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City of Mandurah

Management Plan - Janis Street Reserve (32109)





SMEC

February 2005

5.3 Regional Botanical Context

Beard (1980) has defined boundaries for botanical provinces, districts and sub districts for Western Australia on the basis of his vegetation mapping of the State. In this framework, the Reserve lies in the Drummond Botanical Sub district (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 Sub district 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.

Janis St Reserve is close to the coastline, with its western most point about 150 meters from the beach. It lies on the boundary of an occurrence of the Quindalup Vegetation Complex and the Cottesloe Complex-Central and South (Heddle et al, 1980), which occur respectively on the Quindalup and Cottesloe soil/geomorphic units of Churchwood and McArthur (1980).

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 and 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 bdow).

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 Janis St 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. None of these species were recorded in the areas of the reserve that were surveyed.

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 Janis St Reserve was 109, of which 54 (or 49.5 percent) were native species. The species list for Janis St Reserve is provided in Table 4.

No Declared Rare Flora or Priority Flora were recorded in Janis St Reserve during this survey.

An unusual form of *Opercularia ?vaginata* was collected during the March survey (see the draft report). Forms of *Opercularia ?vaginata* collected during the Spring survey were of the normal form. A more detailed investigation of *Opercularia ?vaginata* was not undertaken during the spring survey, but the specimens of interest collected during the March survey will be lodged with the Western Australian Herbarium.

Table 4: Flora Species List for Janis Reserve

FAMILY/TAXA	Common names	Priority Status
GYMNOSPERMAE		
018 CUPRESSACEAE		
* Callitris preissii	Rottnest Island pine	
ANGIOSPERMAE		
MONOCOTYLEDONS		
031 POACEAE (grasses)		
Austrodanthonia sp.		
Austrostipa flavescens		
* Avena barbata	Wild oats	
* Briza maxima	Blowfly grass	
* Bromus diandrus	Great brome grass	
* Cynodon dactylon	Couch	
* Ehrharta calycina	Perennial veldt grass	
* Ehrharta longiflora	Annual veldt grass	
* Eragrostis curvula	Love grass	
* Lagurus ovatus	Hair's tail grass	
* Lolium perenne x rigidum		
* Lolium rigidum	Annual ryegrass	
Spinifex longifolius		

* Stenotaphrum secundatum	Buffalo	
* Vulpia myuros var. myuros	Silver grass	
032 CYPERACEAE (sedges)		
Bolboschoenus caldwellii		
Ficinia nodulosa	Knotted club rush	
* Isolepis marginata		
Lepidosperma gladiatum	Coast sword sedge	
Lepidosperma pubisquameum		
Schoenus grandiflorus		
039 RESTIONACEAE (rushes)		
Desmocladus asper		
054C DASYPOGONACEAE		
Acanthocarpus preissii	Prickle lily	
Lomandra maritima		
Lomandra suaveolens		
054E PHORMIACEAE		
Dianella revoluta var. divaricata	Blueberry lily	

054F ANTHERICACEAE		
Tricoryne elatior	Yellow autumn lily	
054G ASPHODELACEAE		
* Trachyandra divaricata	Dune onion weed	
055 HAEMODORACEAE		
Conostylis candicans subsp. calicola	Grey cottonhead	
Conostylis sp.		
056B AGAVACEAE		
* Argave americana	Century plant	
060 IRIDACEAE (Iris family)		
* Romulea rosea	Guildford grass	
DICOTYLEDONS		
070 CASUARINACEAE		
Allocasuarina humilis	Dwarf sheok	
* Casuarina equisetifolia	Coast sheok	
* Casuarina obesa	Swamp sheok	

087 MORACEAE		
* Ficus benjamina		
* Ficus macrophylla	Moreton Bay fig	
090 PROTEACEAE		
Dryandra lindleyana var. lindleyana		
Grevillea crithmifolia		
Grevillea preissii subsp. preissii		
Hakea prostrata	Harsh hakea	
Hakea trifurcata	Two-leaf hakea	
Petrophile axillaris		
Synaphea spinulosa subsp. spinulosa		
092 SANTALACEAE		
Santalum acuminatum	Quandong	
105 CHENOPODEACEAE		
Rhagodia baccata subsp. baccata		
110 AIZOACEAE		
* Tetragonia decumbens	Sea spinnach	

113 CARYOPHYLLACEAE		
*Petrorhagia dubia	Velvet pink	
131 LAURACEAE		
Cassytha flava		
138 BRASSICACEAE		
* Heliophila pusilla		
* Raphanus raphanistrum	Wild raddish	
149 CRASSULACEAE		
Crassula colorata		
* Crassula glomerata		
163 MIMOSACEAE		
Acacia cochlearis	Rigid wattle	
Acacia cyclops	Coastal wattle	
Acacia lasiocarpa var. lasiocarpa	Dune moses	
Acacia rostellifera	Summer scented wattle	
Acacia saligna	Golden wreath wattle	
Acacia truncata (Lake Preston variant)		

165 PAPILIONACEAE		
Daviesia physodes		
Hardenbergia comptoniana	Native Wisteria	
Jacksonia furcellata	Grey stinkwood	
* Lupinus cosentinii	Sandplain (blue) lupin	
*Medicago polymorpha	Burr medic	
* Melilotus indicus		
* Papillionaceae sp.		
* Retama raetam		
Templetonia retusa	Cockies tongue	
* Trifolium campestre var. campestre	Hop clover	
167 GERANIACEAE		
*Erodium moschatum		
* Pelargonium capitatum	Rose Pelargonium	
168 OXALIDACEAE		
*Oxalis pes-caprae	Soursob	
178 MELIACEAE		
* Melia azedarach	Cape lilac	

185 EUPHORBIACEAE		
* Euphorbia terracina	Geraldton carnation weed	
Phyllanthus calycinus	False Boronia	
* Ricinus communis	Castor oil plant	
194 ANACARDIACEAE		
* Schinus terebinthifolia	Japanese pepper	
215 RHAMNACEAE		
Cryptandra mutila		
Spyridium globulosum	Basket bush	
226 DILLENIACEAE		
Hibbertia racemosa		
237 TAMARICACEAE		
*Tamarix aphylla	Tamarisk	
243 VIOLACEAE		
Hybanthus calycinus	Wild violet	

263 THYMELAEACEAE		
Pimelea calcicola		
273 MYRTACEAE		
* Eucalyptus erythrocorys		
* Eucalyptus platypus		
* Leptospermum laevigatum	Victorian t-tree	
Melaleuca huegelii subsp. huegelii	Chenille honeymyrtle	
Melaleuca systena	Coastal honeymyrtle	
* Metrosideros sp.	New Zealand Xmas tree	
275 ONAGRACEAE		
*Oenothera drummondii subsp. drummondii	Beach evening primrose	
288 EPACRIDACEAE		
Leucopogon parviflorus	Coast beard-heath	
293 PRIMULACEAE		
*Anagallis arvensis var. caerulea		
304 APOCYNACEAE		

Alyxia buxifolia	Sea box, Dysentery bush	
313 LAMIACEAE		
Hemiandra glabra subsp. glabra		
331 RUBIACEAE		
Opercularia vaginata		
Opercularia ?vaginata		
334 VALERIANACEAE		
*Centranthus macrosiphon	Pretty betsy	
340 LOBELIACEAE		
Lobelia gibbosa		
341 GOODENIACEAE		
Scaevola crassifolia	Thickleaved fanflower	
345 ASTERACEAE		
*Arctotheca calendula	Capeweed	
* Arctotis stoechadifolia	White arctotis	

* Gazania linearis		
* Hypochaeris glabra	Smooth catsear	
* Lactuca saligna	Wild lettuce	
Olearia axillaris	Coastal daisy bush	
* 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 B. 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 C). 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 D. 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 six from Janis St Reserve (BR1-BR3).

5.5.1.3.1 Data Preparation and Compatibility

The vegetation site data from the sixteen sites in 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 (for example, 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 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 a particularly difficult problem in Janis St Reserve where weed cover was high. This made it necessary to check the weed grid cover estimates 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 Janis Reserve Survey Results

5.5.4.1 Vegetation Units

There was considerable variation in the vegetation in the Reserve, which reflects the fact that the Reserve lies on the boundary of the Quindalup and Spearwood geomorphic elements, as well as the variation in habitat (swale and lower dune slopes). Seven vegetation units were recorded in Janis St Reserve.. Figure 3 delineates the location of the vegetation units. 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 Janis St Reserve vegetation units were not found in the Beacham, Dawesville or Tindale St Reserves.

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 being referred to (Table 5).

Table 5: Species names and abbreviations

Ar	Acacia rostellifera	**Oa**	*Olearia* axillaris
Hp	*Hakea prostrata*	**Pa**	Petrophile axillaris
Ht	*Hakea trifurcata*	**Rb**	*Rhagodia baccata ssp baccata*
Mh	Melaleuca huegelii ssp huegelii	**Sc**	Scaevola crassifolia
Ms	Melaleuca systena	**Sg**	Spyridium globulosum

The vegetation units within Janis St Reserve include:

- **Mh** – (unit represented by site JSR1)

  Melaleuca huegelii subsp. huegelii, Templetonia retusa, (Spyridium globosum) closed heath to closed scrub over *Rhagodia baccata* subsp. *baccata* scattered shrubs over *Grevillea preissii* subsp. *preissii*, *Phylanthus calycinus* low open shrubland to low shrubland over *Desmocladus asper*, *Lepidosperma pubisquameum* very open sedgeland with *Lomandra maritima, Opercularia ? vaginata* scattered herbs and **Ehrharta longiflora, *Lolium rigidum,* (annual rye grass), **Avena barbata, (*Romulea rosea)* annual weedland.

  Habitat and Soil: Gentle, west-facing, lower slope of low dune to east of a high Quindelup dune. Soil is light reddish-brown siliceous sand with limestone outcropping (5% surface cover). Spearwood limestone unit.

  Notes: This covers a large area of the Reserve.

- **ArSg**

  Acacia rostellifera closed scrub over *Spyridium globulosum* scattered tall shrubs over mixed open shrubland over *Grevillea preissii* subsp. *preissii* scattered low shrubs *over Lepidosperma pubisquameum* scattered sedges and *Acanthocarpus preissii* very open herbland *and *Ehrharta longiflora. *Bromus diandrus, Lolium rigidum* and **Avena barbata* annual weed grassland.

Habitat and Soil: Swale between a high Quindalup dune to the west and a low dune to east. Pale brown sand (mixture of quartz and calcareous shell fragments) indicates a mixture of Quindalup and Spearwood sands).

Notes: vegetation varied in the main area of this unit from understorey species typical of Quinadlup sands (site JSR2) to species more typical of Spearwood limestone (site JSR3).

- **HtMs** – (unit represented by site JSR4)

Hakea trifurcata, (Melaleuca huegelii subsp. huegelii) scrub over *Petrophile axillaris, Melaleuca systena* open shrubland over *Lepidosperma pubisquameum, Desmocladus asper* very open sedgeland and **Ehrharta longiflora, *Avena barbata* closed annual grassland

Habitat and Soil: Gentle, west-facing slope of low dune. Soil is pale reddish-brown sand (Spearwood sands) with <2% limestone outcropping

Notes: This unit was a narrow unit on the eastern side of the reserve, beside and upslope of unit Mh.

- **PaMs** – (unit represented by site JSR5)

Templetonia retusa open shrubland over *Petrophile axillaris* open shrubland to shrubland over *Grevillea preissii* subsp. *preissii, Melaleuca systena, Rhagodia baccata* subsp. *baccata, (Grevillea crithmifolia)* low shrubland over *Lepidosperma pubisquameum* open sedgeland *with Opercularia vaginata* very open herbland and **Avena barbata, *Ehrharta calycina* annual weed grassland.

Habitat and Soil: Gentle, west-facing slope of low dune. Soil is pale reddish-brown sand (Spearwood limestone). Scattered limestone outcrop <1%.

Notes: Unit represented by site JSR5. This unit occurs in a mosaic.

- **OaSc** – (unit represented by site JSR6)

Retama raetam high open shrubland over *Olearia axillaris* scattered tall shrubs over *Grevillea preissii* subsp. *preissii, Scaevola crassifolia* low open shrubland to low shrubland over *Ficinia nodulosa* scattered sedges with *Conostylus candicans* subsp. *calicola, Hemiandra glabra* subsp. *glabra, *Euphorbia terracina, Acanthocarpus preissii, *Trachyandra divaricata* open herbland and **Bromus diandrus* and *Lolium perenne x rigidum* annual grassland.

Habitat and Soil: Very gentle, north east-facing slope in swale between a high Quindalup dune to the west and a low Spearwood dune to east. The colour of the sand is white to pale brown (mixture of Quindalup and Spearwood sands). A few limestone rocks present but no outcrop observed.

Notes: It is difficult to know how much, if any, the structure of this vegetation has changed. However, at site JSR6 the shrub weed **Retama raetam* is a dominant and an area where **Leptospermum laevigatum* is a dominant lies in the northern part of this unit.

- **HpRb** – (unit represented by site JSR7)

  Hakea prostrata, Acacia rostellifera shrubland to high shrubland over *Rhagodia baccata* subsp. *baccata, Petrophile axillaris, Grevillea crithmifolia, Daviesia physodes* low shrubland over *Desmocladus asper, Lepidosperma pubisquameum* scattered sedges with *Lomandra maritima, Opercularia vaginata* scattered herbs and **Ehrharta longiflora* and **Lolium rigidum* annual weed grassland.

  Habitat and Soil: Very gently sloping, west-facing lower slopes of low dune with a high Quindelup dune to the west. Soil is reddish-brown sand (Spearwood sands).

  Notes: This unit occupies a small unit and is probably ecotonal, but is quite distinct from unit Mh to the east and unit ArSg to the west.

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 mainly Good to Very Good (see Appendix D). Weeds are the main issue in this reserve, with high covers of a range of weeds in different parts of the reserve. Refer to Figure 4, which delineates the condition of vegetation within the Reserve.

5.5.4.3 Determination of floristic community types

Two floristic communities were inferred for Janis St Reserve. However, there was considerable uncertainty about the inferred FCT's, as FCT 26a and FCT 24 are quite difficult to differentiate.

The dendrogram from 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 sites JSR1, JSR2, JSR3, JSR4, JSR5 and JSR6 together (Appendix H), indicating they are floristically similar to each other. The grouping of the Janis St 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 that the Janis St Reserve sites grouped with Meadow Springs sites (Spearwood landform) and Gibson *et al.* (1994) sites belonging to FCT 30 and 29. However, the nearest neighbour analysis showed that sites JSR1, JSR4 and JSR5 had a close affinity with the Spearwood landform FCT 24 (Appendix H). 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. FCT 24 occurs predominantly on the Spearwood Dunes and is a 'Northern Spearwood shrublands and woodlands' unit. The other three Janis St Reserve sites (JSR2, JSR3 and JSR6) were located near the boundary of the Quindelup and Spearwood units in the reserve. This is reflected in those units also having affinities with Quindelup FCT's. The nearest neighbour analysis indicated that site JSR3 had affinity to the Spearwood landform FCT 24 and the Quindelup landform FCT 29b 'Acacia shrublands on taller dunes' (Appendix H). Site JSR3 was an *Acacia rostellifera* scrub vegetation unit with numerous shrubs which occurred in an open area beside the Acacia scrub. While site JSR2 came out closest to the FCT 30a in the nearest neighbour analysis (Appendix H), it also had an affinity with FCT 24 and 29b (Table 6) and was more like FCT 29 (Mellisa Hoskins, *pers. comm.*, (WATSCU, Dept of CALM). FCT 30a is a '*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands' unit (Quindelup landform). Neither *Callitris preissii* nor *Melaleuca lanceolata* occurred naturally in the Janis St Reserve and a number of species occurred in JSR2 that are not typical of FCT 30a (Val English, *pers comm.*. (WATSCU, Dept of CALM). Site JSR2 was an *Acacia rostellifera* scrub vegetation unit, with sparse understorey (including some typical Quindelup species) under the scrub canopy and this may be why it has come out close to FCT30a in the analysis. Site JSR6 also occurred on the Quindelup and Spearwood boundary and had an affinity with the Spearwood landform unit 24. The presence of the sedge *Ficinia nodulosa* and one or two other dampland species may be the reason it was grouped with the 'sedgelands in Holocene swales' FCT 19. However, these plants occurred on the edge of the JSR6 site and only in a very small area of the swale and so the affinity with FCT19 is probably an anomoly. Also, site JSR6 was quite disturbed (high weed cover), and this is likely to have affected the results of the analysis. Site JSR6 is more likely to have greater affinity to the Spearwood landform FCT 24 or the Quindelup landform FCT 29a.

In conclusion, after reviewing the results of the PATN analysis and receiving an opinion from WATSCU, Department of Conservation and Land Management, it was concluded that three of the Janis vegetation units were FCT 24 and the other three had affinities to FCT's 24, 29a and 29b (see Table 6 for the assigned FCT's). The PATN analysis showed that inferred FCT 26a does not occur in the Janis St Reserve.

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 Janis St Reserve.

fc= floristic community

TEC=Threatened Ecological Community:

VU=Vulnerable

Vegetation sites	Inferre fc	fc from Dendro-gram	fc from Nearest Neighbr	Floristic Community Types Assigned	TEC's
JSR1	26a	29/30	24	24	
JSR2	29b	29/30	30a/24	29a/24	(FCT 29 is currently on a Dept CALM priority list for consideration as a TEC
JSR3	29b	29/30	24/29b	24/29b	
JSR4	?26a (or 27?)	29/30	24	24	
JSR5	?26a (or 27?)	29/30	24	24	
JSR6	29b	29/30	24/19/29a	24/29a	

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 Department of Conservation and Land Management TEC database search resulted in two records of TEC's from 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 was recorded in the Reserve.

The PATN analysis showed that the inferred FCT 26a, a TEC, does not occur in the Janis St Reserve. None of the FCT's that were finally assigned to the vegetation units in the Janis St Reserve are currently TEC's. However, it should be noted that FCT 29 is currently on a Department of Conservation and Land Management priority list for consideration as a TEC (Melissa Hoskins, *pers. comm.*, (WATSCU, Dept of CALM).

LEGEND: VEGETATION UNITS (SEE SECTION 5.5.4) :

Mn - MELALENCA HUEGELII
ArSg - ACACIA ROSTELLIFERA OVER SPYRIDIUM GLOBULOSUM
HtMs - HAKEA TRIFURCATA OVER MELALEUCA SYSTENA
OaSc - OLEARIA AXLLARIS OVER SCAEVOLA CRASSIFOLIA
PaMs - PETROPHILE AXILLARIS OVER MELALEUCA SYSTENA
HpRb - HAKEA PROSTRATA OVER RHAGODIA BACCATA

VEGETATION RECORDING SITE (RELEVES)
CONTOURS
BASKETBALL COURT

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

JANIS STREET RESERVE VEGETATION UNITS

Project Number: 36413

Figure Number: FIGURE 3

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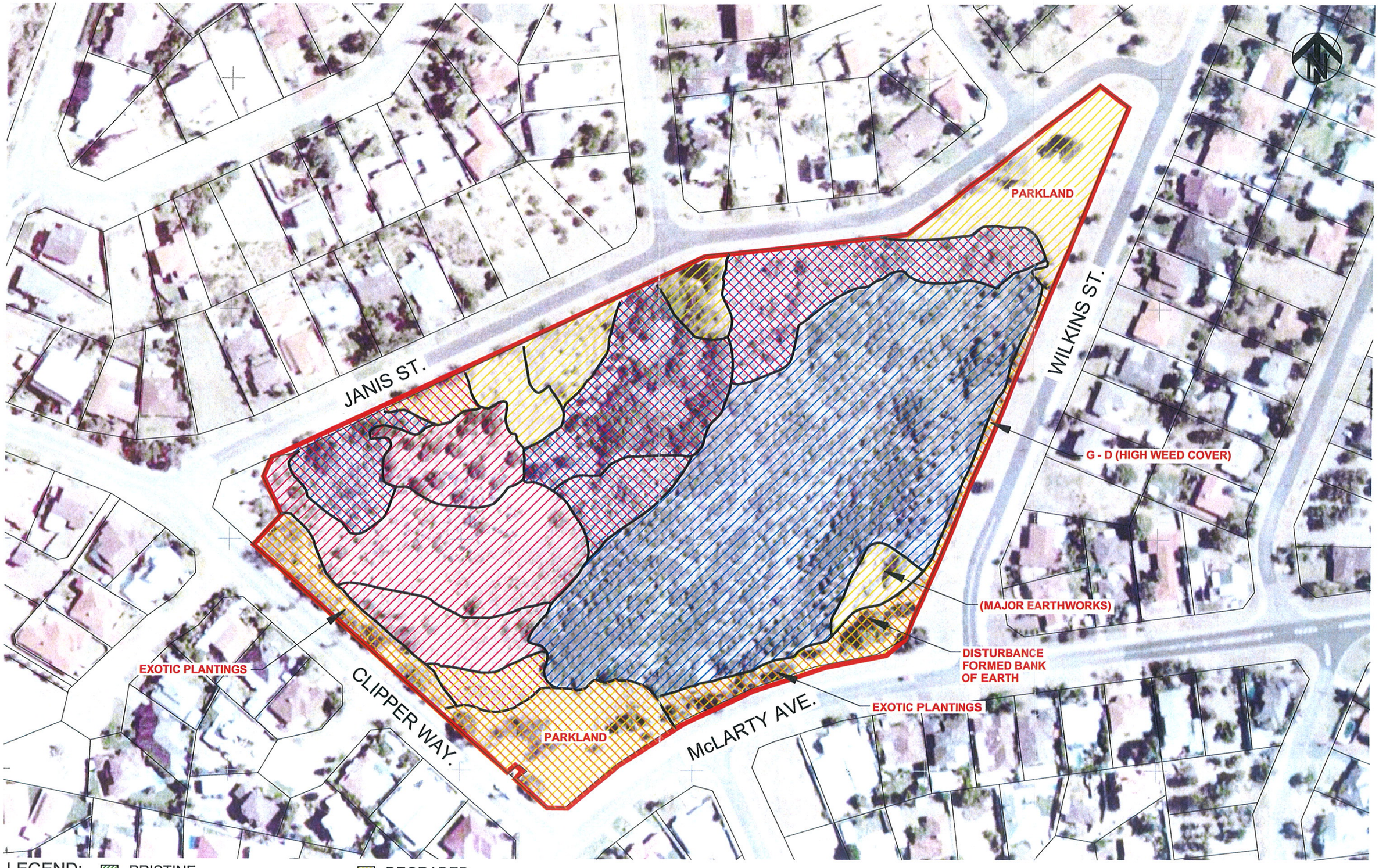

LEGEND:

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

0 25 50 75 100m

SMEC
ACN:065 475 149
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PERTH WA 6000
Tel:(08) 9323 5900 Fax(08) 9323 5901

JANIS STREET RESERVE VEGETATION CONDITIONS

Project Number: 36413

Figure Number: FIGURE 4