

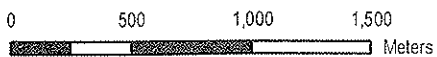


Legend

-  Study Area
-  Disturbance limits



ILUKA

ORIG: B.Bow
DRAWN: T.L.G
SCALE: 1:30,000
DATE: 10 Jan 2006









BUREKUP

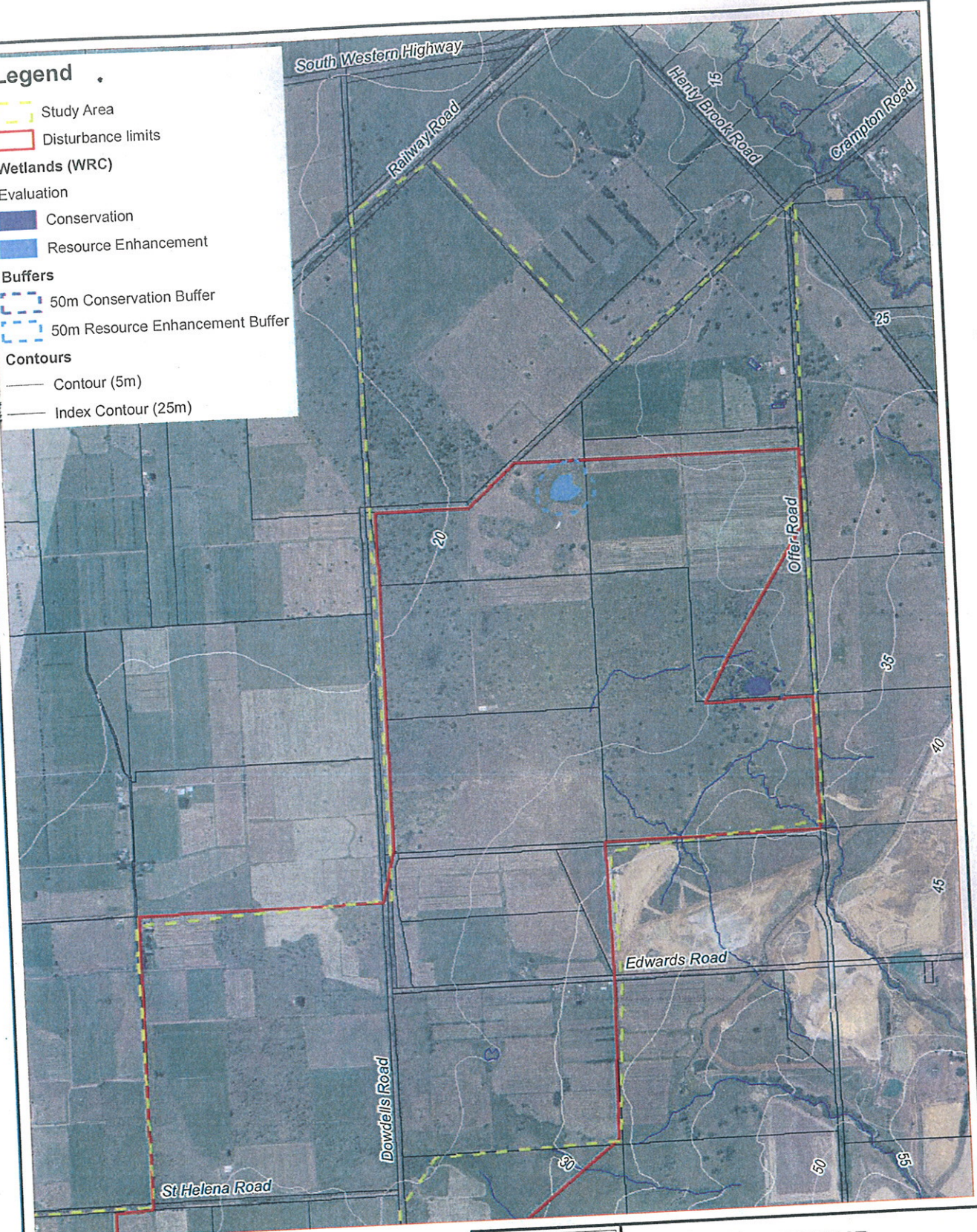
STUDY AREA

DWG No: 170437 ver.00

A4 **FIGURE: 3**

Legend

-  Study Area
-  Disturbance limits
- Wetlands (WRC)**
- Evaluation**
-  Conservation
-  Resource Enhancement
- Buffers**
-  50m Conservation Buffer
-  50m Resource Enhancement Buffer
- Contours**
-  Contour (5m)
-  Index Contour (25m)



Detailed Aerial Photo : 19 November 2005
 Regional Aerial Photo : Skyview 2001



ILUKA
 ORIG: B.Bow
 DRAWN: T.L.G
 SCALE: 1:20,000
 DATE: 10 Jan 2006

BUREKUP

WETLAND AREAS

DWG No: 170436 ver.00

A4 **FIGURE: 6**

HYDER Bridget

Subject: RE: Me away and Burekup

Burekup EIA

Bronwen was going to bring in Bioplan maps/info about this area. From my chat with her the other day I understood that;

The area contains-

The most southern extent of *Casuarina obesa*,

One of the largest and close to most southern stands of *Euc wandoo* (all significant) (and I think Bronwen mentioned significant for habitat in this area),

The rail line corridor veg is all significant,

An unnamed species of *Craspedia* has been found in the area, and should be searched for?

TEC/wetlands to the northwest of the site need to be considered.

DRP/Priority

- *Craspedia argillicola* P2
- *Aporogon hexatepalus* P4
- *Anthodium junciforme* P4

Waterloo Communities - part estimate

EC7	36	} TEC's
	8	
	13	

Request - plot data, interested in location *Euc. peters* (Hova 1st)

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1:	Definition of Rare and Priority Flora Species (Department of Environment and Conservation, 2006a)
2:	Categories of Threatened Flora Species (Environmental Protection and Biodiversity Conservation Act 1999)
3:	Categories of Threatened Ecological Communities (Department of the Environment and Heritage 2006d)
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5:	Condition rating scale from Bush Forever (Government of Western Australia 2000 based on Keighery 1994)

FIGURES

1:	Burekup Vegetation Map
2:	Burekup Vegetation Condition

APPENDICES

A:	Summary of vascular plant species recorded at Burekup survey area, 2005
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1. SUMMARY

Mattiske Consulting Pty Ltd was commissioned by Iluka Resources to conduct a vegetation survey for a proposed mineral sands mine at Burekup in Western Australia. The objectives of the study were to assess the botanical values on the proposed project site. The specific work undertaken by Mattiske Consulting Pty Ltd in December 2005 included a search for rare and priority flora, defining and mapping the plant communities present, assessing the condition of the plant communities and reviewing the local and regional conservation value of the flora and vegetation.

A total of 174 taxa (including subspecies and varieties) from 128 genera and 49 families was recorded within the Burekup survey area (Appendix A). Representation was greatest among the Poaceae (20 taxa), followed by Papilionaceae (17 taxa), Myrtaceae (16 taxa), Cyperaceae (13 taxa) and Mimosaceae (11 taxa). Since fifteen of the Poaceae, five of the Papilionaceae and two of the Cyperaceae were weed species, the families with the highest native representation were Myrtaceae (16 taxa), Cyperaceae and Mimosaceae (both with 11 native taxa).

During the survey, no Declared Rare Flora species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act 1950 and as listed by the Department of Environment and Conservation (2006a and 2006b) was located during the survey. No plant taxa pursuant to section 179 of the Environmental Protection Biodiversity Conservation Act 1999 were located in the survey area. No Priority flora species were recorded in the Burekup survey area, although one Priority 4 species has been recorded previously within the project area.

Altogether, sixty-seven introduced (weed) taxa were recorded during the Burekup survey. Four weed species found during the survey are recognised as Declared Plants pursuant to Section 37 of the Agriculture and Related Resources Protection Act 1976.

Nine plant communities were recorded in the Burekup survey area. The majority of the communities were disturbed and ranged from completely degraded to good. There were only a few areas, which were better than "good" in condition. There was a localised patch of *Corymbia calophylla* community (C4) that has floristic similarities to Community type SCP 3a, a Threatened Ecological Community listed at both the State (Department of Environment and Conservation (2006c) and Federal levels (Department of the Environment and Heritage 2006b). The small patch of this community on the road verges of Simpson Road were ranked as "very good" (see Figure 2) and should be avoided in any clearing proposals.

The representation of the vegetation complexes as defined by Heddle et al. (1980) and as updated by Mattiske and Havel (1998) vary in representation. Of these complexes the vegetation on the Guildford complex is not well represented in the conservation estate (Bush Forever, Government of Western Australia 2000).

Table 2: Categories of Threatened Species (Environmental Protection and Biodiversity Conservation Act 1999)

Category Code	Category
Ex	<p>Extinct A native species is eligible to be included in the <i>extinct</i> category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.</p>
ExW	<p>Extinct in the Wild A native species is eligible to be included in the <i>extinct in the wild</i> category at a particular time if, at that time (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.</p>
CE	<p>Critically Endangered A native species is eligible to be included in the <i>critically endangered</i> category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.</p>
E	<p>Endangered A native species is eligible to be included in the <i>endangered</i> category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.</p>
V	<p>Vulnerable A native species is eligible to be included in the <i>vulnerable</i> category at a particular time if, at that time (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.</p>
CD	<p>Conservation Dependent A native species is eligible to be included in the <i>conservation dependent</i> category at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.</p>

Two species listed as Vulnerable pursuant to the Environmental Protection and Biodiversity Conservation Act 1999 have been found near the Burekup area previously (Department of the Environment and Heritage 2006c). These species are both orchids and are described briefly below (Department of Environment and Conservation 2006a). In addition, a number of species recognised under the Wildlife Conservation Act 1950 (Department of Environment and Conservation 2006a, 2006b), have been found previously in the area, and these are also described below. Note that some species are specially protected by both federal and state laws.

- *Caladenia* sp. Jarrah forest (S.D. Hopper 3990) – Priority Four, Vulnerable PTO
This species is listed as above on the EPBC Act List of Threatened Flora (Department of the Environment and Heritage 2006c), and as *Caladenia arrecta* in the records of the Western Australian Herbarium (Department of Environment and Conservation 2006a). It is a tuberous perennial herb growing to a height of between 12 and 35cm, and producing yellow and red flowers, which are of the typical “spider orchid” appearance, from August to October. It is found on a variety of soils in moist areas including loam, gravel and laterite.
- *Drakaea micrantha* (ms) – Declared Rare Flora, Vulnerable
This species is a tuberous perennial orchid growing to a height of between 15 and 30cm. It produces red and yellow flowers from September to October, which bear a resemblance to a duck in flight. It is found on white-grey sand, in scattered locations along the coastal plain between Perth and Albany.
- *Aponogeton hexatepalus* (Priority 4 Species)
Aponogeton hexatepalus (Stalked Water Ribbons) has been recorded in two locations previously within the project area (near Mt Helena Road). This taxon required local ponding and seasonally wet conditions. There are also a range of Priority Flora that have been recorded north of the project area along the fringes of Railway Road. The species along Railway Road are unlikely to be directly or indirectly impacted.

2.2 Local and Regional Significance

The Environmental Protection Authority in Guidance Statement 51 (Environmental Protection Authority 2004) states that species, subspecies, varieties, hybrids and ecotypes may be significant other than as Declared Rare Flora or Priority Flora, for a variety of reasons, including:

- “ a keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species;
- relic status;
- anomalous features that indicate a potential new discovery;
- being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- the presence of restricted subspecies, varieties, or naturally occurring hybrids;
- local endemism/a restricted distribution;
- being poorly reserved.”

Plant communities or vegetation may be significant for a range of reasons, other than a statutory listing as a Threatened Ecological Community or because the extent is below a threshold level. The Environmental Protection Authority in Guidance Statement 51 (Environmental Protection Authority 2004) states that significant vegetation may include communities that have:

- “ scarcity;
- unusual species;
- novel combinations of species;
- a role as a refuge;
- a role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species;
- being representative of the range of a unit (particularly, a good local and/or regional example of a unit in “prime” habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- a restricted distribution.”

The application of the degree of significance may apply at a range of scales. Plant communities may be referred to as locally significant where the presence of Priority Flora species has been recorded, where they provide a range extension of particular taxa from previously recorded locations, or where they are very restricted to one or two locations or occur as small isolated communities. In addition, communities that exhibit unusually high structural and species diversity are also of local significance (Mattiske EM, pers. comm.). Plant communities may be referred to as regionally significant where they are limited to specific landform types, are uncommon or restricted plant community types within the regional context, or support populations of Declared Rare Flora (Mattiske EM, pers. comm.).

2.3 Vegetation

The proposed mining area lies within the Drummond Botanical Subdistrict of the South-western Botanical Province as recognised by Diels (1906) and later developed by Gardner (1942) and Beard (1979, 1980). Beard (1990) described the Drummond Botanical Subdistrict as being a low-lying coastal plain with sandy soils and swampy deposits, and having a warm dry Mediterranean climate. Vegetation of the Drummond Botanical Subdistrict is typically *Banksia* low woodland on leached sands, *Melaleuca* wetlands in areas of poorer drainage, and *Eucalyptus gomphocephala* / *E. marginata* / *Corymbia calophylla* woodlands on soils with a higher nutrient content (Beard 1990).

Previous workers have stressed the significance of the climate, landforms and soils in determining the distribution of plant communities in this area (Diels 1906; Williams 1932, 1942; Speck 1958; Lange 1960; Churchill 1961, 1968; Smith 1974; Seddon 1972; Havel 1968, 1975a, 1975b; Heddle *et al.* 1980a; Beard 1981, Mattiske and Havel 1998). In vegetation mapping it is necessary to define and map the plant communities into groups with common characteristics in structure and floristics.

This grouping and classification has been achieved by:

- . Havel on the Swan Coastal Plain (1968) and in the Northern Jarrah Forest (1975a, 1975b),
- . Smith (1974) on the Collie area (1:250,000),
- . Beard (1979) in the Pinjarra area (1:250,000),
- . Heddle *et al.* (1980a) in the System 6 area; Perth, Pinjarra and Collie areas (1:250,000),
- . Gibson *et al.* (1994) on the southern Swan Coastal Plain, and
- . Mattiske and Havel (1998) in the vegetation mapping for the Regional Forest Agreement.

The classification system of Heddle *et al.* (1980a), which utilised the concept of vegetation complexes, emphasised the relationships between the underlying landforms, soils and the plant communities. This latter system incorporated linkages with the previous work by Havel (1975a and b). The complexes on the Swan Coastal Plain were defined and mapped by Heddle *et al.* (1980a). The vegetation complexes on the adjacent Darling Scarp and Plateau were revised and mapped by Mattiske and Havel (1998) for the purposes of the Regional Forest Agreement.

The Burekup lease area occurs within the Guildford vegetation complex as defined by Heddle *et al.* (1980a), namely:

Guildford - A mixture of open forest to tall open forest of *Corymbia calophylla* - *Eucalyptus wandoo* - *Eucalyptus marginata* and woodland of *Eucalyptus wandoo*. Minor components include *Eucalyptus rudis* - *Melaleuca raphiophylla*.

This vegetation complex has been largely cleared for agricultural activities and is under represented in the conservation estate (Bush Forever (Government of Western Australia 2000) refers to 6% representation within the Perth metropolitan area and this would be lower in the southern areas of the Swan Coastal Plain). More recently, the vegetation of Western Australia has been assigned to bioregions under the Interim Biogeographical Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995 and Department of the Environment and Heritage 2006b). These subdivisions largely relied on the earlier physiographic work of Beard (1981). The Burekup area lies within the Swan Coastal Plain Bioregion. The Swan Coastal Plain Bioregion is characterised by *Banksia* sp. and *Eucalyptus gomphocephala* (Tuart) woodlands on sandy soils, *Casuarina obesa* woodlands on outwash plains (with *Corymbia calophylla* to the south), and *Melaleuca* sp. woodlands on swampy areas (Department of Environment and Conservation 2006a).

Excavation
of low
left over
this degree
of intactness

2.4 Threatened Ecological Communities

Communities are described as 'Threatened Ecological Communities' (TEC's) if they have been defined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee and found to be Presumed Totally Destroyed (PD), Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). For definitions of TEC categories and criteria refer to English and Blyth (1997) and Department of Environment and Conservation (2006c). Selected plant communities have also been listed as "Threatened Ecological Communities" under the Environmental Protection and Biodiversity Conservation Act (EPBC Act) 1999. Three categories exist for describing the vulnerability or status of threat to Threatened Ecological communities (Department of the Environment and Heritage 2006d), and are described below (Table 3).

Table 3: Categories of Threatened Ecological Communities (Department of the Environment and Heritage 2006d)

TEC Category	Definition
Critically Endangered	"An ecological community may be included in the Critically Endangered category if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future."
Endangered	"An ecological community may be included in the Endangered category if, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future."
Vulnerable	"An ecological community may be included in the Vulnerable category if, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future."

Five Threatened Ecological Communities occur in the general Capel area (Table 3). Communities 10b and 3a are listed as endangered under the EPBC Act 1999 (Department of the Environment and Heritage 2006b). ?? Backup

Table 3: Threatened Ecological Communities found in the general Capel area

Gibson <i>et al.</i> (1994) plant community	General Description	Status (DEC)	Status (EPBC Act 1999 Category)
10b	Shrublands of southern Swan Coastal Plain Ironstones (Busselton area)	Endangered	Endangered
2	Southern wet shrublands, Swan Coastal Plain	Endangered	not listed
3a	<i>Corymbia calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils, Swan Coastal Plain	Critically Endangered	Endangered
1b	<i>Corymbia calophylla</i> woodlands on heavy soils of the southern Swan Coastal Plain	Vulnerable	not listed
.7	Herb rich saline shrublands in clay pans	Vulnerable	not listed

There is a conservation category (WRC) wetland located at the northern end of the project area near Railway Road. One type of Threatened Ecological Community, the vegetation complex of *Corymbia calophylla* / *Xanthorrhoea preissii* woodland or shrubland of the Swan Coastal Plain, is known to occur within the area (Department of the Environment and Heritage 2006c), and is listed as "Endangered" according to the categories presented in Table 3.

2.5 Introduced Species and Declared Plants

The Agricultural Protection Board within the Department of Agriculture and Food, Western Australia, recognises some introduced or weed species as Declared Plants due to their invasive or aggressive growth. Pursuant to Section 37 of the Agriculture and Related Resources Protection Act 1976, the Agriculture Protection Board lists several classes of declaration and actions required to be taken made under Section 35 of the Act (Table 4).

Table 4: Classes of Declared Plant in Western Australia and (Department of Agriculture and Food 2006a)

Declared Plant Class	Action Required by Law
P1	"Prohibits movement of plants or their seeds within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder:"
P2	"Eradicate infestation to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery:"
P3	"Control infestation in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants:"
P4	"Prevent the spread of infestation from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set on all plants:"
P5	"Infestations on public lands must be controlled."

3. OBJECTIVES

The specific scope of works issued by Iluka for the Burekup site was to:

- Identify all vascular plant species present;
- Review the conservation status of the vascular plant species with reference to current literature and listings by the Department of Environment and Conservation (2006a, 2006b) and the Environmental Protection and Biodiversity Conservation Act (EPBC Act) 1999 (Department of the Environment and Heritage 2006a).
- Compare the plant communities at each site with those defined by Gibson *et al.* (1994) to aid in assessment of local and regional significance;
- Review the impacts of the proposed clearing on the vegetation, flora, fauna species and Threatened Ecological Communities in local and regional contexts; and
- Produce a report summarising the findings.

4. METHODS

An initial search for the Declared Rare and Priority flora species and Threatened Ecological Communities known to occur in the region was made using the databases compiled by the Department of Environment and Conservation (2006a, 2006b) and the Department of the Environment and Heritage (2006c).

The flora and vegetation of the Burekup survey area was described and collected systematically at 32 survey sites, during December 2005. At each site, environmental data were recorded with respect to topography, percentage litter cover, soil ratio, percentage of bare ground, outcropping rocks and their type, pebble type and size, and time since fire. The average height and percent foliage cover of living and dead vascular plant species were recorded along with species and life form.

The condition of each plant community was rated according to the scale used for assessing Bush Forever sites (Government of Western Australia 2000). The condition rating scale is summarised in Table 5.

Table 5: Condition rating scale from Bush Forever (Government of Western Australia 2000 based on Keighery 1994)

Rating	Description	Explanation
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure covers repeated fire, aggressive weeds, dieback, logging, grazing.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure covers frequent fires, aggressive weeds at high density, partial clearing, dieback and grazing.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure includes frequent fires, presence of very aggressive weeds, partial clearing, dieback and grazing.
6	Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.

All plant specimens collected during the field survey were dried and fumigated in accordance with the requirements of the Western Australian Herbarium. The plant species were identified and then compared with pressed specimens housed at the Western Australian Herbarium. Where appropriate, plant taxonomists with specialist skills were consulted. Nomenclature of the species recorded follows the Department of Environment and Conservation standards (Department of Environment and Conservation 2006a & b).

5. RESULTS

5.1 Flora

A total of 174 taxa (including subspecies and varieties) from 128 genera and 49 families was recorded within the Burekup survey area (Appendix A). Representation was greatest among the Poaceae (20 taxa), followed by Papilionaceae (17 taxa), Myrtaceae (16 taxa), Cyperaceae (13 taxa) and Mimosaceae (11 taxa). Since fifteen of the Poaceae, five of the Papilionaceae and two of the Cyperaceae were weed species, the families with the highest native representation were Myrtaceae (16 taxa), Cyperaceae and Mimosaceae (both with 11 native taxa).

5.2 Rare and Priority Flora

During the survey, no Declared Rare Flora species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act 1950 and as listed by the Department of Environment and Conservation (2006a and 2006b) were located during the survey. No plant taxa pursuant to section 179 of the Environmental Protection Biodiversity Conservation Act 1999 were located in the survey area. No Priority flora species were recorded in the Burekup survey area, although one Priority 4 species has been recorded previously within the project area.

5.3 Vegetation

A total of nine plant communities were recorded in the Burekup survey area (Figure 1).

- A1 – Woodland of *Agonis flexuosa* – *Corymbia calophylla* – *Eucalyptus rudis* over weeds on loam soils along flowlines.
- C1 – Woodland of *Corymbia calophylla* – *Eucalyptus wandoo* over *Xanthorrhoea preissii*, *Hypocalymma angustifolium* and weeds on sandy-loam soils.
- C2 – Woodland to forest of *Corymbia calophylla* – *Eucalyptus rudis* – *Melaleuca raphiophylla* – *Melaleuca preissiana* over weeds on loam soils.
- C3 – Low woodland of *Casuarina obesa* over *Melaleuca viminea* subsp. *viminea* and *Hakea varia* over *Chorizandra enodis* on sandy-loam soils.
- C4 – Forest of *Corymbia calophylla* over *Banksia grandis*, *Xanthorrhoea preissii* and *Kingia australis* over *Cyathochaeta avenacea* on sandy loam soils.
- C5 – Woodland to forest of *Corymbia calophylla* – *Corymbia haemotoxylon* over *Xanthorrhoea preissii* over *Cyathochaeta avenacea* on sandy loam soils.
- E1 – Woodland of *Eucalyptus wandoo* over *Melaleuca raphiophylla* over pasture on loam soils.
- M1 – Low woodland to forest of *Melaleuca raphiophylla* with emergent *Corymbia calophylla* and *Eucalyptus rudis* over pasture on loam soils.
- M2 – Woodland of *Melaleuca preissiana*, with *Eucalyptus rudis* and *Corymbia calophylla* over *Melaleuca lateritia*, *Viminaria juncea*, *Acacia saligna* and *Hakea varia* over *Lepidosperma longitudinale* on clay-loam soils.

5.4 Status of Plant Communities

Nine plant communities were recorded in the Burekup survey area (Figure 1). The majority of the communities were disturbed and ranged from completely degraded to good. There were only a few areas, which were better than "good" in condition. There was a localised patch of *Corymbia calophylla* community (C4) that has floristic similarities to Community type SCP 3a, a Threatened Ecological Community listed at both the State (Department of Environment and Conservation (2006c) and Federal levels (Department of the Environment and Heritage 2006b). The small patch of this community on the road verges of Simpson Road were ranked as "very good" (see Figure 2) and should be avoided in any clearing proposals.

5.5 Condition of the Plant Communities

A large proportion of the site was disturbed, and completely degraded. Vegetation communities present were mostly defined in a mixture of condition of 'good' and 'degraded', with only four sites classified as being in very good condition. The size and location of these is presented in Figure 2. The four sites each represented different communities: C1, C3, C4 and M2 (see above or Figure One for descriptions). All were located adjacent to roads.

5.6 Introduced and Declared Weed Species

During the survey, a total of sixty-seven introduced or weed species was recorded. Four species found during the survey are recognised as Declared Plants pursuant to Section 37 of the Agriculture and Related Resources Protection Act 1976. Descriptions of these along with actions required are listed below (Parsons & Cuthbertson 1992, Hussey *et al.* 1997, Department of Environment and Conservation 2006a, Department of Agriculture and Food 2006a).

➤ **Acacia dealbata* (Silver Wattle) P1, P2 (Family: MIMOSACEAE)

This species is a tree or shrub reaching a height of 30m, and growing on loamy or granitic soils on stony slopes and creekbanks. On the project area it was recorded at 385680mE: 6309271mN (GDA94). It has smooth grey-brown bark, which is deeply corrugate in mature trees, glaucous leaves, and produces yellow flowers from August to October. It readily regenerates and often forms a thicket after fire, and suckers freely if the roots are damaged.

Movement of **Acacia dealbata* or its seeds is prohibited, including movement of contaminated machinery, livestock, fodder and other produce. The infestation must be destroyed and propagation prevented until all plants have been eradicated.

➤ **Rubus fruticosus* agg. (Blackberry) P1, P4 (Family: ROSACEAE)

The plant commonly known as Blackberry is an aggregate of several species, including *Rubus fruticosus* and *R. ulmifolius*. On the project area it was recorded at 388828mE: 6312810mN (GDA94). Blackberry is a straggling perennial shrub, which may reach 4m in height, and is commonly found along natural and artificial watercourses. It produces pink and white flowers from December to January, followed by dark red or black berries. Propagation occurs via suckers from lateral roots, tip-rooting, and germinating seeds. Seeds are readily spread by birds, including emus, and foxes. Blackberry is a highly invasive species which can out-compete native vegetation to very quickly become the dominant species.

Movement of **Rubus fruticosus* agg. or their seed is prohibited, including movement of contaminated machinery, livestock, fodder and other produce. Spread of the infestation must be prevented by treating plants to destroy or prevent the production of seeds or propagules. Care must be taken when choosing herbicides as some can stimulate propagation via suckering.

- **Asparagus asparagoides* (Bridal creeper) P1 (Family: ASPARAGACEAE)
This species is a rhizomatous and tuberous perennial herb, which often climbs to a height of 5m. It is found on a range of soils including sand, loam, clay and granite. . On the project area it was recorded at 387063mE: 6308759mN, 386099mE: 6307603mN and at 385696mE: 6307249mN (GDA94).It produces white flowers from August to September. The fleshy fruits of this highly invasive environmental weed are spread by birds, and the plants sprawl over natural vegetation, eventually smothering it. It is capable of spreading rapidly in disturbed areas such as along roadsides but can also easily invade undisturbed bushland.

Movement of this plant or its seeds is prohibited, including movement of contaminated machinery, livestock, fodder and other produce.

- **Gomphocarpus fruticosus* (Narrowleaf Cotton Bush) P1, P4 (Family: ASCELPIADACEAE)
This species is an erect perennial herb or shrub, growing to a height of between 50 and 150cm. It is found on disturbed sites in scattered pockets within the project area. It produces white or cream flowers from February to July. The fruit is an ovoid inflated pod, which is covered in soft bristles, and filled with seeds bearing silky white hairs. Propagation is mainly by seed, which are readily dispersed by wind and water, but suckering occurs within colonies to increase density and size. Seeds can be dispersed as contaminants in produce (e.g. hay and chaff) and in mud on machinery and vehicles.

Movement of **Gomphocarpus fruticosus* or its seeds is prohibited, including movement of contaminated machinery, livestock, fodder and other produce. Spread of the infestation must be prevented by treating plants to destroy or prevent the production of seeds or propagules.

6. DISCUSSION

A total of 174 taxa (including subspecies and varieties) from 128 genera and 49 families was recorded within the Burekup survey area (Appendix A). Representation was greatest among the Poaceae (20 taxa), followed by Papilionaceae (17 taxa), Myrtaceae (16 taxa), Cyperaceae (13 taxa) and Mimosaceae (11 taxa). Since fifteen of the Poaceae, five of the Papilionaceae and two of the Cyperaceae were weed species, the families with the highest native representation were Myrtaceae (16 taxa), Cyperaceae and Mimosaceae (both with 11 native taxa). Altogether, sixty-seven introduced (weed) taxa were recorded. Four species found during the survey are recognised as Declared Plants pursuant to Section 37 of the Agriculture and Related Resources Protection Act 1976.

During the survey, no Declared Rare Flora species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act 1950 and as listed by the Department of Environment and Conservation (2006a and 2006b) was located during the survey. No plant taxa pursuant to section 179 of the Environmental Protection Biodiversity Conservation Act 1999 were located in the survey area. No Priority flora species were recorded in the Burekup survey area.

Altogether, sixty-seven introduced (weed) taxa were recorded during the Burekup survey. Four weed species found during the survey are recognised as Declared Plants pursuant to Section 37 of the Agriculture and Related Resources Protection Act 1976. It is recommended that weed hygiene measures be undertaken to prevent the spread of introduced species, particularly the four Declared plants found during the survey. Movement of all Declared Plants or their seeds and propagules are prohibited, including movement of contaminated machinery, livestock, fodder and other produce (e.g. hay and chaff). Current methods of weed control and eradication for these and other species, although beyond the scope of this report, can be sourced from the Department of Agriculture and Food website (2006b).

Nine plant communities were recorded in the Burekup survey area (Figure 1). The majority of the communities were disturbed and ranged from completely degraded to good. There were only a few areas, which were better than "good" in condition. There was a localised patch of *Corymbia calophylla* community (C4) that has floristic similarities to Community type SCP 3a, a Threatened Ecological Community listed at both the State (Department of Environment and Conservation (2006c) and Federal levels (Department of the Environment and Heritage 2006b). The small patch of this community on the road verges of Simpson Road were ranked as "very good" (see Figure 2) and should be avoided in any clearing proposals.

The representation of the vegetation complexes as defined by Heddle *et al.* (1980) and as updated by Mattiske and Havel (1998) vary in representation. Of these complexes the vegetation on the Guildford complex is not well represented in the conservation estate (Bush Forever, Government of Western Australia 2000). This lack of representation along with the presence of a threatened ecological community (albeit modified and slight degraded) highlights the significance of any remnants within the project area that are not degraded in a local and regional context.

7. LIST OF PARTICIPANTS

The following personnel of Mattiske Consulting Pty Ltd have been involved with this project:

Principal Ecologist:	Dr E. M. Mattiske
Experienced Botanists:	Mr D. Rathbone Ms F. Smith Ms L. Dalglish

8. REFERENCES

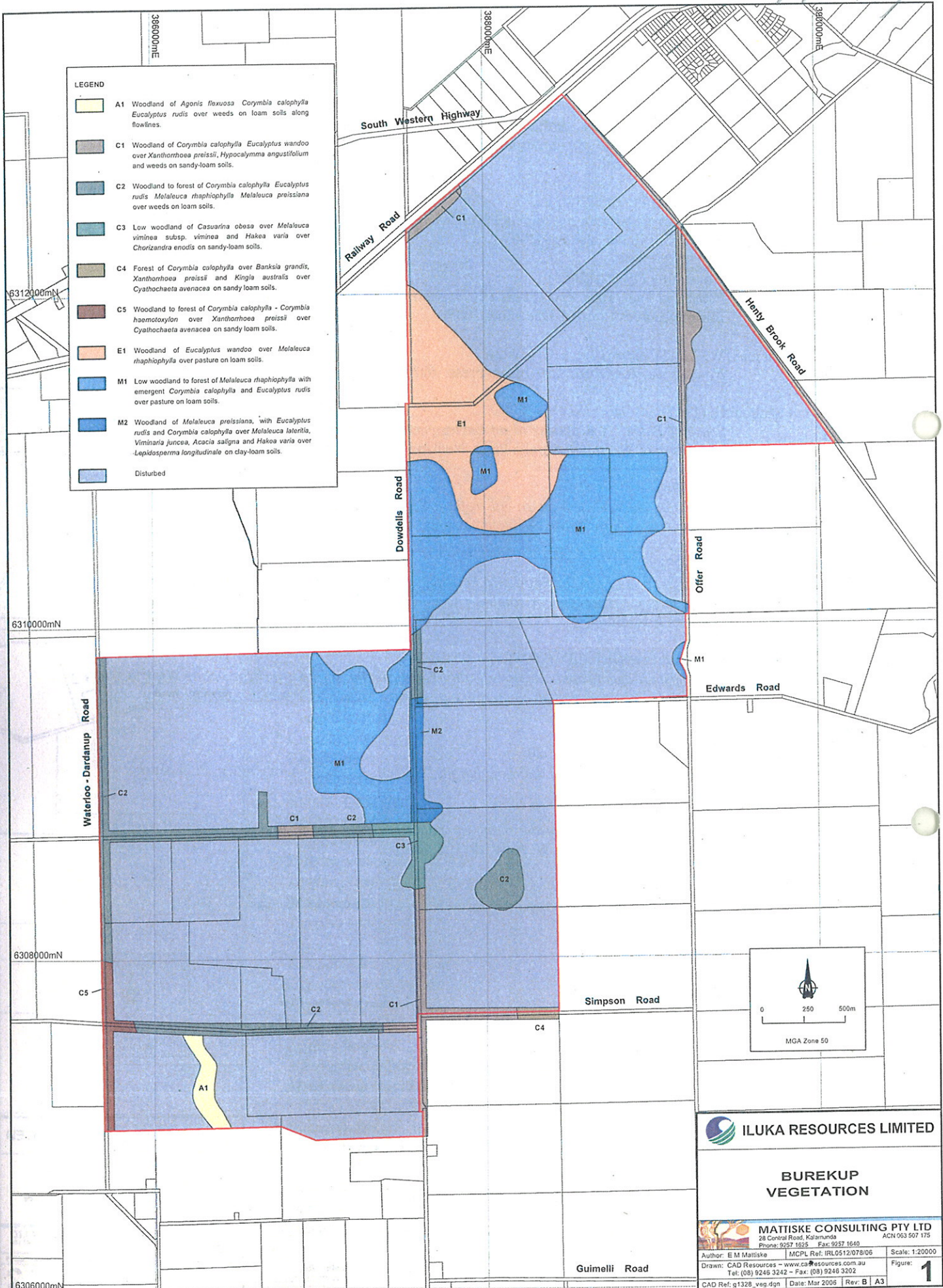
- Beard, J.S. (1979)
The vegetation of the Pinjarra Area, Western Australia. Map and Explanatory Memoir, 1:250,000 Series, Vegmap Publications, Perth.
- Beard, J.S. (1980)
A New Phytogeographic Map of Western Australia. Western Australian Herbarium Notes Number 3: 37-58.
- Beard, J.S. (1981)
Vegetation Survey of Western Australia. Swan. Map and Explanatory Notes, Sheet 7, 1:1,000,000 Series, University of Western Australia Press, Perth.
- Beard, J.S. (1990)
Plant Life of Western Australia. Kangaroo Press Pty Ltd, Kenthurst, N.S.W.
- Churchill, D.M. (1961)
The Tertiary and Quaternary vegetation and climate in relation to the living flora in South Western Australia. Ph.D. thesis, University of Western Australia.
- Churchill, D. M. (1968)
The distribution of and prehistory of Eucalyptus diversicolor F. Muell., E. marginata Donn ex Sm., and E. calophylla R. Br. in relation to rainfall. Aust J. Bot. 16: 125 – 151.
- Conservation Commission (2004)
Forest Management Plan 2003-2010. Published by the Conservation Commission, Western Australia.

- Department of Agriculture and Food (2006a)
Declared Plants List.
http://www.agric.wa.gov.au/pls/portal30/docs/FOLDER/IKMP/PW/WEED/DECP/20050805_DECLARED_PLANTS.PDF
- Department of Agriculture and Food (2006b)
Weed Science Topics.
www.agric.wa.gov.au (Department of Agriculture and Food Homepage) > Topics: Pests, Weeds + Diseases > Weeds > Weed Science Topics
- Department of Conservation and Environment (1980)
Atlas of Natural Resources Darling System, Western Australia. Published by the Department of Conservation and Environment, Perth, 1980.
- Department of Environment and Conservation (2006a)
Florabase. Department of Environment and Conservation.
<http://www.florabase.calm.wa.gov.au>
- Department of Environment and Conservation (2006b)
Max Version 2.1.1.129. Department of Environment and Conservation.
- Department of Environment and Conservation (2006c)
 List of Threatened Ecological Communities on the (TEC) Database endorsed by the Minister for the Environment.
http://www.naturebase.net/plants_animals/watscu/pdf/tec/endorsed_tec_list_jan04.pdf
- Department of Environment and Conservation (2006d)
http://www.naturebase.net/plants_animals/watscu/tec_criteria_en.html
- Department of the Environment and Heritage (2006a)
EPBC Act List of Threatened Flora
<http://www.deh.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora>
- Department of the Environment and Heritage (2006b)
EPBC Act List of Threatened Ecological Communities.
<http://www.deh.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl>
- Department of the Environment and Heritage (2006c)
Protected Matters Search Tool
<http://www.deh.gov.au/erin/ert/epbc/index.html>
- Department of the Environment and Heritage (2006d)
Categories of Ecological Communities.
<http://www.deh.gov.au/biodiversity/threatened/communities/index.html>
- Diels, L. (1906)
Die Pflanzenwelt von Western-Australien sudlich des Wendekreises. Vegn. Erde 7, Leipzig.
- English, V. and Blyth, J. (1997)
Identifying and Conserving Threatened Ecological Communities (TECs) in the South West Botanical Province. Published jointly by Environment Australia, Canberra and the Department of Environment and Conservation, Perth.
- Environmental Protection Authority (2004)
Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) -- Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia. No. 51. June 2004.

- Gardner, C.A. (1942)
The vegetation of Western Australia with special reference to climate and soils. J. Proc. R. Soc. West. Aust. **28**:11-87.
- GHD Pty Ltd (2004)
Iluka Resources Ltd. Environmental Assessment, Flora and Fauna Survey.
- Gibson, N., Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M.N. (1994)
A Floristic survey of the southern Swan Coastal Plain. Unpublished Report for the Australian Heritage Commission prepared by Department of Environment and Conservation and the Conservation Council of Western Australia (Inc.).
- Government of Western Australia (2000)
Bush Forever Volume 2. Directory of Bush Forever Sites. Department of Environmental Protection, Perth.
- Havel, J.J. (1968)
The potential of the northern Swan Coastal Plain for Pinus pinaster Ait plantations. Bull. For. Dep. W. Aust. **76**.
- Havel, J.J (1975a)
Site-vegetation mapping in the northern jarrah forest (Darling Range). I. Definition of site-vegetation types. Bull. For. Dep. W. Aust. **86**.
- Havel, J.J (1975b)
Site-vegetation mapping in the northern jarrah forest (Darling Range). II. Location and mapping of site-vegetation types. Bull. For. Dep. W. Aust. **87**.
- Heddle, E.M., J.J. Havel, and O.W. Loneragan (1980a)
Vegetation Complexes of the Darling System, Western Australia. In: Department of Conservation and Environment (1980) *Atlas of Natural Resources Darling System, Western Australia.* Department of Conservation and Environment, Perth, 1980.
- Heddle, E.M., J.J. Havel, and O.W. Loneragan (1980b)
Focus on Northern Jarrah Forest Conservation and Recreation Areas. Forest Focus Number **22**.
- Hussey, B.M.J., Keighery, G.J., Cousens, R.D., Dodd, J. and Lloyd, S.G. (1997)
Western Weeds -- a guide to the weeds of Western Australia. Plant Protection Society of Western Australia (Inc), and The Gordon Reid Foundation for Conservation. 254pp.
- Keighery, B.J. (1994)
Bushland Plant Survey. A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc.), Western Australia.
- Lange, R.T. (1960)
Rainfall and soil control of tree species distribution around Narrogin, Western Australia. J. Roy. Soc. W. Aust. **43**:104-110.

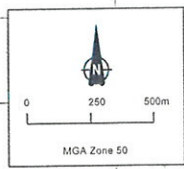
- Mattiske, E.M. and Havel, J.J. (1998)
Vegetation Complexes – Pinjarra 1:250,000 Sheet. Vegetation Mapping in the South West of Western Australia” for Environment Australia and the Department of Environment and Conservation, Perth.
- Mattiske Consulting Pty Ltd (2003)
Flora and Vegetation on Yoganup West Survey Area. Unpublished report prepared for Iluka Resources Limited, January 2003.
- Mattiske Consulting Pty Ltd (2005)
Flora and Vegetation Assessment of Cloverdale Lease Area. Unpublished report prepared for Iluka Resources Limited, December 2005.
- Parsons, W.T. and Cuthbertson, E.G. (1992)
Noxious weeds of Australia. Inkata Press. 692pp.
- Seddon, G. (1972)
Sense of Place. A Response to an Environment, the Swan Coastal Plain, Western Australia. University of Western Australia Press, Nedlands.
- Smith, F.G. (1974)
Vegetation Survey of Western Australia. Vegetation Map of the Collie Sheet. 1:250 000. Department of Agriculture, Western Australia.
- Speck, N.H. (1958)
The vegetation of the Darling-Irwin botanical districts and an investigation of the distribution of the family Proteaceae in south-western Western Australia. Ph.D. thesis, University of Western Australia.
- Thackway, R. and Cresswell, I.D. (1995)
An Interim Biogeographic Regionalisation for Australia: a framework for setting priorities in the national reserves system cooperative program. Australian Nature Conservation Agency Canberra.
- Wildlife Conservation Act 1950-1980
Wildlife Conservation Act and Regulations. Western Australian Government Publication.
- Williams, R.F. (1932)
An ecological analysis of the plant communities of the jarrah region on a small area near Darlington. J. Roy. Soc. W. Aust. 18: 105-124.
- Williams, R.F. (1942)
An ecological study near Beraking forest station. J. Roy. Soc. W. Aust. 31: 19-31.

Map OK Compare SB Mapping



LEGEND

- A1 Woodland of *Agonis flexuosa* *Corymbia calophylla* *Eucalyptus rudis* over weeds on loam soils along flowlines.
- C1 Woodland of *Corymbia calophylla* *Eucalyptus wandoo* over *Xanthorrhoea preissii*, *Hypocalymma angustifolium* and weeds on sandy-loam soils.
- C2 Woodland to forest of *Corymbia calophylla* *Eucalyptus rudis* *Melaleuca raphiophylla* *Melaleuca preissiana* over weeds on loam soils.
- C3 Low woodland of *Casuarina obesa* over *Melaleuca viminea* subsp. *viminea* and *Hakea varia* over *Chorizandra enodis* on sandy-loam soils.
- C4 Forest of *Corymbia calophylla* over *Banksia grandis*, *Xanthorrhoea preissii* and *Kingia australis* over *Cyathochaeta avenacea* on sandy-loam soils.
- C5 Woodland to forest of *Corymbia calophylla* - *Corymbia haematoxylon* over *Xanthorrhoea preissii* over *Cyathochaeta avenacea* on sandy-loam soils.
- E1 Woodland of *Eucalyptus wandoo* over *Melaleuca raphiophylla* over pasture on loam soils.
- M1 Low woodland to forest of *Melaleuca raphiophylla* with emergent *Corymbia calophylla* and *Eucalyptus rudis* over pasture on loam soils.
- M2 Woodland of *Melaleuca preissiana*, with *Eucalyptus rudis* and *Corymbia calophylla* over *Melaleuca lateralis*, *Viminaria juncea*, *Acacia saligna* and *Hakea varia* over *Lepidosperma longitudinale* on clay-loam soils.
- Disturbed



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BUREKUP VEGETATION

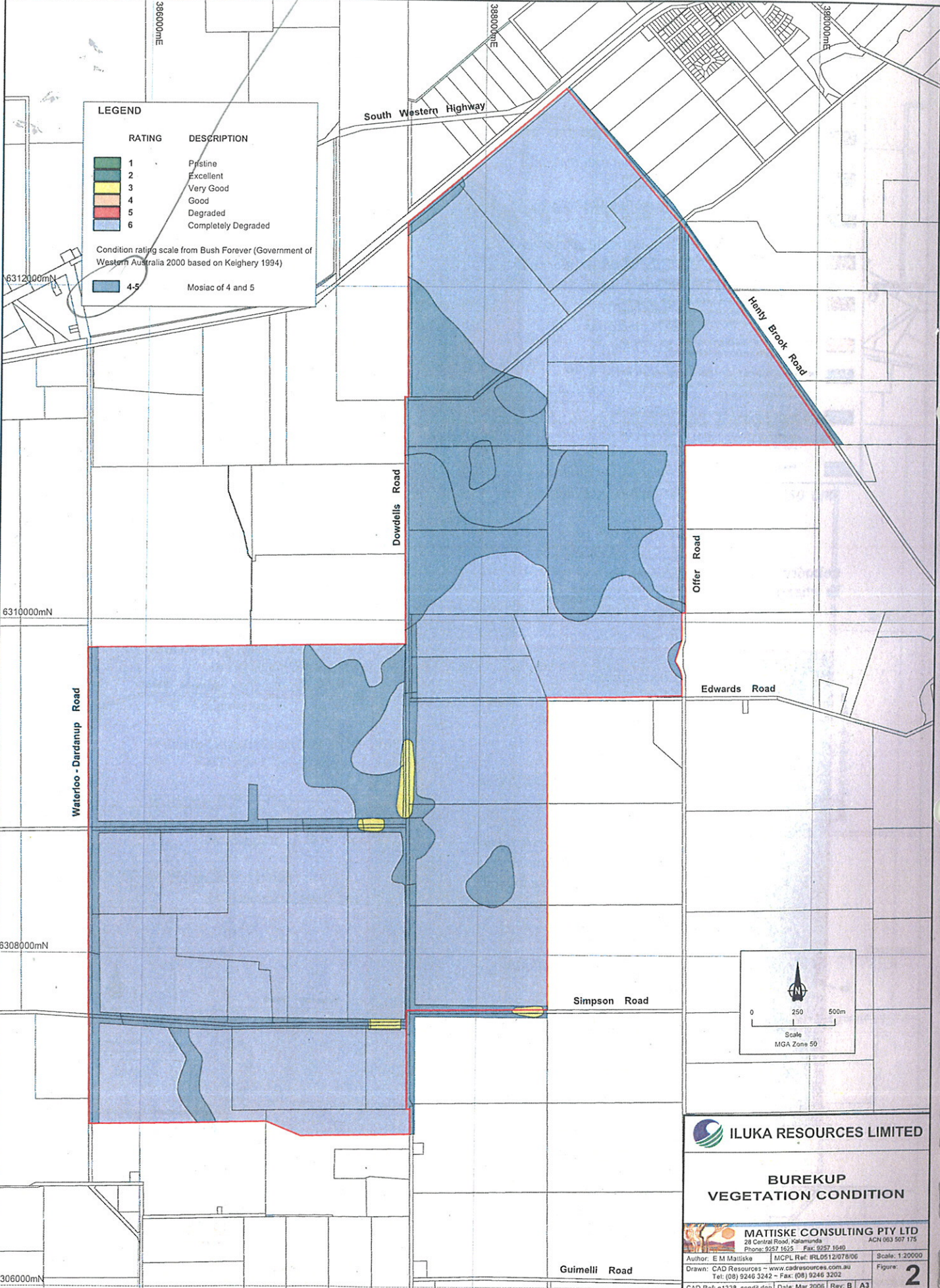
MATTISKE CONSULTING PTY LTD
 28 Central Road, Kalbarurua
 Phone: 9237 1625 Fax: 9237 1640
 Author: E M Mattiske MCPL Ref: IRL0512/078/06 Scale: 1:20000
 Drawn: CAD Resources - www.cadresources.com.au
 Tel: (08) 9246 3242 Fax: (08) 9246 3202
 CAD Ref: g1328_veg.dgn Date: Mar 2006 Rev: B | A3

APPENDIX A: VASCULAR PLANT SPECIES FOUND IN BUREKUP LEASE AREA

FAMILY	SPECIES
DENNSTAEDTIACEAE	<i>Pteridium esculentum</i>
TYPHACEAE	<i>Typha domingensis</i>
POACEAE	<i>Amphibromus nervosus</i> * <i>Anthoxanthum odoratum</i> <i>Austrostipa mollis</i> * <i>Avena fatua</i> * <i>Briza maxima</i> * <i>Briza minor</i> * <i>Bromus diandrus</i> * <i>Bromus hordeaceus</i> * <i>Bromus</i> sp. * <i>Cynodon dactylon</i> * <i>Ehrharta calycina</i> * <i>Ehrharta longiflora</i> * <i>Eragrostis curvula</i> * <i>Holcus lanatus</i> * <i>Lagurus ovatus</i> * <i>Lolium perenne</i> <i>Lolium</i> sp. <i>Microlaena stipoides</i> <i>Neurachne alopecuroidea</i> * <i>Paspalum dilatatum</i>
CYPERACEAE	<i>Carex appressa</i> <i>Chorizandra enodis</i> <i>Cyathochaeta avenacea</i> * <i>Cyperus congestus</i> <i>Eleocharis acuta</i> <i>Isolepis cernua</i> var. <i>setiformis</i> <i>Isolepis cyperoides</i> * <i>Isolepis prolifera</i> <i>?Lepidosperma leptostachyum</i> <i>Lepidosperma longitudinale</i> <i>Lepidosperma pubisquameum</i> <i>Mesomelaena tetragona</i> <i>Tetraria octandra</i>
RESTIONACEAE	<i>Desmocladius fasciculatus</i> <i>Hypolaena exsulca</i> <i>Hypolaena pubescens</i> <i>Lepyrodia glauca</i> <i>Lyginia barbata</i> <i>Meeboldina ?decipiens</i> subsp. <i>decipiens</i> (ms) <i>Meeboldina roycei</i> (ms)
JUNCACEAE	* <i>Juncus bufonius</i> * <i>Juncus microcephalus</i> <i>Juncus pallidus</i> <i>Juncus planifolius</i> <i>Juncus subsecundus</i> * <i>Juncus usitatus</i>

- Setting
- Consider.

Mostly this is
Deciduous in adequate form
for SIS Flora +
Condition



LEGEND

RATING	DESCRIPTION
1	Pristine
2	Excellent
3	Very Good
4	Good
5	Degraded
6	Completely Degraded

Condition rating scale from Bush Forever (Government of Western Australia 2000 based on Keighery 1994)

4-5 Mosaic of 4 and 5

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**BUREKUP
VEGETATION CONDITION**

MATTISKE CONSULTING PTY LTD
 28 Central Road, Kalamunda ACN 063 507 175
 Phone: 9257 1625 Fax: 9257 1660
 Author: E M Mattiske MCPL Ref: IRL0512078/06 Scale: 1:20000
 Drawn: CAD Resources - www.cadresources.com.au Figure: 2
 Tel: (08) 9246 3242 - Fax: (08) 9246 3202
 CAD Ref: g1329_condit.dgn | Date: Mar 2006 | Rev: B | A3

APPENDIX A: VASCULAR PLANT SPECIES FOUND IN BUREKUP LEASE AREA

FAMILY	SPECIES
ASPARAGACEAE	* <i>Asparagus asparagoides</i>
DASYPOGONACEAE	<i>Dasyogon bromeliifolius</i> <i>Kingia australis</i> <i>Lomandra hermaphrodita</i> <i>Lomandra micrantha</i> subsp. <i>micrantha</i> <i>Lomandra preissii</i>
XANTHORRHOEACEAE	<i>Xanthorrhoea preissii</i>
ANTHERICACEAE	<i>Agrostocrinum scabrum</i> <i>Dichopogon preissii</i> <i>Thysanotus patersonii</i> <i>Thysanotus</i> sp. <i>Tricoryne humilis</i>
ALLIACEAE	* <i>Agapanthus praecox</i>
COLCHICACEAE	<i>Burchardia umbellata</i>
HAEMODORACEAE	<i>Conostylis aculeata</i> subsp. <i>aculeata</i> <i>Haemodorum laxum</i> <i>Phlebocarya ciliata</i>
IRIDACEAE	* <i>Freesia alba x leichtlinii</i> * <i>Gladiolus undulatus</i> * <i>Ixia polystachya</i> * <i>Moraea lewisiae</i> <i>Patersonia occidentalis</i> * <i>Romulea rosea</i> * <i>Watsonia meriana</i> var. <i>bulbillifera</i> * <i>Watsonia</i> sp.
ORCHIDACEAE	* <i>Disa bracteata</i>
CASUARINACEAE	<i>Casuarina obesa</i>
MORACEAE	* <i>Ficus carica</i>
PROTEACEAE	<i>Adenanthos meisneri</i> <i>Banksia grandis</i> <i>Dryandra lindleyana</i> var. <i>lindleyana</i> * <i>Grevillea dimorpha</i> <i>Hakea lissocarpa</i> <i>Hakea prostrata</i> <i>Hakea varia</i> <i>Stirlingia latifolia</i> <i>Synaphea petiolaris</i> subsp. <i>triloba</i>
LORANTHACEAE	<i>Nuytsia floribunda</i>
POLYGONACEAE	* <i>Acetosella vulgaris</i> * <i>Rumex crispus</i>

APPENDIX A: VASCULAR PLANT SPECIES FOUND IN BUREKUP LEASE AREA

FAMILY	SPECIES
CHENOPODIACEAE	<i>Chenopodium pumilio</i>
AMARANTHACEAE	<i>Ptilotus manglesii</i>
PHYTOLACCACEAE	* <i>Phytolacca octandra</i>
CARYOPHYLLACEAE	* <i>Silene gallica</i> var. <i>gallica</i>
PITTOSPORACEAE	<i>Billardiera heterophylla</i>
ROSACEAE	* <i>Rubus</i> ?sp
MIMOSACEAE	<i>Acacia alata</i> var. <i>alata</i> <i>Acacia applanata</i> * <i>Acacia dealbata</i> <i>Acacia dentifera</i> <i>Acacia extensa</i> <i>Acacia ?myrtifolia</i> <i>Acacia pulchella</i> <i>Acacia saligna</i> <i>Acacia sessilis</i> <i>Acacia stenoptera</i> <i>Acacia urophylla</i>
PAPILIONACEAE	<i>Bossiaea eriocarpa</i> <i>Daviesia decurrens</i> subsp. <i>decurrens</i> (ms) <i>Daviesia physodes</i> * <i>Dipogon lignosus</i> <i>Eutaxia virgata</i> <i>Gastrolobium praemorsum</i> <i>Gompholobium marginatum</i> <i>Gompholobium shuttleworthii</i> <i>Hovea trisperma</i> <i>Jacksonia furcellata</i> <i>Kennedia prostrata</i> * <i>Lotus angustissimus</i> * <i>Lupinus angustifolius</i> <i>Medicago</i> sp. * <i>Trifolium angustifolium</i> * <i>Vicia sativa</i> subsp. <i>nigra</i> <i>Viminaria juncea</i>
GERANIACEAE	* <i>Geranium</i> sp.
OXALIDACEAE	* <i>Oxalis glabra</i>
LINACEAE	* <i>Linum trigynum</i>
ANACARDIACEAE	* <i>Schinus terebinthifolius</i>
RHAMNACEAE	<i>Trymalium floribundum</i>

APPENDIX A: VASCULAR PLANT SPECIES FOUND IN BUREKUP LEASE AREA

FAMILY	SPECIES
DILLENIACEAE	<i>Hibbertia hypericoides</i>
LYTHRACEAE	* <i>Lythrum hyssopifolia</i>
MYRTACEAE	<i>Agonis flexuosa</i> <i>Astartea leptophylla</i> <i>Corymbia calophylla</i> <i>Corymbia haematoxylon</i> ————— ✱ ✱ <i>Darwinia citriodora</i> <i>Eucalyptus marginata</i> subsp. <i>marginata</i> <i>Eucalyptus patens</i> ————— <i>Eucalyptus rudis</i> <i>Eucalyptus wandoo</i> <i>Hypocalymma angustifolium</i> <i>Kunzea micrantha</i> subsp. <i>micrantha</i> <i>Kunzea recurva</i> <i>Melaleuca lateritia</i> <i>Melaleuca preissiana</i> <i>Melaleuca raphiophylla</i> <i>Melaleuca viminea</i> subsp. <i>viminea</i>
HALORAGACEAE	<i>Myriophyllum ?salsugineum</i>
EPACRIDACEAE	<i>Astroloma ciliatum</i>
PRIMULACEAE	* <i>Anagallis arvensis</i>
OLEACEAE	* <i>Olea europaea</i>
GENTIANACEAE	* <i>Centaurium erythraea</i>
ASCLEPIADACEAE	* <i>Gomphocarpus fruticosus</i>
LAMIACEAE	* <i>Lavandula stoechas</i> * <i>Mentha pulegium</i>
SCROPHULARIACEAE	* <i>Parentucellia latifolia</i>
PLANTAGINACEAE	* <i>Plantago lanceolata</i>
RUBIACEAE	<i>Opercularia echinocephala</i> <i>Opercularia vaginata</i>
LOBELIACEAE	<i>Lobelia alata</i> * <i>Monopsis debilis</i>
GOODENIACEAE	<i>Dampiera alata</i> <i>Dampiera linearis</i> <i>Goodenia caerulea</i> <i>Goodenia micrantha</i> <i>Scaevola calliptera</i>

APPENDIX A: VASCULAR PLANT SPECIES FOUND IN BUREKUP LEASE AREA

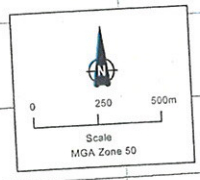
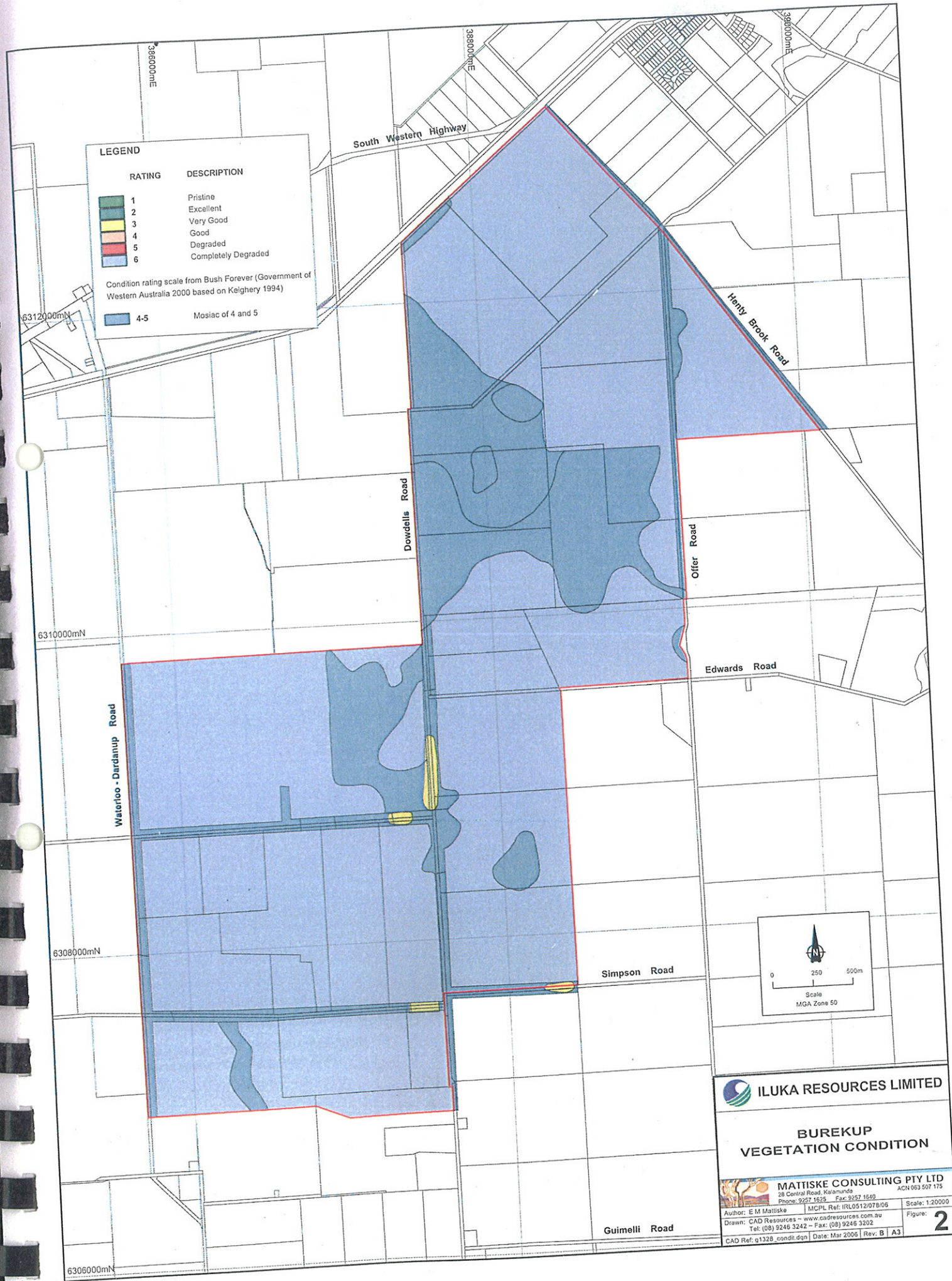
FAMILY	SPECIES
ASTERACEAE	* <i>Arctotheca calendula</i>
	* <i>Cirsium vulgare</i>
	* <i>Conyza bonariensis</i>
	* <i>Cotula coronopifolia</i>
	* <i>Hypochaeris radicata</i>
	* <i>Lactuca</i> sp.
	* <i>Sonchus asper</i>
	* <i>Sonchus oleraceus</i>
	* <i>Tolpis barbata</i>
	* <i>Vellereophyton dealbatum</i>

LEGEND

RATING	DESCRIPTION
1	Pristine
2	Excellent
3	Very Good
4	Good
5	Degraded
6	Completely Degraded

Condition rating scale from Bush Forever (Government of Western Australia 2000 based on Kelgbery 1994)

4-5 Mosaic of 4 and 5













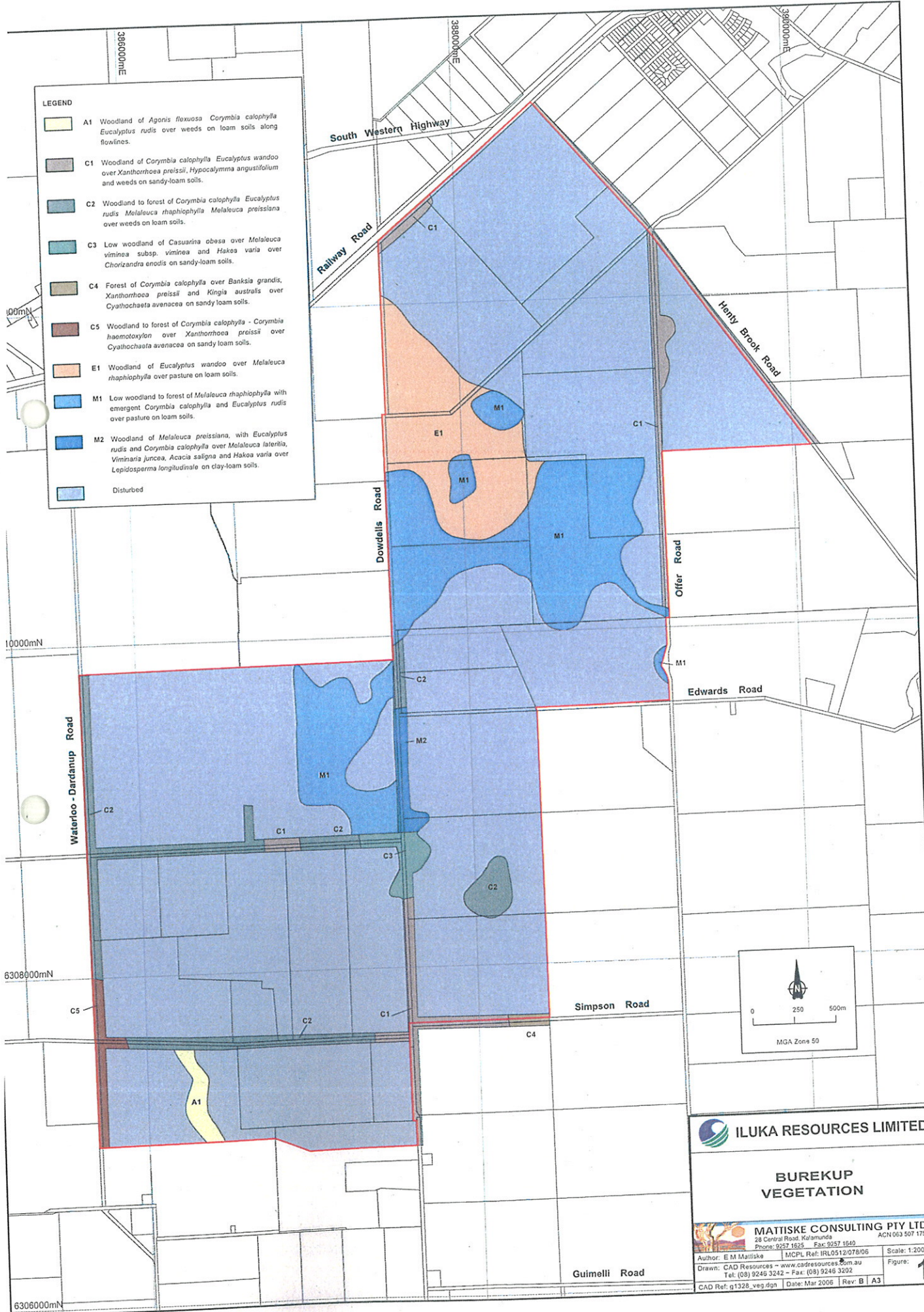
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BUREKUP VEGETATION CONDITION

MATTISKE CONSULTING PTY LTD
 28 Central Road, Kalamunda
 Phone: 9257 1625 Fax: 9257 1640
 Author: E M Mattiske MCPL Ref: IRL0512/076/06 Scale: 1:20000
 Drawn: CAD Resources - www.cadresources.com.au
 Tel: (08) 9246 3242 - Fax: (08) 9246 3202 Figure: **2**
 CAD Ref: q1328_condit.dgn Date: Mar 2006 Rev: B A3

LEGEND

-  A1 Woodland of *Agonis flexuosa* *Corymbia calophylla* *Eucalyptus rudis* over weeds on loam soils along flowlines.
-  C1 Woodland of *Corymbia calophylla* *Eucalyptus wandoo* over *Xanthorrhoea preissii*, *Hypocalymma angustifolium* and weeds on sandy-loam soils.
-  C2 Woodland to forest of *Corymbia calophylla* *Eucalyptus rudis* *Melaleuca raphiophylla* *Melaleuca preissiana* over weeds on loam soils.
-  C3 Low woodland of *Casuarina obesa* over *Melaleuca viminea* subsp. *viminea* and *Hakoa varia* over *Chorizandra enodis* on sandy-loam soils.
-  C4 Forest of *Corymbia calophylla* over *Banksia grandis*, *Xanthorrhoea preissii* and *Kingia australis* over *Cyathochaeta avenacea* on sandy loam soils.
-  C5 Woodland to forest of *Corymbia calophylla* - *Corymbia haemotoxylon* over *Xanthorrhoea preissii* over *Cyathochaeta avenacea* on sandy loam soils.
-  E1 Woodland of *Eucalyptus wandoo* over *Melaleuca raphiophylla* over pasture on loam soils.
-  M1 Low woodland to forest of *Melaleuca raphiophylla* with emergent *Corymbia calophylla* and *Eucalyptus rudis* over pasture on loam soils.
-  M2 Woodland of *Melaleuca preissiana*, with *Eucalyptus rudis* and *Corymbia calophylla* over *Melaleuca lateritia*, *Viminaria juncea*, *Acacia saligna* and *Hakoa varia* over *Lepidosperma longitudinale* on clay-loam soils.
-  Disturbed



 **ILUKA RESOURCES LIMITED**

BUREKUP VEGETATION

MATTISKE CONSULTING PTY LTD
 28 Central Road, Kalamunda ACN 063 507 175
 Phone: 9257 1625 Fax: 9257 1640
 Author: E M Mattiske MCPL Ref: IRL0512/076/06 Scale: 1:20000
 Drawn: CAD Resources - www.cadresources.com.au Figure: **1**
 Tel: (08) 9246 3242 - Fax: (08) 9246 3202
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