

The Flora and Vegetation of the Meelup reserve system.



A report for the Meelup Park Management Committee

Andrew Webb 2013

Contents:

1. Introduction	4
2. Geology	4
3. Environmental Setting	5
3.1. IBRA Regions	6
3.2. Soil Landscape Mapping	6
3.3. Vegetation Complexes	7
4. The Meelup Landscape	9
5. The Meelup Vegetation	10
5.1. Jarrah, Marri Forests	10
5.2. Jarrah, Marri Woodland	12
5.3. Banksia Woodland	12
5.4. Granitic Heath	13
5.5. <i>Calothamnus graniticus</i> Closed Heath	14
5.6. Granitic Apron	15
5.7. Creeklines	15
5.8. Coastal Vegetation	16
5.9. Floristic Diversity	17
6. Meelup Plant Communities	18
7. Significant Vegetation	19
8. Meelup Flora	22
9. Significant Flora	23
9.1. Threatened and Endemic Flora	24
9.2. Disjunct Populations	24
9.3. Habitat Specific Flora	26
10. Conclusion	26
11. References	29

Figures

Figure 1: Landforms of the Busselton to Augusta area	5
Figure 2: Land systems of the Meelup Reserve	7

Tables

Table 1: Vegetation complexes of the Meelup Reserve	8
Table 2: Survey quadrats per vegetation association	17
Table 3: Keating & Trudgen communities per vegetation association	19
Table 4: Keating & Trudgen conservation comments	20
Table 5: Comparison of flora diversity	22

Maps (map shapefiles on CD)

Map 1: Meelup Reserves	32
Map 2: Vegetation complexes of the Meelup Reserve	33
Map 3: Vegetation Associations of the Meelup reserve	34

Photographs 35-38

Appendices

Appendix 1:	
Table 1: Vegetation Structural Descriptions	39
Table 2: Conservation Codes for WA flora	40
Appendix 2:	
Table 1: Meelup Reserve Species List	41-62
Table 2: Meelup species list per Vegetation Association (on CD)	--
Appendix 3: Significant Flora of Meelup Reserve	63-73
Appendix 4: Keating & Trudgen plant community map and descriptions (on CD)	--
Appendix 5: Survey Quadrat Datasheets (on CD)	--

1. Introduction

The Meelup reserve system includes Res.21629 and Res.34894 (Map 1) a total of 613 hectares. Areas of the reserves have been cleared for urban and golf course development and other areas for historical gravel pits and rubbish dumping. The north-western extent of the reserve system is mostly beach sand of Bunkers Bay. Not including gravel pit/rubbish tip regeneration, approximately 560ha of the reserve system is remnant vegetation.

This report documents the floristic values of the Meelup reserve systems remnant vegetation as compiled from field work over the Spring of 2012, reference to existing reports, unpublished floristic data and herbarium collections.

Recognition needs to go to members of the Dunsborough community who have helped in survey work and/or compiled considerable information on the flora of the area, including but not limited to Hazel Cole, Don Carter, Richard Clark, Brian and Pauline Clay, Shirley Fisher, Ron Glencross, Margaret Winchcombe and to Arthur Weston for the unpublished information compiled on the reserve in the 1990's.

2. Geology

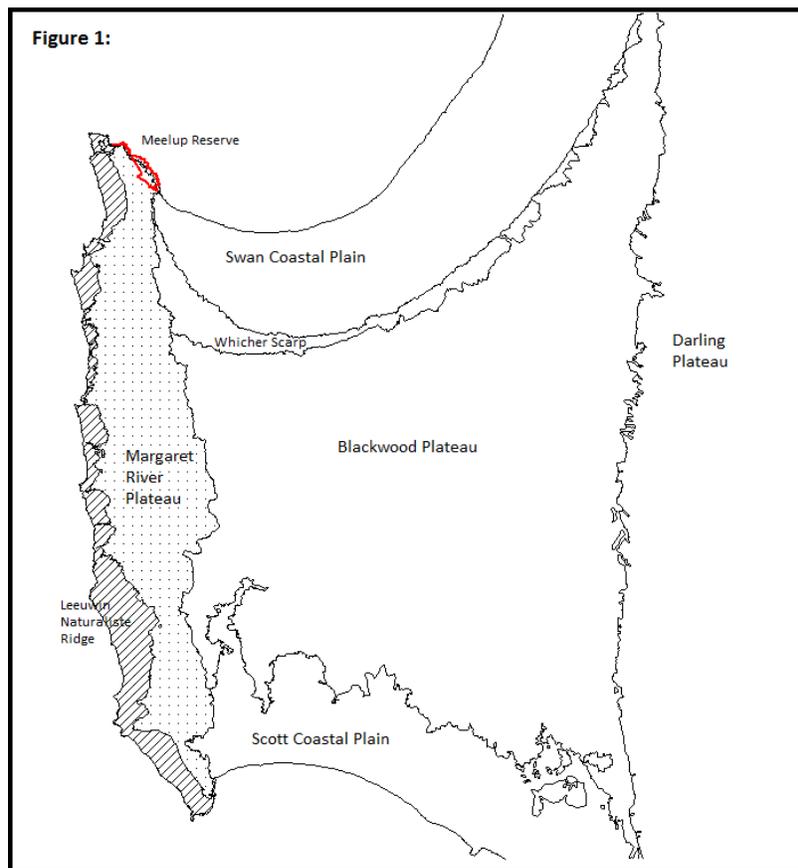
The underlying geology of the Meelup reserve system is Precambrian granite and gneiss of the Leeuwin Block major landform. This basement rock dates from a sequence of mountain building from approximately 1100 to 550 million years ago (Freeman & Donaldson 2006) in the formation and break-up of the supercontinent Rodinia forming the next supercontinent Gondwana.

From approximately 200-125 million years ago Gondwana was subject to significant tectonic activity and faulting in the breakup of the modern-day India from Western Australia. This breakup resulted in the slippage of basement rock between the Darling and Dunsborough faults to form a rift valley between the Darling Plateau and the Leeuwin Block. Over millions of years this rift valley estimated to be over 30,000 feet deep (Seddon 1972) was subject to the extensive deposition of thick alluvial sediments from the erosion of the adjacent landscapes to form the sedimentary basin known as the Perth Basin. With the granitic bedrock of the Perth Basin overlain by kilometres of sediment, the Leeuwin Block and the Darling Plateau are the only major landforms in the Busselton-Augusta area that are characterised by outcropping granite and gneiss.

The Leeuwin Block major landform is further divided into two landform units being the Leeuwin-Naturaliste Ridge and the Margaret River Plateau. The Leeuwin-Naturaliste Ridge along the western edge of the Leeuwin Block is characterised by tamala limestone and various aged deposits of calcareous sands overlying the granitic basement rock which is exposed in places, generally adjacent to the coast. The eastern extent of the Leeuwin Block known as the Margaret River Plateau does not support limestone and is instead characterized by a lateritic soil profile, the product of in situ weathering. In places the underlying granitic bedrock is exposed.

Meelup reserve is located on the north-eastern tip of the Leeuwin Block within the Margaret River Plateau; the reserve system supports some of the largest areas of exposed basement rock of the Plateau landform. The uplands of the reserve still retain a lateritic soil profile and the lower slopes adjacent to the coast support massive exposed boulders. To the east Meelup reserve overlooks the above sea-level expressions of the Perth Basin (the Swan Coastal Plain and the Blackwood Plateau), and in the distant east lie the hills of the Darling Scarp extending as a granitic ridge from Perth through Nannup to the mouth of the Donnelly River.

Figure 1 shows landforms of the Busselton to Augusta area together with the location of the Meelup reserve system (modified DAFWA 2007).



3. Environmental Setting

The Meelup reserve system is within the South West Botanical Province , this province includes the extent of Western Australia south-west of a line from approximately Kalbarri to Esperance. The province is recognized as one of the world’s 34 biodiversity hotspots (Conservation International 2011), which are defined as areas on earth that support exceptional concentrations of endemic species (both flora and fauna) but are also suffering

significant habitat loss. It is estimated that 1.4% of the world's flora is endemic to this South West Botanical Province (Myers *et al.* 2000).

Western Australia and Australia have been mapped by a range of datasets relating to soil and vegetation, some of the datasets relevant to the Meelup reserve system include the following:

3.1 IBRA Regions

Australia has been subject to landscape scale mapping, known as the Interim Biogeographic Regionalisation for Australia (IBRA) which seeks to map and describe biogeographic regions based on attributes of climate, lithology, geology, landforms and vegetation (National Land and Water Resources Audit 2001). The Meelup reserve system sits on a narrow north-west extension of the Jarrah Forest bioregion. This narrow extension adjoins the Warren bioregion to the south and the Swan Coastal Plain bioregion to the east. The Jarrah Forest bioregion has been further subdivided into northern and southern jarrah forest subregions, the southern jarrah forest bioregion in which Meelup is located is characterised by a warm Mediterranean climate with 600-1200mm of annual rainfall and 5-6 dry months per year (Beard 1990). A forest of Jarrah is the characteristic vegetation of the bioregion on a laterized plateau with loamy soil in the valleys, the understorey is considered similar to that of the Warren bioregion (Beard 1990).

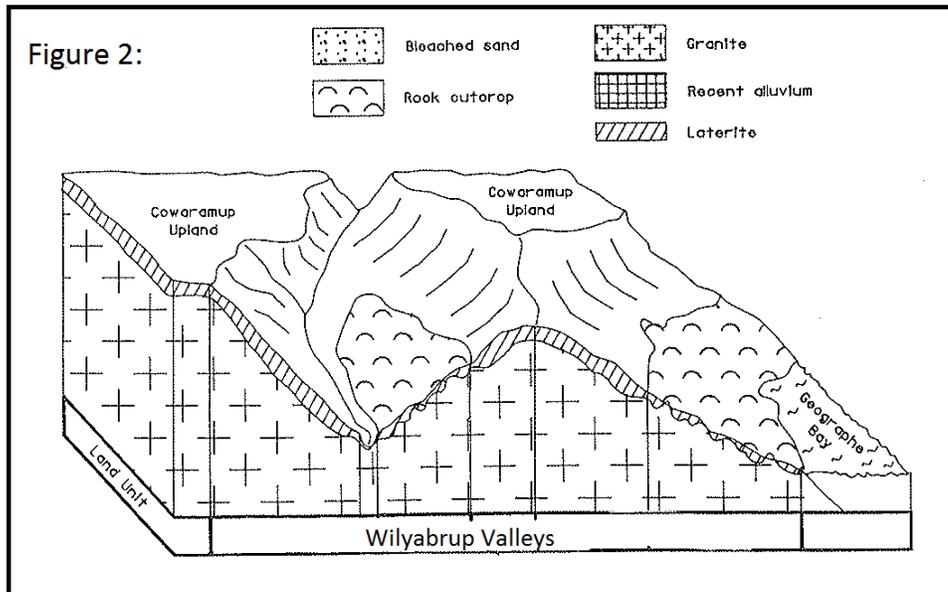
3.2 Soil Landscape Mapping

Soil landscape mapping is the subdivision of the landscape based recurring patterns of topography, geology and soils with some reference to vegetation. This mapping has been undertaken over the Meelup reserve system by Tille and Lantzke (1990), which has shown the reserve to be of the Cowaramup Upland and Wilyabrup Valley land systems.

The Cowaramup Uplands are the gently undulating plains of laterized granitic basement of the Margaret River Plateau. These uplands range in elevation in the Meelup area from 80-140m above sea level (Tille and Lantske 1990).

The Wilyabrup Valleys are the undulating valley slopes and low hills found below the Cowaramup Uplands; the soils of the valleys are commonly a gravelly duplex (Tille and Lantzke 1990). The lower slopes of the Meelup Wilyabrup valleys are associated with shallow rocky soils and granitic outcrops. Both the Cowaramup and Wilyabrup land systems can have areas of deep bleached sand overlying the basement rock.

Figure 2 is a simplified block diagram of the patterning of the Cowaramup Upland and Wilyabrup Valley land systems within the Meelup reserve system (modified from Tille and Lantske 1990).



3.3 Vegetation Complexes

Vegetation complex mapping is the mapping of vegetation based on landform, soils and climatic zones and their relationship to vegetation (primarily understorey vegetation). This mapping has been undertaken over the forested extent of Western Australia which includes the Meelup reserves at a scale of 1:50,000 by Mattiske and Havel (1998). Five vegetation complexes are mapped for the Meelup reserve system (Map 2) and are broadly described below as per Havel and Mattiske (2000).

- The Cowaramup (C2) vegetation complex is associated with mildly undulating uplands with gravely duplex soils and outcrops of laterite. Dominant vegetation is an Open Forest of *Eucalyptus marginata* and *Corymbia calophylla* with a second storey of *Persoonia longifolia*, *Banksia grandis*, *Xylomelum occidentale*. Shrub and herb storey consists of *Xanthorrhoea preissii*, *X.gracilis*, *Adenanthos barbiger*, *Hakea amplexicaulis*, *Daviesia incrassata* and *Hakea lissocarpha*. This complex occurs on the Margaret River Plateau north of approximately Cowaramup.
- The Kilcarnup (KbE) complex is associated with exposed dunes consisting of lime rich sands with low waterholding capacity. Vegetation is mainly a Shrubland of *Melaleuca huegelii*, *Pimelea ferruginea*, *Olearia axillaris*, *Spyridium globulosum*, *Acacia littorea* with sedges *Lepidosperma gladiatum* and *Ficinia nodosa*. This complex occurs in near-coastal areas of the Leeuwin Block major landform; only a very small extent of this complex is within the Meelup reserve system as beach sand and is generally lacking native vegetation.

- The Wilyabrup complexes (W2) and (Ww2) are associated with valley incised into the Margaret River Plateau with soils ranging from yellow duplex to red earths. Dominant vegetation is an Open Forest of *Corymbia calophylla* with a mixture of *Eucalyptus patens* on lower slopes and *E.marginata* on upper slopes. The second storey consists of *Hakea lasianthoides*, *Agonis flexuosa*, *Banksia grandis* and *Persoonia longifolia*. The understorey components includes *Taxandria linearifolia*, *Mirbelia dilatata*, *Acacia alata*, *Astartea fascicularis* on the floor and *Pteridium esculentum*, *Hovea elliptica*, *Leucopogon verticillatus*, *Macrozamia riedlei*, *Logania vaginalis* and *Opercularia hispidula* on the slopes. Both these Wilyabrup complexes are only associated with riverine valleys north of approximately Cowaramup.
- The Wilyabrup (Wr) complex is associated steep rocky slopes of valleys incised into the Margaret River Plateau. Soils are mainly a shallow duplex with vegetation ranging from Lithic Complex, Herbfield through to Heath to Woodland of *Corymbia calophylla* with *Agonis flexuosa* and *Banksia grandis*. Shrubs and herb consist of *Hakea lissocarpha*, *Hibbertia hypericoides*, *Gastrolobium spinosum*, *Calothamnus sanguines*, *Hypocalymma angustifolia*, *Hemigenia incana*, *Hakea trifurcata*, *Dodonaea ceratocarpa*, *Verticordia plumosa* and *Cryptandra arbutiflora*.

There is a close correlation between vegetation complex and soil landscape mapping. Within Meelup the Cowaramup vegetation complex relates to the Cowaramup Upland soil landscape units. The Kilcarnup (KbE) complex relates to vegetation on near coastal dunes and units of the Wilyabrup vegetation complex relate to different vegetation and soils of the Wilyabrup Valley soil landscape units.

Table 1 details the extent of the above-mentioned vegetation complexes pre-european extent remaining uncleared and in formal reservation (as per DEC 2007). The extent of the complexes within the Meelup reserve system is also shown in Table 1.

Table 1: Extent of Meelup reserve system vegetation complexes

Vegetation complex	Pre-european extent (Ha)	Extent remaining (Ha)	% remaining	% in formal reservation	Extent in Meelup res. system (Ha)*
Cowaramup (C2)	13,683	4,889	36	6	60
Kilcarnup (KbE)	355	285	80	69	5
Wilyabrup (W2)	4,101	1,407	34	2	145
Wilyabrup (Ww2)	1,328	519	39	0	52
Wilyabrup (Wr)	1,111	799	72	9	390

(* - includes partly cleared and regenerating vegetation)

In regards to the Meelup reserve system, the Wilyabrup (Wr) vegetation complex is the most significant. This complex together with the Cowaramup (Cr) vegetation complex represents the mapped extent of outcropping granite and associated vegetation within the larger Margaret River Plateau. This extent represents only 2.6% (2024ha) of the entire Margaret River Plateau landform. Within Meelup all vegetation associated with outcropping granite is mapped as the Wilyabrup (Wr) complex which represents only 1.5% (1111ha) of the Margaret River Plateau landform, as such this vegetation and its associated geology is highly restricted. The Wilyabrup (Wr) vegetation complex is only found in any extent at the northern and southern extremes of the Margaret River Plateau with very small areas in the vicinity of Bramley National Park, along the Margaret River and the Cowaramup and Calgardup Brooks. As shown in Table1, approximately 50% of the remaining uncleared extent of the Wilyabrup (Wr) complex vegetation is found in the Meelup reserve system.

All the vegetation complexes found in the Meelup reserve system are only associated with the Leeuwin Block major landform and are all of a naturally restricted extent. The *National Objectives and Targets for Biodiversity Conservation 2001-2005* (Commonwealth of Australia 2001) has recognised that in order to protect Australia's biological diversity there needs to be the minimum retention of 30% of the pre-clearing extent of an ecological community (in Western Australia vegetation complexes are considered ecological communities). Molloy *et al.* (2007) also recognizes that together with a percentage target of retention there needs to be a minimum 1500 hectare retention target or whatever is greater. Reference to Table 1 shows that with the exception of the Cowaramup (C2) complex, all the vegetation complexes as found within Meelup are restricted and well below recommended levels of retention. It is likely that with consideration of clearing since extent calculations that the Cowaramup (C2) complex has also slipped below recommended levels of retention.

4. The Meelup Landscape

The Meelup reserve supports an intact granitic landscape and associated vegetation from the top of the landscape to the bottom. The vegetation of the reserve system has patterns linked to upland, mid-slope and lower slope topographic position.

The uplands and the upper slopes of the reserve system has vegetation on a lateritic gravelly loam, the result of in situ weathering, these soils are dominated by forests of Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*). North-west of the junction of Meelup road and Cape Naturaliste Drive some limited areas of exposed granite are found high in the landscape.

In the mid-slopes the lateritic soils have been stripped by erosional forces to only be a shallow profile of either lateritic gravel or loam soils over the granite bedrock which in place is exposed. These soils are characterised by a shrubland with a woodland of stunted Jarrah and Marri. In areas the overlying soil becomes particularly shallow over massive granite rock and a closed heath form of vegetation becomes dominant.

The lower slopes of Meelup are characterised by exposed granite as either massive or small boulders, the soil here is a clayey loam and a *Calothmanus graniticus* heath is the characteristic community. At the northern extent of Meelup reserve, areas of deeper loamy soil over granite extend to the lower slopes allowing a low forest community to extend to the beach.

The incised valleys/creeklines of the reserve system generally have relatively deep loamy soils allowing for a taller forest to extend down the valleys to almost the ocean. An exception to this would be the informally named Stoney Creek adjacent to Eagle Bay which cuts a narrow valley through shallow soils and exposed granite, this creekline lacks forest trees and is instead fringed by *Melaleuca viminea*.

Small areas of the Meelup landscape support what is termed an “apron” in relation to the granite outcrop ecosystem (Main 1997); this is where the edges of outcropping granite are covered in shallow soil of varying depths resulting in the soil alternating between waterlogged and dry throughout the seasons. These areas within the Meelup reserve system, depending on the depth of soil over the underlying rock, can support a plant community ranging from an annually renewed herbland to a wetland taxa influenced scrub community.

The coastal fringe of Meelup is generally granitic rock with loamy soils although small beaches of calcareous sand have formed in the bays. No limestone is found in the Meelup reserve system.

5. The Meelup Vegetation

The survey undertaken as part of this report has mapped the vegetation of the Meelup reserve system at the association level. Vegetation associations can be defined as a concept that covers two or more plant communities¹ with similar structure and dominant species (Trudgen & Trudgen 2010). The mapping has recognised the following associations as described below using Keighery (1994) structural descriptions (Appendix 1). The approximate extent of the vegetation as detailed below is shown in Map 3 (also a shapefile on the attached CD). The vegetation of the Meelup reserve system is very complex and any mapping and associated boundaries should be considered indicative.

5.1 Jarrah, Marri Forests (Map 3 communities 1, 1b, 2, 2b)

The Jarrah and Marri open forests (trees > 10m, 30-70% cover) of the reserve system are found in the uplands and upper slopes on relatively deep lateritic profile. The uplands are predominantly a heavy lateritic gravelly loam with an understorey dominated by

¹ A plant community is the basic unit of vegetation classification; the mapping of similar vegetation stands. A vegetation stand is a particular physical example of a plant community described by structure and dominant species at all levels. The grouping of similar stands introduces some variation which is the plant community concept (Trudgen & Trudgen 2010).

Calothamnus sanguines (photograph 1). Near Eagle Bay and the shady northern valley slopes of the Meelup Brook the soils are more of a sandy loam and dominated by Marri with a lesser extent of Jarrah and often Peppermint (*Agonis flexuosa*). The understorey of this community is dominated by *Xanthorrhoea preissii* (photograph 2). These open forest communities are mapped as Communities 1 and 2 respectively in Map 3.

Both these forms of forest community extend into the mid and lower slopes of the reserve on gentle valley slopes, although with soils becoming shallow over underlying rock the trees become shorter and sparser resembling a low open forest structure (trees <10m, 30-70% cover). The mid to lower slopes of the reserves northern extent adjacent to Eagle Bay are low open forests predominantly on loam soils with small areas of exposed granite and an open understorey with an increasing dominance of shrubs such as *Thomasia foliosa* and the herb *Dampiera lindleyi* reflecting poor drainage. The reserves southern mid to lower slope low open forests are predominantly on lateritic soils; these forests have small areas of exposed granite and occasional areas of poor drainage where the forest becomes sparse and the understorey rich in annually renewed herbs. These low open forests are mapped as Communities 2b and 1b respectively in Map 3

The southern-most mapped occurrence of Jarrah, Marri low open forest on loam soils (community 2b, Map 3) is unusual in that the community has *Allocasuarina fraseriana* as a dominant tree species. This is the only location in the Meelup reserve system that this tree occurs.

Dominant taxa of the Meelup Jarrah, Marri forest communities include:

Trees: *Corymbia calophylla*, *Eucalyptus marginata*, *Agonis flexuosa*, *Persoonia longifolia*

Shrubs: *Acacia pulchella*, *Banksia dallanneyi*, *Bossiaea ornata*, *Calothamnus sanguines*, *Chorizema rhombeum*, *Gompholobium polymorphum*, *Hakea amplexicaulis*, *H.lissocarpa*, *Hibbertia commutata*, *H.cunninghamii*, *H.hypericoides*, *Hovea trisperma*, *Hypocalymma angustifolia*, *Pimelea preissii*, *Philotheca spicatum*, *Synaphea gracillima*, *Xanthorrhoea gracilis*, *X.preissii*

In the sandy loam community *Bossiaea linophylla*, *Chorizema cordatum*, *Hibbertia racemosa*, *Hovea elliptica*, *Macrozamia reidleyi* and *Thomasia foliosa* become more common

Sedges: *Desmocladius fascicularis*, *Lepidosperma leptostachya*, *Mesomelaena tetragona*, *Tetragonia capillaris*, *T.octandra*

Herbs: *Burchardia congesta*, *Caesia micrantha*, *Chaemascilla corymbosa*, *Dampiera linearis*, *Lagenifera huegelii*, *Lomandra caespitosa*, *L.micrantha*, *L.sericea*, *Opercularia echinocephala*, *Patersonia babionoides*, *Pentapeltis peltigera*, *Scaveola calliptera*, *Stylidium amoenum*, *Trichocline spathulata*, *Xanthosia candida*

Dichopogon capillipes is common in the sandy loam community

Grasses: *Austrodanthonia setacea*, *Neurachne alopecuroidea*, *Tetrarrhena laevis*. With *Microlaena stipoides* common in the sandy loam community.

5.2 Jarrah, Marri Woodland (Map 3 community 4)

In mid to lower slope areas of the Meelup Reserve system where soils become particularly shallow over granite and occasionally massive laterite the trees become sparse, low in height and often multi-stemmed (photograph 3). Jarrah and Marri are still the dominant tree species, but this association also supports solitary populations of *Eucalyptus virginea* and *E.phylacis*. This low woodland to open mallee vegetation (trees <10m, 10-30% cover) is often over a diverse closed heath understorey (shrubs <1m, 70-100% cover) on either a heavy lateritic gravelly loam or a less gravelly sandy loam.

This community can have a high degree of similarity with open forms of the low open forest vegetation as described in section 5.1. In some areas, particularly between Castle Bay Road and Meelup Brook, it is difficult to distinguish between the two forms of vegetation. Generally the understorey of the woodland community differs from that of the forest community by an increasing abundance of species typically associated with the Meelup granitic heath vegetation (section 5.4). An approximate extent of this woodland vegetation is shown in Map 3.

Common taxa of the woodland vegetation can include:

Trees: *Banksia grandis*, *Corymbia calophylla*, *Eucalyptus marginata*, *Nuytsia floribunda*, *Persoonia longifolia*

Shrubs: *Acacia stenoptera*, *Allocasuarina humilis*, *Astroloma ciliatum*, *Banksia dallanneyi*, *Calothamnus sanguines*, *Cryptandra arbutifolia*, *Darwinia vestita*, *Daviesia horrida*, *Daviesia preissii*, *Gastrolobium spinosum*, *Gompholobium marginata*, *Grevillea quercifolia*, *G.trifida*, *Hakea lissocarpa*, *H.trifurcata*, *Hibbertia cunninghamii*, *H.hypericoides*, *Hypocalymma angustifolia*, *Jacksonia alata*, *Melaleuca systema*, *Petrophile striata*, *Philothea spicata*, *Stachystemon virgatus*, *Synaphea gracillima*, *Trymalium ledifolium*, *Xanthorrhoea gracilis*, *X.preissii*.

Herbs: *Chaemascilla corymbosa*, *Conostylis setigera*, *Dampiera linearis*, *Laxmannia sessiliflora*, *Levenhookia pussila*, *Lomandra hermaphrodita*, *L.micrantha*, *L.sericea*, *Patersonia juncea*, *P.occidentalis*, *Stylidium repens*, *Xanthosia candida*, *X.huegelii*

Sedges: *Desmocladus fascicularis*, *Lepidosperma squamata*, *Mesomelaena tetragona*, *Schoenus aff. subflavus*, *S.nanus*, *Tetraria capillaris*, *T.octandra*

Grasses: *Neurachne alopecuroidea*

5.3 *Banksia* Woodland (Map 3 community 3)

Adjacent to Eagle Bay and to the north of Dunsborough townsite (near Bird Crescent and Cape Naturaliste Road) can be found areas of grey sandy soil that are dominated by Peppermint and Marri often with *Banksia attenuata* and occasionally *Eucalyptus patens* (photograph 4). The vegetation ranges from a low woodland (trees <10m, 10-30% cover) adjacent to Eagle Bay to predominantly a low open forest (trees <10m, 30-70% cover) near

Dunsborough. The vegetation is found in a mid to lower slope position with the presence of *E.patens* and occasionally *Banksia littoralis* indicating poor drainage at depth, most likely as a result of the sand overlying relatively impermeable lateritic soil and/or granitic rock.

All occurrences of these grey sands are associated with wetland features lower in the landscape; the deep sands adjacent to Eagle Bay terminate at the permanent groundwater expression locally known as Kangaroo seep, the sandy soils adjacent to Bird Crescent become an unnamed creekline and the Cape Naturaliste Rd occurrence of these soils become a branch of Dandatup Brook.

The woodland vegetation found on these sandy soils can commonly include:

Trees: *Agonis flexuosa*, *Banksia attenuata*, *B.littoralis*, *Corymbia calophylla*, *Eucalyptus patens*, *Nuytsia floribunda*

Shrubs: *Acacia pulchella*, *Adenanthos meisneri*, *Bossiaea eriocarpa*, *Hibbertia hypericoides*, *Gompholobium tomentosum*, *Isotropis cuneifolia*, *Jacksonia furcellata*, *Leucopogon propinquus*, *Melaleuca scabra*, *M.thymoides*, *Phyllanthus calycinus*, *Pimelea rosea*, *Stirlingia latifolia*

Herbs: *Anigozanthos manglesii*, *Asteridea pulverulenta*, *Dasypogon bromelifolius*, *Hydrocotyle callicarpa*, *Hypochaeris glabra**, *Lomandra micrantha*, *Patersonia occidentalis*, *Phlebocarya ciliata*, *Podotrochea angustifolia*, *Rhodanthe citrina*, *Sowerbaea laxiflora*, *Stackhousia monogyne*, *Trachymene pilosa*

Sedges: *Hypolaena exsulca*, *Lyginia barbarta*, *Schoenus curvifolius*

Grasses: *Microlaena stipoides*

Keating and Trudgen (1986) in their mapping of plant communities indicate that *Banksia littoralis* was once common in this type of vegetation. Plants of this species are now rare, most likely a result of *Phytophthora* dieback impact.

5.4 Granitic Heath (Map 3 community 6)

In lower to mid slope areas where lateritic and/or loamy soils are very shallow over granite, often intermingling with the Jarrah, Marri woodland association a closed low heath (shrubs <1m, 70-100% cover) will form dominated primarily by *Gastrolobium spinosum*, *Allocasuarina humilis* and *Dodonaea ceratocarpa* (photograph 5 & 6). The southern extents of this vegetation are often also dominated by *Dillwynia laxiflora* which together with *Gastrolobium spinosum* is generally absent from occurrences of the community in the reserves northern extent. In places this community will support occasional plants of *Calothamnus graniticus ssp. graniticus*.

This particular type of vegetation supports a range of species many of which are otherwise uncommon in the Meelup reserve system and the larger Leeuwin block major landform. Common species of this association can include:

Trees: *Banksia grandis*, *Corymbia calophylla*, *Nuytsia floribunda* (trees when present are very occasional)

Shrubs: *Acacia nervosa*, *Allocasuarina humilis*, *Astroloma pallida*, *Banksia dallanneyi*, *Boronia tenuis*, *Calothamnus sanguines*, *Chorizema aciculare*, *Cryptandra arbutiflora*, *Darwinia citriodora*, *D.vestita*, *Daviesia horrida*, *Dillwynia laxiflora*, *Dodonaea ceratocarpa*, *Gastrolobium spinosum*, *Grevillea trifida*, *Hakea trifurcata*, *Hibbertia cunninghamii*, *H.hypericoides*, *H.spicata*, *Leucopogon tenuis*, *Lysinema pentapetalum*, *Melaleuca systema*, *Petrophile striata*, *Pimelea imbricata*, *Stachystemon virgatus*, *Synaphea gracillima*, *Trymalium ledifolium*, *Xanthorrhoea gracilis*, *X.preissii*

Herbs: *Burchardia congesta*, *Comesperma ciliatum*, *Conostylis setigera*, *Chaemasquilla corymbosa*, *Laxmannia sessiliflora*, *Lomandra sericea*, *Patersonia babianooides*, *Platysace haplosciadia*, *Stylidium megacarpum*, *S.repens*, *Xanthosia candida*, *X.huegelii*

Sedges: *Desmocladus fasciculatus*, *Lepidosperma squamata*, *Schoenus clandestinus*, *Tetraria octandra*

Grasses: *Neurachne alopecuroidea*

5.5 *Calothamnus graniticus* Closed Heath (Map 3 community 5)

In areas of massive exposed granite either as small or large boulders with pockets of shallow loam soil the vegetation is dominated by a closed to open heath (shrubs 1-2m, 70-100% or 30-70% cover) of the Leeuwin Block endemic *Calothamnus graniticus* ssp. *graniticus* (photograph 7). This vegetation is predominantly found low in the landscape adjacent to the coast but can also be found in some isolated upper slope areas where exposed granitic boulders are dominant. Common taxa in this vegetation can include:

Trees: very occasional *Corymbia calophylla*

Shrubs: *Boronia tenuis*, *Calothamnus graniticus* ssp. *graniticus*, *Chorizema aciculare*, *Commersonia cygnorum*, *Darwinia citriodora*, *Dodonaea ceratocarpa*, *Hakea trifurcata*, *Hibbertia cunninghamii*, *H.hypericoides*, *H.spicata* ssp. *spicata*, *Melaleuca systema*, *Phyllanthus calycinus*, *Thryptomene saxicola*, *Xanthorrhoea preissii*

Herbs: *Burchardia congesta*, *Caladenia caesarea* ssp. *maritima*, *Cheilanthes austrotenuifolia*, *Conostylis setigera*, *Laxmannia sessiliflora*, *Lomandra micrantha*, *Stylidium affine*, *S.megacarpum*, *S.repens*, *Stypandra glauca*, *Xanthosia candida*

Sedges: *Lepidosperma squamata*, *Tetraria octandra*

Grasses: *Neurachne alopecuroidea*

5.6 Granitic Apron (Map 3 community 7)

On the lowest slopes of the Meelup reserve system within the vicinity of the coast and also fringing the informally named Stoney Creek can be found relatively small deposits of clay soil overlying shallow granite that are saturated in winter months. These soils are mostly dominated by a low shrubland (shrubs <1m, 10-30% cover) over a diverse range of annually renewed herbs in the spring months (photograph 8). In some areas such as adjacent to Curtis Bay and near Eagle Bay the vegetation on these seasonally wet clays are dominated by an open heath (shrubs 1-2m, 30-70% cover) of mostly wetland dependent shrubs.

Examples of this community are often small in size, only the largest occurrences are shown in Map 3. Good examples of this granitic apron vegetation can be found both sides of Curtis Bay and adjacent to Meelup Drive west of Point Picquet. The largest and most intact example of the community is found adjacent to Stoney Creek. It is also possible that another large occurrence of this vegetation is found in private land due west of Rocky Point.

Common taxa in this association can include:

Trees: *Melaleuca viminea*

Shrubs: *Acacia saligna*, *Babingtonia camphorosmae*, *Daviesia horrida*, *Dodonaea ceratocarpa*, *Exocarpos odoratus*, *Phyllanthus calycinus*, *Spyridium globulosum*, *Thomasia foliosa*, *Viminaria juncea*, *Xanthorrhoea preissii*

Herbs: *Aphelia cyperoides*, *Borya scirpoidea*, *Caladenia caesarea ssp. maritima*, *Centrolepis aristata*, *Chaemascilla corymbosa*, *Cicienda filiformis*, *Dampiera lindleyii*, *Drosera gigantea*, *Haemodorum simplex*, *Hydrocotyle alata*, *H. callicarpa*, *Lysimachia arvensis**, *Parentucellia latifolia**, *Patersonia occidentalis*, *Podolepis lessonii*, *Quinetia urvillei*, *Stylidium crassifolium*, *Tribonanthes australis*

Sedges: *Chorizandra enodis*, *Lepidosperma longitudinale*, *Mesomelaena tetragona*, *Schoenus asperocarpus*, *S. bifidus*, *S. nanus*, *S. odontocarpus*

Grasses: *Aira caryophyllea**, *Briza minor**, *Neurachne alopecuroidea*

5.7 Creeklines (Map 3 community 8)

There are a number of seasonal creeklines within Meelup reserve although only two of them seem to be formally named being Meelup Brook and Dolugup Brook (entering the ocean at Meelup Beach and Castle Bay respectively). Meelup and Dolugup Brooks are the largest creeklines of the Meelup reserve system and in areas maintain year round subsoil moisture indicated by the presence of *Lepidosperma tetraquetrum*. In addition to creeklines the reserve also supports a permanently wet groundwater seep locally known as Kangaroo seep. The creeklines of the Meelup reserve system are characterised by loam soils and Kangaroo seep by coarse grey loamy sand.

Meelup Brook and Dolugup Brook are characterised by an overstorey of *Eucalyptus patens*, *Agonis flexuosa*, and *Corymbia calophylla* with *E.rudis ssp. cratyantha* becoming common in the Brook's lower reaches.

Kangaroo seep is an area of permanent groundwater expression at the base of a *Banksia* woodland most likely caused by the grey sands becoming shallow over a less permeable soil layer. A dam has been dug into the seep but the remaining vegetation is dominated by a *Baumea rubiginosa* closed sedgeland in the permanently inundated areas which is fringed by the sedges *Cyathochaeta avenacea* and *Lepidosperma pubisquameum* under an overstorey of *Agonis flexuosa*, *Viminaria juncea* and *Acacia divergens*.

The less pronounced creeklines of Meelup reserve are characterised by tree and shrub species that favour moist shaded valleys, *E.patens* if present in these smaller systems will only be found in their lowest reaches. The smallest of the creeklines can often only be distinguished from the adjacent plant communities by species such as *Viminaria juncea*, *Stylidium crassifolium* and *Philydrella drummondii* within the seasonal drainage channel. The informally named Stoney Creek near Eagle Bay townsite cuts through a rocky valley and is dominated by a *Melaleuca viminea* overstorey over an open understorey of predominantly herbs and sedges (*Dichopogon preissii*, *Samolus junceus*, *Lepidosperma longitudinale*, *Chorizandra enodis*)

Some of the characteristic taxa of the Meelup creeklines include:

Trees: *Agonis flexuosa*, *Corymbia calophylla*, *Eucalyptus patens*, *Melaleuca viminea*

Shrubs: *Acacia alata*, *A.divergens*, *A.saligna*, *Bossiaea linophylla*, *Hibbertia cuneiformis*, *Hovea elliptica*, *Logania vaginalis*, *Hemigenia incana*, *Leucopogon hirsutus*, *Melaleuca incana*, *Mirbelia dilitata*, *Myoporum oppositifolium*, *Paraserianthes lophantha*, *Tremandra diffusa*, *Viminaria juncea*

Herbs: *Adiantum aethiopicum*, *Anigozanthus flavidus*, *Dampiera trigona*, *Dichondra repens*, *Liparophyllaum latifolium*, *Oxalis perennans*, *Pteridium esculentum*, *Trihaloragis hexandra*

Sedges: *Baumea juncea*, *Juncus pallidus*, *Lepidosperma longitudinale*, *L.tetraquetrum*

Grasses: *Microlaena stipoides*, *Tetrahaena laevis*

5.8 Coastal Vegetation (Map 3 community 9)

With the exception of vegetated foredunes on small beaches, coastal vegetation is otherwise rare within the Meelup reserve system. The reserve's coastal fringe is predominantly combinations of the above described vegetation associations, in particular the *Calothamnus graniticus* heath, the granitic apron and the jarrah, marri forest vegetation. The jarrah, marri forest vegetation when near the coast is generally on loamy soils and dominated by marri and peppermint (*Agonis flexuosa*). The coastal occurrences of these vegetation associations will typically include several species that within Meelup are only restricted to the coastline.

As mentioned the Meelup reserve system only has small areas of true coastal vegetation on calcareous sands and these are generally dominated by an *Acacia cochlearis*, *A.cyclops*, *Spyridium globulosum* open heath over *Lepidosperma gladiatum* sedges. The extent of coastal vegetation as shown in Map 3 is only limited to the larger areas of this true coastal vegetation.

Apart from coastal weeds, the following native species are some of the taxa within the Meelup reserve system that are only found in the vicinity of the coast, be that both on calcareous sands and within coastal fringing examples of other vegetation associations:

Trees: *Melaleuca lanceolata*

Shrubs: *Acacia cochlearis*, *A.cyclops*, *Acanthocarpus preissii*, *Anthocercis littorea*, *Beyeria viscosa*, *Chorizema diversifolium*, *Diplolaena dampieri*, *Enchylaena tomentosa*, *Exocarpos sparteus*, *Frankenia pauciflora*, *Hakea prostrata*, *Leucopogon parviflorus*, *Muehlenbeckia adpressa*, *Olearia axillaris*, *Pimelea ferruginea*, *Pittosporum ligustrifolium*, *Rhagodia baccata*, *Scaevola crassifolia*, *Billardiera fusiformis*, *Spyridium globulosum*, *Templetonia retusa*

Herbs: *Apium prostratum*, *Carpobrotus virescens*, *Sarcocornia blackiana*

Sedges: *Ficinia nodosa*, *Juncus kraussii*, *Lepidosperma gladiatum*

Grasses: *Poa poiiformis*, *Spinifex hirsutus*, *Sporobolus virginicus*, *Themeda triandra*

5.9 Floristic Diversity

During the spring of 2012 the vegetation associations as detailed above were sampled by 25 floristic survey quadrats (10x10m), which included the resampling of 10 quadrats originally installed in the late 1990's by Arthur Weston and/or the Toby Inlet Catchment Group and the installation of a further 15 quadrats as part of this report. Scanned copies of the quadrat datasheets are provided in Appendix 5. Table 2 links the survey quadrats with vegetation association and details the average number of taxa recorded by those quadrats for each association.

Table 2: Meelup survey quadrats per vegetation associations

Vegetation Association	Average taxa	Average weed taxa	Quadrats
Jarrah, Marri open/low open forest on lateritic soils	77 (73)	2	TIC25, TIC25a, WEBB26, WEBB29, WEBB30, WESTON03
Jarrah, Marri open/low open forest on loam soils	53	11.6	WEBB28, WEBB35, WEBB40,
Jarrah, Marri Woodland	72	3	WEBB31, WEBB33, WESTON11, WESTON23
Banksia Woodland	77	12	WESTON15, WESTON24, WESTON24a
Granitic Heath	66	1.6	WEBB32, WEBB36, WEBB37, WEBB38, WESTON18

<i>C.graniticus</i> Heath	56	8	WEBB27, WEBB34
Granitic Apron	64	11.5	WEBB39, WESTON13

The richest quadrat sampled by the 2012 survey was within the Jarrah, Marri forest association on lateritic soils (TIC25a) with a total of 97 taxa. This quadrat could possibly be considered an anomaly as it was fenced to exclude grazing over 15 years ago as part of a study into the impact of herbivore grazing within the Meelup reserve system. The number of species recorded in this quadrat is almost 20% more than the number recorded in other quadrats of the same vegetation association. For example the unfenced control quadrat which is directly adjacent to the excluded quadrat only recorded 76 taxa. Table 2 shows the average species diversity of the lateritic soil Jarrah, Marri forest with and without the excluded quadrat (the bracketed figure is without the excluded quadrat).

In terms of average species diversity from the sample quadrats, the *Banksia* woodland and the lateritic Jarrah, Marri forest associations are the richest (av.77 taxa). The *Banksia* woodland also has one quadrat that has been excluded from grazing for the last 15 years, but this quadrat while supporting 15% more taxa than its adjacent control, is of a lesser diversity than other quadrats sampling this association. The *Banksia* woodland also recorded the richest occurrence of weed taxa with an average of 12 weeds per quadrat.

From the sampling undertaken the least diverse vegetation is the *Calothamnus graniticus* closed heath and the Jarrah, Marri forest community on loam soils. Reasons for this would include the *Calothamnus* community having up to 40% exposed rock and the loam soil Jarrah, Marri forest being associated with shaded valleys, a dense tree canopy and for a majority of its extent a very dense mid-layer of *Xanthorrhoea preissii* preventing the development of a diverse understorey.

6. Meelup Plant Communities

Plant communities of the Meelup reserve system have been mapped by Keating and Trudgen (1986) in their flora and vegetation survey of the coastal strip from Forest Beach to Woodlands (near Wilyabrup). While the report describes plant communities in detail, the maps associated with the report do not seem to extend to communities west of the Dunsborough townsite. The Meelup Park Management Committee (MPMC) has a Keating and Trudgen (1986) plant community map for the reserve system, but it includes some community units that were not described for the reserve, hence not fully matching the text of the original report.

Appendix 4 provides plant community descriptions extracted from Keating and Trudgen (1986) for vegetation of the Meelup reserve system. The community descriptions have been updated to current taxonomy. Appendix 4 also includes a copy of the plant community map as obtained from the MPMC; minor edits have been made where possible to update the mapped plant community units to those as described for the reserve by Keating and Trudgen (1986).

Table 3 provides an interpretation of which plant communities as mapped by Keating and Trudgen (1986) have similarity to the vegetation associations as mapped by this report. The subjectivity of all scales of vegetation mapping has resulted in the overlap of some plant communities into two vegetation associations.

Table 3: Keating and Trudgen (1986) plant communities per vegetation association

Vegetation Association	Keating & Trudgen (1986) plant comm.
Jarrah, Marri open/low open forest on laterite soils	Htr, Marri1, JXo, JM2, JM3, MJ/Ag2, J1, JM1
Marri, Jarrah open/low open forest on loam soils	Allo2, GH6, MGr, MJ/Xp1, JM/Xp2, JM3, MJ/Ag2
Jarrah, Marri woodland	St1, St3, MJ/Ki
Banksia woodland	MJ/Bg, MJ/BgBa, JM/BaBg2
Granitic Heath	GH5, GH6, Htr2, GH2, XH, MGr
<i>C.graniticus</i> Closed Heath	GH1, AgCg, AgM, Ah, MGr
Granitic Apron	Dr, MIVj
Creepline	MIVj, Blitt, Er1M
Coastal	AgCg, AgM, P2, AgMEr, D1, D2, D4, M1, St4

7. Significant Vegetation

Over the extent of their survey, Keating and Trudgen (1986) considered the vegetation of the Meelup reserve system to be highly significant. They considered it to contain a significant variety of vegetation types that are poorly represented elsewhere and within the reserve system at their best development.

Within the extent of their survey Keating and Trudgen (1986) made specific comments that the Jarrah, Marri woodland and forest vegetation of the Meelup reserve system and that of Big Rock reserve (Res.28665) are of significant diversity, good condition and the only areas of such vegetation in any substantial extent in reservation. While they imply similarity between these two areas they also note that the plant communities are significantly different floristically.

Subsequent surveys of the larger Leeuwin Block major landform, including preliminary inspections of Big Rock reserve, have further supported the Keating and Trudgen comments in recognising that the form of Jarrah, Marri woodland as mapped by this report is only restricted to the Meelup reserve system².

The Jarrah, Marri woodland vegetation occurs on shallow granitic soils and is closely associated with the granitic heath vegetation as mapped by this report, be that both through shared species and often close and intermingling occurrence. It is considered that the

² Reference to aerial images indicate that small areas of this woodland vegetation may extend into the private location (Loc.595) adjoining the northern extent of the reserve within the vicinity of Bunkers Bay.

granitic heath vegetation within Meelup is also only restricted to the Meelup reserve system. Both these forms of vegetation make up approximately 116 hectares of the Meelup vegetation (ca.70ha Jarrah, Marri woodland and ca.46ha granitic heath) and need to be considered of high conservation significance as they appear to be highly restricted, support the majority of the reserves threatened and significant flora, are exceptionally diverse and of an excellent condition. Being of such limited extent these vegetation types should be assessed for nomination as a threatened ecological community.

In relation to the Jarrah, Marri forest vegetation of the Meelup reserve system, subsequent surveys of the larger Leeuwin Block major landform have been unable to confidently place the Meelup form into a broader context. It is possible that comparable forest vegetation may extend within the Margaret River Plateau landform as far south as Cowaramup, associated with the Cowaramup (C2) vegetation complex. Although within this area very little of the vegetation complex is in reservation, limited to only Yelverton National Park and small reserves on Abbys Farm and Pusey Roads. The forest vegetation of these areas and that of Big Rock reserve need to be subject to appropriate survey to establish the significance of the Meelup forest vegetation.

In addition to comments relating to the Meelup Jarrah, Marri woodlands and forests, Keating and Trudgen (1986) also in the context of their survey, provided specific comments on the conservation significance of certain plant communities. These comments are summarized in Table 4.

Table 4: Keating & Trudgen (1986) conservation comments

Keating & Trudgen unit	Conservation comment
M1	<i>Melaleuca lanceolata</i> forest; Keating & Trudgen note that due to high levels of disturbance the conservation value of any intact occurrences of this community are very high. Occurrences of this community are currently recognised as a Priority 3 listed Ecological Community (PEC). Stands of this community within Meelup are poorly developed, i.e. comprising a few trees, generally degraded and unlikely to be considered examples of this PEC.
GH1, AgCg, Ah	<i>Calothamnus graniticus ssp. graniticus</i> dominated heaths; Keating & Trudgen recognised the restricted nature and associated high conservation value of these communities dominated by the Cape Naturaliste endemic form of <i>Calothamnus graniticus</i> .
Dr	<i>Drosera gigantea</i> , <i>Stylidium crassifolium</i> herbland; Keating & Trudgen only mapped one occurrence of this community type in their study area and considered it to be of high conservation value. This community is an example of the vegetation association detailed as “granitic apron” in this report.
MIVj	<i>Melaleuca viminea</i> , <i>Viminaria juncea</i> scrub; this plant community also part of the vegetation association detailed as “granitic apron” was only noted once by Keating & Trudgen near Eagle Bay, they considered it to have high conservation value because of its limited occurrence.
St1	Jarrah, Marri woodland; Keating & Trudgen considered this vegetation to be of a limited distribution and considered it to have high conservation value.

Blitt	<i>Banksia littoralis</i> open forest; this is the plant community Keating & Trudgen described for Kangaroo seep. Only the one occurrence of this community type was found within their study area and they considered it to be of high conservation value.
JM1	Jarraah, Marri forest; Keating & Trudgen considered this vegetation type to be of very limited occurrence and of very high conservation value.
Er1M	Flooded gum, Marri forest; this valley vegetation was only mapped in three locations by Keating & Trudgen; the occurrence associated with Meelup Brook is the only one in public land. They considered the inclusion of this plant community into National Park highly desirable.
Allo2	Sheoak, Jarrah, Marri forest; Keating & Trudgen only located the one area of this community type in their study area and due to its restricted nature considered it must have a high conservation value.

Of these communities mentioned in Table 4, the *Calothamnus graniticus* dominated heath is clearly of very high conservation value in the broader Leeuwin Block context. The dominant subspecies of *Calothamnus graniticus* and its associated vegetation is only known from the tip of Cape Naturaliste in Meelup reserve and at Sugarloaf rock. The form of the heath vegetation in Meelup is recognised as a vulnerably listed Threatened Ecological Community (TEC) and the form at Sugarloaf rock a Priority one listed ecological community (PEC).

The granitic apron vegetation (Keating and Trudgen units Dr and MIVj) is another community considered to be of particularly high conservation significance in the broader Leeuwin Block context. Only one other area of comparable granitic apron vegetation is known for the Leeuwin Block major landform being at flat rock north of Augusta. Both these areas of apron vegetation are found low in the landscape (i.e. the most water retaining part of the landscape) and/or associated with groundwater seepage. Other areas of outcropping granite within the Leeuwin block are either relatively high in the landscape or if low in the landscape are on the west coast, exposed to the Indian Ocean and subject to significantly different environmental conditions. The relatively sheltered wet conditions of the Meelup and Augusta granitic aprons allows for the development of a relatively rich herbaceous flora.

As a result of this survey it is considered that the coastal fringing vegetation of Meelup needs to be recognised as conservation significant. Particularly the form on loamy soils associated with outcropping granite. The sheltered nature of the Meelup coastline has allowed for a unique combination of woodland and heath vegetation to combine with a number of taxa typically associated with the coastal fringe to form a very attractive and otherwise un-replicated coastal flora.

A number of the plant communities of the Meelup Reserve system, particularly those mentioned above are not replicated in existing conservation estate of the Leeuwin Block major landform. The Meelup reserve system as such is of very high importance in representing the range of vegetation that exists on the Leeuwin Block major landform.

8. Meelup Flora

The flora of the Meelup reserve system as presented in this report was documented from a number of sources including,

- the sampling of 25 floristic survey quadrats (10x10m) during the spring months of 2012.
- over 20 days of additional ad hoc survey undertaken between 2006 and 2013
- reference to species recorded by survey quadrats installed within the Meelup reserve system as part of the Warren bioregional survey (Lyons *et al.* 2000)
- reference to Western Australian herbarium records (Western Australian Herbarium 1998) and unpublished species lists held by the MPMC.

Herbarium records and unpublished records held by the MPMC records were edited to ensure that only records with identifications confirmed by experts and/or species considered likely to be found within the Meelup reserve system were included in this report.

In excess of 3000 records were used to compile a species list of five hundred and seventy one vascular plant species for the Meelup reserve system. Over 95% of the species within the list were recorded by fieldwork in the last six years. The species list comprises 480 native taxa and 91 introduced weeds. The largest families are Fabaceae (57 native, 10 weeds), Orchidaceae (37 native, 1 weed), Cyperaceae (34 native, 2 weeds), Poaceae (16 native, 19 weeds), Asteraceae (24 native, 10 weeds) and Myrtaceae (27 native). The largest genera are *Acacia* (16), *Schoenus* (15), *Caladenia* (14), *Stylidium* (13), *Lomandra* (10), *Drosera* (9), *Hibbertia* (8) and *Leucopogon* (8).

The composition of the flora is consistent with the dominant families of Australia (Crisp *et al.* 1999) and while just outside the Warren bioregion is also comparable with the floristic composition of that high rainfall zone as documented by Hopper *et al.* (1992) and Lyons *et al.* (2000). A species list for the Meelup reserve system is found in Appendix 2; two lists are presented being a straight list and a list indicating species distribution per vegetation association.

The flora of Meelup is particularly rich for its small area and is more than comparable to other reserves within the south-west botanical province some of which are considered to be centres of species diversity (Table 5, modified from Keighery *et al.* 2011).

Table 5: Comparison of flora diversity

Name	Area (ha)	No. Taxa (native/weeds)	Endemics	Reference
Fitzgerald River	329,000	1748 (104 weeds)	75	Chapman & Newbey (1995)
Stirling Range	115,600	1571 (93 weeds)	87	Keighery (1993)
Kalbarri	186,000	1071 (53 weeds)	23	Keighery <i>et al.</i> (2000)

Mount Lesueur	27,500	821 (93 weeds)	9	Hopper & Burbidge (1990)
Whicher Scarp	21,000	917 (79 weeds)	13	Keighery <i>et al.</i> (2008)
Leeuwin-Naturaliste National Park	15,600	1232 (249 weeds)	5	Keighery <i>et al.</i> (2011)
Margaret River Plateau DEC estate	8782	644 (87 weeds)	0	Keighery <i>et al.</i> (2010)
Meelup reserve system	560	480 (91 weeds)	2	This report

9. Significant Flora

An assessment of the reserves species list has recognised 101 species that would be considered as significant to Meelup reserve system and the larger Leeuwin Block major landform. This equates to 21% of the reserves native flora being regarded as significant.

The significant flora of the Meelup reserve system includes:

- species listed by the Department of Environment and Conservation as threatened (Appendix 1 Details threat categories)
- species that are otherwise unknown to, or uncommon within the Leeuwin Block
- species populations that are at the limit of, outlying to, or extensions of normal geographic range
- species that are endemic to the reserve system
- species that represent an undescribed form, or a species that may be worthy of further taxonomic and/or genetic work

Of the significant species noted in this report, eleven are listed as threatened which includes four species listed as Declared Rare (DRF) and seven assigned a Priority flora status.

Appendix 3 details the significant species of the Meelup reserve system. Reference to Western Australian herbarium records (WA Herbarium 1998) show that half of the significant species as documented in this report (51 species) are the first records of the species within the Leeuwin Block major landform. The majority of these first records are specific to the granitic soils of the Meelup reserve system which as previously noted are highly restricted, these species as such highlight the significance of the reserve system in the conservation of the diversity of species that exist within the Leeuwin Block landform.

Some of the unique features of the Meelup reserve flora are further discussed below.

9.1 Threatened and Endemic Flora

Threatened species found within the Meelup reserve system include the declared rare species *Caladenia excelsa*, *C.caesarea ssp. maritima*, *C.viridescens* and *Eucalyptus phylacis*. With the exception of *C.excelsa* which is listed as Endangered, all these DRF species are listed as Critically Endangered under State legislation. Under the Federal EPBC legislation these DRF species are all listed as Endangered. *Caladenia caesarea ssp. maritima* and *Eucalyptus phylacis* (the Meelup mallee) are endemic to the Meelup reserve system and *Caladenia viridescens* is only known from the Meelup reserve system and other bushland areas within 10km of Meelup.

The recent discovery of *Eucalyptus virginea* approximately 300m from the Meelup mallee population has resulted in Nicolle and French (2012) considering the mallee to be a hybrid of that species and *E.decipiens*³. As a hybrid the plant would not be considered a unique species and could not be listed as threatened. A determination of the species hybrid status is yet to be made, never-the-less even as a hybrid the mallee would still be considered a significant plant within the reserve system.

Priority listed flora known from the reserve system include, *Acacia latericola* (glabrous variant) (P3), *Boronia tenuis* (P4), *Calothamnus graniticus ssp. graniticus* (P4), *Eucalyptus rudis ssp. cratyantha* (P4), *Eucalyptus virginea* (P4), *Thelymitra variegata* (P3) and *Meionectes tenuifolia* (P3). Two of these priority listed species (*B.tenuis*, *E.virginea*) are significantly disjunct from their typical area of occurrence.

The Cape Naturaliste endemic *Calothamnus graniticus ssp. graniticus* is only known from the Meelup reserve system and nearby Sugarloaf rock. Keighery *et al.* (2011) note that the form of this species in Meelup has glabrous leaves compared to hairy leaves at Sugarloaf rock, it is possible that with further taxonomic and/or genetic work that separate forms of this species could be recognised.

9.2 Disjunct Populations

Microhabitats offered by granitic outcrops are considered to have provided refuge for plants typically adapted to wetter and drier conditions as the Australian climate fluctuated over millions of years of continental drift from cool moist to arid conditions (Hopper *et al.* 1997). The refugial opportunities offered by granite outcrops and areas of shallow soil over granite are evident within the south west bioregion with granitic landforms supporting populations of many species that are highly disjunct from their main area of occurrence.

The granitic landforms of the Meelup reserve system are no exception to this pattern of refugial habitat, the granitic landforms of the reserve system are particularly important for supporting a range of flora typically found on granitic landscapes of the Darling Scarp and/or the Darling Plateau. A number of the disjunct species found within Meelup are the only

³ This species is currently only known from the Leeuwin Block from a solitary, significantly disjunct population near Sugarloaf rock

representation of those species within the Leeuwin Block major landform and some are significantly disjunct, in excess of 200km from their nearest area of occurrence. Some of these species include *Boronia tenuis*, *Cheilanthes distans*, *Commersonia cygnorum*, *Dodonaea pinifolia*, *Eucalyptus virginea*, *Gastrolobium spinosum*, *Hemigenia incana*, *Hyalospermum demissum*, *Jacksonia alata* and *Stylidium affine*.

In addition to the above mentioned species there are also a number of other disjunct granitic soils species found not only in Meelup but also on other restricted areas of granite of the Margaret River Plateau. Some of these species include *Allocasuarina microstachya*, *Chorizema reticulatum*, *Hibbertia spicata ssp. spicata*, *Platysace haplosciadia*, *Podolepis lessonii*, *Themeda triandra*, *Thomasia foliosa*, *Stylidium eriopodum* and *Verticordia plumosa var. plumosa*.

Of the significant species detailed in the Appendix 3, almost 50% of them (48 species) are species that are considered to be disjunct from their typical area of occurrence.

It is hypothesised that small disjunct populations subject to recurrent stress (i.e. climatic fluctuations) are considered to be ideal conditions for genetic divergence and speciation. Studies into orchid species show that conditions on south-west granite outcrops support this hypothesis (Hopper *et al.* 1997). An example of an orchid species within Meelup that has speciated would be *Caladenia caesarea ssp. maritima*. The other subspecies of this taxa occur in seasonally wet soils of the Darling Plateau, a considerable distance from the Meelup subspecies.

There has been limited study into perennial species in such disjunct situations, but *Calothamnus graniticus ssp. graniticus* would be an example of a speciated perennial taxa within Meelup. Relevant studies into this species have recognised that the Meelup form is a separate subspecies to the form as found on the Darling Scarp. There are a number of other species within the Meelup reserve system that are significantly disjunct and would warrant further taxonomic and/or genetic studies to see if they have been subject to genetic divergence and speciation.

Another unique feature of the Meelup flora is that it supports a number of species from a variety of habitats that are only known to the Leeuwin Block major landform from the Meelup reserve system, be they disjunct or range end in the reserve system. This includes species typical to sandy soils of the Swan Coastal Plain/Geraldton sandplain/Whicher Scarp, others typical to southern jarrah forests and species that are common throughout the rest of the South West Botanical Province. Such species include *Acacia nervosa*, *Babingtonia camphorosmae*, *Callitris acuminata*, *Darwinia vestita*, *Daviesia longiflora*, *Dichopogon capillipes*, *D.preissii*, *Eremaea pauciflora*, *Lepidosperma carphoides*, *Mesomelaena stygia*, *Petrophile striata* and *Pimelea imbricata var. piligera*.

This diversity of disjunct and range end flora of the reserve system is possibly the result of three features being,

- the reserve system supports a relatively sheltered granitic landscape which while also being found in other areas of the Margaret River Plateau is at its largest and

most diverse development within Meelup. This has allowed for a diverse flora and a large number of relictual populations to persist,

- it is adjacent to the northern extent of the Warren bioregion which in itself and possibly with the assistance of granitic microhabitats has allowed range end/disjunct Warren flora to persist, and
- it is possible that the sandy soils of the reserve system may have an ancient association with the Whicher Scarp; potentially an ancient continuation in which disjunct northern sandplain flora more typical of the Whicher Scarp have persisted⁴.

It is also suspected that a lack of systematic survey effort over the forest vegetation of the larger Margaret River Plateau may contribute to this survey recording a range of otherwise common South West Botanical Province flora for the first time in the Leeuwin Block major landform.

9.3 Habitat Specific Flora

Many of the above mentioned endemic and disjunct species are habitat specific to outcropping granite of the Meelup reserve system. In addition to these the reserve system also has a suite of annually renewed taxa specific to the granitic apron vegetation. This vegetation is associated with shallow clay-loam soils and seasonal waterlogging and in some areas supports very little vegetation except for annually renewed herbaceous species. These herbaceous plant communities in Meelup are structurally comparable to claypans of the Swan Coastal Plain and annual rich communities associated with outcropping granite of the wheatbelt. The flora of the Meelup aprons support approximately fifteen species typically recorded in claypan vegetation of the adjacent Swan Coastal Plain, the majority of which are annually renewed and the first records of the species within the Leeuwin block major landform. Of those newly recorded species eight are *Schoenus* species and one is the priority 3 listed *Meionectes tenuifolia*.

10. Conclusion

The Meelup reserve system supports a diverse range of habitats ranging from lateritic uplands at the top of the landscape to the coastline at the bottom. In between, the reserve system supports deep grey sands, creek lines, both seasonal and permanently wet, granitic outcrops and a variety of woodland, heaths and herbaceous communities associated with differing soil depth over the underlying granitic bedrock. The diversity of habitat within the reserve system has resulted in a significant range of vegetation and a rich diversity of flora, much of which is not represented elsewhere within the Leeuwin Block major landform.

⁴ Unfortunately the sandy soils of Meelup that are known to support the majority of these sandplain species adjacent to the Eagle Bay settlement has been particularly heavily impacted by *Phytophthora* dieback.

The vegetation complexes of the reserve system are restricted and poorly reserved. The reserve system supports almost 50% of the remaining extent of the Wilyabrup (Wr) vegetation complex; this highly restricted complex is associated with expressions of granite in the Margaret River Plateau extent of the Leeuwin Block major landform. All occurrences of this complex support significant populations of endemic and disjunct flora, of which occurrences in Meelup are the largest and the richest.

The Meelup reserve system supports 11 species of flora that are listed as threatened and a further 90 that would be considered significant to the Leeuwin Block major landform, many of which are the only records of the species for the Block landform. The reserve is currently known to support two endemic species, but also has a number of significantly disjunct populations that if subject to the appropriate studies, may also warrant recognition as new endemic taxa.

While all the vegetation of Meelup is of very high conservation value, the most unique and significant plant communities of the reserve system are the woodland and heath vegetation associated with shallow and outcropping granite. One form of heath community (the *Calothamnus graniticus ssp. graniticus* heath) is listed as a threatened ecological community, but it is considered that the remainder of the intermingling woodland and granitic heath vegetation also warrants recognition as a threatened community. This other woodland and heath vegetation is some of the most diverse of the reserve system and supports the majority of the reserve's threatened and significant flora. With the exception of some limited extent in private property near Rocky Point, this woodland and heath vegetation is not replicated outside of the reserve system.

Another significant granitic community of the Meelup reserve system is the granitic apron vegetation dominated by annually renewed herbs. This plant community needs to be recognised as highly significant as the type of vegetation it represents appears to be only replicated outside the reserve system at flat rock near Augusta. This community both at Meelup and Augusta is predominantly low in the landscape and particularly prone to degradation through weed invasion, walk trails and other forms of recreational impact

All the vegetation of the Meelup reserve system needs to be considered as being of extremely high conservation value. The overall combination of geology, vegetation and flora is highly restricted. The significance of the Meelup reserve system has been recognised for almost 40 years when recommended for inclusion as National Park by Valentine and Enright in 1975. Following their survey of the coastal vegetation from Forest Beach to Wilyabrup, Keating and Trudgen (1986) also recognised the conservation value of the Meelup vegetation and again recommended for the reserve system be transferred to National Park tenure.

Reserve 21629 of the Meelup reserve system is currently vested as an A class reserve with the City of Busselton for the purpose of conservation and recreation. The City provides a budget, support staff and facilitates a strong community group for the management of this reserve. Reserve 34894 is mostly golf course development; this reserve is vested as a C class reserve for recreation. The northern extent of this latter reserve supports significant granitic heath vegetation which includes the only known occurrence of the significantly disjunct

species *Dodonaea pinifolia* within the Leeuwin Block major landform. This northern vegetation of Res.34894 is contiguous with Res.21629 and needs to be managed for conservation.

While the majority of the reserve system's vegetation is primarily managed for conservation there is considerable pressure for recreation development, particularly for mountain bike tracks and associated event activity. Development of such tracks, in addition to physical vegetation clearing, creates access into otherwise undisturbed vegetation, risks weed and *Phytophthora* introduction and changes drainage patterns. Changes in drainage, particularly on slopes, can result in erosion and increased soil movement which results in further spread/exacerbation of weed and *Phytophthora* issues.

To obtain a secure conservation vesting the reserve system would require a transfer to the Department of Environment and Conservation (DEC) as either Nature Reserve or National Park. Any such transfer would need to be given careful consideration as with the extent of estate under DPaW management, any such transfer without a dedicated budget may compromise the level of management currently offered to the reserve system. Nevertheless into the future, should pressure for recreational development outweigh the protection of the reserve's conservation values, a transfer of the reserve system to secure conservation vesting should be a priority.

11. References

- Aplin T.E.H. 1979** The Flora. IN: O'Brien BJ (Ed.) *Environment and Science*. University of Western Australia Press, Nedlands, Western Australia.
- Beard J.S. 1990** *Plant Life of Western Australia*. Kangaroo Press, Australia.
- Cape to Cape Catchments Group 2006** *River Action Plan for the Cape Naturaliste Streams*. Department of Water, Perth.
- Chapman A, Newbey K.R. 1995** A biological survey of the Fitzgerald area. *CALMScience Supplement 3*, 1-258.
- National Land and Water Resources Audit 2001** *Australian Native Vegetation Assessment 2001*. Commonwealth of Australia.
- Conservation International 2011** *Biodiversity Hotspots. Southwest Australia*. Available at www.biodiversityhotspots.org/Pages/default.aspx. [Accessed July 2011]
- Commonwealth of Australia 2001** *National Objectives and Targets for Biodiversity Conservation 2001-2005*. Environment Australia, Department of Environment and Heritage, Canberra, Australian Capital Territory.
- Crisp M.D, West J.G, Linder H.P. 1999** Biogeography of the Terrestrial Flora, *Flora of Australia*, 2nd edn, 1: 321-368.
- DEC 2007** *Ecological Criteria for use in determining Regionally or Locally Significant Natural areas in the South West NRM Region within the Swan Coastal Plain, Jarrah Forest and Warren IBRA Bioregions*. Department of Environment and Conservation unpublished report for the South West Biodiversity Project.
- DPaW 2013** *Conservation Codes for Western Australian Flora and Fauna*. Available at www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation_code_definitions_18092013.pdf.
- EPA 2006** *Guidance for the assessment of environmental factors – Guidance No 10. Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region*. Environmental Protection Authority, Perth, Western Australia.
- Freeman M.J, Donaldson M.J. 2006** Geology of the southern Perth Basin and Margaret River wine district, southwestern Western Australia – a field guide: Western Australia Geological Survey, Record 2006/20, 34p.
- George E.A. 2002** *Verticordia: the turner of hearts*. University of Western Australia Press, Perth.
- Government of Western Australia 2000** *Bush Forever Volume 2*. Directory of Bush Forever Sites. Published by the Department of Environmental Protection, Perth, Western Australia

Havel J.J, Mattiske E.M. 2000 Vegetation Mapping of South West Forest Region of Western Australia (part 5). A report for the Department of Conservation and Land Management, Perth.

Hoffman N , Brown A. 2011 *Orchids of South-West Australia (3rd Edition)*. Perth

Hopper S.D, Burbidge A.A. 1990 Significance of the Lesueur area. In *Nature Conservation, Landscape and Recreation Values of the Lesueur Area* (eds AA, Burbidge, SD Hopper, S van Leeuwin), pp 111-115. Environmental Protection Authority Bulletin 424, Environmental Protection Authority, Perth.

Hopper S.D, Keighery G.J, Wardell-Johnson G. 1992 Flora of the Karri Forest and other Communities in the Warren Botanical Subdistrict of Western Australia. In *Research on the Impact of Forest Management in South-West Western Australia*. CALM Occasional Paper No. 2/92.

Hopper S.D, Brown A.P, Marchant N.G. 1997 Plants of Western Australian granite outcrops. *Journal of the Royal Society of Western Australia* 80:141-158.

Keating C, Trudgen M. 1986 *A Flora and Vegetation Survey of the Coastal Strip from Forrest Beach – Cape Naturaliste – Woodlands*. An unpublished report for the Department of Conservation and Environment, Western Australia.

Keighery B.J. 1994 *Bushland Plant Survey. A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc.), Nedlands, Western Australia.

Keighery B.J, Keighery G.J, Webb A, Longman V.M, and Griffin E.A. 2008 *A Floristic Survey of the Whicher Scarp*. A report for the Department of Environment and Conservation (Western Australia) as part of the Swan Bioplan Project.

Keighery G.J. 1993 *Mountains of Mystery: Appendix: Flora List and Synopsis of the Flora of the Stirling Range National Park*. Department of Conservation and Land Management, Perth.

Keighery G.J, Gibson N, Lyons M.N, Burbidge A.H. 2000 Flora and vegetation of the southern Carnarvon Basin. *Records of the Western Australian Museum Supplement* **61**, 77-154.

Keighery G, Lyons M, Gibson N, Keighery B. 2010 Vascular Flora of the Margaret River Plateau National Parks, Conservation reserves and State Forest, south-western Western Australia. *Conservation Science W.Aust.* 7 (3): 481-502.

Keighery G.J, Lyons M.N, Gibson N, Keighery B.J. 2011 Vascular flora of Leeuwin-Naturalite National Park. *Conservation Science W.Aust.* 8 (1): 31-60.

Lyons M.N, Keighery G.J, Gibson N, Wardell-Johnson G. 2000 The vascular flora of the Warren bioregion, south-west Western Australia: composition, reservation status and endemism. *CALMScience* **3**, 181-250.

Mattiske E.M, Havel J.J. 1998 *Vegetation Mapping in the South West of Western Australia and Regional Forest Agreement vegetation complexes*. Map sheets for Pemberton, Collie, Pinjarra, Busselton- Margaret River, Mt Barker, and Perth, Western Australia. Scale 1:250,000. Department of Conservation and Land Management, Perth.

Molloy S, O'Connor T, Wood J, Wallrodt S. 2007 *Addendum for the South West Biodiversity Project Area*, Western Australian Local Government Association, West Perth.

Muir B.G. 1977 Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bending Reserve. *Records of the Western Australian Museum*, Supplement No.3.

Myers N, Mittermeier R.A, Mittermeier C.G, da Fonseca G.A.B, Kent J. 2000 Biodiversity hotspots for conservation priorities. *Nature* 403: 853-858.

Tille P.J, Lantzke N.C. 1990 *Land resources of Busselton-Margaret River-Augusta. Busselton Map*. Western Australian Department of Agriculture, Perth.

Main B.Y. 1997 Granite outcrops: A collective ecosystem. *Journal of the Royal Society of Western Australia* 80:113-122.

Nicolle D, French M.E. 2012 A revision of *Eucalyptus* ser. *Falcatae* (Myrtaceae) from south-western Australia, including the description of new taxa and comments on the probable hybrid origin of *E.balanites*, *E.balanopelex* and *E.phylacis*. *Nuytsia, the journal of the Western Australian Herbarium* 22:409-454.

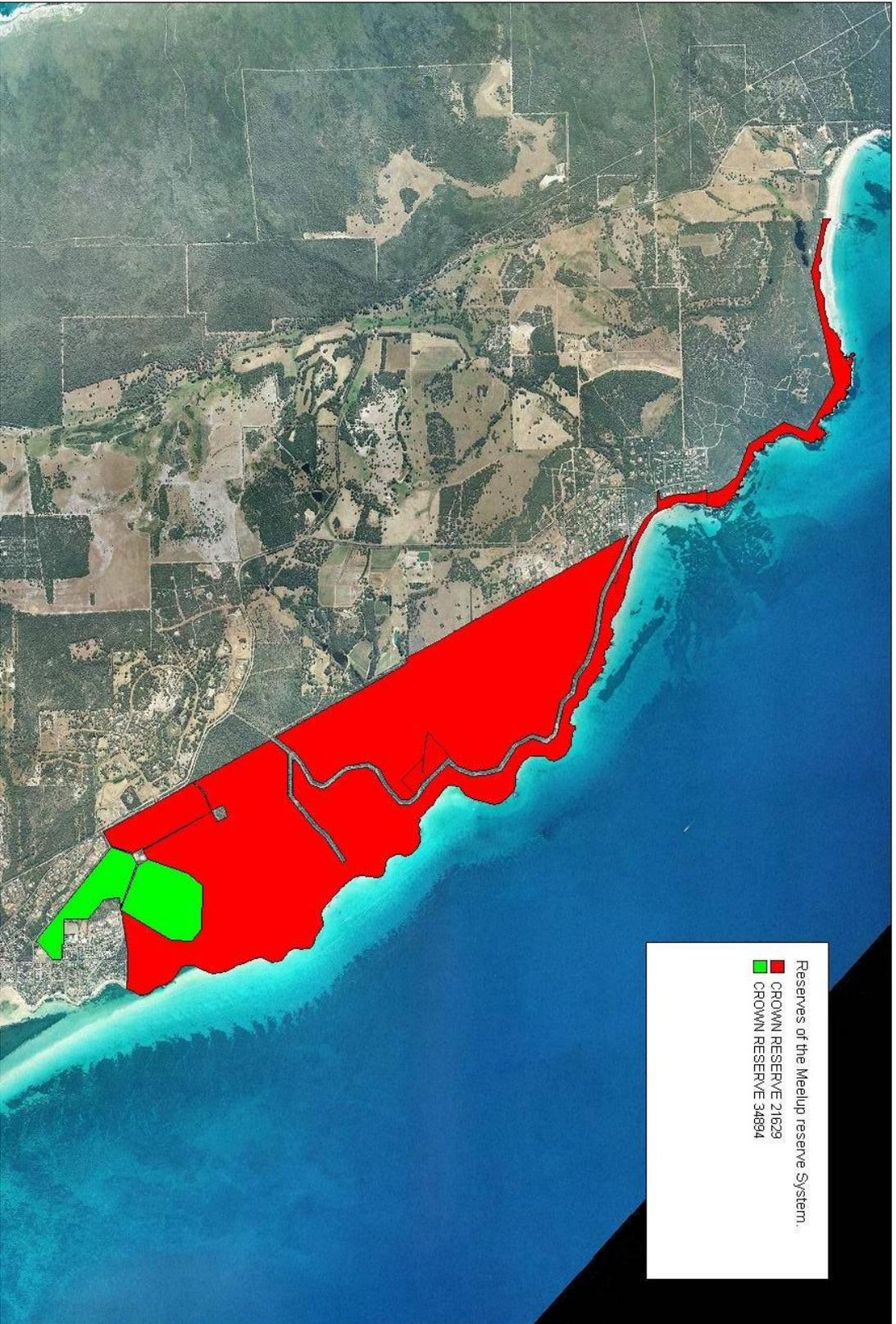
Seddon G. 1972 *A Sense of Place*. University of Western Australia Press, Nedlands, Western Australia.

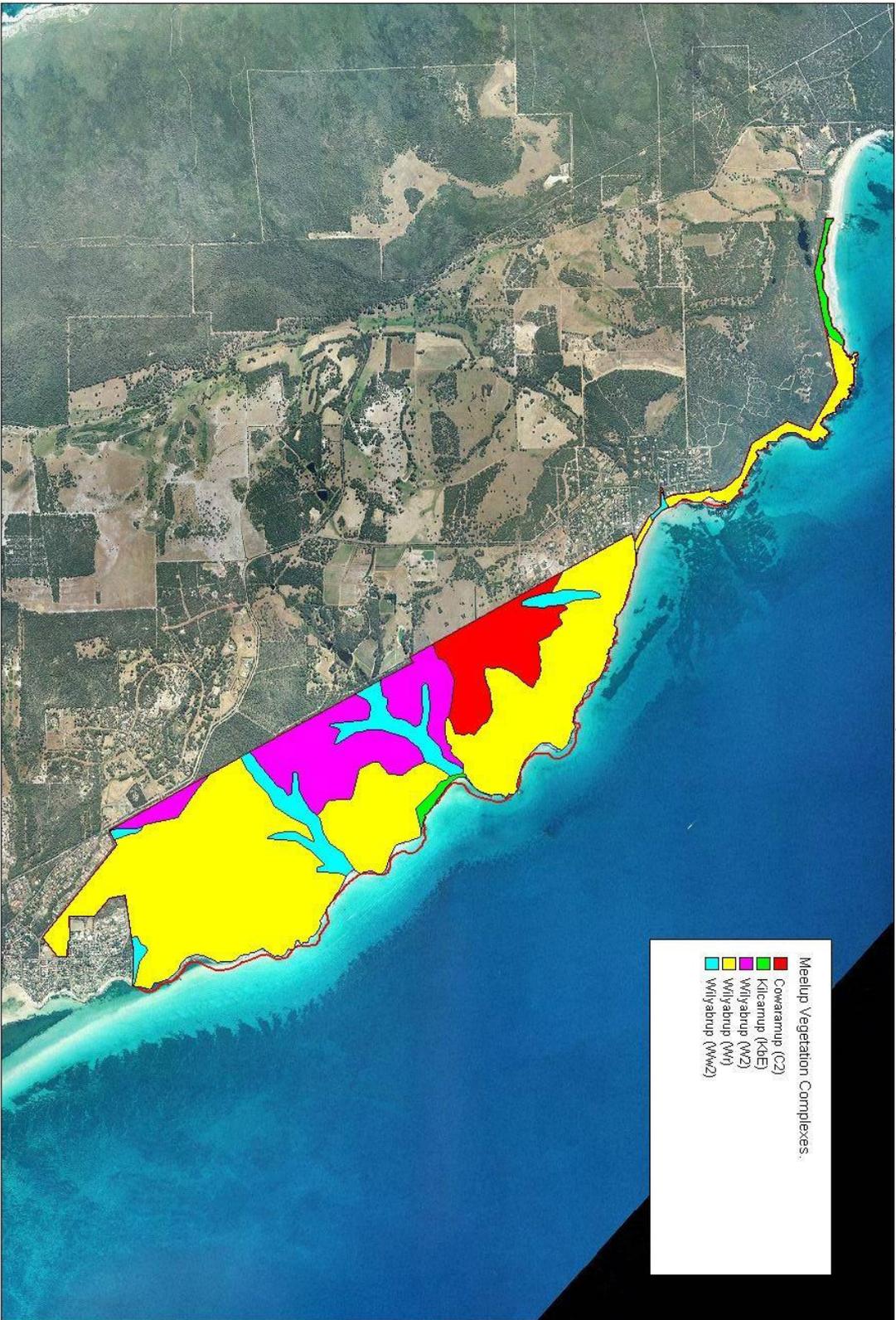
Trudgen M.E, Trudgen M.S. 2010 *A review of two reports relating to the classification of floristic data from the Happy Valley Project survey data with alternative classifications of that data and an assessment of the significance of the vegetation in the Happy Valley mine footprint*. An unpublished report for the Office of the Environmental Protection Authority, Perth, Western Australia.

Valentine P.S, Enright N.J. 1975 *The Cape Naturaliste Area, W.A.* An Environmental Resource Evaluation. Geowest No.6. Dept. of Geography, University of Western Australia, Perth.

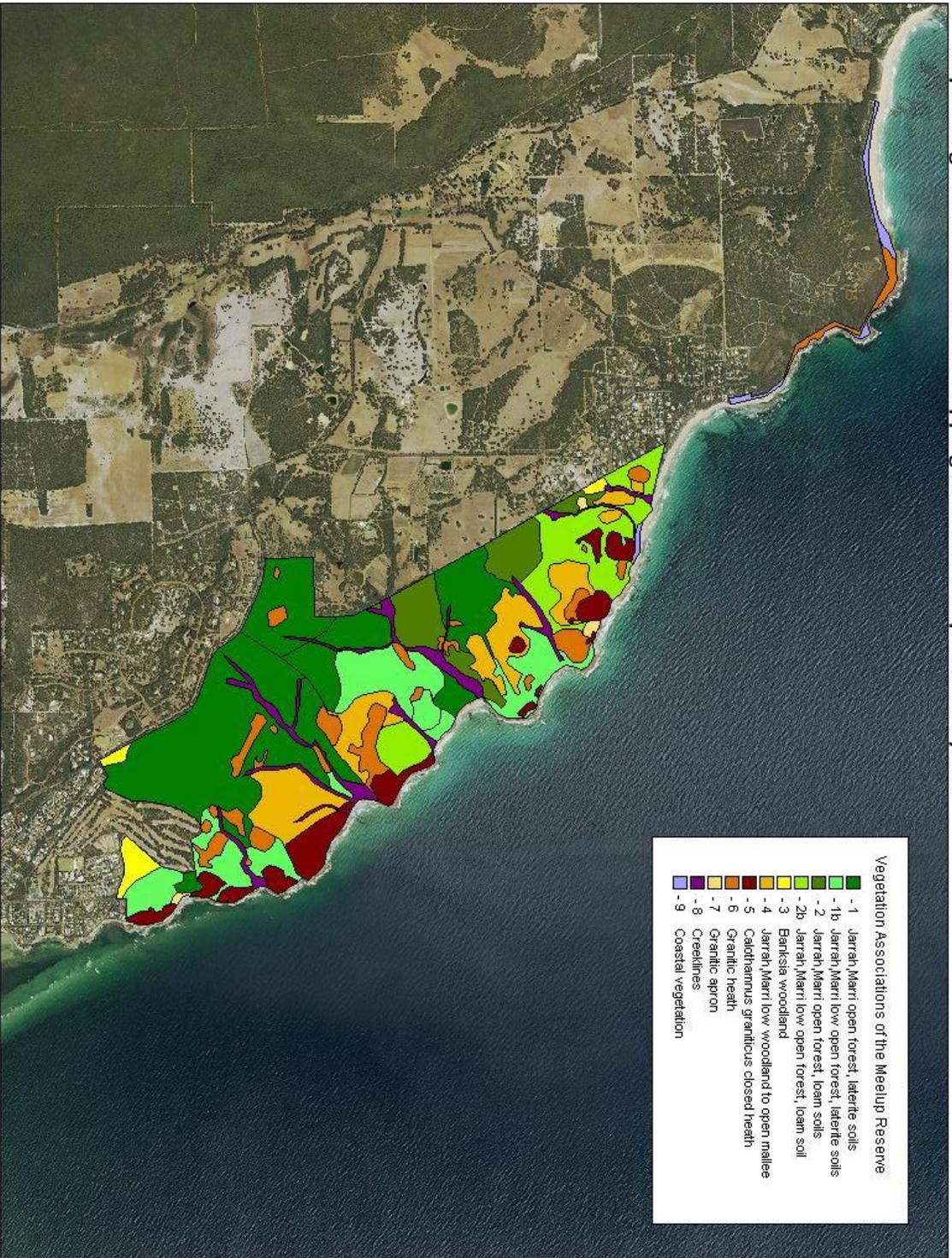
Western Australian Herbarium 1998 *FloraBase – The Western Australian Flora*. Department of Environment and Conservation, Perth, Western Australia. Available at <http://florabase.dec.wa.gov.au/>.

Map 1: Reserves of the Meelup reserve system.





Map 3: Vegetation Association mapping for the Meelup reserve system



Photographs:



Photograph 1 – Jarrah, Marri Forest on lateritic soils.



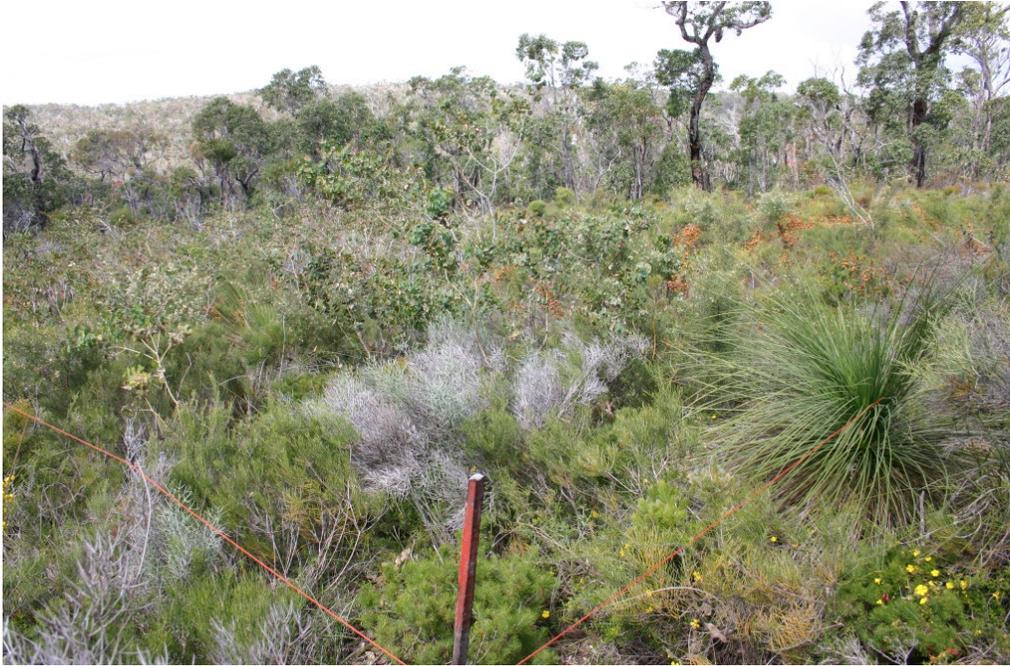
Photograph 2 – Jarrah, Marri Forest on sandy loam soils.



Photograph 3 – Jarrah, Marri Woodland.



Photograph 4 – *Banksia* Woodland.



Photograph 5 – Granitic Heath dominated by *Gastrolobium spinosum*, *Allocasuarina humilis*.



Photograph 6 – Granitic Heath dominated by *Dodonaea ceratocarpa*.



Photograph 7 – *Calothamnus graniticus* Closed Heath.



Photograph 8 – Granitic Apron.

Appendix 1:

Table 1: Vegetation Structural Classes (Keighery, BJ, 1994 (adapted from Muir 1977 and Aplin 1979))

Life Form/ Height Class	Canopy Cover (percentage)			
	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	Closed Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Shrub Mallee	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 1 :

Table 2: Categories used to define the conservation status of flora at the state level.

Categories are defined in DPaW (2013).

R	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, and have been gazetted as such.
X	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, and have been gazetted as such.
P1	Priority One – Poorly known Taxa Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as “rare flora”, but are in urgent need of further survey.
P2	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 (i.e. not currently endangered). Such taxa are under consideration for declaration as ‘rare flora’ but are in urgent need of further survey.
P3	Priority Three – Poorly known Taxa Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as ‘rare flora’ but are in need of further survey.
P4	Priority Four – Poorly known Taxa Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Appendix 2:

Table 1: The Meelup Reserve System Species List (* - introduced species)

NAME_ID	FAMILY		Name	Cons Code	Common Name	AUTHOR
	Aizoaceae					
2798			<i>Carpobrotus virescens</i>		Coastal Pigface	(Haw.) Schwantes
2820		*	<i>Tetragonia decumbens</i>		Sea Spinach	Mill.
	Amaranthaceae					
2718			<i>Ptilotus drummondii</i>		Narrowleaf Mulla Mulla	(Moq.) F.Muell.
2742			<i>Ptilotus manglesii</i>		Pom Poms	(Lindl.) F.Muell.
	Anarthriaceae					
1058			<i>Anarthria gracilis</i>			R.Br.
1097			<i>Lyginia barbata</i>			R.Br.
	Apiaceae					
6211			<i>Apium prostratum</i>		Sea Celery	Vent.
6218			<i>Daucus glochidiatus</i>		Australian Carrot	(Labill.) Fisch., C.A.Mey. & Ave-Lall.
6222			<i>Homalosciadium homalocarpum</i>			(F.Muell.) H.Eichler
6245			<i>Pentapeltis peltigera</i>			(Hook.) Bunge
11160			<i>Platysace haplosciadia</i>			(Benth.) C.Norman
6259			<i>Platysace tenuissima</i>			(Benth.) C.Norman
6284			<i>Xanthosia candida</i>			(Benth.) Steud.
6285			<i>Xanthosia ciliata</i>			Hook.
6289			<i>Xanthosia huegelii</i>			(Benth.) Steud.
	Araceae					
1049		*	<i>Zantedeschia aethiopica</i>		Arum Lily	(L.) Spreng.
	Araliaceae					
6223			<i>Hydrocotyle alata</i>			A.Rich.
6226			<i>Hydrocotyle callicarpa</i>		Small Pennywort	Bunge
6280			<i>Trachymene pilosa</i>		Native Parsnip	Sm.

Asparagaceae				
1208		Acanthocarpus preissii		Lehm.
8779	*	Asparagus asparagoides	Bridal Creeper	(L.) Druce
1280		Chamaescilla corymbosa	Blue Squill	(R.Br.) Benth.
1287		Dichopogon capillipes		(Endl.) Brittan
1289		Dichopogon preissii		(Endl.) Brittan
1308		Laxmannia sessiliflora	Nodding Lily	Decne.
1223		Lomandra caespitosa	Tufted Mat Rush	(Benth.) Ewart
1228		Lomandra hermaphrodita		(C.R.P.Andrews) C.A.Gardner
1229		Lomandra integra		T.Macfarlane
1232		Lomandra micrantha	Small-flower Mat-rush	(Endl.) Ewart
1234		Lomandra nigricans		T.Macfarlane
1238		Lomandra pauciflora		(R.Br.) Ewart
1240		Lomandra purpurea	Purple Mat Rush	(Endl.) Ewart
1243		Lomandra sericea	Silky Mat Rush	(Endl.) Ewart
1244		Lomandra sonderi		(F.Muell.) Ewart
1246		Lomandra suaveolens		(Endl.) Ewart
1312		Sowerbaea laxiflora	Purple Tassels	Lindl.
1335		Thysanotus gracilis		R.Br.
1338		Thysanotus manglesianus	Fringed Lily	Kunth
1339		Thysanotus multiflorus	Many-flowered Fringe Lily	R.Br.
1351		Thysanotus sparteus		R.Br.
1354		Thysanotus tenellus		Endl.
1357		Thysanotus thyrsoideus		Baker
Asphodelaceae				
1368	*	Trachyandra divaricata		(Jacq.) Kunth
Asteraceae				
7838	*	Arctotheca calendula	Cape Weed	(L.) Levyns
7851		Asteridea pulverulenta	Common Bristle Daisy	Lindl.
7878		Brachyscome iberidifolia		Benth.
7909	*	Carduus pycnocephalus	Slender Thistle	L.

-21	*	<i>Conyza</i> sp.			
7945	*	<i>Cotula coronopifolia</i>		Waterbuttons	L.
7947	*	<i>Cotula turbinata</i>		Funnel Weed	L.
13354		<i>Craspedia variabilis</i>			J.Everett & A.N.L.Doust
18307	*	<i>Dimorphotheca ecklonis</i>		Veldt Daisy	DC.
12742		<i>Hyalosperma demissum</i>			(A.Gray) Paul G.Wilson
12717		<i>Hyalosperma pusillum</i>			(Turcz.) Paul G.Wilson
12737		<i>Hyalosperma simplex</i>			(Steetz) Paul G.Wilson
8086	*	<i>Hypochaeris glabra</i>		Smooth Catsear	L.
18585		<i>Lagenophora huegelii</i>			Benth.
16449		<i>Leucophyta brownii</i>			Cass.
8105		<i>Millotia myosotidifolia</i>			(Benth.) Steetz
8106		<i>Millotia tenuifolia</i>		Soft Millotia	Cass.
8127		<i>Olearia axillaris</i>		Coastal Daisybush	(DC.) Benth.
8143		<i>Olearia paucidentata</i>		Autumn Scrub Daisy	(Steetz) Benth.
8177		<i>Podolepis lessonii</i>			(Cass.) Benth.
8182		<i>Podotheca angustifolia</i>		Sticky Longheads	(Labill.) Less.
13255		<i>Pterochaeta paniculata</i>			Steetz
8195		<i>Quinetia urvillei</i>			Cass.
13300		<i>Rhodanthe citrina</i>			(Benth.) Paul G.Wilson
15035		<i>Rhodanthe corymbosa</i>			(A.Gray) Paul G.Wilson
8208		<i>Senecio hispidulus</i>		Hispid Fireweed	A.Rich.
25882		<i>Senecio pinnatifolius</i> var. <i>maritimus</i>		Coastal Groundsel	(Ali) I.Thomps.
8217		<i>Senecio quadridentatus</i>			Labill.
8224		<i>Siloxerus filifolius</i>			(Benth.) Ostenf.
14583		<i>Siloxerus multiflorus</i>			(Nees) P.S.Short
8230	*	<i>Sonchus asper</i>		Rough Sowthistle	(L.) Hill
8231	*	<i>Sonchus oleraceus</i>		Common Sowthistle	L.
8251		<i>Trichocline spathulata</i>		Native Gerbera	(DC.) J.H.Willis
8255	*	<i>Ursinia anthemoides</i>		Ursinia	(L.) Poir.
		Boryaceae			

1272			Borya scirpoidea			Lindl.
	Brassicaceae					
3000		*	Brassica tournefortii		Mediterranean Turnip	Gouan
3002		*	Cakile maritima		Sea Rocket	Scop.
	Campanulaceae					
7396			Isotoma hypocrateriformis		Woodbridge Poison	(R.Br.) Druce
9289			Lobelia aneeps		Angled Lobelia	L.f.
7407			Lobelia rhytidosperra		Wrinked-seeded Lobelia	Benth.
7408			Lobelia tenuior		Slender Lobelia	R.Br.
7410		*	Monopsis debilis			(L.f.) C.Presl
7386			Wahlenbergia gracilentia		Annual Bluebell	Lothian
	Caprifoliaceae					
7366		*	Centranthus macrosiphon			Boiss.
	Caryophyllaceae					
2889		*	Cerastium glomeratum		Mouse Ear Chickweed	Thuill.
17407		*	Illecebrum verticillatum			L.
19825		*	Petrorhagia dubia			(Raf.) G.Lopez & Romo
2909		*	Silene gallica		French Catchfly	L.
	Casuarinaceae					
1728			Allocauarina fraseriana		Sheoak	(Miq.) L.A.S.Johnson
1732			Allocauarina humilis		Dwarf Sheoak	(Otto & F.Dietr.) L.A.S.Johnson
1734			Allocauarina microstachya			(Miq.) L.A.S.Johnson
	Celastraceae					
4733			Stackhousia monogyna			Labill.
4737			Tripterococcus brunonis		Winged Stackhousia	Endl.
	Centrolepidaceae					
1117			Aphelia cyperoides			R.Br.
1121			Centrolepis aristata		Pointed Centrolepis	(R.Br.) Roem. & Schult.
1125			Centrolepis drummondiana			(Nees) Walp.
1133			Centrolepis pilosa			Hieron.
1134			Centrolepis polygyna		Wiry Centrolepis	(R.Br.) Hieron.

	Chenopodiaceae				
2452		Atriplex cinerea		Grey Saltbush	Poir.
2462		Atriplex hypoleuca			Nees
2471		* Atriplex prostrata		Hastate Orache	DC.
2511		Enchylaena tomentosa		Barrier Saltbush	R.Br.
2578		Rhagodia baccata		Berry Saltbush	(Labill.) Moq.
2591		Sarcocornia blackiana			(Ulbr.) A.J.Scott
	Colchicaceae				
12770		Burchardia congesta		Milkmaids	Lindl.
1385		Burchardia multiflora		Dwarf Burchardia	Lindl.
1398		Wurmbea monantha			(Endl.) T.Macfarlane
1403		Wurmbea tenella			(Endl.) Benth.
	Convolvulaceae				
6616		Dichondra repens		Kidney Weed	J.R.Forst. & G.Forst.
	Crassulaceae				
17701		Crassula closiana			(Gay) Reiche
3137		Crassula colorata		Dense Stonecrop	(Nees) Ostenf.
3138		Crassula decumbens		Rufous Stonecrop	Thunb.
3140		* Crassula glomerata			P.J.Bergius
3143		Crassula pedicellosa			(F.Muell.) Ostenf.
	Cupressaceae				
36520		Callitris acuminata		Dwarf Cypress	(Parl.) F.Muell.
	Cyperaceae				
743		Baumea juncea		Bare Twigrush	(R.Br.) Palla
747		Baumea rubiginosa			(Spreng.) Boeckeler
757		Carex preissii			Nees
763		Chorizandra enodis		Black Bristlerush	Nees
768		Cyathochaeta avenacea			(R.Br.) Benth.
815		* Cyperus tenellus		Tiny Flatsedge	L.f.
20216		Ficinia nodosa		Knotted Club Rush	(Rottb.) Goetgh., Muasya & D.A.Simpson
910		Isolepis cernua		Nodding Club-rush	(Vahl) Roem. & Schult.

917	*	<i>Isolepis marginata</i>		Coarse Club-rush	(Thunb.) A.Dietr.
929		<i>Lepidosperma carphoides</i>		Black Rapier Sedge	Benth.
933		<i>Lepidosperma gladiatum</i>		Coast Sword-sedge	Labill.
936		<i>Lepidosperma leptostachyum</i>			Benth.
937		<i>Lepidosperma longitudinale</i>		Pithy Sword-sedge	Labill.
940		<i>Lepidosperma pubisquameum</i>			Steud.
945		<i>Lepidosperma squamatum</i>			Labill.
948		<i>Lepidosperma tetraquetrum</i>			Nees
953		<i>Mesomelaena graciliceps</i>			(C.B.Clarke) K.L.Wilson
956		<i>Mesomelaena stygia</i>			(R.Br.) Nees
957		<i>Mesomelaena tetragona</i>		Semaphore Sedge	(R.Br.) Benth.
1019		<i>Schoenus aff. subflavus</i>		Yellow Bog-rush	Kuek.
973		<i>Schoenus asperocarpus</i>		Poison Sedge	F.Muell.
975		<i>Schoenus bifidus</i>			(Nees) Boeckeler
982		<i>Schoenus clandestinus</i>			S.T.Blake
984		<i>Schoenus curvifolius</i>			(R.Br.) Roem. & Schult.
987		<i>Schoenus elegans</i>			S.T.Blake
1002		<i>Schoenus nanus</i>		Tiny Bog Rush	(Nees) Benth.
1005		<i>Schoenus obtusifolius</i>			(Nees) Boeckeler
1006		<i>Schoenus odontocarpus</i>			F.Muell.
17614		<i>Schoenus plumosus</i>			Rye
1013		<i>Schoenus sculptus</i>		Gimlet Bog-rush	(Nees) Boeckeler
1016		<i>Schoenus subbarbatus</i>		Bearded Bog-rush	Kuk.
1020		<i>Schoenus sublateralis</i>			(Steud.) C.B.Clarke
1026		<i>Schoenus unispiculatus</i>			Benth.
17409		<i>Schoenus variicellae</i>			Rye
1034		<i>Tetraria capillaris</i>		Hair Sedge	(F.Muell.) J.M.Black
1036		<i>Tetraria octandra</i>			(Nees) Kuk.
		Dasygongonaceae			
1218		<i>Dasygogon bromeliifolius</i>		Pineapple Bush	R.Br.
1221		<i>Kingia australis</i>		Kingia	R.Br.

	Dennstaedtiaceae				
57		Pteridium esculentum		Bracken	(G.Forst.) Cockayne
	Dilleniaceae				
5114		Hibbertia commutata			Steud.
5117		Hibbertia cuneiformis		Cutleaf Hibbertia	(Labill.) Sm.
5118		Hibbertia cunninghamii			Hook.
20051		Hibbertia diamesogenos			(Steud.) J.R.Wheeler
5135		Hibbertia hypericoides		Yellow Buttercups	(DC.) Benth.
5157		Hibbertia polystachya			Benth.
5162		Hibbertia racemosa		Stalked Guinea Flower	(Endl.) Gilg
11481		Hibbertia spicata subsp. spicata			F.Muell.
	Droseraceae				
13219		Drosera bulbosa subsp. bulbosa			Hook.
3095		Drosera erythrorhiza		Red Ink Sundew	Lindl.
3097		Drosera gigantea		Giant Sundew	Lindl.
3098		Drosera glanduligera		Pimpernel Sundew	Lehm.
3106		Drosera macrantha		Bridal Rainbow	Endl.
11853		Drosera menziesii subsp. menziesii		Pink Rainbow	DC.
3118		Drosera pallida		Pale Rainbow	Lindl.
3131		Drosera stolonifera		Leafy Sundew	Endl.
13205		Drosera tubaestylis			N.G.Marchant & Lowrie
	Elaeocarpaceae				
4544		Tetratheca setigera			Endl.
4547		Tremandra diffusa			DC.
4548		Tremandra stelligera			DC.
	Ericaceae				
6306		Andersonia caerulea		Foxtails	R.Br.
6317		Andersonia micrantha			R.Br.
6323		Astroloma ciliatum		Candle Cranberry	(Lindl.) Druce
6325		Astroloma drummondii			Sond.
6334		Astroloma pallidum		Kick Bush	R.Br.

6375		Leucopogon aff. cordatus			Sond.
6367		Leucopogon capitellatus			DC.
6374		Leucopogon conostephioides			DC.
6402		Leucopogon hirsutus			Sond.
6425		Leucopogon oxycedrus			Sond.
6427		Leucopogon parviflorus		Coast Beard-heath	(Andrews) Lindl.
6436		Leucopogon propinquus			R.Br.
6451		Leucopogon tenuis			DC.
34736		Lysinema pentapetalum			R.Br.
6476		Styphelia tenuiflora		Common Pinheath	Lindl.
	Euphorbiaceae				
4601		Beyeria viscosa		Pinkwood	(Labill.) Miq.
4636	*	Euphorbia paralias		Sea Spurge	L.
4638	*	Euphorbia peplus		Petty Spurge	L.
4666		Monotaxis occidentalis			Endl.
20537		Stachystemon virgatus			(Klotzsch) Halford & R.J.F.Hend.
	Fabaceae				
3207		Acacia alata		Winged Wattle	R.Br.
3262		Acacia cochlearis		Rigid Wattle	(Labill.) H.L.Wendl.
3282		Acacia cyclops		Coastal Wattle	G.Don
3307		Acacia divergens			Benth.
3374		Acacia huegelii			Benth.
18217	*	Acacia iteaphylla			Benth.
14930		Acacia lateriticola glabrous variant (B.R. Maslin 6765) PN	3		
18597	*	Acacia longifolia			(Labill.) Court
3453		Acacia myrtifolia			(Sm.) Willd.
3454		Acacia nervosa		Rib Wattle	DC.
3464		Acacia obovata			Benth.
3502		Acacia pulchella		Prickly Moses	R.Br.
3525		Acacia rostellifera		Summer-scented Wattle	Benth.

3527		Acacia saligna		Orange Wattle	(Labill.) H.L.Wendl.
30036		Acacia saligna subsp. stolonifera MS			M.W.McDonald & Maslin
3557		Acacia stenoptera		Narrow Winged Wattle	Benth.
3710		Bossiaea eriocarpa		Common Brown Pea	Benth.
3713		Bossiaea linophylla			R.Br.
3714		Bossiaea ornata		Broad Leaved Brown Pea	(Lindl.) Benth.
3751		Chorizema aciculare		Needle-leaved Chorizema	(DC.) C.A.Gardner
8971		Chorizema cordatum			Lindl.
3754		Chorizema diversifolium			A.DC.
12765		Chorizema nanum			(Andrews) Sims
3760		Chorizema reticulatum			Meisn.
3761		Chorizema rhombeum			R.Br.
3799		Daviesia cordata		Bookleaf	Sm.
3805		Daviesia decurrens		Prickly Bitter-pea	Meisn.
3815		Daviesia horrida		Prickly Bitter-pea	Meisn.
3816		Daviesia incrassata			Sm.
3817		Daviesia inflata			Crisp
3819		Daviesia longifolia			Benth.
3835		Daviesia preissii			Meisn.
20367		Dillwynia laxiflora			Benth.
3867	*	Dipogon lignosus		Dolichos Pea	(L.) Verdc.
20214		Eutaxia myrtifolia			(Sm.) R.Br.
20512		Gastrolobium praemorsum			G.Chandler & Crisp
3924		Gastrolobium spinosum		Prickly Poison	Benth.
3936	*	Genista linifolia		Flaxleaf Broom	L.
3950		Gompholobium knightianum			Lindl.
3951		Gompholobium marginatum			R.Br.
3953		Gompholobium ovatum			Meisn.
3954		Gompholobium polymorphum			R.Br.
3955		Gompholobium preissii			Meisn.
3957		Gompholobium tomentosum		Hairy Yellow Pea	Labill.

3961			Hardenbergia comptoniana		Native Wisteria	(Andrews) Benth.
3964			Hovea chorizemifolia		Holly-leaved Hovea	(Sweet) DC.
3965			Hovea elliptica		Tree Hovea	(Sm.) DC.
3966			Hovea pungens		Devil's Pins	Benth.
3968			Hovea trisperma		Common Hovea	Benth.
3992			Isotropis cuneifolia		Granny Bonnets	(Sm.) Heynh.
3997			Jacksonia alata			Benth.
4012			Jacksonia furcellata		Grey Stinkwood	(Bonpl.) DC.
4036			Kennedia carinata			(Benth.) Domin
4037			Kennedia coccinea		Coral Vine	(Curtis) Vent.
3669			Labichea punctata		Lance-leaved Cassia	Benth.
4059		*	Lotus angustissimus		Narrowleaf Trefoil	L.
8564		*	Lotus subbiflorus			Lag.
4085		*	Melilotus indicus			(L.) All.
4090			Mirbelia dilatata		Holly-leaved Mirbelia	R.Br.
4114		*	Ornithopus pinnatus		Slender Serradella	(Mill.) Druce
3618			Paraserianthes lophantha		Albizia	(Willd.) I.C.Nielsen
17551			Sphaerolobium drummondii			Turcz.
4207			Sphaerolobium medium			R.Br.
4256			Templetonia retusa		Cockies Tongues	(Vent.) R.Br.
4292		*	Trifolium campestre		Hop Clover	Schreb.
4313		*	Trifolium subterraneum		Subterranean Clover	L.
4325			Viminaria juncea		Swishbush	(Schrad. & J.C.Wendl.) Hoffmanns.
	Frankeniaceae					
5209			Frankenia pauciflora		Seaheath	DC.
	Gentianaceae					
6539		*	Centaureum erythraea		Common Centaury	Rafn
6543		*	Cicendia filiformis		Slender Cicendia	(L.) Delarbre
	Geraniaceae					
4331		*	Erodium aureum			Carolin
4332		*	Erodium botrys		Long Storksbill	(Cav.) Bertol.

4334			<i>Erodium crinitum</i>		Corkscrew	Carolin
4343		*	<i>Pelargonium capitatum</i>		Rose Pelargonium	(L.) L'Her.
4346			<i>Pelargonium littorale</i>			Huegel
	Goodeniaceae					
7428			<i>Dampiera coronata</i>		Wedge-leaved Dampiera	Lindl.
7453			<i>Dampiera lindleyi</i>			de Vriese
7454			<i>Dampiera linearis</i>		Common Dampiera	R.Br.
7484			<i>Dampiera trigona</i>		Angled-stem Dampiera	de Vriese
29362			<i>Goodenia coerulea</i>			R.Br.
7505			<i>Goodenia eatoniana</i>			F.Muell.
12551			<i>Goodenia micrantha</i>			Carolin
7568			<i>Lechenaultia biloba</i>		Blue Leschenaultia	Lindl.
7602			<i>Scaevola calliptera</i>			Benth.
7606			<i>Scaevola crassifolia</i>		Thick-leaved Fan-flower	Labill.
7613			<i>Scaevola glandulifera</i>		Viscid Hand-flower	DC.
7624			<i>Scaevola microphylla</i>		Small-leaved Scaevola	(de Vriese) Benth.
7626			<i>Scaevola nitida</i>		Shining Fanflower	R.Br.
7665			<i>Velleia trinervis</i>			Labill.
	Haemodoraceae					
1407			<i>Anigozanthos flavidus</i>		Tall Kangaroo Paw	DC.
11434			<i>Anigozanthos humilis</i> subsp. <i>humilis</i>			Lindl.
1411			<i>Anigozanthos manglesii</i>		Mangles Kangaroo Paw	D.Don
1416			<i>Anigozanthos viridis</i>		Green Kangaroo Paw	Endl.
1418			<i>Conostylis aculeata</i>		Prickly Conostylis	R.Br.
1454			<i>Conostylis setigera</i>		Bristly Cottonhead	R.Br.
1465			<i>Haemodorum discolor</i>			T.Macfarlane
1468			<i>Haemodorum laxum</i>			R.Br.
1472			<i>Haemodorum simplex</i>			Lindl.
1478			<i>Phlebocarya ciliata</i>			R.Br.
1481			<i>Tribonanthes australis</i>			Endl.
	Haloragaceae					

33638		Meionectes tenuifolia	3		(Benth.) M.L.Moody & Les
34963		Trihaloragis hexandra			(F.Muell.) M.L.Moody & Les
Hemerocallidaceae					
23474		Agrostocrinum hirsutum			(Lindl.) Keighery
1276		Caesia micrantha		Pale Grass-lily	Lindl.
1276		Caesia micrantha var. minor		Pale Grass-lily	Lindl.
16326		Dianella brevicaulis			(Ostenf.) G.W.Carr & P.F.Horsfall
1295		Johnsonia acaulis (busselton form)			Endl.
1297		Johnsonia lupulina		Hooded Lily	R.Br.
1260		Stypandra glauca		Blind Grass	R.Br.
1361		Tricoryne elatior		Yellow Autumn Lily	R.Br.
1362		Tricoryne humilis			Endl.
Hypoxidaceae					
1503		Hypoxis occidentalis			Benth.
1504		Hypoxis vaginata		Yellow Star	Schltldl.
Iridaceae					
1524	*	Gladiolus undulatus		Wild Gladiolus	L.
19179	*	Moraea flaccida		One-leaf Cape Tulip	(Sweet) Steud.
1537		Orthrosanthus laxus		Morning Iris	(Endl.) Benth.
1542		Patersonia babianoides			Benth.
1546		Patersonia juncea		Rush Leaved Patersonia	Lindl.
1550		Patersonia occidentalis		Purple Flag	R.Br.
1551		Patersonia pygmaea		Pygmy Patersonia	Lindl.
1553		Patersonia umbrosa		Yellow Flags	Endl.
1556	*	Romulea rosea		Guildford Grass	(L.) Eckl.
8338	*	Sisyrinchium iridifolium		Blue Pigrot	Kunth
1558	*	Sparaxis bulbifera			(L.) Ker Gawl.
-23	*	Watsonia sp.			
Juncaceae					
1178	*	Juncus bufonius		Toad Rush	L.
1179		Juncus caespiticius		Grassy Rush	E.Mey.

1180		*	Juncus capitatus		Capitate Rush	Weigel
1185			Juncus kraussii		Sea Rush	Hochst.
1188			Juncus pallidus		Pale Rush	R.Br.
1190			Juncus planifolius		Broadleaf Rush	R.Br.
	Juncaginaceae					
152			Triglochin trichophora			Nees
	Lamiaceae					
6856			Hemigenia incana		Silky Hemigenia	(Lindl.) Benth.
6868			Hemigenia rigida			Benth.
6930		*	Stachys arvensis		Staggerweed	(L.) L.
	Lauraceae					
2952			Cassytha glabella		Tangled Dodder Laurel	R.Br.
2956			Cassytha pomiformis		Dodder Laurel	Nees
2957			Cassytha racemosa		Dodder Laurel	Nees
	Lentibulariaceae					
7148			Utricularia multifida			R.Br.
	Linaceae					
4363		*	Linum trigynum		French Flax	L.
4364		*	Linum usitatissimum		Flax	L.
	Lindsaeaceae					
59			Lindsaea linearis		Screw Fern	Sw.
	Loganiaceae					
6511			Logania serpyllifolia			R.Br.
6515			Logania vaginalis		White Spray	(Labill.) F.Muell.
16825			Phyllangium divergens			(Hook.f.) Dunlop
16177			Phyllangium paradoxum			(R.Br.) Dunlop
	Loranthaceae					
2401			Nuytsia floribunda		Christmas Tree	(Labill.) G.Don
	Malvaceae					
40864			Commersonia cygnorum			Steud.
5080			Thomasia foliosa			Gay

5091		Thomasia paniculata			Lindl.
5092		Thomasia pauciflora		Few Flowered Thomasia	Lindl.
5097		Thomasia rynchocarpa			Turcz.
	Menyanthaceae				
36180		Liparophyllum latifolium			(Benth.) Tippet & Les
	Myrtaceae				
5316		Agonis flexuosa		Peppermint	(Willd.) Sweet
36441		Babingtonia camphorosmae		Camphor Myrtle	(Endl.) Lindl.
11273		Calothamnus graniticus subsp. graniticus	4		Hawkeswood
5429		Calothamnus sanguineus		Silky-leaved Blood flower	Labill.
5458		Calytrix flavescens		Summer Starflower	A.Cunn.
17104		Corymbia calophylla		Marri	(Lindl.) K.D.Hill & L.A.S.Johnson
5508		Darwinia citriodora		Lemon-scented Darwinia	(Endl.) Benth.
5533		Darwinia vestita		Pom-pom Darwinia	(Endl.) Benth.
14104		Eremaea pauciflora var. pauciflora			(Endl.) Druce
5708		Eucalyptus marginata		Jarrah	Sm.
5739		Eucalyptus patens		Swan River Blackbutt	Benth.
13024		Eucalyptus phylacis	T	Meelup Mallee	L.A.S.Johnson & K.D.Hill
13512		Eucalyptus rudis subsp. cratyantha	4		Brooker & Hopper
19629		Eucalyptus virginea	4		Hopper & Ward.-Johnson
5817		Hypocalymma angustifolium		White Myrtle	(Endl.) Schauer
5825		Hypocalymma robustum		Swan River Myrtle	(Endl.) Lindl.
15498		Kunzea glabrescens		Spearwood	Toelken
13273		Melaleuca incana subsp. incana			R.Br.
5922		Melaleuca lanceolata		Rottnest Teatree	Otto
5926		Melaleuca lateritia		Robin Redbreast Bush	A.Dietr.
18598		Melaleuca systema			Craven
5980		Melaleuca thymoides			Labill.
5983		Melaleuca trichophylla			Lindl.
5987		Melaleuca viminea		Mohan	Lindl.
20135		Taxandria linearifolia			(DC.) J.R.Wheeler & N.G.Marchant

6065		<i>Thryptomene saxicola</i>		Rock Thryptomene	(Hook.) Schauer
15618		<i>Verticordia plumosa</i> var. <i>plumosa</i>			(Desf.) Druce
	Orchidaceae				
15331		<i>Caladenia attingens</i>			Hopper & A.P.Br.
13616		<i>Caladenia caesarea</i> subsp. <i>maritima</i>	T		Hopper & A.P.Br.
15579		<i>Caladenia chapmanii</i>			Hopper & A.P.Br.
13619		<i>Caladenia excelsa</i>	T	Giant Spider Orchid	Hopper & A.P.Br.
1590		<i>Caladenia ferruginea</i>		Rusty Spider Orchid	Nicholls
1592		<i>Caladenia flava</i>		Cowslip Orchid	R.Br.
15351		<i>Caladenia gardneri</i>			Hopper & A.P.Br.
13859		<i>Caladenia longicauda</i> subsp. <i>clivicola</i>			Hopper & A.P.Br.
10883		<i>Caladenia magniclavata</i>		Big Clubbed Spider Orchid	Nicholls
15503		<i>Caladenia paludosa</i>			Hopper & A.P.Br.
15377		<i>Caladenia reptans</i> subsp. <i>reptans</i>			Lindl.
10830		<i>Caladenia rhomboidiformis</i>			(E.Coleman) M.A.Clem. & Hopper
18040		<i>Caladenia thinicola</i>			Hopper & A.P.Br.
13622		<i>Caladenia viridescens</i>	T		Hopper & A.P.Br.
15114		<i>Cyanicula gemmata</i>			(Lindl.) Hopper & A.P.Br.
15404		<i>Cyanicula sericea</i>			(Lindl.) Hopper & A.P.Br.
10916		<i>Cyrtostylis huegelii</i>			Endl.
19649	*	<i>Disa bracteata</i>			Sw.
-2		<i>Diuris</i> sp. Dunsborough			
1643		<i>Elythranthera brunonis</i>		Purple Enamel Orchid	(Endl.) A.S.George
1644		<i>Elythranthera emarginata</i>		Pink Enamel Orchid	(Lindl.) A.S.George
1646		<i>Eriochilus dilatatus</i>		White Bunny Orchid	Lindl.
1656		<i>Lyperanthus serratus</i>		Rattle Beak Orchid	Lindl.
10954		<i>Microtis media</i>			R.Br.
16688		<i>Prasophyllum gracile</i>			Lindl.
1680		<i>Prasophyllum parvifolium</i>		Autumn Leek Orchid	Lindl.
1690		<i>Pterostylis</i> aff. <i>nana</i>		Snail Orchid	R.Br.
1690		<i>Pterostylis nana</i>		Snail Orchid	R.Br.

1693			<i>Pterostylis recurva</i>		Jug Orchid	Benth.
16367			<i>Pyrorchis nigricans</i>		Red beaks	(R.Br.) D.L.Jones & M.A.Clem.
1701			<i>Thelymitra antennifera</i>		Vanilla Orchid	(Lindl.) Hook.f.
10856			<i>Thelymitra benthamiana</i>		Cinnamon Sun Orchid	Rchb.f.
1705			<i>Thelymitra crinita</i>		Blue Lady Orchid	Lindl.
1708			<i>Thelymitra fuscolutea</i>		Leopard Orchid	R.Br.
11053			<i>Thelymitra macrophylla</i>			Lindl.
1717			<i>Thelymitra variegata</i>	3	Queen of Sheba	(Lindl.) F.Muell.
1718			<i>Thelymitra villosa</i>		Custard Orchid	Lindl.
20731			<i>Thelymitra vulgaris</i>			Jeanes
	Orobanchaceae					
15037		*	<i>Bartsia trixago</i>			L.
7122		*	<i>Orobanche minor</i>		Lesser Broomrape	Sm.
7089		*	<i>Parentucellia latifolia</i>		Common Bartsia	(L.) Caruel
7090		*	<i>Parentucellia viscosa</i>		Sticky Bartsia	(L.) Caruel
	Oxalidaceae					
17212		*	<i>Oxalis depressa</i>			Eckl. & Zeyh.
4355			<i>Oxalis perennans</i>			Haw.
4356		*	<i>Oxalis pes-caprae</i>		Soursob	L.
	Papaveraceae					
2969		*	<i>Fumaria capreolata</i>		Whiteflower Fumitory	L.
	Philydraceae					
1172			<i>Philydrella drummondii</i>			L.G.Adams
	Phyllanthaceae					
4675			<i>Phyllanthus calycinus</i>		False Boronia	Labill.
4690			<i>Poranthera huegelii</i>			Klotzsch
4691			<i>Poranthera microphylla</i>		Small Poranthera	Brongn.
	Pittosporaceae					
3157			<i>Billardiera floribunda</i>		White-flowered Billardiera	(Putt.) F.Muell.
25798			<i>Billardiera fusiformis</i>		Australian Bluebell	Labill.
3159			<i>Billardiera laxiflora</i>			(Benth.) E.M.Benn.

3165			Billardiera variifolia			DC.
17630			Marianthus tenuis			Benth.
19745			Pittosporum ligustrifolium			Putt.
16322		*	Pittosporum undulatum			Vent.
	Plantaginaceae					
14282			Gratiola pubescens			R.Br.
7303		*	Plantago lanceolata		Ribwort Plantain	L.
	Plumbaginaceae					
6489		*	Limonium sinuatum		Perennial Sea Lavender	(L.) Mill.
	Poaceae					
184		*	Aira caryophyllea		Silvery Hairgrass	L.
185		*	Aira cupaniana		Silvery Hairgrass	Guss.
192		*	Ammophila arenaria		Marram Grass	(L.) Link
194			Amphipogon amphipogonoides			(Steud.) Vickery
198			Amphipogon laguroides			R.Br.
17233			Austrostipa campylachne			(Nees) S.W.L.Jacobs & J.Everett
17234			Austrostipa compressa			(R.Br.) S.W.L.Jacobs & J.Everett
17240			Austrostipa flavescens			(Labill.) S.W.L.Jacobs & J.Everett
17244			Austrostipa macalpinei			(Reader) S.W.L.Jacobs & J.Everett
231		*	Avellinia michelii			(Savi) Parl.
233		*	Avena barbata		Bearded Oat	Link
244		*	Briza maxima		Blowfly Grass	L.
245		*	Briza minor		Shivery Grass	L.
247			Bromus arenarius		Sand Brome	Labill.
10832		*	Desmazeria rigida			(L.) Tutin
306			Dichelachne crinita		Longhair Plumegrass	(L.f.) Hook.f.
348		*	Ehrharta erecta		Panic Veldt Grass	Lam.
349		*	Ehrharta longiflora		Annual Veldt Grass	Sm.
351		*	Ehrharta villosa		Pyp Grass	Schult.f.
467		*	Lagurus ovatus		Hare's Tail Grass	L.
476		*	Lolium perenne		Perennial Ryegrass	L.

478		*	Lolium rigidum		Wimmera Ryegrass	Gaudin
485			Microlaena stipoides		Weeping Grass	(Labill.) R.Br.
492			Neurachne alopecuroidea		Foxtail Mulga Grass	R.Br.
528		*	Paspalum distichum		Water Couch	L.
533		*	Paspalum vaginatum		Salt Water Couch	Sw.
577			Poa poiformis		Coastal Poa	(Labill.) Druce
11151		*	Rostraria pumila			(Desf.) Tzvelev
40427			Rytidosperma setaceum			(R.Br.) Connor & Edgar
624			Spinifex hirsutus		Hairy Spinifex	Labill.
635			Sporobolus virginicus		Marine Couch	(L.) Kunth
667			Tetrarrhena laevis		Forrest Ricegrass	R.Br.
673			Themeda triandra			Forssk.
722		*	Vulpia bromoides		Squirrel Tail Fescue	(L.) Gray
724		*	Vulpia myuros		Rat's Tail Fescue	(L.) C.C.Gmel.
	Podocarpaceae					
86			Podocarpus drouynianus		Wild Plum	F.Muell.
	Polygalaceae					
4551			Comesperma ciliatum			Steetz
4551			Comesperma ciliatum (pink flw form)			Steetz
4552			Comesperma confertum			Labill.
4555			Comesperma integerrimum			Endl.
	Polygonaceae					
2412			Muehlenbeckia adpressa		Climbing Lignum	(Labill.) Meisn.
-22		*	Rumex sp. (sterile)			
	Portulacaceae					
2854			Calandrinia granulifera		Pygmy Purslane	Benth.
	Primulaceae					
36375		*	Lysimachia arvensis		Pimpernel	(L.) U.Manns & Anderb.
36373		*	Lysimachia minima			(L.) U.Manns & Anderb.
6483			Samolus junceus			R.Br.
	Proteaceae					

14970		Adenanthos barbiger			Lindl.
1790		Adenanthos meisneri			Lehm.
28281		Adenanthos sp. Whicher Range (G.J. Keighery 9736) PN			
1800		Banksia attenuata		Slender Banksia	R.Br.
32677		Banksia bipinnatifida			(R.Br.) A.R.Mast & K.R.Thiele
32576		Banksia dallanneyi		Couch Honeypot	A.R.Mast & K.R.Thiele
1819		Banksia grandis		Bull Banksia	Willd.
1830		Banksia littoralis		Swamp Banksia	R.Br.
16853		Conospermum capitatum subsp. glabratum			E.M.Benn.
2080		Grevillea quercifolia		Oak-leaf Grevillea	R.Br.
2112		Grevillea trifida			(R.Br.) Meisn.
2128		Hakea amplexicaulis		Prickly Hakea	R.Br.
2175		Hakea lissocarpha		Honey Bush	R.Br.
2197		Hakea prostrata		Harsh Hakea	R.Br.
2214		Hakea trifurcata		Two-leaf Hakea	(Sm.) R.Br.
2267		Persoonia longifolia		Snottygobble	R.Br.
2312		Petrophile striata			R.Br.
2316		Stirlingia latifolia		Blueboy	(R.Br.) Steud.
2323		Synaphea gracillima			Lindl.
2324		Synaphea petiolaris		Synaphea	R.Br.
16863		Synaphea petiolaris subsp. triloba			A.S.George
2331		Xylomelum occidentale			R.Br.
	Pteridaceae				
25		Adiantum aethiopicum		Common Maidenhair	L.
29		Anogramma leptophylla		Annual Fern	(L.) Link
31		Cheilanthes austrotenuifolia			H.M.Quirk & T.C.Chambers
34		Cheilanthes distans		Bristly Cloak Fern	(R.Br.) Mett.
	Ranunculaceae				
2929		Clematis pubescens		Common Clematis	Endl.

2932			Ranunculus colonorum		Common Buttercup	Endl.
	Restionaceae					
17663			Desmocladus asper			(Nees) B.G.Briggs & L.A.S.Johnson
17691			Desmocladus fasciculatus			(R.Br.) B.G.Briggs & L.A.S.Johnson
16595			Desmocladus flexuosus			(R.Br.) B.G.Briggs & L.A.S.Johnson
1070			Hypolaena exsulca			R.Br.
	Rhamnaceae					
13484			Cryptandra arbutiflora var. tubulosa			(Fenzl) Benth.
4828			Spyridium globulosum		Basket Bush	(Labill.) Benth.
4842			Trymalium ledifolium			Fenzl
	Rosaceae					
3184			Acaena echinata		Sheep's Burr	Nees
	Rubiaceae					
7323		*	Galium murale		Small Goosegrass	(L.) All.
18254			Opercularia apiciflora			Juss.
7346			Opercularia echinocephala		Bristly Headed Stink Weed	Benth.
7348			Opercularia hispidula		Hispid Stinkweed	Endl.
18255			Opercularia vaginata		Dog Weed	Juss.
7362		*	Sherardia arvensis		Field Madder	L.
	Rutaceae					
4417			Boronia dichotoma			Lindl.
4444			Boronia tenuis	4	Blue Boronia	(Lindl.) Benth.
4454			Diplolaena dampieri		Southern Diplolaena	Desf.
18529			Philotheca spicata		Pepper and Salt	(A.Rich.) Paul G.Wilson
	Santalaceae					
10907			Exocarpos odoratus		Scented Ballart	(Miq.) A.DC.
10765			Exocarpos sparteus		Broom Ballart	R.Br.
2342			Leptomeria cunninghamii			Miq.
2355			Leptomeria squarrolosa			R.Br.
2356			Santalum acuminatum		Quandong	(R.Br.) A.DC.
	Sapindaceae					

4757		Dodonaea ceratocarpa			Endl.
4775		Dodonaea pinifolia			Miq.
	Scrophulariaceae				
7289		Myoporum caprarioides		Slender Myoporum	Benth.
7292		Myoporum oppositifolium		Twin-leaf Myoporum	R.Br.
7107	*	Verbascum virgatum		Twiggy Mullein	Stokes
	Selaginellaceae				
6		Selaginella gracillima		Tiny Clubmoss	(Kunze) Salomon
	Solanaceae				
6949		Anthocercis littorea		Yellow Tailflower	Labill.
6988	*	Solanum americanum		Glossy Nightshade	Mill.
7037		Solanum symonii			H.Eichler
	Stylidiaceae				
7676		Levenhookia pusilla		Midget Stylewort	R.Br.
7677		Levenhookia stipitata		Common Stylewort	(Benth.) F.Muell.
7678		Stylidium adnatum		Common Beaked Triggerplant	R.Br.
7681		Stylidium affine		Queen Triggerplant	Sond.
7684		Stylidium amoenum		Lovely Triggerplant	R.Br.
7696		Stylidium calcaratum		Book Triggerplant	R.Br.
7708		Stylidium crassifolium		Thick-leaved Triggerplant	R.Br.
7718		Stylidium diversifolium		Touch-me-not	R.Br.
7719		Stylidium ecorne		Foot Triggerplant	(F.L.Erickson & J.H.Willis) P.G.Farrell & S.H.James
19251		Stylidium eriopodum			DC.
25801		Stylidium hesperium MS			Wege
12590		Stylidium lowrieianum			Carlquist
19248		Stylidium megacarpum			Lowrie, A.H.Burb. & Kenneally
7773		Stylidium petiolare		Horn Triggerplant	Sond.
7785		Stylidium repens		Matted Triggerplant	R.Br.
	Thymelaeaceae				
5231		Pimelea angustifolia		Narrow-leaved Pimelea	R.Br.
5243		Pimelea ferruginea			Labill.

5249		Pimelea hispida		Bristly Pimelea	R.Br.
11402		Pimelea imbricata var. piligera			(Benth.) Diels
5259		Pimelea preissii			Meisn.
5261		Pimelea rosea		Rose Banjine	R.Br.
12041		Pimelea suaveolens subsp. suaveolens		Tall Mulla Mulla	Meisn.
	Urticaceae				
1762		Parietaria debilis		Pellitory	G.Forst.
	Violaceae				
5216		Hybanthus calycinus		Wild Violet	(Ging.) F.Muell.
5221		Hybanthus floribundus			(Lindl.) F.Muell.
	Xanthorrhoeaceae				
1253		Xanthorrhoea gracilis		Graceful Grass Tree	Endl.
1256		Xanthorrhoea preissii		Grass tree	Endl.
	Zamiaceae				
85		Macrozamia riedlei		Zamia	(Gaudich.) C.A.Gardner