

**FLORA AND VEGETATION
OF
MT GIBSON**



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SUMMARY

Bennett Environmental Consulting Pty Ltd was commissioned by Mt Gibson Iron Limited to undertake a flora and vegetation survey of their lease at Mt Gibson, north of Wubin. Mt Gibson Station was settled in 1878 by G. and H. Foss to graze sheep. Recently the station has been partially destocked and a small portion excised as an Emu Farm which provides accommodation and a tourist interest. Lippie *et al.* (1983) described the geology and Payne *et al.* (1998) the soils and the land systems. The geological age of the area is Archaean and Cainozoic with 5 units recognised in both. Five soil types were described for the area and four land systems, basically following the height of the hills above the plain.

A field survey was undertaken between 11th and 16th September when all accessible tracks were traversed by vehicle and where vehicle access was not possible, the different vegetation units were traversed on foot. Vegetation was described in the field and mapped using this information and aerial photographs.

A total of 24 vegetation communities were described for the area using the format of Beard (1990), consisting of 6 Woodlands, 4 Mallee communities, 12 Thicket communities and 2 Heath communities. None of these communities is considered rare or restricted. Muir (1995) examined Mt Singleton, Wyalacopin Hill, Watheragabbing Hill and Kuckamanyou Hill and found these hills supported the same vegetation formations with approximately the same plant species assemblages as found on Mt Gibson.

All the peaks of the Mt Gibson Range were found to vary considerably in the vegetation community with *Acacia* species, *Melaleuca* species and *Allocasuarina acutivalvis* subsp. *prinsepiana* being the dominant taxa. The plains typically consisted of Woodlands of *Eucalyptus loxophleba* subsp. *supralaevis* or Mallees of *E. brachycorys* and *E. hypochlamydea* subsp. *hypochlamydea* often associated with *Callitris glaucophylla* and *Eucalyptus loxophleba* subsp. *supralaevis*. On the edge of the Great Northern Highway there was an extensive area of sandplain which exhibited a varied flora.

Two rare species (WA legislation) and vulnerable species (Commonwealth legislation), *Darwinia masonii* and *Eucalyptus synandra* were located on the lease. However the largest stand of *E. synandra* observed was just off the lease. About 100 plants of *Darwinia masonii* were recorded in the area to be mined however this is only a small number of the total population, estimated to be several thousand. This

species can be readily propagated from cuttings according to horticultural staff at Kings Park and Botanic Garden, so consideration should be given to obtaining a licence to collect propagation material and to use these in any amenity plantings if permission is received for mining to proceed.

Acacia cerastes a Priority 1 taxon was also located in the area proposed for mining. However this species was located at several other sites, including along the main track into the station. *Acacia acanthoclada* subsp. *glaucescens* a Priority 3 species was located on the eastern edge of the lease and near the old Harp mine on the track into the station. Both these *Acacia* species were located where there had been disturbance, on the edge of borrow pits or along track edges. The search undertaken by the Rare Flora Section (CALM) of their database recorded both these species as occurring in adjoining areas.

Very few introduced species (21) were recorded from the lease most being concentrated in two areas, on the southern crest of Mt Gibson and near the old Harp mine. Extremely invasive weeds recorded from the Harp mine included Ruby Dock (*Rumex vesicarius*), Paterson's curse (*Echium plantagineum*), Maltese Cockspur (*Centaurea melitensis*) and Ward's weed (*Carrichtera annua*). It is recommended that these weeds be eradicated using a total herbicide before mining commences. To ensure these weeds are not spread and that the integrity of the bushland is maintained by ensuring no other weeds are introduced during mining, all vehicles entering the area must be checked and if necessary washed, to ensure there is no soil or plant material present.

Once permission is received to mine the area, care must be exercised to ensure there is no damage to the surrounding vegetation through weed introduction or damage by vehicles. All staff employed on the site must be educated in the environmental importance of the area, the presence of the rare species *Darwinia masonii* and the implications if any of these plants are damaged. It is recommended that the mine area be fenced to ensure these requirements are met.

1. INTRODUCTION

Mt Gibson Station is approximately half way between Wubin and Paynes Find on the Great Northern Highway. The station was settled in 1878 by G. and H. Foss as a pastoral lease to graze sheep. Today the station has had the stocking rate reduced to 1 sheep per 3ha and also includes an Emu Farm with accommodation and tourist facilities. Gold has been mined at two locations on the Mt Gibson Pastoral lease, the last at the southern extremity closing about one year ago.

Mt Gibson occurs on the boundary between the Austin Botanical District of the Eremaean and the Avon Botanical District of the Southwest Botanical Provinces (Beard, 1990). The division between these two Botanical Provinces is the 'Eucalyptus-Acacia' line between the *Acacia* low woodland and the *Eucalyptus* medium height woodland on lower slope soils. The Austin Botanical District is characterised by mulga (*Acacia aneura*) low woodland on the plains and shrubs on the hills with *Eucalyptus* spp. and *Triodia basedowii* on the sand plains. The Avon Botanical District is characterised by low shrubs and heath on the sandplain, *Acacia-Allocasuarina* thickets on the ironstone gravels, woodlands of York Gum (*Eucalyptus loxophleba*), salmon gums (*Eucalyptus salmonophloia*) and wandoo (*Eucalyptus wandoo*) on loam soils and halophytes on saline soils.

Both these Botanical Districts have a similar geology being Archaean granites with infolded metamorphics of the Yilgarn Block. The rainfall of the Avon Botanical District varies over its range from 300-650mm whereas the Austin Botanical District has a rainfall of approximately 200mm. The topography is described by Beard (1990) as undulating plateau mostly with disorganised drainage for the Avon Botanical District and undulating with occasional ranges of low hills for the Austin Botanical District. The soils of the Avon Botanical District are typically yellow earths on sandplains with ironstone gravels, hard setting loam soils on the slopes and lower land and saline soils in the depressions. The soils of the Austin Botanical District are described as shallow earthy loam over overlying red-brown hardpan with shallow stony loams on the hills and red earthy sands on the sand plains.

2. BACKGROUND

2.1 CLIMATE

Mt Gibson occurs in the the Semi-desert Mediterranean bioclimatic region of Beard (1990). There are 9-11 months of dry weather with mild wet winters, hot dry summers and an average annual rainfall between 250-300mm. The nearest rainfall recording station is at Paynes Find where the average rainfall is 273mm. The rainfall is both irregular and variable in the area. In early 2000 Mt Gibson received an above average rainfall from a rain bearing depression following a cyclone but did not receive the typical winter rain. As a consequence the annuals so typical after a good winter rain were not apparent during the spring months.

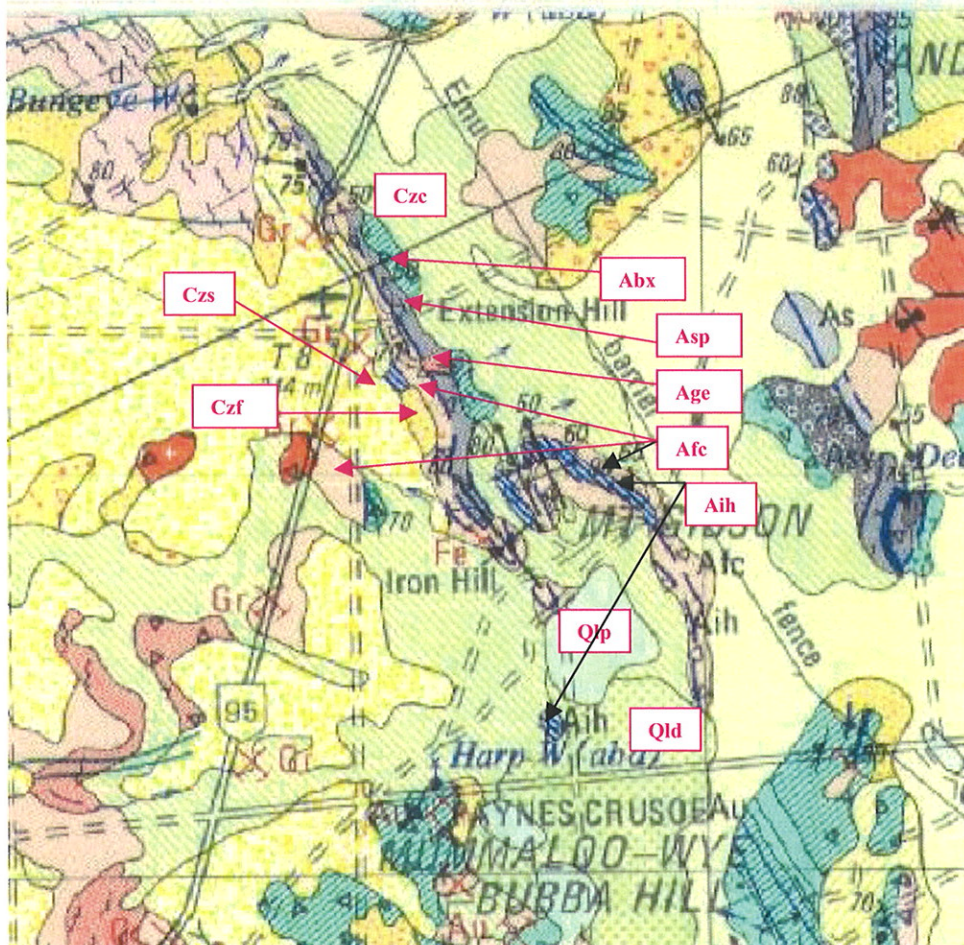
2.2 GEOLOGY

Mt Gibson occurs within the Ninghan Geological Sheet (Lipple *et al.*, 1983). The lease area proposed has the units as illustrated in Diagram 2.1 and explained in Table 2.1.

Table 2.1. Geology of Mt Gibson Iron lease

ERA	REFERENCE	DESCRIPTION
Archaean	Age	Adamellite to granodiorite – medium even grained
	Afc	Plesic tuff and agglomerate
	Abx	Differentiated mafic flow and sill rocks with pyroxenite or peridotite bases
	Aih	Haematite-magnetite-quartz banded iron formation
	Asp	Pelitic to semi-pelitic quartz-feldspar rocks – includes siltstone, shale, phyllite and schist
Cainozoic	Qld	Dunes – sand and kopi; marginal to lakes
	Qlp	Playas – clay silt and sand; mainly saline
	Czc	Alluvial and colluvial deposits – transported clay, sand and lithic fragments
	Czf	Quartz-felspar sand and lithic fragments from granitoid rocks
	Czs	Sandplain – yellow sand; commonly reworked by wind.

Figure 2.1 Geology of Mt Gibson Iron



2.3 SOILS

Agriculture Western Australia (Payne *et.al*, 1998) discussed the soils of the area, their wind and water erosion potential and inundation risk. The soils associated with the land systems of the lease (Diagram 2.2) are listed in Table 2.2.

Table 2.2. Soils of the Mount Gibson Iron project (from Payne *et.al*, 1998)

LAND TYPE	SOIL TYPE
Hillslopes, ridges and crests	Stony soils; Shallow stony red earths; Shallow red earths
Sandplains	Shallow red clayey sands; Shallow yellow clayey sands; Deep red sands
Alluvial plains, drainage zones	Deep red earths; Shallow red earths; Shallow to deep clays
Lake margins	Shallow red clayey sands
Lake beds	Highly saline soils

Table 2.3. Land System Units of the Mt Gibson Iron project (from Payne *et al.*, 1998)

UNIT	DESCRIPTION
Tallering	Scattered to moderately dense tall shrublands of <i>Acacia ramulosa</i> and other acacias with undershrubs such as <i>Thryptomene</i> and <i>Eriostemon</i> species on the ridges and hills and an understorey of <i>Eremophila</i> spp. and <i>Ptilotus obovatus</i> on the slopes.
Moriarty	Very scattered to moderately close eucalypt woodlands with <i>Atriplex bunburyana</i> and other halophytic low shrubs or shrublands of <i>Acacia</i> or <i>Atriplex</i> spp. Also some eucalypt-acacia woodlands with non-halophytic low shrubs on the alluvial plains and drainage lines.
Illaara	Scattered acacia tall shrublands with <i>Eucalyptus loxophleba</i> overstorey of close <i>Acacia aneura</i> shrublands and woodlands on loamy plains and drainage lines.
Pindar	Scattered to moderately close eucalypt woodland or acacia tall shrubland with a eucalypt overstorey with perennial grasses including <i>Monochaeta paradoxa</i> on the loamy plains. Moderately close to open acacia mid to tall shrubland occasionally with <i>Eucalyptus loxophleba</i> or <i>Callitris glaucophylla</i> overstorey on sand sheets.

Whilst undertaking a survey of the Mt Gibson hills for a rare plant species, *Darwinia masonii*, Muir (1995) recorded the vegetation of the Project Area as being predominantly *Acacia ramulosa* – *A. linophylla* – *A. quadrimarginea* shrubland with areas dominated by *Allocasuarina acutivalvis* shrubs up to 4m tall with a canopy cover of 8%. The understorey was described as sparse with *Grevillea paradoxa* and *Phebalium tuberculatum* to 1m tall and a canopy cover of 5%. The soils are skeletal clay to heavy loam. The lower slopes and plains at the foot of the hills mainly supported a similar plant assemblage with *Acacia* shrubland and woodland of *Acacia* and *Allocasuarina* shrubland up to 5m tall and with a canopy cover of 80%. The understorey was very similar to the hills. The soils are sandy clay loams.

At the southern end of the hills the vegetation was *Eucalyptus loxophleba* Woodland to 10m tall with a canopy cover of 20%. The understorey was very sparse with some *Olearia muelleri* and scattered halophytes including *Maireana georgei*. The soils are a heavy clay.

In addition to the Mt Gibson Range, Muir (1995) also examined Mt Singleton, Wyalacoopin Hill, Watheragabbing Hill and Kuckamanyou Hill all part of the Mt Singleton complex. These were all found to support the same vegetation formation with approximately the same plant species assemblage.

2.5 RARE AND PRIORITY FLORA

Muir (1995) surveyed *Darwinia masonii*, the rare plant species known to occur in the area and also located another rare species, *Eucalyptus synandra*. He recorded

Darwinia masonii from 10 locations on the Mt Gibson Range. These were all on steep ridges (20°-25°) slope and all on jaspilite or hematite ore. Most were found on the crest line or upper one third of the south-western side of the ridges only a few being found on the north eastern side of the ridges. As a conservative estimate. Muir (1995) suggested there was in excess of 1,800 plants in the Mt Gibson area.

3. OBJECTIVES

The objectives of this project were to:

- describe and map the vegetation communities of the lease;
- locate any Rare and Priority species on the lease;
- provide a list of taxa from the lease; and
- provide the Wubin Community Herbarium with a duplicate of the taxa recorded from the lease.

4. METHODS

Prior to undertaking the field work a search was requested from the Department of Conservation and Land Management Rare Flora database for the Mt Gibson Range and surrounding areas. The search was extended beyond the immediate vicinity of the Mt Gibson Range to ensure that any potential rare and priority flora that may occur were known. Time was spent at the Western Australian Herbarium becoming familiar with the species on this list. In addition a search was made of the Western Australian Herbarium's Florabase (CALM, 2000) to locate all taxa recorded from the Mt Gibson area.

Field work was undertaken between 11th and 16th September 2000 when most plants were flowering. Maps were provided of the area but no aerial photographs were available before the field work commenced. However as the hills were much higher than the surrounding land the vegetation was viewed from these vantage points and different vegetation units noted. All accessible tracks were traversed by vehicle and where access was not possible, hills were climbed or different vegetation units were walked.

Two collections of each taxon recorded within the vegetation communities were pressed. One collection was for the Wubin Community Herbarium and the other for the Western Australian Herbarium. These were dried and their identity checked against specimens held at the Western Australian Herbarium.

All Rare and Priority plant taxa located had their GPS location, the vegetation unit in which they grew and the approximate number of plants recorded.

The location of the different vegetation communities noted in the field was recorded by distance along the tracks traversed and by GPS, providing their exact location on the map provided. Aerial photographs became available at the completion of the field work and the final vegetation map was prepared from the data obtained in the field and from comparison with the aerial photographs.

5. RESULTS

Ten different geological units have been recorded for the mine site (Lipple *et al.*, 1983) so it was anticipated that the vegetation and flora would vary accordingly. A total of 62 sites were sampled, recording the vegetation community and the taxa present.

5.1 VEGETATION

The different vegetation communities identified at the site are discussed below under their structural units. A complete list of taxa recorded for each vegetation community is given in Appendix B and a photographic record in Appendix C. The vegetation map (Appendix E) indicates the distribution of each vegetation community within the lease. The format for nomenclature follows that of Beard (1990) as outlined in Appendix D.

5.1.1 WOODLANDS

W1 Woodland of *Eucalyptus salmonophloia* (Salmon gum) over Thicket of *Acacia* species over Dense Low Heath dominated by *Atriplex bunburyana* on loam.

Upper stratum: *Eucalyptus salmonophloia* (20%)

Middle stratum: *Pittosporum phylliraeoides* var. *microcarpa*, *Acacia anthochaera*, *Acacia obtecta* (15%)

Lower stratum: *Atriplex bunburyana* (75%)

W2 Dense to Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with occasional *Callitris glaucophylla* over a Thicket of *Acacia* species dominated by *A.assimilis* over Herbs dominated at the time of survey by *Velleia rosea* on silty sand.

Upper stratum: *Eucalyptus loxophleba* subsp. *supralaevis*, *Callitris glaucophylla* (40-60%)

Middle stratum: *Acacia assimilis*, *A. anthochaera*, *A. ramulosa*, *A. tetragonophylla*, *Exocarpos aphyllus*, *Grevillea hakeoides* subsp. *hakeoides* (30%)

Lower stratum: *Austrostipa elegantissima*, *Cephalopterum drummondii*, *Maireana georgei*, *Podolepis lessonii*, *Velleia rosea*, *Zygophyllum ovatum* (50%)

W3 Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* and *Callitris glaucophylla* over a Thicket of *Melaleuca stereophloia*, *Acacia nigripilosa* subsp. *nigripilosa*, *A. obtecta* over Low Shrubland of *Olearia dampiera* subsp. *eremicola* and *Bossiaea walkeri* and Herbs on silty sand.

Upper stratum: *Eucalyptus loxophleba* subsp. *supralaevis*, *Callitris glaucophylla* (10%)

Middle stratum: *Acacia nigripilosa* subsp. *nigripilosa*, *A. obtecta*, *Exocarpos aphyllus*, *Eremophila ?_cupulantha*, *Grevillea hakeoides* subsp. *hakeoides*, *Melaleuca stereophloia* (30%)

Lower stratum: *Acacia andrewsii*, *Bossiaea walkeri*, *Lomandra effusa*, *Olearia dampiera* subsp. *eremicola*, *O. muelleri*, *Rhagodia preissii*, *Velleia rosea* (15%)

W4 Very Open Woodland of *Callitris glaucophylla* and *Eucalyptus loxophleba* subsp. *supralaevis* over an Open Thicket of *Acacia acuminata* over a Herbland in sandy loam.

Upper stratum: *Callitris glaucophylla*, *Eucalyptus loxophleba* subsp. *supralaevis* (20%)

Middle stratum: *Acacia acuminata*, *Allocasuarina acutivalvis* subsp. *prinsepiana* (30%)

Lower stratum: *Austrostipa elegantissima*, *Cephalopterum drummondii*, *Podolepis canescens*, *Schoenia cassiniana*, *Velleia rosea*, *Waitzia acuminata* (60%)

W5 Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with occasional *Callitris glaucophylla* over an Open Thicket of *Acacia acuminata* over a Low Shrubland of mixed species in silty clay.

Upper stratum: *Callitris glaucophylla*, *Eucalyptus loxophleba* subsp. *supralaevis* (28%)

Middle stratum: *Acacia acuminata*, *Santalum acuminatum* (40%)

Lower stratum: *Dodonaea inaequifolia*, *Scaevola spinescens*, *Velleia rosea* (5%)

W6 Very Open Woodland of *Eucalyptus salicola* over Open Low Shrubland of mixed shrubs over Herbs and Dense Low Grass.

Upper stratum: *Eucalyptus salicola* (5%)

Middle stratum: *Dodonaea viscosa* subsp. *angustissima*, *Eremophila* ? *caperata*,
Olearia dampieri subsp. *eremicola*

Lower stratum: Herbs; *Brachyscome cheilocarpa*, *Podolepis capillaries* (5%)

Grasses; *Aristida contorta*, *Austrostipa elegantissima*, *A.*
trichophylla, *Pentastichis airoides* (90%)

5.1.2 MALLEES

M1 Open Tree Mallee of *Eucalyptus brachycorys*, *E. hypochlamydea* subsp. *hypochlamydea*, *E. loxophleba* subsp. *supralaevis* and *Callitris glaucophylla* over and surrounded by a Thicket of *Acacia* species, *Baeckea benthamii* and/or *Eremophila* ? *cupulantha* over Low Shrubland dominated by *Olearia dampiera* subsp. *eremicola* and Herbs on loam.

Upper stratum: *Eucalyptus brachycorys*, *E. hypochlamydea* subsp. *hypochlamydea*, *E. loxophleba* subsp. *supralaevis*, *Callitris glaucophylla* (10%)

Middle stratum: *Acacia acuminata*, *A. anthochaera*, *A. ramulosa*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Baeckea benthamii* (ms), *Hakea francisiana*, *Melaleuca eleuterostachya*, *M. leiocarpa*, *M. stereophloia*, *M. uncinata* (50%)

Lower stratum: *Dianella revoluta*, *Olearia dampiera* subsp. *eremicola*, *Phebalium tuberculatum*, *Prostanthera campbellii* (10%)

M2 Very Open Tree Mallee of *Eucalyptus brachycorys* and *E. oldfieldii* over a Thicket of *Acacia anthochaera* and *A. ramulosa* over a Herbland in loamy clay.

Upper stratum: *Eucalyptus brachycorys*, *E. oldfieldii*, *Melaleuca eleuterostachya*, *M. leiocarpa*, *M. uncinata* (50%)

Middle stratum: *Acacia anthochaera*, *A. ramulosa* (50%)

Lower stratum: *Microcorys* sp. Mt Gibson (S.Patrick 2098), *Velleia rosea* (10%)

M3 Open Shrub Mallee of *Eucalyptus brachycorys* and *E. synandra* over Thicket of *Acacia anthochaera* and *A. ramulosa* over Low Shrubland of *Baeckea* affin. *cryptandroides* and *Ptilotus obovatus* over Herbs of *Amphipogon caricinus* subsp. *caricinus*, *Chamaexeros macrantha*, *Gilbertia tenuifolia*, *Waitzia acuminata* and *Velleia rosea*.

Upper stratum: *Callitris glaucophylla*, *Eucalyptus brachycorys*, *E. loxophleba* subsp. *supralaevis*, *E. synandra* (20%)

Middle stratum: *Acacia anthochaera*, *A. ramulosa*, *A. tetragonophylla*, *Eremophila clarkei*, *E. latrobei*, *Senna artemidioides* subsp. *filifolia*

Lower stratum: *Baeckea* affin. *cryptandroides*, *Olearia humilis*, *Philotheca sericea*, *Ptilotus obovatus*

Herbs: *Amphipogon caricinus* subsp. *caricinus*, *Austrostipa elegantissima*, *Chamaexeros macrantha*, *Gilbertia tenuifolia*, *Goodenia pinnatifida*, *Stenopetalum filifolium*, *Waitzia acuminata*, *Velleia rosea*.

M4 Very Open Shrub Mallee of *Eucalyptus leptopoda* with emergent *Eucalyptus loxophleba* subsp. *supraleavis* over Thicket of *Acacia ramulosa* over Herbland of Asteraceae species in loam.

Upper stratum: *Eucalyptus leptopoda*, *E. loxophleba* subsp. *supraleavis* (6%)

Middle stratum: *Acacia anthochaera*, *A. ramulosa*, *Melaleuca leiocarpa* (65%)

Lower stratum: *Velleia rosea*, *Waitzia acuminata* (35%)

5.1.3 THICKETS

T1 Dense Thicket of mixed species dominated by *Acacia assimilis*, *A. stereophylla* var. *stereophylla*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Calycopeplus paucifolius*, *Grevillea obliquistigma*, and *Melaleuca nematophylla* over Low Shrubland dominated by *Darwinia masonii*, *Grevillea paradoxa*, *Hemigenia* sp. Paynes Find, *Hibbertia acerosa*, *Leucopogon breviflorus* and *Philotheca sericea* in jaspilite rocks with pockets of loam.

Upper stratum: *Acacia assimilis*, *A. stereophylla* var. *stereophylla*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Calycopeplus paucifolius*, *Eucalyptus oldfieldii*, *Grevillea obliquistigma*, *Melaleuca nematophylla*, *Micromytrus racemosa* subsp. *racemosa* (85%)

Middle stratum: *Acacia cerastes*, *Darwinia masonii*, *Gastrolobium laytonii*, *Grevillea paradoxa*, *Hemigenia* sp. Paynes Find, *Hibbertia acerosa*, *Leucopogon breviflorus*, *Philotheca sericea* (25%)

Lower stratum: *Amphipogon caricinus* var. *caricinus*, *Lepidosperma tenue*, *Sclerolaena fusiformis*, *Xanthosia bungei* (10%)

T2 Dense Thicket dominated by *Acacia assimilis*, *A. stereophylla* var. *stereophylla*, *A. ramulosa* and *Allocasuarina acutivalvis* var. *prinsepiana* over Low Shrubland of *Acacia acuaria*, *Hemigenia* sp. Paynes Find and *Baeckea* affin. *cryptandroides* in loam with scattered rocks on the surface.

Upper stratum: *Acacia assimilis*, *A. stereophylla* var. *stereophylla*, *A. ramulosa*, *Allocasuarina acutivalvis* var. *prinsepiana*, *Malleostemon roseus*, *Melaleuca nematophylla*, *M. uncinata* (85%)

Middle stratum: *Acacia acuaria*, *Hemigenia* sp. Paynes Find, *Baeckea* affin. *cryptandroides*, *Keraudrenia integrifolia*, *Melaleuca cordata* (15%)

Lower stratum: *Brunonia australis*, *Velleia cyptopotamica* (5%)

T3 Dense Thicket of *Acacia assimilis*, *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Melaleuca nematophylla* over Low Shrubland of *Hemigenia* sp. Paynes Find and *Hibbertia crassifolia* in loam pockets in jaspilite rocks.

Upper stratum: *Acacia assimilis*, *A. ramulosa*, *A. stereophylla* var. *stereophylla*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Calycopeplus paucifolius*, *Grevillea obliquistigma*, *Melaleuca nematophylla* (70%)

Middle stratum: *Baeckea* affin. *cryptandroides*, *Hemigenia* sp. Paynes Find, *Hibbertia crassifolia*, *Philotheca sericea* (35%)

Lower stratum: *Xanthosia bungei* (40%)

T4 Dense Thicket of *Allocasuarina acutivalvis* subsp. *prinsepiana* with occasional *Eucalyptus oldfieldii* over an Open Shrubland of *Acacia* species over Open Low Shrubland of *Hemigenia* sp. Paynes Find or Open Herbs of *Xanthosia bungei* in loam with abundant small rocks on the surface.

Upper stratum: *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Eucalyptus oldfieldii*, *Melaleuca nematophylla*, *Micromyrtus racemosa* subsp. *racemosa* (85%)

Middle stratum: *Acacia assimilis*, *A. ramulosa* (3%)

Lower stratum: *Amphipogon carinatus* subsp. *carinatus*, *Hemigenia* sp. Paynes Find, *Xanthosia bungei* (20%)

T5 Thicket of *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Grevillea obliquistigma* with emergent *Callitris glaucophylla* over Low Shrubland dominated by *Darwinia masonii*, *Hibbertia crassifolia*, *Melaleuca radula* and *Philotheca brucei* subsp. *brucei* over Open Herbs of *Xanthosia bungei* in loam pockets in dense jaspilite rocks.

Upper stratum: *Acacia ramulosa*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Callitris glaucophylla*, *Grevillea obliquistigma* (60%)

Middle stratum: *Darwinia masonii*, *Eremophila clarkei*, *E. latrobei*, *Hibbertia crassifolia*, *Malleostemon roseus*, *Melaleuca nematophylla*, *M. radula*, *Philotheca brucei* subsp. *brucei* (15%)

Lower stratum: *Cheilanthes austrotenuifolia*, *Podolepis lessonii*, *Ptilotus obovatus*, *Xanthosia bungei* (5%)

T6 Thicket of *Acacia aneura* and *Acacia stowardii* over Low Shrubland of mixed species with large numbers of *Darwinia masonii* in loam with abundant rocks on the surface.

Upper stratum: *Acacia aneura*, *A. stowardii*, *Allocasuarina acutivalvis* subsp. *prinsepiana* (30%)

Middle stratum: *Acacia assimilis*, *Darwinia masonii*, *Eremophila clarkei*, *Grevillea obliquistigma*, *Malleostemon roseus* (30%)

Lower stratum: *Cheilanthes austrotenuifolia*, *Hibbertia crassifolia*, *Philotheca sericea*, *Ptilotus obovatus* (5%)

T7 Open Thicket of *Acacia ramulosa* with emergent *Callitris glaucophylla* and *Eucalyptus loxophleba* subsp. *supralaevis* over Low Shrubland and Herbs in loamy sand surrounding the lake edge.

Upper stratum: *Acacia anthochaera*, *A. ramulosa*, *Eucalyptus loxophleba* subsp. *supralaevis*, *Exocarpos aphyllus*, *Melaleuca eleuterostachya* (75%)

Middle stratum: *Acacia tetragonophylla*, *Alyxia buxifolia*, *Bossiaea walkeri*, *Scaevola spinescens* (5%)

Lower stratum: *Velleia rosea*,

T8 Dense thicket of *Melaleuca* sp. Wongan Hills and *Acacia ramulosa* over low shrubland of mixed species in loamy clay soil.

Upper stratum: *Acacia ramulosa*, *Callitris glaucophylla*, *Eucalyptus brachycorys*, *E. loxophleba* subsp. *supralaevis*, *Melaleuca* sp. Wongan Hills (82%)

Middle stratum: *Acacia anthochaera*, *A. stowardii* (5%)

Lower stratum: *Acacia andrewsii*, *Philotheca brucei* subsp. *brucei* (1%)

T9 Dense Thicket of *Acacia* species, *Hakea* species with occasional *Eucalyptus brachycorys* and *E. oldfieldii* with emergent *Callitris glaucophylla*, over Open Low Shrubland of mixed species on sand.

Upper stratum: *Acacia anthochaera*, *A. assimilis*, *A. ramulosa*, *Eucalyptus brachycorys*, *E. oldfieldii*, *Hakea francisiana*, *Calycopeplus pauciflorus*, *Santalum acuminatum* (80%)

Middle stratum: *Melaleuca cordata*, *Grevillea paradoxa*, *Hakea invaginata* (5%)

Lower stratum: *Baeckea* affin *cryptandroides*, *Hemigenia* sp. Paynes Find, *Phebalium tuberculatum*, *Philotheca sericea* (10%)

T10 Thicket of *Acacia acuminata*, *A. ramulosa*, *Allocasuarina acutivalvis* subsp. *prinsepiana* with emergent *Eucalyptus hypoclamydea* subsp. *hypoclamydea* over an Open Shrubland of mixed species on sandy loam.

Upper stratum: *Acacia acuminata*, *A. ramulosa*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Eucalyptus hypoclamydea* subsp. *hypoclamydea* (75%)

Middle stratum: *Acacia acuaria* (20%)

Lower stratum: *Millotia tenuifolia* var. *tenuifolia*, *Podolepis lessonii*, *Velleia rosea*(2%)

T11 Thicket of *Acacia* species and *Allocasuarina acutivalvis* subsp. *prinsepiana* with emergent Very Open Mallee of *Eucalyptus brachycorys* and *E. leptopoda* a in loam.

Upper stratum: *Eucalyptus brachycorys*, *E. oldfieldii* (1-25%)

Middle stratum: *Acacia acuminata*, *A. anthochaera*, *A. assimilis*, *A. ramulosa*, *A. stereophylla* var. *stereophylla*, *Allocasuarina acutivalvis* subsp. *prinsepiana* (20-90%)

Lower stratum: *Hemigenia* sp. Paynes Find, *Hibbertia acerosa*, *Microcorys* sp. Mt Gibson (5-20%)

T12 Thicket of *Acacia ramulosa* with emergent *Eucalyptus oldfieldii* and *E. loxophleba* subsp. *supralaevis* over a Low Shrubland over Herbs in loam with pebbles common on the surface.

Upper stratum: *Eucalyptus oldfieldii*, *E. loxophleba* subsp. *supralaevis*

Middle stratum: *Acacia aneura*, *A. ramulosa*, *Allocasuarina acutivalvis* subsp. *prinsepiana*

Lower stratum: *Amphipogon caricinus* var. *caricinus*, *Baeckea* affin. *cryptandroides*, *Wrixonia prostanthoides*

5.1.4 HEATHS

HS1 Low Heath of *Ptilotus obovatus* with emergent shrubs of *Acacia stowardii* and *Calycopeplus paucifolius* over Herbs in loamy clay amongst large boulders.

Upper stratum: *Acacia stowardii*, *Calycopeplus paucifolius*, *Melaleuca nematophylla* (12%)

Middle stratum: *Acacia exocarpoides*, *Dodonaea inaequifolia*, *Eremophila clarkei* (10%)

Lower stratum: *Austrostipa trichophylla*, *Cheilanthes austrotenuifolia*, *Gilbertia tenuifolia*, *Lawrencina repens* (15%)

HS2 Dense Low Heath of *Halosarcia* species with other chenopods over Herbs in sandy clay soil in a salt lake.

Upper stratum: *Atriplex lindleyi* subsp. *inflata*, *Halosarcis halocnemoides*, *H. indica* subsp. *bidens*, *H. lylei*, *H. peltata*, *Maireana carnososa*, *M. georgei*, *M. radiata*, *Lawrencina repens* (90%)

Lower stratum: *Eragrostis falcata*, *Disphyma sp.*, *Podolepis capillaris* (2%)

5.2 FLORA

A total of 285 taxa in 160 genera and 56 families were recorded from the lease area (Appendix A). Of these 21 were introduced species. The dominant families and the number of taxa present in each is listed in Table 5.1 representing 52% of the total taxa.

Table 5.1 The dominant plant families recorded from the lease area.

PLANT FAMILY	NATIVE TAXA	INTRODUCED TAXA
Asteraceae	41	6
Myrtaceae	28	-
Mimosaceae	22	-
Chenopodiaceae	21	-
Poaceae	11	5
Proteaceae	13	-

5.3 RARE AND PRIORITY FLORA

Plant taxa likely to become extinct or in need of special protection are gazetted as Declared Rare Flora under the Western Australian Wildlife Conservation Act (1950) and Commonwealth, Australian New Zealand Environment and Conservation Council (ANZEC). The Wildlife Conservation Act prohibits the taking of declared rare flora by any person on any land throughout the State without the written consent of the Minister for the Environment (Brown, 1998).

In addition to the rare flora list the Department of Conservation and Land Management maintain priority flora lists. Priority flora are not mentioned in the legislation and do not have the same legal status and protection as rare flora. The

priority flora are grouped according to the perceived urgency for further survey. Priority 1 flora are “Taxa with few, poorly known populations on threatened lands (ie not managed for conservation)”: Priority 2 flora are “Taxa with few, poorly known populations on conservation lands eg nature reserves or national parks”: Priority 3 flora are “Taxa with several, poorly known populations, some on conservation lands or are present over a large range and not under immediate threat”: and Priority 4 are “Taxa that have been adequately surveyed and found to be rare but secure, but require monitoring to check their conservation status does not change”.

A search was requested from the Rare Flora Section of CALM for the co-ordinates 29°20’ – 29°50’ and 117°15’ – 117°45’. The area requested in the search extended well beyond the lease area and resulted in the following taxa being recorded as listed in Table 5.2.

Table 5.2 Potential List of Rare and Priority Species from Mt Gibson and surrounding areas

TAXON	CONSERVATION STATUS	LOCATION
<i>Acacia acanthoclada</i> subsp. <i>glaucescens</i>	P3	Mt Gibson Stn, Three Springs, Paynes Find, Koolanooka, Mt Correll, Mt Jackson
<i>Acacia cerastes</i>	P1	Mt Gibson, Ninghan Station
<i>Acacia imitans</i>	P1	Mt Singleton, Mt Gibson, Ninghan
<i>Acacia synoria</i>	P2	Mt Gibson
<i>Acacia unguicula</i>	P1	Mt Singleton
<i>Acacia vassalii</i>	Rare	Bindi Bindi Road
<i>Allocasuarina tessellata</i>	P1	Mt Singleton, Mt Gibson Station
<i>Baeckea</i> sp. Paynes Find		Mt Singleton, Ninghan Station
<i>Calytrix plumosa</i>	P3	Wubin, Koorda, Chiddarcooping, Mt Churchman, Mollerin, Mt Gibson, Bencubbin
<i>Calytrix uncinata</i>	P3	Mt Edon
<i>Cryptandra imbricata</i>	P3	Mt Gibson Station
<i>Cyphanthera odgersii</i>	Rare	Lake Moore
<i>Darwinia masonii</i>	Rare	Mt Gibson Station
<i>Eucalyptus crucis</i> subsp. <i>praecipua</i>	Rare	Ninghan Station
<i>Eucalyptus synandra</i>	Rare	Mt Gibson Station
<i>Goodenia perryi</i>	P3	Bunjil, Mt Gibson, Mollerin, Lake Moore, Ballidu, Kalannie, Wonganderrah
<i>Grevillea eriobotrya</i>	P3	Lake Moore
<i>Grevillea granulosa</i>	P3	Ninghan Station
<i>Grevillea rudis</i>	P4	Eridoon Road
<i>Grevillea scabrifida</i>	P3	Mt Gibson, Mt Singleton
<i>Grevillea subtiliflora</i>	P1	Mt Singleton, Wubin-Paynes Find, Mt Gibson
<i>Hybanthus cymulosus</i>	P1	Mt Singleton, Mt Gibson, Ninghan
<i>Micromyrtus cuensis</i>	P1	Paynes Find
<i>Micromyrtus racemosa</i> var. <i>mucronata</i>	P1	Mt Singleton, Ninghan
<i>Pityrodia axillaris</i>	P3	Lake Moore

TAXON	CONSERVATION STATUS	LOCATION
<i>Podotheca uniseta</i>	P3	Lake Moore
<i>Prostanthera magnifica</i>	P4	
<i>Rhodantha collina</i>	P1	Monger Lake, Yalgoo., Mt Gibson, Mingenew Hill
<i>Thryptomene ninghanensis</i>	P1	Ninghan, Mt Singleton
<i>Verticordia insignis</i> subsp. <i>eomagis</i>	P3	Boothendarra Nature Reserve

The Australian New Zealand Environment and Conservation Council (ANZECC) (1999) lists plants under threat throughout Australia as:

- Endangered - facing a high risk of extinction in the wild in the near future; and
- Vulnerable - facing a high risk of extinction in the wild in the medium-term future.

Of the above species the following are classified as Endangered: *Acacia vassalii*, *Cyphanthera odgersii* and *Eucalyptus crucis* subsp. *praecipua* and the following as Vulnerable: *Darwinia masonii* and *Eucalyptus synandra*. All these taxa are classified by CALM as Rare.

During the September 2000 survey the following Rare and Priority plant taxa were recorded. These together with the GPS reading are listed in Table 5.3 and mapped in Appendix F.

Table 5.3 Rare and Priority Taxa recorded from Mt Gibson Iron lease in September 2000

TAXON	GPS		NUMBER OF PLANTS RECORDED
	NORTHING	EASTING	
<i>Acacia acanthoclada</i> subsp. <i>glaucescens</i>	6725679	50519350	50
	6725707	50519908	50
	6720996	5051774	2
<i>Acacia cerastes</i>	6727809	50515609	50
	6725841	50517514	20
	6725811	50517056	25
	6722095	50537987	40*
	6729584	50514404	1
<i>Darwinia masonii</i>	6728315	50515344	40
	6727809	50515609	20
	6725074	50519199	>50
	6725334	50519104	10
	6725430	50518988	10
	6725624	50516388	>>100
	6725811	50517056	80-100
	6725841	50517514	50-80
	6725892	50518314	ca 1000
29°35'36"	117°11'24"	ca 1000	
<i>Eucalyptus synandra</i>	6725221	50519586	50-100
	6725074	50519199	1
<i>Prostanthera magnifica</i>	6728920	50515055	10

* Outside of lease



Acacia acanthoclada subsp. *glaucescens* habit and leaves and flowers



Eucalyptus synandra habit



Acacia cerastes habit.



Darwinia masonii habit in jaspilite rocks; leaf shape and flowering heads.

Both *Acacia* species were abundant where there was disturbance along track edges and where other clearing had occurred. *Acacia cerastes* was also recorded on the edge of the main track into Mt Gibson Station and Emu Farm so is widespread throughout the station. The taxon of most concern to the mining of the area is *Darwinia masonii* which was abundant on the hill tops and upper slopes. Mt Gibson Iron intends to mine a small portion only of the northern Mt Gibson Range, the area where the lowest density of plants was recorded during this survey. If mining is approved and Ministerial approval is received to remove plants of this species only a very small number (about 100 plants) of the total plants (several thousand) in the area will be affected.

Darwinia masonii is associated with jaspilite (banded ironstone formation) within the area and has only been recorded from the Mt Gibson hills. Some plants grew out from cracks in the rocks others in soil amongst loose rocks. Seedlings were recorded from several sites.

Kings Park nursery was contacted about the cultivation of these plants. The success rate is 50% from cutting material (R.Fryer, pers. comm.) so it is regarded as relatively easy to cultivate. When success is obtained from cutting material seed is not attempted. It is known that *Darwinia* spp. generally do not set much fertile seed.

The largest stand of *Eucalyptus synandra* was recorded off the lease site (see Appendix E) and therefore will not be affected by mining. The one plant recorded on the site again is not in the vicinity of proposed infrastructure or roads. This species is

readily cultivated from seed. It is a spectacular small tree when in flower so very useful in the horticulture trade. Both Kings Park and Western Australian Herbarium have plants of this species growing.

Acacia species are not difficult to cultivate as is indicated in the location of several of the plants recorded growing in disturbance areas. *Acacia acanthoclada* subsp. *glaucescens* was recorded from several locations (see Table 5.2) and *Acacia cerastes* has also been recorded from Ninghan Station.

Care should be taken to ensure minimal disturbance to these rare and priority plant species and where possible, disturbance should be avoided. Ministerial approval must be received before clearing of areas where *Darwinia masonii* and *Eucalyptus synandra* grow and CALM must be contacted before the removal of any of the Priority flora species.

5.4 INTRODUCED FLORA

There were very few (21) introduced taxa located throughout the lease. The southern tip of Mt Gibson recorded several species however the area did not appear to be frequented by sheep. It is possible that the weeds have been brought into the area by goats. Another outbreak of weeds was towards the southern extremity of the lease at the site of the abandoned Harp mine, a previous gold mine. Here there are some extremely invasive weeds including Ruby dock (*Rumex vesicarius*), Paterson's curse (*Echium plantagineum*), Maltese cockspur (*Centaurea melitensis*) and Ward's weed (*Carrichtera annua*). As these outbreaks are isolated and at present of relatively small size it would be advisable to undertake an eradication programme. Paterson's curse has been recorded from Paynes Find and the other three weeds are common throughout the Goldfields. However if these weeds are not controlled it is possible with development of the lease that they will become more widely spread.

6. DISCUSSION

The soils of the lease varied considerably from sand plains through loams to clays and to solid rock. Consequently the vegetation from the area varied accordingly. However the dominant plants present in all vegetation communities were species of *Acacia* and *Allocasuarina acutivalvis* subsp. *prinsepiana*. A total of 22 *Acacia* species were recorded from the lease area, the most common being *Acacia ramulosa* which occurred in all soils.

A total of five Woodland communities, four Mallee communities, twelve Thicket communities and two Heath communities were recorded from the lease area. Typically the area below the hills consisted of an Acacia Thicket with emergent *Eucalyptus* spp. and *Callitris glaucophylla*. The most commonly recorded *Eucalyptus* species was *E. loxophleba* subsp. *supralaevis* (York gum) which grew on the flat and along the gullies of the hillsides. *Eucalyptus salmonophloia* (salmon gum) was recorded only near the south western edge of the lease. *E. brachycorys* was also relatively common in the lower areas usually growing in association with York gum.

Callitris glaucophylla was the dominant tree where the soil was sandy however it was typically associated with *E. loxophleba* subsp. *supralaevis*. It was in these sandy soils that *Ecdeicola monostachya* was recorded. One stand of this species, on the Great Northern Highway near where it is intended to place the camp, was dead. It appeared to be due to inundation caused by the placement of a road culvert that drained into this stand. However the whole of this area appeared to be subject to long periods of inundation with the water standing for a time. If it is decided to build the village at this site, adequate drainage will need to be installed.

The vegetation of each peak varied considerably although jaspilite was the dominant rock at the surface. The rare plant species (WA list) and vulnerable species (Commonwealth list), *Darwinia masonii* was recorded from most of these upper slopes or summits of the hills, on both the south eastern and south western slopes and was not restricted to the south western slope as recorded by Muir (1995) or dominant on the south western slope as recorded by Brown *et al.* (1998).

The hillslopes were very similar differing predominantly in the percentage combination of the species. The dominant species were *Acacia ramulosa*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Melaleuca nematophylla* and *Grevillea obliquistigma*. The understorey species tended to vary from area to area but it was difficult to determine if some, if not all of this variation, could have been due to time since fire.

On the eastern side of Mt Gibson there was a dramatic change in the dominant upper vegetation between one side and the other side of the hill side (Front cover). The southern slope had *Acacia stowardii* and *A. aneura* as the dominant upper storey plants whereas the northern slope had *Acacia ramulosa* as the dominant species.

The vegetation associations and the component taxa indicated the boundary between the Eremaean and Southwest Botanical Provinces. The large number of *Acacia* species is indicative of the Eremaean Province and the presence of *Eucalyptus* species especially York gum (*E. loxophleba*) and Salmon gum (*E. salmonophloia*) is

indicative of the Southwest Botanical Province. Only one small stand of Mulga (*Acacia aneura*) was recorded in the area, a species typical of the Austin Botanical District of the Eremaean Botanical Province.

The Mt Gibson lease covered four land systems; Illaara, Moriarty, Tallering and Pindar (Payne, *et al.*, 1998). The total area covered by these are 202, 825, 329 and 1519 km² respectively. Pringle (1998) described the habitats common within these different land systems as below.

- The Tallering land system is the higher ground within the lease and is represented by 'Ironstone ridge mixed shrubland', supporting a distinctive flora associated with the South West Botanical Province.
- The Moriarty land system is represented by 'Lateritic sandplain acacia shrubland' which can often be in near pristine condition as it is not palatable to stock, feral goats and kangaroos.
- The Illaara land system is represented by 'Plain York gum acacia woodland' that was found to be the most species rich during the Sandstone-Yalgoo-Paynes Find survey. This habitat is stated as a regionally significant vegetation unit but is common on Mt Elvire pastoral lease acquired by the Department of Conservation and Land Management in May 1991.
- The Pindar land system is represented by two habitats, 'Sandplain with mallees and acacias' and 'Plain native pine acacia woodland or shrubland'. Payne noted that the understorey species of the 'Sandplain with mallees and acacias' varied considerably with the soil type and drainage. Neither habitat is considered threatened by livestock.

A total of 285 plant taxa were recorded from the area. The dominant families were Asteraceae, Myrtaceae, Mimosaceae, Chenopodiaceae, Poaceae and Proteaceae representing 52% of the total number of taxa. The 2000 winter was dry and with better rainfall a much greater than recorded cover of annual daisy species would be expected. Annual species are very dependent upon rainfall daisies only being abundant after a good winter rainfall, whereas the grass species dominate after a good summer rainfall.

Two gazetted rare flora (WA legislation) and vulnerable species (Commonwealth legislation) *Darwinia masonii* and *Eucalyptus synandra* were recorded from the area. Most of the plants of *Eucalyptus synandra* recorded during the survey were just outside of the lease area and will therefore not be affected by the development. Large numbers of *Darwinia masonii* plants were recorded as indicated in Table 5.3, the majority being recorded outside the proposed mine area. Permission will need to be

obtained from the Minister for the Environment to remove any of these plants. Kings Park and Botanic Garden consider this species easy to propagate so consideration should be given to obtaining a permit to collect cutting material, having the cuttings propagated and incorporating the plants into landscaping around the village or other infrastructures.

In addition the elegant plants of *Eucalyptus synandra* and seeds of the priority Acacia species should also be propagated for incorporation in any landscaping of the area. Also *Prostanthera magnifica*, although no longer a priority plant species, should be propagated for its extremely striking flowers. Only a few plants of *Prostanthera magnifica* were located but this species is widespread and is relatively abundant in a similar habitat near Golden Grove, Yalgoo.

Introduced species were generally not common throughout the bushland. The area of greatest weed infestation was in the vicinity of the now abandoned Harp Mine. Here some extremely invasive weed species, eg Ruby Dock, Paterson's Curse, Ward's Weed and Maltese Cockspur were recorded. These weeds should be controlled now as they have the potential to be spread by increased traffic associated with the mine. Most of these occurred in weed infested sections so a total spray eg glyphosate could be applied.

The other area where several weed plants were recorded was on the southern summit and upper slopes of Mt Gibson, where it was thought that goats had introduced these plants. However most of these plants were not as invasive as the species above and generally had invaded amongst the rocks and along tracks.

During mining of the area it is essential to ensure that weeds are not introduced and that those already present are not further spread through the area. All machinery and vehicles entering the area should be washed to ensure no soil or seeds are attached and where possible should be site dedicated. If weeds are located they should be eradicated immediately.

To ensure minimal damage to the surrounding vegetation which generally is in excellent to very good condition, the boundary of the area to be mined area must be well marked, preferably with a fence. It will be essential where *Darwinia masonii* plants are growing adjoining the mine area. To ensure no damage to this rare species and ensure minimal damage to the vegetation as a whole.

All staff, both employees and contractors must be educated in the environmental importance of the area and must be educated to ensure they recognise and do not cause damage to the rare species, both *Darwinia masonii* and *Eucalyptus synandra*. The penalty for causing damage to any of these plants must be emphasised. Similarly

no native animals must be killed, including snakes but should be relocated away from the mine or accommodation areas.

7. REFERENCES

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APPENDIX A

Taxa recorded from the lease

* = plant introduced

subsp. = subspecies

var. = variety

affin. = closest to the species named

? = sterile material only collected, plant
not positively identified

ms = manuscript name, name not published

sp. = unable to identify the plant to species level

sp. followed by name and number = method of
identification used for this species by the
Western Australian Herbarium

FAMILY	TAXON
ADIANTACEAE	<i>Cheilanthes austrotenuifolia</i>
AIZOACEAE	<i>Mesembryanthemum nodiflorum</i>
AMARANTHACEAE	<i>Ptilotus chamaecladus</i>
	<i>Ptilotus eriotrichus</i>
	<i>Ptilotus exaltatus</i>
	<i>Ptilotus gaudichaudi</i> subsp. <i>gaudichaudi</i>
	<i>Ptilotus holosericeus</i>
	<i>Ptilotus obovatus</i>
	<i>Ptilotus schwartzii</i>
ANTHERICACEAE	<i>Murchisonia volubilis</i>
APIACEAE	<i>Daucus glochidiatus</i>
	<i>Trachymene cyanopetala</i>
	<i>Xanthosia bungei</i>
APOCYNACEAE	<i>Alyxia buxifolia</i>
ASTERACEAE	<i>Actinobole uliginosum</i>
	* <i>Arctotheca calendula</i>
	<i>Bellida graminea</i>
	<i>Brachyscome perpuscilla</i>
	<i>Brachyscome pusilla</i>
	<i>Brachyscome cheilocarpa</i>
	<i>Brachyscome oncocarpa</i>
	<i>Calotis hispidula</i>
	* <i>Centaureum melitensis</i>
	<i>Cephalipterum drummondii</i>
	<i>Ceratogyne obionoides</i>
	<i>Cotula cotuloides</i>
	<i>Erymophyllum ramosum</i> subsp. <i>ramosum</i>
	<i>Gilbertia tenuifolia</i>
	<i>Gnephosis eriocephala</i>
	<i>Gnephosis tenuissima</i>
	* <i>Hedypnois rhagadioloides</i>
	<i>Hyalosperma glutinosum</i> subsp. <i>venustum</i>
	* <i>Hypochaeris glabra</i>
	<i>Lawrencella davenportii</i>
	<i>Lawrencella rosea</i>
	<i>Lemooria burkittii</i>
	<i>Millotia myostidifolia</i>
	<i>Millotia tenuifolia</i> var. <i>tenuifolia</i>
	<i>Myriocephalus rudallii</i>
	<i>Olearia dampieri</i> subsp. <i>eremicola</i>
	<i>Olearia humilis</i>
	<i>Olearia muelleri</i>
	<i>Olearia pimeleoides</i>
	* <i>Osteospermum clandestinum</i>
	<i>Podolepis canescens</i>
	<i>Podolepis capillaris</i>
	<i>Podolepis lessonii</i>
	<i>Podotrochea angustifolia</i>
	<i>Pogonolepis muelleriana</i>
	<i>Rhodanthe battii</i>
	<i>Rhodanthe pygmaea</i>
	<i>Rhodanthe tiekensii</i>
	<i>Schoenia cassiniana</i>
	<i>Senecio lautus</i>
	<i>Senecio</i> sp.
	* <i>Sonchus oleraceus</i>
	<i>Triptilodiscus pygmaeus</i>

FAMILY	TAXON
ASTERACEAE (cont)	* <i>Ursinia anthemoides</i> <i>Vittadenia humerata</i> <i>Vulpia myuros</i> var. <i>myuros</i> <i>Waitzia acuminata</i> var. <i>acuminata</i>
BORAGINACEAE	* <i>Echium plantagineum</i>
BRASSICACEAE	* <i>Carrichtera annua</i> <i>Lepidium oxytrichum</i> * <i>Sisymbrium orientale</i> <i>Stenopetalum filifolium</i>
CAESALPINIACEAE	<i>Petalostylis cassioides</i> <i>Senna artemisioides</i> subsp. <i>filifolia</i> <i>Senna cardiosperma</i> <i>Senna charlesiana</i> <i>Senna pleurocarpa</i> var. <i>angustifolia</i> <i>Senna</i> sp. Austin (A.Strid 20210)
CAMPANULACEAE	<i>Wahlenbergia communis</i>
CARYOPHYLLACEAE	* <i>Petrohragia velutina</i> * <i>Spergularia rubra</i>
CASUARINACEAE	<i>Allocasuarina acutivalvis</i> subsp. <i>prinsepiana</i>
CELASTRACEAE	<i>Psamomoya grandiflora</i>
CHENOPODIACEAE	<i>Atriplex bunburyana</i> <i>Atriplex lindleyi</i> subsp. <i>inflata</i> <i>Atriplex nummularium</i> <i>Didymanthus roei</i> <i>Disphyma crassifolium</i> <i>Enchylaena tomentosa</i> <i>Halosarcia halocnemoides</i> <i>Halosarcia indica</i> subsp. <i>bidens</i> <i>Halosarcia peltata</i> <i>Halosarcia</i> sp. Lake Moore <i>Maireana atkinsiana</i> <i>Maireana carnosa</i> <i>Maireana georgei</i> <i>Maireana platycarpa</i> <i>Maireana radiata</i> <i>Maireana trichoptera</i> <i>Rhagodia eremaea</i> <i>Rhagodia preissii</i> <i>Sclerolaena diacantha</i> <i>Sclerolaena eurotioides</i> <i>Sclerolaena fusiformis</i>
CHLOANTHACEAE	<i>Cyanostegia angustifolia</i> <i>Dicratylis parvifolia</i>
CRASSULACEAE	<i>Crassula colorata</i> var. <i>acuminata</i>
CUPRESSACEAE	<i>Callitris glaucophylla</i>
CUSCUTACEAE	<i>Cuscuta australis</i>
CYPERACEAE	<i>Lepidosperma tenue</i>
DASYPOGONACEAE	<i>Chamaexeros macrantha</i> <i>Lomandra effusa</i>
DILLENACEAE	<i>Hibbertia acerosa</i> <i>Hibbertia crassifolia</i> <i>Hibbertia glomerosa</i> <i>Hibbertia rostellata</i>
DROSERACEAE	<i>Drosera glanduligera</i> <i>Drosera</i> sp. Climbing
EPACRIDACEAE	<i>Leucopogon breviflorus</i>
EUPHORBIACEAE	<i>Calycopeplus paucifolius</i> <i>Euphorbia boophthona</i>
FRANKENIACEAE	<i>Frankenia cinerea</i>

FAMILY	TAXON
FRANKENIACEAE (cont)	<i>Frankenia laxiflora</i> <i>Frankenia setosa</i>
GERANIACEAE	* <i>Erodium botrys</i>
GOODENIACEAE	<i>Brunonia australis</i> <i>Dampiera eriocephala</i> <i>Goodenia berardiana</i> <i>Goodenia occidentalis</i> <i>Goodenia pinnatifida</i> <i>Lechenaultia macrantha</i> <i>Scaevola spinescens</i> <i>Velleia cynopotamica</i> <i>Velleia rosea</i>
GYROSTEMONACEAE	<i>Gyrostemon ramulosus</i>
HALORAGACEAE	<i>Glischrocaryon aureum</i> <i>Gonocarpus nodulosus</i> <i>Haloragis gossei</i>
JUNCAGINACEAE	<i>Triglochin hexagonum</i>
LAMIACEAE	<i>Hemigenia</i> sp. Paynes Find (AC Beaglehole 49138) <i>Hemigenia</i> sp. Yuna (AC Burns 95) <i>Microcorys</i> sp. Mt Gibson (S.Patrick 2098) <i>Prostanthera campbellii</i> <i>Prostanthera eckersleyana</i> <i>Prostanthera magnifica</i> <i>Westringia</i> ? <i>cephalantha</i> <i>Wrixonia prostanthoides</i>
LAURACEAE	<i>Cassytha glabella</i>
LOBELIACEAE	<i>Isotoma petraea</i>
LOGANIACEAE	<i>Phyllangium sulcatum</i>
LORANTHACEAE	<i>Amyema miquelii</i>
MALVACEAE	<i>Lawrencia repens</i> <i>Lawrencia squamata</i> <i>Sida atrovirens</i>
MIMOSACEAE	<i>Acacia acanthoclada</i> subsp. <i>glaucescens</i> <i>Acacia acuaria</i> <i>Acacia acuminata</i> subsp. <i>acuminata</i> <i>Acacia andrewsii</i> <i>Acacia aneura</i> <i>Acacia anthochaera</i> <i>Acacia assimilis</i> subsp. <i>assimilis</i> <i>Acacia burkittii</i> <i>Acacia cerastes</i> <i>Acacia colletioides</i> <i>Acacia exocarpoides</i> <i>Acacia kochii</i> <i>Acacia longispinea</i> <i>Acacia microbotrya</i> subsp. <i>borealis</i> <i>Acacia nigripilosa</i> subsp. <i>nigripilosa</i> <i>Acacia oblecta</i> <i>Acacia prainii</i> <i>Acacia ramulosa</i> <i>Acacia resinomarginea</i> <i>Acacia stereophylla</i> var. <i>stereophylla</i> <i>Acacia stowardii</i> <i>Acacia tetragonophylla</i>
MYOPORACEAE	<i>Eremophila</i> ? <i>caperata</i> <i>Eremophila clarkei</i> <i>Eremophila decipiens</i> <i>Eremophila eriocalyx</i> <i>Eremophila latrobei</i>

FAMILY	TAXON
MYOPORACEAE (cont)	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>
	<i>Eremophila oldfieldii</i> subsp. <i>oldfieldii</i>
	<i>Eremophila oppositifolia</i>
	<i>Eremophila pantoni</i>
	<i>Eremophila scoparia</i>
MYRTACEAE	<i>Baeckea</i> affin. <i>cryptandroides</i>
	<i>Baeckea benthamii</i> (ms)
	<i>Baeckea</i> sp.
	<i>Calothamnus gilesii</i>
	<i>Calytrix strigosa</i>
	<i>Darwinia masonii</i>
	<i>Eucalyptus brachycorys</i>
	<i>Eucalyptus ewartiana</i>
	<i>Eucalyptus hypochlamydea</i> subsp. <i>hypochlamydea</i>
	<i>Eucalyptus leptopoda</i>
	<i>Eucalyptus loxophleba</i> subsp. <i>supralaevis</i>
	<i>Eucalyptus oldfieldii</i>
	<i>Eucalyptus salicola</i>
	<i>Eucalyptus salmonophloia</i>
	<i>Eucalyptus synandra</i>
	<i>Homalocalyx aureus</i>
	<i>Malleostemon roseus</i>
	<i>Malleostemon tuberculatus</i>
	<i>Melaleuca barlowii</i>
	<i>Melaleuca cordata</i>
	<i>Melaleuca eleutherostachya</i>
	<i>Melaleuca leiocarpa</i>
	<i>Melaleuca nematophylla</i>
	<i>Melaleuca radula</i>
	<i>Melaleuca</i> sp. Wongan Hills (R Davis 1959)
	<i>Melaleuca stereophloia</i>
<i>Melaleuca uncinata</i>	
<i>Micromyrtus racemosa</i> var. <i>racemosa</i>	
PAPILIONACEAE	<i>Bossiaea walkeri</i>
	<i>Daviesia divaricata</i> subsp. <i>lanulosa</i>
	<i>Gastrolobium laytonii</i>
	<i>Leptosema aphyllum</i>
	* <i>Medicago truncatula</i>
	<i>Mirbelia</i> sp. 'Paynes Find'
* <i>Trifolium tomentosum</i>	
PHORMIACEAE	<i>Dianella revoluta</i>
PITTOSPORACEAE	<i>Bursaria occidentalis</i>
	<i>Cheiranthra filifolia</i> subsp. <i>filifolia</i>
PLANTAGINACEAE	<i>Pittosporum phylliraeoides</i> subsp. <i>microcarpa</i>
	<i>Plantago debilis</i>
POACEAE	<i>Agrostis avenacea</i> var. <i>avenacea</i>
	<i>Amphipogon caricinus</i> var. <i>caricinus</i>
	<i>Aristida contorta</i>
	<i>Austrodanthonia caespitosa</i>
	<i>Austrostipa elegantissima</i>
	<i>Austrostipa nitida</i>
	<i>Austrostipa trichophylla</i>
	* <i>Bromus diandrus</i>
	* <i>Bromus rubens</i>
	* <i>Ehrharta longiflora</i>
	<i>Eragrostis dielsii</i>
	<i>Eragrostis falcata</i>
	<i>Lamarckia aurea</i>
	<i>Monachather paradoxa</i>

FAMILY	TAXON
POACEAE (cont)	<i>*Pentaschistis airoides</i> <i>*Rostraria pumila</i>
POLYGALACEAE	<i>Comesperma integerrimum</i> <i>Muehlenbeckia adpressa</i> <i>*Rumex vesicarius</i>
PORTULACEAE	<i>Calandrinia calyptata</i> <i>Calandrinia polyandra</i>
PRIMULACEAE	<i>*Anagallis arvensis</i>
PROTEACEAE	<i>Grevillea ? acacioides</i> <i>Grevillea eriostachya</i> <i>Grevillea hakeoides</i> subsp. <i>hakeoides</i> <i>Grevillea juncifolia</i> <i>Grevillea nematophylla</i> <i>Grevillea obliquistigma</i> <i>Grevillea paradoxa</i> <i>Hakea francisiana</i> <i>Hakea invaginata</i> <i>Hakea minyma</i> <i>Hakea preissii</i> <i>Hakea recurva</i> subsp. <i>recurva</i> <i>Persoonia stricta</i>
RESTIONACEAE	<i>Ecdeicola monostachya</i>
RUTACEAE	<i>Drummondita hasselli</i> <i>Phebalium tuberosum</i> <i>Philotheca brucei</i> subsp. <i>brucei</i> <i>Philotheca sericea</i> <i>Philotheca tomentella</i>
SANTALACEAE	<i>Exocarpos aphyllus</i> <i>Santalum acuminatum</i> <i>Santalum spicatum</i>
SAPINDACEAE	<i>Dodonaea inaequifolia</i> <i>Dodonaea microzyga</i> var. <i>acrolobata</i> <i>Dodonaea petiolaris</i> <i>Dodonaea viscosa</i> subsp. <i>angustissima</i>
SOLANACEAE	<i>Duboisia hopwoodii</i> <i>Nicotiana occidentalis</i> <i>Solanum ellipticum</i> <i>Solanum lasiophyllum</i> <i>Solanum nummularium</i>
STACKHOUSIACEAE	<i>Stackhousia muricata</i>
STERCULIACEAE	<i>Hannafordia quadrivalvis</i> <i>Keraudrenia integrifolia</i> <i>Rulingia kempeana</i> <i>Rulingia luteiflora</i>
STYLIDIACEAE	<i>Levenhookia leptantha</i> <i>Stylidium elongatum</i>
THYMELAEACEAE	<i>Pimelea brevistyla</i> subsp. <i>minor</i> <i>Pimelea spiculigera</i> var. <i>spiculigera</i>
ZYGOPHYLLACEAE	<i>Zygophyllum eremaeum</i> <i>Zygophyllum glaucum</i> <i>Zygophyllum ovatum</i>

APPENDIX B

List of taxa recorded for the vegetation units

TAXON	VEGETATION COMMUNITY																								
	HS1	HS2	M1	M2	M3	M4	T1	T2	I3	T4	I5	I6	T7	I8	T9	T10	T11	T12	W1	W2	W3	W4	W5	W6	
<i>Acacia acanthoclada</i> subsp. <i>glaucescens</i>			+																		+				
<i>Acacia acutaria</i>								+								+									
<i>Acacia acuminata</i> subsp. <i>acuminata</i>	+		+			+		+								+							+		+
<i>Acacia andrewsii</i>			+					+								+							+		+
<i>Acacia aneura</i>								+																	
<i>Acacia anthochaera</i>			+			+		+								+							+		+
<i>Acacia assimilis</i> subsp. <i>assimilis</i>						+		+								+							+		+
<i>Acacia burkittii</i>			+																						
<i>Acacia cerastes</i>								+																	
<i>Acacia colletioides</i>			+																						
<i>Acacia exocarpoides</i>	+															+									+
<i>Acacia kochii</i>																									
<i>Acacia longispinea</i>																									
<i>Acacia microbotrya</i> subsp. <i>borealis</i>			+																						
<i>Acacia nigripilosa</i> subsp. <i>nigripilosa</i>			+																						
<i>Acacia oblecta</i>			+																						
<i>Acacia prainii</i>			+																						
<i>Acacia ramulosa</i>			+																						
<i>Acacia resinomarginea</i>																									
<i>Acacia stereophylla</i> var. <i>stereophylla</i>																									
<i>Acacia stowardii</i>	+		+																						
<i>Acacia tetragonophylla</i>			+																						
<i>Actinobole uliginosum</i>																									
<i>Agrostis avenacea</i> var. <i>avenacea</i>																									
<i>Allocasuarina acutivalvis</i> subsp. <i>prinsepiana</i>	+		+																						
<i>Alyxia buxifolia</i>			+																						
<i>Amphipogon caricinus</i> var. <i>caricinus</i>			+																						

TAXON	VEGETATION COMMUNITY																								
	HS1	HS2	M1	M2	M3	M4	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	W1	W2	W3	W4	W5	W6	
<i>Amyema miquelii</i>																									
<i>Anagallis arvensis</i>																									
<i>Arctotheca calendula</i>	+																								
<i>Aristida contorta</i>																									
<i>Atriplex bunburyana</i>		+																							
<i>Atriplex lindleyi</i> subsp. <i>inflata</i>		+																							
<i>Atriplex nummularium</i>		+																							
<i>Austrodanthonia caespitosa</i>																									
<i>Austrostipa elegantissima</i>	+																								
<i>Austrostipa nitida</i>																									
<i>Austrostipa trichophylla</i>	+																								
<i>Baeckea</i> affin. <i>cryptandroides</i>																									
<i>Baeckea benthamii</i> (ms)																									
<i>Baeckea</i> sp.																									
<i>Bellida graminea</i>																									
<i>Bossiaea walkeri</i>																									
<i>Brachyscome cheilocarpa</i>																									
<i>Brachyscome oncocarpa</i>																									
<i>Brachyscome perpusilla</i>																									
<i>Brachyscome pusilla</i>	+																								
<i>Bromus diandrus</i>																									
<i>Bromus rubens</i>																									
<i>Brunonia australis</i>																									
<i>Bursaria occidentalis</i>																									
<i>Calandrinia calyptrata</i>																									
<i>Calandrinia polyandra</i>																									
<i>Callitris glaucophylla</i>	+																								
<i>Calothamnus gilesii</i>																									
<i>Calotis hispidula</i>	+																								

TAXON	VEGETATION COMMUNITY																								
	HS1	HS2	M1	M2	M3	M4	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	W1	W2	W3	W4	W5	W6	
<i>Calycopeplus paucifolius</i>	+																								
<i>Calyrix strigosa</i>																									
<i>Cassytha glabella</i>																									
<i>Cephalopterum drummondii</i>																									
<i>Ceratogyne obionoides</i>																									
<i>Chamaeeros macrantha</i>																									
<i>Cheilanthes austrotenuifolia</i>																									
<i>Cheiranthra filifolia</i> subsp. <i>filifolia</i>																									
<i>Comesperma integerrimum</i>																									
<i>Cotula cotuloides</i>																									
<i>Crassula colorata</i> var. <i>acuminata</i>																									
<i>Cuscuta australis</i>																									
<i>Cyanostegia angustifolia</i>																									
<i>Dampiera eriocephala</i>																									
<i>Darwinia masonii</i>																									
<i>Daucus glochidiatius</i>																									
<i>Daviesia divaricata</i> subsp. <i>lanulosa</i>																									
<i>Dianella revoluta</i>																									
<i>Dicratislis parvifolia</i>																									
<i>Didymantus roei</i>																									
<i>Disphyma crassifolium</i>																									
<i>Dodonaea inaequifolia</i>																									
<i>Dodonaea microzyga</i> var. <i>acrolobata</i>																									
<i>Dodonaea petiolaris</i>																									
<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>																									
<i>Drosera glanduligera</i>																									
<i>Drosera</i> sp. Climbing																									
<i>Drummondita hasselli</i>																									

TAXON	VEGETATION COMMUNITY																								
	HS1	HS2	M1	M2	M3	M4	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	W1	W2	W3	W4	W5	W6	
<i>Duboisia hopwoodii</i>							+									+									
<i>Ecdiceolea monostachya</i>			+													+									
<i>Ehrharta longiflora</i>	+																								
<i>Enchylaena tomentosa</i>																					+				
<i>Eragrostis dielsii</i>		+																							
<i>Eragrostis falcata</i>		+																							
<i>Eremophila ? caperata</i>				+																					+
<i>Eremophila clarkei</i>	+				+																				
<i>Eremophila decipiens</i>	+																								
<i>Eremophila eriocalyx</i>	+																								
<i>Eremophila latrobei</i>																									
<i>Eremophila latrobei</i> subsp. <i>latrobei</i>																									
<i>Eremophila oldfieldii</i> subsp. <i>oldfieldii</i>																									
<i>Eremophila oppositifolia</i>		+																							
<i>Eremophila pantoni</i>																									
<i>Eremophila scoparia</i>																									
<i>Erodium botrys</i>	+																								
<i>Erymophyllum ramosum</i> subsp. <i>ramosum</i>																									
<i>Eucalyptus brachycorys</i>			+																						
<i>Eucalyptus ewaritiana</i>																									
<i>Eucalyptus hypochlamydea</i> subsp. <i>hypochlamydea</i>																									
<i>Eucalyptus leptopoda</i>																									
<i>Eucalyptus loxophleba</i> subsp. <i>supralaevis</i>																									
<i>Eucalyptus oldfieldii</i>																									
<i>Eucalyptus salicicola</i>																									
<i>Eucalyptus salmonophloia</i>																									
<i>Eucalyptus synandra</i>																									
<i>Euphorbia boophthona</i>																									
<i>Exocarpos aphyllus</i>																									

TAXON	VEGETATION COMMUNITY																								
	HS1	HS2	M1	M2	M3	M4	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	W1	W2	W3	W4	W5	W6	
<i>Halosarcia peltata</i>	+																								
<i>Halosarcia</i> sp. Lake Moore	+																								
<i>Hannafordia quadrivalvis</i>								+																	
<i>Hedypnois rhagadioloides</i>	+																								
<i>Hemigenia</i> sp. Paynes Find (AC Beauglehole 49138)							+	+	+	+															
<i>Hemigenia</i> sp. Yuna (AC Burns 95)							+																		
<i>Hibbertia acerosa</i>																									
<i>Hibbertia crassifolia</i>																									
<i>Hibbertia glomerosa</i>																									
<i>Hibbertia rostellata</i>																									
<i>Homalocalyx aureus</i>																									
<i>Hyalosperma glutinosum</i> subsp. <i>venustum</i>																									
<i>Hypochoeris glabra</i>	+																								
<i>Isotoma petraea</i>	+																								
<i>Keraudrenia integrifolia</i>																									
<i>Lamarckia aurea</i>	+																								
<i>Lawrencella davenportii</i>																									
<i>Lawrencella rosea</i>																									
<i>Lawrencella repens</i>	+																								
<i>Lawrencella squamata</i>	+																								
<i>Lechenaultia macrantha</i>																									
<i>Lemooria burkittii</i>	+																								
<i>Lepidium oxytrichum</i>	+																								
<i>Lepidosperma tenue</i>																									
<i>Leptosema aphyllum</i>																									
<i>Leucopogon breviflorus</i>																									
<i>Levenhookia leptantha</i>																									
<i>Lomandra effusa</i>																									
<i>Maireana atkinsiana</i>	+																								

TAXON	VEGETATION COMMUNITY																								
	HS1	HS2	M1	M2	M3	M4	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	W1	W2	W3	W4	W5	W6	
<i>Maireana carnosus</i>	+								+										+						
<i>Maireana georgei</i>	+			+					+										+						
<i>Maireana platycarpa</i>	+																								
<i>Maireana radiata</i>	+																								
<i>Maireana trichoptera</i>																									
<i>Malleostemon roseus</i>																									
<i>Malleostemon tuberculatus</i>																									
<i>Melaleuca barlowii</i>																									
<i>Melaleuca cordata</i>																									
<i>Melaleuca eleantherostachya</i>																									
<i>Melaleuca leiocarpa</i>																									
<i>Melaleuca nematophylla</i>																									
<i>Melaleuca radula</i>																									
<i>Melaleuca</i> sp. Wongan Hills (R Davis 1959)																									
<i>Melaleuca stereophloia</i>																									
<i>Melaleuca uncinata</i>																									
<i>Mesembryanthemum nodiflorum</i>																									
<i>Microcorys</i> sp. Mt Gibson (S.Patrick 2008)																									
<i>Micromyrtus racemosa</i> var. <i>racemosa</i>																									
<i>Mitilola myosinifolia</i>																									
<i>Mitilola tenuifolia</i> var. <i>tenuifolia</i>																									
<i>Mirbelia</i> sp. 'Paynes Find'																									
<i>Monachather paradoxus</i>																									
<i>Monochaeta paradoxus</i>																									
<i>Muehlenbeckia adpressa</i>																									
<i>Murchisonia volubilis</i>																									
<i>Myriocephalus rudallii</i>																									
<i>Nicotiana occidentalis</i>																									
<i>Olearia dampieri</i> subsp. <i>eremicola</i>																									

TAXON	VEGETATION COMMUNITY																								
	HS1	HS2	M1	M2	M3	M4	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	W1	W2	W3	W4	W5	W6	
<i>Olearia muelleri</i>			+						+										+	+	+	+	+	+	+
<i>Olearia pimeleoides</i>			+	+	+	+													+	+	+	+	+	+	+
<i>Olearia humilis</i>																									
<i>Osteospermum clandestinum</i>		+																							
<i>Pentstemonis airoides</i>		+																							+
<i>Persoonia stricta</i>																									
<i>Petalostylis cassioides</i>																									
<i>Petrorhagia velutina</i>																									
<i>Phebalium tuberosulosum</i>																									
<i>Philotheca brucei</i> subsp. <i>brucei</i>		+																							+
<i>Philotheca sericea</i>																									
<i>Philotheca tomentella</i>																									
<i>Phyllangium sulcatum</i>																									
<i>Pimelea brevistyla</i> subsp. <i>minor</i>																									
<i>Pimelea spiculigera</i> var. <i>spiculigera</i>																									
<i>Pitiosporum phylliraeoides</i> subsp. <i>microcarpa</i>																									
<i>Plantago debilis</i>																									
<i>Podolepis canescens</i>																									
<i>Podolepis capillaris</i>		+																							+
<i>Podolepis lessonii</i>																									+
<i>Podotroche angustifolia</i>																									
<i>Pogonolepis muelleriana</i>		+																							+
<i>Prostanthera campbellii</i>																									
<i>Prostanthera eckerstejana</i>																									
<i>Prostanthera magnifica</i>																									
<i>Psamomoya grandiflora</i>																									
<i>Ptilotus chamaecladus</i>																									
<i>Ptilotus eriostichus</i>																									
<i>Ptilotus exaltatus</i>		+																							+

TAXON	VEGETATION COMMUNITY																								
	HS1	HS2	M1	M2	M3	M4	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	W1	W2	W3	W4	W5	W6	
<i>Ptilotus gaudichaudii</i> subsp. <i>gaudichaudii</i>																									
<i>Ptilotus holosericeus</i>																									
<i>Ptilotus obovatus</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Ptilotus schwarzii</i>																									
<i>Rhagodia eremaea</i>																									
<i>Rhagodia preissii</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Rhodanthe battii</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Rhodanthe pygmaea</i>																									
<i>Rhodanthe tiakensii</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Rostraria pumila</i>																									
<i>Rulingia kempeana</i>																									
<i>Rulingia luteiflora</i>																									
<i>Santalum acuminatum</i>																									
<i>Santalum spicatum</i>																									
<i>Scaevola spinescens</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Schoenia cassiniana</i>																									
<i>Sclerolaena diacantha</i>																									
<i>Sclerolaena eurotioides</i>																									
<i>Sclerolaena fusiformis</i>																									
<i>Senecio lautus</i>																									
<i>Senecio</i> sp.																									
<i>Senna artemisioides</i> subsp. <i>filifolia</i>																									
<i>Senna cardiosperma</i>																									
<i>Senna charlesiana</i>																									
<i>Senna pleurocarpa</i> var. <i>angustifolia</i>																									
<i>Senna</i> sp. Austin (A.Strid 20210)																									
<i>Sida atrovirens</i>																									
<i>Sisymbrium orientale</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Solanum ellipticum</i>																									

TAXON	VEGETATION COMMUNITY																								
	HS1	HS2	M1	M2	M3	M4	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	W1	W2	W3	W4	W5	W6	
<i>Solanum lasiophyllum</i>	+		+									+					+			+				+	
<i>Solanum nummularium</i>			+									+								+					
<i>Sonchus oleraceus</i>		+										+								+					
<i>Spergularia rubra</i>		+																							
<i>Stackhousia muricata</i>			+		+								+							+		+		+	
<i>Stenopetalum filifolium</i>			+																	+					
<i>Syldium elongatum</i>													+												
<i>Trachymene cyanopetala</i>																									
<i>Trifolium tomentosum</i>		+																							
<i>Triglochin hexagonum</i>		+																							
<i>Triptilodiscus pygmaeus</i>		+																							
<i>Ursinia anthemoides</i>		+																							
<i>Velleia cycnopotamica</i>		+											+							+					
<i>Velleia rosea</i>			+										+							+					
<i>Vittadenia humerata</i>			+																	+					
<i>Vulpia myuros</i> var. <i>myuros</i>																									
<i>Wahlenbergia communis</i>		+																							
<i>Waitzia acuminata</i> var. <i>acuminata</i>			+										+							+					+
<i>Westringia</i> ? <i>cephalantha</i>																									
<i>Wrixonia prostanthoides</i>																									
<i>Xanthostia bungei</i>													+												
<i>Zygophyllum eremaeum</i>													+												
<i>Zygophyllum glaucum</i>			+																	+					+
<i>Zygophyllum ovatum</i>			+																	+					

APPENDIX C
Photographic record
of the
vegetation communities



W1 Woodland of *Eucalyptus salmonophloia* (Salmon gum) over Thicket of *Acacia* species over Dense Low Heath dominated by *Atriplex bunburyana* on loam



W2 Dense to Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with occasional *Callitris glaucophylla* over a Thicket of *Acacia* species dominated by *A. assimilis* over Herbs dominated at the time of survey by *Velleia rosea* on silty sand.



W3 Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* and *Callitris glaucophylla* over a Thicket of *Melaleuca stereophloia*, *Acacia nigripilosa* subsp. *nigripilosa*, *A. oblecta* over Low Shrubland of *Olearia dampiera* subsp. *erimcola* and *Bossiaea walkeri* and Herbs on silty sand.



W4 Very Open Woodland of *Callitris glaucophylla* and *Eucalyptus loxophleba* subsp. *supralaevis* over an Open Thicket of *Acacia acuminata* over a Herbland in sandy loam.



W5 Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with occasional *Callitris glaucophylla* over an Open Thicket of *Acacia acuminata* over a Low Shrubland of mixed species in silty clay.



W6 Very Open Woodland of *Eucalyptus salicola* over Open Low Shrubland of mixed shrubs over Herbs and Dense Low Grass.



M1 Open Tree Mallee of *Eucalyptus brachycorys*, *E. hypochlamydea* subsp. *hypochlamydea*, *E. loxophleba* subsp. *supralaevis* and *Callitris glaucophylla* over Thicket of *Acacia* species and *Eremophila ? cupulantha* over Low Shrubland dominated by *Olearia dampiera* subsp. *eremicola* and Herbs on loam.



M2 Very Open Tree Mallee of *Eucalyptus brachycorys* and *E. oldfieldii* over a Thicket of *Acacia anthochaera* and *A. ramulosa* over a Herbland in loamy clay.



- M3** Open Shrub Mallee of *Eucalyptus brachycorys* and *E. synandra* over Thicket of *Acacia anthochaera* and *A. ramulosa* over Low Shrubland of *Baeckea* affin. *cryptandroides* and *Ptilotus obovatus* over Herbs of *Amphipogon caricinus* subsp. *caricinus*, *Chamaexeros macrantha*, *Gilbertia tenuifolia*, *Waitzia acuminata* and *Velleia rosea*.



- M4** Very Open Shrub Mallee of *Eucalyptus leptopoda* with emergent *Eucalyptus loxophleba* subsp. *supralaevis* over Thicket of *Acacia ramulosa* over Herbland of Asteraceae species in loam.



T1 Dense Thicket of mixed species dominated by *Acacia* species, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Calycopeplus paucifolius*, and *Melaleuca nematophylla* over Low Shrubland in jaspilite rocks with pockets of loam.



T2 Dense Thicket dominated by *Acacia assimilis*, *A. stereophylla* var. *stereophylla*, *A. ramulosa* and *Allocasuarina acutivalvis* subsp. *prinsepiana* over Low Shrubland of *Acacia acuarina*, *Hemigenia* sp. Paynes Find and *Baeckea* affinis *cryptandroides* in loam with scattered rocks on the surface.



T3 Dense Thicket of *Acacia assimilis*, *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Melaleuca nematophylla* over Low Shrubland of *Hemigenia* sp. Paynes Find and *Hibbertia crassifolia* in loam pockets in jaspilite rocks.



T4 Dense Thicket of *Allocasuarina acutivalvis* subsp. *prinsepiana* with occasional *Eucalyptus oldfieldii* over an Open Scrub of *Acacia* species over Open Shrubland of *Hemigenia* sp. Paynes Find or Open Herbs of *Xanthosia bungei*.



- T5** Thicket of *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Grevillea obliquistigma* with emergent *Callitris glaucophylla* over Low Shrubland dominated by *Darwinia masonii*, *Hibbertia crassifolia*, *Melaleuca radula* and *Philotheca brucei* subsp. *brucei* over Open Herbs of *Xanthosia bungei* in loam pockets in dense jaspilite rocks.



- T6** Thicket of *Acacia aneura* and *Acacia stowardii* over Low Shrubland of mixed species with large numbers of *Darwinia masonii* in loam with abundant rocks on the surface.



T7 Open Thicket of *Acacia ramulosa* with emergent *Callitris glaucophylla* and *Eucalyptus loxophleba* subsp. *supralaevis* over Low Shrubland and Herbs in loamy sand surrounding the lake edge.



T8 Dense thicket of *Melaleuca* sp. Wongan Hills and *Acacia ramulosa* over low shrubland of mixed species in loamy clay soil.



T9 Dense Thicket of *Acacia* species, *Hakea* species, *Eucalyptus brachycorys* and *E. oldfieldii* with emergent *Callitris glaucophylla*, over Open Low Shrubland of mixed species on sand.



T10 Thicket of *Acacia acuminata*, *A. ramulosa*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Eucalyptus hypoclamydea* subsp. *hypoclamydea* over an Open Shrubland of mixed species on sandy loam.



T11 Thicket of *Acacia* species and *Allocasuarina acutivalvis* subsp. *prinsepiana* with emergent Very Open Mallee of *Eucalyptus brachycorys* and *E. leptopoda* in loam.



T12 Thicket of *Acacia ramulosa* with emergent *Eucalyptus oldfieldii* and *E. loxophleba* subsp. *supralaevis* over a Low Shrubland over Herbs in loam with pebbles common on the surface.



HS1 Low Heath of *Ptilotus obovatus* with emergent shrubs of *Acacia stowardii* and *Calycopeplus paucifolius* over Herbs in loamy clay amongst large boulders.

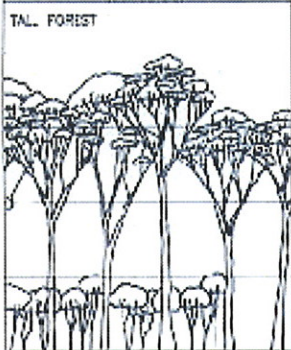
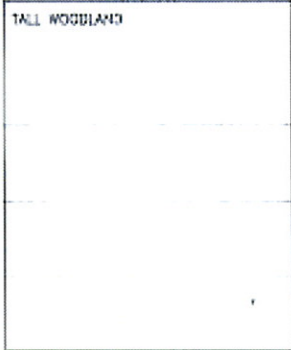
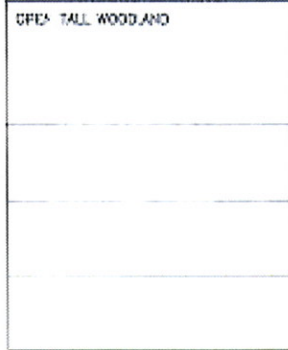

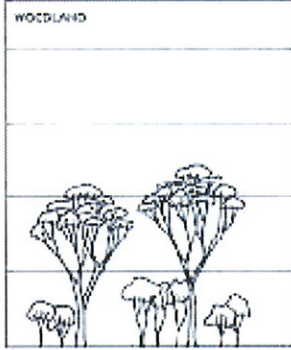
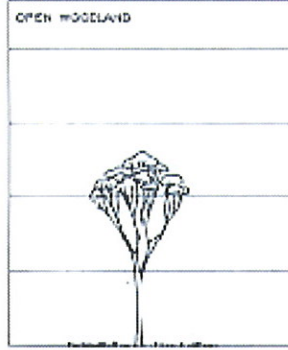
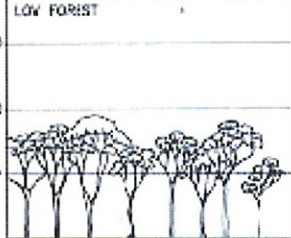
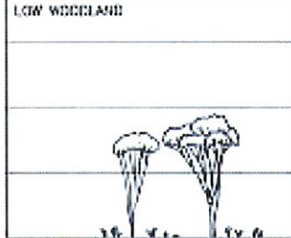
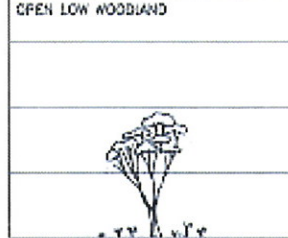


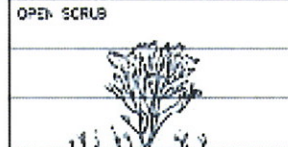
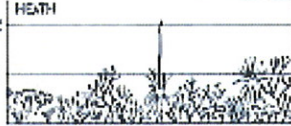
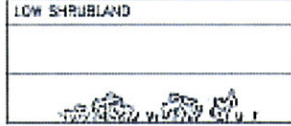






HS2 Dense Low Heath of *Halosarcia* species with other chenopods over Herbs in sandy clay soil in a salt lake.

APPENDIX D

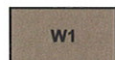
Structural forms of Australian vegetation

STRUCTURAL FORMS OF AUSTRALIAN VEGETATION

GROWTH FORM OF TALLEST STRATUM	FOLIAGE COVER OF TALLEST STRATUM		
	33-70%	10-30%	Less than 10%
TALL TREES Greater than 30m <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">40</div> <div style="margin-right: 5px;">30</div> <div style="margin-right: 5px;">20</div> <div style="margin-right: 5px;">10</div> </div>	TALL FOREST 	TALL WOODLAND 	OPEN TALL WOODLAND 
MEDIUM TREES 10-30m <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">40</div> <div style="margin-right: 5px;">30</div> <div style="margin-right: 5px;">20</div> <div style="margin-right: 5px;">10</div> </div>	FOREST 	WOODLAND 	OPEN WOODLAND 
LOW TREES Less than 10m <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">15</div> <div style="margin-right: 5px;">10</div> <div style="margin-right: 5px;">5</div> </div>	LOW FOREST 	LOW WOODLAND 	OPEN LOW WOODLAND 
TALL SHRUBS Greater than 2m <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">2</div> <div style="margin-right: 5px;">1</div> </div>	THicket 	SCRUB 	OPEN SCRUB 
LOW SHRUBS Less than 2m <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">2</div> <div style="margin-right: 5px;">1</div> </div>	HEATH 	LOW SHRUBLAND 	OPEN LOW SHRUBLAND 
GRASSLAND Less than 1m <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">1</div> <div style="margin-right: 5px;">0.5</div> </div>	CLOSED BUNCH GRASSLAND 	OPEN BUNCH GRASSLAND 	HUMBOCK GRASSLAND 

APPENDIX E

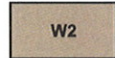
Map of vegetation communities



W1

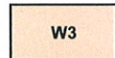
WOODLANDS

Woodland of *Eucalyptus salmonophloia* (Salmon gum) over Thicket of *Acacia* species over Dense Low Heath dominated by *Atriplex bunburyana* on loam



W2

Dense to Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with occasional *Callitris glaucophylla* over a Thicket of *Acacia* species dominated by *A.assimilis* over Herbs dominated at the time of survey by *Velleia rosea* on silty sand.



W3

Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* and *Callitris glaucophylla* over a Thicket of *Melaleuca stereophloia*, *Acacia nigripilosa* subsp. *nigripilosa*, *A. obtecta* over Low Shrubland of *Olearia dampiera* subsp. *erimcola* and *Bossiaea walkeri* and Herbs on silty sand.



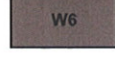
W4

Very Open Woodland of *Callitris glaucophylla* and *Eucalyptus loxophleba* subsp. *supralaevis* over an Open Thicket of *Acacia acuminata* over a Herbland in sandy loam.



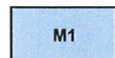
W5

Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with occasional *Callitris glaucophylla* over an Open Thicket of *Acacia acuminata* over a Low Shrubland of mixed species in silty clay.



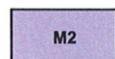
W6

Very Open Woodland of *Eucalyptus salicola* over Open Low Shrubland of mixed shrubs over Herbs and Dense Low Grass.

MALLEE COMMUNITIES

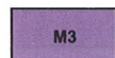
M1

Open Tree Mallee of *Eucalyptus brachycorys*, *E. hypochlamydea* subsp. *hypochlamydea*, *E. loxophleba* subsp. *supralaevis* and *Callitris glaucophylla* over Thicket of *Acacia* species over Low Shrubland and Herbs on loam.



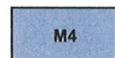
M2

Very Open Tree Mallee of *Eucalyptus brachycorys* and *E. oldfieldii* over a Thicket of *Acacia anthochaera* and *A. ramulosa* over a Herbland in loamy clay.



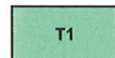
M3

Open Shrub Mallee of *Eucalyptus brachycorys* and *E. synandra* over Thicket of *Acacia anthochaera* and *A. ramulosa* over Low Shrubland of *Baeckea* affn. *cryptandroides* and *Ptilotus obovatus* over Herbs of *Amphipogon caricinus* subsp. *caricinus*, *Chamaexeros macrantha*, *Gilbertia tenuifolia*, *Waitzia acuminata* and *Velleia rosea*.



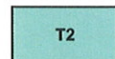
M4

Very Open Shrub Mallee of *Eucalyptus leptopoda* with emergent *Eucalyptus loxophleba* subsp. *supralaevis* over Thicket of *Acacia ramulosa* over Herbland of Asteraceae species in loam.

THICKET COMMUNITIES

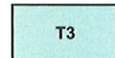
T1

Dense Thicket of mixed species dominated by *Acacia* species, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Calcopeplus paucifolius*, and *Melaleuca nematophylla* over Low Shrubland in jaspilite rocks with pockets of loam.



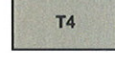
T2

Dense Thicket dominated by *Acacia assimilis*, *A. stereophylla* var. *stereophylla*, *A. ramulosa* and *Allocasuarina acutivalvis* var. *prinsepiana* over Low Shrubland of *Acacia acuaria*, *Hemigenia* sp. Paynes Find and *Baeckea* affn. *cryptandroides* in loam with scattered rocks on the surface.



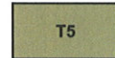
T3

Dense Thicket of *Acacia assimilis*, *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Melaleuca nematophylla* over Low Shrubland of *Hemigenia* sp. Paynes Find and *Hibbertia crassifolia* in loam pockets in jaspilite rocks.



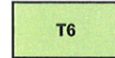
T4

Dense Thicket of *Allocasuarina acutivalvis* subsp. *prinsepiana* with occasional *Eucalyptus oldfieldii* over an Open Scrub of *Acacia* species over Open Shrubland of *Hemigenia* sp. Paynes Find or Open Herbs of *Xanthosia bungei*.



T5

Thicket of *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Grevillea obliquistigma* with emergent *Callitris glaucophylla* over Low Shrubland dominated by *Darwinia masonii*, *Hibbertia crassifolia*, *Melaleuca radula* and *Philothea brucei* subsp. *brucei* over Open Herbs of *Xanthosia bungei* in loam pockets in dense jaspilite rocks.



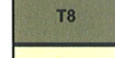
T6

Thicket of *Acacia aneura* and *Acacia stowardii* over Low Shrubland of mixed species with large numbers of *Darwinia masonii* in loam with abundant rocks on the surface.



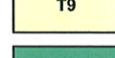
T7

Open Thicket of *Acacia ramulosa* with emergent *Callitris glaucophylla* and *Eucalyptus loxophleba* subsp. *supralaevis* over Low Shrubland and Herbs in loamy sand surrounding the lake edge.



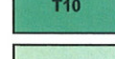
T8

Dense thicket of *Melaleuca* sp. Wongan Hills and *Acacia ramulosa* over low shrubland of mixed species in loamy clay soil.



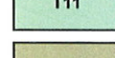
T9

Dense Thicket of *Acacia* species, *Hakea* species, *Eucalyptus brachycorys* and *E. oldfieldii* with emergent *Callitris glaucophylla*, over Open Low Shrubland of mixed species on sand.



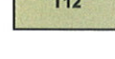
T10

Thicket of *Acacia acuminata*, *A. ramulosa*, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Eucalyptus hypochlamydea* subsp. *hypochlamydea* over an Open Shrubland of mixed species on sandy loam.



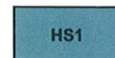
T11

Thicket of *Acacia* species and *Allocasuarina acutivalvis* subsp. *prinsepiana* with emergent Very Open Mallee of *Eucalyptus brachycorys* and *E. leptopoda* in loam.



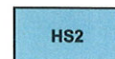
T12

Thicket of *Acacia ramulosa* with emergent *Eucalyptus oldfieldii* and *E. loxophleba* subsp. *supralaevis* over a Low Shrubland over Herbs in loam with pebbles common on the surface.

HEATH COMMUNITIES

HS1

Low Heath of *Ptilotus obovatus* with emergent shrubs of *Acacia stowardii* and *Calcopeplus paucifolius* over Herbs in loamy clay amongst large boulders.



HS2

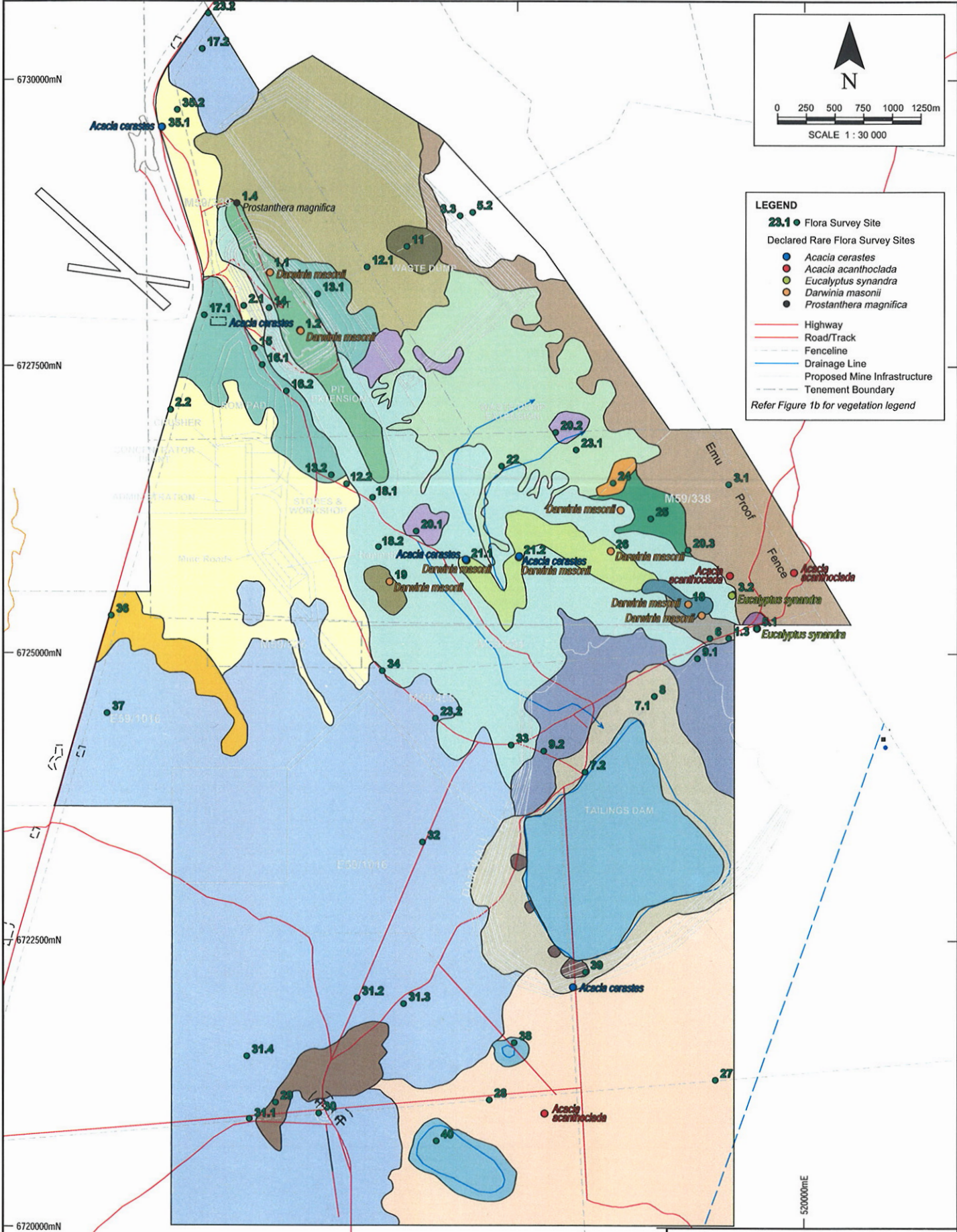
Dense Low Heath of *Halosarcia* species with other chenopods over Herbs in sandy clay soil in a salt lake.

**BENNETT ENVIRONMENTAL CONSULTING**Mt Gibson Iron
VEGETATION SURVEY**VEGETATION LEGEND****Figure 1b**

APPENDIX F

Map of Rare and Priority Flora

NB: *Prostanthera magnifica* was recently removed from the Priority Flora list but as there were only a few scattered locations on the lease these are included in this map.



LEGEND

23.1 ● Flora Survey Site

Declared Rare Flora Survey Sites

- Acacia cerastes
- Acacia acanthoclada
- Eucalyptus synandra
- Darwinia masonii
- Prostanthera magnifica

- Highway
- Road/Track
- - - Fenceline
- Drainage Line
- - - Proposed Mine Infrastructure
- - - Tenement Boundary

Refer Figure 1b for vegetation legend

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VEGETATION SURVEY
**FLORA SURVEY SITES AND
DECLARED RARE FLORA SITES**

Figure 2