

**Medallion Metals Ltd**

**Tenement E74/578**

**BANDALUP POOLS**

**THREATENED FLORA AND THREATENED  
ECOLOGICAL COMMUNITIES SURVEY**



A report prepared for  
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**Cover photo:** Bandalup Creek at proposed crossing for access to drill holes

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## SUMMARY

Bandalup Pools is a prospect area on tenement E74/578, situated 30 km south-east of Ravensthorpe and 9 km east of Kundip, and mainly lies between Bandalup Creek and Hatfield Track. The proponent requested a targeted search for Threatened and Priority flora and Threatened Ecological Communities (TEC) at proposed drill holes and access tracks to them:

- drill lines – total 1.1 km long;
- access lines – total 2.3 km long;
- NW-SE access track from Hatfield Track – 2.3 km long.

### Vegetation

The survey area lies in the South West Botanical Province and the Esperance Biogeographic Region (Cresswell and Thackway 1995). At this location, Bandalup Creek forms a divide between the Ravensthorpe and Esperance Systems described by Beard (1973).

Hickman (2011) mapped the vegetation in a greater area around the Bandalup Pools and this map was ground-truthed during the current survey. Subsequently, a number of the Hickman (2011) polygons and vegetation association descriptions were modified.

Seventeen vegetation units were identified in the current survey area. A number of the units, especially the mallet-form *Eucalyptus* species, formed fine-scale mosaics which could not be mapped individually, but as a combination of two or three units. This ‘mosaic’ of mallets, *Eucalyptus platypus*, *E. extensa* and *E. clivicola*, was the predominant structural form of vegetation on the calcareous loamy soils along the proposed access and drill lines.

Vegetation types with a more diverse flora were found on the sandier soils along the banks of Bandalup Creek and in the north-east sector of the survey area, with mallee-form eucalypts and myrtaceous shrublands predominating, i.e. the *Eucalyptus austrina* (Eaus), *E. flocktoniae*/*E. phenax* (Eflo/Ephe), *E. oleosa* ssp. *corvina* (Eole) and *E. sporadica* (Espo) vegetation units.

### Vegetation Condition

The vegetation was in pristine condition, except near drill hole BDC021 and the old E-W drill lines varied in condition. The two southern access lines were traversable by vehicle while the northern lines were barely visible. The main NW-SE access track has been maintained and is regularly used by vehicles.

The last fire was recorded over 32 years ago in August 1989, which burnt most of the NW-SE access track, the northern survey line and old track. Only the mid-section of the survey area was old growth vegetation.

A few *Asparagus asparagoides* (bridal creeper) plants, a Weed of National Significance (WONS), were growing in the *Eucalyptus oleosa* ssp. *corvina* (Eole) vegetation near the southernmost drill line. There was no evidence of disease.

### Threatened and Priority Ecological Communities

The EPBC Act listed TEC ‘Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia’ was typical of the gently undulating plain in the south-east sector of the survey area. Three vegetation types fulfilled the diagnostic features to be considered the TEC, as they had greater than 30% proteaceous cover and were in excellent

condition: *Banksia cirsioides* shrubland (Bcir); *Eucalyptus ecostata*/*Eucalyptus pleurocarpa* mallee shrubland (Eeco/ Eple); and *Eucalyptus pleurocarpa* open mallee shrubland/*Banksia media* shrubland (Eple/Bmed).

The WA listed Priority 3(iii) PEC 'Heath on Komatiite of the Ravensthorpe area' existed in the *Eucalyptus flocktoniae* open mallee woodland/*Melaleuca ulicoides* heathland (Eflo/ Muli) vegetation unit. The largest area of this PEC occurred at the west end and south of a drill line, close to Bandalup Creek. Another small patch, extended for about 40 m along one of the old, central drill lines.

### Flora

A total of 163 native species from 34 Families were recorded. The most represented Families of native taxa were: Myrtaceae – 48 species (18 *Eucalyptus*, 18 *Melaleuca*); Cyperaceae – 19 species (13 *Lepidosperma*); Fabaceae – 19 species and Proteaceae – 15 species.

### Priority Flora

The search of DBCA's WAHERB and TPFL databases listed 11 conservation taxa within a 5 km radius of the survey area. Four Priority taxa were present:

- *Lepidosperma* sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844) (P1)
- *Hydrocotyle ?tuberculata* (P2)
- *Lepidosperma* sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764) (P4)
- *Eucalyptus stoatei* (P4)

*Acacia errabunda* (P3) was recorded by Hickman (2011) within the survey area, however it was not found during the current survey. *Eucalyptus ravensthorpensis* (P4) was included in Hickman's vegetation unit descriptions, but no mallets could be confidently identified as this species, instead *E. clivicola* was found to be the predominant taxon.

### Access and drill lines

Alternative access lines to drill holes BCD033 and BDC028 have been recommended.

# 1. INTRODUCTION

Bandalup Pools is a prospect area on tenement E74/578 (previously known as E74/448), situated 30 km south-east of Ravensthorpe and 9 km east of Kundip, and mainly lies between Bandalup Creek and Hatfield Track (Fig 1).

As part of their Jerdacuttup Project, Medallion Metals propose to drill west of Hatfield Track along four east-west lines and an old track parallel to Bandalup Creek that links two of the lines. The survey site can be reached via Hatfield Track, a graded 4WD track/ firebreak that links South Coast Highway in the north with Jerdacuttup Road in the south, then along a 4WD track that heads north-west to the proposed drill lines (Fig 2).

The proposed drill lines were previously cleared late last century with vehicle access along some lines maintained by Tectonic Resources NL in 2012, when further exploration drilling was carried out. The current lines vary in length from 310 m to 900 m long and extend over a north-south distance of 850 m, mostly east of Bandalup Creek except for the northernmost line which continues west of the creek for 500 m.

The proponent requested a targeted search for Threatened and Priority flora and Threatened Ecological Communities (TEC) at proposed drill holes and access tracks to them. Optional alternative routes to the drill holes were also to be investigated:

- drill lines – total 1.1 km long;
- access lines – total 2.3 km long;
- NW-SE access track from Hatfield Track – 2.3 km long.

## 1.1 Climate

Ravensthorpe lies in the 'dry mediterranean' bioclimatic region experiencing 5-6 dry months per year. Winters are cool and damp while summers are warm to hot.

Daily maximum temperatures at Ravensthorpe average from 29°C in January to 16°C in July, and daily minimum temperatures average 14°C in January-February and 7°C in July-September. Temperatures have reached as high as 46°C in January-February and as low as -1.0 to 0.0°C between June and August (Bureau of Meteorology, 2021).

Rainfall in Ravensthorpe is variable and unreliable, with an average annual rainfall of 430 mm. Generally, about two-thirds of the annual rain falls in the six months between May and October as a result of cold fronts and occasional depressions. Summer rainfall comes mainly from thunderstorms associated with cyclones that have degenerated into rain-bearing depressions. Ravensthorpe was drought-affected for three years starting from March 2017 until 2020, i.e. the annual rainfall was within the first decile range (lowest 10%) for the average for that centre.

## 1.2 Soil-Landscape System

The survey area lies within the Ravensthorpe System of undulating low hills on Archaean greenstone of metasediments and ultramafics. It lies close to the west boundary of the Hammersley System, a level plain occasionally gently undulating with extensive gilgai microrelief. The soils are summarised in Table 1 (Department of Agriculture and Food, 2006).

**Table 1 – Soil-landscape subsystems in the Bandalup Pools survey area (Department of Agriculture and Food, 2006).**

Subsystem	Landscape	Soil	Vegetation
<b>Ravensthorpe 2</b>	Hills (400m) with steep slopes grading to moderately inclined on lower slopes, dominated by a south-east to north-west trending central ridge.	Calcareous loamy earths and shallow gravels with associated red shallow loams and bare rock.	Scrub heath on upper slopes.
<b>Hammersley 1</b>	Level plain, occasionally gently undulating with extensive gilgai microrelief.	Alkaline grey shallow sandy duplex soils with associated calcareous loamy earths, which may occur in a complex.	Mallee shrubland of eucalypts

### 1.3 Geology

Bandalup Creek meanders along the eastern base of the Ravensthorpe Range and flows into the Jerdacuttup River 1.3 km south of Bandalup Pools. The topography is steep on the creek banks, while away from the creek landforms change rapidly with steep breakaways and gullies before reaching a gently undulating plain towards Hatfield Track.

The Hatfield Formation lies in the core of Maydon Syncline and is at least 1 km thick north of Bandalup Pools. This formation is the uppermost unit of the Carlingup Terrane (2958 ± 4 Ma), i.e. one of the tectonic units of the Archaean greenstones of the Ravensthorpe greenstone belt. It comprises mainly metapelitic rocks with minor felsic volcanic rocks. Coarser grained metasedimentary rocks become more abundant towards Jerdacuttup Road in the south (Witt 1997).

### 1.4 Pre-European Vegetation

The survey area lies in the South West Botanical Province and the Esperance Biogeographic Region (Cresswell and Thackway 1995). At this location, Bandalup Creek forms a divide between the Ravensthorpe and Esperance Systems described by Beard (1973). Beard's vegetation associations in the area are:

- e<sub>27</sub>Si (Assoc #516) occurs west of Bandalup Creek – 'Shrublands; mallee scrub, black marlock', including *Eucalyptus uncinata*, *Eucalyptus redunca*, *Eucalyptus flocktoniae*, *Eucalyptus incrassata*, *Eucalyptus conglobata*, *Banksia calyei*, *Hakea laurina*, *Hakea crassifolia*, *Hakea coymbosa*, *Melaleuca uncinata*, *Melaleuca thymoides*, and other *Melaleuca* spp.
- e<sub>26</sub>SZc (Assoc #47) occurs east of Bandalup Creek - Shrublands; tallerack mallee-heath'', including *Eucalyptus pleurocarpa*, *Eucalyptus incrassata*, *Lambertia inermis*, *Banksia baueri*, *Calothamnus quadrifidus*, *Eucalyptus tetraptera*, *Andersonia parvifolia*, *Banksia repens*, *Calytrix decandra*.



### 1.5 Previous surveys

Three flora and vegetation surveys have previously been carried out in the Bandalup Pools area:

- 1) Kern et al (2007) included the area to the west of Hatfield Track as part of their floristic survey of Banded Iron Formations (BIF) in the Ravensthorpe Range. Two permanent quadrats, R141 and R142, lie close to the one of the proposed drill lines (Fig 2);
- 2) In February 2011, Ellen Hickman surveyed 13 drill lines and associated access routes in the Bandalup Pools exploration area of E74/578 (Hickman 2011). Hickman prepared a vegetation map and recorded two Priority taxa – *Acacia errabunda* (P3) and *Eucalyptus stoatei* (P4). *Eucalyptus ravensthorpensis* (P4) was included in her vegetation descriptions;
- 3) In November 2011, Craig (2011) carried out a targeted survey for Threatened and Priority flora and Threatened Ecological Communities along two drill lines which were tangential to Lines 11A and 11B of Hickman (2011).

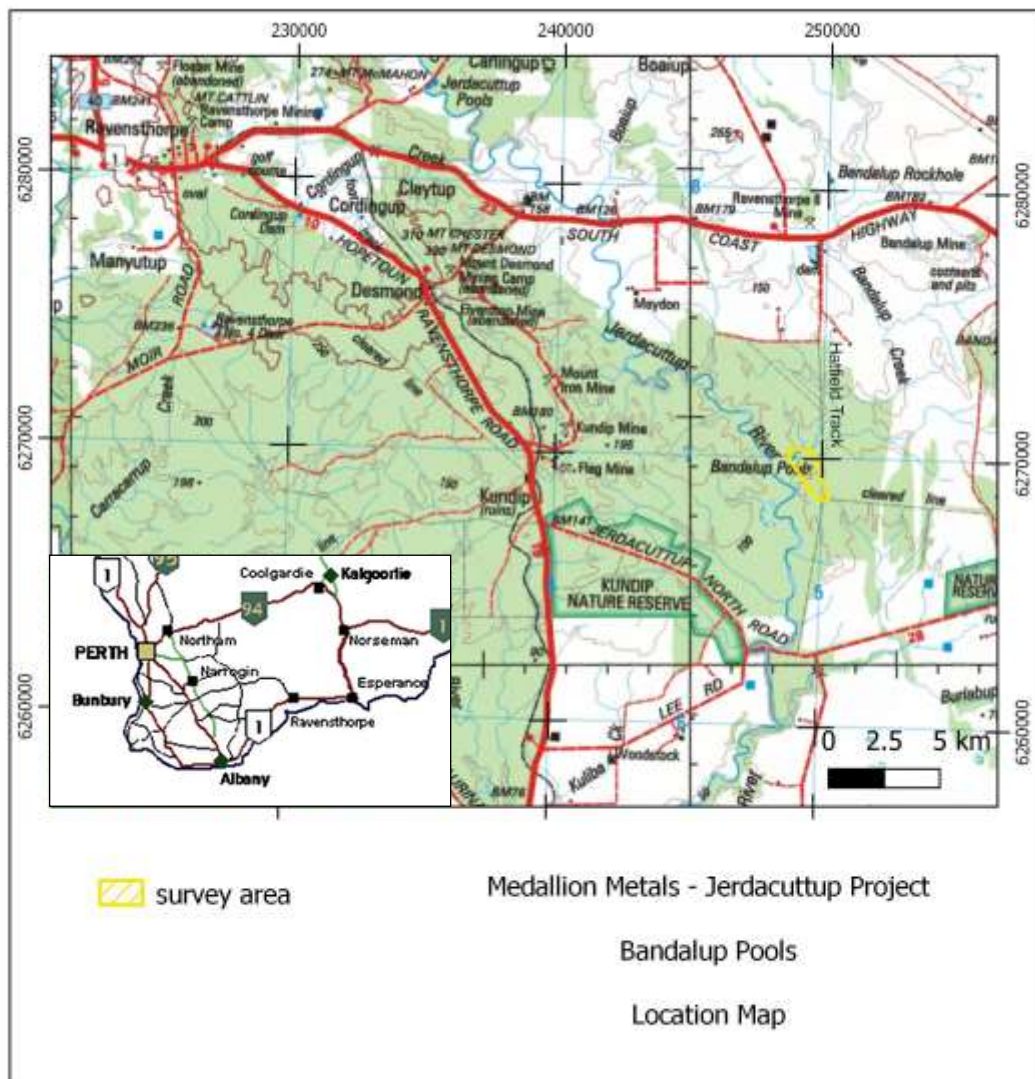


Figure 1 – Location of Bandalup Pools survey area

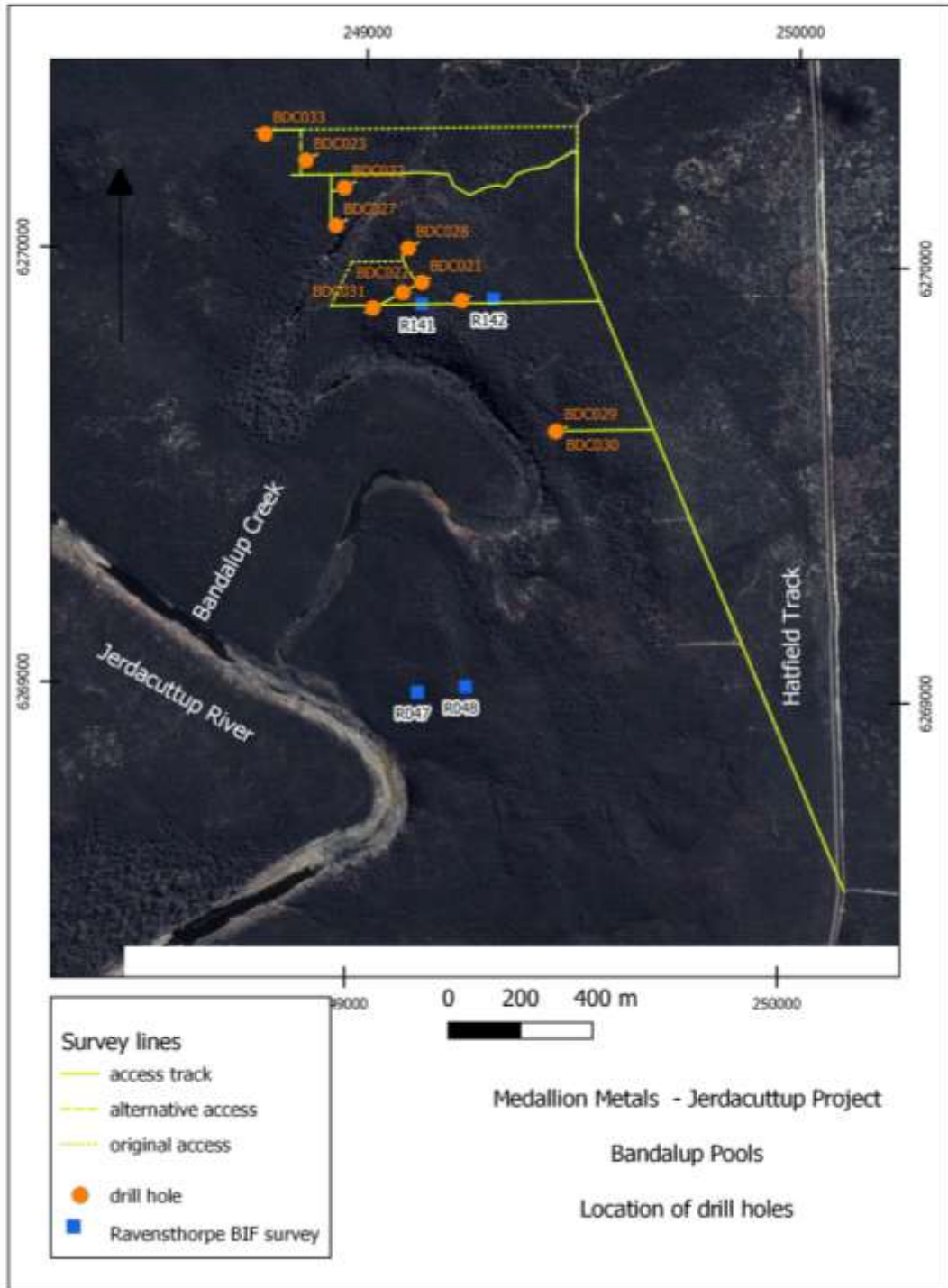


Figure 2 – Location of drill holes and proposed access

## 2. METHODS

### 2.1 Desktop

Medallion Metals obtained searches of DBCA's databases (WAHerb and TPFL) over the Jerdacuttup Project which were used to determine the likelihood of any Threatened and Priority flora occurring in the Bandalup Pools survey area. A Naturemap search identified conservation taxa occurring within a 5 km radius of the survey area. In addition, the report by Hickman (2011) was used to locate any other conservation taxa.

DBCA's (2021) list of Priority Ecological Communities was assessed for the likelihood of any TECs or PECs occurring in the survey area.

The vegetation map prepared by Hickman (2011) was digitised by Damien Rathbone (Southern Ecology) prior to the field survey. Taxonomic names were updated to reflect current nomenclature used by the WA Herbarium.

### 2.2 Field Survey

A survey was carried out according to the Environmental Protection Authority's technical guide (EPA 2016) on 30<sup>th</sup> September and 4<sup>th</sup> October 2021. The weather was pleasantly warm (23°C max), sunny, with a slight wind. Further surveys were carried out on the 6<sup>th</sup> and 8<sup>th</sup> July 2022, when the weather was cool (19°C max), overcast with occasional showers. Medallion Metals provided digital polylines and points of areas to be surveyed.

Sites of interest were marked as waypoints with a hand-held GPS (Garmin II) using the Geocentric Datum Australia 1994 (GDA94) with  $\pm$  4-6 m accuracy.

Traverses (10 m width) along the access and drill lines recorded significant flora and changes in vegetation types. One or two 10 m x 10 m non-permanent quadrats were recorded at each of the proposed drill holes, plus all species recorded around the site (20 m x 20 m). If proteaceous species were present, the projected foliage cover of each taxon was recorded to determine the TEC status. Soil type, landform, vegetation structure and percentage cover (NVIS 2017), vegetation condition (EPA 2016), species present in each vegetation layer and photograph was documented for each quadrat/ drill hole.

QGIS mapping software was used to prepare shapefiles and maps. Vegetation units were classified using floristic composition. Hickman's (2011) vegetation map was ground-truthed along the access and drill lines and polygons modified where discrepancies were found. Vegetation mapping was extended out from the drill lines using interpretation of aerial photography to delineate polygon boundaries.

Plant specimens were verified using the author's private herbarium, which has previously been verified in the Perth Herbarium. Nomenclature follows WAHerb.

### 2.3 Survey limitations

The limitations to the survey are outlined in Table 1.

**Table 2 – Limitations of survey**

Possible Limitations	Constraints (Yes/No): Significant, Moderate Or Negligible	Comment
<b>Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed</b>	No	Dr Gillian Craig is a Senior Botanist who has carried out vegetation and flora surveys in the Shire of Ravensthorpe, including the Kundip area, over the past 30 years.
<b>Availability of contextual information at a regional and local scale</b>	No	Published reports are available on the vegetation, geology and soil-landscape in the Shire.
<b>Proportion of flora recorded and/or collected, any identification issues</b>	Yes	All species were known to the botanist and could be identified with confidence, except identification of <i>Eucalyptus ravensthorpensis</i> (P4) which had been recorded by Hickman (2011). In the areas surveyed, all field observations and collected specimens were deemed to be the similar mallet, <i>E. clivicola</i> . <i>Hydrocotyle</i> require fruits to confirm identification, and only immature plants were present.
<b>Completeness (was the appropriate area fully surveyed - effort and extent)</b>	No	The access lines and drill lines were traversed on foot. The NW-SE access track was surveyed by vehicle as no further clearing would be required.
<b>Remoteness and/or access problems</b>	No	All sections of the study area were accessible either by foot or 4WD vehicle.
<b>Survey timing, weather, season of survey</b>	No	The survey was carried out in two different seasons, Spring 2021 and Winter 2022.
<b>Disturbance that may have affected the results of survey such as fire, flood or clearing.</b>	No	All vegetation was in pristine condition. The drill lines varied in level of historic clearance, from clearly visible and traversable by vehicle to hardly distinguishable.
<b>Vegetation type descriptions</b>	Negligible	The larger area surveyed Hickman (2011) provided vegetation descriptions that needed modification of some polygons for the current study. As found by Hickman, the mallet species formed mosaics which could not be mapped into separate units.

## 3. RESULTS

### 3.1 Vegetation Units

Seventeen vegetation units were identified in the survey area (Table 3). A number of the units, especially the mallet form *Eucalyptus* species, formed fine-scale mosaics which could not be mapped individually, but as a combination of two or three units (Fig 3). Hickman (2011) provided the species composition for each vegetation unit which are again provided in Appendix 1 of this report with updated species names, some additional species, NVIS structural formation terminology and photo from the survey area.

A number of polygons of Hickman's (2011) vegetation map were modified and some additional patches of **Eflo/Ephe** and **Eflo/Muli** have been included in Fig 3.

**Table 3 - Vegetation Units (after Hickman 2011) identified in the Bandalup Pools survey area**

Map Code	Vegetation Unit	TEC/PEC
1. Bcir	<i>Banksia cirsioides</i>	EPBC Act Endangered TEC
2. Eaus	<i>Eucalyptus austrina</i>	
3. Eeco/Eple	<i>Eucalyptus ecostata/ E.pleurocarpa</i>	EPBC Act Endangered TEC
4. Eflo/Ephe	<i>Eucalyptus flocktoniae/ E.phenax</i>	
5. Eflo/Espp	<i>Eucalyptus flocktoniae/ Eucalyptus species</i>	
6. Eflo/Muli	<i>Eucalyptus flocktoniae/ Melaleuca ulicoides</i>	WA Priority 3(iii)
7. Elep/Mrig	<i>Eucalyptus leptocalyx/ Melaleuca rigidifolia</i>	
8. Eole	<i>Eucalyptus oleosa subsp. corvina</i>	
9. Eole/Mpau	<i>Eucalyptus oleosa subsp. corvina/ Melaleuca pauperiflora</i>	
10. Eple/Bmed	<i>Eucalyptus pleurocarpa/ Banksia media</i>	EPBC Act Endangered TEC
11. Eunc/Einc	<i>Eucalyptus uncinata/ E.incrassata</i>	
12. Mosaic: Eext	<i>Eucalyptus extensa</i>	
13. Epla	<i>Eucalyptus platypus</i>	
14. Ecli	<i>Eucalyptus clivicola</i>	
15. Espo	<i>Eucalyptus sporadica</i>	
16. Mcut	<i>Melaleuca cuticularis</i>	
17. Mtha	<i>Melaleuca thapsina</i>	

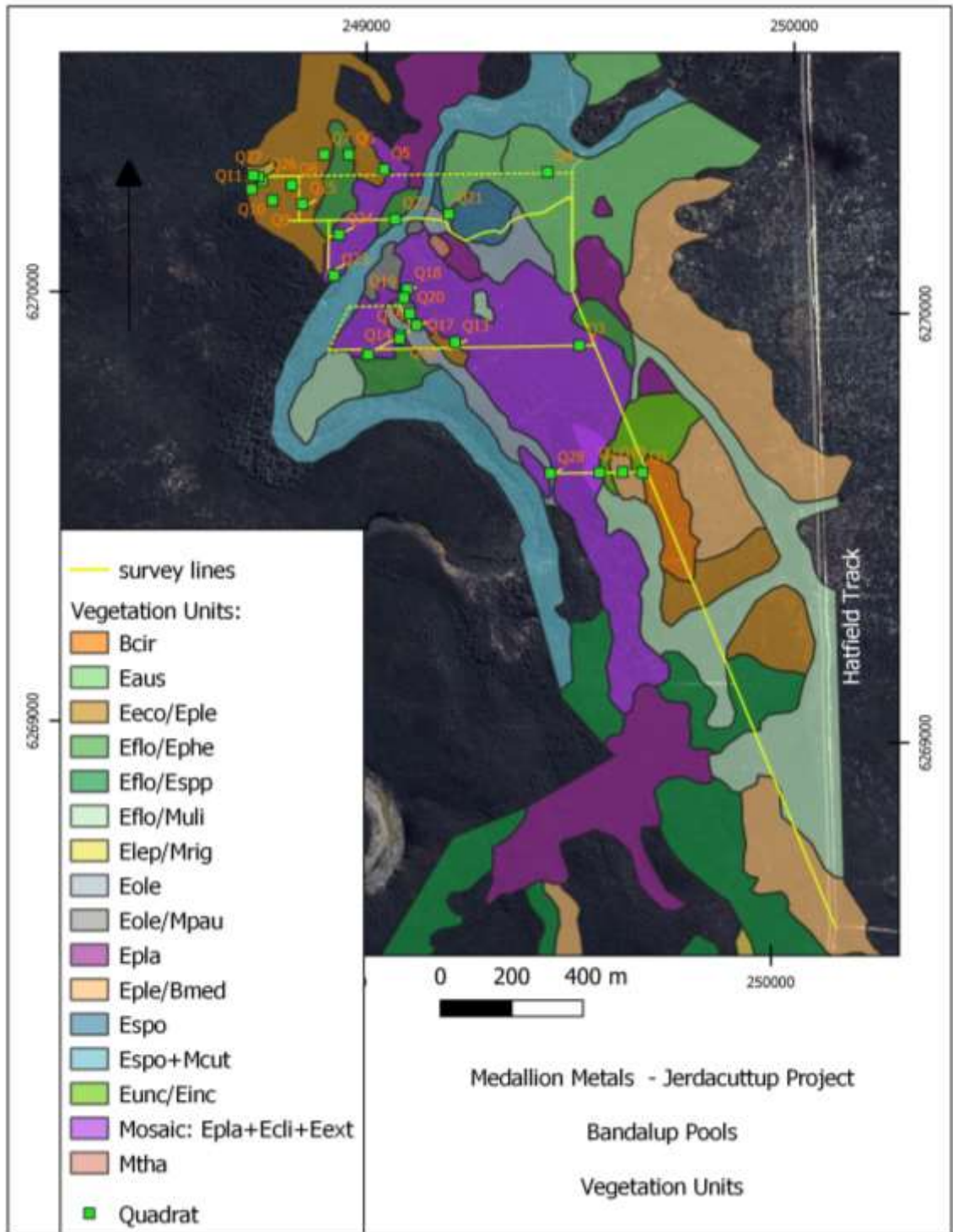


Figure 3 – Vegetation units in the Bandalup Pools survey area.

### 3.2 Vegetation Condition

The vegetation was in pristine condition, except drill hole BDC021 showed signs of old clearance for earlier drilling and the old E-W drill lines varied in condition. The two southern access lines were traversable by vehicle for most of their length. Except for an old track that leads to Bandalup Creek and follows its eastern bank, the northern lines were barely visible, overgrown, narrow pads that were being used by kangaroos. The main NW-SE access track has been maintained and is regularly used by vehicles.

The last fire was recorded over 32 years ago in August 1989, which burnt most of the NW-SE access track, the northern survey line and old track. The three southern drill lines were partially burnt, mainly at the western and eastern ends, leaving the mid-sections as old growth vegetation.

A few *Asparagus asparagoides* (bridal creeper) plants, a Weed of National Significance (WONS), were growing in the low-lying, winter moist *Eucalyptus oleosa* ssp *corvina* (Eole) vegetation near the southernmost drill line (Fig 5). There was no evidence of disease.

### 3.3 Threatened and Priority Ecological Communities

A search of DBCA's TEC/PEC database found that there was the potential for the EPBC Act listed TEC 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia' and the WA listed Priority 3(iii) PEC 'Heath on Komatiite of the Ravensthorpe area' to occur in the survey area (Table 4).

A number of areas were considered to be either TEC or PEC (Fig 4). Three vegetation types fulfilled the diagnostic features to be considered the TEC, as they had greater than 30% proteaceous cover and were in excellent condition: *Banksia cirsioides* shrubland (Bcir); *Eucalyptus ecostata*/*Eucalyptus pleurocarpa* mallee shrubland (Eeco/ Eple); and *Eucalyptus pleurocarpa* open mallee shrubland/ *Banksia media* shrubland (Eple/Bmed). The proteaceous composition of these vegetation types was variable over relatively short distances, from 10% cover up to 50% cover (see quadrat data, Appendix 2).

The *Eucalyptus flocktoniae* open mallee woodland/ *Melaleuca ulicoides* heathland (Eflo/ Muli) included species that are in the complex 'Heath on Komatiite of the Ravensthorpe area' which is a Priority 3(iii) PEC in Western Australia (DBCA 2021), i.e. *Melaleuca ulicoides* and *Acacia ophiolithica*. The largest area of this vegetation unit occurred at the west end and south of a drill line, close to Bandalup Creek. Another small patch, extended for about 40 m along one of the old central drill lines (Fig 4).

Table 4 – Threatened/Priority Ecological Community within 10 km radius of the survey areas

Name	State Category	Commonwealth Category	Vegetation Unit
<b>Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia</b>	Priority 3(iii)	Endangered TEC	Bcir Eeco/Eple Eple/Bmed
<b>Heath on Komatiite of the Ravensthorpe area</b>	Priority 3(iii)		Eflo/Muli

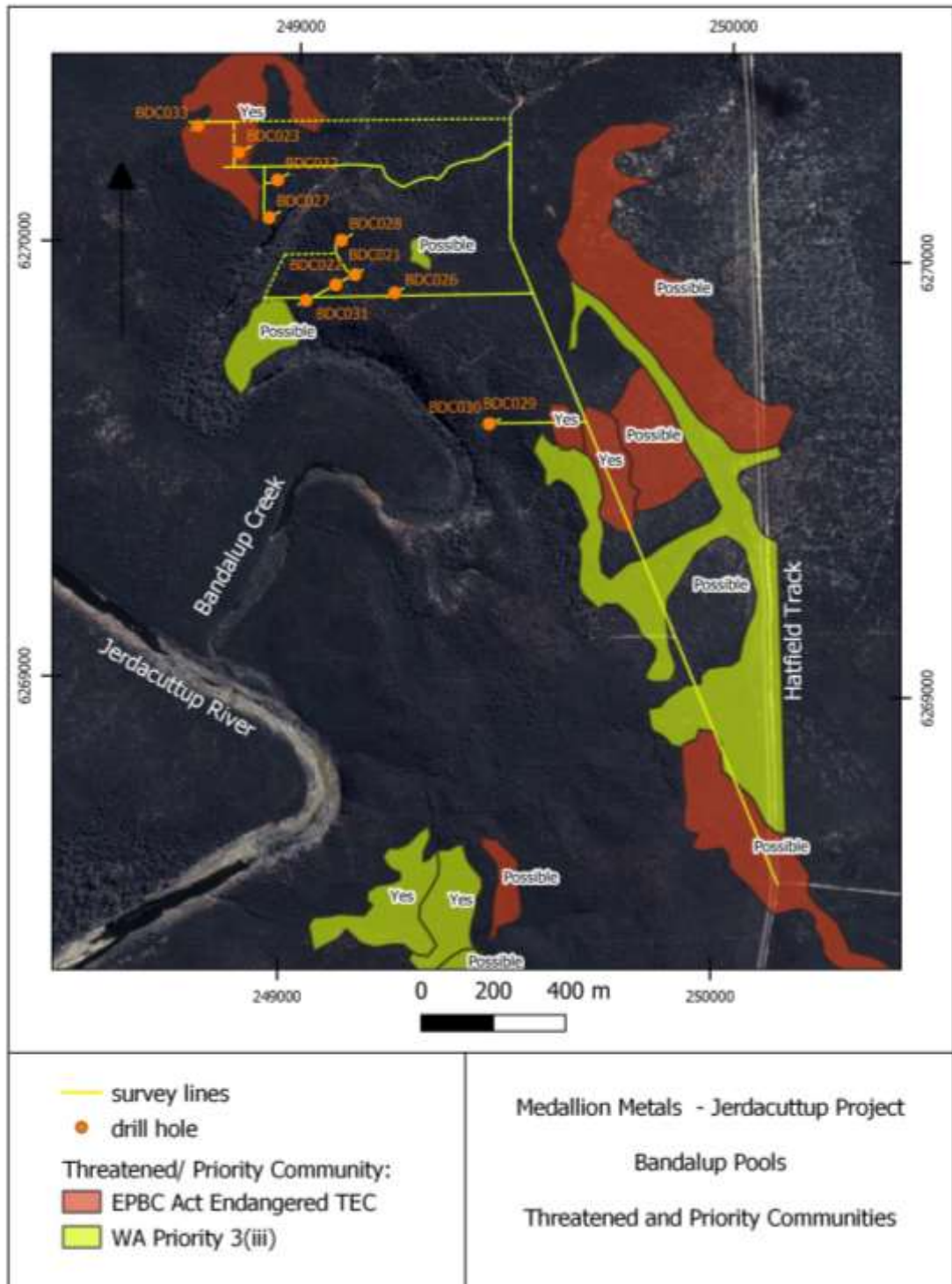


Figure 4 – Threatened and Priority Ecological Communities in the Bandalup Pools survey area



### 3.4 Flora

A total of 163 native species from 34 Families were recorded in the survey area (Appendix 3). The most represented Families of native taxa were:

- Myrtaceae – 48 species (18 *Eucalyptus*, 18 *Melaleuca*)
- Cyperaceae – 19 species (13 *Lepidosperma*)
- Fabaceae – 19 species
- Proteaceae – 15 species

### 3.5 Threatened and Priority Flora

The Naturemap search listed 11 conservation taxa, including one Threatened species within a 5 km radius of the Bandalup Pools survey area (Table 5). Review of the preferred habitat of these species using WAHERB and TPFL data, and the author's knowledge, found that most could potentially occur in the survey area.

Table 5 – Conservation taxa occurring within a 5 km radius of the survey area (Naturemap 28/9/2021)

Taxon	Cons Status	Likelihood of Occurrence
<i>Hibbertia abyssus</i>	T	Unlikely, only known from Bandalup Hill
<i>Lepidosperma</i> sp. Archer Drive (S. Kern & R. Jasper LCH 18300)	P1	Possible, known to occur near survey area
<i>Lepidosperma</i> sp. Mt Chester (S. Kern et al. LCH 16596)	P1	Possible, known to occur near survey area
<i>Lepidosperma</i> sp. Mt Short (S. Kern et al. LCH 17510)	P1	Possible, known to occur near survey area
<i>Lepidosperma</i> sp. Shoemaker Levy (L. Ang & O. Davies 10815)	P3	Possible, known to occur near survey area
<i>Dampiera</i> sp. Ravensthorpe (G.F. Craig 8277)	P3	Possible, known to occur near survey area
<i>Pultenaea craigiana</i>	P3	Likely, known to occur near survey area
<i>Acacia argutifolia</i>	P4	Unlikely, only known from quartzite outcrops
<i>Eucalyptus stoatei</i>	P4	Likely, known to occur near survey area
<i>Goodenia phillipsiae</i>	P4	Likely, known to occur near survey area
<i>Stachystemon vinosus</i>	P4	Likely, known to occur near survey area

No Threatened Flora was found. Three Priority species were found on the proposed access and drill lines, i.e. *Lepidosperma* sp. Maydon (P1), *Hydrocotyle ?tuberculata* (P2) and *Lepidosperma* sp. Steere River (P4) (Fig 5). *Eucalyptus stoatei* (P4) was present beside the NW-SE access track (Hickman 2011). Hickman recorded *Acacia errabunda* (P3) within the survey area, however no plants were relocated during this survey. She also included *Eucalyptus ravensthorpensis* (P4) in her vegetation descriptions, however this taxon could not be definitely identified in the current survey. This taxon can be readily confused with *E. clivicola* which has blue-green juvenile leaves similar to the mature leaves of *E. ravensthorpensis*: buds and fruits are the same in both mallots. Details of the four Priority taxa found in the current survey are given below. The GPS locations of Priority flora are given in Appendix 4.

***Lepidosperma* sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844) (P1)**

A sedge to 70 cm tall, with stiff culms 3-4 mm wide. Margins are evenly and continuously covered with a very fine band of short red hairs. The inflorescence is narrowly branching, with several long branchlets with numerous spikelets. Sheath bases are pale brown and fibrous (Barrett et al, 2009).

This putative species is known from three scattered populations on the Ravensthorpe Range, the nearest occurring near the Maydon Link track, 7.5 km NW of the survey area (Kern et al 2008). Taxonomically, *Lepidosperma* sp. Maydon is difficult to distinguish from *Lepidosperma* sp. Elverdton (R. Jasper et al. LCH16844) and *Lepidosperma* sp. Mt Short (S. Kern et al. LCH 17510).

This taxon was recorded in two areas: (1) west of Bandalup Creek in the vicinity of the northernmost drill hole BDC033, where it was frequent in the *Eucalyptus ecostata*/*Eucalyptus pleurocarpa* (Eco/Eple) vegetation unit; and, (2) on the southernmost access line to drill holes BDC029/030. The extent of plants at each recorded site was not determined. Collection GFC 11095 will be lodged in the WA Herbarium.



**Plate 1. *Lepidosperma* sp. Maydon: A – clump base, B – inflorescence**

***Hydrocotyle tuberculata* (P2)**

*Hydrocotyle* species are very small, annual herbs which can be easily overlooked and therefore tend to be poorly collected. Most winter-moist drainage lines in the region have *Hydrocotyle* growing in them (Craig 2011). The small tubercles on the fruits of *H. decipiens*, only visible under high magnification, differentiate it from the smooth-fruited *H. callicarpa*.

There are five collections of *H. tuberculata* in the WA Herbarium, extending from the Fitzgerald River National Park in the west to Mt Ridley in the east, a range of over 240 km. Specimens have previously been collected in the Bandalup Creek catchment.

**Plate 2. *Hydrocotyle tuberculata***

*Hydrocotyle ?tuberculata* was found on a moist, old track which forms part of the access line to the drill holes on the west side of Bandalup Creek (Fig 5). Plants were vegetative in July 2022, so the population could not be confirmed as this taxon until they fruit in September/October.

***Lepidosperma* sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764) (P4)**

A sedge to 80 cm tall, with rigid culms 4-6 mm wide. Margins are smooth, without hairs. Inflorescences are relatively large, clustered to open, with several long branchlets with numerous clustered spikelets. Sheath bases are dark brown, shiny, with copious yellow resin (Barrett et al, 2009).

This species is known from scattered locations, ranging over a distance of 100 km, from near Mt Madden, Ravensthorpe Range, Jerdacuttup, Munglinup and in the Fitzgerald River National Park. There are 15 collections in the WA herbarium. The priority status of this taxon has recently been changed from P1 to P4.

Clumps of *Lepidosperma* sp. Steere River were recorded 460 m apart on two drill lines in different vegetation types – the mosaic of *Eucalyptus clivicola* (Ecli), *E. extensa* (Eext) mallet low forest, and the *Eucalyptus austrina* mallee shrubland (Eaus). The extent of plants at each site was not determined. Collections GFC 11076 will be lodged in the WA herbarium.



**Plate 3. *Lepidosperma* sp. Steere River: A – clump, B – inflorescence, C - base**

***Eucalyptus stoatei* (P4)**



A mallet with smooth grey bark and glossy green oblong to ovate leaves. Buds and fruits are pendulous, red and coarsely ribbed. Flowers are yellow from July to February.

Two plants occur adjacent to the NW-SE access track to the drill lines (Hickman 2011).

**Plate 4. *Eucalyptus stoatei***

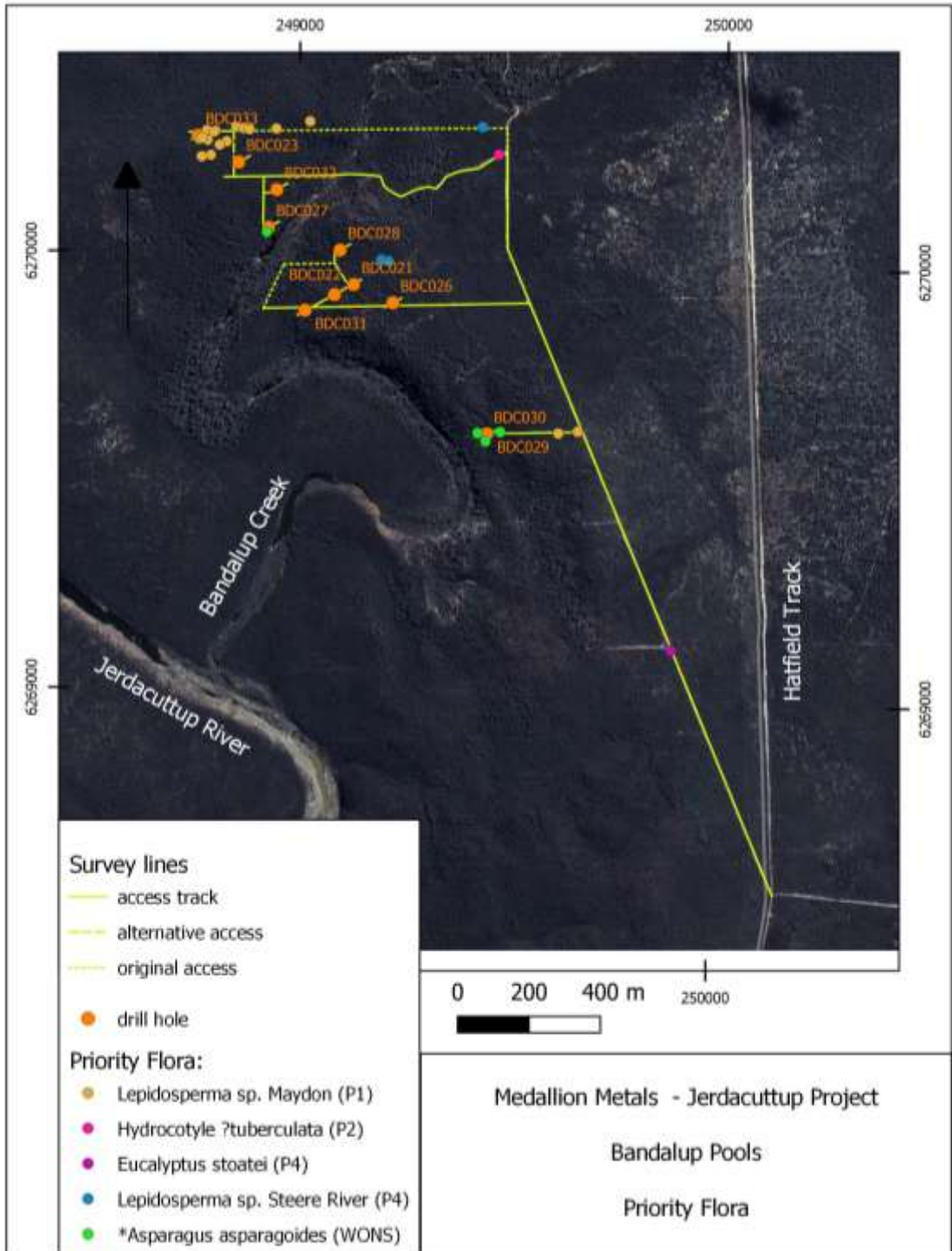


Figure 5 – Priority flora in the Bandalup Pools survey area

## 4. DISCUSSION

### 4.1 Vegetation

The vegetation in the survey area forms part of the Ravensthorpe corridor which has been recognised as an important linkage between the Fitzgerald River National Park and Crown land east of the Vermin Proof Fence which extends to the southern Goldfields. It is within an Environmentally Sensitive Area of the Department of Water and Environmental Regulation.

Although Bandalup Creek forms a divide between the Ravensthorpe and Esperance Systems described by Beard (1973), it was found that many of the vegetation types were similar to those mapped further west in the Ravensthorpe Range by Craig et al (2008). Hickman (2011) mapped a larger area adjacent to Bandalup Creek than covered by the current survey. Overall, it was found that the vegetation concurred with Hickman's map, although the boundaries of a number of polygons were modified to better reflect the species composition along the proposed access and drill lines. The mallet-form eucalypts, *Eucalyptus clivicola*, *E. extensa*, and *E. platypus* usually form distinct units in the Ravensthorpe region, however at Bandalup Pools they either co-occurred or formed fine-scale mosaics that could not be individually mapped. This 'mosaic' of mallets was the predominant structural form of vegetation on the calcareous loamy soils along the proposed access and drill lines.

Vegetation types with a more diverse flora were found on the sandier soils along the banks of Bandalup Creek and in the north-east sector of the survey area, with mallee-form eucalypts and myrtaceous shrublands predominating, i.e. the *Eucalyptus austrina* (Eaus), *E. flocktoniae/E. phenax* (Eflo/Ephe), *E. oleosa ssp. corvina* (Eole) and *E. sporadica* (Espo) vegetation units.

Vegetation with a high content of proteaceous species was typical of the gently undulating plain in the both the north-west and south-east sectors of the survey area and is described in the next section.

### 4.3 Threatened and Priority Ecological Communities

The survey identified the 'Proteaceae Dominated Kwongkan Shrublands of the southeast coastal province of Western Australia' that is listed as an 'endangered' TEC under the EPBC Act. This TEC community included three mapped vegetation units: *Banksia cirsioides* heathland (Bcir); *Eucalyptus pleurocarpa* open mallee/ *Banksia media* shrubland (Eple/Bmed); and *Eucalyptus ecostata/Eucalyptus pleurocarpa* mallee shrubland (Eeco/Eple).

Although some of the quadrats had less than the diagnostic 30% cover of proteaceous species, under the EPBC Act listing for this community, it states "mallee eucalypts may be present at varying densities, but providing the minimum Proteaceae cover is present, the ecological community is still recognised".

These vegetation types occurred on the gently undulating upper plain in the north-west sector near drill hole BDC033 and in the south-eastern sector of the survey area, particularly along the NW-SE access track to the drill lines. At present, the NW-SE access track should not require any additional clearing for vehicular access.

The 'Heath on Komatiite of the Ravensthorpe area' Priority 3(iii) Ecological Community listed in Western Australia was found in two areas. The largest area of *Eucalyptus flocktoniae* open mallee woodland/ *Melaleuca ulicoides* heathland (Eflo/ Muli) unit occurred at the west end and south of an access line, close to Bandalup Creek. Another small patch, extended for about 40 m along an old, central access line.

### 4.3 Priority Flora

The search of DBCA's WAHERB and TPFL databases listed 11 conservation taxa within a 5 km radius of the survey area. Review of the preferred habitat of these species found that most had the potential to occur in the survey area. Two Priority *Lepidosperma* species were found, one of which has recently been changed from P1 to P4.

The taxonomy of *Lepidosperma* in the Ravensthorpe region has been researched by Russell Barrett (2009) and he identified a number of putative taxa for Kern et al (2007). In trying to obtain a better understanding of Barrett's concept of *Lepidosperma*, the author has made collections from the Kern quadrats, in addition to her own earlier collections already verified by R. Barrett. These reference collections were used to identify the specimens collected for this survey and, although some of the taxa have not yet been incorporated into the WA herbarium, Barrett's phrase names were used to identify the specimens. Further genetic work is required to clarify taxonomic differences within this difficult genus.

Since it is impossible to identify many of the Priority *Lepidosperma* species in the field (due to subtle differences in morphology only apparent under a magnification), the total distribution and size of each population was not determined. *Lepidosperma* sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844) (P1) was found to be frequent and widespread in the *Eucalyptus ecostata*/*Eucalyptus pleurocarpa* mallee shrubland (Eeco/Eple) vegetation in the north-west sector of the survey area.

*Hydrocotyle ?tuberculata* (previously known as *H. decipiens*) (P2) was found on an old track that has been proposed as the access line to the drill holes on the west side of Bandalup Creek. The identification of this taxon needs to be confirmed in late September/October when fruiting material is available. The old track would be the preferred access to the creek crossing, as it would limit the amount of vegetation to be cleared.

*Acacia errabunda* (P3) was recorded by Hickman (2011) within the survey area, near the central access lines, however it was not found during the current survey. *Acacia mutabilis* subsp. Young River (G.F. Craig 2052) was present in the vicinity of Hickman's records and has similar phyllode morphology, so could be mistaken for the former species.

In the field, it was difficult to determine whether *Eucalyptus ravensthorpensis* (P4), which was included by Hickman (2011) in her vegetation descriptions, was present. *E. ravensthorpensis* and *E. clivicola* have very similar buds and fruits and are usually distinguished by the dull, blue-green mature leaves in the former species, while those of *E. clivicola* are shiny green. As the mallets are 6-10 m tall, with minimal foliage up the trunk, ascertaining which species was which was a problem. The main identifier used in the field was the horizontal scarring typically found on the trunks of *E. clivicola*. Although specimens were taken, the immature leaves of *E. clivicola* are dull, blue-green and identification was not conclusive. Hickman (2011) mapped *E. ravensthorpensis* (Erav) as forming a mosaic with the *Eucalyptus flocktoniae*/*Eucalyptus*

*phenax* mallee shrub community. The polygons and their descriptions outside the current survey area which Hickman mapped have not been modified. A survey by drone would help to confirm whether *E. ravensthorpensis* occurs in the Bandalup Pools area.

#### **4.4 Access and drill lines**

Figure 5 shows the original proposal by Medallion Metals to access drill hole BDC033 along an old E-W access line. This line has successfully regenerated and is now largely overgrown and often hard to distinguish from the surrounding vegetation. Using this line would mean a second crossing across Bandalup Creek. An alternative line was surveyed to access BDC033 from the south and, although it passes through TEC, it would be the shorter, preferred route.

Similarly, access to drill hole BDC028 is via an old, overgrown E-W drill line and a partially regenerated track parallel to the Bandalup Creek. A more direct route from drill hole BDC021 would cause less clearing of vegetation.

## Acknowledgements

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[www.dec.wa.gov.au/florabase](http://www.dec.wa.gov.au/florabase)

[www.dec.wa.gov.au/naturemap](http://www.dec.wa.gov.au/naturemap)



## Appendix 1

### ***Vegetation Unit descriptions***

#### ***1. Banksia cirsioides shrubland (Bcir) (TEC)***

**Description:** *Eucalyptus pleurocarpa* sparse mallee shrubland; *Banksia cirsioides* heathland.

**Soil:** Yellow-orange loamy sand, loam or clay loam with lateritic gravel and quartz small stones.

**Landform:** Mid- to upper slopes and crests.

**Regional Extent:** Concordant with regional mapping unit “58. *Dryandra cirsioides* (Dcir)” (Craig et al 2008) of which 521 ha has been mapped in the Ravensthorpe Range.

**TEC/PEC:** Due to >30% cover of proteaceous shrubs, it is included within the ‘Proteaceae Dominated Kwongan Shrubland’ threatened ecological community, listed as ‘Endangered’ (EPBC Act 1999).

Lifeform	% Cover	Characteristic taxa
Mallee <10m	<10%	<i>Eucalyptus pleurocarpa</i> , <i>Eucalyptus incrassata</i> , <i>Eucalyptus uncinata</i>
Shrubs >2m	2-30%	<i>Banksia lemanniana</i> , <i>Melaleuca hamata</i> , <i>Calothamnus quadrifidus</i>
Shrubs <2m	30-70%	<i>Banksia cirsioides</i> , <i>Taxandria spathulata</i> , <i>Beaufortia schaueri</i> , <i>Petrophile fastigiata</i>
Ground	<10%	<i>Hibbertia gracilipes</i> , <i>Boronia crassifolia</i> , <i>Caustis dioica</i> , <i>Gahnia ancistrophylla</i> , <i>Lomandra micrantha</i> subsp. <i>teretifolia</i> , <i>Mesomelaena stygia</i> , <i>Neurachne alopecuroidea</i>



**2. *Eucalyptus austrina* mallee shrubland (Eaus)**Old name: *E. sp.* Ravensthorpe (ASG 616) (EspR)**Description:** *Eucalyptus austrina* mallee shrubland; *Melaleuca hamata* shrubland; *Melaleuca glaberrima* heathland**Soil:** Light brown silty clay loam**Landform:** Lower slope and flat**Regional Extent:** Affinity with regional mapping unit “48. *Eucalyptus sp.* Ravensthorpe/*Melaleuca cliffordioides* (EspR/Mcli)” (Craig et al 2008) of which 94.7 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Mallee <10m	10-60%	<i>Eucalyptus austrina</i> , <i>Eucalyptus leptocalyx</i>
Shrubs >2m	30-60%	<i>Melaleuca hamata</i> , <i>Santalum acuminatum</i>
Shrubs 1-2m	30-60%	<i>Melaleuca glaberrima</i> , <i>Melaleuca lateriflora</i> , <i>Beyeria brevifolia</i> , <i>Hakea lissocarpha</i>
Ground	10-30%	<i>Otton microphyllum</i> , <i>Boronia inornata</i> , <i>Lepidosperma sp.</i> Bandalup scabrid (NE 10798), <i>Austrostipa variabilis</i>



**3. *Eucalyptus ecostata*/*Eucalyptus pleurocarpa* mallee shrubland (Eeco/ Eple) (TEC)**Old name: *Eucalyptus falcata*/*E.pleurocarpa* (Efal/Eple)**Description:** *Eucalyptus ecostata*/*Eucalyptus pleurocarpa* mallee shrubland; heathland**Soil:** Brown clayey sand to light clay **Landform:** Upper to lower slopes, open depressions.**Regional Extent:** Concordant with regional mapping unit “1. *Eucalyptus falcata*/*E.pleurocarpa* (Efal/Eple)” (Craig et al 2008) of which 293 ha has been mapped in the Ravensthorpe Range.**TEC/PEC:** Due to >30% cover of proteaceous shrubs in some locations, it is included within the ‘Proteaceae Dominated Kwongkan Shrubland’ threatened ecological community, listed as ‘Endangered’ (EPBC Act 1999).

Lifeform	% Cover	Characteristic taxa
Mallee <10m	30-70%	<i>Eucalyptus pleurocarpa</i> , <i>Eucalyptus ecostata</i> , <i>Eucalyptus phaenophylla</i> , <i>Eucalyptus uncinata</i> , <i>Eucalyptus incrassata</i>
Shrubs >2m	10-70%	<i>Banksia lemanniana</i> , <i>Banksia heliantha</i>
Shrubs 1-2m	10-70%	<i>Petrophile fastigiata</i> , <i>Taxandria spathulata</i> , <i>Beaufortia schaueri</i> , <i>Grevillea coccinea</i> , <i>Allocasuarina humilis</i> , <i>Calothamnus quadrifidus</i> , <i>Gastrolobium parviflorum</i> , <i>Hakea lissocarpha</i> , <i>Hakea verrucosa</i> , <i>Leptospermum spinescens</i>
Ground	10-30%	<i>Melaleuca rigidifolia</i> , <i>Melaleuca subtrigona</i> , <i>Acacia gonophylla</i> , <i>Leucopogon</i> sp. Coujinup (MAB 1085)



Quadrat 9

**4. *Eucalyptus flocktoniae*/*Eucalyptus phenax* mallee shrubland (Eflo/Ephe)**

**Description:** *Eucalyptus flocktoniae*/*Eucalyptus phenax* mallee shrubland; open heathland  
**Soil:** Red brown clay loam or clay loam sandy **Landform:** Upper to lower slopes and flat  
**Regional Extent:** Concordant with regional mapping unit “15. *Eucalyptus flocktoniae*/*Eucalyptus phenax* (Eflo/ Ephe)” (Craig et al 2008) of which 465 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Mallee <10m	10-60%	<i>Eucalyptus flocktoniae</i> , <i>Eucalyptus phenax</i> , <i>Eucalyptus calycogona</i>
Shrubs 1- >2m	10-60%	<i>Melaleuca hamata</i> , <i>Melaleuca pauperiflora</i> , <i>Melaleuca ulicoides</i> , <i>Daviesia nematophylla</i>
Ground	<10%	<i>Lasiopetalum compactum</i> , <i>Grevillea huegeli</i> , <i>Pultenaea purpurea</i> , <i>Acacia ingrata</i> , <i>Gahnia ancistrophylla</i>
Forb/		<i>Cassytha melantha</i>



Quadrat 24

**5. *Eucalyptus flocktoniae*/ *Eucalyptus* spp. mallee woodland (Eflo/Espp)**

**Description:** *Eucalyptus flocktoniae* mallee woodland; mixed *Eucalyptus* spp. mallee shrubland  
**Soil:** Orange to light brown sandy clay loam or loam **Landform:** Gentle mid- and lower slopes.  
**Regional Extent:** Concordant with regional mapping unit “17. *Eucalyptus flocktoniae*/*Eucalyptus* species (Eflo/ Espp) “ (Craig et al 2008) of which 184 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Mallee <10m	60%	<i>Eucalyptus flocktoniae</i> , <i>Eucalyptus pileata</i> , <i>Eucalyptus phaenophylla</i> ,
Shrubs <2m	10-30%	<i>Lasiopetalum compactum</i>
Ground	10-30%	<i>Gahnia aristata</i> , <i>Lepidosperma</i> sp. Bandalup scabrid, <i>Netrostylis</i> sp. Mt Madden

**6. *Eucalyptus flocktoniae* open mallee woodland/ *Melaleuca ulicoides* heathland (Eflo/ Muli) (PEC)**

Old name: *Eucalyptus flocktoniae/ Melaleuca sp. Gorse* (Eflo/ Mgor)

**Description:** *Eucalyptus flocktoniae* mallee woodland; *Melaleuca ulicoides* heathland

**Soil:** Brown loam                      **Landform:** Mid to lower slope

**Regional Extent:** Concordant with regional mapping unit “36. *Eucalyptus flocktoniae/ Melaleuca sp. Gorse* (Eflo/ Mgor)” (Craig et al 2008) of which 188 ha has been mapped in the Ravensthorpe Range.

**PEC:** Due to presence of *Melaleuca ulicoides* and *Acacia ophiolithica*, this unit is included in the ‘Heath on Komatiite’ PEC listed as Priority 3(iii) in Western Australia.

Lifeform	% Cover	Characteristic taxa
Mallee <10m	10-60%	<i>Eucalyptus flocktoniae</i> , <i>Eucalyptus phenax</i> , <i>Eucalyptus suggrandis</i>
Shrubs 1- 2m	10-60%	<i>Melaleuca hamata</i> , <i>Melaleuca ulicoides</i> , <i>Hakea commutata</i> , <i>Daviesia nematophylla</i> , <i>Acacia ophiolithica</i>
Ground	2-30%	<i>Acacia deficiens</i> , <i>Acacia glaucoptera</i> , <i>Halgania andromedifolia</i> , <i>Daviesia articulata</i> , <i>Wilsonia humilis</i> , <i>Acacia ingrata</i>
Forb/ vine		<i>Cassytha melantha</i>



**7. *Eucalyptus leptocalyx* open mallee shrubland/ *Melaleuca rigidifolia* open heathland (Elep/Mrig)**

**Description:** *Eucalyptus leptocalyx* open mallee shrubland; *Melaleuca rigidifolia* open heathland

**Soil:** Yellow-brown loamy sand

**Landform:** Gentle slope to flat plain

**Regional Extent:** Concordant with regional mapping unit “*Eucalyptus leptocalyx/ Melaleuca rigidifolia* (Elep/Mrig)” (Craig et al 2008) of which 10 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Mallee <10m	10-60%	<i>Eucalyptus leptocalyx</i> , <i>Eucalyptus phaenophylla</i> , <i>Eucalyptus incrassata</i> , <i>Eucalyptus flocktoniae</i>
Shrubs 0.5- >2m	10-30%	<i>Melaleuca hamata</i> , <i>Banksia media</i> , <i>Hakea laurina</i> , <i>Hakea lissocarpha</i> , <i>Austrobaecka verrucosa</i>
Ground	10-70%	<i>Melaleuca rigidifolia</i> , <i>Gompholobium confertum</i> , <i>Allocasuarina humilis</i> , <i>Leucopogon</i> sp. Coujinup (MAB 1085), <i>Acacia ingrata</i>



Quadrat 27

**8. *Eucalyptus oleosa* subsp. *corvina* mallee woodland (Eole)**

**Description:** *Eucalyptus oleosa* subsp. *corvina* mallee woodland; *Melaleuca acuminata* shrubland.

**Soil:** Red brown alluvial sandy clay loam. **Landform:** Drainage line.

**Regional Extent:** Concordant to regional mapping unit "33. *Eucalyptus oleosa* subsp. *corvina* (Eole) (Craig et al 2008), of which 98 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Tree Mallee <10m	10-60%	<i>Eucalyptus oleosa</i> subsp. <i>corvina</i>
Shrubs >2m	30-70%	<i>Melaleuca acuminata</i> , <i>Melaleuca pauperiflora</i> , <i>Melaleuca viminea</i>
Shrubs 1-2m	30-70%	<i>Melaleuca acuminata</i> , <i>Melaleuca pauperiflora</i> , <i>Melaleuca glaberrima</i> , <i>Senna artemisioides</i> , <i>Exocarpus aphyllus</i> , <i>Acacia errabunda</i> , <i>Dodonaea ceratocarpa</i>
Ground	<2%	<i>Acacia glaucoptera</i> , <i>Otione microphyllum</i> , <i>Pultenaea purpurea</i>



**Quadrat 15**

**9. *Eucalyptus oleosa* subsp. *corvina* mallee woodland/ *Melaleuca pauperiflora* shrubland (Eole/Mpau)**

**Description:** *Eucalyptus oleosa* subsp. *corvina* mallee woodland; *Melaleuca pauperiflora* shrubland.

**Soil:** Red brown alluvial sandy clay loam. **Landform:** Lower slopes and drainage line.

**Regional Extent:** Concordant to regional mapping unit “35. *Eucalyptus oleosa* subsp. *corvina*/*Melaleuca pauperiflora* (Eole/Mpau) (Craig et al 2008), of which 47 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Tree Mallee <10m	10-30%	<i>Eucalyptus oleosa</i> subsp. <i>corvina</i>
Shrubs >2m	30-70%	<i>Melaleuca pauperiflora</i>
Shrubs 1-2m	<10%	<i>Senna artemisioides</i> , <i>Exocarpus aphyllus</i> , <i>Boronia inornata</i>





**10. *Eucalyptus pleurocarpa* open mallee shrubland/ *Banksia media* shrubland (Eple/Bmed) (possible TEC)**

**Description:** *Eucalyptus pleurocarpa* open mallee shrubland; *Banksia media* shrubland; *Melaleuca rigidifolia* heathland

**Soil:** Light grey sand. **Landform:** Gentle mid-slope and flat.

**Regional Extent:** Concordant with regional mapping unit “55. *Eucalyptus pleurocarpa*/ *Banksia media* (Eple/Bmed)” (Craig et al 2008) of which 333 ha has been mapped in the Ravensthorpe Range.

**TEC/PEC:** Due to presence of >30% cover of proteaceous shrubs in some locations, it is included within the ‘Proteaceae Dominated Kwongkan Shrubland’ threatened ecological community, listed as ‘Endangered’ (EPBC Act 1999).

Lifeform	% Cover	Characteristic taxa
Mallee <10m	10-30%	<i>Eucalyptus pleurocarpa</i> , <i>Eucalyptus incrassata</i> , <i>Eucalyptus uncinata</i> , <i>Eucalyptus phaenophylla</i>
Shrubs >2m	10-70%	<i>Banksia media</i> , <i>Acacia assimilis</i> , <i>Melaleuca hamata</i> , <i>Leptospermum maxwellii</i> , <i>Santalum acuminatum</i>
Shrubs 0.5-2m	10-30%	<i>Banksia cirsioides</i> , <i>Austrobaecka verrucosa</i> , <i>Calothamnus quadrifidus</i> , <i>Hakea corymbosa</i> , <i>Hakea lissocarpha</i> , <i>Melaleuca bracteosa</i> , <i>Melaleuca subfalcata</i> , <i>Petrophile fastigiata</i> , <i>Taxandria spathulata</i>
Ground	10-70%	<i>Melaleuca rigidifolia</i> , <i>Acacia gonophylla</i> , <i>Beaufortia schaueri</i> , <i>Leucopogon</i> sp. Coujinup (MAB 1085), <i>Gahnia ancistrophylla</i> , <i>Lomandra micrantha</i> subsp. <i>teretifolia</i> , <i>Mesomelaena stygia</i>



Quadrat 12

**11. *Eucalyptus uncinata*/*Eucalyptus incrassata* mallee shrubland (Eunc/Einc)**

**Description:** *Eucalyptus uncinata* and *Eucalyptus incrassata* mallee shrubland; heathland

**Soil:** Light brown to light grey clayey or sandy loam      **Landform:** Gentle slope to flat plain

**Regional Extent:** Concordant with regional mapping unit “18. *Eucalyptus uncinata*/*Eucalyptus incrassata* (Eunc/Einc)” (Craig et al 2008) of which 103 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Mallee <10m	30-60%	<i>Eucalyptus incrassata</i> , <i>Eucalyptus uncinata</i> , <i>Eucalyptus pleurocarpa</i> , <i>Eucalyptus phaenophylla</i>
Shrubs 0.5- >2m	10-30%	<i>Melaleuca hamata</i> , <i>Hakea lissocarpha</i> , <i>Petrophile fastigiata</i> , <i>Gastrolobium parviflorum</i>
Ground	10-30%	<i>Melaleuca rigidifolia</i> , <i>Lasiopetalum compactum</i>



**12. Mosaic: *Eucalyptus extensa* open forest (Eext)**

**Description:** *Eucalyptus extensa* (mallet) open forest; isolated shrubs and sedges.

**Soil:** Light brown clay loam sandy. **Landform:** Mid-slope and flat.

**Regional Extent:** Concordant to regional mapping unit “50. *Eucalyptus extensa* (Eext)” (Craig et al 2008) of which 56 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Mallet <10m	30-70%	<i>Eucalyptus extensa</i> , <i>Eucalyptus platypus</i> , <i>Eucalyptus ravensthorpensis</i>
Shrubs 0.5 ->2m	2-30%	<i>Melaleuca pauperiflora</i> , <i>Melaleuca hamata</i> , <i>Santalum acuminatum</i> , <i>Exocarpus aphyllus</i> , <i>Olearia muelleri</i> , <i>Acacia glaucoptera</i> , <i>Microcybe albiflora</i>
Forb/ vine		<i>Cassytha melantha</i>



**13. Mosaic: *Eucalyptus platypus* open forest (Epla)**

**Description:** *Eucalyptus platypus* (mallet) open forest; isolated shrubs and sedges.

**Soil:** Red-brown loamy clay. **Landform:** Mid-slope and flat.

**Regional Extent:** Concordant to regional mapping unit “51. *Eucalyptus platypus* (Epla)” (Craig et al 2008) of which 108 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Mallet <10m	30-70%	<i>Eucalyptus platypus</i>
Shrubs 0.5 ->2m	2-30%	<i>Melaleuca cucullata</i> , <i>Melaleuca acuminata</i> , <i>Daviesia nematophylla</i> , <i>Exocarpus aphyllus</i> , <i>Lasiopetalum compactum</i> , <i>Acacia glaucoptera</i> , <i>Grevillea pectinata</i>



**14. Mosaic: *Eucalyptus clivicola* open forest (Ecli)**

**Description:** *Eucalyptus clivicola* (mallet) open forest; isolated shrubs and sedges.

**Soil:** Yellow, brown and red brown sandy loam to clay loam. **Landform:** Crest, upper to lower slope and flat.

**Regional Extent:** Concordant to regional mapping unit “14. *Eucalyptus clivicola* (Ecli)” (Craig et al 2008) of which 465 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Mallet <10m	30-70%	<i>Eucalyptus clivicola</i>
Mallee <10m	<2%	<i>Eucalyptus flocktoniae</i>
Shrubs >2m	<2-10%	<i>Melaleuca hamata</i> , <i>Exocarpus aphyllus</i> , <i>Gastrolobium parviflorum</i>
Ground	<2%	<i>Lasiopetalum compactum</i> , <i>Pultenaea purpurea</i> , <i>Boronia inornata</i>



**Quadrat 14**

**15. *Eucalyptus sporadica* mallee woodland (Espo)**

**Description:** *Eucalyptus sporadica* mallee woodland; *Melaleuca acuminata* shrubland; grassland.

**Soil:** Orange-brown alluvial sand or sandy clay loam.      **Landform:** Drainage line.

**Regional Extent:** Concordant to regional mapping unit “67. *Eucalyptus sporadica* (Espo)” (Craig et al 2008), of which 113 ha has been mapped in the Ravensthorpe Range, respectively.

Lifeform	% Cover	Characteristic taxa
Tree Mallee <10m	10-30%	<i>Eucalyptus sporadica</i> , <i>Eucalyptus austrina</i>
Shrubs >2m	30-60%	<i>Melaleuca acuminata</i> , <i>Melaleuca hamata</i> , <i>Callistris roei</i> , <i>Hakea laurina</i>
Shrubs 0.5- 2m	10-60%	<i>Hakea lissocarpha</i> , <i>Senna artemisioides</i> , <i>Dodonaea caespitosa</i> , <i>Melaleuca glaberrima</i>
Ground	<10%	<i>Acacia glaucoptera</i> , <i>Hybanthus floribundus</i> , <i>Spartochloa scirpoidea</i> , <i>Lepidosperma sanguinolentum</i>



**16. Melaleuca cuticularis shrubland (Mcut)**

**Description:** *Melaleuca cuticularis* shrubland; sedgeland

**Soil:** Light brown loamy sand      **Landform:** Drainage line.

**Regional Extent:** Concordant with regional mapping unit “69. *Melaleuca cuticularis* (Mcut)” (Craig et al 2008) of which 1.3 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Shrubs >2m	30-60%	<i>Melaleuca cuticularis</i> , <i>Callistemon phoeniceus</i>
Ground	10-30%	<i>Gahnia trifida</i>



**17. Melaleuca thapsina shrubland (Mtha)**

**Description:** *Melaleuca thapsina* shrubland

**Soil:** not recorded                      **Landform:** Slopes, breakaways.

**Regional Extent:** Concordant with regional mapping unit “9. *Melaleuca thapsina* (Mtha)” (Craig et al 2008) of which 53 ha has been mapped in the Ravensthorpe Range.

Lifeform	% Cover	Characteristic taxa
Shrubs >2m	30- 100%	<i>Melaleuca thapsina</i>



*Melaleuca thapsina* growing on stony ridge (LHS) adjacent to mallet open forest.



## Appendix 2

### Quadrat data and GPS locations

QUADRAT	VEG_CODE	STRATUM	%COVER	SPECIES_NAME	PROTEACEOUS COVER (%)
Q1	Bcir intergrade	Mallee <10 m	15	<i>Eucalyptus pleurocarpa</i> <i>Eucalyptus leptocalyx</i> <i>Eucalyptus phaenophylla</i>	
		Shrub 1-2 m	40	<i>Melaleuca hamata</i> <i>Leptospermum maxwellii</i> <i>Hakea lissocarpha</i>	5
		Shrub 0.5-1 m	60	<i>Melaleuca rigidifolia</i> <i>Melaleuca glaberrima</i> <i>Styphelia decussata</i> <i>Gastrolobium musaceum</i> <i>Verticordia acerosa</i> var. <i>preissii</i> <i>Petrophile fastigiata</i> <i>Philothea gardneri</i>	10
		Ground <0.5 m	20	<i>Gahnia ancistrophylla</i> <i>Schoenus breviculmis</i> <i>Mesomelaena stygia</i> <i>Hibbertia pungens</i> <i>Neurachne alopecuroidea</i> <i>Stylidium breviscapum</i>	
Q2	Mosaic	Mallet <10 m	70	<i>Eucalyptus flocktoniae</i> <i>Eucalyptus clivicola</i> <i>Eucalyptus platypus</i> <i>Eucalyptus pileata</i>	
		Shrub 1-2 m	25	<i>Melaleuca hamata</i> <i>Melaleuca torquata</i> <i>Melaleuca pauperiflora</i> <i>Gastrolobium parviflorum</i> <i>Daviesia nematophylla</i>	
		Shrub 0.5-1 m	5	<i>Lasiopetalum compactum</i> <i>Boronia inornata</i> <i>Microcybe albiflora</i> <i>Acacia glaucoptera</i>	
		Ground <0.5 m	5	<i>Pultenaea purpurea</i> <i>Cassytha melantha</i> <i>Grevillea huegelii</i> <i>Gahnia ancistrophylla</i>	2
Q3	Mosaic	Mallet	90	<i>Eucalyptus platypus</i>	
		Shrub 0.5-2 m	15	<i>Melaleuca torquata</i> <i>Melaleuca cucullata</i> <i>Grevillea pectinata</i> <i>Exocarpos aphyllus</i> <i>Acacia glaucoptera</i>	2

QUADRAT	VEG_CODE	STRATUM	%COVER	SPECIES_NAME	PROTEACEOUS COVER (%)
				<i>Microcybe albiflora</i>	
		Ground	2	<i>Pultenaea purpurea</i>	
Q4	Eaus	Mallee <10 m	30	<i>Eucalyptus austrina</i> <i>Eucalyptus leptocalyx</i>	
		Shrub 0.5-2 m	60	<i>Melaleuca hamata</i> <i>Melaleuca brevifolia</i> <i>Melaleuca lateriflora</i> <i>Melaleuca glaberrima</i> <i>Grevillea pectinata</i> <i>Grevillea oligantha</i>	4 2
		Ground <0.5 m	10 40	<i>Aotus sp. Southern Wheatbelt</i> <i>Boronia inornata</i> <i>Gahnia ancistrophylla</i> <i>Lepidosperma sp. Steere River</i> <i>Neurachne alopecuroidea</i>	
Q5	Eeco/Eple	Mallee		<i>Eucalyptus ecostata</i>	
		Shrub 1-2 m	50	<i>Gastrolobium parviflorum</i> <i>Melaleuca hamata</i> <i>Kunzea cincinnata</i> <i>Calothamnus quadrifidus</i> <i>Hakea laurina</i> <i>Acacia binata</i>	3
		Shrub 0.5-1 m	40	<i>Lasiopetalum compactum</i> <i>Philotheca gardneri</i>	
		Ground <0.5 m	2	<i>Lepidosperma sp. Bandalup Scabrid</i> <i>Stylidium albomontis</i>	
Q6	Eflo/Ephe	Mallee <10 m	25	<i>Eucalyptus suggrandis</i> <i>Eucalyptus leptocalyx</i> <i>Eucalyptus uncinata</i> <i>Eucalyptus pleurocarpa</i>	
		Shrub 0.5-2 m	40	<i>Melaleuca hamata</i> <i>Hakea laurina</i> <i>Gastrolobium parviflorum</i> <i>Melaleuca lateriflora</i> <i>Melaleuca glaberrima</i>	5
		Shrub <1 m	30	<i>Acacia glaucoptera</i> <i>Melaleuca rigidifolia</i> <i>Spyridium cordatum</i> <i>Boronia inornata</i>	
		Ground <0.5 m	15	<i>Gahnia ancistrophylla</i> <i>Netrostylis sp. Mt Madden</i> <i>Lepidosperma fairallianum</i> <i>Cassytha melantha</i>	
Q7	Eeco/Eple	Mallee <10 m	50	<i>Eucalyptus ecostata</i> <i>Eucalyptus pleurocarpa</i>	
		Shrub 0.5-2 m	50	<i>Melaleuca hamata</i> <i>Hakea laurina</i> <i>Calothamnus quadrifidus</i>	4

QUADRAT	VEG_CODE	STRATUM	%COVER	SPECIES_NAME	PROTEACEOUS COVER (%)
				<i>Taxandria spathulata</i>	
				<i>Hakea corymbosa</i>	3
				<i>Isopogon trilobus</i>	3
		Shrub <0.5 m	10	<i>Hibbertia gracilipes</i>	
				<i>Hibbertia pungens</i>	
				<i>Leucopogon sp. Coujinup</i>	
Q8	Eeco/Eple	Mallee <10 m	30	<i>Eucalyptus ecostata</i>	
				<i>Eucalyptus pleurocarpa</i>	
		Shrub 0.5-2 m	60	<i>Melaleuca hamata</i>	
				<i>Calothamnus pinifolius</i>	
				<i>Hakea laurina</i>	5
				<i>Taxandria spathulata</i>	
				<i>Beaufortia schaueri</i>	
				<i>Petrophile fastigiata</i>	10
				<i>Grevillea coccinea</i>	5
				<i>Hakea lissocarpha</i>	5
		Ground	20	<i>Leucopogon sp. Coujinup</i>	
Q9	Eeco/Eple	Mallee <10 m	30	<i>Eucalyptus ecostata</i>	
				<i>Eucalyptus pleurocarpa</i>	
		Shrub 0.5-2 m	70	<i>Melaleuca hamata</i>	
				<i>Taxandria spathulata</i>	
				<i>Beaufortia schaueri</i>	
				<i>Petrophile fastigiata</i>	30
				<i>Grevillea coccinea</i>	10
				<i>Hakea lissocarpha</i>	10
Q10	Eeco/Eple	Mallee <10 m	20	<i>Eucalyptus pleurocarpa</i>	
				<i>Eucalyptus leptocalyx</i>	
		Shrub 0.5-2 m	60	<i>Gastrolobium parviflorum</i>	
				<i>Acacia binata</i>	
				<i>Calothamnus quadrifidus</i>	
				<i>Kunzea cincinnata</i>	
				<i>Petrophile fastigiata</i>	
Q11	Elep/Mrig	Mallee <10 m	20	<i>Eucalyptus leptocalyx</i>	
				<i>Eucalyptus flocktoniae</i>	
				<i>Eucalyptus phenax</i>	
		Shrub 0.5-2 m	80	<i>Melaleuca hamata</i>	
				<i>Hakea laurina</i>	5
				<i>Melaleuca rigidifolia</i>	
				<i>Austrobaecka verrucosa</i>	
		Ground <0.5 m	15	<i>Acacia ingrata</i>	
				<i>Gahnia ancistrophylla</i>	
				<i>Cassytha melantha</i>	
Q12	Eple/Bmed	Mallee	10	<i>Eucalyptus pleurocarpa</i>	
		Tall Shrub	5	<i>Banksia media</i>	5
		Shrub 1-2 m	10	<i>Callitris roei</i>	
				<i>Taxandria spathulata</i>	
				<i>Hakea lissocarpha</i>	10
		Shrub	65	<i>Gastrolobium musaceum</i>	

QUADRAT	VEG_CODE	STRATUM	%COVER	SPECIES_NAME	PROTEACEOUS COVER (%)
		<1 m		<i>Allocasuarina humilis</i> <i>Beaufortia schaueri</i> <i>Calothamnus quadrifidus</i> <i>Melaleuca rigidifolia</i> <i>Verticordia chrysantha</i> <i>Petrophile fastigiata</i> <i>Philotheca gardneri</i> <i>Leucopogon sp. Coujinup</i> <i>Styphelia lissanthoides</i>	25
		Ground <0.5 m	5	<i>Lepidosperma sp.</i> <i>Neurachne alopecuroidea</i>	
Q13	Eeco/Eple	Mallee	30	<i>Eucalyptus ecostata</i> <i>Eucalyptus pleurocarpa</i> <i>Eucalyptus clivicola</i>	
		Tall Shrub	10	<i>Melaleuca hamata</i> <i>Hakea laurina</i>	
		Shrub 1-2 m	50	<i>Gastrolobium musaceum</i> <i>Kunzea cincinnata</i> <i>Calothamnus quadrifidus</i>	
		Shrub <1 m	40	<i>Lasiopetalum compactum</i> <i>Philotheca gardneri</i> <i>Styphelia crassifolia</i> <i>Styphelia lissanthoides</i>	
		Ground <0.5 m	5	<i>Lepidosperma sp. Cordingup (G.F.Craig 6138)</i> <i>Stylidium albomontis</i> <i>Platysace maxwellii</i> <i>Thysanotus patersonii</i> <i>Pterostylis leptochila</i>	
Q14	Mosaic	Mallet Mallee	40	<i>Eucalyptus clivicola</i> <i>Eucalyptus pleurocarpa</i>	
		Shrub 1-2 m	10	<i>Gastrolobium parviflorum</i> <i>Melaleuca hamata</i> <i>Hovea pungens</i> <i>Exocarpos aphyllus</i>	
		Shrub <1 m	15	<i>Lasiopetalum compactum</i> <i>Philotheca gardneri</i> <i>Acacia glaucoptera</i> <i>Grevillea patentiloba subsp. patentiloba</i>	
		Ground <0.5 m	2	<i>Lepidosperma sp. Cordingup (G.F.Craig 6138)</i> <i>Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)</i> <i>Gahnia aristata</i> <i>Thysanotus patersonii</i> <i>Stylidium albomontis</i> <i>Lepidosperma sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738)</i> <i>Pterostylis leptochila</i> <i>Platysace maxwellii</i>	
Q15	Eole	Mallee	25	<i>Eucalyptus oleosa subsp. corvina</i>	

QUADRAT	VEG_CODE	STRATUM	%COVER	SPECIES_NAME	PROTEACEOUS COVER (%)
		Shrub	10	<i>Melaleuca pauperiflora</i>	
		Shrub <1 m	40	<i>Boronia inornata</i> subsp. <i>leptophylla</i> <i>Olearia muelleri</i> <i>Lasiopetalum compactum</i> <i>Acacia mutabilis</i> subsp. <i>Young River</i> (G.F. Craig 2052) <i>Grevillea pectinata</i> <i>Acacia glaucoptera</i>	
		Ground <0.5 m	10	<i>Pultenaea purpurea</i> <i>Cassytha melantha</i>	
Q16	Mosaic	Mallet	40	<i>Eucalyptus clivicola</i>	
		Shrub 1-2 m	40	<i>Melaleuca hamata</i> <i>Gastrolobium parviflorum</i> <i>Callitris roei</i>	
		Shrub <1 m	20	<i>Philotheca gardneri</i> <i>Lasiopetalum compactum</i> <i>Hovea pungens</i> <i>Grevillea patentiloba</i> subsp. <i>patentiloba</i> <i>Lepidosperma</i> sp. <i>Cordingup</i> (G.F.Craig 6138) <i>Thysanotus patersonii</i>	
		Ground <0.5 m	5	<i>Lepidosperma</i> sp. <i>Carracarrup Creek</i> (S. Kern, R. Jasper, D. Brassington LCH 16738) <i>Platysace maxwellii</i>	
Q17	Eole + Ecli	Mallet Mallee	25	<i>Eucalyptus clivicola</i> <i>Eucalyptus flocktoniae</i> <i>Eucalyptus pileata</i>	
		Shrub >2m	5	<i>Melaleuca hamata</i> <i>Melaleuca pauperiflora</i>	
		Shrub 1-2 m	20	<i>Gastrolobium parviflorum</i> <i>Acacia glaucoptera</i> <i>Grevillea pectinata</i> <i>Acacia mutabilis</i> subsp. <i>Young River</i> (G.F. Craig 2052) <i>Grevillea patentiloba</i> subsp. <i>patentiloba</i>	
		Shrub <1 m	15	<i>Lasiopetalum compactum</i> <i>Boronia inornata</i> subsp. <i>leptophylla</i> <i>Cyanothamnus inconspicuus</i>	
		Ground <0.5 m	3	<i>Lepidosperma</i> sp. <i>Cordingup</i> (G.F.Craig 6138) <i>Pultenaea purpurea</i> <i>Gahnia</i> sp. <i>Ravensthorpe</i> (G.F. Craig 5005) <i>Thysanotus patersonii</i> <i>Cassytha melantha</i>	
Q18	Mosaic	Mallet	60	<i>Eucalyptus clivicola</i> <i>Eucalyptus platypus</i>	
		Shrub <1 m	10	<i>Exocarpos aphyllus</i> <i>Acacia glaucoptera</i> <i>Melaleuca pauperiflora</i> <i>Gastrolobium parviflorum</i>	
		Ground	1	<i>Acrotriche ramiflora</i>	

QUADRAT	VEG_CODE	STRATUM	%COVER	SPECIES_NAME	PROTEACEOUS COVER (%)
Q19	Eole	Mallee	40	<i>Eucalyptus oleosa subsp. corvina</i>	
		Shrub 1>2 m	10	<i>Melaleuca pauperiflora</i> <i>Hakea laurina</i>	
		Shrub <1 m	10	<i>Microcybe albiflora</i> <i>Lasiopetalum compactum</i> <i>Acacia ingrata</i> <i>Olearia muelleri</i> <i>Acacia glaucoptera</i> <i>Pomaderris brevifolia</i> <i>Acacia mutabilis subsp. Young River (G.F. Craig 2052)</i>	
		Ground	1	<i>Pultenaea purpurea</i>	
Q20	Eole/Mpau	Mallee	20	<i>Eucalyptus oleosa subsp. corvina</i>	
		Shrub <1 m		<i>Melaleuca pauperiflora</i> <i>Daviesia nematophylla</i> <i>Lasiopetalum compactum</i> <i>Hibbertia psilocarpa</i>	
		Ground <0.5 m		<i>Acacia ingrata</i> <i>Pultenaea purpurea</i> <i>Microcybe albiflora</i> <i>Gahnia sp. Ravensthorpe (G.F. Craig 5005)</i>	
Q21	Espo	Mallee	15	<i>Eucalyptus sporadica</i>	
		Shrub >2 m	10	<i>Melaleuca glaberrima</i> <i>Melaleuca hamata</i>	
		Shrub <2 m	20	<i>Melaleuca acuminata</i> <i>Acacia glaucoptera</i> <i>Persoonia teretifolia</i>	
		Ground <0.5 m	20 30	<i>Aotus sp. Southern Wheatbelt (C.A. Gardner &amp; W.E. Blackall 1412)</i> <i>Acacia ingrata</i> <i>Lepidosperma sanguinolentum</i> <i>Lomandra effusa</i> <i>Gahnia ancistrophylla</i>	
Q22	Eflo/Ephe	Mallee	30	<i>Eucalyptus leptocalyx</i> <i>Eucalyptus flocktoniae</i> <i>Eucalyptus phenax</i>	
		Shrub 1-2 m	40	<i>Melaleuca glaberrima</i> <i>Melaleuca hamata</i> <i>Acacia glaucoptera</i> <i>Melaleuca undulata</i>	
		Ground <0.5 m	50	<i>Aotus sp. Southern Wheatbelt (C.A. Gardner &amp; W.E. Blackall 1412)</i> <i>Cyanothamnus inconspicuus</i> <i>Gahnia ancistrophylla</i>	
Q23	Mosaic	Mallet	50	<i>Eucalyptus platypus</i> <i>Eucalyptus clivicola</i> <i>Eucalyptus occidentalis</i>	
		Shrub <1 m	2 15	<i>Melaleuca hamata</i> <i>Persoonia teretifolia</i>	

QUADRAT	VEG_CODE	STRATUM	%COVER	SPECIES_NAME	PROTEACEOUS COVER (%)
				<i>Acacia glaucoptera</i> <i>Lasiopetalum compactum</i> <i>Grevillea pectinata</i>	
		Ground <0.5 m	5	<i>Thysanotus patersonii</i> <i>Hydrocotyle rugulosa</i> <i>Pterostylis leptochila</i> <i>Lepidosperma</i> sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738)	
Q24	Eflo/Ephe	Mallet Mallee	30	<i>Eucalyptus clivicola</i> <i>Eucalyptus phaenophylla</i> <i>Eucalyptus suggrandis</i>	
		Tall Shrub	1	<i>Hakea laurina</i>	
		Shrub 1-2 m	70	<i>Melaleuca hamata</i> <i>Microcorys obovata</i> <i>Gastrolobium parviflorum</i> <i>Melaleuca glaberrima</i> <i>Hibbertia pungens</i> <i>Calothamnus quadrifidus</i> <i>Acacia glaucoptera</i>	
		Shrub <1 m	10	<i>Lasiopetalum compactum</i> <i>Dodonaea trifida</i> <i>Philotheca gardneri</i> <i>Grevillea huegelii</i>	
		Ground <0.5 m		<i>Gahnia ancistrophylla</i> <i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798) <i>Lepidosperma gahnioides</i> <i>Cassytha melantha</i>	
Q25	Eeco/Eple	Mallee	50	<i>Eucalyptus pleurocarpa</i> <i>Eucalyptus ecostata</i>	
		Tall Shrub	5	<i>Hakea laurina</i>	
		Shrub 1-2 m	50	<i>Melaleuca hamata</i> <i>Taxandria spathulata</i> <i>Beaufortia schaueri</i> <i>Brachyloma geissoloma</i> <i>Acacia gonophylla</i> <i>Petrophile fastigiata</i> <i>Hibbertia pungens</i> <i>Leucopogon carinatus</i>	5
		Shrub <1 m	10	<i>Leucopogon</i> sp. Coujinup (M.A. Burgman 1085) <i>Pultenaea indira</i> <i>Daviesia anceps</i> <i>Platysace maxwellii</i> <i>Boronia crassifolia</i> <i>Logania micrantha</i>	
		Ground <0.5 m	5	<i>Netrostylis</i> sp. Mt Madden (C.D. Turley 40 BP/897) <i>Lepidosperma</i> sp. Saltbush Hill (K.R. Newbey 4118)	

QUADRAT	VEG_CODE	STRATUM	%COVER	SPECIES_NAME	PROTEACEOUS COVER (%)
Q26	Eeco/Eple	Mallee	10	<i>Eucalyptus pleurocarpa</i> <i>Eucalyptus ecostata</i>	
		Shrub 1-2 m	60	<i>Calothamnus quadrifidus</i> <i>Hakea lissocarpa</i> <i>Petrophile fastigiata</i> <i>Kunzea cincinnata</i> <i>Philotheca gardneri</i> <i>Gastrolobium congestum</i>	2 5
		Shrub <1 m	5	<i>Leucopogon sp. Coujinup (M.A. Burgman 1085)</i> <i>Melaleuca rigidifolia</i> <i>Chamelaucium ciliatum</i>	
		Ground <0.5 m	1	<i>Dampiera angulata</i> <i>Platysace maxwellii</i> <i>Lepidosperma sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)</i>	
Q27	Elep/Mrig	Mallee	30	<i>Eucalyptus flocktoniae</i> <i>Eucalyptus phenax</i> <i>Eucalyptus leptocalyx</i> <i>Eucalyptus suggrandis</i>	
		Tall shrub	5	<i>Hakea laurina</i>	
		Shrub 1-2 m	50	<i>Melaleuca hamata</i> <i>Melaleuca rigidifolia</i> <i>Melaleuca undulata</i> <i>Melaleuca subfalcata</i> <i>Grevillea nudiflora</i> <i>Austrobaecka verrucosa</i> <i>Hakea lissocarpa</i> <i>Exocarpos aphyllus</i>	2
		Shrub <1 m	15	<i>Boronia inornata subsp. leptophylla</i> <i>Hibbertia psilocarpa</i> <i>Acacia ingrata</i>	
Q28	Mosaic	Mallet		<i>Eucalyptus platypus</i> <i>Eucalyptus clivicola</i>	
		Shrub >2 m		<i>Melaleuca acuminata</i> <i>Melaleuca lanceolata</i>	
		Shrub <1		<i>Exocarpos aphyllus</i>	
		Ground <0.5 m		<i>Disphyma crassifolium</i> <i>Roepera glauca</i> <i>Crassula colorata</i> <i>Thysanotus patersonii</i> <i>Threlkeldia diffusa</i> <i>Hydrocotyle rugulosa</i>	



**GPS locations of Quadrats (datum GDA94)**

<b>Quadrat</b>	<b>Date</b>	<b>Waypoint</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Zone</b>	<b>Easting</b>	<b>Northing</b>
<b>Q1</b>	30-Sep-21	1	-33.6839	120.2996	51H	249670	6269614
<b>Q2</b>	30-Sep-21	9	-33.6839	120.2985	51H	249569	6269611
<b>Q3</b>	30-Sep-21	27	-33.6813	120.298	51H	249514	6269906
<b>Q4</b>	4-Oct-21	106	-33.6776	120.2972	51H	249430	6270308
<b>Q5</b>	4-Oct-21	116	-33.6776	120.2931	51H	249047	6270304
<b>Q6</b>	4-Oct-21	118	-33.6773	120.2922	51H	248964	6270337
<b>Q7</b>	4-Oct-21	120	-33.6773	120.2916	51H	248906	6270335
<b>Q8</b>	4-Oct-21	122	-33.6779	120.2908	51H	248832	6270262
<b>Q9</b>	4-Oct-21	125	-33.6782	120.2903	51H	248789	6270225
<b>Q10</b>	4-Oct-21	127	-33.678	120.2898	51H	248739	6270250
<b>Q11</b>	4-Oct-21	128	-33.6777	120.2898	51H	248742	6270282
<b>Q12</b>	4-Oct-21	158	-33.6839	120.2991	51H	249623	6269613
<b>Q13</b>	6-Jul-22	1	-33.6812	120.2949	51H	249224	6269906
<b>Q14</b>	6-Jul-22	2	-33.6815	120.2927	51H	249022	6269872
<b>Q15</b>	6-Jul-22	7	-33.6811	120.2935	51H	249096	6269918
<b>Q16</b>	6-Jul-22	8	-33.6809	120.2939	51H	249134	6269936
<b>Q17</b>	6-Jul-22	9	-33.6808	120.2939	51H	249133	6269944
<b>Q18</b>	6-Jul-22	13	-33.6801	120.2937	51H	249108	6270026
<b>Q19</b>	6-Jul-22	14	-33.6803	120.2936	51H	249102	6270006
<b>Q20</b>	6-Jul-22	16	-33.6806	120.2938	51H	249116	6269970
<b>Q21</b>	8-Jul-22	20	-33.6785	120.2947	51H	249201	6270204
<b>Q22</b>	8-Jul-22	25	-33.6786	120.2934	51H	249076	6270189
<b>Q23</b>	8-Jul-22	28	-33.6798	120.2919	51H	248937	6270054
<b>Q24</b>	8-Jul-22	40	-33.6789	120.292	51H	248947	6270150
<b>Q25</b>	8-Jul-22	43	-33.6783	120.2911	51H	248858	6270218
<b>Q26</b>	8-Jul-22	52	-33.6778	120.2901	51H	248764	6270270
<b>Q27</b>	8-Jul-22	55	-33.6777	120.29	51H	248755	6270279
<b>Q28</b>	8-Jul-22	74	-33.684	120.2973	51H	249454	6269606

## Appendix 3

### Bandalup Pools species list - 2022

FAMILY_NAME	SPECIES_NAME	CONSV_CODE
Liverwort	<i>Asterella drummondii</i>	
Aizoaceae	<i>Carpobrotus modestus</i>	
	<i>Disphyma crassifolium</i>	
Amaranthaceae	<i>Ptilotus obovatus</i>	
Apiaceae	<i>Apium annuum</i>	
	<i>Daucus glochidiatus</i>	
	<i>Platysace maxwellii</i>	
Araliaceae	<i>Hydrocotyle rugulosa</i>	
	<i>Hydrocotyle tuberculata</i>	2
	<i>Trachymene pilosa</i>	
Asparagaceae	<i>Lomandra effusa</i>	
	<i>Thysanotus patersonii</i>	
	<i>Thysanotus sparteus</i>	
Asphodelaceae	<i>Bulbine semibarbata</i>	
Asteraceae	<i>Olearia muelleri</i>	
Casuarinaceae	<i>Allocasuarina humilis</i>	
Chenopodiaceae	<i>Threlkeldia diffusa</i>	
Crassulaceae	<i>Crassula colorata</i>	
Cupressaceae	<i>Callitris drummondii</i>	
Cupressaceae	<i>Callitris roei</i>	
Cyperaceae	<i>Gahnia ancistrophylla</i>	
	<i>Gahnia aristata</i>	
	<i>Gahnia sp. Ravensthorpe (G.F. Craig 5005)</i>	
	<i>Lepidosperma diurnum</i>	
	<i>Lepidosperma fairallianum</i>	
	<i>Lepidosperma fimbriatum</i>	
	<i>Lepidosperma gahnioides</i>	
	<i>Lepidosperma sanguinolentum</i>	
	<i>Lepidosperma sp. Bandalup Scabrid (N. Eveleigh 10798)</i>	
	<i>Lepidosperma sp. Carracarrup Creek (S. Kern, R. Jasper, D. Brassington LCH 16738)</i>	
	<i>Lepidosperma sp. Claytup (GF Craig 8243)</i>	
	<i>Lepidosperma sp. Cordingup (G.F.Craig 6138)</i>	
	<i>Lepidosperma sp. Halleys (GF Craig 8249)</i>	
	<i>Lepidosperma sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)</i>	1
	<i>Lepidosperma sp. Saltbush Hill (K.R. Newbey 4118)</i>	
	<i>Lepidosperma sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764)</i>	1
	<i>Mesomelaena stygia</i>	
	<i>Netrostylis sp. Mt Madden (C.D. Turley 40 BP/897)</i>	
	<i>Schoenus breviculmis</i>	
Dilleniaceae	<i>Hibbertia gracilipes</i>	
	<i>Hibbertia mucronata</i>	
	<i>Hibbertia psilocarpa</i>	

FAMILY_NAME	SPECIES_NAME	CONSV_CODE
	<i>Hibbertia pungens</i>	
Droseraceae	<i>Drosera glanduligera</i>	
	<i>Drosera sp.</i>	
Ericaceae	<i>Acrotriche ramiflora</i>	
	<i>Brachyloma geissoloma</i>	
	<i>Leucopogon carinatus</i>	
	<i>Leucopogon sp. Coujinup (M.A. Burgman 1085)</i>	
	<i>Styphelia crassifolia</i>	
	<i>Styphelia decussata</i>	
	<i>Styphelia lissanthoides</i>	
Fabaceae	<i>Acacia binata</i>	
	<i>Acacia cyclops</i>	
	<i>Acacia glaucoptera</i>	
	<i>Acacia gonophylla</i>	
	<i>Acacia ingrata</i>	
	<i>Acacia mutabilis subsp. Young River (G.F. Craig 2052)</i>	
	<i>Acacia ophiolithica</i>	
	<i>Aotus sp. Southern Wheatbelt (C.A. Gardner &amp; W.E. Blackall 1412)</i>	
	<i>Chorizema trigonum</i>	
	<i>Daviesia anceps</i>	
	<i>Daviesia nematophylla</i>	
	<i>Gastrolobium congestum</i>	
	<i>Gastrolobium musaceum</i>	
	<i>Gastrolobium parviflorum</i>	
	<i>Hovea pungens</i>	
	<i>Pultenaea indira</i>	
	<i>Pultenaea purpurea</i>	
	<i>Senna artemisioides subsp. filifolia</i>	
Goodeniaceae	<i>Dampiera angulata</i>	
Lamiaceae	<i>Microcorys obovata</i>	
Lauraceae	<i>Cassytha melantha</i>	
Loganiaceae	<i>Logania micrantha</i>	
Malvaceae	<i>Lasiopetalum compactum</i>	
Myrtaceae	<i>Austrobaecka verrucosa</i>	
	<i>Beaufortia schaueri</i>	
	<i>Calothamnus pinifolius</i>	
	<i>Calothamnus quadrifidus</i>	
	<i>Calytrix tetragona</i>	
	<i>Chamelaucium ciliatum</i>	
	<i>Eucalyptus austrina</i>	
	<i>Eucalyptus calycogona</i>	
	<i>Eucalyptus clivicola</i>	
	<i>Eucalyptus ecostata</i>	
	<i>Eucalyptus extensa</i>	
	<i>Eucalyptus flocktoniae</i>	
	<i>Eucalyptus leptocalyx</i>	
	<i>Eucalyptus occidentalis</i>	
	<i>Eucalyptus oleosa subsp. corvina</i>	
	<i>Eucalyptus phaenophylla</i>	

FAMILY_NAME	SPECIES_NAME	CONSV_CODE
	<i>Eucalyptus phenax</i>	
	<i>Eucalyptus pileata</i>	
	<i>Eucalyptus platypus</i>	
	<i>Eucalyptus pleurocarpa</i>	
	<i>Eucalyptus ?ravensthorpensis</i>	4
	<i>Eucalyptus sporadica</i>	
	<i>Eucalyptus suggrandis</i>	
	<i>Eucalyptus uncinata</i>	
	<i>Kunzea cincinnata</i>	
	<i>Leptospermum maxwellii</i>	
	<i>Melaleuca acuminata</i>	
	<i>Melaleuca brevifolia</i>	
	<i>Melaleuca cucullata</i>	
	<i>Melaleuca cuticularis</i>	
	<i>Melaleuca glaberrima</i>	
	<i>Melaleuca hamata</i>	
	<i>Melaleuca hamata</i>	
	<i>Melaleuca lanceolata</i>	
	<i>Melaleuca lateriflora</i>	
	<i>Melaleuca pauperiflora</i>	
	<i>Melaleuca rigidifolia</i>	
	<i>Melaleuca subfalcata</i>	
	<i>Melaleuca thapsina</i>	
	<i>Melaleuca torquata</i>	
	<i>Melaleuca ulicoides</i>	
	<i>Melaleuca undulata</i>	
	<i>Melaleuca villosisepala</i>	
	<i>Melaleuca viminea</i>	
	<i>Rinzia communis</i>	
	<i>Taxandria spathulata</i>	
	<i>Verticordia acerosa</i> var. <i>preissii</i>	
	<i>Verticordia chrysantha</i>	
Orchidaceae	<i>Pterostylis leptochila</i>	
Phyllanthaceae	<i>Poranthera microphylla</i>	
Poaceae	<i>Austrostipa acrociliata</i>	
	<i>Austrostipa exilis</i>	
	<i>Austrostipa juncifolia</i>	
	<i>Austrostipa pycnostachya</i>	
	<i>Austrostipa variabilis</i>	
	<i>Neurachne alopecuroidea</i>	
	<i>Spartochloa scirpoidea</i>	
Proteaceae	<i>Banksia media</i>	
	<i>Grevillea coccinea</i>	
	<i>Grevillea huegelii</i>	
	<i>Grevillea nudiflora</i>	
	<i>Grevillea oligantha</i>	
	<i>Grevillea patentiloba</i>	
	<i>Grevillea pectinata</i>	
	<i>Hakea commutata</i>	

FAMILY_NAME	SPECIES_NAME	CONSV_CODE
	<i>Hakea corymbosa</i>	
	<i>Hakea laurina</i>	
	<i>Hakea lissocarpha</i>	
	<i>Hakea verrucosa</i>	
	<i>Isopogon trilobus</i>	
	<i>Persoonia teretifolia</i>	
	<i>Petrophile fastigiata</i>	
Rhamnaceae	<i>Pomaderris brevifolia</i>	
	<i>Spyridium cordatum</i>	
Rutaceae	<i>Boronia crassifolia</i>	
	<i>Boronia inornata</i> subsp. <i>leptophylla</i>	
	<i>Boronia oxyantha</i> var. <i>brevicalyx</i>	
	<i>Cyanothamnus inconspicuus</i>	
	<i>Microcybe albiflora</i>	
	<i>Nematolepis phebalioides</i>	
	<i>Phebalium tuberculosum</i>	
	<i>Philotheca gardneri</i>	
Santalaceae	<i>Exocarpos aphyllus</i>	
Sapindaceae	<i>Dodonaea trifida</i>	
Stylidiaceae	<i>Levenhookia stipitata</i>	
	<i>Stylidium albomontis</i>	
	<i>Stylidium breviscapum</i>	
Zygophyllaceae	<i>Roepera glauca</i>	

## Appendix 4

### GPS locations of Priority flora

Datum: GDA94

TaxonName	WA ConStat	Wpt	HerbRef	Latitude	Longitude	Zone	Easting	Northing
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	2		-33.6839	120.2996	51H	249669	6269616
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	117	GFC11092	-33.6775	120.2929	51H	249027	6270310
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	123	GFC11095	-33.6779	120.2908	51H	248833	6270260
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	124		-33.6782	120.2904	51H	248797	6270228
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	126		-33.6782	120.2902	51H	248776	6270224
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	130		-33.6777	120.2903	51H	248786	6270284
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	131		-33.6777	120.2905	51H	248807	6270284
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	135		-33.6776	120.291	51H	248855	6270294
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	136		-33.6777	120.2912	51H	248872	6270291
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	137		-33.6777	120.2914	51H	248885	6270289
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	139		-33.6777	120.292	51H	248948	6270292
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	159		-33.684	120.2991	51H	249624	6269610
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	50		-33.678	120.2906	51H	248817	6270252

TaxonName	WA ConStat	Wpt	HerbRef	Latitude	Longitude	Zone	Easting	Northing
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	51		-33.6779	120.2903	51H	248789	6270262
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	53	GFC11270	-33.6779	120.2901	51H	248770	6270264
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	54		-33.6779	120.2902	51H	248776	6270266
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	1	58		-33.6777	120.2905	51H	248803	6270281
<i>Hydrocotyle ?tuberculata</i>	2	69		-33.6782	120.2976	51H	249469	6270245
<i>Lepidosperma</i> sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764)	4	68	GFC11076	-33.6804	120.2947	51H	249201	6269998
<i>Lepidosperma</i> sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764)	4	69		-33.6804	120.2949	51H	249218	6269995
<i>Lepidosperma</i> sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764)	4	106		-33.6776	120.2972	51H	249430	6270308
<i>Eucalyptus ?ravensthorpensis</i>	4	115		-33.6775	120.2938	51H	249109	6270309
<i>Eucalyptus ?ravensthorpensis</i>	4	142		-33.6776	120.2934	51H	249074	6270297
<i>Eucalyptus ?ravensthorpensis</i>	4	152		-33.6789	120.2942	51H	249152	6270163
<b>Hickman (2011) locations:</b>								
<i>Acacia errabunda</i>	3	ACAERR1		-33.6812	120.2937	51H	249110	6269903
<i>Acacia errabunda</i>	3	ACAERR2		-33.6813	120.2947	51H	249204	6269890
<i>Acacia errabunda</i>	3	ACAERR3		-33.6812	120.2946	51H	249199	6269902
<i>Acacia errabunda</i>	3	ACAERR4		-33.6799	120.2937	51H	249109	6270047
<i>Acacia errabunda</i>	3	ACAERR5		-33.6875	120.3006	51H	249774	6269217
<i>Eucalyptus stoatei</i>	4	EUCSTO1		-33.6659	120.2977	51H	249436	6271606
<i>Eucalyptus stoatei</i>	4	EUCSTO2		-33.6659	120.3001	51H	249659	6271619
<i>Eucalyptus stoatei</i>	4	EUCSTO3		-33.6884	120.302	51H	249900	6269120
<i>Eucalyptus stoatei</i>	4	EUCSTO4		-33.6676	120.2874	51H	248492	6271401
<i>Pultenaea craigiana</i>	3	PULCRA1		-33.6889	120.3004	51H	249753	6269062
<b>Weed of National Significance:</b>								
* <i>Asparagus asparagoides</i>	WONS	15		-33.6841	120.2973	51H	249455	6269588
* <i>Asparagus asparagoides</i>	WONS	16		-33.684	120.2971	51H	249436	6269606
* <i>Asparagus asparagoides</i>	WONS	29		-33.6798	120.2918	51H	248932	6270055
* <i>Asparagus asparagoides</i>	WONS	71		-33.6839	120.2977	51H	249489	6269610