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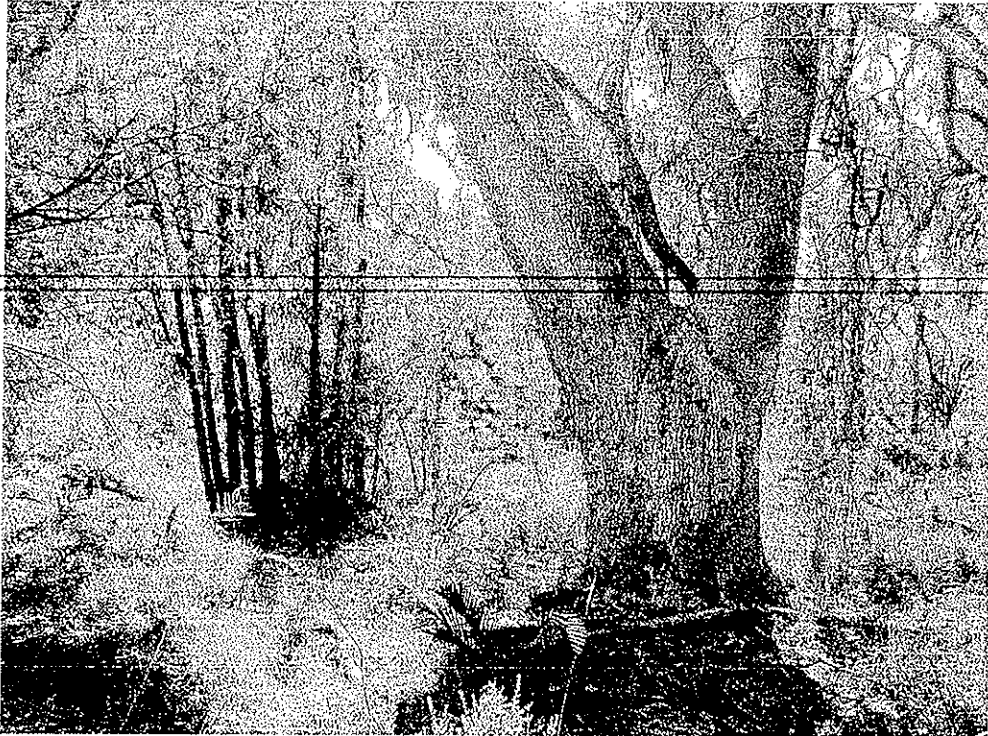
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VEGETATION AND FLORA
OF
LOT 203 STOCK ROAD
STAKEHILL



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Adjust Tuart
Mapping

Add

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Base camp SP

4th April 2004

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1. BACKGROUND

Bennett Environmental Consulting Pty Ltd was commissioned by Smargiassi Nominees to undertake a vegetation and flora survey of an area 'site' proposed for sand extraction. The site, Lot 297 Stock Road, Stakehill has a homestead and sheds and is also used for parking and storage of agricultural equipment. Previously it was used for cattle grazing.

The site occurs in the Drummond Subdistrict of the South West Botanical Province (Beard, 1981). It is included in the Spearwood Dunes System and the Karrakatta Complex – Central and South. This complex is described as being predominantly an open forest of *Eucalyptus gomphocephala* – *Eucalyptus marginata* – *Corymbia calophylla* and a woodland of *Eucalyptus marginata* and *Banksia* species (Hedde, 1980).

The entire site consists of a grey and yellow sand of the Spearwood system, reaching a maximum thickness of 18 metres. It is underlain by sandy clays of the Guildford Formation. The topography of the site is a sandhill, which gently rises from an elevation of 9m AHD in the southern extremity to 18m AHD in the northern extremity (Lundstrom, 2003). The unconfined water table elevation is estimated at 1.5 metres ADH on the western boundary and approximately 2 metres AHD on the eastern boundary.

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 and the surrounding remnant bushland was undertaken on 31st March 2004. The remnant bushland at the site was walked 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 is triangular in shape and the vegetation along the perimeter of the sides appears to have been cleared previously and regrown. This was indicated by the presence of many *Kunzea glabrescens* shrubs.

4.1 Vegetation Units

There were three vegetation units described from the site. 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 set out in Appendix A.

Open Woodland of *Eucalyptus marginata* subsp. *marginata* (Jarrah) over a Low Woodland of *Banksia attenuata* (Narrow leaf banksia), *Banksia menziesii* (Firewood banksia) and *Allocasuarina fraseriana* (Sheoak) and a Tall Shrubland of *Kunzea glabrescens* (Spearwood) over an Open Low Heath dominated by *Hibbertia hypericoides* (Buttercups) in sandy soil. (Em)

Dominant trees: *Allocasuarina fraseriana*, *Banksia attenuata*, *Banksia menziesii*, *Eucalyptus marginata* subsp. *marginata*

Dominant shrubs >1m tall: *Acacia pulchella*, *Kunzea glabrescens*, *Macrozamia riedlei*

Dominant shrubs <1m tall: *Brachyloma preissii*, *Conostephium preissii*, *Daviesia triflora*, *Hibbertia hypericoides*, *Xanthorrhoea brunonis* subsp. *brunonis*

Dominant sedges: *Desmocladius fascicularis*, *Hypolaena exsulca*, *Lepidosperma squamatum*



This was the dominant vegetation unit for a short distance in from the boundary fences. Trees of *Corymbia calophylla* were recorded scattered through this vegetation unit, predominantly on the western and eastern boundary. In some sections *Kunzea glabrescens* was the dominant species and formed a dense canopy. This vegetation unit is most probably regrowth after clearing many decades previously.

Low Open to Closed Forest of *Banksia attenuata* (Narrow leaf banksia), *Banksia menziesii* (Firewood banksia) and *Allocasuarina fraseriana* (Sheoak) over an Open Low Heath dominated by *Hibbertia hypericoides* (Buttercups) and *Stirlingia latifolia* (Blueboy) in sand. (Ba)

Dominant trees: *Allocasuarina fraseriana*, *Banksia attenuata*, *Banksia menziesii*, *Eucalyptus marginata* subsp. *marginata*

Dominant shrubs >1m tall: *Kunzea glabrescens*, *Macrozamia riedlei*

Dominant shrubs <1m tall: *Calytrix flavescens*, *Hibbertia hypericoides*, *Hibbertia racemosa*, *Xanthorrhoea brunonis* subsp. *brunonis*

Dominant sedges: *Desmocladius fascicularis*, *Hypolaena exsulca*, *Lepidosperma squamatum*



This vegetation unit was dominant in the central part of the site. The canopy formed by the *Banksia* species was dense and there were scattered emergent *Eucalyptus marginata* subsp. *marginata* throughout the area.

Open Woodland of *Eucalyptus gomphocephala* (Tuart) over a Low Open Woodland of *Eucalyptus marginata* subsp. *marginata* (Jarrah) over a Low Open Shrubland of *Hibbertia hypericoides* (Buttercups) in sand. (Eg)

Dominant trees: *Allocasuarina fraseriana*, *Banksia attenuata*, *Eucalyptus marginata* subsp. *marginata*

Dominant shrubs >1m tall: *Kunzea glabrescens*, *Macrozamia riedlei*, *Persoonia saccata*, *Rhagodia baccata*

Dominant shrubs <1m tall: *Acanthocarpus preissii*, *Hibbertia hypericoides*, *Hibbertia racemosa*, *Leucopogon propinquus*

Dominant sedges: *Desmocladus fascicularis*, *Hypolaena exsulca*, *Lepidosperma squamatum*



This vegetation unit was recorded in the north western section of the block only. It was limited in size and blended in with vegetation unit Em.

4.2 Vegetation Condition

As the whole site had been logged previously, the best condition that could be allocated was very good (see Appendix B) throughout the area. There were very few weeds recorded. Vegetation unit Eg, recorded many more weeds and would be allocated a vegetation condition of good. Along the fire breaks there were several weeds but into the vegetation units the weeds were scattered. It is not expected this interpretation would change with a spring survey.

4.3 Floristic Community Type

The vegetation throughout the site is inferred to be Floristic Community Type (FCT) 21a, Central *Banksia attenuata* – *Eucalyptus marginata* Woodland (Gibson *et al.*, 1994). This FCT is well reserved and considered to be at low risk. It is not listed by the Department of Conservation and Land Management as a Threatened Ecological Community (English, 2003).

4.4 Number of Species

A total of 29 vascular plant families, 72 genera and 97 species were recorded during the survey (See Appendix C). The dominant families were Proteaceae with 10 species; Papilionaceae with 9 species; Poaceae and Myrtaceae each with 8 species. These four families represent 36% of the total number of species recorded during the survey. In a survey undertaken in spring, 6 orchid species were recorded (Ludstrom, 2002). This number would

be expected to increase as several of the widespread species eg. *Caladenia flava* were not included.

4.5 Weeds

A total of 8 weeds were recorded from the site all of which have all been determined as weeds by the Department of Conservation and Land Management (1999). This listing is not complete due to the timing of the survey. 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	Common Name	CALM Rating		
		Rating	Invasiveness	Impacts
* <i>Euphorbia terracina</i>	Geraldton carnation weed	High	✓	✓
* <i>Lagurus ovatus</i>	Hares tail grass	High	✓	✓
* <i>Avena barbata</i>	Bearded oat	Moderate	✓	
* <i>Briza maxima</i>	Blowfly grass	Moderate	✓	
* <i>Carpobrotus edulis</i>	Hottentot fig	Moderate	✓	
* <i>Ehrharta longiflora</i>	Annual veldtgrass	Moderate	✓	
* <i>Heliphila pusilla</i>		Moderate	✓	
* <i>Ursinia anthemoides</i>	Ursinia	Moderate	✓	

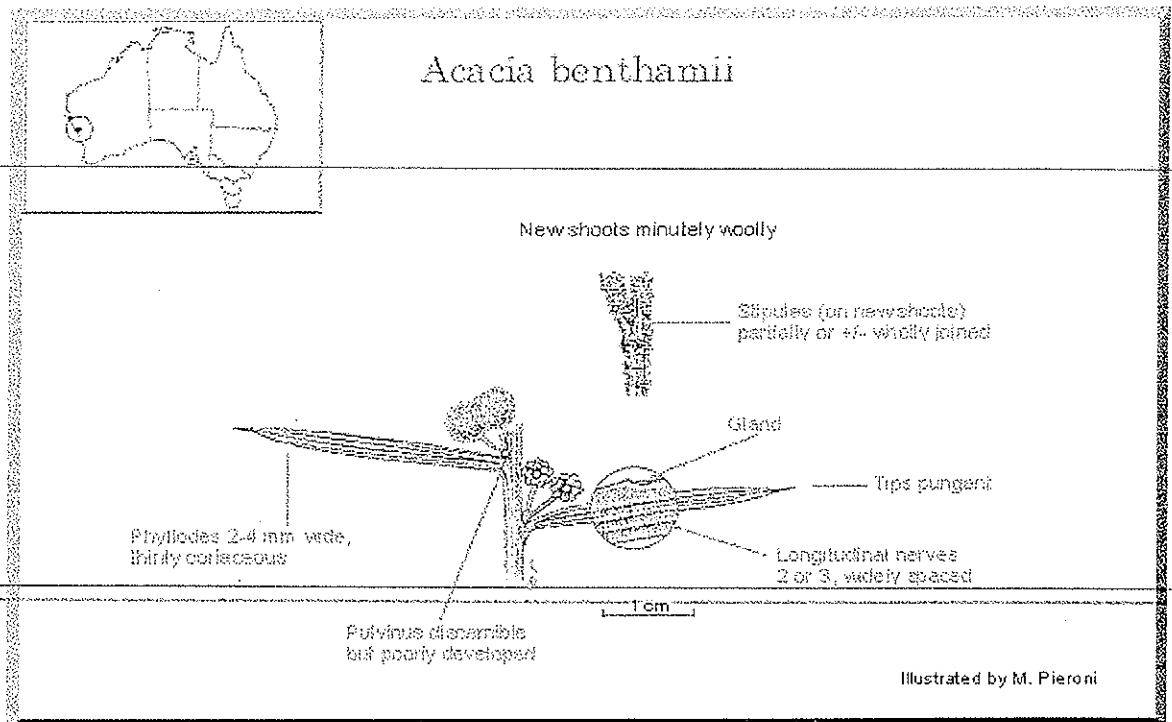
Two weeds were rated as high indicating these are of the greatest environmental concern and are the ones that should be eradicated first. Only a few plants of Geraldton carnation weed were recorded under the Tuarts in the north west corner. Grass weeds are readily eradicated with the use of grass specific herbicides.

4.6 Significant Flora

A search undertaken of the Department of Conservation and Land Management Rare Flora database prior to undertaking the field work resulted in a list of 1 Declared Rare Flora (DRF), no Priority 1 Flora, 1 Priority 2 Flora, 2 Priority 3 Flora and 3 Priority 4 Flora (See Appendix E). Of the 7 species recorded by the Department of Conservation and Land Management, one occurred along river banks and three (including the DRF) were associated with wetlands. Neither of these habitats occurred at the site.

Acacia benthamii a Priority 2 Flora was recorded from the site. This species is very close to the narrow leaved form of *Acacia cochlearis* but differs in the joined stipules and the curly not straight hairs on the young foliage. There were about 20 plants recorded along the eastern and western boundary in vegetation unit Em, none were flowering, but all were in tight bud.

Maslin (2001) included an illustration of this species which is copied below.



Two other priority flora, both priority 4 flora, may occur at the site. *Jacksonia sparsa*, a prostrate shrub, was not observed during the survey. *Caladenia speciosa*, an orchid species, should be searched for during the spring months.

4.7 General comments

The bushland at the site adjoins an area of bushland on the eastern side. Together these two bushland remnants represent an area in excess of 20ha, the preferred lowest area limit. Because the bushland had previously been logged and grazed the maximum vegetation condition that could be allocated was very good. The under storey in the *Eucalyptus marginata* subsp *marginata* woodland was dense and included a range of species which would be expected to increase if a survey was undertaken in spring. The canopy of the *Banksia* woodland in the centre of the area was dense and due to the density of the upper canopy the number of species in the lower storey was reduced.

Some of the Jarrah trees were dying back. This could be due to *Phytophthora cinnamomi*, Jarrah dieback or to stress from other factors. None of the *Banksia* trees were showing signs of dieback, but if approval is given for the sand pit to go ahead there will need to be strict guidelines in place to ensure that weeds and dieback are not introduced into the site.

5. SUMMARY

The site is included in the Karrakatta Complex – Central and South of which 18% remains vegetated (Department of Environmental Protection, 2000). The aim for the Swan Coastal Plain is to retain at least 10% of each vegetation complex.

The survey of Lot 203 Stock Road, Stakehill, undertaken on 31st March 2004 recorded three vegetation units:

1. Open Woodland of *Eucalyptus marginata* subsp. *marginata* over a Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina fraseriana* and a Tall Shrubland of *Kunzea glabrescens* over an Open Low Heath dominated by *Hibbertia hypericoides*.

2. Low Open to Closed Forest of *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina fraseriana* over an Open Low Heath dominated by *Hibbertia hypericoides* and *Stirlingia latifolia*.
3. Open Woodland of *Eucalyptus gomphocephala* over a Low Open Woodland of *Eucalyptus marginata* subsp. *marginata* over a Low Open Shrubland of *Hibbertia hypericoides*.

The first vegetation unit may be a regenerating form of the second vegetation unit as *Kunzea glabrescence* was dominant in several areas of the first unit and only scattered shrubs occurred in the second unit. *Eucalyptus marginata* subsp. *marginata* (Jarrah) was scattered through both units, while *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina fraseriana* formed a dense canopy in the second unit but were only scattered in the first unit. Where there were openings in canopy of the second unit there were additional understorey plants recorded. The third unit was restricted to a small area at the site but extended beyond onto other sites. All these vegetation units are inferred to Floristic Community Type 21a which is not listed by the Department of Conservation and Land Management as a Threatened Ecological Community.

Some of the Jarrah and Tuart trees were of a great height and worthy of preservation. The area had been heavily logged evidenced by the large piles of old timber throughout the first vegetation unit.

One priority 2 flora, *Acacia benthamii* was recorded from the site. One declared rare flora was recorded during the wider search undertaken but it occurs in damp areas, a habitat not recorded at the site. There is the possibility that a priority 4 flora, *Caladenia speciosa* may occur at the site but this would need to be confirmed at a spring survey.

A total of 97 species, 72 genera and 29 vascular plant families were recorded from the site. The dominant families were Proteaceae, Papilionaceae, Myrtaceae and Poaceae. Eight weeds were recorded, two of which were rated as high and therefore should be targeted for removal. *Euphorbia terracina* is an aggressive weed but only a few plants were located at the site under the Tuarts. These plants should be removed immediately to ensure they do not become more widespread. It is possible that a survey undertaken during spring may record more weeds, but these would be more likely confined to the firebreaks.

Some of the Jarrahs were showing dieback of the upper branches but none of the Banksias appeared to be dying. If sand extraction is allowed at the site a dieback survey should be undertaken and an action plan drawn up and implemented to ensure that no additional weeds or dieback are introduced to the site.

6. REFERENCES

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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

LEGEND

subsp.	Subspecies
var.	Variety
*	Weed

FAMILY	SPECIES
AIZOACEAE	* <i>Carpobrotus edulis</i>
ANTHERICACEAE	<i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>
	<i>Dichopogon preissii</i> <i>capitulosus</i>
	<i>Sowerbaea laxiflora</i>
ASTERACEAE	<i>Thysanotus patersonii</i>
	* <i>Craspedia variabilis</i>
	<i>Lagenophora huegelii</i>
	<i>Olearia axillaris</i>
	<i>Podolepis gracilis</i>
	* <i>Ursinia anthemoides</i>
BRASSICACEAE	* <i>Heliophila pusilla</i>
CASUARINACEAE	<i>Allocasuarina fraseriana</i>
CHENOPODIACEAE	<i>Rhagodia baccata</i> subsp. <i>dioica</i>
COLCHIDACEAE	<i>Burchardia umbellata</i>
CYPERACEAE	<i>Lepidosperma leptostachyum</i>
	<i>Lepidosperma squamatum</i>
	<i>Tetraria octandra</i>
DASYPOGONACEAE	<i>Acanthocarpus preissii</i>
	<i>Dasyogon bromeliifolius</i>
	<i>Lomandra hermaphrodita</i>
	<i>Lomandra sericea</i>
	<i>Lomandra suaveolens</i>
DILLENIACEAE	<i>Hibbertia hypericoides</i>
	<i>Hibbertia racemosa</i>
DROSERACEAE	<i>Drosera erythrorhiza</i>
	<i>Drosera menziesii</i>
	<i>Drosera pallida</i>
	<i>Drosera stolonifera</i>
EPACRIDACEAE	<i>Astroloma pallidum</i>
	* <i>Brachyloma preissii</i>
	<i>Conostephium pendulum</i>
	<i>Conostephium preissii</i>
	<i>Leucopogon conostephioides</i>
	<i>Leucopogon propinquus</i>
EUPHORBIACEAE	* <i>Euphorbia terracina</i>
	<i>Phyllanthus calycinus</i>
GOODENIACEAE	<i>Dampiera linearis</i>
HAEMODORACEAE	<i>Anigozanthos humilis</i>
	<i>Conostylis aculeata</i>
IRIDACEAE	<i>Patersonia occidentalis</i>
LAMIACEAE	<i>Hemiandra pungens</i>
MIMOSACEAE	<i>Acacia benthamii</i>
	<i>Acacia pulchella</i> var. <i>glaberrima</i>
	<i>Acacia rostellifera</i>
	<i>Acacia saligna</i>
	<i>Acacia stenoptera</i>
MYRTACEAE	* <i>Baekea camphorosmae</i>

APPENDIX D

Species recorded during survey and listed under vegetation unit

LEGEND

ABBREVIATION	MEANING
Ba	Low Open to Closed Forest of <i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Allocasuarina fraseriana</i> over an Open Low Heath dominated by <i>Hibbertia hypericoides</i> and <i>Stirlingia latifolia</i>
Eg	Open Woodland of <i>Eucalyptus gomphocephala</i> over a Low Open Woodland of <i>Eucalyptus marginata</i> subsp. <i>marginata</i> over a Low Open Shrubland of <i>Hibbertia hypericoides</i>
Em	Open Woodland of <i>Eucalyptus marginata</i> subsp. <i>marginata</i> over a Low Woodland of <i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Allocasuarina fraseriana</i> and a Tall Shrubland of <i>Kunzea glabrescens</i> over an Open Low Heath dominated by <i>Hibbertia hypericoides</i>
subsp.	Subspecies
var.	Variety
*	Weed

FAMILY	SPECIES
MYRTACEAE	<i>Calytrix flavescens</i>
	<i>Calytrix fraseri</i>
	<i>Corymbia calophylla</i>
	<i>Eucalyptus gomphocephala</i>
	<i>Eucalyptus marginata</i> subsp. <i>marginata</i>
	<i>Melaleuca thymoides</i>
	<i>Kunzea glabrescens</i>
ORCHIDACEAE	<i>Caladenia discoidea</i> ✓
	<i>Caladenia flava</i> ✓
	<i>Leporella fimbriata</i> ✓
	<i>Oligochaetochilus vittatus</i>
	<i>Pterostylis recurva</i>
	<i>Pyrorchis nigricans</i>
PAPILIONACEAE	<i>Bossiaea eriocarpa</i>
	<i>Daviesia triflora</i>
	<i>Gompholobium confertum</i>
	<i>Gompholobium tomentosum</i>
	<i>Hardenbergia comptoniana</i>
	<i>Hovea trisperma</i>
	<i>Jacksonia furcellata</i>
	<i>Kennedia prostrata</i>
	<i>Nemcia capitata</i>
PHORMIACEAE	<i>Dianella revoluta</i> var. <i>divaricata</i>
POACEAE	<i>Austrodanthonia occidentalis</i>
	<i>Austrostipa compressa</i>
	<i>Austrostipa flavescens</i>
	<i>Austrostipa semibarbata</i>
	* <i>Avena barbata</i>
	* <i>Briza maxima</i>
	* <i>Ehrharta longiflora</i>
	* <i>Lagurus ovatus</i>
PROTEACEAE	<i>Banksia attenuata</i>
	<i>Banksia ilicifolia</i>
	<i>Banksia menziesii</i>
	<i>Dryandra lindleyana</i>
	<i>Dryandra sessilis</i>
	<i>Persoonia saccata</i>
	<i>Petrophile linearis</i>
	<i>Stirlingia latifolia</i>
	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>
	<i>Xylomelum occidentale</i>
RESTIONACEAE	<i>Desmocladius fasciculatus</i>
	<i>Desmocladius flexuosus</i>
	<i>Hypolaena exsulca</i>
	<i>Lyginia barbata</i>
RUTACEAE	<i>Philotheca spicata</i>
VIOLACEAE	<i>Hybanthus calycinus</i>

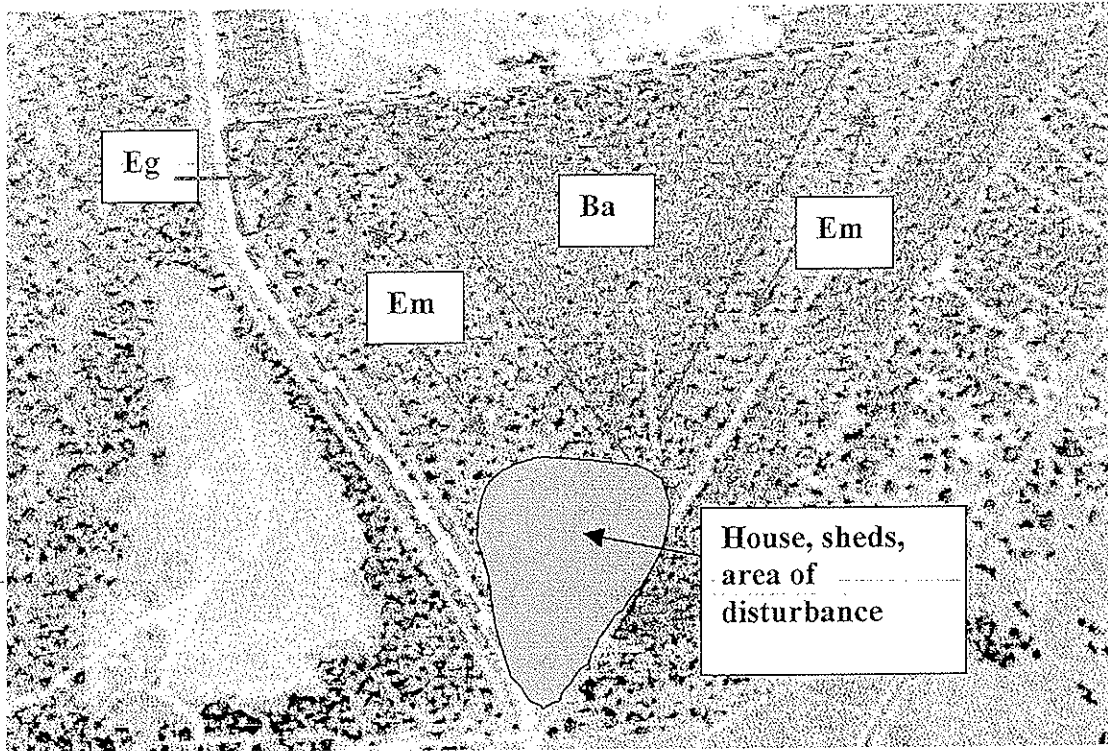
FAMILY	SPECIES
XANTHORRHOEACEAE	<i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i>
ZAMIACEAE	<i>Macrozamia riedlei</i>

SPECIES	Ba	Eg	Em
<i>Acacia benthamii</i>		✓	
<i>Acacia pulchella</i> var. <i>glaberrima</i>		✓	✓
<i>Acacia saligna</i>		✓	✓
<i>Acacia stenoptera</i>		✓	
<i>Acanthocarpus preissii</i>		✓	
<i>Allocasuarina fraseriana</i>	✓	✓	✓
<i>Astroloma pallidum</i>		✓	✓
<i>Austrodanthonia occidentalis</i>		✓	
<i>Austrostipa compressa</i>		✓	✓
<i>Austrostipa flavescens</i>		✓	
<i>Austrostipa semibarbata</i>	✓		✓
* <i>Avena barbata</i>		✓	
<i>Baeckea camphorosmae</i>			✓
<i>Banksia attenuata</i>	✓	✓	✓
<i>Banksia menziesii</i>	✓		✓
<i>Bossiaea eriocarpa</i>		✓	✓
<i>Brachyloma preissii</i>	✓	✓	✓
* <i>Briza maxima</i>	✓	✓	✓
<i>Burchardia umbellata</i>		✓	✓
<i>Calytrix flavescens</i>	✓		
<i>Calytrix fraseri</i>			✓
* <i>Carpobrotus edulis</i>		✓	
<i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>	✓		
<i>Conostephium pendulum</i>			✓
<i>Conostephium preissii</i>			✓
<i>Conostylis aculeata</i>		✓	✓
<i>Corymbia calophylla</i>			✓
<i>Dasypogon bromeliifolius</i>		✓	✓
<i>Daviesia triflora</i>			✓
<i>Desmocladius fasciculatus</i>	✓		✓
<i>Desmocladius flexuosus</i>	✓	✓	✓
<i>Dianella revoluta</i> var. <i>divaricata</i>		✓	
<i>Dichopogon preissii</i>		✓	
<i>Dryandra lindleyana</i>			✓
* <i>Ehrharta longiflora</i>		✓	
<i>Eucalyptus gomphocephala</i>		✓	
<i>Eucalyptus marginata</i> subsp. <i>marginata</i>	✓	✓	✓
* <i>Euphorbia terracina</i>		✓	
<i>Gompholobium confertum</i>			✓
<i>Gompholobium tomentosum</i>		✓	✓
<i>Hardenbergia comptoniana</i>		✓	✓
* <i>Heliophila pusilla</i>		✓	
<i>Hemiandra pungens</i>			✓
<i>Hibbertia hypericoides</i>	✓	✓	✓
<i>Hibbertia racemosa</i>	✓	✓	✓
<i>Hypolaena exsulca</i>	✓		✓
<i>Jacksonia furcellata</i>		✓	

SPECIES	Ba	Eg	Em
<i>Kunzea glabrescens</i>	✓	✓	✓
* <i>Lagurus ovatus</i>		✓	
<i>Lepidosperma leptostachyum</i>	✓		
<i>Lepidosperma squamatum</i>	✓	✓	✓
<i>Leucopogon conostephioides</i>			✓
<i>Leucopogon propinquus</i>		✓	
<i>Lomandra hermaphrodita</i>		✓	
<i>Lomandra sericea</i>			✓
<i>Lomandra suaveolens</i>		✓	
<i>Lyginia barbata</i>			✓
<i>Macrozamia riedlei</i>	✓	✓	✓
<i>Melaleuca thymoides</i>			✓
<i>Nemcia capitata</i>		✓	
<i>Paterosonia occidentalis</i>			✓
<i>Persoonia saccata</i>		✓	✓
<i>Petrophile linearis</i>	✓		✓
<i>Philothea spicata</i>			✓
<i>Phyllanthus calycinus</i>	✓		
<i>Podolepis gracilis</i>			✓
<i>Rhagodia baccata</i> subsp. <i>dioica</i>		✓	
<i>Stirlingia latifolia</i>	✓		✓
<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>		✓	✓
<i>Tetraria octandra</i>			✓
<i>Thysanotus patersonii</i>		✓	✓
* <i>Ursinia anthemoides</i>		✓	
<i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i>	✓		✓
<i>Xylomelum occidentale</i>	✓		✓

APPENDIX D

Map of Vegetation units



Property boundary

APPENDIX E

Declared Rare and Priority Flora

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 Declared Rare and Priority Flora obtained from CALM

TAXON	CODE	LOCATION
<i>Drakaea elastica</i>	R	Hopelands Road near the SE corner of Hopelands farm
<i>Acacia benthamii</i>	P2	Pagononi Block, Pagononi Road, Baldivis
<i>Dillwynia dillwynioides</i>	P3	Paganoni block E of Mandurah Rd, near Serpentine River
<i>Stylidium longitubum</i>	P3	Paganoni block E of Mandurah Rd, near Serpentine River
<i>Caladenia speciosa</i>	P4	Hopelands Road on the SE corner of Hopelands farm, W of North Dandalup
<i>Jacksonia sericea</i>	P4	The Plains, near Mandurah, ca 31 miles S of Fremantle
<i>Parsonsia diaphanophleba</i>	P4	64 km S of Perth on the W bank of the Serpentine River, N of Lake Goegerup.

List of Declared Rare and Priority Flora – Habit and habitat description

TAXON	DESCRIPTION (from Western Australian Herbarium, 2004a)
<i>Drakaea elastica</i>	Tuberous, perennial, herb, 0.12–0.3 m high. Fl. red, green, yellow, Oct–Nov. White or grey sand. Low-lying situations adjoining winter-wet swamps.
<i>Acacia benthamii</i>	Shrub, ca 1 m high. Fl. yellow, Aug–Sep. Sand. Typically on limestone breakaways
<i>Dillwynia dillwynioides</i>	Decumbent or erect, slender shrub, 0.3–1.2 m high. Fl. red, yellow, orange, Aug–Dec. Sandy soils. Winter-wet depressions.
<i>Stylidium longitubum</i>	Erect annual (ephemeral), herb, 0.05–0.12 m high. Fl. pink, Oct–Dec. Sandy clay, clay. Seasonal wetlands.
<i>Caladenia speciosa</i>	Tuberous, perennial, herb, 0.35–0.6 m high. Fl. white, pink, Sep–Oct. White, grey or black sand.
<i>Jacksonia sericea</i>	Low spreading shrub, to 0.6 m high. Fl. orange, Dec–Feb. Calcareous & sandy soils.
<i>Parsonsia diaphanophleba</i>	Woody climber, to 10 m high. Fl. white, cream, pink, Jan–Jun–Sep. Alluvial soils. Along rivers.

APPENDIX F

Quadrat data

opp = opportunistic species, recorded outside of the quadrat

QUADRAT 1

Located at the northern edge of the block

GPS (WGS84): 386492E; 6407994N

Soil: Pale grey sand with pale yellow beneath

Litter: Leaves 60%; twigs 10%; logs <1%; bare ground 60%

Vegetation notes: Very Open Jarrah with occasional *Allocasuarina fraseriana* over Woodland of *Banksia attenuata*, *Banksia menziesii* and *Kunzea glabrescens* over mixed Shrubland dominated by *Hibbertia hypericoides*

Vegetation condition: 3 – Very good

Other Notes: Dieback? As some of the Jarrah are showing signs of death in upper branches
 Area logged previously
 Several seedlings of Jarrah and Kunzea
 In some areas Kunzea is 70% cover especially where it has regrown after logging

SPECIES	HEIGHT	% COVER
<i>Banksia attenuata</i>	300	2
<i>Banksia menziesii</i>	400	5
<i>Brachyloma preissii</i>	50	1
<i>Daviesia triflora</i>	70	<1
<i>Eucalyptus marginata</i> subsp. <i>marginata</i>	1200	5
<i>Hibbertia hypericoides</i>	40	50
<i>Kunzea glabrescens</i>	400	30
<i>Lepidosperma squamatum</i>	40	5
<i>Philothea spicata</i>	40	<1
<i>Stirlingia latifolia</i>	60	5
<i>Tetraria octandra</i>	30	2
<i>Acacia pulchella</i> var. <i>glaberrima</i>	opp	
<i>Acacia saligna</i>	opp	
<i>Allocasuarina fraseriana</i>	opp	
<i>Astroloma pallidum</i>	opp	
<i>Austrostipa compressa</i>	opp	
<i>Austrostipa semibarbata</i>	opp	
<i>Baeckea camphorosmae</i>	opp	
<i>Bossiaea eriocarpa</i>	opp	
* <i>Briza maxima</i>	opp	
<i>Burchardia umbellata</i>	opp	
<i>Calytrix fraseri</i>	opp	
<i>Conostephium pendulum</i>	opp	
<i>Conostephium preissii</i>	opp	
<i>Conostylis aculeata</i>	opp	
<i>Corymbia calophylla</i>	opp	
<i>Dasyogon bromeliifolius</i>	opp	
<i>Desmocladius fasciculatus</i>	opp	
<i>Desmocladius flexuosus</i>	opp	
<i>Dryandra lindleyana</i>	opp	
<i>Gompholobium confertum</i>	opp	

SPECIES	HEIGHT	% COVER
<i>Gompholobium tomentosum</i>	opp	
<i>Hardenbergia comptoniana</i>	opp	
<i>Hemiandra pungens</i>	opp	
<i>Hibbertia racemosa</i>	opp	
<i>Hypolaena exsulca</i>	opp	
<i>Leucopogon conostephioides</i>	opp	
<i>Lomandra sericea</i>	opp	
<i>Lyginia barbata</i>	opp	
<i>Macrozamia riedlei</i>	opp	
<i>Melaleuca thymoides</i>	opp	
<i>Patersonia occidentalis</i>	opp	
<i>Persoonia saccata</i>	opp	
<i>Petrophile linearis</i>	opp	
<i>Podolepis gracilis</i>	opp	
<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>	opp	
<i>Thysanotus patersonii</i>	opp	
<i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i>	opp	
<i>Xylomelum occidentale</i>	opp	

QUADRAT 2

Location: In the central portion of the site

GPS (WGS84): 386397E; 6407927N

Soil: Pale grey sand with pale yellow beneath

Litter: Leaves 80%; twigs 5%; logs <1%; bare ground <1%

Vegetation notes: Dense Woodland of *Banksia attenuata* and *Banksia menziesii* with occasional *Allocasuarina fraseriana* over *Hibbertia hypericoides* and *Stirlingia latifolia*

Other notes: Where the *Banksia* forming a dense canopy there is very little of no *Kunzea*. Occasionally the upper canopy is dominated by *Allocasuarina fraseriana*, especially near to the sheds. Consistently through the central region of the block. Area appears a darker colour on the aerial photograph.

SPECIES	HEIGHT	% COVER
<i>Allocasuarina fraseriana</i>	700	20
<i>Banksia attenuata</i>	800	30
<i>Banksia menziesii</i>	600	30
<i>Desmocladius fasciculatus</i>	15	3
<i>Desmocladius flexuosus</i>	15	2
<i>Hibbertia hypericoides</i>	40	15
<i>Hibbertia racemosa</i>	40	<1
<i>Lepidosperma squamatum</i>	40	<1
<i>Stirlingia latifolia</i>	40	15
<i>Austrostipa semibarbata</i>	opp	
<i>Brachyloma preissii</i>	opp	
* <i>Briza maxima</i>	opp	
<i>Calytrix flavescens</i>	opp	
<i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>	opp	
<i>Eucalyptus marginata</i> subsp. <i>marginata</i>	opp	
<i>Hypolaena exsulca</i>	opp	
<i>Kunzea glabrescens</i>	opp	
<i>Lepidosperma leptostachyum</i>	opp	
<i>Lepidosperma squamatum</i>	opp	
<i>Macrozamia riedlei</i>	opp	
<i>Petrophile linearis</i>	opp	
<i>Phyllanthus calycinus</i>	opp	
<i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i>	opp	
<i>Xylomelum occidentale</i>	opp	

Quadrat 3

Location: At the north west corner of the site

GPS (WGS84): 385829E; 6407986N

Soil: Pale grey sand with pale yellow beneath

Litter: Leaves 70%; twigs 10%; logs 10%; bare ground 10%

Vegetation notes: Very Open Woodland of Tuart (ca 5% cover) over Jarrah (5%) over Shrubland dominated by *Hibbertia hypericoides*

Other notes: Very weedy on the edge of the firebreak.

Some of the Tuarts of a very large size.

A very small area where this vegetation unit occurs

SPECIES	HEIGHT	% COVER
<i>Acanthocarpus preissii</i>	70	2
<i>Astroloma pallidum</i>	30	2
<i>Austrostipa compressa</i>	80	<1
* <i>Briza maxima</i>	70	5
* <i>Carpobrotus edulis</i>	10	2
<i>Conostylis aculeata</i>	30	1
<i>Desmocladius flexuosus</i>	5	1
<i>Dianella revoluta</i> var. <i>divaricata</i>	70	<1
<i>Eucalyptus gomphocephala</i>	1600	50
<i>Eucalyptus marginata</i> subsp. <i>marginata</i>	700	30
* <i>Euphorbia terracina</i>	40	<1
<i>Hardenbergia comptoniana</i>	twiner	2
<i>Hibbertia hypericoides</i>	50	10
<i>Kunzea glabrescens</i>	350	1
<i>Lepidosperma squamatum</i>	40	1
<i>Lomandra hermaphrodita</i>	30	<1
<i>Lomandra suaveolens</i>	20	1
<i>Macrozamia riedlei</i>	90	3
<i>Persoonia saccata</i>	60	2
<i>Acacia benthamii</i>	opp	
<i>Acacia pulchella</i> var. <i>glaberrima</i>	opp	
<i>Acacia saligna</i>	opp	
<i>Acacia stenoptera</i>	opp	
<i>Allocasuarina fraseriana</i>	opp	
<i>Austrostipa flavescens</i>	opp	
<i>Austrodanthonia occidentalis</i>	opp	
* <i>Avena barbata</i>	opp	
<i>Banksia attenuata</i>	opp	
<i>Bossiaea eriocarpa</i>	opp	
<i>Brachyloma preissii</i>	opp	
<i>Burchardia umbellata</i>	opp	
<i>Dasypogon bromeliifolius</i>	opp	
<i>Dichopogon preissii</i>	opp	
* <i>Ehrharta longiflora</i>	opp	
<i>Gompholobium tomentosum</i>	opp	

SPECIES	HEIGHT	% COVER
<i>*Heliophila pusilla</i>	opp	
<i>Hibbertia racemosa</i>	opp	
<i>Jacksonia furcellata</i>	opp	
<i>*Lagurus ovatus</i>	opp	
<i>Leucopogon propinquus</i>	opp	
<i>Nemcia capitata</i>	opp	
<i>Rhagodia baccata</i> subsp. <i>dioica</i>	opp	
<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>	opp	
<i>Thysanotus patersonii</i>	opp	
<i>*Ursinia anthemoides</i>	opp	