostylis sp.	X	X			X						X		X	X			
Pterostylis timothyi	X	X	X		X		X				X		X	X			
Pterostylis vittata	X																
Ptilotus spathulatus									X								
Pultenaea calycina subsp. *proxena* (P4)	X														X		
Pultenaea indira subsp. *indira*	X															X	
Pyrorchis nigricans								X								X	X
Rhagodia preissii subsp. *preissii*									X								
Rhodanthe laevis								X									
Rinzia communis							X										
**Rumex crispus*												X					
Rytidosperma ?setaceum	X						X	X			X		X	X			
Rytidosperma setaceum														X			
Rytidosperma sp.									X					X			
Salicornia quinqueflora subsp. *quinqueflora*												X					
Santalum acuminatum	X	X								X	X				X		
Schoenus breviculmis											X						
Schoenus brevisetis																X	
Schoenus caespititius																	X
Schoenus curvifolius																	X
Schoenus obtusifolius	X															X	X
Schoenus pleiostemoneus																X	X
Schoenus sesquispiculus	X																
Schoenus subbarbatus																X	
Schoenus subflavus subsp. long leaves (K.L. Wilson 2865)																X	
Schoenus subflavus subsp. *subflavus*	X	X				X		X		X						X	X
Senecio glossanthus				X					X			X	X	X			
Senna sp. Pallinup River (J.W. Green 4847)										X			X				

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
**Solanum nigrum*												X	X				
**Sonchus oleraceus*												X	X	X			
Sphaerolobium daviesioides	X																
Spyridium sp. Jerdacuttup (A. Williams 332)	X															X	
Stachystemon polyandrus																X	
Stachystemon vinosus (P4)																X	
Stackhousia scoparia																X	
Stenanthemum intricatum	X							X			X						
Stylidium albomontis			X	X			X									X	
Stylidium dichotomum						X				X							
Stylidium piliferum							X				X					X	X
Stylidium repens	X															X	X
Stylidium rupestre																	X
Stylidium schoenoides																X	
Stylidium turleyae	X	X															
Stypandra glauca										X							
Styphelia exserta	X	X															
Styphelia intertexta	X	X					X			X				X			
Styphelia sp. Cascades (R. Davis 11037)					X					X	X						
Styphelia sp. South Coast (J.M. Powell 3374)																X	X
Suaeda australis												X					
Synaphea divaricata																X	
Synaphea aff. *drummondii*																X	
Synaphea sp. Jilakin Flat Rocks Rd (R. Butcher et. al RB200)																X	
Taxandria spathulata	X															X	X
Templetonia neglecta	X	X															
Tetrapora preissiana																X	X
Tetrapora verrucosa	X		X	X			X										
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)	X	X			X		X	X	X	X		X				X	
Teucrium sessiliflorum									X								
Thelymitra occidentalis		X															
Thelymitra ?petrophila		X						X									

WOODMAN ENVIRONMENTAL

Taxon	Vegetation Unit																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Thelymitra sp.		X							X					X			
Thelymitra villosa																	X
Thomasia angustifolia								X		X			X	X			
Thomasia foliosa					X				X		X		X				
Thomasia microphylla	X	X															
Thysanotus patersonii	X	X	X		X	X	X	X	X		X		X	X			
Thysanotus sparteus	X															X	X
Trachymene ornata								X	X		X		X				
Tricoryne tenella	X																
Tricostularia exsul																	X
Tricostularia neesii																	X
**Ursinia anthemoides* subsp. *anthemoides*								X			X		X				
**Vellereophyton dealbatum*												X	X				
Verticordia acerosa var. *preissii*	X										X					X	
Verticordia chrysantha						X										X	
Verticordia densiflora var. *cespitosa*																X	X
Verticordia ?inclusa											X						
Verticordia inclusa																X	X
Vittadinia australasica var. *australasica*									X								
**Vulpia myuros*										X							
Wahlenbergia gracilenta				X			X	X	X		X						
Waitzia ?nitida								X			X						
Waitzia suaveolens var. *suaveolens*								X									
Westringia dampieri	X														X		
Wilsonia humilis	X	X												X			
Wurmbea sinora									X								
Xanthorrhoea platyphylla																X	X
Xanthosia huegelii																X	X

Appendix L: Results of Indicator Species Analysis of Vegetation Units

Note: -Shading denotes highest indicator values per taxon;
-Indicator values are shown only for taxa which were significant at P<0.05 (* = p <0.05; ** = p <0.01; *** = p <0.001);
-There were no indicator taxa for VTs 3, 4 and 6 as there is only one quadrat for each of these VUs.

Taxon	Vegetation Unit													
	1	2	5	7	8	9	10	11	12	13	14	15	16	17
*Anthotium humile***	43	20	0	0	0	0	0	0	0	0	0	0	0	0
Cassytha glabella forma *dispar***	24	22	0	0	0	0	7	0	7	0	0	0	2	3
*Daviesia articulata**	46	7	0	0	0	0	0	0	0	0	0	0	0	0
*Daviesia lancifolia**	44	0	0	0	0	0	0	0	0	0	0	0	9	0
*Eucalyptus uncinata***	46	0	0	0	0	0	0	0	0	0	0	0	16	0
*Grevillea oligantha****	51	4	0	0	0	0	0	7	0	0	0	0	1	0
*Hibbertia pungens****	34	13	0	9	9	0	0	0	0	0	0	0	3	0
*Logania buxifolia**	40	14	0	0	0	0	0	0	0	0	0	0	0	0
*Melaleuca rigidifolia****	30	9	0	0	9	0	0	0	0	0	1	0	19	0
*Melaleuca subfalcata****	63	6	0	0	0	0	0	0	0	0	0	0	0	0
*Acacia ingrata****	24	36	0	0	0	0	9	0	0	0	0	4	1	0
*Chorizema nervosum****	14	69	0	0	0	0	0	0	0	0	0	0	0	0
*Coopernookia polygalacea****	24	35	0	9	0	0	9	0	0	0	0	0	0	0
Eucalyptus leptocalyx subsp. *leptocalyx****	32	39	0	0	0	0	0	0	0	10	0	0	1	0
*Grevillea pectinata****	25	47	0	0	0	0	0	0	0	0	1	0	0	0
*Lepidosperma gahnioides**	0	38	0	0	0	0	0	0	0	0	0	0	0	0
*Astus tetragonus**	0	0	60	0	0	0	0	27	0	0	0	0	0	0
*Cyrtostylis huegelii***	0	0	100	0	0	0	0	0	0	0	0	0	0	0
*Lepidosperma sanguinolentum**	0	0	55	0	14	0	0	6	0	0	0	0	0	0
*Leucopogon cuneifolius**	0	0	51	13	0	0	0	6	0	0	0	0	1	0
Philotheca gardneri subsp. *gardneri**	0	1	69	0	0	0	0	8	0	0	0	0	0	0
*Eucalyptus densa***	1	0	0	92	0	0	0	0	0	0	0	0	0	0
*Blennospora drummondii**	0	0	0	0	75	0	0	8	0	0	0	0	0	0
*Caladenia brevisura**	1	0	0	0	63	0	0	0	0	16	0	0	0	0
*Ceratogyne obionoides***	0	0	0	0	100	0	0	0	0	0	0	0	0	0
*Eucalyptus pleurocarpa**	2	1	0	0	33	0	0	4	0	0	0	0	33	4
*Lepidobolus preissianus**	0	0	0	0	61	0	15	0	0	0	0	0	1	0
Lomandra micrantha subsp. *teretifolia***	19	13	0	0	23	0	23	0	0	0	0	0	4	3
*Poranthera microphylla**	0	0	0	0	60	0	0	27	0	0	0	0	0	0
*Rhodanthe laevis***	0	0	0	0	100	0	0	0	0	0	0	0	0	0
*Stenanthemum intricatum**	0	0	0	0	57	0	0	25	0	0	0	0	0	0
Waitzia suaveolens var. *suaveolens***	0	0	0	0	100	0	0	0	0	0	0	0	0	0

Taxon	Vegetation Unit													
	1	2	5	7	8	9	10	11	12	13	14	15	16	17
*Acacia glaucoptera**	0	7	0	7	0	30	7	0	0	0	23	0	0	0
*Calandrinia calyptrata**	0	0	0	11	11	43	0	5	0	0	0	0	0	0
*Eucalyptus quadrans***	0	0	0	0	0	100	0	0	0	0	0	0	0	0
*Exocarpos aphyllus****	4	18	0	0	0	31	0	0	0	0	18	3	0	0
*Isotropis juncea**	0	0	0	0	17	67	0	0	0	0	0	0	0	0
Pauridia glabella var. *glabella***	0	0	0	0	0	75	0	8	0	0	0	0	0	0
*Plantago hispida**	0	0	0	0	11	43	0	5	11	0	0	0	0	0
*Ptilotus spathulatus***	0	0	0	0	0	100	0	0	0	0	0	0	0	0
*Senecio glossanthus**	0	0	0	0	0	47	0	0	12	12	1	0	0	0
*Teucrium sessiliflorum***	0	0	0	0	0	100	0	0	0	0	0	0	0	0
*Melaleuca lateriflora****	22	17	0	0	0	0	43	0	0	0	0	0	0	0
*Caladenia cairnsiana**	0	0	0	21	0	0	0	38	0	0	0	0	0	0
*Drosera glanduligera**	0	0	0	0	0	0	17	67	0	0	0	0	0	0
*Hydrocotyle callicarpa***	0	0	0	0	0	0	0	67	0	0	0	0	0	0
*Leptospermum oligandrum**	0	0	0	17	0	0	0	67	0	0	0	0	0	0
*Melaleuca elliptica**	0	0	21	0	0	0	0	38	0	0	0	0	0	0
*Melaleuca uncinata****	0	0	0	0	0	0	0	100	0	0	0	0	0	0
*Cotula australis**	0	0	0	0	0	0	0	0	50	50	0	0	0	0
*Acacia harveyi***	0	0	0	0	0	0	0	0	0	89	1	0	0	0
*Chamelaucium ciliatum**	0	0	13	0	0	0	0	0	0	52	0	0	10	0
*Grevillea anethifolia**	0	0	17	0	0	0	0	0	0	67	0	0	0	0
*Hakea laurina****	14	21	0	0	0	7	0	3	0	27	2	0	0	0
Labichea lanceolata subsp. *brevifolia**	0	0	0	13	0	0	0	0	13	50	0	0	0	0
*Macrozamia dyeri***	0	1	0	0	0	0	0	0	0	89	0	0	0	0
*Comesperma polygaloides**	0	0	0	0	0	0	0	0	0	0	50	0	0	0
*Eucalyptus dielsii**	0	0	0	0	0	0	0	0	0	0	50	0	0	0
Eucalyptus platypus subsp. *platypus****	0	1	0	0	15	0	0	0	0	0	58	0	0	0
*Melaleuca torquata****	6	1	0	0	0	0	0	0	0	0	60	0	0	0
Boronia inornata subsp. *inornata****	5	4	0	0	0	0	0	0	0	0	0	66	0	0
*Choretrum glomeratum****	0	1	0	0	0	0	0	0	0	0	0	89	0	0
*Dodonaea stenozyga**	0	2	0	0	0	0	0	0	0	0	0	56	0	0
Eucalyptus flocktoniae subsp. *flocktoniae****	21	24	0	8	0	0	0	0	0	0	0	31	0	0

Taxon	Vegetation Unit													
	1	2	5	7	8	9	10	11	12	13	14	15	16	17
*Eucalyptus indurata**	0	0	0	0	0	0	0	0	0	0	0	67	0	0
*Leptomeria pachyclada**	1	0	0	0	0	0	0	0	0	0	0	59	0	0
Melaleuca pauperiflora subsp. *pauperiflora****	0	1	0	0	0	0	0	0	0	0	1	80	0	0
Pultenaea calycina subsp. *proxena* (P4)*	1	0	0	0	0	0	0	0	0	0	0	59	0	0
*Allocasuarina microstachya**	0	0	0	0	0	0	0	0	0	0	0	0	57	0
*Amphipogon avenaceus**	0	0	0	0	0	0	0	0	0	0	0	0	57	0
*Banksia alliacea****	7	0	0	0	0	0	0	0	0	0	0	0	65	0
Banksia armata var. *ignicida****	1	0	0	0	0	0	0	0	0	0	0	0	77	0
*Banksia violacea**	0	0	0	0	0	0	0	0	0	0	0	0	57	0
*Beaufortia micrantha***	0	0	0	0	0	0	0	0	0	0	0	0	71	0
*Billardiera venusta**	1	0	0	0	0	0	0	0	0	0	0	0	49	0
*Conostylis argentea**	0	0	0	0	0	0	0	0	0	0	0	0	43	0
Dampiera angulata subsp. Peak Charles (K.R. Newbey 5402)****	0	0	0	0	0	0	0	0	0	0	0	0	86	0
*Daviesia teretifolia**	1	0	0	0	0	0	0	0	0	0	0	0	63	0
*Drosera scorpioides**	0	0	0	0	0	0	0	0	0	0	0	0	57	0
Goodenia scapigera subsp. *scapigera**	7	1	0	0	0	0	0	0	0	0	0	0	46	0
*Lepidosperma carphoides***	4	0	0	0	0	0	0	0	0	0	0	0	57	0
Lepidosperma sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)'****	3	0	0	0	0	0	0	0	0	0	0	0	71	0
*Leptospermum spinescens**	0	0	0	0	0	0	0	0	0	0	0	0	49	11
Leucopogon sp. Newdegate (M. Hislop 3585)*	2	0	0	16	0	0	0	0	0	0	0	0	48	0
Mesomelaena stygia subsp. *stygia**	0	0	0	0	0	0	0	0	0	0	0	0	48	29
*Microcorys subcanescens**	0	0	0	0	0	0	0	0	0	0	0	0	43	0
*Petrophile seminuda***	0	0	0	0	0	0	0	0	0	0	0	0	71	0
Petrophile squamata subsp. northern (J. Monks 40)*	2	0	0	0	0	0	0	0	0	0	0	0	35	0
Schoenus subflavus subsp. long leaves (K.L. Wilson 2865)*	0	0	0	0	0	0	0	0	0	0	0	0	43	0
Schoenus subflavus subsp. *subflavus**	0	1	0	0	9	0	9	0	0	0	0	0	35	15
*Stachystemon polyandrus**	0	0	0	0	0	0	0	0	0	0	0	0	57	0
*Verticordia chrysantha**	0	0	0	0	0	0	0	0	0	0	0	0	43	0
*Adenanthos cuneatus****	0	0	0	0	0	0	0	0	0	0	0	0	0	100
*Allocasuarina humilis***	0	0	0	0	0	0	0	0	0	0	0	0	21	64
*Allocasuarina thuyoides**	0	0	0	0	0	0	0	0	0	0	0	0	9	47
*Amphipogon turbinatus***	3	0	0	0	10	0	0	0	0	0	0	0	28	38

Taxon	Vegetation Unit													
	1	2	5	7	8	9	10	11	12	13	14	15	16	17
*Andersonia caerulea**	0	0	0	0	0	0	0	0	0	0	0	0	3	55
*Banksia baueri**	0	0	0	0	0	0	0	0	0	0	0	0	0	67
Boronia ramosa subsp. *anethifolia**	0	0	0	0	0	0	0	0	0	0	0	0	3	55
*Caustis dioica***	0	0	0	0	0	0	0	0	0	0	0	0	21	64
*Chamelaucium megalopetalum**	0	0	0	0	0	0	0	0	0	0	0	0	0	67
*Chordifex sphacelatus****	0	0	0	0	0	0	0	0	0	0	0	0	2	87
*Conothamnus aureus***	0	0	0	0	0	0	0	0	0	0	0	0	6	78
*Conostylis vaginata***	0	0	0	0	0	0	0	0	0	0	0	0	0	67
*Darwinia vestita**	0	0	0	0	0	0	0	0	0	0	0	0	9	47
*Eutaxia inuncta***	0	0	0	0	0	0	0	0	0	0	0	0	0	67
*Gompholobium confertum**	0	0	0	0	0	0	0	0	0	0	0	0	0	67
*Goodenia incana***	0	0	0	0	0	0	0	0	0	0	0	0	21	64
*Hibbertia acerosa****	0	0	0	0	0	0	0	0	0	0	0	0	0	100
*Hypolaena fastigiata****	0	0	0	0	0	0	0	0	0	0	0	0	0	100
*Isopogon trilobus**	0	0	0	0	0	0	0	0	0	0	0	0	0	67
*Jacksonia viscosa****	0	0	0	0	0	0	0	0	0	0	0	0	13	70
Lambertia inermis var. *inermis****	1	0	0	0	0	0	0	0	0	0	0	0	2	81
*Lechenaultia tubiflora**	0	0	0	0	0	0	0	0	0	0	0	0	0	67
*Lepidobolus chaetocephalus***	0	0	0	0	0	0	0	0	0	0	0	0	21	64
Leucopogon sp. Coujinup (M.A. Burgman 1085)*	0	0	0	0	0	0	0	10	0	0	0	0	2	39
*Lyginia imberbis****	0	0	0	0	0	0	0	0	0	0	0	0	0	100
*Lysinema ciliatum****	9	1	0	0	0	0	0	0	0	0	0	0	22	44
*Mesomelaena tetragona***	0	0	0	0	0	0	0	0	0	0	0	0	0	67
Micromyrtus elobata subsp. *elobata***	1	0	0	0	0	0	0	5	0	0	0	0	23	45
*Nuytsia floribunda***	0	0	0	0	0	0	0	0	0	0	0	0	0	67
*Petrophile teretifolia****	1	0	0	0	0	0	0	0	0	0	0	0	2	81
*Schoenus curvifolius****	0	0	0	0	0	0	0	0	0	0	0	0	0	100
*Stylidium repens****	1	0	0	0	0	0	0	0	0	0	0	0	2	81
*Taxandria spathulata****	1	0	0	0	0	0	0	0	0	0	0	0	6	73
*Tricostularia neesii***	0	0	0	0	0	0	0	0	0	0	0	0	0	67
*Xanthosia huegelii**	0	0	0	0	0	0	0	0	0	0	0	0	3	55

Appendix M: Regional Targeted Vegetation Survey Data

Part 1 – VU Regional Location Notes

Vegetation Unit: 2
Location: 1
Location Description: Crown Land (Shire of Ravensthorpe?) (Uncleared), Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area)

Note Point: 1
GPS Location: 293175 E 6284729 N
Notes: Taxa present: *Eucalyptus leptocalyx*, *Eucalyptus flocktoniae, Eucalyptus suggrandis, Grevillea pectinata, Coopernookia polygalacea Daviesia aphylla*, *Melaleuca hamata*, *Melaleuca sapientes* and *Melaleuca lateriflora*. Soil and substrate: clay with mixed gravels.
Photo:

Note Point: 2
GPS Location: 293435 E 6284739 N
Notes: As for Note Point 1, however, area has been relatively recently burnt.

Vegetation Unit: 2
Location: 2
Location Description: Crown Land (Shire of Ravensthorpe?) (Uncleared) and Parkland Reserve, Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area)

Note Point: 1
GPS Location: 294046 E 6285107 N
Notes: As for Location 1, Note Point 1. Extensive areas around this point (general locality) on both sides of Rawlinson Rd.

Note Point: 2
GPS Location: 294916 E 6285675 N
Notes: As for Location 1, Note Point 1. Occurs as part of a mosaic with patches of *Eucalyptus* mallet species-dominated vegetation.

Vegetation Unit: 2
Location: 3
Location Description: Crown Land (Shire of Ravensthorpe?) (Uncleared) and Parkland Reserve, Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area)

Note Point: 1
GPS Location: 295867 E 6286306 N
Notes: As for Location 1, Note Point 1. Vegetation recently burnt on northern side of Rawlinson Rd.

Vegetation Unit: 2
Location: 4
Location Description: Parkland Reserve, Young River Corridor, near Mills Road crossing (10 km north-east of Study Area)

Note Point: 1
GPS Location: 311799 E 6282417 N
Notes: Taxa present: *Eucalyptus leptocalyx*, *Eucalyptus flocktoniae, Eucalyptus suggrandis, Grevillea pectinata, Coopernookia polygalacea Daviesia aphylla*, *Melaleuca hamata*, *Melaleuca undulata, Gahnia ancistrophylla*. Soil and substrate: clay with mixed gravels. Present in a mosaic with vegetation similar to VU 1.

Vegetation Unit: 7
Location: 1
Location Description: Parkland Reserve, Munglinup River Corridor, just north of Mills Road (2 km north-west of Study Area)

Note Point: 1
GPS Location: 298244 E 6278447 N
Notes: Sandstone breakaway. Taxa present: *Eucalyptus flocktoniae*, *Eucalyptus conglobata*, *Gastrolobium parviflorum*, *Calothamnus quadrifidus*, *Hakea lissocarpha* and *Melaleuca hamata.*

Vegetation Unit: 9
Location: 1
Location Description: Parkland Reserve, Munglinup River Corridor, just north of Mills Road (2 km north-west of Study Area)

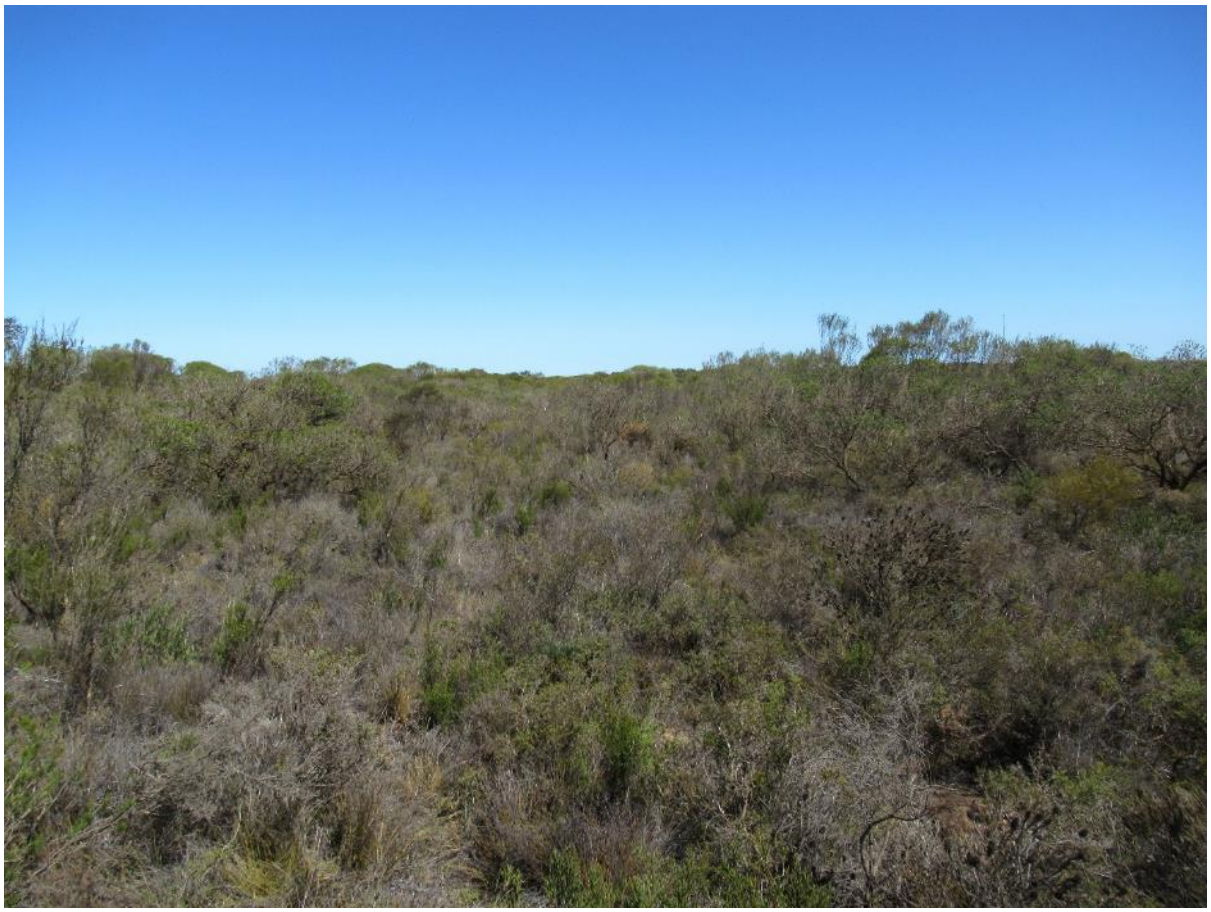
Note Point: 1
GPS Location: 298600 E 6278464 N
Notes: Slope above Munglinup River. Taxa present: *Eucalyptus occidentalis, Acacia glaucoptera*, *Acacia cyclops*, *Phyllanthus calycinus*, *Lomandra effusa* and *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Acacia acuminata*, *Allocasuarina huegeliana*, *Thomasia angustifolia*
Photo:

Vegetation Unit: 10
Location: 1
Location Description: Parkland Reserve, Munglinup River Corridor, just north of Mills Road (2 km north-west of Study Area)

Note Point: 1
GPS Location: 298264 E 6278312 N
Notes: Top of slope above Munglinup River. Taxa present: Mixed eucalypts (*Eucalyptus conglobata*, *Eucalyptus leptocalyx*, *Eucalyptus flocktoniae*), *Calothamnus quadrifidus*, *Hakea lissocarpha, Melaleuca hamata*, *Gahnia ancistrophylla, Gastrolobium parviflorum*, *Acacia glaucoptera*.

Vegetation Unit: 11
Location: 1
Location Description: East Naemup Nature Reserve (5 km west of Study Area)

Note Point: 1
GPS Location: 296330 E 6272730 N
Notes: Taxa present: *Melaleuca uncinata*, *Acacia sulcata, Calothamnus quadrifidus*, occasional *Eucalyptus pleurocarpa*, *Melaleuca tuberculata*, *Lepidobolus preissianus*, *Eucalyptus uncinata*, but *Melaleuca elliptica* absent. Soil and substrate: granite-derived over granite outcropping.
Photo:

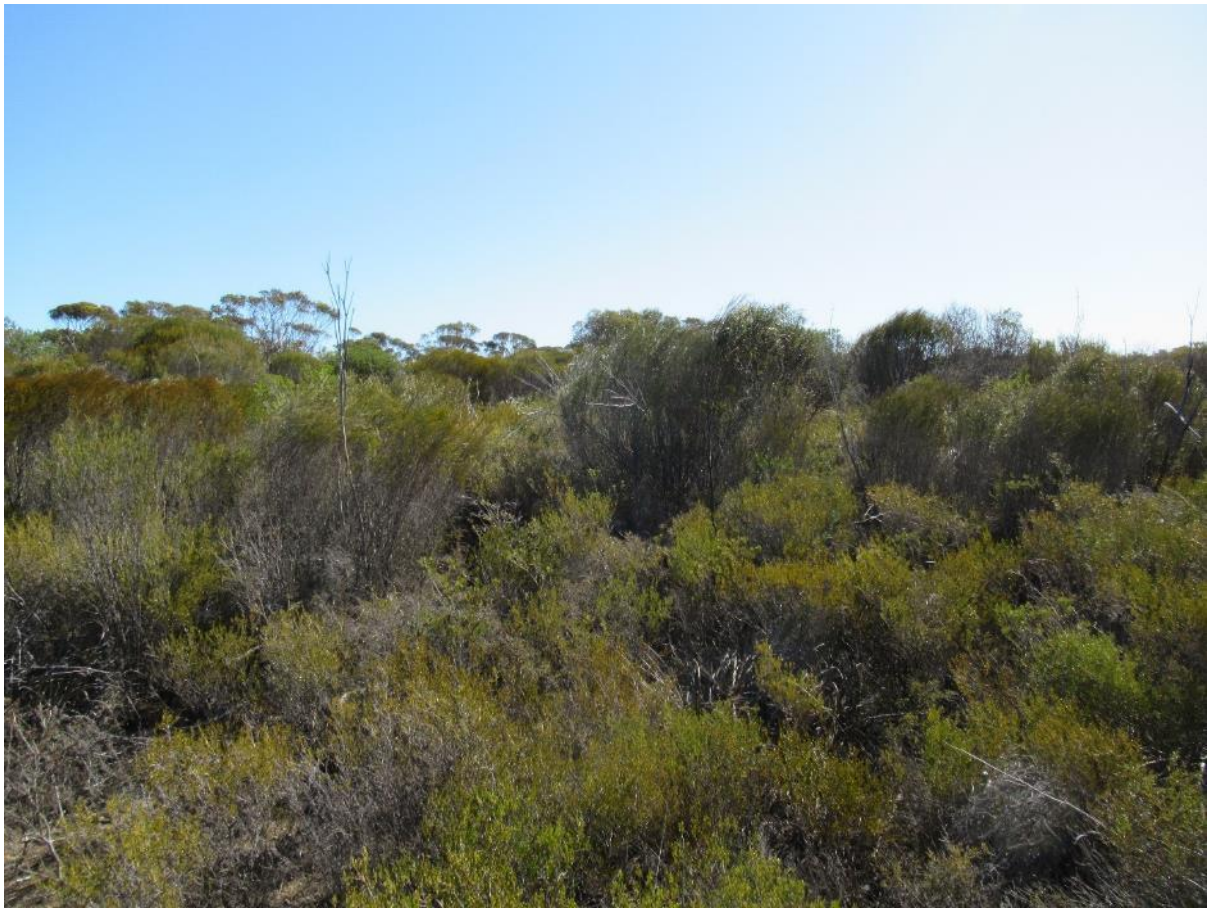


Note Point: 2
GPS Location: 296211 E 6272697 N
Notes: Similar to Note Point 1, *Melaleuca uncinata*, *Acacia sulcata, Astus tetragonus*, *Leptospermum oligandrum* and *Melaleuca elliptica*. Soil and substrate: granite-derived over granite outcropping.

Note Point: 3
GPS Location: 296004 E 6273742 N
Notes: Similar to Note Point 1, *Melaleuca uncinata*, *Acacia sulcata, Calothamnus quadrifidus*. Soil and substrate: granite-derived over granite outcropping.
Photo:

Vegetation Unit: 11
Location: 2
Location Description: Crown Land (Shire of Ravensthorpe?) (Uncleared), Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area)

Note Point: 1
GPS Location: 292954 E 6284715 N
Notes: Similar to Location 1 note points, with *Melaleuca uncinata*, *Acacia sulcata*, *Calothamnus quadrifidus*, limited surface granite outcropping here.
Photo:



Vegetation Unit: 11
Location: 3
Location Description: Crown Land (Shire of Ravensthorpe?) (Uncleared), Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area)

Note Point: 1
GPS Location: 293801 E 6284946 N
Notes: Similar to Location 1 note points, with *Melaleuca uncinata*, *Acacia sulcata*, *Calothamnus quadrifidus*.

Vegetation Unit: 11
Location: 4
Location Description: Crown Land (Shire of Ravensthorpe?) (Uncleared), Munglinup River Corridor, Rawlinson Road (10 km north-west of Study Area)

Note Point: 1
GPS Location: 295637 E 6286280 N
Notes: Similar to Location 1 note points, with *Melaleuca uncinata*, *Acacia sulcata*, *Astus tetragonus*, limited surface granite here.

Vegetation Unit: 11
Location: 5
Location Description: Parkland Reserve, Young River Corridor, between Oldfield and Mills Roads (16 km north-east of Study Area)

Note Point: 1
GPS Location: 311935 E 6289304 N
Notes: Taxa present: *Melaleuca uncinata*, *Acacia sulcata*, *Leptospermum oligandrum, Melaleuca elliptica*, limited surface granite here.
Photo:

Vegetation Unit: 11
Location: 6
Location Description: Parkland Reserve, Young River Corridor, near Mills Road crossing (11 km north-east of Study Area)

Note Point: 1
GPS Location: 314232 E 6282116 N
Notes: Similar to VU 11; *Melaleuca uncinata* dominant with surface granite, other characteristic taxa not seen but may be present in general area.

Vegetation Unit: 15
Location: 1
Location Description: Parkland Reserve, Young River Corridor, between Oldfield and Mills Roads (15 km north-east of Study Area)

Note Point: 1
GPS Location: 313689 E 6287592 N
Notes: Similar to VU 15; *Eucalyptus indurata* together with *Eucalyptus extensa* and *Eucalyptus densa*, *Pultenaea calycina* subsp. *proxena*, *Exocarpos aphyllus*, *Melaleuca cucullata* and *Melaleuca* sp. (unidentified). Many species characteristic of VU 15 (especially *Melaleuca pauperiflora*, *Boronia inornata*) absent. Soils are calcareous clay loam with calcareous stones, no outcropping present.
Photo:

Note Point: 2
GPS Location: 313876 E 6287423 N
Notes: Similar to Note Point 1, but also occasional *Boronia inornata*, *Choretrum glomeratum*, and *Melaleuca torquata*; *Melaleuca pauperiflora* absent.

Note Point: 3
GPS Location: 313955 E 6287227 N
Notes: Similar to Note Point 1, but *Eucalyptus indurata* absent, and some dolerite outcropping present.

Note Point: 4

GPS Location: 313915 E 6287074 N

Notes: Similar to VU 15, *Eucalyptus conglobata* dominant, *Pultenaea calycina* subsp. *proxena*, *Exocarpos aphyllus*, *Melaleuca acuminata*. However, *Eucalyptus indurata*, *Melaleuca pauperiflora* and *Boronia inornata* subsp. *inornata* absent. Significant amount of calcareous rock at surface.

Photo:

Part 2 – VU Extrapolation Mapping Notes

Note Point: 1
Location: 299927 E 6275931 N
Vegetation Unit: 7
Notes: Sandstone breakaway. Taxa present: *Eucalyptus flocktoniae*, *Eucalyptus densa, Melaleuca hamata*, *Gastrolobium parviflorum, Hakea lissocarpha, Hibbertia pungens, Calothamnus quadrifidus, Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798).
Photo:

Note Point: 2
Location: 299731 E 6276084 N
Vegetation Unit: 8
Notes: Slope to Munglinup River. Appears very similar to VU 8, *Eucalyptus occidentalis*, *Hakea lissocarpha, Thomasia floribunda, Lepidosperma sanguinolentum*, *Dodonaea stenozyga*.
Photo:

Note Point: 3
Location: 300525 E 6275050 N
Vegetation Unit: 7
Notes: Sandstone breakaway. Taxa present: *Eucalyptus flocktoniae*, *Eucalyptus densa, Melaleuca hamata, Hakea lissocarpha, Hibbertia pungens, Calothamnus quadrifidus, Lasiopetalum rosmarinifolium*.
Photo:

Note Point: 4
Location: 300195 E 6275007 N
Vegetation Unit: 8
Notes: Slope to Munglinup River. Taxa present: *Eucalyptus occidentalis* (dominant), *Eucalyptus pleurocarpa, Melaleuca hamata, Acacia cyclops, Hakea lissocarpha, Calothamnus quadrifidus, Lepidosperma sanguinolentum, Labichea lanceolata* and occasional (scattered) *Acacia acuminata*
Photo:

Note Point: 5
Location: 302193 E 6268680 N
Vegetation Unit: 8
Notes: Slope to Munglinup River. Taxa present: *Eucalyptus occidentalis* (dominant), *Eucalyptus pleurocarpa, Allocasuarina huegeliana, Lepidosperma sanguinolentum, Phyllanthus calycinus*, *Acacia verriculum* and occasional (scattered) *Acacia acuminata.*
Photo:

Appendix N: Assessment of Quadrats against Criteria for 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia'

VU	Quadrat	Total Quadrat Foliage Cover (%)^	Total Proteaceae Cover (%)*	Proteaceae Cover Relative to Quadrat Cover (%)** (Criterion 2a)	Years since Fire	Diagnostic Species (Criterion 2b) (as listed in Table 1 of the Approved Conservation Advice (DoEE 2014) - Fitzgerald and Esperance districts)	Quadrat Result	VU Result
1	MRC01	52.8	2.2	4.17	> 20 years	NA	Not TEC	Not TEC
	MRC04	34.7	3.1	8.93	> 20 years	NA	Not TEC	
	MRC06	67.7	2.3	3.40	~ 10 years	*Banksia media* (0.1%) - **Total 0.1%**	Not TEC (only 1 diagnostic species recorded)	
	MRC12	42.4	4.3	10.14	~ 10 years	*Banksia media* (0.1%) - **Total 0.1%**	Not TEC Not TEC (only 1 diagnostic species recorded)	
	MRC23	31.4	2.6	8.28	~ 10 years	No diagnostic species recorded	Not TEC	
	MRC25	31.4	4	12.74	> 20 years	NA	Not TEC	
	MRC32	23.7	5.9	24.89	~ 10 years	*Banksia alliacea* (0.1%), *Banksia armata* (0.1%), *Banksia media* (0.1%), *Banksia tenuis* (0.1%), *Lambertia inermis* (0.1%) - **Total 0.5%**	Not TEC (foliage cover of diagnostics 2.1 % of total foliage cover)	
	MRC34	116.2	2.2	1.89	~ 10 years	No diagnostic species recorded	Not TEC	
	MRC42	93.8	0.4	0.43	> 20 years	NA	Not TEC	
	MRC43	67.7	10.4	15.36	~ 10 years	*Banksia media* (7%) - **Total 7 %**	Not TEC Not TEC (only 1 diagnostic species recorded)	
	MRC57	34	8.5	25.00	~ 10 years	*Banksia alliacea* (0.1%), *Banksia media* (0.1%) - **Total 0.2%**	Not TEC (foliage cover of diagnostics 0.6 % of total foliage cover)	
2	MRC18	41.1	0.3	0.73	~ 10 years	No diagnostic species recorded	Not TEC	Not TEC
	MRC45	41.3	1	2.42	> 20 years	NA	Not TEC	
	MRC46	18.9	3.3	17.46	~ 10 years	*Banksia media* (0.1%) - **Total 0.1%**	Not TEC Not TEC (only 1 diagnostic species recorded)	
	MRC48	21	5.3	25.24	~ 10 years	No diagnostic species recorded	Not TEC	
	MRC49	41.8	2	4.78	> 20 years	NA	Not TEC	
	MRC52	35.1	3	8.55	> 20 years	NA	Not TEC	

VU	Quadrat	Total Quadrat Foliage Cover (%)^	Total Proteaceae Cover (%)*	Proteaceae Cover Relative to Quadrat Cover (%)** (Criterion 2a)	Years since Fire	Diagnostic Species (Criterion 2b) (as listed in Table 1 of the Approved Conservation Advice (DoEE 2014) - Fitzgerald and Esperance districts)	Quadrat Result	VU Result
2 cont.	MRC54	18	3.1	17.22	~ 10 years	No diagnostic species recorded	Not TEC	Not TEC
	MRC56	29.8	1	3.36	> 20 years	NA	Not TEC	
3	MRC08	38.9	6	15.42	> 20 years	NA	Not TEC	Not TEC
4	MRC40	165.6	1.6	0.97	~ 10 years	No diagnostic species recorded	Not TEC	Not TEC
5	MRC31	65	1	1.54	> 20 years	NA	Not TEC	Not TEC
	MRC47	81.7	1	1.22	> 20 years	NA	Not TEC	
6	MRC53	46.2	0.1	0.22	> 20 years	NA	Not TEC	Not TEC
7	MRC30	93.3	0.1	0.11	~ 10 years	No diagnostic species recorded	Not TEC	Not TEC
	MRC55	49.6	6.2	12.50	> 20 years	NA	Not TEC	
8	MRC02	41.2	1	2.43	> 20 years	NA	Not TEC	
	MRC50	52	3	5.77	> 20 years	NA	Not TEC	
9	MRC07	29.4	1.1	3.74	> 20 years	NA	Not TEC	Not TEC
	MRC61	23.1	0	0.00	> 20 years	NA	Not TEC	
10	MRC05	76.4	0	0.00	> 20 years	NA	Not TEC	Not TEC
	MRC17	43.8	3	6.85	> 20 years	NA	Not TEC	
11	MRC22	45.9	2.4	5.23	~ 10 years	No diagnostic species recorded	Not TEC	Not TEC
	MRC24	104.9	0	0.00	~ 10 years	No diagnostic species recorded	Not TEC	
	MRC38	99.5	0	0.00	~ 10 years	No diagnostic species recorded	Not TEC	
12	MRC13	58.6	0	0.00	> 20 years	NA	Not TEC	Not TEC
	MRC33	64.6	0	0.00	> 20 years	NA	Not TEC	
13	MRC14	92.2	6.1	6.62	> 20 years	NA	Not TEC	Not TEC
	MRC36	97.2	5.5	5.66	~ 10 years	No diagnostic species recorded	Not TEC	
14	MRC09	1.8	0	0.00	> 20 years	NA	Not TEC	Not TEC
	MRC10	31	1.1	3.55	~ 10 years	No diagnostic species recorded	Not TEC	
	MRC16	30.3	0.1	0.33	~ 10 years	No diagnostic species recorded	Not TEC	
	MRC20	10	0	0.00	> 20 years	NA	Not TEC	
	MRC26	8.3	0.1	1.20	~ 10 years	No diagnostic species recorded	Not TEC	
	MRC28	93.1	0	0.00	~ 10 years	No diagnostic species recorded	Not TEC	
	MRC39	2.6	0	0.00	> 20 years	NA	Not TEC	
	MRC51	13.3	0	0.00	> 20 years	NA	Not TEC	

VU	Quadrat	Total Quadrat Foliage Cover (%)^	Total Proteaceae Cover (%)*	Proteaceae Cover Relative to Quadrat Cover (%)** (Criterion 2a)	Years since Fire	Diagnostic Species (Criterion 2b) (as listed in Table 1 of the Approved Conservation Advice (DoEE 2014) - Fitzgerald and Esperance districts)	Quadrat Result	VU Result
15	MRC03	41.4	0	0.00	> 20 years	NA	Not TEC	Not TEC
	MRC21	21	0	0.00	~ 10 years	No diagnostic species recorded	Not TEC	
	MRC63	41.1	0	0.00	> 20 years	NA	Not TEC	
16	MRC11	42.1	11.5	27.32	> 20 years	NA	Not TEC	**TEC** 71.43% quadrats (2a - 42.86% 2b - 28.57%)
	MRC15	44.6	5.6	12.56	> 20 years	NA	Not TEC	
	MRC27	42.6	17.4	40.85	> 20 years	NA	**TEC**	
	MRC35	47.2	25.6	54.24	> 20 years	NA	**TEC**	
	MRC41	42.4	22.4	52.83	> 20 years	NA	**TEC**	
	MRC44	35.8	5.6	15.64	~ 10 years	*Banksia alliacea* (0.1%), *Banksia armata* (1%), *Grevillea concinna* (3%) - **Total 4.1%**	**TEC** (foliage cover of diagnostics 11.5 % of total foliage cover)	
	MRC59	42.5	8.3	19.53	~ 10 years	*Banksia alliacea* (0.2%), *Banksia armata* (1.5%), *Banksia obovata* (1.5%), *Grevillea concinna* (1%), *Hakea pandanicarpa* (0.6%), *Isopogon polycephalus* (1.5%) - **Total 6.3%**	**TEC** (foliage cover of diagnostics 14.8 % of total foliage cover)	
17	MRC19	45.8	12.3	26.86	> 20 years	NA	Not TEC	**TEC** 66.67% quadrats (2a- 66.67% 2b- 0)
	MRC29	56.2	17.7	31.49	> 20 years	NA	**TEC**	
	MRC37	67.9	38.7	57.00	> 20 years	NA	**TEC**	

^Sum of foliage cover for all taxa recorded in each quadrat excluding *Eucalyptus* taxa - *Eucalyptus* taxa were excluded on the basis that they occur in a different stratum to Proteaceae taxa. All other taxa (including introduced taxa, annual taxa and sedges were included on the basis that (a) introduced/annual taxa form such a low component of the foliage cover for quadrats in this assessment that removing them would not alter the results of the survey; and (b) as Proteaceae taxa can range from lower to mid stratums, establishing clear cut-offs (such as on the basis of height or growth form such as sedge) is not considered appropriate in this case.
*Sum of all Proteaceae taxa cover recorded in each quadrat.
** Total Proteaceae Cover (*) as a percentage of the Total Quadrat Foliage Cover (^)

Appendix O: Desktop Review of Potential Regional Extent of Vegetation Units (Woodman Environmental (2019)

Munglinup Graphite Project

Desktop Review of Potential Regional Extent of Vegetation Units

MRC GRAPHITE PTY LTD

NOVEMBER 2019

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Munglinup Graphite Project – Desktop Review of Potential Regional Extent of Vegetation Units

Desktop review of the likely survey areas for Vegetation Units (VU's) as mapped by Woodman Environmental (2019).

Prepared for: MRC Graphite Pty Ltd

Job Number: MRC19-48

Report Number: MRC19-48-01

Cover Photograph: 'Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia' (Woodman Environmental 2018)

DOCUMENT REVISION AND STATUS

Revision	Status	Originator	Internal Reviewer	Internal Review Date	Client Reviewer	Client Review Date
A	Draft Report	GW/CG	CG	6/11/2019	-	-

DISCLAIMER

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FIGURES

TABLES

APPENDICES

1 INTRODUCTION

MRC Graphite Pty Ltd (MRC Graphite) intends to develop the Munglinup Graphite Project (the Project), located 20 kilometres north-west of Munglinup. A detailed flora and vegetation survey of the Project Study Area (Study Area) was undertaken by Woodman Environmental Consulting Pty Ltd (Woodman Environmental) (2019). This area covered tenement area M74/245, and the eastern area of Mining Reserve R24814 within tenement E74/565.

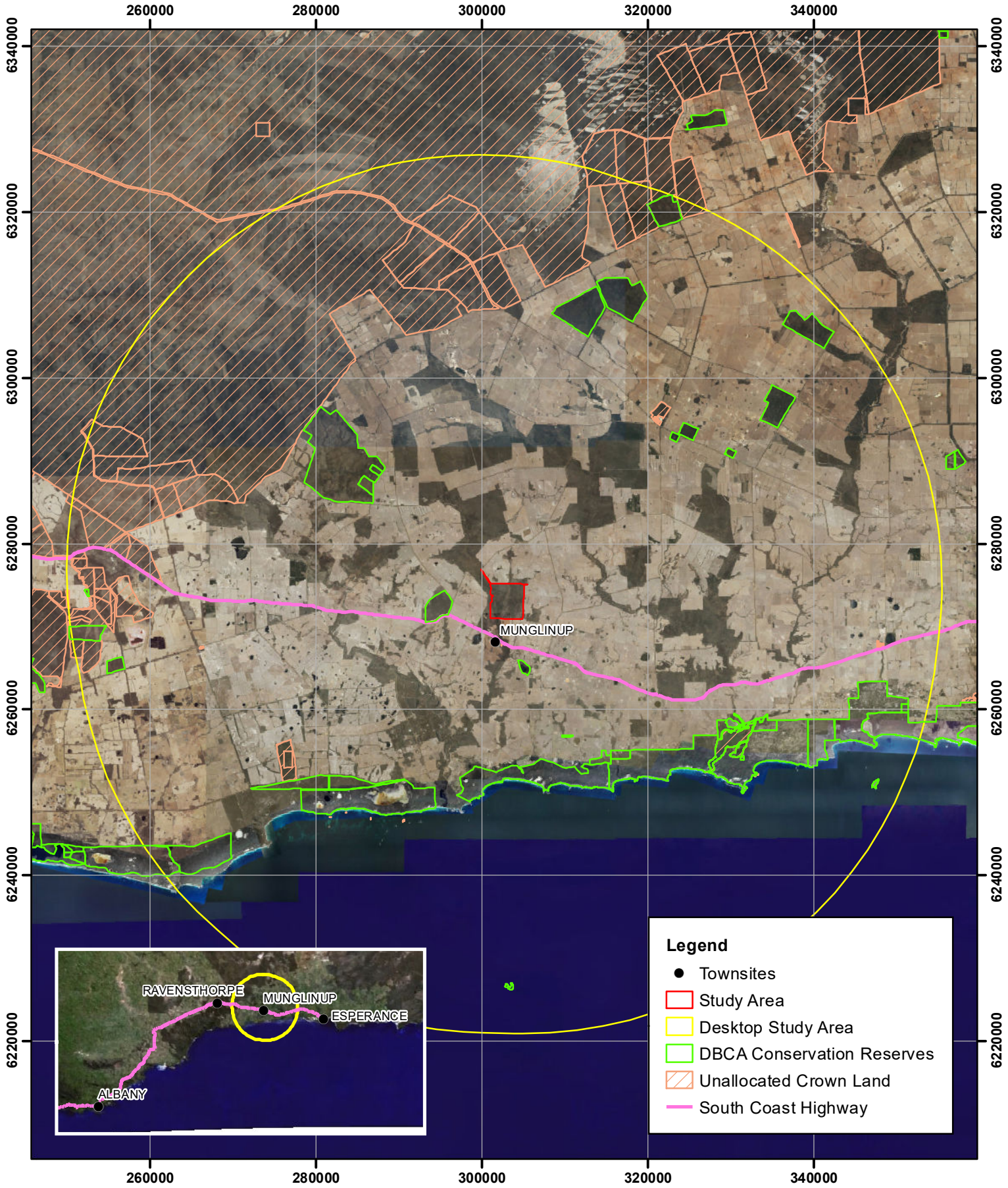
The Project was referred to the Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (EP Act) and to the Department of the Environment and Energy (DoEE) under Section 68 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in November 2018. On the 12th of July 2019 the EPA provided the proponent with a letter outlining the additional work required to proceed with the assessment. As indicated in this letter and following further discussion between Integrate Sustainability, EPA Services and DoEE, it was acknowledged that Woodman Environmental (2019) is the key document that will be used for the assessment; superseding any previous survey reports and it was also highlighted that additional flora and vegetation work and clarification is required to support this document. Additional targeted survey of the local and regional distribution of key vegetation units to provide more context for the assessment of the significance of the proposed impacts was noted to be required.

This memo presents an assessment of the potential regional extent of vegetation units which are to be targeted for further local and regional survey. These areas for possible regional survey are presented for further discussion and approval by EPA Services.

1.1 Study Location

The project area is located approximately 2.5 km north of Munglinup in the south-west of Western Australia, 500 km south-east of Perth and 100 km west of Esperance (Figure 1). The Study Area encompasses approximately 1651 ha of intact native vegetation adjacent to the Munglinup River, with some limited historical clearing associated with exploration of Graphite deposits on low rises.

The Desktop Study Area which forms the basis for the regional review presented in this memo covers an area within a 50km radius of the Study Area (Figure 1).



The location of the project and the extent of the desktop study area	Author: Steve Vlahos	N
	WEC Ref: MRC19-48-01	
WOODMAN ENVIRONMENTAL	Filename: MRC19-48-01-f01.mxd	**Figure**
	Scale: 1:600,000 (A4)	1
	Projection: GDA 1994 MGA Zone 51	
This map should only be used in conjunction with WEC report MRC19-48-01.	Revision: A - 09 October 2019	

1.2 Aim and Objectives

The aim of this memo is to provide a review of regional datasets to identify the potential distribution of vegetation units which are currently proposed to experience clearing of greater than 50% of their area within the Munglinup Graphite Project Study Area (Key vegetation units). The specific objectives of this memo are to:

- Present the sources of data investigated and the methods utilised to determine areas likely to contain similar vegetation to the Key vegetation units;
- Present a summary of the assessment results identifying potential areas for targeted survey and potential methods for survey for discussion with EPA Services.

2 KEY VEGETATION UNITS FOR LOCAL AND REGIONAL SURVEY

It was determined by Integrate Sustainability that the key vegetation units which require further local and regional survey are those which have 50% or greater of their currently mapped extents located within the Development Envelope and is therefore proposed to be impacted by the development of the project to a large degree.

Woodman Environmental (2019) described 17 Vegetation Units (VUs) in the Study Area (Figure 2). Of the VUs mapped in the Study Area, 13 were mapped within the Development Envelope and are therefore likely to be impacted by the development of the Project. Furthermore, seven of these VUs have more than 50% of their mapped extent within the Development Envelope. These Key VUs are the focus of this assessment (highlighted in yellow in Table 1).

300000 302000 304000

6278000 6276000 6274000 6272000

WOODMAN ENVIRONMENTAL

This map should only be used in conjunction with WEC report MRC19-48-01.

N

Vegetation Units of the Study Area (Woodman Environmental 2019)

Revision: A - 09 October 2019 Scale: 1:22,500 (A3)

Author: Steve Vlahos

WEC Ref: MRC19-48-01

Filename: MRC19-48-01-f02-1.mxd

Projection: GDA 1994 MGA Zone 51

Figure

2.1

Legend

Study Area

Development Envelope

Vegetation Mapping

1 Low mallee woodland to open woodland of mixed species including *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus uncinata*, *Eucalyptus suggrandis* subsp. *suggrandis* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland of mixed species usually dominated by *Melaleuca rigidifolia* and occasionally *Melaleuca subfalcata*, *Melaleuca calycina* and *Melaleuca lateriflora* over low open to sparse shrubland of mixed species including *Grevillea oligantha*, *Daviesia articulata*, *Daviesia lancifolia*, *Hibbertia pungens* and *Grevillea pectinata* over low sparse sedgeland of mixed species dominated by *Gahnia ancistrophylla*, *Gahnia aristata* and *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897) on red-brown, orange-brown or grey-brown clay loam, usually with ironstone, sandstone or mixed colluvial gravel, on upper to mid slopes of valleys and low hills.

2 Low mallee woodland to open woodland of mixed species including *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus leptocalyx* subsp. *leptocalyx*, *Eucalyptus suggrandis* subsp. *suggrandis*, *Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland to open shrubland of mixed species dominated by *Melaleuca hamata*, *Melaleuca sapientes*, *Melaleuca lateriflora*, *Daviesia aphylla* and *Melaleuca undulata* over low open to sparse shrubland of mixed species including *Acacia ingrata*, *Grevillea pectinata*, *Aotus* sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412), *Hibbertia psilocarpa* and *Chorizema nervosum* over low open sedgeland of mixed species dominated by *Gahnia ancistrophylla*, *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Gahnia aristata* and *Lepidosperma gahnioides* on red-brown to brown clay loam, usually with ironstone, sandstone or mixed colluvial gravel, on slopes valleys and low hills.

3 Low mallee woodland dominated by *Eucalyptus densa* subsp. *densa* over tall shrubland dominated by *Melaleuca pentagona* var. *pentagona* and *Banksia media* over low sparse shrubland dominated by *Hibbertia pungens* on skeletal light brown clay loam with sandstone stones over sandstone outcropping on breakaways and ridges.

4 Low mallee woodland of *Eucalyptus densa* subsp. *densa* over tall sparse shrubland dominated by *Acacia harveyi* and *Hakea laurina* over mid shrubland dominated by *Gastrolobium parviflorum* and *Melaleuca thapsina* over low shrubland dominated by *Dampiera* sp. Ravensthorpe (G.F. Craig 8277) (P3) on skeletal brown sandy loam with sandstone stones over sandstone outcropping on breakaways and ridges.

5 Low isolated mallees of mixed species including *Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall shrubland dominated by *Melaleuca hamata*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Melaleuca elliptica* and occasionally *Allocasuarina campestris* over mid to low open shrubland of mixed species dominated by *Astus tetragonus*, *Leucopogon cuneifolius*, *Philotheca gardneri* subsp. *gardneri* and occasionally *Hybanthus floribundus* subsp. *adpressus* and *Grevillea anethifolia* over low open sedgeland of mixed species dominated by *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma sanguinolentum*, *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' and *Gahnia aristata* on dark brown to brown clay loam with dolerite gravel and dolerite outcropping on upper and mid slopes of valleys.

6 Low open mallee woodland of mixed species dominated by *Eucalyptus ecostata* and *Eucalyptus pleurocarpa* over tall to mid shrubland of mixed species dominated by *Calothamnus villosus*, *Melaleuca hamata*, *Kunzea affinis*, *Acacia sulcata* var. *platyphylla* and *Melaleuca rigidifolia* over low sparse shrubland of mixed species dominated by *Darwinia* sp. Lake Cobham (K. Newbey 3262), *Leucopogon* sp. Newdegate (M. Hislop 3585), *Hemigenia teretiuscula*, *Philotheca gardneri* subsp. *gardneri* and *Calytrix leschenaultii* over low open sedgeland of mixed species dominated by *Lepidosperma sanguinolentum*, *Lepidosperma* ?sp. Mt Short (S. Kern et al. LCH 17510) (P1), *Lepidosperma rigidulum* and *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' on brown sandy loam with sandstone gravel and stones and occasional sandstone outcropping on breakaways and ridges.

7 Low mallee woodland to open forest dominated by *Eucalyptus densa* subsp. *densa* and occasionally *Eucalyptus flocktoniae* subsp. *flocktoniae* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid open shrubland of mixed species dominated by *Gastrolobium parviflorum*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Hakea lissocarpha* and occasionally *Melaleuca hamata* over low sparse shrubland of mixed species including *Hibbertia pungens*, *Hibbertia gracilipes* and *Lasiopetalum rosmarinifolium* over low sedgeland and forbland of mixed species including *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798), *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' and *Stylidium albomontis* on red-brown or light brown sandy loam with sandstone gravel and sandstone outcropping on breakaways and ridges.

8 Low woodland of *Eucalyptus occidentalis* over tall open to sparse shrubland dominated by *Melaleuca hamata* and *Acacia cyclops* over mid open to sparse shrubland of mixed species including *Hakea lissocarpha*, *Melaleuca glaberrima* and *Hakea nitida* over low sparse shrubland of mixed species including *Lasiopetalum rosmarinifolium*, *Hibbertia gracilipes*, *Dodonaea caespitosa* and *Thomasia angustifolia* over low open to sparse sedgeland and rushland of mixed species dominated by *Gahnia ancistrophylla*, *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798), *Lepidobolus preissianus*, *Lomandra micrantha* subsp. *teretifolia* and *Lepidosperma sanguinolentum* over low sparse forbland and grassland of mixed species including *Neurachne alopecuroidea*, *Chamaescilla corymbosa* var. *corymbosa*, *Goodenia affinis*, *Oxalis exilis* and *Lagenophora huegelii* on orange-brown clay loam or sandy loam on river flats.

9 Low woodland of *Eucalyptus occidentalis* over low open mallee woodland of *Eucalyptus quadrans* over tall to mid open to sparse shrubland of mixed species including *Acacia glaucoptera*, *Hakea lissocarpha*, *Acacia cyclops*, *Melaleuca acuminata* subsp. *acuminata* and *Acacia verriculum* over low sparse shrubland of mixed species including *Thomasia foliosa* , *Dodonaea caespitosa* and *Phyllanthus calycinus* over low open to sparse sedgeland of mixed species dominated by *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897) and *Lomandra effusa* over low sparse forbland of mixed species including *Lysimachia arvensis*, *Chamaescilla corymbosa* var. *corymbosa*, *Goodenia affinis*, *Oxalis exilis* and *Plantago hispida* on brown clay loam with quartz gravel on valley slopes.

10 Low open mallee woodland dominated by *Eucalyptus conglobata* subsp. *conglobata* and occasionally *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland to open shrubland of mixed species dominated by *Melaleuca hamata* and *Melaleuca lateriflora*, and occasionally *Melaleuca glaberrima*, *Santalum acuminatum* and *Acacia cyclops*, over low sparse shrubland of mixed species including *Lasiopetalum rosmarinifolium*, *Dodonaea caespitosa* and *Hakea lissocarpha* over low open to sparse sedgeland, forbland and rushland of mixed species dominated by *Gahnia ancistrophylla*, *Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma* sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738), *Lepidobolus preissianus* and *Opercularia vaginata* on red-brown or brown clay loam with dolerite and occasionally quartz stones on valley flats and slopes.

11 Tall to mid open to sparse shrubland dominated by *Melaleuca uncinata* over mid to low shrubland to open shrubland of mixed species dominated by *Acacia sulcata* var. *platyphylla*, *Melaleuca elliptica* and *Astus tetragonus* over low sparse shrubland of mixed species including *Leptospermum oligandrum* and *Styphelia* sp. Cascades (R. Davis 11037) on brown clayey sand or clay loam with granite and quartz stones and often granite outcropping on low rises and slopes.

12 Low woodland to open forest dominated by *Eucalyptus occidentalis* and *Melaleuca cuticularis* over tall open shrubland of mixed species dominated by *Acacia cyclops*, *Acacia saligna* subsp. *lindleyi* ms and *Labichea lanceolata* subsp. *brevifolia* over low open to sparse sedgeland of mixed species including *Chorizandra enodis*, *Gahnia trifida* and *Juncus pallidus* over occasional low sparse chenopod shrubland dominated by *Salicornia quinqueflora* subsp. *quinqueflora*, *Suaeda australis* and *Disphyma crassifolium* subsp. *clavellatum* over low sparse forbland of mixed species including *Cotula australis* and **Cotula coronopifolia* on grey-brown to clay or clay loam in narrow drainage line channels.

13 Low woodland dominated by *Eucalyptus occidentalis* over tall to mid shrubland to closed shrubland of mixed species dominated by *Labichea lanceolata* subsp. *brevifolia*, *Acacia cyclops*, *Acacia sulcata* var. *platyphylla* and *Grevillea anethifolia* over low sparse shrubland of mixed species including *Thomasia angustifolia* and *Thomasia foliosa* over low sparse sedgeland dominated by *Lepidosperma fimbriatum* and *Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798) over low sparse forbland of mixed species including *Dichondra repens*, *Cotula australis* and *Oxalis exilis* on yellow-brown to light brown sand or sandy clay in broad drainage lines and adjacent flats.

14 Low open mallee forest dominated by *Eucalyptus platypus* subsp. *platypus* and occasionally *Eucalyptus dielsii* and *Eucalyptus extensa* over tall sparse shrubland of mixed species dominated by *Melaleuca torquata*, *Melaleuca cucullata*, *Melaleuca acuminata* subsp. *acuminata*, *Acacia cyclops* and *Exocarpos sparteus* over low sparse shrubland of mixed species dominated by *Acacia glaucoptera* and *Exocarpos aphyllus* over low sparse grassland dominated by *Rytidosperma setaceum* on grey, light brown or brown clay, clay loam or sandy clay with colluvial stones (frequently sandstone, quartz, irostone and laterite) on valley slopes and flats and undulating plains.

15 Low mallee woodland dominated by *Eucalyptus flocktoniae* subsp. *flocktoniae*, *Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus indurata* over tall to mid shrubland dominated by *Melaleuca pauperiflora* subsp. *pauperiflora* and occasionally *Choretrum glomeratum*, *Dodonaea stenozyga* and *Pultenaea calycina* subsp. *proxena* (P4) over low shrubland dominated by *Boronia inornata* subsp. *inornata* on grey or grey-brown clay loam with calcareous stones on low rises on undulating plains.

16 Low mallee woodland dominated by *Eucalyptus pleurocarpa* and occasionally *Eucalyptus uncinata* over mid to low shrubland of mixed species dominated by *Banksia armata* var. *ignicida, Banksia alliacea*, *Banksia obovata, Beaufortia micrantha* and *Leucopogon* sp. Newdegate (M. Hislop 3585) over low open to sparse sedgeland of mixed species dominated by *Mesomelaena stygia* subsp. *stygia*, *Lepidosperma* sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)', *Caustis dioica*, *Lepidosperma carphoides* and *Lepidobolus chaetocephalus* on grey-yellow, yellow-brown or grey-brown sandy or clay loam with lateritic gravel on undulating plains.

17 Tall open to sparse shrubland dominated by *Lambertia inermis* var. *inermis* and occasionally *Nuytsia floribunda* over mid shrubland to open shrubland of mixed species dominated by *Adenanthos cuneatus*, *Allocasuarina humilis*, *Banksia baueri*, *Taxandria spathulata* and *Chamelaucium megalopetalum* over low shrubland of mixed species including *Conothamnus aureus*, *Petrophile teretifolia, Eutaxia inuncta*, *Jacksonia viscosa* and *Hibbertia gracilipes* over low sedgeland and rushland of mixed species dominated by *Caustis dioica*, *Chordifex sphacelatus, Hypolaena fastigiata, Lepidobolus chaetocephalus* and *Lyginia imberbis* on grey-brown sand, occasionally with laterite gravel, on undulating plains.

C Cleared land (roads and permanent tracks)

WOODMAN ENVIRONMENTAL

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N

Vegetation Units of the Study Area (Woodman Environmental 2019) Legend

Revision: A - 09 October 2019 Scale: 1:17,500 (A3)

Author: Steve Vlahos

WEC Ref: MRC19-48-01

Filename: MRC19-48-01-f02-2.mxd

Projection: GDA 1994 MGA Zone 51

Figure

2.2

Table 1: Vegetation Units within the Development Envelope of the Munglinup Graphite Project

Note: Preliminary vegetation types for regional survey extent are highlighted in yellow

Vegetation Unit	Description	Study Area (ha / %)	Development Envelope (ha / %)	Impact to VT (ha / %)
1	Low mallee woodland to open woodland of mixed species including *Eucalyptus leptocalyx* subsp. *leptocalyx, Eucalyptus flocktoniae* subsp. *flocktoniae, Eucalyptus uncinata, Eucalyptus suggrandis* subsp. *suggrandis* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland of mixed species usually dominated by *Melaleuca rigidifolia* and occasionally *Melaleuca subfalcata, Melaleuca calycina* and *Melaleuca lateriflora* over low open to sparse shrubland of mixed species including *Grevillea oligantha, Daviesia articulata, Daviesia lancifolia, Hibbertia pungens* and *Grevillea pectinata* over low sparse sedgeland of mixed species dominated by *Gahnia ancistrophylla, Gahnia aristata* and *Tetraria* sp. Mt Madden on red-brown, orange-brown or grey-brown clay loam, usually with ironstone, sandstone or mixed colluvial gravel, on upper to mid slopes of valleys and low hills.	445.1ha / 26.6%	149.3ha / 23%	149.3ha / 33.53%
2	Low mallee woodland to open woodland of mixed species including *Eucalyptus flocktoniae* subsp. *flocktoniae, Eucalyptus leptocalyx* subsp. *leptocalyx, Eucalyptus suggrandis* subsp. *suggrandis, Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland to open shrubland of mixed species dominated by *Melaleuca hamata, Melaleuca sapientes, Melaleuca lateriflora, Daviesia aphylla* and *Melaleuca undulata* over low open to sparse shrubland of mixed species including *Acacia ingrata, Grevillea pectinata, Aotus* sp. Southern Wheatbelt, *Hibbertia psilocarpa* and *Chorizema nervosum* over low open sedgeland of mixed species dominated by *Gahnia ancistrophylla, Tetraria* sp. Mt Madden, *Gahnia aristata* and *Lepidosperma gahnioides* on red-brown to brown clay loam, usually with ironstone, sandstone or mixed colluvial gravel, on slopes valleys and low hills.	182.9ha / 10%	111.6ha / 17.2%	111.6ha / 61%
5	Low isolated mallees of mixed species including *Eucalyptus conglobata* subsp. conglobata and *Eucalyptus phaenophylla* subsp. *interjacens* over tall shrubland dominated by *Melaleuca hamata, Calothamnus quadrifidus* subsp. *quadrifidus, Melaleuca elliptica* and occasionally *Allocasuarina campestris* over mid to low open shrubland of mixed species dominated by *Astus tetragonus, Leucopogon cuneifolius, Philotheca gardneri* subsp. *gardneri* and occasionally *Hybanthus floribundus* subsp. *adpressus* and *Grevillea anethifolia* over low open sedgeland of mixed species dominated by *Tetraria* sp. Mt Madden, *Lepidosperma sanguinolentum, Lepidosperma* sp. Ravensthorpe, *Lepidosperma* sp. 'Jerdacuttup and *Gahnia aristata* on dark brown to brown clay loam with dolerite gravel and dolerite outcropping on upper and mid slopes of valleys.	7.5 ha / 0.5%	3.6ha / 0.55%	3.6ha / 47.8%
7	Low mallee woodland to open forest dominated by *Eucalyptus densa* subsp. *densa* and occasionally *Eucalyptus flocktoniae* subsp. *flocktoniae* and *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid open shrubland of mixed species dominated by *Gastrolobium parviflorum, Calothamnus quadrifidus* subsp. *quadrifidus, Hakea lissocarpha* and occasionally *Melaleuca hamata* over low sparse shrubland of mixed species including *Hibbertia pungens, Hibbertia gracilipes* and *Lasiopetalum rosmarinifolium* over low sedgeland and forbland of mixed species including *Tetraria* sp. Mt Madden, *Lepidosperma* sp. Ravensthorpe, *Lepidosperma* sp. *Bandalup Scabrid* (N. Evelegh 10798), *Lepidosperma* sp. 'Jerdacuttup (R.L. Barrett RLB 2770)' and *Stylidium albomontis* on red-brown or light brown sandy loam with sandstone gravel and sandstone outcropping on breakaways and ridges.	19.9ha / 1.2%	19.4ha / 2.98%	19.4ha / 97.2%

Vegetation Unit	Description	Study Area (ha / %)	Development Envelope (ha / %)	Impact to VT (ha / %)
8	Low woodland of *Eucalyptus occidentalis* over tall open to sparse shrubland dominated by *Melaleuca hamata* and *Acacia cyclops* over mid open to sparse shrubland of mixed species including *Hakea lissocarpha, Melaleuca glaberrima* and *Hakea nitida* over low sparse shrubland of mixed species including *Lasiopetalum rosmarinifolium, Hibbertia gracilipes, Dodonaea caespitosa* and *Thomasia angustifolia* over low open to sparse sedgeland and rushland of mixed species dominated by *Gahnia ancistrophylla, Lepidosperma* sp. Bandalup Scabrid (N. Evelegh 10798*), Lepidobolus preissianus, Lomandra micrantha* subsp. *teretifolia* and *Lepidosperma sanguinolentum* over low sparse forbland and grassland of mixed species including *Neurachne alopecuroidea, Chamaescilla corymbosa* var. *corymbosa, Goodenia affinis, Oxalis exilis* and *Lagenophora huegelii* on orange-brown clay loam or sandy loam on river flats.	42.7ha / 2.6%	30.3ha / 4.6%	30.3ha / 71%
9	Low woodland of *Eucalyptus occidentalis* over low open mallee woodland of *Eucalyptus quadrans* over tall to mid open to sparse shrubland of mixed species including *Acacia glaucoptera, Hakea lissocarpha, Acacia cyclops, Melaleuca acuminata* subsp. *acuminata* and *Acacia verriculum* over low sparse shrubland of mixed species including *Thomasia foliosa*, *Dodonaea caespitosa* and *Phyllanthus calycinus* over low open to sparse sedgeland of mixed species dominated by *Lepidosperma* sp. Ravensthorpe (G.F. Craig 5188), Tetraria sp. Mt Madden (C.D. Turley 40 BP/897) and *Lomandra effusa* over low sparse forbland of mixed species including *Lysimachia arvensis, Chamaescilla corymbosa var. corymbosa, Goodenia affinis, Oxalis exilis* and *Plantago hispida* on brown clay loam with quartz gravel on valley slopes.	32ha / 1.9%	31.3ha / 4.8%	31.3ha / 97.8%
10	Low open mallee woodland dominated by *Eucalyptus conglobata* subsp. *conglobata* and occasionally *Eucalyptus phaenophylla* subsp. *interjacens* over tall to mid shrubland to open shrubland of mixed species dominated by *Melaleuca hamata* and *Melaleuca lateriflora*, and occasionally *Melaleuca glaberrima, Santalum acuminatum* and *Acacia cyclops*, over low sparse shrubland of mixed species including *Lasiopetalum rosmarinifolium, Dodonaea caespitosa* and *Hakea lissocarpha* over low open to sparse sedgeland, forbland and rushland of mixed species dominated by *Gahnia ancistrophylla, Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897), *Lepidosperma* sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738), *Lepidobolus preissianus* and *Opercularia vaginata* on red-brown or brown clay loam with dolerite and occasionally quartz stones on valley flats and slopes.	7.1ha / 0.4%	6.4ha / 0.9%	6.4ha / 89.6%
11	Tall to mid open to sparse shrubland dominated by *Melaleuca uncinata* over mid to low shrubland to open shrubland of mixed species dominated by *Acacia sulcata var. platyphylla*, *Melaleuca elliptica* and *Astus tetragonus* over low sparse shrubland of mixed species including *Leptospermum oligandrum* and *Styphelia* sp. Cascades (R. Davis 11037) on brown clayey sand or clay loam with granite and quartz stones and often granite outcropping on low rises and slopes.	26.4ha / 1.6%	14.1ha / 2.2%	14.1ha / 53.4%
12	Low woodland to open forest dominated by *Eucalyptus occidentalis* and *Melaleuca cuticularis* over tall open shrubland of mixed species dominated by *Acacia cyclops, Acacia saligna* subsp. *lindleyi* ms and *Labichea lanceolata* subsp. *brevifolia* over low open to sparse sedgeland of mixed species including *Chorizandra enodis, Gahnia trifida* and *Juncus pallidus* over occasional low sparse chenopod shrubland dominated by *Salicornia quinqueflora* subsp. *quinqueflora, Suaeda australis* and *Disphyma crassifolium* subsp. *clavellatum* over low sparse forbland of mixed species including *Cotula australis* and **Cotula coronopifolia* on grey-brown to clay or clay loam in narrow drainage line channels.	26.9ha / 1.6%	3.2ha / 0.5%	3.2ha / 11.9%

Vegetation Unit	Description	Study Area (ha / %)	Development Envelope (ha / %)	Impact to VT (ha / %)
14	Low open mallee forest dominated by *Eucalyptus platypus* subsp. *platypus* and occasionally *Eucalyptus dielsii* and *Eucalyptus extensa* over tall sparse shrubland of mixed species dominated by *Melaleuca torquata, Melaleuca cucullata, Melaleuca acuminata* subsp. *acuminata, Acacia cyclops* and *Exocarpos sparteus* over low sparse shrubland of mixed species dominated by *Acacia glaucoptera* and *Exocarpos aphyllus* over low sparse grassland dominated by *Rytidosperma setaceum* on grey, light brown or brown clay, clay loam or sandy clay with colluvial stones (frequently sandstone, quartz, irostone and laterite) on valley slopes and flats and undulating plains.	465.3ha / 27.8%	205.5ha / 31.7%	205.5ha / 44.2%
15	Low mallee woodland dominated by *Eucalyptus flocktoniae* subsp. *flocktoniae, Eucalyptus conglobata* subsp. *conglobata* and *Eucalyptus indurata* over tall to mid shrubland dominated by *Melaleuca pauperiflora* subsp. *pauperiflora* and occasionally *Choretrum glomeratum, Dodonaea stenozyga* and *Pultenaea calycina* subsp. *proxena* (P4) over low shrubland dominated by *Boronia inornata* subsp. *inornata* on grey or grey-brown clay loam with calcareous stones on low rises on undulating plains.	40.2ha / 2.4%	36.3ha / 5.6%	36.3ha / 90.3%
16	Low mallee woodland dominated by *Eucalyptus pleurocarpa* and occasionally *Eucalyptus uncinata* over mid to low shrubland of mixed species dominated by *Banksia armata var. ignicida, Banksia alliacea, Banksia obovata, Beaufortia micrantha* and *Leucopogon* sp. Newdegate (M. Hislop 3585) over low open to sparse sedgeland of mixed species dominated by *Mesomelaena stygia* subsp. *stygia, Lepidosperma* sp. 'Clathrate (R.L. Barrett & G.F. Craig RLB 3570)', *Caustis dioica, Lepidosperma carphoides* and *Lepidobolus chaetocephalus* on grey-yellow, yellow-brown or grey-brown sandy or clay loam with lateritic gravel on undulating plains.	226.8ha / 13.6%	28.6ha / 4.4%	28.6ha / 12.6%
17	Tall open to sparse shrubland dominated by *Lambertia inermis var. inermis* and occasionally *Nuytsia floribunda* over mid shrubland to open shrubland of mixed species dominated by *Adenanthos cuneatus, Allocasuarina humilis, Banksia baueri, Taxandria spathulata* and *Chamelaucium megalopetalum* over low shrubland of mixed species including *Conothamnus aureus, Petrophile teretifolia, Eutaxia inuncta, Jacksonia viscosa* and *Hibbertia gracilipes* over low sedgeland and rushland of mixed species dominated by *Caustis dioica, Chordifex sphacelatus, Hypolaena fastigiata, Lepidobolus chaetocephalus* and *Lyginia imberbis* on grey-brown sand, occasionally with laterite gravel, on undulating plains.	89.3ha / 5.3%	4.3ha / 0.6^	4.3ha / 4.8%

3 DESKTOP REVIEW OF POTENTIAL SIMILAR AREAS OF VEGETATION

3.1 Background and Methods

The regional extent of VUs mapped in the Study Area (as per Woodman Environmental (2019)) is currently not able to be assessed at a floristic scale due to the lack of a regional vegetation dataset at an appropriate scale. Furthermore the large extent of clearing which has historically been undertaken in the region for agriculture has left relatively limited tracts of intact vegetation. The definition of likely extent of the Key VUs in the region should be undertaken using a two phase approach. The first phase is the subject of this report and involves a desktop review of likely regional extent of vegetation with the same or similar soil and vegetation characteristics to that of the key VUs of the Development Envelope.

The extent of the Desktop Review Area extends 50km in all directions from the Study Area. This extent will best target vegetation that may be floristically similar to that of the Study Area; a high rate of turn-over of flora taxa over relatively short distances (high β diversity) is a characteristic the region.

The desktop review initially interrogates regional datasets pertinent to the characteristics of the mapped area of the Key VUs within the Study Area as defined in Table 1. This initial assessment is undertaken to provide an overview of initial target areas within the Desktop Review Area, to determine where areas of same or similar vegetation are likely to occur. The datasets interrogated included:

- Interim Biogeographic Regionalisation of Australia (IBRA) dataset (Commonwealth of Australia 2012). Classification of Australia's landscapes into 89 distinct bioregions which are further refined to 419 subregions based on climate, geology, landform, native vegetation and species information. Version 7.
- Vegetation System Association dataset (Beard, J.S., Beeston, G.R., Harvey, J.M., Hopkins, A.J.M and Shepherd, D.P (2013). This dataset is held by the Department of Primary Industries and Regional Development (DPIRD); it consists of mapping of type and extent of original natural vegetation presumed to have existed prior to European Settlement of Australia; originally mapped at 1:250 000 scale across Western Australia.
- Soil-landscape mapping of the south-west of Western Australia (Purdie, B R, Tille, P J, and Schoknecht, N R. 2004): Soil and land resource inventory for the south-west of Western Australia. Soil landscape mapping delineates repeating patterns of landscapes and associated soils; native vegetation is incorporated (where available) into the mapping process as it is a good predictor/indicator of soil type and landscape position.
- Current Extent of Native Vegetation (The Department of Primary Industries and Regional Development (DPIRD) (2019). A dataset containing vegetation extent polygons from the mapping of remnant vegetation in Western Australia. Updated annually, latest data February 2019.
- Cadastre and land tenure (lands managed for conservation; other government reserves; private property). Data sourced from LandGate (2019).

This initial review includes cadastre data to determine potentially suitable survey areas in the extent of government-managed lands (UCL, nature reserves, other reserves, etc.). Areas which may contain the same or similar vegetation to the Key VUs on private property may also be identified, however it

is noted that access to these areas would require negotiation and therefore access may be problematic. The results of this analysis are presented in Section 3.2.

Subsequent to this analysis, a review of other publicly available vegetation mapping datasets and vegetation survey reports undertaken within the Desktop Review Area was undertaken to determine whether any vegetation units similar to the Key VUs have been identified by other surveyors.

The following sources were approached or interrogated for information:

- Index of Biodiversity Surveys for Assessments (IBSA) https://www.dwer.wa.gov.au/ibsa
- The Department of Biodiversity, Conservation and Attractions (DBCA). Albany and Esperance offices – Flora Conservation Officers
- NRInfo for Western Australia - https://www.agric.wa.gov.au/resource-assessment/nrinfo-western-australia
- TERN – (Terrestrial Ecosystem Research network - Data Discovery Portal) https://portal.tern.org.au/#/9c52483a
- National Trust – Western Australia. Perth and Denmark Officers
- Bush Heritage Australia – Angela Sanders
- Consultant: G Craig.

3.2 Initial Regional Overview Assessment

The vegetation and soil characteristics of the Key VUs (as per Table 1) as presented in regional datasets are presented in Table 2.

Table 2: Initial Review of Applicable Regional Target Survey Areas

Vegetation/ Soil Datasets	Unit	Applicable Key Vegetation Units
IBRA Region	Esperance Plains	All
IBRA Subregion	Recherche	All
Vegetation System Association (VSA)	Esperance_4048	2
	Esperance_47	2; 7; 11
	Esperance_516	2; 7; 8; 9; 10; 11
	Esperance_931	8
Soil-Landscape Unit (SLU)	245_Munglinup 1 subsystem	2; 10;
	245_Young 1 subsystem	2; 7; 8; 9; 10; 11; 15

The extent of IBRA subregions, vegetation system associations, soil landscape units, extent of native vegetation and land tenure associated with the Desktop Review Area are presented in Appendix A. Figures 3a-3b presents an intersect of the areas from the datasets presented in Table 2 that are relevant to the Key VUs.

A total of 46, 945 hectares of remnant vegetation have been identified that occur within the Recherche IBRA subregion, and comprise the same VSA and SLU as the Key VUs (Figures 3b and 3c). Given the complexity of VUs mapped in the Study Area and the broad descriptions of the VSAs it is possible that vegetation types that closely match the floristics of the Key VUs may not be present in the identified remnants. However suitable remnant vegetation occurs adjacent to the Study Area, primarily along the Munglinup River vegetated corridor and in associated remnants in proximity to

this corridor. These areas present the greatest potential to contain floristically similar vegetation types.

Potential target survey areas include:

- Munglinup River corridor remnant vegetation: including Munglinup Nature Reserve ((R 26410; Figure 3b; 3c), R 30869 and R 31759;
- East Naernup Nature Reserve: R 31755 (Figure 3b)
- Oldfield River corridor remnant vegetation: R 31757; R 31758 and R 7352 (Figure 3b); and
- Young River corridor remnant vegetation: R 31762 / R 31751 (Figure 3c).

260000 280000 300000 320000 340000

6340000 6320000 6300000 6280000 6260000 6240000 6220000 6200000

CASCADE

JERDACUTTUP

MUNGLINUP

COOMALBIDGUP

3b

3c

Legend

- Townsites
- South Coast Highway
- Potential Target Study Areas
- Native Vegetation Extent
- Study Area
- Desktop Study Area
- 20km Buffer
- 40km Buffer
- Recherche IBRA subregion

Vegetation System Associations

- ESPERANCE_47
- ESPERANCE_516
- ESPERANCE_931
- ESPERANCE_4048

Map Units

- 245Mu_1 Munglinup 1 Subsystem
- 245Yo_1 Young 1 Subsystem

260000 280000 300000 320000 340000

WOODMAN ENVIRONMENTAL

This map should only be used in conjunction with WEC report MRC19-48-01.

N

Intersect of Regional Datasets relevant to the Key Vegetation Units

Revision: A - 15 October 2019 Scale: 1:400,000 (A3)

Author: Steve Vlahos

WEC Ref: MRC19-48-01

Filename: MRC19-48-01-f03.mxd

Projection: GDA 1994 MGA Zone 51

Figure

3a

280000

300000

6280000

6260000

R 31753

R 31754

R 31754

R 30869

R 29715

R 31756

R 31756

R 23924

R 29716

R 24714

R 31755

R 29446

R 31121

R 29447

R 37613

R 30489

R 31345

R 30488

MUNGLINUP

R 31759

R 31757

R 31758

R 7352

R 26410

R 29448

2

R 32339

R 32338

R 32337

Legend

- Townsites
- South Coast Highway
- Potential Target Study Areas
- Study Area
- Desktop Study Area
- 20km Buffer
- 40km Buffer
- Recherche IBRA subregion
- Reserves

280000

300000

WOODMAN ENVIRONMENTAL

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N

Intersect of Regional Datasets relevant to the Key Vegetation Units

Revision: A - 15 October 2019 Scale: 1:125,000 (A3)

Author: Steve Vlahos

WEC Ref: MRC19-48-01

Filename: MRC19-48-01-f03.mxd

Projection: GDA 1994 MGA Zone 51

Figure

3b

320000

CASCADE

R 31751

R 31764

R 30818

R 31762

R 31764

R 31762

R 31766

R 35808

R 31765

R 32339

6280000

6260000

Legend

- Townsites
- South Coast Highway
- Potential Target Study Areas
- Study Area
- Desktop Study Area
- 20km Buffer
- 40km Buffer
- Recherche IBRA subregion
- Reserves

320000

WOODMAN ENVIRONMENTAL

This map should only be used in conjunction with WEC report MRC19-48-01.

N

Intersect of Regional Datasets relevant to the Key Vegetation Units

Revision: A - 15 October 2019 Scale: 1:125,000 (A3)

Author: Steve Vlahos

WEC Ref: MRC19-48-01

Filename: MRC19-48-01-f03.mxd

Projection: GDA 1994 MGA Zone 51

Figure

3c

3.3 Review of Publicly Available Vegetation Survey Data

Appendix B presents a summary table of all publicly available vegetation survey reports and data which have been reviewed as part of this assessment. Figure 4 presents the extent of the reviewed survey areas (where available) in comparison to the Desktop Review Area and Study Area. The review found that none of the vegetation described in the reviewed reports appears to be equivalent to the Key VUs as described in Table 1.

It should be noted that there is a reasonable likelihood that VUs 2 and 8 occur in the wider region; they were all noted to potentially extend outside the Study Area into adjacent areas from the mapped occurrences that extend to the edge of the Study Area (Woodman Environmental 2019). They also occur on landforms that appear to be relatively common in the region, increasing the potential for them to occur elsewhere in the region; a preliminary review of aerial photography has also identified potential regional occurrences of these VUs.

Woodman Environmental (2019) presented a supplementary floristic analysis using quadrats established by Markey *et al.* (2012) across the Ravensthorpe Range, to examine the similarity of vegetation in the Study Area to that study. This analysis provided a strong indication that almost all VUs described in the Study Area are dissimilar to any of the communities described in the Ravensthorpe Range by Markey *et al.* (2012). This result was expected, given the distance between the Study Area and the Ravensthorpe Range, and the rapid species turnover known to occur across the Esperance Plains IBRA region, and in particular the Ravensthorpe Range (Markey *et al.* 2012).

The analysis did however indicate a relatively close relationship between the Study Area quadrats that VU 15 is based on, and the quadrats that comprise Markey *et al.* (2012) Community 11. It was noted in Woodman Environmental (2019) that this was an expected result, having previously visited a number of locations of Community 11 in the Ravensthorpe Range, and noted the similarities between Community 11 and VU 15 during the field visit to the Study Area. Both VU 15 and Community 11 characteristically occur on rocky calcareous soils resulting from weathering of volcanic rocks; in the Ravensthorpe Range the rocks are magnesite, and it is presumed (but not known) that the rocks in the Study Area are also magnesite based on Woodman Environmental field observations. Community 11 and VU 15 area also both characteristically species-poor (approximately 16 species per quadrat for Community 11, approximately 11 species per quadrat for VU 15), and share many taxa in common, particularly *Eucalyptus indurata*, *Melaleuca pauperiflora* subsp. *pauperiflora*, *Boronia inornata* subsp. *inornata* and *Pultenaea calycina* subsp. *proxena* (P4), all of which are indicator taxa for both communities; the latter was considered a short range endemic by Markey *et al.* (2012), so its discovery in the Study Area is of particular interest.

Despite this clear similarity, the current available data suggests that Community 11 and VU 15 should not be considered equivalent. Although one taxon considered to be endemic to the Ravensthorpe area in Community 11 also occurs in VU 15 (*Pultenaea calycina* subsp. *proxena* (P4)), there are a number of other taxa that are unique to the quadrats in Community 11 in the Ravensthorpe area; this likely explains the classification of VU 15 quadrats into a discrete group in the dendrogram.

In addition, one of the communities described by Markey *et al.* (2012) (Community 19: Mixed *Eucalyptus flocktoniae*/*E. leptocalyx*/*E.* spp mallee shrubland) appears superficially similar to VU 2. There is some overlap in common taxa as described in Community 19 by Markey *et al.* (2012) and VU 2 (including *Eucalyptus flocktoniaea* subsp. *flocktoniaea*, *E. phaenophylla*, *Melaleuca lateriflora*);

additional taxa were also recorded in both (Appendix K of Woodman Environmental 2019). Several taxa noted as being key indicator taxa in both studies were common to Community 19 and VU 2, including *E. leptocalyx*, *Coopernookia polygalacea*, *Acacia ingrata* and *Grevillea pectinata*. Community 19 was recorded on seven locations on low gradient hillslopes on rocky brown clay loams with no outcropping, which is similar to the soil and topographical position of VU 2. However, there were many taxa that were likewise not represented in both Community 19 and VU 2; in addition, the analysis by Woodman Environmental (2019) did not show similarity in the groupings of quadrats from Community 19 and VU2, and therefore they should not be considered equivalent.

4 RECOMMENDATIONS

Figures 3b and 3c present areas where potentially suitable vegetation for further investigation for the presence and extent of the Key VUs presented in Table 1 may occur. These areas are located in the same IBRA subregion, in the same vegetation system associations and soil types as mapped across the Munglinup Study Area.

It is recommended that the second phase of this assessment (section 3.1) comprise a reconnaissance survey of those potential target survey areas which occur on lands managed by the Western Australian Government, particularly those occurring in areas managed for conservation. The results of the reconnaissance survey should then be used to inform whether floristically similar vegetation types to the Key VUs potentially occur in these areas. Additional survey and floristic analysis and/or mapping of identified target vegetation types could be undertaken following consultation with EPA Services. Such surveys should be conducted in accordance with the methods as detailed in EPA (2016).

It is recommended that potential target survey areas (as per Section 3.2) located in the Munglinup River Corridor (including the Munglinup Nature Reserve) are surveyed initially; due to the relatively high turn-over of plant taxa in the region, it is most likely that vegetation that corresponds to the VUs as described in Table 1 are located in closer proximity to the original Munglinup Study Area.

220000 240000 260000 280000 300000 320000 340000

6360000 6340000 6320000 6300000 6280000 6260000 6240000 6220000 6200000

River Road Construction Project

CASCADE

Neds Corner Road Construction Project

Location 762, 'Nairnup'

Location 761, 'Nairnup'

RAVENSTHORPE

DESMOND

Ravensthorpe Range

KUNDIP

JERDACUTTUP

MUNGLINUP

COOMALBIDGUP

GHD 2006 - Passing Lanes 3 and 4

GHD 2007 - Passing Lanes 5 and 6

HOPETOUN

Legend

- Townsites
- State Barrier Fence
- Other Vegetation Projects
- Study Area
- Desktop Study Area
- 20km Buffer
- 40km Buffer
- DBCA Conservation Reserves
- Unallocated Crown Land

220000 240000 260000 280000 300000 320000 340000

WOODMAN ENVIRONMENTAL

N

This map should only be used in conjunction with WEC report MRC19-48-01.

Extent of available vegetation survey data

Revision: A - 15 October 2019 Scale: 1:500,000 (A3)

Author: Steve Vlahos

WEC Ref: MRC19-48-01

Filename: MRC19-48-01-f04.mxd

Projection: GDA 1994 MGA Zone 51

Figure

4

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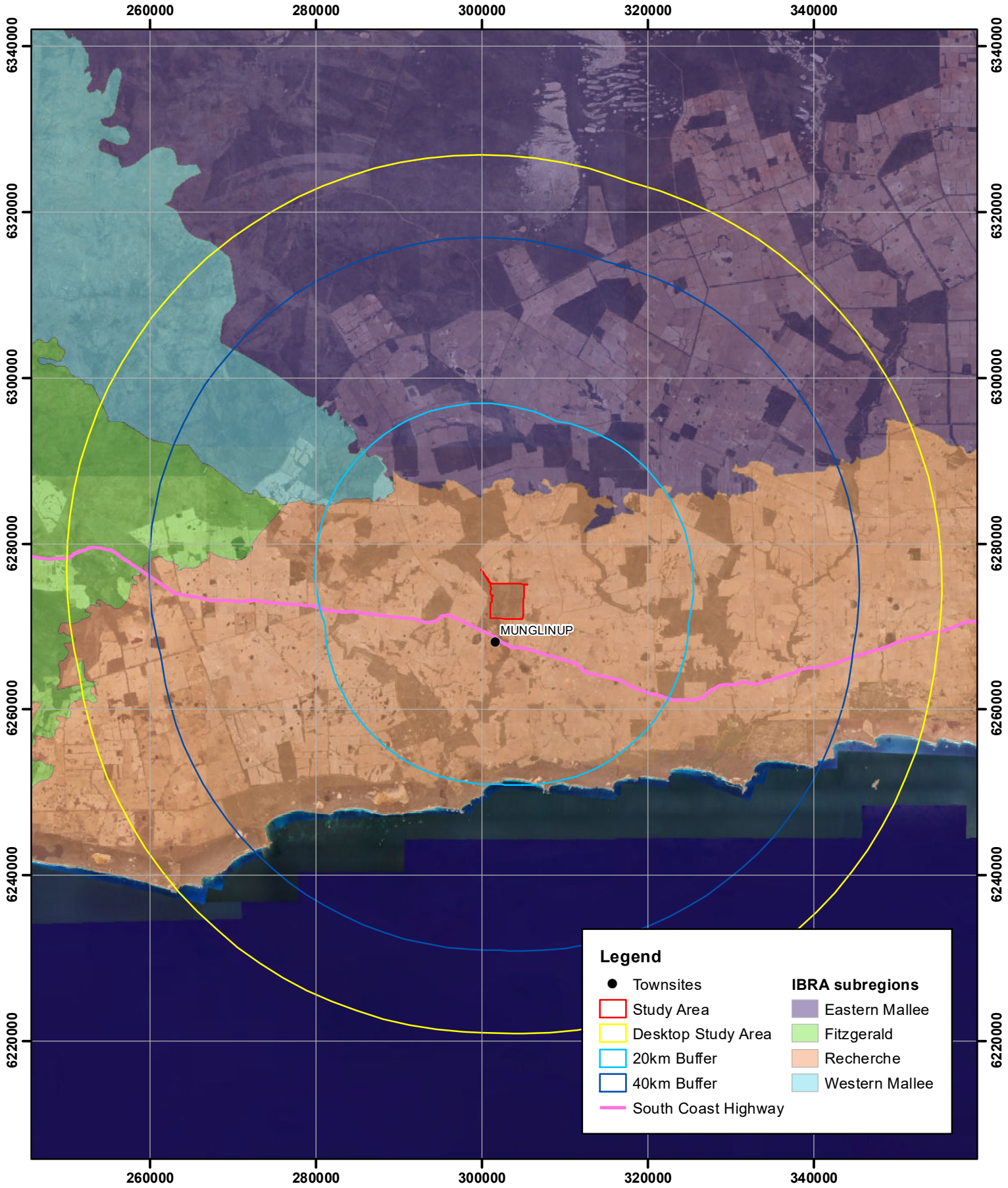
Appendix A: Relevant Figures showing Extent of Regional Dataset Information, the Desktop Study Area and Study Area



The location of the project and the extent of the desktop study area

Author: Steve Vlahos

WEC Ref: MRC19-48-01

WOODMAN ENVIRONMENTAL

Filename: MRC19-48-01-App-A1.mxd

Scale: 1:600,000 (A4)

Projection: GDA 1994 MGA Zone 51

Revision: A - 09 October 2019

Appendix

A1

This map should only be used in conjunction with WEC report MRC19-48-01.

260000 280000 300000 320000 340000

6340000 6320000 6300000 6280000 6260000 6240000 6220000 6200000

CASCADE

JERDACUTTUP

MUNGLINUP

COOMALBIDGUP

Legend

- Townsites
- Study Area
- Desktop Study Area
- 20km Buffer
- 40km Buffer
- South Coast Highway

Vegetation System Associations

- BROAD ARROW_468
- ESPERANCE_125
- ESPERANCE_128
- ESPERANCE_4048
- ESPERANCE_41
- ESPERANCE_47
- ESPERANCE_5048
- ESPERANCE_516
- ESPERANCE_519
- ESPERANCE_929
- ESPERANCE_931
- ESPERANCE_934
- FANNY COVE_125
- FANNY COVE_129
- FANNY COVE_4048
- FANNY COVE_41
- FANNY COVE_42
- FANNY COVE_47
- FANNY COVE_7048
- FANNY COVE_931
- HYDEN_128
- HYDEN_1413
- HYDEN_2048
- HYDEN_47
- HYDEN_519
- HYDEN_929
- LAKE HOPE_125
- LAKE HOPE_128
- LAKE HOPE_413
- LAKE HOPE_47
- LAKE HOPE_482
- LAKE HOPE_486
- LAKE HOPE_493
- LAKE HOPE_519
- LAKE HOPE_521
- LAKE HOPE_924
- LAKE HOPE_925
- LAKE HOPE_931
- LAKE HOPE_936
- LORT_128
- LORT_47
- LORT_51
- LORT_512
- LORT_519
- LORT_552
- LORT_924
- LORT_929
- LORT_931
- LORT_934
- OLDFIELD_128
- OLDFIELD_1413
- OLDFIELD_2048
- OLDFIELD_47
- OLDFIELD_519
- OLDFIELD_552
- OLDFIELD_929
- OLDFIELD_931
- QUALUP_516
- RAVENSTHORPE_352
- RAVENSTHORPE_47
- RAVENSTHORPE_691
- RAVENSTHORPE_929
- SALMON GUMS_128
- SALMON GUMS_486
- SALMON GUMS_552
- SALMON GUMS_924

260000 280000 300000 320000 340000

WOODMAN ENVIRONMENTAL

This map should only be used in conjunction with WEC report MRC19-48-01.

N

Pre-European Vegetation System Associations of the Desktop Study Area

Revision: A - 09 October 2019 Scale: 1:400,000 (A3)

Author: Steve Vlahos

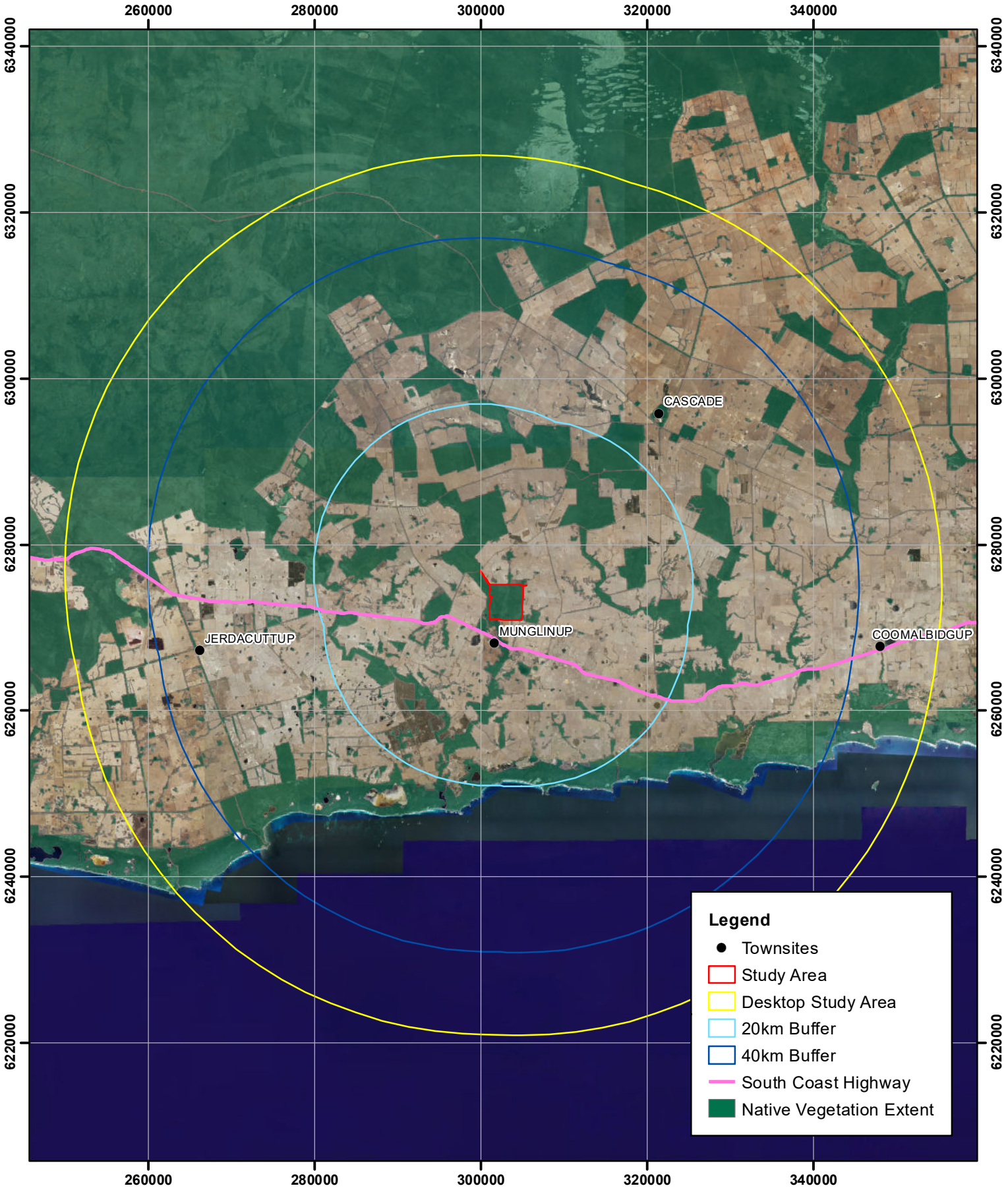
WEC Ref: MRC19-48-01

Filename: MRC19-48-01-App-A2.mxd

Projection: GDA 1994 MGA Zone 51

Appendix

A2



Native Vegetation Extent of the Desktop Study Area	Author: Steve Vlahos	N
	WEC Ref: MRC19-48-01	
WOODMAN ENVIRONMENTAL	Filename: MRC19-48-01-App-A3.mxd	**Appendix**
	Scale: 1:600,000 (A4)	A3
	Projection: GDA 1994 MGA Zone 51	
This map should only be used in conjunction with WEC report MRC19-48-01.	Revision: A - 09 October 2019	

820000 840000 860000 880000 900000

6320000 6300000 6280000 6260000 6240000 6220000 6200000 6180000

CASCADE

JERDACUTTUP

MUNGLINUP

COOMALBIDGUP

Legend

- Townsites
- South Coast Highway
- Study Area
- Desktop Study Area
- 20km Buffer
- 40km Buffer

Map Units

244Hm_1, 244Hm_9, 244Od_1, 244Od_2, 244Od_4, 244Ra_2, 244Ra_3, 245Es_1, 245Es_1Cd, 245Es_1Cp, 245Es_1Cs, 245Es_1E1a, 245Es_1E1b, 245Es_1E1d, 245Es_1E2a, 245Es_1E2b, 245Es_1E2d, 245Es_1E3a, 245Es_1E3b, 245Es_1E3h, 245Es_1S1a, 245Es_1S1b, 245Es_1s, 245Es_1sd, 245Es_2, 245Es_2E2a, 245Es_2E3b, 245Es_3sd, 245Es_4, 245Es_4E4e, 245Es_4G2a, 245Es_4T3, 245Es_5, 245Es_5E1b, 245Es_5E4b, 245Go_1, 245Go_1G3d, 245Go_1G5, 245Go_2, 245Go_3, 245Mu_1, 245Mu_2, 245Mu_3, 245Mu_4, 245Mu_5, 245Mu_6, 245To_1, 245To_2, 245Yo_1, 245Yo_1R, 245Yo_1Y1, 245Yo_1Y2, 245Yo_1Y3, 245Yo_1Y4, 245Yo_3, 246Ha_1, 246Ha_2, 246Sc_1, 246Sc_1E1b, 246Sc_1E2c, 246Sc_1E3b, 246Sc_1S1b, 246Sc_1S4b, 246Sc_1S4c, 246Sc_1S5b, 246Sc_1S6b, 246Sc_1S7c, 246Sc_1S8c, 246Sc_1S9a, 246Sc_2, 246Sc_4, 246Sc_5, 246Sc_6, 246Sc_8, 246Sg_2, 246Sg_3, 246Sg_4, 250HoA_, 250Ln_1, 250Ln_2g, 250Nw_2

820000 840000 860000 880000 900000

WOODMAN ENVIRONMENTAL

This map should only be used in conjunction with WEC report MRC19-48-01.

N

Soil-landscape Units of the Desktop Study Area (Purdie *et al.* 2004)

Revision: A - 09 October 2019 Scale: 1:400,000 (A3)

Author: Steve Vlahos

WEC Ref: MRC19-48-01

Filename: MRC19-48-01-App-A4.mxd

Projection: GDA 1994 MGA Zone 50

Appendix

A4

260000 280000 300000 320000 340000

6340000 6320000 6300000 6280000 6260000 6240000 6220000 6200000

CASCADE

JERDACUTTUP

MUNGLINUP

COOMALBIDGUP

Legend

- Townsites
- Study Area
- Desktop Study Area
- 20km Buffer
- 40km Buffer
- South Coast Highway
- Native Vegetation Extent
- DBCA Conservation Reserves
- Other Reserves
- Unallocated Crown Land
- Freehold
- Other Crown Land

WOODMAN ENVIRONMENTAL

This map should only be used in conjunction with WEC report MRC19-48-01.

N

Remnant vegetation and land tenure of the Desktop Study Area

Revision: A - 09 October 2019 Scale: 1:400,000 (A3)

Author: Steve Vlahos

WEC Ref: MRC19-48-01

Filename: MRC19-48-01-App-A5.mxd

Projection: GDA 1994 MGA Zone 51

Figure

A5

Appendix B: Summary of flora and vegetation surveys of the Desktop Study Area

Summary of relevant flora and vegetation surveys in the Desktop Study Area

Source	Survey Details	Comments
Ecoscape (2015) *State Barrier Fence Biological Survey* Report Number: 9309-3087-13R Final rev1 Proponent: Department of Agriculture and Food Western Australia	• Study Area included 640km length surveyed at width of 100m. • Study Area almost entirely within the Eastern Mallee subregion of the Mallee IBRA region and the Fitzgerald subregion of the Esperance Plain IBRA region. Includes a small area of the Recherche subregion of the Esperance IBRA region in the far east of the study area (east of Esperance). • Level 2 surveys conducted in areas adjacent to conservation estate (10m x 10m quadrats). • 88 vegetation types identified.	**Not further assessed in this review; portion of the study area in the vicinity of Munglinup is not located in the Recherche IBRA subregion.**
ecoscape (2017) *State Barrier Fence Biological Survey.* Proponent: Department of Agriculture and Food Western Australia.	• Targeted flora surveys to identify and map the extent of conservation significant flora (Threatened and Priority Flora) intersected by the study area. • Study Area almost entirely within the Eastern Mallee subregion of the Mallee IBRA region; small area in the Fitzgerald subregion of the Esperance Plain IBRA region and a small area corresponds with the Recherche subregion of the Esperance Plain IBRA region. • Some area covered in Esperance_4048; _47 and _516 • Level 2 surveys conducted in areas adjacent to conservation estate (10m x 10m quadrats). • 88 vegetation types identified.	**Not further assessed in this review; portion of the study area in the vicinity of Munglinup is not located in the Recherche IBRA subregion.**
ecologia Environment (2015) *Munglinup Graphite Project Flora and Fauna Assessment.* Proponent: Gold Terrace Pty Ltd	• Level 2 flora and vegetation assessment of the Munglinup Graphite Project (the study area) to support the Native Vegetation Clearing Permit	Previous survey of Study area. No further information provided regarding the regional extent of mapped vegetation. **Not further assessed as will not provide additional regional context.**

Source	Survey Details	Comments
Craig, G. (2017a) *Botanical Survey Report; Location 761, 'Nairnup'.* Unpublished report prepared for Ronald and Gweyth Gibson. IBSA reference: IBSA-BK00-0025. https://biocollect.ala.org.au/ibsa/project/index/106a316f-6829-4f07-a0f1-b59a37747f7a	• Level 1 Flora and Vegetation survey conducted for Ronald and Gweyth Gibson, for Location 761, 'Nairnup' (Figure 4). • Report not available; no information provided as per vegetation units described or mapped.	Small portion adjacent to remnant vegetation within Esperance_36 VSA. Located on private property. **Report not publicly available; not utilised in this assessment.**
Craig, G. (2017b). *Botanical Survey Report: Location 762, 'Nairnup'.* Unpublished report prepared for Ronald and Gweyth Gibson IBSA reference: IBSA-BK00-0026. https://biocollect.ala.org.au/ibsa/project/index/1621376a-ebc9-42d5-9179-2401e5024146	• Level 1 Flora and Vegetation survey conducted for Ronald and Gweyth Gibson, for Location 762, 'Nairnup' (Figure 4). • Report not available; no information provided as per vegetation units described or mapped.	Adjacent to remnant vegetation within Esperance_516 and Esperance-47 VSAs. Located on private property. **Report not publicly available; not utilised in this assessment.**
Water, J (2017) *River Road Construction Project: Vegetation, Flora, Fauna and Environmental Considerations Report*. Unpublished report prepared for Shire of Esperance IBSA reference: IBSA-BK00-0063. https://biocollect.ala.org.au/ibsa/project/index/99b2617b-a55f-425d-8b6b-5ce6264a06da	• Level 1 Flora and Vegetation survey conducted for the Shire of Esperance, for the River Road Construction Project, from Cascade Rd to Oldfield Rd. • 6.35ha of native vegetation assessed. • Approximately 22km north-east of the Study Area (Figure 4). • Eastern Mallee IBRA subregion. • Vegetation descriptions as presented very brief and direct comparison to key VUs; however, one vegetation description has same dominant overstory as VU 8 (*Eucalyptus occidentalis*) on similar substrate (river area)	Roadside reserve vegetation survey adjacent to remnant vegetation. Survey area is outside of the Esperance Vegetation system. **Report not considered further; vegetation descriptions generally not comprehensive enough to determine similarity to key VUs; incorrect IBRA subregion.**

Source	Survey Details	Comments
Shire of Esperance (2017). *Neds Corner Road Construction Project: Vegetation, Flora, Fauna and Environmental Considerations Report.* Unpublished report prepared for Shire of Esperance. IBSA reference: IBSA-BK00-0062. https://biocollect.ala.org.au/ibsa/project/index/dfc78df4-b4b5-4635-9ed0-d60de19ebaa8	• Level 1 Flora and Vegetation survey conducted for the Shire of Esperance, for the Neds Corner Road Construction Project. • Survey primarily to determine presence of TEC 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia'. • Approximately 22km north-east of the Study Area (Figure 4). • Eastern Mallee IBRA subregion. • Vegetation descriptions very brief; however none appear to be similar to key VUs.	Roadside reserve vegetation survey. No adjacent remnant vegetation. **Report not considered further; vegetation descriptions not comprehensive enough to determine similarity to key VUs; incorrect IBRA subregion.**
GHD Pty Ltd (GHD) (2006) *South Coast Highway Ravensthorpe Upgrade Project Passing Lanes 3 and 4* *Preliminary Environmental Impact Assessment*. Unpublished report (61/16918/9271) prepared for Main Roads Western Australia, April 2006. https://www.der.wa.gov.au/images/documents/your-environment/native-vegetation/Clearing_Permit_Annual_Reports/CPS_818/2006/Great_Southern/South_Coastal_Hwy_Ravensthorpe_Upgrade_Project_Passing_lanes_3_and_4.pdf	• Preliminary Environmental Impact Assessment including survey of flora species in the roadside reserve adjacent to ''C'' Class Reserves; • Located on South Coast Hwy immediately west of Munglinup (Figure 4). • Survey conducted in VSA Esperance_47. • Vegetation units not mapped or described; significant flora survey undertaken only.	Roadside reserve vegetation survey; survey did not extend into nearby conservation reserves. **Report not considered further; vegetation descriptions or mapping not undertaken.**

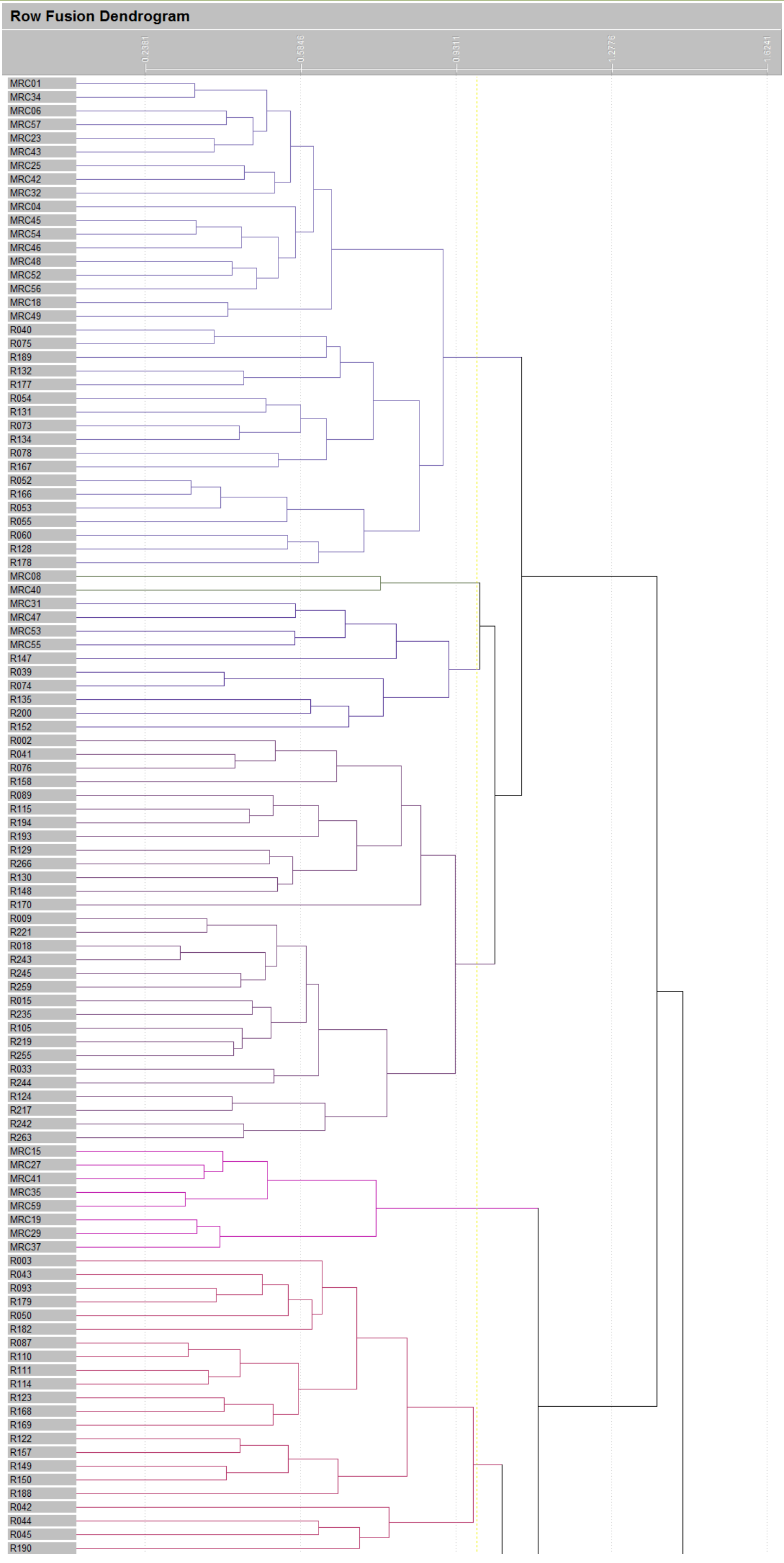
Source	Survey Details	Comments
GHD Pty Ltd (GHD) (2007) *South Coast Highway Passing Lanes 5 & 6 Project* *Preliminary Environmental Impact Assessment and Biological Report.* Unpublished report (61/18533/10292) prepared for Main Roads Western Australia, March 2007. https://www.der.wa.gov.au/images/documents/your-environment/native-vegetation/Clearing_Permit_Annual_Reports/CPS_818/2008/Goldfields/EIA_South_Coast_Highway_Passing_Lanes_5_and_6.PDF	• Preliminary Environmental Impact Assessment including survey of plant species in the roadside reserve adjacent to DBCA conservation reserve; • Located on South Coast Hwy approximately 30km east of Munglinup (Figure 4). • Survey conducted in VSA Esperance_47. • Flora species recorded during survey. • Vegetation units not mapped or described.	Roadside reserve vegetation survey; survey did not extend into nearby conservation reserves. **Report not considered further; vegetation descriptions or mapping not undertaken.**
Ravensthorpe Range **There are a number of reports covering the various surveys of flora and vegetation within the Ravensthorpe Range (Figure 4)**		
Craig, G. F. (2004). *Tectonic Resources NL KUNDIP MINING LEASES M74/41, 51, 53 & 135 and P74/153 Vegetation and Flora Survey* http://www.epa.wa.gov.au/sites/default/files/Referral_Documentation/Appendix%20F%20Vegetation%20and%20Flora.pdf	• Flora and vegetation survey of the Kundip mining leases and target flora survey, located north of Kundip Nature Reserve. • 18 vegetation units mapped based on the basis of dominant life form and structure. This does not enable direct comparison to the vegetation units mapped in the Study Area.	Outside the 50km Desktop Study Area. Survey area is outside of the Esperance VS. **Report not considered further.**

Source	Survey Details	Comments
Massenbauer, A. (2006) Ravensthorpe area catchment appraisal 2006. Department of Agriculture and Food, Western Australia. Report 311 https://pdfs.semanticscholar.org/856e/0f77398f3a7b3edbf6e7c92c9f407d9af865.pdf	• The objective of Rapid Catchment Appraisal (RCA) is to assess the condition of, and future risks to agricultural and natural resources. • The report summarises current information for the Ravensthorpe area, in relation to soils, groundwater, erosion. • No vegetation unit description or mapping provided.	**Report not considered further; general collation of information with no specific vegetation data.**
G.F. Craig E.M. Sandiford E.J. Hickman A.M. Rick J. Newell (2007). *The vegetation of the Ravensthorpe Range, Western Australia: I. Mt Short to South Coast Highway*. The Department of Environment and Conservation, and South Coast Natural Resource Management. https://library.dbca.wa.gov.au/static/FullTextFiles/064929.pdf	• Pilot project of the Biodiversity Inventory Program. • Located north of Ravensthorpe, outside of the 50km Desktop Study Area (Figure 4) in UCL and Crown Reserve. • Study area mainly on Ravensthorpe_1 and Kybulup_1 soil landsystem units. • Located in the Ravensthorpe Vegetation System. • Releve information of dominant species collected. • 50 vegetation units described; vegetation descriptions not undertaken in a format able to be directly compared to that of the Study Area.	Outside the Esperance System associations. Outside (just to West) of desktop study area. **Report not considered further.**
Craig GF, EJ Hickman, N McQuoid, J Newell, AM Rick and EM Sandiford (2008) Vegetation of the Ravensthorpe Range, Western Australia: Mt Short to Kundip, 1:10 000 scale. Department of Environment and Conservation and South Coast Natural Resource Management Inc, Albany, Western Australia. https://library.dbca.wa.gov.au/static/FullTextFiles/024860.pdf	• 2008 survey area of the Biodiversity Inventory Program. • Located north of Kundip and east of Ravensthorpe, outside of the 50km radius Desktop Study Area (Figure 4) in Crown Reserve. • Study area mainly on Ravensthorpe_1 and Kybulup_1 soil landscape units. • Located in the Ravensthorpe Vegetation System. • Releve information of dominant species collected. • 70 vegetation units described; vegetation descriptions not undertaken in a format able to be directly compared to that of the Study Area.	Outside the Esperance System associations. Outside (just to West) of desktop study area. **Report not considered further.**

Source	Survey Details	Comments
S. Kern, R. Jasper and D. True (Western Botanical 2008) Floristic Survey of the Ravensthorpe Range. Report prepared for Department of Environment and Conservation (DEC), April 2008; Report reference WB483	• Located in the Mallee IBRA subregion, Ravensthorpe Range (Figure 4); • 200 20x20m quadrats established • No analysis of vegetation units undertaken	• Outside of the Esperance System. • No vegetation units described. • **Report not considered further.**
Department of Parks and Wildlife (Biogeography Program) (2012). Biological Survey of the Ravensthorpe Range (Phase 1), Version 1/2013. Persistent URL: http://www.aekos.org.au/collection/wa.gov.au/ravensthorpe. TERN AEKOS, rights owned by the State of Western Australia (Department of Parks and Wildlife). Accessed [dd mmm yyyy, e.g. 01 Jan 2016 https://portal.tern.org.au/biological-survey-ravensthorpe-phase-1/18474	• Biological Survey of the Ravensthorpe Range (Phase 1) • Phase 1 of this survey involved the establishment of 200 permanent quadrats covering the geomorphologic, geologic and floristic variation across the range. • Phase 2 of this survey involved the establishment of a further 66 permanent quadrats and a detailed analysis of the compositional vegetation patterns across the range based on all 266 quadrats.	• Outside the Esperance System associations. • Outside (just to West) of desktop study area. • **Report not considered further.**

Source	Survey Details	Comments
Adrienne Markey , Stephen Kern, and Neil Gibson (2012) Floristic communities of the Ravensthorpe Range, Western Australia. *Conservation Science W. Aust*. 8 (2) : 187–239. https://www.researchgate.net/publication/286978068_Floristic_communities_of_the_ravensthorpe_range_western_australia	• Study area mainly located outside of the Desktop Study Area; some of the eastern section is located within the Desktop Study area however (Figure 4). • The Study Area is mainly located on the Ravensthorpe System (Beard); mainly in the Fitzgerald but also partly in the Recherche IBRA subregions; • Total of 266 quadrats established; all floristics recorded within 10mx10m plot, with canopy cover recorded in nested 20mx20m plot. • Total of 21 communities described. Community 19 superficially similar to VU 2, however mid storey and under storey species are not similar.	Survey area is generally to the NW of the desktop study area. 18 plots within Vegetation Association – Esperance 47. **Report not considered further – the bulk of the works undertaken in a separate IBRA subregion. Although similar structure (mallee woodland/shrubland) vegetation described, the vegetation units are not similar between the two surveys.**
Craig, G. F. Oldfield Landcare Group.& Western Australia. Agriculture Western Australia. (1998). Oldfield catchment, 1998 : a report prepared for the Oldfield Landcare Group. Perth, W.A : Agriculture Western Australia	No survey details available.	Report not considered further – report not accessed.

Appendix P: Classification Analysis Dendrogram of Study Area and Markey *et al.* (2012) Quadrats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MRC43
MRC25
MRC42
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MRC04
MRC45
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R053
R055
R060
R128
R178
MRC08
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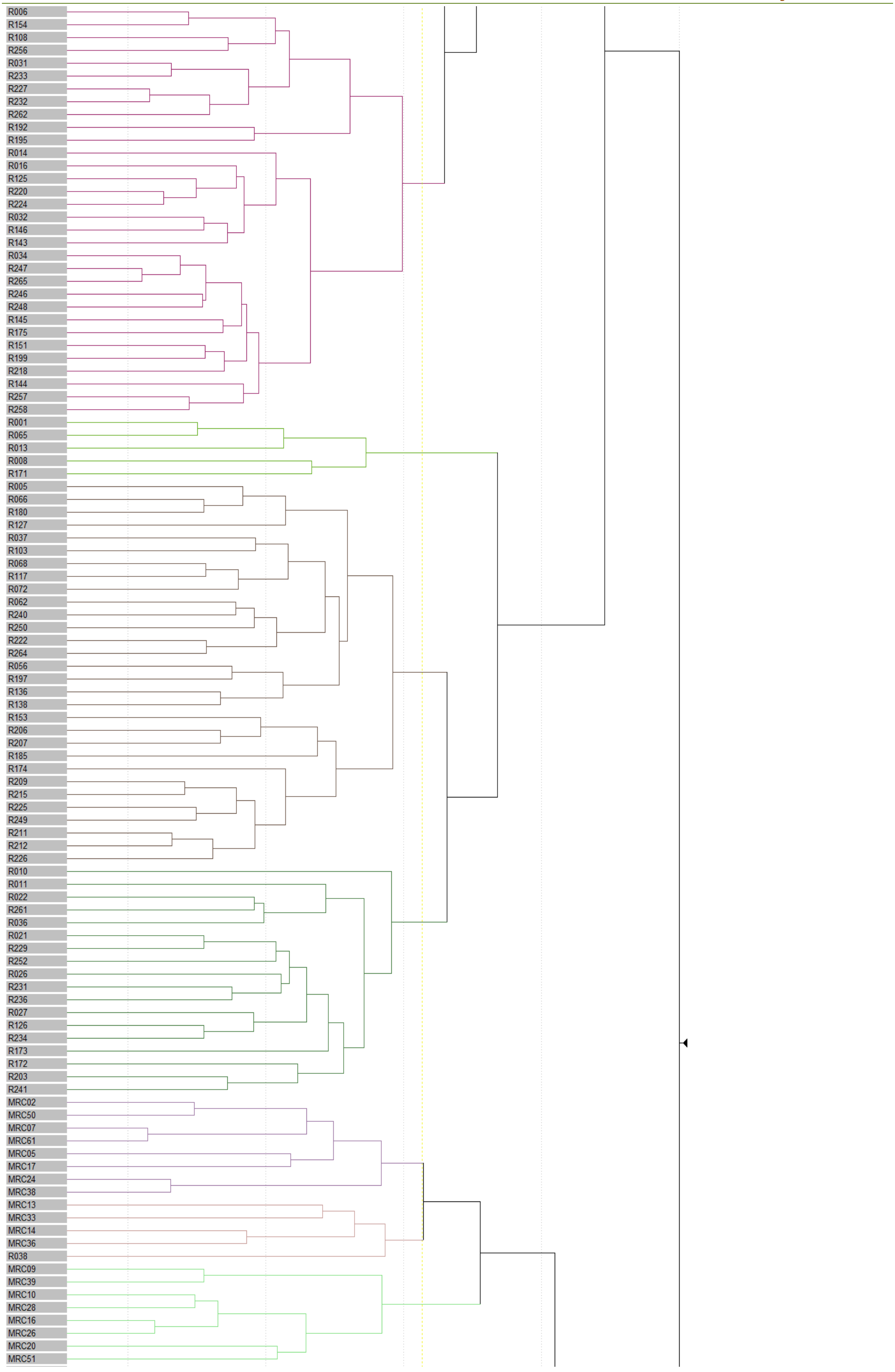
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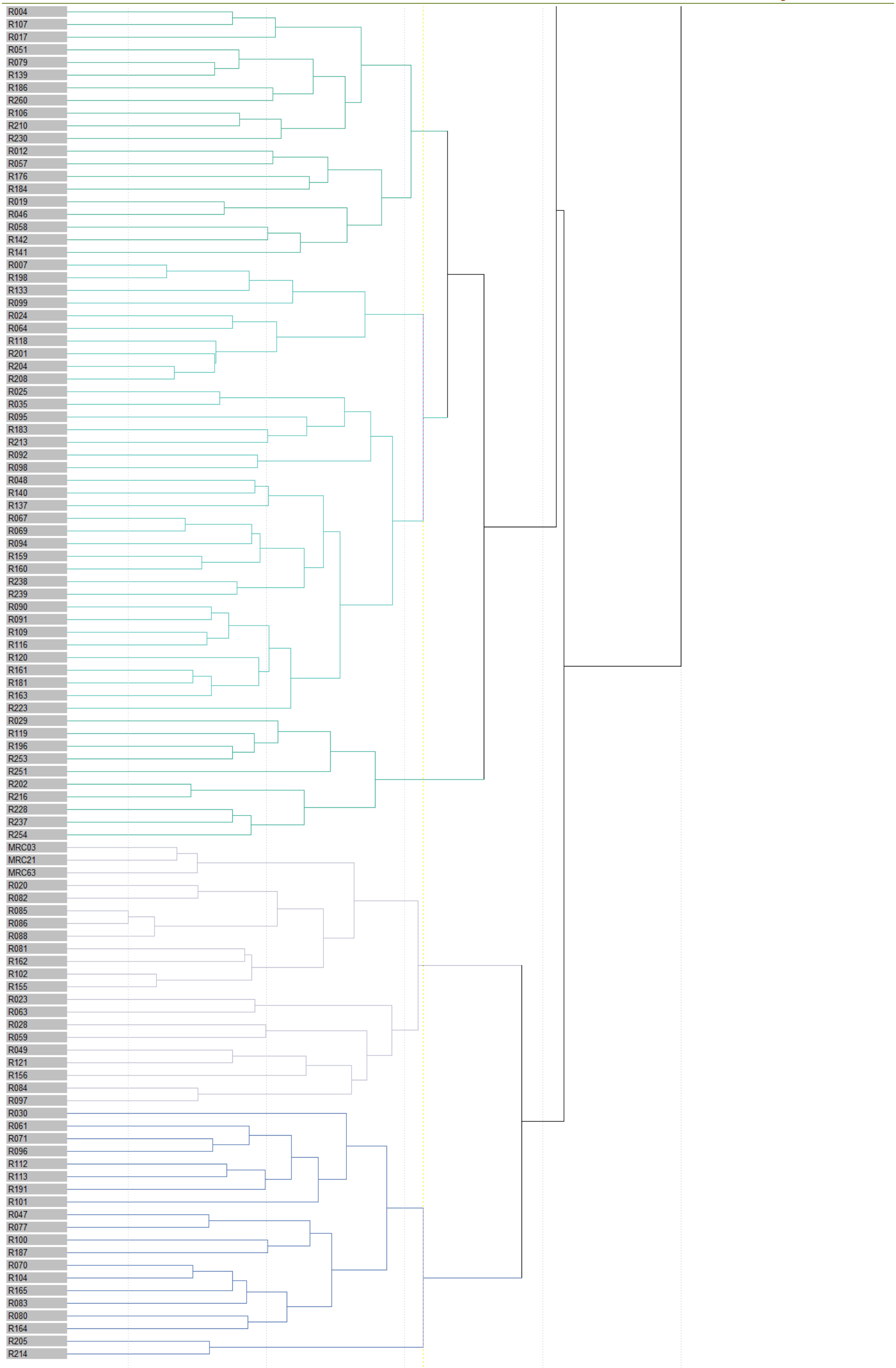
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