716

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Attributes
Partial copy of section 5 of original document, values entered for attributes below cannot be taken as accurate

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MAP 553

4 GRID SQUARES MEASURE 1km

SCALE 1:19 000
Metres 500 1000 1km

FREEWAY	PARK, RESERVE, OVAL
PROPOSED FREEWAY	SCHOOL, HOSPITAL
HIGHWAY or MAIN ROUTE	MISCELLANEOUS AREA
ALTERNATE ROUTE	MALL, PLAZA
TRAFFICABLE ROAD	SWAMP
PROPOSED ROAD	

AMBULANCE STATION	CAR PARK
BARBECUE	COLLEGE - PRIVATE
BOAT RAMP	COLLEGE - PUBLIC
BOWLING CLUB/GREEN	CYCLEWAY
CAMPING AREA	DISTANCE FROM GPO
CARAVAN PARK	EMERGENCY TELEPHO

PRIMARY RECTANGLE MURRAY BF32
PRIMARY RECTANGLE MURRAY BG32

COPY FOR YOUR INFORMATION

* check - things didn't like. - duplicated from Janis

SUPERSEDED

* Need Final Version & full copy SB Tile 413

DRAFT

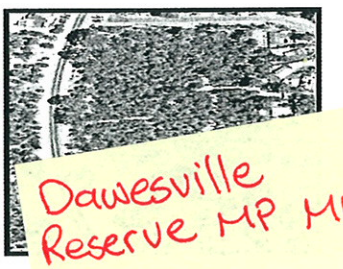
City of Mandurah

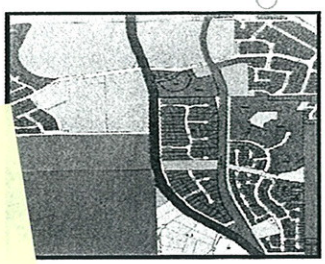
Management Plan - Dawesville Reserve (34226)

UBD 2006 Map 583 E10/11
Lot 1664, Dawesville Road
Tile 413/403

(Map 818)

CALM Map 107
372 000mE
6388 000mN





Vegn Map
Cond Map
Spp list

Dawesville Reserve MP MH

PEEL

* Need copies of reports for the 3 other reserves
- Janis St
- Tindale
- Beacham

SMEC

February 2005

5 Reserve Environment and Management

5.1 Climate

The CoM experiences a Mediterranean climate with cool wet winters and hot dry summers. The dry period is usually around mid October to the end of March where the average maximum and minimum temperatures range from 21.2°C to 29.5°C and 10.9°C to 17.0°C, respectively (Bureau of Meteorology, 2001). The average maximum and minimum temperatures during the wet periods range from 17.3°C to 24.4°C and 8.6°C to 13.0°C, respectively (Bureau of Meteorology, 2001).

5.2 Landform and Soils

Dawesville Reserve is situated on the Swan Coastal Plain landform unit. The regional geology of the Swan Coastal Plain is primarily alluvial, with shoreline and Aeolian deposits from the Phanerozoic age (approximately 0 to 5 million years ago).

The Reserve is gently sloping to the east, toward the Harvey Estuary.

Deep, rapidly drained siliceous yellow-brown sands occur within the Reserve area. These soils types are similar to those of the Spearwood Dune System (Semenuik, 1988).

Additional information on landform and soil is provided in Section 3.4.3.4.1 for the various vegetation units of the Reserve.

5.3 Regional Botanical Context

Beard (1980) has defined boundaries for botanical provinces, districts and subdistricts for Western Australia on the basis of his vegetation mapping of the State. In this framework, the Reserve lies in the Drummond Botanical Subdistrict (more or less equivalent to the Swan Coastal Plain and part of the Dandaragan Plateau) of the Darling Botanical District of the South Western Botanical Province of Western Australia.

Heddle et al (1980) mapped the vegetation of part of the Drummond Botanical Subdistrict at a very broad scale, describing the vegetation complexes (related groups of vegetation associations) associated with particular landform-soil units. A total of 38 vegetation complexes on the Swan Coastal Plain were mapped.

Dawesville Reserve lies in an area where the Cottesloe Complex Central and South border on the Karrakatta Complex Central and South. These vegetation complexes occur in the

Cottesloe and Karrakata soil/geomorphic units of Churchwood and McArthur respectively. Not far to the west is the Yoongarillup Complex.

More recently an alternative analysis of the plant assemblages on the Swan Coastal Plain south of Gingin Brook was carried out using a floristic approach (Gibson et al., 1994; Department of Environment Protection, 2000). This work, which is at a similar level of synthesis to that of Heddle et al. (1980), identified 66 floristic community types in four floristic 'Supergroups' for the southern Swan Coastal Plain. The four 'super groups' of sites correlate closely with the major geomorphological units on the Swan Coastal Plain (and also to rainfall), with the exception of one group which contained the seasonal wetlands which includes sites across all geomorphological groups (Gibson et al., 1994).

5.4 Flora

5.4.1 Survey Methodology

First, a search was conducted of the Department of Conservation and Land Management's (CALM's) Threatened (Declared Rare) Flora and Priority Flora database and the Western Australian Herbarium Specimen database for rare (DRF) and Priority species previously collected in the Reserve and an extensive surrounding area. The search area was defined by the coordinates 32° 30' S to 32° 38' S and 115° 37' E to 115° 45' E (GDA94 datum). The database search resulted in a target list of rare and priority flora to look for when conducting the flora and vegetation field work in the Reserve.

An initial flora survey of the Reserve was conducted in April 2004. It comprised recordings of flora at vegetation sites and opportunistic recordings while walking between the vegetation description sites or while undertaking vegetation and weed mapping activities.

Informal vegetation recording sites (releves) were selected in a representative area of each type of vegetation unit. The releve descriptions were based on an estimated 10m x 10m area. Plant species were recorded at the releve sites in the estimated 10m x 10m areas and where time permitted, in the surrounding part of 30m x 30m areas (nested 'plots'). Where plant species were not well known, flora specimens were collected and allocated a specimen number.

Plant specimens were also recorded and where necessary, collected, wherever a species was seen in the survey area that had not already been recorded. An effort was made to note the GPS coordinates for these specimens if it was thought the species may prove to be of particular importance.

Collected specimens were pressed and subsequently dried. They were then sorted and identified. The identifications were made by comparison to specimens in the reference and research collections of the Western Australian Herbarium, by the use of keys in various papers and books and by relevant experts on various groups of flora of the Swan Coastal Plain (see the acknowledgments section below).

A follow-up Spring survey was conducted between the 28th of September and the 11th of October 2004. Each of the sites previously described were revisited and any plant species observed that had not been previously recorded was noted and if necessary, a specimen collected for identification. Observations of species not previously recorded in the Reserve were also made while walking between sites and on general reconnaissance walks and these were added to the species list.

5.4.2 Survey Limitations

The major limitation of the flora survey is that any such survey is a sampling procedure of a variable environment with plant populations of variable growth habit, life span and flowering season. Some species, including annuals, are only available for collection for part of the year. This means that to locate all species that grow in an area is a substantial task, the success of which is related to the time available and the size and diversity of habitat in the survey. Consequently, it is possible that there are species present on the subject land that were not recorded during this survey as they only have low abundance on the land.

A particular limitation of this flora survey is that it was initially conducted in March/April when few plant species are flowering and when the annual plants have died or 'died back and are generally difficult to observe and have often disintegrated to the point that they are difficult to identify. However, as part of this study, a second visit to the survey area was undertaken in spring (late September, early October) when annual grasses, cryptophytes and many of the perennials are flowering or setting seed.

The third limitation of the flora survey was that it was restricted to flowering plant species and a few other groups (cycads, and ferns). Fungi, mosses, liverworts, lichens and algae are not generally surveyed systematically for environmental assessments in Western Australia, as surveying these groups (which form a small part of the biomass of the vegetation) is a specialist task and the level of information available to assess them against is quite poor.

Given the above limitations, it is likely that this survey recorded more than 80% of the vascular flora in the survey area. Once a spring survey has been conducted in the survey area, it is likely that more than 85% to 90% of the vascular flora in the survey area will have been recorded. That is, while the flora survey is relatively thorough, it is possible that some species occurring on the subject land have not been recorded.

5.4.3 Dawesville Reserve Survey Results

The Department of Conservation and Land Management database searches found four priority plant species had been recorded in the area containing Janis St Reserve, Tindale Reserve, Dawesville Reserve and Beacham Reserve. Table 3 lists these species.

Table 3: Priority flora previously recorded in survey area

Plant Species	Conservation Status
Chamaescilla gibsonii	P3
Dillwynia dillwynioides	P3
Laseopetalum membranaceum	P3
Villarsia submersa	P4

The total number of species recorded in Dawesville Reserve during this survey was 142, of which 103 (or 72.5 percent) were native species. The species list for Dawesville Reserve is provided in Table 4. Twelve species of orchids were recorded during the survey and the flowering orchids were a highlight of the Dawesville Reserve bushland during Spring.

No Declared Rare Flora were recorded in Dawesville Reserve. The Department of Conservation and Land Management organised a search of Dawesville Reserve for the DRF orchid, *Caladenia huegelii* (Grand Spider Orchid) during Spring 2004. *Caladenia huegelii* was not recorded during their survey (Emma Adams, Department of Conservation and Land Management).

One Priority 3 species, *Lasiopetalum membranaceum*, was recorded at all three releve sites in the Reserve (see Appendix E). It was recorded with a cover of 2 to 3 percent at site DR3.

No species of other special conservation interest were recorded in Dawesville Reserve during the survey.

Table 4: Flora Species List for Dawesville Reserve

FAMILY/TAXA	Common names	Priority Status
GYMNOSPERMAE		
016A ZAMIACEAE		
Macrozamia riedlei	Zamia	
ANGIOSPERMAE		
MONOCOTYLEDONS		
031 POACEAE (grasses)		
*Aira cupaniana		
Austrodanthonia sp.		
Austrostipa flavescens		
* Avena barbata	Wild oats	
* Briza maxima	Blowfly grass	
* Briza minor		
* Bromus diandrus	Great brome grass	
* Cynosurus echinatus	Rough dogs tail	
Dichelachne crinita		
* Ehrharta calycina	Perennial veldt grass	
*Ehrharta longiflora	Annual veldt grass	
* Eragrostis curvula	Love grass	
*Holcus setiger	Annual fog grass	
* Lagurus ovatus	Hair's tail grass	
Poa drummondiana	Knotted Poa	

Poa poiformis		
032 CYPERACEAE (sedges)		
Lepidosperma pubisquameum		
Schoenus grandiflorus		
Tetraria octandra		
039 RESTIONACEAE (rushes)		
Desmocladus flexuosus		
Lyginia imberbis		
054B ASPARAGACEAE		
* Asparagus asparagoides	Bridal creeper	
054C DASYPOGONACEAE		
Calectasia narragara		
Lomandra caespitosa		
Lomandra suaveolens		
054D XANTHORRHOEACEAE		
Xanthorrhoea preissii		
054E PHORMIACEAE		
Dianella revoluta var. divaricata	Blueberry lily	

054F ANTHERICACEAE		
Agrostocrinum hirsutum		
Caesia micrantha		
Chamaescilla corymbosa var corymbosa		
Corynotheca micrantha var. micrantha		
Dichopogon capillipes		
Sowerbaea laxiflora	Purple tassels	
Thysanotus manglesianus	Fringed lily	
Thysanotus sparteus		
054G ASPHODELACEAE		
* Trachyandra divaricata	Dune onion weed	
054J COLCHICACEAE		
Burchardia umbellata		
055 HAEMODORACEAE		
Anigozanthos humilis	Catspaw	
Conostylis aculeata subsp. aculeata	Prickly Conostylis	
Haemodorum paniculatum		
Phlebocarya ciliata		
060 IRIDACEAE (Iris family)		

*Freesia sp.		
* Gladiolus sp.		
*Homeria flaccida	Cape tulip	
Patersonia occidentalis	Purple flag	
066 ORCHIDACEAE (orchids)		
Caladenia arenicola	Carousel spider orchid	
Caladenia flava subsp. flava	Cowslip orchid	
Caladenia georgei	Tuart spider orchid	
Caladenia latifolia	Pink fairy orchid	
Diuris magnifica	Pansy (donkey) orchid	
Leporella fimbriata	Hare orchid	
Leptoceras menziesii	Rabbit orchid	
Microtis media subsp. media	Common mignonette orchid	
Pterostylis ? vittata	Banded greenhood	
Pterostylis aff. sanguinea	Coastal banded greenhood	
Pterostylis recurva	Jug orchid	
Pyrorchis nigricans	Elephant's ears	
DICOTYLEDONS		
070 CASUARINACEAE		

Allocasuarina fraseriana	Sheok	
Allocasuarina humilis	Dwarf sheok	
087 MORACEAE		
* Ficus sp.		
090 PROTEACEAE		
Banksia attenuata	Slender banksia	
Banksia grandis	Bull banksia	
Hakea lissocarpha		
Persoonia saccata		
Petrophile linearis	Pixie mops	
Synaphea spinulosa subsp. spinulosa		
105 CHENOPODEACEAE		
Rhagodia baccata subsp. baccata		
111 PORTULACACEAE		
Calandrinia liniflora	Parakeelya	
113 CARYOPHYLLACEAE		
*Petrorhagia dubia	Velvet pink	
119 RANUNCULACEAE		

Clematis pubescens	Common Clematis	
143 DROSERACEAE		
Drosera bulbosa subsp. bulbosa	Red-leaved sundew	
Drosera pallida	Pale rainbow	
Drosera stolonifera subsp. stolonifera	Leafy sundew	
163 MIMOSACEAE		
Acacia cochlearis	Rigid wattle	
* Acacia iteaphylla	Flinders Range wattle	
Acacia pulchella var. glaberrima	Prickly moses	
Acacia saligna	Golden wreath wattle	
Acacia stenoptera	Narrow winged wattle	
Acacia willdenowiana	Grass wattle	
165 PAPILIONACEAE		
Daviesia divaricata subsp. divaricata		
Hardenbergia comptoniana	Native Wisteria	
Hovea trisperma	Common Hovea	
Isotropis cuneifolia subsp. cuneifolia	Granny bonnets	
Jacksonia furcellata	Grey stinkwood	

Jacksonia sternbergiana	Stinkwood	
Kennedia prostrata	Scarlet runner	
*Lotus subbiflorus		
* Melilotus indicus		
Templetonia retusa	Cockies tongue	
* Trifolium campestre var. campestre	Hop clover	
167 GERANIACEAE		
Geranium solanderi		
* Pelargonium capitatum	Rose Pelargonium	
168 OXALIDACEAE		
*Oxalis pes-caprae	Soursob	
169 TROPAEOLACEAE		
*Tropaeolum majus	Nasturtium	
175 RUTACEAE		
Diplolaena dampieri	Dampier's rose (southern Diplolaena)	
Philotheca spicata	Pepper and salt	
183 POLYGALACEAE		
* Polygala myrtifolia	Myrtle-leafed	

	milkweed	
185 EUPHORBIACEAE		
* Euphorbia terracina	Geraldton carnation weed	
Phyllanthus calycinus	False Boronia	
215 RHAMNACEAE		
Spyridium globulosum	Basket bush	
223 STERCULIACEAE		
Lasiopetalum membranaceum		P3
226 DILLENIACEAE		
Hibbertia hypericoides	Yellow buttercups	
243 VIOLACEAE		
Hybanthus calycinus	Wild violet	
273 MYRTACEAE		
Agonis flexuosa	Peppermint	
Corymbia calophylla		
Eucalyptus gomphocephala	Tuart	
Eucalyptus marginata subsp. marginata	Jarrah	

Hypocalymma robustum	Swan river myrtle	
Melaleuca systena	Coastal honeymyrtle	
Melaleuca thymoides		
281 APIACEAE		
Daucus glochidiatus	Australian carrot	
Eryngium pinnatifidum		
Trachymene pilosa	Native parsnip	
288 EPACRIDACEAE		
Astroloma ciliatum	Candle cranberry	
Astroloma pallidum		
Leucopogon propinquus		
Leucopogon racemulosus		
293 PRIMULACEAE		
* Anagallis arvensis	Pimpernel	
*Anagallis arvensis var. caerulea		
304 APOCYNACEAE		
Alyxia buxifolia	Sea box, Dysentery bush	
311 VERBENACEAE		

* Phyla nodiflora		
315 SOLANACEAE		
* Solanum nigrum	Deadly nightshades	
320 OROBANCHACEAE		
* Orobanche minor	Lesser broomrape	
331 RUBIACEAE		
Opercularia vaginata		
334 VALERIANACEAE		
*Centranthus macrosiphon	Pretty betsy	
340 LOBELIACEAE		
Lobelia tenuior	Slender lobelia	
341 GOODENIACEAE		
Scaevola repens var. repens		
343 STYLIDIACEAE (trigger plants)		
Stylidium brunonianum subsp. brunonianum	Pink fountain trigger plant	
Stylidium piliferum subsp. piliferum	Common butterfly	

	triggerplant	
Stylidium schoenoides	Cow kicks	
345 ASTERACEAE		
*Arctotheca calendula	Capeweed	
Asteridea pulverulenta		
* Conyza sumatrensis		
* Hypochaeris glabra	Smooth catsear	
Lagenifera huegelii		
Olearia axillaris	Coastal daisy bush	
* Osteospermum ecklonis		
Podolepis gracilis		
Podolepis lessonii		
* Sonchus oleraceus	Common sowthistle	
* Ursinia anthemoides		

Notes:

1. The numbers in front of the plant families are the numbers for families used at the Western Australian Herbarium.

2. An asterisk (*) beside the taxon name indicates an introduced species (weed).

3. The priority status column shows the conservation code of any rare or priority plants in the list.

5.5 Vegetation

5.5.1 Survey Methodology

5.5.1.1 Vegetation Units and Condition

The description of the vegetation units in the study areas was undertaken as a basis for the vegetation unit mapping and to enable inference of the Gibson et al (1994) floristic community to which those units would belong and hence whether any of the vegetation units would be Threatened Ecological Communities (TEC's).

The vegetation survey was based on informal releve recordings located in an area of vegetation that was considered representative of a particular vegetation unit. The releve areas were based on estimated distances from a centre point. The use of estimated 10 metre by 10 metre areas meant the releve data is, in that regard, consistent with Gibson et al's (1994) data set for the Swan Coastal Plain on which Gibson et al's floristic community analysis was based.

While the centre of each releve was not permanently marked, it was referenced by recording the releve centre point coordinate (WGS84 datum), using an Etrex GPS unit. GPS coordinate readings were recorded when the GPS unit indicated the locational error was (+/-) 4 to 5 meters. Photographs of each releve are provided in Appendix A. A description of the releve location, the habitat, surface soil texture and colour and any rock outcropping (and rock type) were all recorded and the time since the site was last burnt was estimated. The vegetation structure was described using a modification by Mr M Trudgen (pers comm.) of Aplin's (1979) modification of Specht's vegetation description table (Appendix B). These are the same structural units used in the Bush Forever documentation (Department of Environmental Protection, 2000b), although there are some minor differences in the wording of some of the cover classes. To obtain more representative data for the overstorey cover, the tree layer(s) cover was estimated over a larger area around the releve. All plant species occurring in the releve area were recorded along with their height and percentage cover. Plant species recorded for the releve which were outside the 10 meter by 10 meter estimated area were listed separately.

The condition of vegetation in the releve was recorded using the same scale used by Bush Forever Volume 2 (Department of Environmental Protection, 2000b). The vegetation condition scale and description are provided in Appendix C. Other notes were made regarding vegetation health and any indications of the presence of dieback or indeed other plant diseases. Impacts of dieback on the condition of the vegetation should be included in assessing vegetation condition (Keighery 1994, reproduced in Department of Environmental

Protection Vol 2 (2000)), but where the cause of tree deaths was inconclusive the occurrence of deaths were not given great weight in the assessment of vegetation condition.

The information recorded for each vegetation unit was consistent with the templates developed as part of the Perth Biodiversity Project and should enable completion of the templates if desired.

5.5.1.2 Inferring Floristic Community Types (FCT)

The Floristic Community Type of a vegetation unit was inferred by looking at the floristic communities that had been recorded in the area and a list of the floristic communities on the Swan Coastal Plain with their generalised descriptions and the geomorphological unit on which they occurred (Gibson et al. 1994). Then the site species list was compared in detail with a two way table that only showed species which occurred in any one community type with frequencies of at least 50% (Gibson et al., 1994).

5.5.1.3 Determining Floristic Community Type using PATN analysis

Because of difficulties in inferring floristic community type, FCT's are best determined by running computer-based PATN analysis on the site data and the Gibson *et al.* (1994) Swan Coastal Plain data set to generate a grouping of the sites against the Gibson *et al.* floristic community groups.

The floristic analysis carried out was based on species presence/absence data from sixteen sites in four City of Mandurah reserves combined in a database with the 509 sites from Gibson *et al.* (1994). The sixteen sites from the City of Mandurah reserves included two from Dawesville Reserve (DR1 and DR3).

Janice's Reserve

Tindale Reserve

Beachlands Reserve

5.5.1.3.1 Data Preparation and Compatibility

The vegetation site data from sixteen sites in the four City of Mandurah reserves was entered into a specially designed computer database developed by E. A. Griffin using Microsoft Access.

To conduct the analysis on the data from the four City of Mandurah reserves and Gibson *et al.* (1994) datasets, it was first necessary to reconcile the flora species names. This step was necessary because of changes in the nomenclature over the last ten years and the potential for survey specific variations in the application of names (Griffin and Trudgen, 2004). The reconciliation involved reducing some infra-specific names to the relevant species name, combining some taxa where confusion is known to have occurred in field observations and

identifications and omitting some names (mostly where a taxon had only been identified to genus).

It should be noted that the data from the four reserves was compatible with the Gibson *et al.* (1994) data. Both datasets were based on data collected from sites of similar sizes, with the Gibson *et al.* (1994) sites being 10 metre by 10 metre quadrats and the City of Mandurah reserve sites being releves of estimated 10 metre by 10 metre areas. The Gibson *et al.* (1994) sites and the City of Mandurah reserve sites were visited twice to record plant species present, including a spring visit. Weed species were included in both the Gibson *et al.* (1994) and City of Mandurah reserve data sets.

5.5.1.3.2 PATN Analysis

The PATN modules used were ASO (calculation of similarity matrix), FUSE (classification), DEND (representation of classification) and NNB (determination of sites most similar to each site) (Griffin and Trudgen, 2004). The results of the analyses were imported into a database so that site characteristics and previous classifications (eg Floristic Community Types derived in earlier classifications) could be associated with them.

Two types of PATN analysis were used. The first method (using the PATN ASO, FUSE and DEND modules) ran an analysis of the combined City of Mandurah reserves and Gibson *et al.* (1994) data sets to produce a classification of the sites vegetation in the form of a dendrogram of the combined data sets, with the Floristic Community Types defined by Gibson *et al.* (1984) assigned to the Gibson *et al.* (1994) sites. The appropriate Floristic Community Type to assign to the City of Mandurah reserve sites could then be interpreted by the relative position of those sites to the Gibson *et al.* sites in the dendrogram.

The second method (Nearest Neighbours method) used the NNB module of PATN to investigate which 20 sites in the combined data set were most similar to each of the City of Mandurah reserve sites.

A final assignment of a Floristic Community Type was then made to each of the City of Mandurah reserve sites taking into account the results of both methods and the fact that the dendrogram relationships can be arranged in a more 'spread out' and less easily interpretable manner.

5.5.1.4 Identification of Threatened Ecological Communities (TEC)

Once each of the City of Mandurah reserve sites was assigned to a Floristic Community Type, a table of Floristic Communities Types on the Swan Coastal Plain and their TEC status (Department of Environmental Protection, 2000) was consulted to determine if any of

the City of Mandurah Reserves sites were TEC's. No new TEC's have been assessed for the western part of the Swan Coastal Plain (which includes the survey area) since the publication of Bush Forever Vol 2 (B.J. Keighery, pers. comm.).

5.5.2 Survey Limitations

5.5.2.1 Vegetation Survey

There is a limit to the accuracy of the assignment of the different strata in the vegetation descriptions to structural units (eg, low open woodland, low woodland, low open forest, open shrubland, shrubland etc.). Referral of a stratum to a structural category depends on assessment of its cover. Such estimation is notoriously imprecise and it is not unusual for different observers to give quite different estimates of the cover of a species, or stratum in a stand. However, descriptive exercises such as that carried out for this report require only a moderate level of accuracy, sufficient to determine which of a few cover categories a species or stratum falls into (or close to).

For this report, vegetation cover was estimated for each plant species recorded in the quadrats by estimating each species canopy cover. The assumption was made that for most species, canopy cover and projected foliar cover are reasonably similar, or that the difference is less than the level of accuracy of the estimates. Conducting the main survey in March and April meant that the estimation of cover of the annual grasses was particularly difficult because they were in various stages of break down and decomposition and had often at least partial collapsed and were lying across the ground. This was not a significant problem in Dawesville Reserve because the cover was low. However, weed cover was checked during the Spring revisit when weed condition was good.

5.5.2.2 Inferring Floristic Community Type

Inferring floristic community type is not an easy process. Many species can be common to a number of floristic communities. The method depends on using existing floristic communities and a poor outcome might occur if sites are forced into existing floristic communities.

Another problem arises for floristic communities that have been determined more recently and which cannot be accessed from the Gibson et al. 1994 data set.

5.5.2.3 PATN Floristic Analysis

It has been found in other floristic analysis that the addition of new sites to the Gibson *et al.* (1994) data set to produce a combined classification may disrupt the original classification of

sites (Griffin and Trudgen, 2004). The more data entered, the higher the level of disruption. If this occurs it can make it difficult to assign the new sites to the Floristic Community Types of Gibson *et al.* (Griffin and Trudgen, 2004).

Another limitation in conducting a PATN floristic analysis using the above methods may arise depending on the degree of success in reconciling the two data sets. A further limitation may arise from any significant differences in data collection methods between the two surveys. This is unlikely to have caused a material difference in the results for this study.

5.5.3 Mapping

5.5.3.1 Vegetation Units

Vegetation units were recorded generally between plant community and plant association level. Vegetation unit boundaries were noted on computer generated aerial photographs while traversing between vegetation releve sites. The aerial photographs were at 1:1000 scale, colour, orthocorrected and overlain with the UTM coordinate grid (GDA94 datum). GPS coordinate readings were sometimes used to confirm boundary locations. In each reserve, the alignment of GPS readings and coordinates of points on the aerial photographs were checked at least once. Some additional traversing of the survey areas was undertaken, as required, to complete vegetation unit boundaries.

Vegetation mapping unit descriptions were based on the releve vegetation descriptions. In some cases where the vegetation was ecotonal or very variable, it was mapped as a mosaic of described vegetation units.

Mapping vegetation units is very subjective and the vegetation boundaries mapped for the survey areas are a particular interpretation of the vegetation of the area. However, boundaries should delineate areas of vegetation with consistently different dominant species, significantly different percentage cover of the dominants or significantly different species composition.

5.5.3.2 Vegetation Condition

The vegetation condition was mapped using the vegetation condition assessment at each of the releves and using the same approach as outlined for the vegetation unit mapping in Section 3.4.3.3.2.

5.5.4 Dawesville Reserve Survey Results

5.5.4.1 Vegetation Units

Three vegetation units occur within the Reserve. Figure 3 delineates the location of the vegetation units. The largest unit within the Reserve is scattered *Eucalyptus marginata* (jarrah) over *Banksia attenuata, Agonis flexuosa* (peppermint), *Allocasuarina fraseriana* (sheoak) low woodland. Photos of the vegetation units are provided in Appendix B. Appendix E provides additional information for each site and the species within these sites.

The vegetation units include:

- **EmBaAf -** (unit represented by site DR1)

  Eucalyptus marginata subsp. *marginata* scattered trees over *Allocasuarina fraseriana, Agonis flexuosa, Banksia attenuata, (Banksia grandis)* low open forest over *Jacksonia furcellata* scattered tall shrubs over *Hakea lissocarpha, Acacia pulchella* var. *glaberrima, Xanthorrhoea preisii, Macrozamia riedlei* open shrubland over *Hibbertia hypericoides* low open heath over *Desmocladus flexuosa, Tetraria octandra)* very open sedgeland.

  Habitat and Soil: Small, flat swale between a high dune with gentle slope to the west and a low dune to the east. Soil is pale brown sand (surface) over yellow sand at about 40cm.

- **EgMs –** (unit represented by site DR2)

  Eucalyptus gomphocephala, (Eucalyptus marginata subsp. *marginata)* scattered trees over *Allocasuarina fraseriana, Agonis flexuosa* low woodland to low forest over *Jacksonia furcellata* scattered tall shrubs over *Melaleuca systena, Hakea lissocarpha* open shrubland over *Xanthorrhoea preisii* scattered shrubs over *Hibbertia hypericoides* low shrubland over *Desmocladus flexuosa, Lepidosperma pubisquameum* very open sedgeland and **Avena barbata, *Briza maxima, *Cynosurus echinatus, *Ehrharta longiflora* annual weed grassland.

  Habitat and Soil: Gentle, east-facing, lower to mid-slope. Soil (surface) is white sand.

- **EgAf** – (unit represented by sites DR3)

  Eucalyptus gomphocephala scattered trees to open woodland over *Eucalyptus marginata* subsp. *marginata* scattered trees over *Agonis flexuosa (Allocasuarina fraseriana*) low woodland to low open forest over **Acacia iteophylla* scattered tall shrubs over *Templetonia retusa, Hakea lissocarpha, Acacia cochlearis, Diplolaena dampiera, Macrozamia riedlei* open shrubland over *Hibbertia hypericoides, (Lasiopaetalum membranaceum)* low shrubland over *Tetraria octandra, Desmocladus flexuosus* very open sedgeland.

Habitat and Soil: Very gently sloping, west-facing, lower slope. Soil is pale brown sand over yellow sand at about 40cm.

The codes for the vegetation units that discriminate the vegetation units are shown on the vegetation map (Figure 3). The codes are derived from the generic and species names of the more abundant genera or species in the different strata present in the unit. Where there is more than one species in the genus, or where two genera have the same initial, a lower case letter is used to distinguish which species is referred (Table 5).

Table 5: Species names and abbreviations

Af	Agonis flexuosa	**Ba**	*Banksia attenuata*
Eg	*Eucalyptus gomphocephala* (Tuart)	**Em**	*Eucalyptus marginata* (Jarrah)
Ms	Melaleuca systena		

The vegetation structure/species dominance/floristic units defined for the area are considered to be mostly described at the plant community level but may represent broader units. Some stands of some of the vegetation units occurring in the areas mapped for vegetation units are quite small and as a result are not shown on the vegetation maps.

5.5.4.2 Vegetation Condition

The vegetation in the Reserve is predominately in Very Good to Excellent condition. There was a low cover of non-aggressive weeds in the main area. Weed density was higher along the edges of firebreaks and other tracks, with some patches of **Eragrostis curvula* (love grass)). Several shrub weeds occurred in the Reserve.

Figure 4 delineates the condition of vegetation within the Reserve.

Dieback may be an issue in the Reserve; this is further discussed in Section 3.4.5.

5.5.4.3 Determination of Floristic Community Types

Two Floristic Community Types, FCT's 21a and 25, were inferred for the Dawesville Reserve. Table 6 shows the inferred FCT's.

The dendrogram generated by the PATN analysis from the combined data set of the City of Mandurah Reserves survey area sites and Gibson *et al.* (1994) Swan Coastal Plain sites, grouped the Dawesville Reserve sites DR1 and DR3 together (Appendix H), indicating they

are floristically similar to each other. The grouping of the Dawesville Reserve sites is most probably because they are very geographically close (within 200 to 300 meters of each other) relative to the distance between them and the other Gibson *et al.* (1994) sites.

The dendrogram (Appendix H) shows sites DR1 and DR3 grouped with Gibson *et al.* (1994) sites belonging to FCT 25 (Southern *Eucalyptus gomphocephala* (tuart) – *Agonis flexuosa* (peppermint) woodlands). However, the nearest neighbour analysis showed that sites DR1 and DR3 had a close affinity with the Spearwood/Bassendean landform FCT 21a (Appendix H). Site DR3 also showed similarity with FCT 28 sites (Spearwood landform '*Banksia attenuata* or *Banksia attenuata* – *Eucalyptus* woodlands' unit). The nearest neighbour analysis is more easily interpreted and reliable (Ted Griffin, *pers. comm.*) and its assignment to FCT's is given more weight here. It was concluded that the Dawesville Reserve sites DR1 and DR3 be assigned to FCT 21a/25 and FCT21a/25/28 units respectively (Table 6). The grouping of the Dawesville Reserve sites with the Spearwood landform FCT's 21a and 25 reflects the location of Dawesville Reserve on the Cottesloe (Spearwood) landform element.

Table 6: The inferred floristic community, the floristic community generated from the PATN dendrogram and nearest neighbour analysis and the overall assigned Floristic Community Type for vegetation units in the Dawesville Reserve.

fc= floristic community

TEC=Threatened Ecological Community

Vegetation sites	Inferred fc	fc from Dendrogram	fc from Nearest Neighbr	Floristic Community Types Assigned	TEC's
DR1	?21a	25	21a/25	21a/25	
DR3	25	25	21a/25/28	21a/25/28	

5.5.4.4 Threatened Ecological Communities

The Department of Conservation and Land Management has developed a procedure for identifying TEC's (Department of Environmental Protection 2000b; English and Blythe 1997). Threatened ecological communities are assigned to one of four categories: 'Presumed Totally Destroyed'; 'Critically Endangered'; 'Endangered' or 'Vulnerable' (Department of Environmental Protection, 2000b).

On the Swan Coastal Plain, twenty five ecological communities delineated by a number of floristic studies and freshwater organism studies have been assessed for TEC status. Twenty four of these have assessed as 'threatened' (Department of Environmental Protection 2000b). Sixteen of these are floristic community types as identified by Gibson et al. (1994) (Department of Environmental Protection 2000b).

The TEC database search resulted in two records of TEC's in a wide area, which incorporated the Reserve, including SCP15 (Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain) and SCP07 (herb rich saline shrublands in clay pans). Neither of these TEC's were recorded in the Reserve.

The vegetation of Dawesville Reserve has affinities with FCT's 21a, 25 and 28. FCT's 21a, 25 and 28 are not TEC's.

OLD COAST RD.

EmBaAf

DR1

EgMs

DR2

EmBaAf

DR3

EgAf

LEURA STREET

CLEARED RECREATION AREA

RECREATION RD.

LEGEND: VEGETATION UNITS (SEE SECTION 5.5.4)

EmBaAf - EUCALYPTUS MARGINATA OVER BANKSIA ATTENNATA AND AGONIS FLEXUOSA

EgMs - EUCALYPTUS GOMPHOCEPHALA OVER MELALEUIA SYSTENA

EgAs - EUCALYPTUS GOMPHOCEPHALA OVER AGONIS FLEXNOSA

VEGETATION RECORDING SITE (RELEVES)

CONTOURS (SEE SECTION 5.5.4)

0 25 50 75 100m

SMEC
ACN:065 475 149
Level 6, 12 St Georges Terrace
PERTH WA 6000
Tel:(08) 9323 5900 Fax(08) 9323 5901

DAWESVILLE RESERVE
VEGETATION UNITS

Project Number: 36413

Figure Number: FIGURE 3

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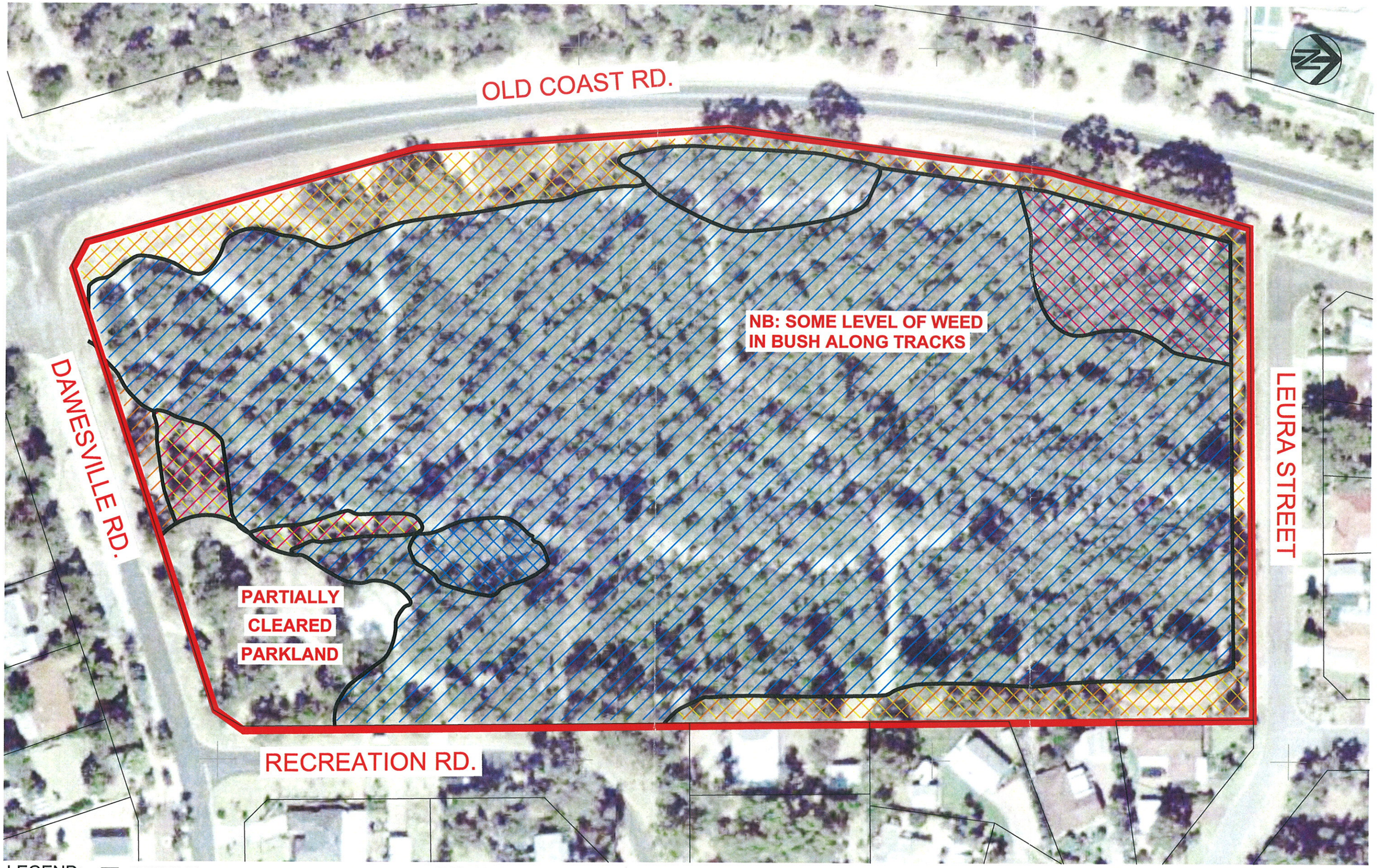

LEGEND:

- PRISTINE
- EXCELLENT
- VERY GOOD
- GOOD
- DEGRADED
- COMPLETELY DEGRADED
- EXCELLENT - VERY GOOD
- VERY GOOD - GOOD
- GOOD - DEGRADED
- DEGRADED - COMPLETELY DEGRADED

0 25 50 75 100m

SMEC
ACN:065 475 149
Level 6, 12 St Georges Terrace
PERTH WA 6000
Tel:(08) 9323 5900 Fax(08) 9323 5901

DAWESVILLE RESERVE VEGETATION CONDITIONS

Project Number: 36413

Figure Number: FIGURE 4