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VEGETATION OF SUSSEX LOCATION LOT 1 VASSE-YALLINGUP SIDING ROAD

Prepared for:
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Prepared by:
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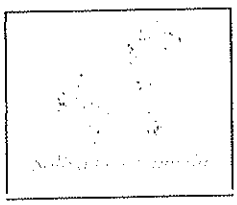

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17th December 2003

INDEX

1 BACKGROUND

Bennett Environmental Consulting Pty Ltd was commissioned by Mr and Mrs Norrish to undertake a vegetation and flora survey of an area 'site' proposed for subdivision. The site, Sussex Location Lot 1, Vasse-Yallingup Road includes a house on the site and a small amount of clearing but most is remnant bushland. The area is included in the Leeuwin – Naturaliste Ridge (Ministry for Planning, 1998). It is proposed to divide the site of approximately 20ha, into 8 lots of 1ha or greater area, plus an additional 2.7ha is proposed to be retained as conservation.

The site is included in the Whicher Scarp System (Department of Agriculture, 2003) on the northern edge of the Donnybrook Sunkland, Burekup to Dunsborough. The landscape includes low scarp slopes and terraces, laterite colluvium and alluvium over sedimentary rocks. The soils are duplex sandy gravels and yellow deep sands and sandy earths, loamy gravels, wet and semi-wet soils.

The vegetation complex at the site is a combination of two subunits of the Blackwood Plateau and Plain (Mattiske and Havel, 1998). Both are in the Yelverton system, which is divided into Y and Yd. Y is described as a Woodland of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* – *Allocasuarina fraseriana* – *Agonis flexuosa* and open Woodland of *Corymbia calophylla* on low undulating uplands in the humid zone. Yd is described as a Woodland of *Allocasuarina fraseriana* – *Eucalyptus marginata* subsp. *marginata* – *Xylomelum occidentale* – *Banksia attenuata* on sandy slopes in the humid zone.

2 OBJECTIVES

The objectives of the project were to:

- Locate the presence of any Declared Rare or Priority Flora, and
- To describe the vegetation present at the site.

3 METHODS

A field survey of the site was undertaken on 18th October 2003. All the remnant bushland at the site was traversed on foot to list the vegetation units and the associated species. Temporary 10m x 10m quadrats were established in accordance with the requirements of EPA Guidance No 51 (2003). Plants unknown in the field were collected, pressed and later identified using relevant keys and by comparison with specimens housed at the Western Australian Herbarium.

4 RESULTS

The site sloped from a creek on the east to a sandy rise to the west. On the slope face laterite rocks were outcropping.

4.1 Vegetation Units

There were four vegetation units described from the site, one from the sandy soil, a second from the laterite, one near the creek and the fourth along the creek. In addition there was an area of pasture species, which was degraded but still included a few of the local indigenous species. The dominant species for each unit are listed below but a full list of species is provided in Appendix C

and mapped in Appendix D. The vegetation units are described using the vegetation layers listed in Appendix A.

YELVERTON SYSTEM Y

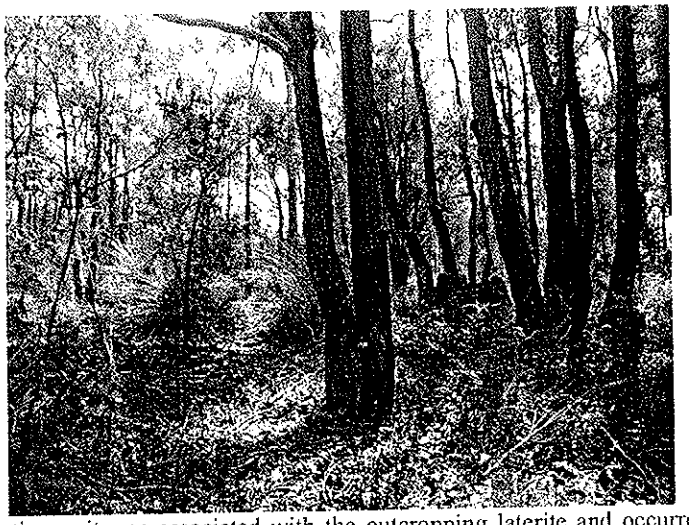
Woodland of *Eucalyptus marginata* subsp. *marginata* over a Low Open to Low Closed Forest dominated by *Allocasuarina fraseriana, Kunzea glabrescens* and *Banksia attenuata* over a Low Shrubland of mixed species dominated by *Hibbertia hypericoides* in sandy soil. (EmKg)

Dominant trees: *Allocasuarina fraseriana, Banksia attenuata, Eucalyptus marginata* subsp. *marginata, Kunzea glabrescens*
Dominant shrubs >1m tall: *Acacia pulchella, Macrozamia riedlei, Xanthorrhoea brunonis, Xanthorrhoea preissii*
Dominant shrubs <1m tall: *Adenanthos meisneri, Hibbertia hypericoides, Melaleuca thymoides*
Dominant herbs: *Patersonia umbrosa* subsp. *umbrosa, Phlebocarya ciliata*
Dominant sedges: *Desmocladus flexuosus, Lyginia imberbis*

This was the vegetation unit in the sandy soil at the western side of the site. The density of the *Kunzea glabescens* varied considerably from a cover of 80% to 10%. There was a good litter cover associated with this vegetation unit but dieback appeared to be in the area as there were several dead *Banksia* trees. Several tall *Xanthorrhoea preissii* were recorded and should be retained with any development. Scattered through this vegetation unit were several groves of *Lindsaea linearis*.

Open Forest of *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* over an Open Shrubland of *Hakea amplexicaulis* and *Acacia dentifera* in sandy soil over outcropping laterite. (EmCc)

Dominant trees: *Eucalyptus marginata* subsp. *marginata, Corymbia calophylla*
Dominant shrubs >1m tall: *Dasypogon hookeri, Hakea amplexicaulis, Xanthorrhoea preissii*
Dominant shrubs <1m tall: *Hibbertia hypericoides*
Dominant herbs: *Lomandra sericea, Patersonia umbrosa* subsp. *xanthina*
Dominant sedges: *Mesomelaena tetragona*



This vegetation unit was associated with the outcropping laterite and occurred lower down the slope than that described above. It adjoined the paddock at the lower level where several weeds had infiltrated into the bushland.

YELVERTON SYSTEM Yd
Low Open Woodland of *Corymbia calophylla* over an Open Forest of *Agonis flexuosa* over a Shrubland of *Xanthorrhoea preissii* and a Herbland of *Pteridium esculentum*, in clayey sand. This vegetation community occurred to the west of the creek. (AfCc)
Dominant trees: *Agonis flexuosa, Corymbia calophylla, Kunzea glabrescens*
Dominant shrubs >1m tall: *Xanthorrhoea preissii*
Dominant herbs: *Pteridium esculentum*
Dominant sedges: *Aphelia brizoides, Gahnia trifida, Juncus pallidus, Lepidosperma longitudinale*
Dominant grasses: **Briza maxima, *Anthoxanthum odoratum*

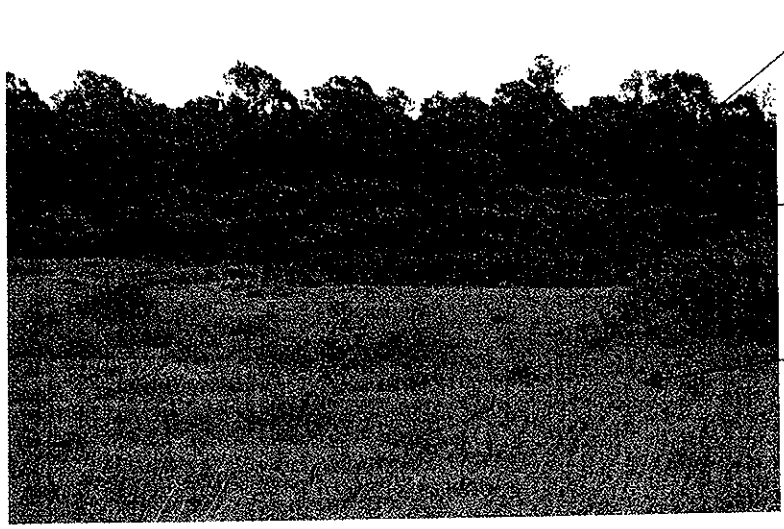
This unit was located along the northern edge of the site, to the west of the creek.

Low Open Woodland of *Eucalyptus patens* over an Open Forest of *Agonis flexuosa* over a Closed Tall Scrub of *Agonis linearifolia* or a Sedgeland dominated by *Juncus pallidus* in clayey sand. (AfEp)

Dominant trees: *Agonis flexuosa, Eucalyptus patens*
Dominant shrubs >1m tall: *Acacia mooreana*, **Rubus* sp.
Dominant herbs: *Pteridium exculentum*
Dominant sedges: *Baumea articulata, Isolepis prolifera, Juncus pallidus, Lepidosperma longitudinale, Sporadanthus rivularis*
Dominant grasses: **Pennisetum clandestinum, *Anthoxanthum odoratum*

This photograph is of the creek where it is crossed by the track from the house.

Degraded areas - paddocks.
There were occasional native species recorded within these degraded areas as listed in Appendix C.



4.2 Vegetation Condition

The vegetation condition of the remnant vegetation varied between Very Good and Good, vegetation condition 3 – 4 (Appendix B, also see map in Appendix D) but the predominant area was condition 4. As the area had previously been logged the highest vegetation condition that could be assigned to the area is Very Good, vegetation condition 3. The major weed invasion recorded was adjacent to roads, tracks and paddocks.

The vegetation condition of the creekline varied between condition 4 - 5, Good - Degraded. Blackberries are a problem along the eastern side of the creek although an attempt is being made by the owner to control them. Where the track crosses the creek from the house to Vasse-Yallingup Siding Road two dams have been installed (see cover photograph). The vegetation condition at these areas was good.

4.3 Significance of Vegetation Units

None of the vegetation units described above are listed by the Department of Conservation and Land Management as Threatened Ecological Communities (English, 2003).

Within the RFA region the area of Yelveton System Y, prior to European settlement was 7625ha, of which 1543ha remains vegetated, a total of 20.2% of the original area. For the Yelverton System Yd the pre-European area was 1765ha of which 614ha remains vegetation, a total of 34.8% of the original area. The Yelverton System Yd has greater than the 30% of the original vegetation remaining, the objective of the The National Objectives and Target for Biodiversity Conservation 2001-2005 (Commonwealth of Australia, 2001) but the Yelverton System Y has less than 30%. In this it is recognised that at least 30% of the original pre-clearing extent must be retained to protect Australia's biodiversity. However it is intended to conserve the upper section of the area as conservation which is representative of the Yelverton System Y (P. Jones, pers.comm). Neither Y nor Yd are listed as poorly represented vegetation complexes in the recent Environmental Strategy (Eastern metropolitan Regional Council (2003)

4.4 Number of Species

A total of 38 vascular plant families, 123 genera and 180 taxa of which 18 were weeds were recorded during the survey (See Appendix C). The dominant families were Papilionaceae with 19 species, 2 of which were introduced; Orchidaceae and Poaceae with 14 species, of which 1 and 9 respectively were introduced; Proteaceae with 11 species all of which are endemic and Myrtaceae with 10 species, all endemic. These five families represent 38% of the total number of species recorded during the survey.

4.5 Weeds

A total of 24 weeds were recorded from the site all, of which have all been determined as weeds by the Department of Conservation and Land Management (1999). The rating allocated to each weed by CALM is based on three criteria:

Invasiveness – ability to invade natural bushland in good to excellent condition or ability to invade waterways.

Distribution – wide current or potential distribution including consideration of known history of wide spread distribution elsewhere in the world.

Environmental impacts – Ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community.

Ratings indicate the following.

High indicates this weed is prioritised for control and/or research ie prioritising funding to it.

Moderate indicates control or research effort should be directed to it if funds are available, however it should be monitored (possibly a reasonably high level of monitoring).

Mild indicates monitoring of the weed and control where appropriate.

Low indicates that this species would require a low level of monitoring.

Table 1. Weeds recorded during the survey classified according to CALM (1999)

Scientific Name	CALM Rating		
	Rating	Invasiveness	Impacts
**Romulea rosea*	High	✓	✓
**Aira caryophyllea*	Moderate	✓	
**Anthoxanthus odoratum*	Moderate	✓	
**Arctotheca calendula*	Moderate	✓	
**Briza maxima*	Moderate	✓	
**Cynodon dactylon*	Moderate	✓	
**Disa bracteata*	Moderate	✓	
**Holcus lanatus*	Moderate	✓	
**Hypochaeris glabra*	Moderate	✓	
**Paspalum dilatatum*	Moderate	✓	
**Pennisetum clandestinum*	Moderate	✓	
**Rubus* sp.	Moderate	✓	
**Solanum nigrum*	Moderate	✓	
**Ursinia anthemoides*	Moderate	✓	
**Vulpia bromoides*	Moderate	✓	
**Ornithopus compressus*	Mild		
**Acetosella vulgaris*	Low		
**Lotus suaveolens*	Low		

One weed only is rated high indicating it is the one of greatest environmental concern and should be the first eradicated. There are 8 grass weeds listed in Table 1. These are readily eradicated with the use of grass specific herbicides.

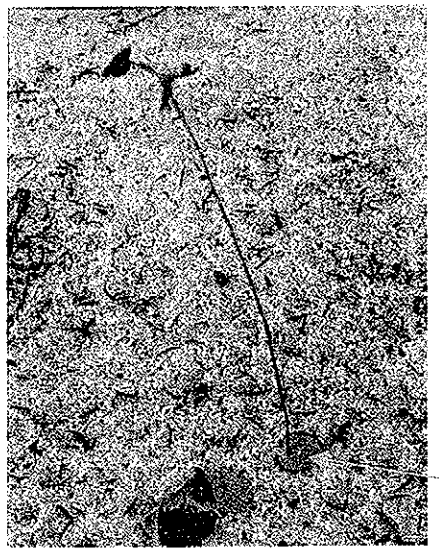
4.6 Significant Flora

One Declared Rare Flora (DRF) and two Priority Flora were recorded from the site. These are:

Declared Rare Flora

***Drakea micrantha*, Dwarf hammer orchid,** is listed as a Declared Rare Flora protected under the provisions of the Wildlife Conservation Act (1950), section 23F, and as an Endangered Species under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Several plants of this species were recorded in open areas within the sandy soil of the Woodland of *Eucalyptus marginata* subsp. *marginata* over a Low Open to Low Closed Forest dominated by *Allocasuarina fraseriana* and *Kunzea glabrescens*. This species was flowering at the time of the survey and has a characteristic 2-toned basal leaf that readily distinguishes it from the other *Drakea* species. Most of these plants were recorded from the proposed conservation area.



To be able to take or destroy plants of any Declared Rare species, application must be made and approval received from the Western Australian Minister for the Environment and from Environment Australia.

Priority Flora

***Jacksonia sparsa*, Priority 4.** This is a shrub to 2m tall and was relatively common through the site.

***Johnsonia inconspicua*, Priority 3.** One clump of this species was located in the bushland adjacent to Glover Road. It was in young flower at the time of the survey.

Plant of *Johnsonia inconspicua*

***Pultenaea pinifolia*, Priority 3.** One shrub of this pea-flowering species was located to the east of the creek crossing from the house.

5. SUMMARY

Lot 1 Vasse-Yallingup Siding Road is included in the Whicher Scarp System (Department of Agriculture, 2003) at the northern edge of the Donnybrook Sunkland Burekup to Dunsborough The vegetation complex at the site is included in the Yelverton system a unit of the Blackwood Plateau and Plain (Mattiske and Havel, 1998). There were two distinct sub-units recorded, one described as a Woodland of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* – *Allocasuarina fraseriana* – *Agonis flexuosa* and open Woodland of *Corymbia calophylla* on low undulating uplands in the humid zone and the second as a Woodland of *Allocasuarina fraseriana* – *Eucalyptus marginata* subsp. *marginata* – *Xylomelum occidentale* – *Banksia attenuata* on sandy slopes in the humid zone.

Four vegetation units were described varying with their position on the landscape. None were listed as Threatened Ecological Communities by the Department of Conservation and Land Management (English, 2003). The first one described is representative of the Yelverton System Y of which less than 30% remains vegetated. The other three are representative of the Yelverton System Yd of which more than 30% remains vegetated (P. Jones, pers.comm).

1. Woodland of *Eucalyptus marginata* subsp. *marginata* over a Low Open to Low Closed Forest dominated by *Allocasuarina fraseriana, Kunzea glabrescens* and *Banksia attenuata* over a Low Shrubland of mixed species dominated by *Hibbertia hypericoides* in sandy soil. This occurred at the western, higher section of the site. It is proposed to conserve this area.
2. Open Forest of *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* over an Open Shrubland of *Hakea amplexicaulis* and *Acacia dentifera* in sandy soil over outcropping laterite. This occurred lower down the landscape towards the creek along the eastern boundary.
3. Low Open Woodland of *Corymbia calophylla* over an Open Forest of *Agonis flexuosa* over a Shrubland of *Xanthorrhoea preissii* and a Herbland of *Pteridium esculentum,* in clayey sand. This vegetation unit occurred above the creek and remained on the northern side of the site only.
4. Low Open Woodland of *Eucalyptus patens* over an Open Forest of *Agonis flexuosa* over a Closed Tall Scrub of *Agonis linearifolia* or a Sedgeland dominated by *Juncus pallidus* in clayey sand. This was the vegetation in better condition along the creek.

At the site the vegetation condition varied from 3-4, Very Good to Good, with some sections, mainly along tracks and roads, recording the vegetation condition 5, degraded. There were large sections of paddocks where some endemic species still remained.

A total of 38 vascular plant families, 123 genera and 180 taxa were recorded during the survey. Eighteen species were weeds, one of which were rated as high for their environmental impacts.

One taxon recorded during the survey *Drakea micranthera* is listed as a Declared Rare Flora protected under the provisions of the Wildlife Conservation Act (1950), section 23F and as an Endangered Species under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Before any development of the site can occur, ie to be able to take or destroy plants of any Declared Rare species, application must be made and approval received from the Western Australian Minister for the Environment and from Environment Australia.

6. REFERENCES

Commonwealth of Australia (2001). *National Objectives and Targets for Biodiversity Conservation 2001-2005.* Environment Australia, Department of Environment and Heritage, Canberra

Department of Agriculture (2003). AgMaps Land Profiler, Shires of Capel, Busselton and Augusta-Margaret River

Department of Conservation and Land Management (1999). *Environmental Weed Strategy for Western Australia*

Department of Environmental Protection (2000). *Bush Forever.* Government of Western Australia

Eastern Metrolopitan Regional Council (ERMC) Environmental Services (2003). *Shire of Busselton Final Draft Environmental Strategy.* Report prepared for Shire of Busselton

English, V. (2003). List of Communities on CALM's Threatened Ecological Community data base

Environmental Protection Authority (2003). Guidance for the assessment of Environmental Factors – Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia. No 51.

Mattiske, E.M. and Havel, J.J. (1998). Vegetation Complexes- Busselton 1: 250,000 Sheet. Department of Conservation and Land Management

Ministry for Planning (1998). Leeuwin – Naturaliste Ridge Statement of Planning Policy Report. Western Australian Planning Commission

APPENDIX A

Vegetation layers

Vegetation layers. Adapted from: Bush Forever (Department of Environmental Protection, 2000)

Life Form/ Height Class	Canopy Cover			
	100-70%	70-30%	30-10%	10-2%
Trees over 30m	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees under 10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Tree mallee(8m tall)	Closed Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Shrub mallee(under 8m tall)	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs over 2m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland
Shrubs under 1m	Closed Low Heath	Open Low Heath	Low Shrubland	Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

APPENDIX B

Vegetation Condition

Explanation of Vegetation Condition Rating (Department of Environmental Protection, 2000)

Rating	Description	Explanation
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

APPENDIX C

Species listed under vascular plant family and vegetation unit

ABBREVIATION	MEANING
EmKg	Woodland of *Eucalyptus marginata* subsp. *marginata* over a Low Open to Low Closed Forest dominated by *Allocasuarina fraseriana, Kunzea glabrescens* and *Banksia attenuata* over a Low Shrubland of mixed species dominated by *Hibbertia hypericoides* in sandy soil.
CcHa	Open Forest of *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* over an Open Shrubland of *Hakea amplexicaulis* and *Acacia dentifera* in sandy soil over outcropping laterite.
AfCc	Low Open Woodland of *Corymbia calophylla* over an Open Forest of *Agonis flexuosa* over a Shrubland of *Xanthorrhoea preissii* and a Herbland of *Pteridium esculentum,* in clayey sand.
AfEp	Low Open Woodland of *Eucalyptus patens* over an Open Forest of *Agonis flexuosa* over a Closed Tall Scrub of *Agonis linearifolia* or a Sedgeland dominated by *Juncus pallidus* in clayey sand.
Deg	Degraded areas (pasture)
subsp.	Subspecies
var.	Variety
?	Unsure if species name is correct
affin.	Closest to that species
sp.	Unable to identify to species due to no flowering or fruiting material present at the time of the survey
*	Weed

FAMILY	SPECIES	EmKg	CcHa	AfCc	AfEp	Deg
ANTHERICACEAE	*Agrostocrinum scabrum*				+	
	Caesia parviflora			+		
	Chamaescilla corymbosa	+	+			+
	Johnsonia inconspicua	+				
	Johnsonia lupulina	+	+			
	Thysanotus multiflorus	+				
	Thysanotus patersonii	+	+			
	Thysanotus sparteus	+				
	Tricoryne elatior		+			
APIACEAE	*Hydrocotyle diantha*	+				
	Pentapeltis peltigera	+	+			
	Platysace tenuissima		+			
	Trachymene pilosa	+				
	Xanthosia huegelii	+				
ASTERACEAE	**Arctotheca calendula*	+				+
	Hyalopserma cotula		+			
	**Hypochaeris glabra*	+	+	+		+
	Rhodanthe citrina	+				
	Siloxerus humifusus	+				
	Trichocline spathulata		+			
	**Ursinia anthemoides*					+
CASUARINACEAE	*Allocasuarina fraseriana*	+	+			
CENTROLEPIDACEAE	*Aphelia brizoides*			+		
	Centrolepis aristata					+
	Centrolepis drummondiana					+
COLCHICACEAE	*Burchardia umbellata*	+	+			
CYPERACEAE	*Gahnia trifida*			+	+	
	Isolepis prolifera				+	
	Lepidosperma longitudinale			+		
	Lepidosperma squamatum	+	+			
	Lepidosperma tetraquetrum				+	
	Mesomelaena tetragona		+	+		+
	Tetraria capillaris	+	+			
	Tetraria octandra		+			
DASYPOGONACEAE	*Dasypogon bromeliifolius*	+				
	Dasypogon hookeri		+			
	Lomandra nigricans	+				
	Lomandra preissii	+				
	Lomandra sericea	+	+			
DENNSTAEDTIACEAE	*Pteridium esculentum*			+	+	
DILLENIACEAE	*Hibbertia cunninghamii*		+			
	Hibbertia huegelii	+	+			
	Hibbertia hypericoides	+	+	+		
	Hibbertia vaginata	+				
DROSERACEAE	*Drosera erythrorhiza*		+			
	Drosera glanduligera	+		+		
	Drosera macrantha	+				
	Drosera menziesii subsp. *menziesii*	+				
	Drosera pallida	+	+			
EPACRIDACEAE	*Astroloma ciliatum*	+	+			
	Astroloma microcalyx			+		
	Conostephium pendulum	+				
	Leucopogon propinquus	+				+
	Lysinema ciliata	+				
GERANIACEAE	**Erodium botrys*					+
GOODENIACEAE	*Dampiera linearis*	+	+			
	Goodenia eatoniae		+			
	Lechenaultia biloba		+			

FAMILY	SPECIES	EmKg	CcHa	AfCc	AfEp	Deg
GOODENIACEAE (cont.)	*Scaevola calliptera*	+	+			
	Velleia trinervis		+			
HAEMODORACEAE	*Anigozanthos flava*				+	
	Anigozanthos manglesii	+	+			
	Conostylis aculeata subsp. *aculeata*	+		+		
	Conostylis serrulata		+			
	Conostylis setigera subsp. *setigera*	+				
	Haemodorum paniculatum		+			
	Phlebocarya ciliata	+				
IRIDACEAE	*Patersonia umbrosa* var. *umbrosa*	+				
	Patersonia umbrosa var. *xanthina*		+			
	**Romulea rosea*					+
JUNCACEAE	*Juncus pallidus*			+	+	
	Juncus planifolius				+	
LINDSAEACEAE	*Lindsaea linearis*	+				
LOBELIACEAE	*Lobelia rhytidosperma*				+	
LOGANIACEAE	*Logania serpyllifolia* subsp. *serpyllifolia*	+	+			
MIMOSACEAE	*Acacia dentifera*		+			
	Acacia extensa		+	+		+
	Acacia mooreana		+	+	+	+
	Acacia pulchella	+				
	Acacia stenoptera	+				
MYRTACEAE	*Agonis flexuosa*	+		+	+	+
	Agonis linearifolia			+	+	
	Astartea fascicularis				+	
	Calothamnus sanguineus	+				+
	Corymbia calophylla		+	+	+	+
	Eucalyptus marginata subsp. *marginata*	+	+			+
	Eucalyptus patens				+	
	Hypocalymma robustum	+	+			
	Kunzea glabrescens	+		+		+
	Melaleuca thymoides	+				
ORCHIDACEAE	*Caladenia attigens*	+	+			+
	Caladenia flava	+	+	+		+
	**Disa bracteata*			+		+
	Drakea livida	+				
	Drakea microptera	+				
	Elythranthera brunonis	+	+			
	Oligochaetochilus vittatus	+				
	Paracaleana nigrita	+				
	Prasophyllum sp.		+			
	Pterostylis affin. *nana*	+				
	Pterostylis barbata		+			
	Pyrorchis nigricans	+				
	Thelymitra crinita	+				
	Thelymitra sp.	+				
PAPILIONACEAE	*Bossiaea ornata*		+			
	Bossiaea rufa	+				
	Daviesia divaricata		+			
	Daviesia preissii		+			
	Gompholobium knightianum		+			
	Gompholobium marginatum		+			
	Gompholobium preissii	+	+			
	Gompholobium tomentosum					+
	Hovea chorizemifolia		+			
	Hovea trisperma	+	+			

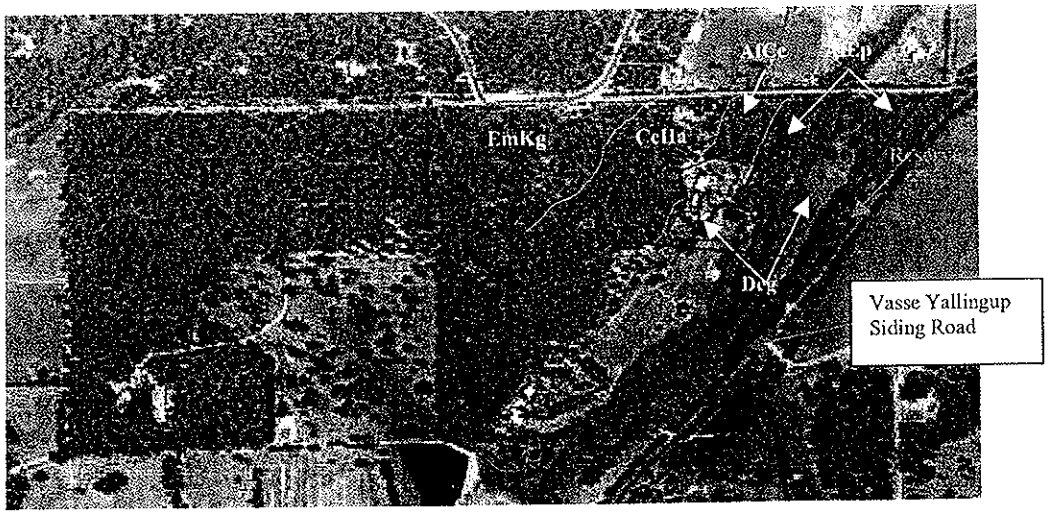
FAMILY	SPECIES	EmKg	CcHa	AfCc	AfEp	Deg
PAPILIONACEAE (cont.)	*Jacksonia sparsa*	+				
	Kennedia coccinea		+			
	**Lotus suaveolens*		+	+	+	
	Mirbelia dilatata		+	+	+	
	**Ornithopus compressus*					+
	Pultenaea pinifolia				+	
	Pultenaea reticulata	+				
	Sphaerolobium scabriusculum	+	+			
PITTOSPORACEAE	*Billardiera laxiflora*	+	+			
	Marianthus tenuis		+			
	Sollya heterophylla			+	+	
POACEAE	**Aira caryophyllea*	+		+	+	+
	Amphipogon amphipogonoides		+			
	**Anthoxanthum odoratum*			+		
	Austrodanthonia acerosa					+
	Austrostipa campylachne		+			
	Austrostipa compressa	+				
	**Briza maxima*		+	+		
	**Briza minor*	+		+		
	**Cynodon dactylon*				+	
	**Holcus lanatus*					+
	**Paspalum dilatum*				+	
	**Pennisetum clandestinum*				+	+
	Tetrarrhena laevis		+			
	**Vulpia bromoides*					+
POLYGONACEAE	**Acetosella vulgaris*					+
PROTEACEAE	*Adenanthos barbiger*		+			
	Adenanthos meisneri	+				
	Banksia attenuata	+				
	Banksia grandis	+	+			
	Grevillea quercifolia		+			
	Grevillea trifida		+			
	Hakea amplexicaulis		+			
	Hakea lissocarpha		+			
	Persoonia longifolia	+	+			
	Stirlingia latifolia	+				
	Xylomelum occidentale	+	+			+
RESTIONACEAE	*Anarthria prolifera*	+	+			
	Baumea articulata				+	
	Desmocladus fascicularis	+	+			
	Desmocladus flexuosus	+				
	Hypolaena exsulca	+		+		
	Lyginia imberbis	+				
	Meeboldina decipiens				+	
	Sporadanthus rivularis				+	
ROSACEAE	**Rubus* sp.				+	
RUBIACEAE	*Opercularia hispida*	+	+			
RUTACEAE	*Philotheca spicata*	+	+			
SOLANACEAE	**Solanum nigrum*			+		
STACKHOUSIACEAE	*Tripterococcus brunonis*		+			
STYLIDIACEAE	*Levenhookia stipitata*	+				
	Stylidium amoenum	+				
	Stylidium brunonis	+				
	Stylidium calcaratum	+	+			
	Stylidium piliferum subsp. *piliferum*	+	+			
	Stylidium schoenoides	+				
THYMELAEACEAE	*Pimelea angustifolia*		+			
	Pimelea rosea var. *rosea*		+			

FAMILY	SPECIES	EmKg	CcHa	AfCc	AfEp	Deg
THYMELAEACEAE (cont.)	*Pimelea suaveolens*		+			
	Pimelea sylvestris				+	
TREMANDRACEAE	*Tetratheca hirsuta*		+			
XANTHORRHOEACEAE	*Xanthorrhoea brunonis*	+				
	Xanthorrhoea gracilis	+	+			
	Xanthorrhoea preissii	+	+	+		
ZAMIACEAE	*Macrozamia riedlei*	+	+			

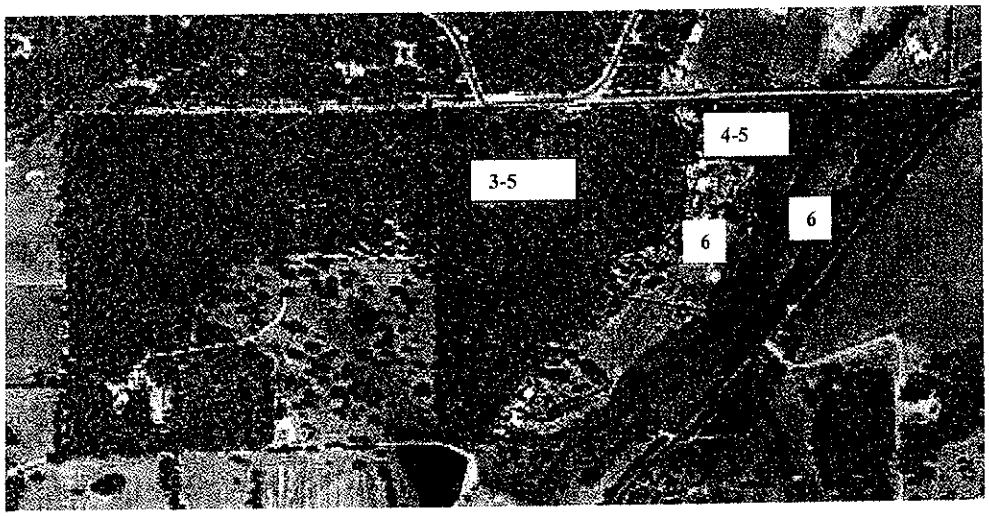
APPENDIX D

Vegetation and Vegetation Condition Maps

ABBREVIATION	MEANING
EmKg	Woodland of *Eucalyptus marginata* subsp. *marginata* over a Low Open to Low Closed Forest dominated by *Allocasuarina fraseriana, Kunzea glabrescens* and *Banksia attenuata* over a Low Shrubland of mixed species dominated by *Hibbertia hypericoides* in sandy soil.
CcHa	Open Forest of *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* over an Open Shrubland of *Hakea amplexicaulis* and *Acacia dentifera* in sandy soil over outcropping laterite.
AfCc	Low Open Woodland of *Corymbia calophylla* over an Open Forest of *Agonis flexuosa* over a Shrubland of *Xanthorrhoea preissii* and a Herbland of *Pteridium esculentum*, in clayey sand.
AfEp	Low Open Woodland of *Eucalyptus patens* over an Open Forest of *Agonis flexuosa* over a Closed Tall Scrub of *Agonis linearifolia* or a Sedgeland dominated by *Juncus pallidus* in clayey sand.
Deg	Degraded areas (pasture)



Map of vegetation units recorded from site



Map showing vegetation condition recorded at the site.

APPENDIX E

List of Declared Rare and Priority Flora obtained from the Department of Conservation and Land Management

Code and description of Rare and Priority Flora categories

Code	Code Declared Rare and Priority Flora Categories
R	DRF (Declared Rare Flora) -Extant Taxa. Taxa, which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection.
X	DRF (Declared Rare Flora) -Presumed Extinct Taxa. Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently.
1	Priority One -Poorly Known Taxa. Taxa, which are known from one or a few (generally <5) populations, which are under threat.
2	Priority Two -Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat.
3	Priority Three -Poorly Known Taxa. Taxa which are known from several populations, at least some of which are not believed to be under immediate threat.
4	Priority Four -Rare Taxa. Taxa which are considered to have been adequately surveyed and which whilst being rare, are not currently threatened by any identifiable factors.

List of potential Declared Rare and Priority Flora obtained from the Department of Conservation and Land Management for the area

CODE	SPECIES	DESCRIPTION
R	*Caladenia busselliana*	Tuberous, herb, 0.2–0.3 m high. Fl. green, yellow, cream, Sep–Oct. Sandy loam. Winter-wet swamps.
R	*Caladenia caesarea* subsp. *maritima*	Tuberous, herb, 0.15–0.2 m high. Fl. green, yellow, brown, Aug–Sep. Loam, granite. Rock outcrops.
R	*Caladenia excelsa*	Tuberous, herb, 0.45–0.9 m high. Fl. green, white, red, Sep–Oct. White, grey or brown sand, sandy loam.
R	*Caladenia huegelii*	Tuberous, herb, 0.25–0.6 m high. Fl. green, cream, red, Sep–Oct. Grey or brown sand, clay loam.
R	*Caladenia viridescens*	Tuberous, herb, 0.25–0.4 m high. Fl. green, yellow, Sep–Oct. Loam, grey sand.
R	*Drakea micrantha*	Erect, multi-stemmed shrub, 1–2.5 m high. Fl. red, May–Jun. Skeletal sandy soils. Granite outcrops.
R	*Drakea elastica*	Tuberous, herb, 0.12–0.3 m high. Fl. red, green, yellow, Oct–Nov. White or grey sand. Low-lying situations adjoining winter-wet swamps.
R	*Eucalyptus phylacis*	Tree (mallee), to 5 m high, bark rough & flaky on trunk. Fl. cream, May. Laterite, loam over granite. Coastal areas.
R	*Laxmannia jamesii*	Herb, 0.05–0.2 m high. Fl. red, white, May–Jul. Grey sand. Winter-wet locations.
R	*Wurmbea calcicola*	Cormous, herb, to 0.25 m high. Fl. white, Jun. Loam. Coastal limestone cliffs.
1	*Senecio gilberti*	Erect shrub, 0.3–1 m high. Fl. pink, Oct–Dec. Grey sand over clay, loam.
1	*Thomasia laxiflora*	Shrub, 0.25–0.45 m high. Fl. pink, purple, Oct–Nov. Gravelly soils.
2	*Acacia subracemosa*	Spreading shrub, 1.8–5 m high. Fl. cream, white, yellow, Sep–Nov. Red or yellow sand over limestone.
2	*Boronia capitata* subsp. *gracilis*	Slender shrub, 0.3–0.6(–3) m high, branches pilose. Fl. pink, Jun–Nov. White/grey or black sand. Winter-wet swamps, hillslopes.
2	*Dryandra sessilis* var. *cordata*	Non-lignotuberous shrub, to 2.5 m high. Fl. cream, yellow, Jul–Oct. White/grey sand. Coastal limestone.
2	*Goodenia arthrotricha*	Herb, to 0.4 m high. Fl. blue, Oct–Nov. Gravel. Granite rocks, slopes.

CODE	SPECIES	DESCRIPTION
2	*Grevillea manglesioides* subsp. *ferricola*	Erect or spreading shrub, 1.5 m high. Fl. red, green, Oct. Red sandy clay over ironstone. Winter wet flats.
2	*Hydrocotyle hamelinensis* ms	Herb. Fl. Sep–Oct. Grey sand. Limestone ridges.
2	*Leptomeria furtiva*	Lax, sprawling shrub, 0.2–0.45 m high. Fl. orange, brown, Aug–Oct. Grey or black peaty sand. Winter-wet flats.
2	*Millotia tenuifolia var. laevis*	Herb, 0.02–0.1 m high. Fl. yellow, Sep–Oct. Granite or laterite soils.
2	*Trichocline* sp. Treeton	Tuberous, herb, to 1.6 m high. Sand over limestone, sandy clay over ironstone. Seasonally wet flats.
3	*Acacia inops*	Weak, scrambling, pungent shrub, 0.4–1.1 m high. Fl. white, cream, Sep–Nov. Black peaty sand, clay. Swamps, creeks.
3	*Acacia latericola* glabrous variant	Shrub, 0.4–0.8 m high. Fl. yellow, Aug–Oct. Lateritic soils.
3	*Acacia semitrullata*	Slender, erect, pungent shrub, (0.1–)0.2–0.7(–1.5) m high. Fl. cream, white, May–Oct. White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas.
3	*Aotus cordifolia*	Erect or straggling shrub, 0.3–1.5 m high. Fl. yellow, Aug–Jan. Peaty soils. Swamps.
3	*Boronia anceps*	Herb, 0.3–0.6 m high, lacking lignotuber, stem flattened and ancipitous when young. Fl. pink, purple, Sep–Jan. White sand, gravelly laterite. Seasonally swampy heaths
3	*Boronia tetragona*	Herb, 0.3–0.7 m high, leaves sessile, entire, with papillate margins, branches quadrangular, sepals ciliate. Fl. pink, red, Oct–Dec. Black/white sand, laterite, brown sandy loam. Winter-wet flats, swamps, open woodland.
3	*Bossiaea disticha*	Erect or straggly to spreading shrub, 0.1–1.5 m high. Fl. yellow, brown, red, Sep–Nov. Sandy soils over limestone.
3	*Chorizema reticulatum*	Erect, wiry shrub, 0.1–0.5 m high. Fl. pink, orange, Aug–Oct. Sand over laterite.
3	*Cyathochaeta teretifolia*	Rhizomatous, grass-like or herb (sedge), to 2 m high, to 1.0 m wide. Fl. brown. Grey sand, sandy clay. Swamps, creek edges.
3	*Dampiera heteroptera*	Herb or shrub, 0.3–0.6 m high. Fl. blue, Sep–Oct. Sandy soils. Swampy areas.
3	*Gahnia sclerioides*	Lax, slender rhizomatous, grass-like or herb (sedge), 0.3–0.9 m high. Loam, sandy soils. Moist shaded situations.
3	*Gonocarpus pusillus*	Herb, 0.05–1.2 m high. Fl. green, yellow, red, Nov–Dec. Grey sandy clay. Winter-wet swamps.
3	*Johnsonia inconspicua*	Rhizomatous, grass-like or herb, 0.1–0.3 m high, to 0.2 m wide. Fl. green, white, pink, Oct–Nov. White-grey or black sand. Low dunes, winter-wet flats.
3	*Lepyrodia heleocharoides*	Rhizomatous, herb (sedge-like), 0.15–0.25 m high. Fl. Dec. Moist peaty sand. Dry or seasonally inundated heath or woodland, swamps.
3	*Pimelea ciliata* subsp. *longituba*	Erect shrub, 0.3–1 m high. Fl. pink, Oct–Dec. Grey sand over clay, loam.
3	*Pultenaea pinifolia*	Erect, slender shrub, 1–3 m high. Fl. yellow, orange, Oct–Nov. Loam or clay. Floodplains, swampy areas.
3	*Sphenotoma parviflorum*	Slender erect or straggling shrub, 0.15–1 m high. Fl. white, Feb–Apr/Sep–Nov. Grey or white sand. Swampy areas, granite hills.

CODE	SPECIES	DESCRIPTION
3	*Tetratheca parvifolia*	Small shrub, 0.2–0.3 m high. Fl. pink, Oct.
4	*Acacia flagelliformis*	Rush-like, erect or sprawling shrub, 0.3–0.75(–1.6)m high. Fl. yellow, May–Sep. Sandy soils. Winter-wet areas.
4	*Anthotium junciforme*	Herb, 0.05–0.4 m high, leaves linear to terete, 0.5–1 mm wide; flowering stems 12–40 cm long. Fl. blue, violet, purple, Nov–Mar. Sandy clay, clay. Winter-wet depressions, drainage lines.
4	*Asplenium aethiopicum*	Rhizomatous, herb (fern), 0.1–0.4 m high, fronds 1–2-pinnate, glabrous, coriaceous; sori numerous; indusium present. Fl. Mar. Loam over granite, sandy loam, sandy clay. In rock crevices of rocky outcrops, in niches beneath overhanging rocks.
4	*Boronia tenuis*	Procumbent or erect & slender shrub, 0.1–0.5 m high. Fl. blue, pink, white, Aug–Nov. Laterite, stony soils, granite.
4	*Caladenia longicauda* subsp. *clivicola*	Tuberous, herb, 0.3–0.5 m high. Fl. white, green, yellow, Sep–Oct. Clayey loam, gravel, sand. Granite outcrops.
4	*Caladenia plicata*	Tuberous, herb, 0.18–0.35 m high. Fl. green, yellow, Sep–Oct. Sand, gravel.
4	*Calothamnus graniticus* subsp. *graniticus*	Erect, multi-stemmed shrub, 1–2.5 m high. Fl. red, May–Jun. Skeletal sandy soils. Granite outcrops.
4	*Drosera fimbriata*	Erect tuberous, herb, 0.05–0.15 m high. Fl. white, Sep–Oct. White sand, granite.
4	*Eucalyptus marginata* x *megacarpa*	Tree, to 8 m high. Sandy loam. Interdunal areas.
4	*Eucalyptus rudis* subsp. *cratyantha*	Tree, 5–20 m high, bark rough, box-type. Fl. white, Jul–Sep. Loam. Flats, hillsides.
4	*Thysanotus glaucus*	Herb, 0.1–0.2 m high. Fl. purple, Oct–Mar. White, grey or yellow sand, sandy gravel.
4	*Verticordia lehmannii*	Slender shrub, 0.2–1 m high. Fl. pink, Jan/Apr–Aug/Dec. Sandy clay. Winter-wet flats.