

# **SOUTH CAPEL FLORA AND VEGETATION ASSESSMENT**

## **FINAL REPORT**

**Prepared for Iluka**

**by**

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## EXECUTIVE SUMMARY

Iluka is reviewing the Closure Plan for its South Capel site. A flora and vegetation assessment was undertaken in order to determine the current flora and vegetation values of these areas. This information will assist in the development of a final land use plan for the area.

The South Capel study site covers approximately 543 Ha. Part A sits to the west of Bussell Hwy and covers 342 Ha of land that has mostly been mined and subsequently revegetated, in places with species not native to the area. Part B, on the eastern side of the highway, covers a former processing site and containment facility as well as a large area of relatively undisturbed bushland (the 'eastern bushland') immediately adjacent to high value conservation Reserve.

The purpose of the flora and vegetation study was to:

- compile a list of the flora in the survey area, including any Significant flora;
- map the vegetation and the vegetation condition in the survey area;
- assess the flora and vegetation values of remnant bushland and revegetation in the survey area;
- report on the survey results.

The survey was undertaken over a number of dates spanning from November 2010 through to November 2012 and covered two Spring survey seasons. Flora and vegetation were surveyed using quadrats, releves and mapping notes. Where species were not well known or of particular interest, specimens were collected. A total of 294 native species, 69 weed species and 24 revegetation species (plantings native to Australia but not endemic to the South Capel area), were recorded.

One Threatened species (Declared Rare Flora), *Drakaea elastica*, was recorded in three previously unrecorded areas in the eastern bushland of Part B. A further thirteen Priority species (1xP2, 6xP3, and 6xP4) and two species of regional significance were recorded in the survey area. A likely new taxon of *Stylidium* and two potentially new taxa of *Lepidosperma* were also recorded.

Eleven remnant vegetation units were described and mapped, covering three broad groupings: vegetation on low sand rises; wetland vegetation; and vegetation of lowlying areas adjacent to wetlands. A further twenty vegetation units were used to describe the revegetated areas of Part A, though these revegetated areas were found to be highly variable in species composition. Affinities of the eleven remnant vegetation units with Floristic Community Types were analysed using PATN analysis. Vegetation on the low rises and margins and also a *Melaleuca preissiana* wetland unit (MpKg) were found to have PEC affinities (a measure of vegetation rarity). No TECs were identified.

Remnant vegetation condition was mapped using the Keighery scale described in Bush Forever (2000). The former processing site and containment facility on Part B was mapped largely as 'Completely Degraded', with areas of 'Degraded', however the adjacent eastern bushland was largely mapped from 'Good' through to 'Excellent'. Small areas of remnant on Part A were rated mostly as 'Good'.

This condition scale was not applied to areas of revegetation, as it would be neither valid nor useful for these systems. Instead, revegetated areas were mapped using alternative criteria based on their perceived natural values including: number and endemism of taxa; vegetation structure; cover; and weed presence.

Flora and vegetation values in the South Capel survey area were assessed for regional significance using the criteria for determination of regional significance of natural areas set out in the EPA Guidance Statement No. 10 (EPA, 2006). The SC PartB – eastern bushland corridor was assessed as being Regionally Significant, while the SC PartA area and SC PartB former processing area were found not to be Regionally Significant.

# 1 INTRODUCTION

## 1.1 Background

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## 1.2 Purpose of the study

The purpose of the flora and vegetation study was to:

- compile a list of the flora in the survey area, including any Significant flora;
- map the vegetation and the vegetation condition in the survey area;
- assess the flora and vegetation values of remnant bushland and revegetation in the survey area;
- report on the survey results.

The flora and vegetation study has been conducted in accordance with the requirements of the Environmental Protection Authority's 'Guidance for the Assessment of Environmental Factors No 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia' (2004).

## 1.3 The study area

The study area consisted of the 'Capel Wetlands' area (hereafter referred to as 'South Capel Part A' or 'SC PartA') and a former processing area, containment facility and adjacent bushland areas (hereafter referred to as 'South Capel Part B' or 'SC PartB') (Figure 1).

On the western side of Bussell Hwy, South Capel Part A, or the 'Capel Wetlands' area, is an area of approximately 342 Ha that has been mostly mined and subsequently revegetated, in some parts with species not endemic to the area.

On the eastern side of Bussell Hwy, SC Part B covers approximately 201 Ha. As well as the historical mineral processing area, SC Part B includes a large area of unmined remnant bushland, including areas of wetland habitat, referred to hereafter as the 'eastern bushland' (Figure 1). Part of the South Capel Part B area, covering the former processing area and Hutton Road containment facility, was surveyed and assessed by Endemic in 2010 and 2011. Data from this survey has been incorporated into the current report.

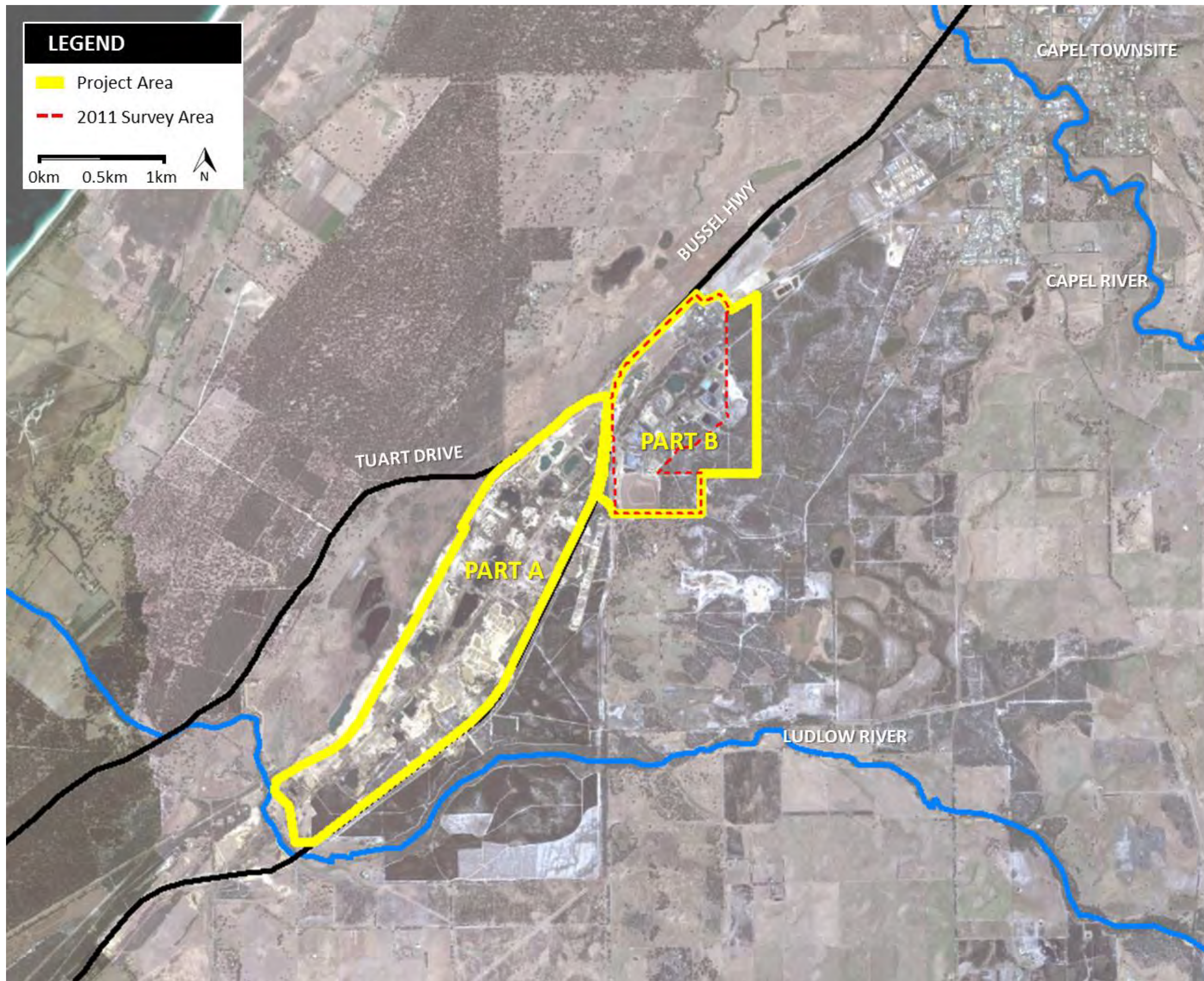


FIGURE 1. Location of the survey area.

## 2 SITE DESCRIPTION AND BACKGROUND INFORMATION

### 2.1 Physical Environment

#### 2.1.1 Climate

The Swan Coastal Plain, which includes the survey area, has a Mediterranean type climate with hot, dry summers and mild, wet winters.

#### 2.1.2 Geomorphology of the survey area

The Swan Coastal Plain consists of a series of geomorphological elements, which are sub-parallel to the present coastline (McArthur and Bettenay, 1960; Churchward and McArthur, 1980). Each of these geomorphic elements has distinctive geology, vegetation, topography and soils.

The South Capel survey area lies in the Southern River unit of the Bassendean Dune System (Churchward and McArthur, 1980). The Bassendean Dune System is the most eastern one of three main aeolian deposits on the Swan Coastal Plain that can be arranged in age sequence. The Southern River unit consists of 'sandplain with low dunes and many intervening swamps', and occurs where 'sand appears to have been blown over the alluvial soils', resulting in the swamps often having a clay base (Churchward and McArthur, 1980).

### 2.2 Flora and vegetation of the area

#### 2.2.1 Vegetation

##### 2.2.1.1 Regional vegetation

Beard (1980) 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 survey area 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.

Hedde *et al* (1980) mapped the vegetation of part of the Drummond Botanical Sub-district at a very broad scale, describing a series of vegetation complexes. These are related groups of vegetation associations found on particular landform-soil units (geomorphic elements, see above). They mapped a total of 29 vegetation complexes on the Swan Coastal Plain and 9 vegetation complexes on the Dandaragan Plateau. The South Capel survey area corresponds to the 'Southern River Complex' (Figure 2; Hedde *et al.*, 1980). The Southern River Complex was described as 'consisting of an open woodland of marri-jarrah-banksia on the elevated areas and a fringing woodland of *E. rudis* – *M. raphiophylla* along the streams' (Hedde *et al.*, 1980).

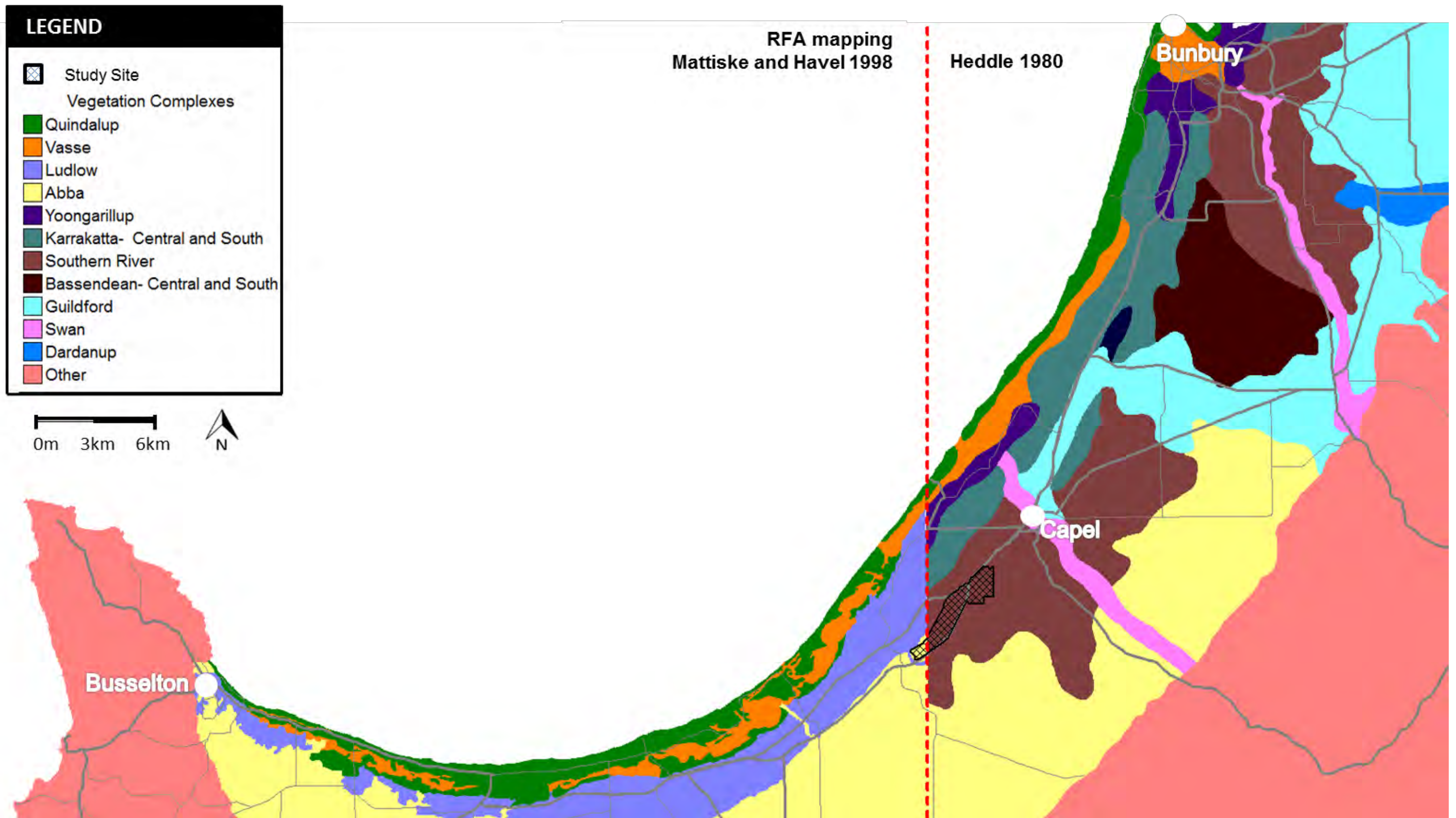


FIGURE 2. Swan Coastal Plain Vegetation Complexes (adapted from Heddle *et al.*, 1980) in the South Capel survey area.



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 was extended in 2000. The Gibson study identified 30 Floristic Community Types (with a further 13 subdivisions) in four floristic 'Super Groups' for the southern Swan Coastal Plain. These units are defined at a similar level of synthesis to that of Hedde *et al.* (1980) (Trudgen, 1999). The four 'super groups' of sites correlate closely with the major geomorphological elements 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).

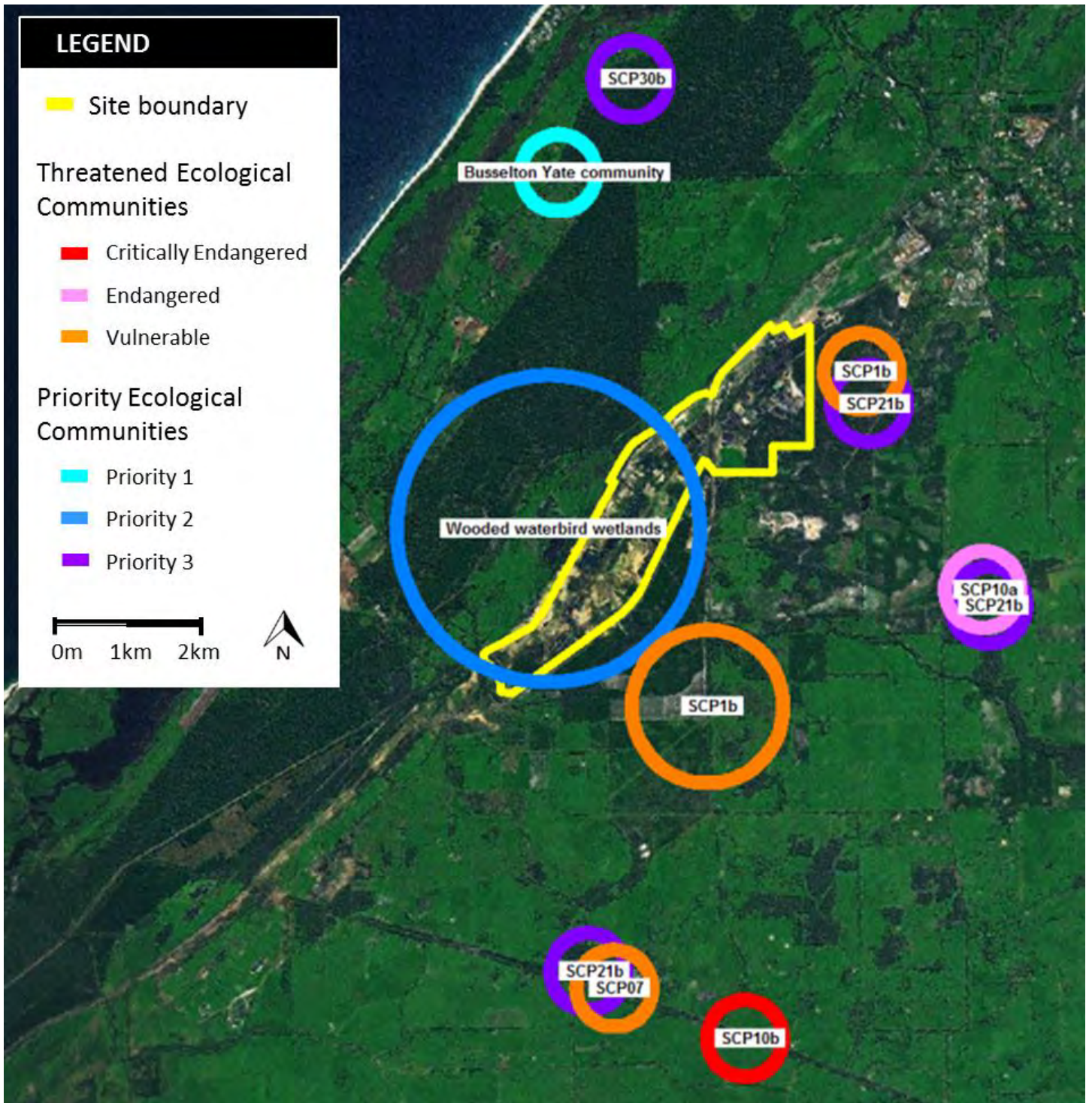
#### 2.2.1.2 Rare vegetation: Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs)

The Department of Conservation and Land Management has developed a procedure for identifying 'Threatened Ecological Communities' (Department of Environmental Protection 2000b; English and Blythe 1997). Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat'.

TECs 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 four Threatened Ecological Communities have been confirmed (FloraBase, Department of Environmental and Conservation website, 2012). Eighteen of these Threatened Ecological Communities are Floristic Community Types as identified by Gibson *et al.* (1994).

Priority Ecological Communities (PECs) include 'possible threatened ecological communities that do not meet survey criteria or are not adequately defined' (DEC, unpublished). These are added to the DEC's PECs list under Priorities 1, 2 and 3. Priority 4 status is given to "Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. Conservation Dependent ecological communities are placed in Priority 5 (DEC, unpublished). The list of PECs (DEC, unpublished) includes some that are Floristic Community Types (FCTs) as identified by Gibson *et al.* (1994).



**FIGURE 3. DEC records of Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) in the South Capel survey area locality at September 2012.**

A search of the Department of Environment and Conservation's database of currently known TEC and PEC locations, found that there were a number of TECs and PECs recorded in the survey area locality (Figure 3):

- TEC SCP10b (Critically Endangered): 'Shrublands on southern Swan Coastal Plain ironstones (Busselton area)';
- TEC SCP10a (Endangered): 'Shrublands on dry clay flats, Swan Coastal Plain'
- TEC SCP1b (Vulnerable): 'Eucalyptus calophylla woodlands on heavy soils of the southern Swan Coastal Plain'
- TEC SCP07 (Vulnerable): 'Herb rich saline shrublands in clay pans, Swan Coastal Plain';
- PEC '*Eucalyptus cornuta*, *Agonis flexuosa* and *Eucalyptus decipiens* forest on deep yellow-brown siliceous sands over limestone (Busselton Yate Community)' (Priority 1)
- PEC 'Wooded Wetlands that support colonial waterbird nesting areas' (Priority 2): includes McCarley's Swamp.
- PEC SCP21b (Priority 3): 'Southern *Banksia attenuata* woodlands (Community type 21b)'.
- PEC SCP30b (Priority 3): 'Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands (Community type 30b)'

None of the TECs or PECs currently on the Department of Environment and Conservation's database are located in the survey area.

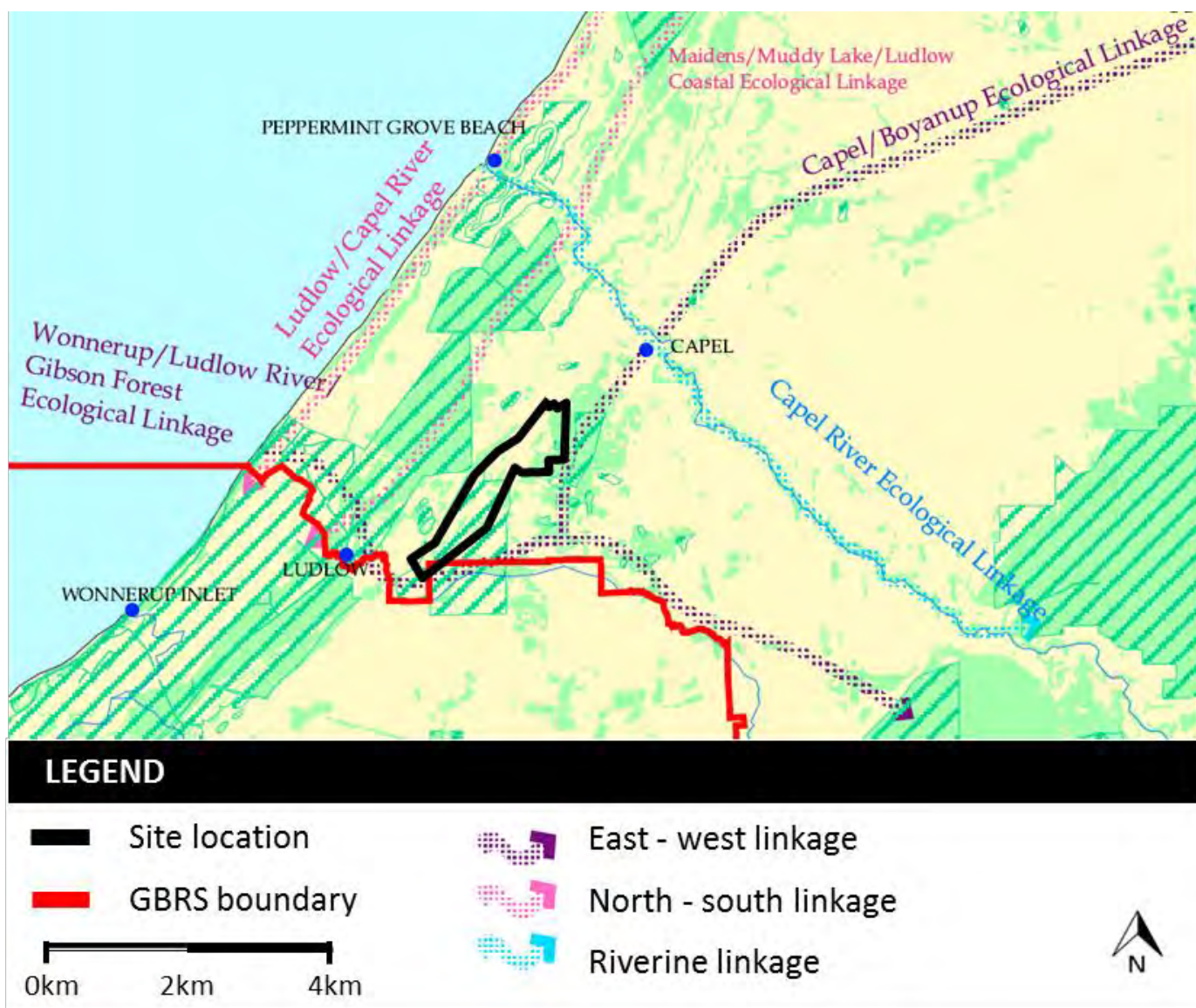
#### 2.2.1.4 Vegetation linkages

The consideration of proximity to other natural areas, and connectivity with them, is important in assessing the significance of natural areas.

The South Capel survey area is located in the vicinity of east-west linkages identified in the Greater Bunbury Region Scheme (Figure 4) (Environmental Protection Authority, 2003). An east-west linkage identified as the Wonnerup/Ludlow River/Gibson Forest linkage runs approximately along the southern boundary of SC PartA. The Capel/Boyanup linkage passes through Conservation Reserve to the east of SC PartB. Remnant vegetation in the 'eastern bushland' of SC PartB is contiguous with this Conservation area and therefore is expected to meet criteria for regional significance.

#### 2.2.2 Rare flora

A search of the Department of Environment and Conservation rare flora databases in September 2012, found forty four rare flora taxa have been previously recorded in the South Capel survey area locality, including eight (8) DRF taxa and thirty six (36) Priority taxa (Figure 5; Table 1).



**FIGURE 4.** Excerpt from Map 1 of 'Ecological linkages in the Great Bunbury Region' (EPA 2004) showing regional ecological linkages in the vicinity of the study site.

**Table 1. Declared Rare and Priority Flora previously recorded within the South Capel locality (from DEC TPFL and WAHERB database searches, September 2012).**

Taxon	Conservation Status
<i>Banksia nivea</i> subsp. <i>uliginosa</i>	T
<i>Chamelaucium</i> sp. C Coastal Plain (R.D. Royce 4872)	T
<i>Diuris drummondii</i>	T
<i>Drakaea elastica</i>	T
<i>Grevillea elongata</i>	T
<i>Tetraria australiensis</i>	T
<i>Verticordia densiflora</i> var. <i>pedunculata</i>	T
<i>Verticordia plumosa</i> var. <i>vassensis</i>	T
<i>Bolboschoenus medianus</i>	1
<i>Boronia humifusa</i>	1
<i>Amperea micrantha</i>	2
<i>Leucopogon</i> sp. Busselton (D. Cooper 243)	2
<i>Montia australasica</i>	2
<i>Schoenus loliaceus</i>	2
<i>Synaphea petiolaris</i> subsp. <i>simplex</i>	2
<i>Trichocline</i> sp. Treeton (B.J. Keighery & N. Gibson 564)	2
<i>Angianthus drummondii</i>	3
<i>Blennospora doliiformis</i>	3
<i>Boronia anceps</i>	3
<i>Boronia tetragona</i>	3
<i>Chamaescilla gibsonii</i>	3
<i>Eryngium ferox</i>	3
<i>Grevillea brachystylis</i> subsp. <i>brachystylis</i>	3
<i>Isopogon formosus</i> subsp. <i>dasylepis</i>	3
<i>Jacksonia gracillima</i>	3
<i>Lasiopetalum membranaceum</i>	3
<i>Loxocarya magna</i>	3
<i>Meeboldina thysanantha</i>	3
<i>Synaphea hians</i>	3
<i>Tetratheca parvifolia</i>	3
<i>Thelymitra variegata</i>	3
<i>Verticordia attenuata</i>	3
<i>Acacia flagelliformis</i>	4
<i>Acacia semitrullata</i>	4
<i>Aponogeton hexatepalus</i>	4
<i>Caladenia speciosa</i>	4
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	4
<i>Chamelaucium</i> sp. Yoongarillup (G.J. Keighery 3635)	4
<i>Franklandia triaristata</i>	4
<i>Ornduffia submerse</i>	4
<i>Schoenus natans</i>	4
<i>Stylidium striatum</i>	4
<i>Thysanotus glaucus</i>	4
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	4



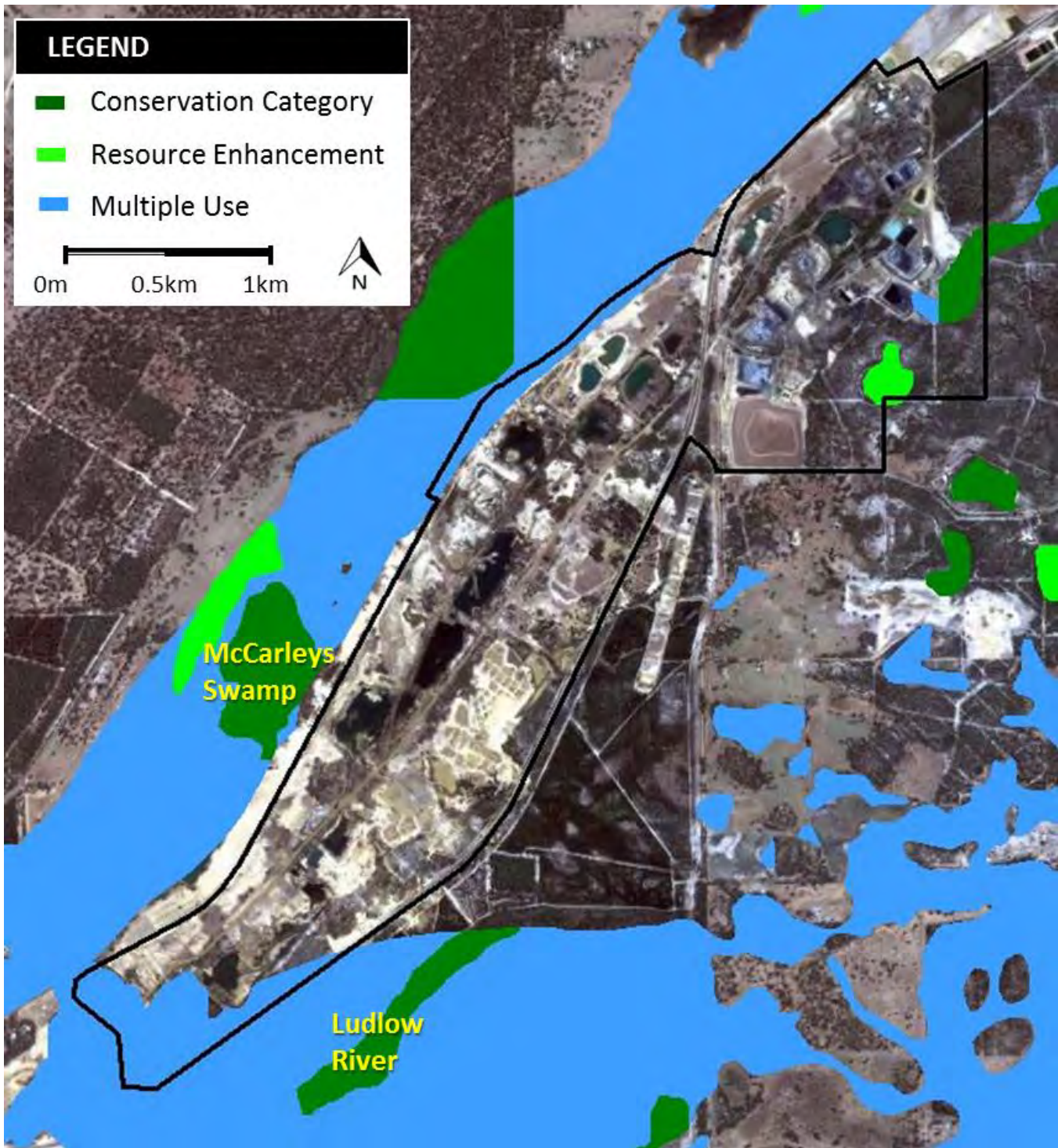
## 2.3 Wetlands

Western Australia's wetlands have been defined as 'areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetland Advisory Committee 1977, quoted in DEC, 2000b). There are over 9600 wetlands covering over 25% of the Swan Coastal Plain land area (Balla, 1994).

Management categories for wetlands in Western Australia have been described by the Water and Rivers Commission (DEC 2000b). They are:

- Conservation wetlands: 95-100% vegetated; management objective of preserving their natural attributes and functions;
- Resource enhancement: 10-94% vegetated; management for restoration and enhancement of natural attributes and functions;
- Multiple Use: 0-9% vegetated; management for their use and development in the context of water, town and environmental planning.

Geomorphic wetlands have been mapped for the Swan Coastal Plain. Geomorphic wetlands and their management categories in the South Capel locality are shown in Figure 6. A number of small wetlands are mapped in the eastern bushland of SC PartB. McCarley's Swamp (Conservation wetland) lies to the west of SC PartA. Large areas of Multiple Use wetlands occur on the western and southern sides (associated with Ludlow River) of the survey area.



**FIGURE 6. Geomorphic wetlands in the South Capel survey area locality.**



## 3 METHODS AND LIMITATIONS

### 3.1 Timing of the survey

This report draws on data collected in a field survey undertaken on parts of SC PartB in 2010 and 2011. This survey was centred on the former mineral processing area and containment facility of SC PartB. Site surveys were conducted on the following five occasions across one spring and two summer seasons: November 2010, 20<sup>th</sup> June, 6<sup>th</sup> July, 30<sup>th</sup> August and 28<sup>th</sup> October 2011.

A further comprehensive survey, which provided additional detail and extended the survey across a broader area was conducted between the 8th of October and the 15th of November 2012. Twelve of thirteen quadrats were recorded between the 8th and 17th of October, with the last quadrat, in South Capel Part A, recorded on the 6<sup>th</sup> November.

### 3.2 Flora survey

Initial field investigations were targeted at broadscale vegetation community analysis, identifying suitable habitat for declared rare flora, and opportunistic identification of flora or evidence thereof. Further detail was collected on subsequent visits.

#### 3.2.1 Compilation of a flora species list – general flora survey methods

The flora in the study area was surveyed while recording the vegetation description sites (quadrats, releves and mapping notes), while walking between the vegetation recording sites and when conducting general traverses through the study area.

At each 2012 quadrat site, all plant species present were recorded. At releve sites ('unbounded' sample sites), mapping note sites (abbreviated releves), and 2010/11 quadrat sites (covering disturbed areas of the historical processing site) dominant and subdominant species and some associated species were recorded. In the case of both quadrats, releves and mapping note sites, where a plant species was not well known, a specimen was collected and allocated a specimen number.

Plant species were recorded elsewhere in the study area if they had not been previously recorded or if they were of particular interest (ie. of potential conservation significance). Again, where a plant species was not well known, a specimen was collected and allocated a specimen number. GPS coordinates were recorded (using a Garmin 60CX hand held GPS unit, GDA94 datum) whenever it was considered there was a possibility that the plant species may be of special interest.

The specimens collected were pressed, dried 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 that occur on the Swan Coastal Plain.

The Department of Environment and Conservation Declared Rare and Priority Flora List (Smith, 2010; definitions in Appendix 1) and FloraBase (DEC website) were consulted as required, to confirm the status of plant species in the survey area.

### **3.2.2 Limitations of the flora survey**

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 in the survey area that were not recorded during this survey as they have only low abundance on the land, or were not flowering at the time of the survey.

Given the limitations of the flora survey, it is likely that this survey recorded more than 85% of the vascular flora in the survey area. That is, while the flora survey was relatively thorough, it was possible that some species occurring in the survey area were not recorded.

## **3.3 Vegetation survey**

### **3.3.1 Methods of the vegetation survey in remnant bushland**

Locations were selected for survey quadrats, releves and mapping notes that were representative of observed variations in the vegetation and habitat. Suitable sites for the more detailed 2012 quadrats were limited to sites in Good or better condition, where a good suite of species representative of that vegetation type were present.

Thirteen (13) 10 metre by 10 metre detailed quadrats (CSQ1-2 and CSBQ1-11) were marked out with a field measuring tape between fence dropper stakes driven into the ground at each corner, each fitted with a yellow plastic safety cap. The 10 metre by 10 metre quadrat dimensions were used firstly because a 100m<sup>2</sup> sample area on the Swan Coastal Plain is considered to be the minimum size to capture most species in a given plant community and secondly because that was the quadrat size used to collect data for the Gibson et al. (1994) Swan Coastal Plain study, with which the South Capel survey data set needed to be compatible for the purpose of analysis.

Each quadrat was photographed. A description of the quadrat location, the habitat, surface soil texture and colour were all recorded and the time since the site was last burnt was estimated. The vegetation structure was described using a modification of Specht's vegetation description table by Aplin (1979; Appendix 2). To obtain more representative data for the overstorey cover, the tree layer(s) cover was estimated over a larger area around the quadrats. The condition of vegetation in the quadrat was described using the Keighery classification outlined in Bush Forever (Department of Environmental Protection, 2000b; see Appendix 3). All plant species occurring in a

quadrat were recorded (except at degraded 2010/11 quadrat sites), along with their height, percentage cover and specimen number if collected.

Eight less detailed quadrats (NSAQ1-NSAQ8, recorded in degraded areas on the former processing site in 2010/11) were undertaken in a similar manner, however only dominant and sub-dominant species were recorded, as well as any species of potential conservation significance.

Twelve releves were also recorded in the remnant bushland to describe vegetation units. The composition of the releve descriptions was similar to that of the quadrats, but the area described was 'open' (not a measured 10m x 10m space) and the data recorded not as detailed. Twenty three mapping notes (quick abbreviated form of releves descriptions) were also recorded in the remnant bushland areas.

### 3.3.2 Methods of the survey of revegetation

#### 3.3.2.1 Description of revegetation in the survey area

The revegetation in the 2012 South Capel survey area (mostly in the SC PartA) was described using releves and mapping notes in a similar way to that outlined in the previous section. However, percentage cover of dominants was generally only recorded in those areas with recognisable structure.

The descriptions also varied in that 'vegetation condition' was not recorded using the Bush Forever 'vegetation condition' classification applied to the remnant native bushland stands, as it was not conceptually appropriate to apply this classification to revegetation stands. The Bush Forever 'vegetation condition' classification has been specifically designed for assessing remnant bushland condition, and its potential for restoration. Therefore an alternative 'revegetation assessment' was employed to allow a qualitative assessment of revegetation areas (see details below).

Non-endemic taxa recorded in the revegetation plantings were identified in the descriptions (prefix '\*\*'). Taxa that were endemic to the region, but may not have been endemic to the survey area prior to revegetation efforts, were treated as endemic in the descriptions (eg *Melaleuca cuticularis*, *Melaleuca lanceolata* and *Eucalyptus cornuta*). Eucalypts from eastern Australia which were used in the revegetation but did not appear frequently in revegetation stands and/or were difficult to sample due to height and difficulty accessing fruit, were simply referred to as \*\**Eucalyptus* sp. in the revegetation descriptions.

#### 3.3.2.2 Assessing revegetation 'values'

The 'revegetation assessment' used for this survey categorizes stands of revegetation into one of four classes, R1, R2, R3 and R4, in order of increasing 'value', using criteria based on the perceived natural values of the revegetation. These criteria were:

- Number of taxa and predominance of taxa endemic to the locality (the higher the number of endemic taxa, the higher the rating). This rating was applied because it was considered that the higher the number of endemic taxa in a

revegetation stand, the greater the chance that a higher number of taxa would regenerate (sustainability of the revegetation) and the lower the risk that a troublesome weed would be introduced into the locality.

- Revegetation structure (the more strata and the more taxa in each strata, the more complex the revegetation stand would be and consequently, the more varied the range of fauna/flora habitat available).
- Canopy cover, concentration of stems and percentage bare ground (canopy cover and concentration of stems would tend to be inversely related to percentage bare ground and directly related to soil stabilization and resistance to soil erosion).
- Weed cover (higher weed cover would normally be associated with greater competition with native taxa for resources).

Other factors considered included landform 'naturalness' and the presence of significant flora taxa (greater value placed on natural occurrences, rather than planted) and aesthetic amenity.

Revegetation assessments were a single classification made across multiple criteria. Therefore, one criteria could reduce the value of other criteria in arriving at the final assessment.

The classification of revegetation was designed to allow a comparative assessment of revegetation areas and may be useful in any future consideration of alternative works in the area. However, it must be recognised that this classification is based on a subjective assessment of the values of revegetation. Alternative assessments could be applied which consider, for example, plantation timber values, resulting in a very different rating across the revegetation stands. Alternative rating schemes could be applied using the vegetation descriptions, which are included in the Appendices.

### **3.3.3 Limitations of the survey of remnant vegetation and revegetation**

The cover estimate of each plant species recorded in the quadrats was based on estimating species projected 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.

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 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.

Revegetation assessments were very much a subjective process across multiple criteria. Two field botanists worked together for several days describing and assessing the revegetation to try and get a comparable treatment.

## 3.4 Vegetation and revegetation mapping

### 3.4.1 Methods for vegetation and revegetation mapping

Vegetation units in the remnant bushland were recorded generally between plant community and plant association level. Revegetation units were also recorded at a detailed level.

The vegetation and revegetation unit boundaries were drawn on a computer generated ortho-corrected aerial photograph at 1:5000 while traversing the study area, using GPS coordinate readings to locate actual boundary positions.

The remnant vegetation and revegetation mapping unit descriptions were based on the quadrat (remnant vegetation only), releve and mapping note descriptions. The vegetation descriptions recorded in the field were later synthesized into vegetation units. Results of the ordination analysis (see below), which analysed floristic similarity of survey quadrats, were also considered when synthesizing the remnant vegetation units.

The revegetation units were synthesized from the descriptions by giving particular consideration to the dominant taxa in stands and the landform and soils associated with the stands. Revegetation units were broad due to the great number of discrete revegetation stands in the survey area, the variation amongst the revegetation stands after, in some cases, more than forty years of maturation and the limited time available. Some revegetation 'types' were broad generic groupings, such as 'endemic: other'.

### 3.4.2 Wetland vegetation mapping

The identification and delineation of a wetland is dependent on the hydrology, hydric soils and wetland vegetation of an area (Hill et al., 1996). Obligate wetland species are considered reliable wetland indicators (Hill et al., 1996).

The remnant vegetation units recorded in the South Capel survey area were classified as wetland vegetation if a number of obligate wetland species were present in the units as dominants. Obligate wetland species were considered to be those that only occur in wetland sites and therefore appear to require wetland conditions for growth. Table 2 shows a list of plant species that were considered to be obligate wetland species after reference to the literature (Water and Rivers Commission, 1997) and from the botanists experience.

**Table 2. List of plant species from the South Capel survey area considered to be wetland species.**

Wetland Species	Notes <sup>a</sup>
<i>Astartea scoparia</i>	Found on damp, sandy soils near watercourses, swamps or seasonally wet depressions.
<i>Banksia littoralis</i> (Swamp banksia)	Frequently occurs in swampy areas, but is not tolerant of inundation and prefers areas with short winter waterlogging or very shallow water table.
<i>Cyathochaeta teretifolia</i>	
<i>Eucalyptus rudis</i> subsp. <i>rudis</i>	Flooded gum is common fringing winter-wet depressions, lakes and watercourses on the SCP. It can tolerate prolonged periods of flooding and usually found in waterlogged areas.
<i>Lepidosperma longitudinale</i>	Sandy and peaty soils in winter-wet depressions and along watercourses.
<i>Melaleuca lateritia</i>	Fringes watercourses and in seasonally wet depressions.
<i>Melaleuca preissiana</i>	In waterlogged soils fringing rivers and swamps. Less tolerant of prolonged inundation than <i>Melaleuca raphiophylla</i>
<i>Melaleuca raphiophylla</i>	Tolerates periodic inundation, but prefers waterlogged sites. Found near both fresh and saline water, but is less adapted for saline water conditions than Saltwater Paperbark.
<i>Melaleuca teretifolia</i>	Associated with lakes or in winter-wet depressions on the SCP (Marchant <i>et al.</i> , 1987)

<sup>a</sup>: Notes from Water and Rivers Commission publication (1997), unless otherwise indicated.

## 3.5 Floristic Community Types and ordination analysis of vegetation units

### 3.5.1 Introduction

The floristic analysis compared the similarity of species presence/absence data collected at the thirteen (13) 2012 quadrats and eight 2010/11 quadrats (with two of these, NSAQ11 and NSAQ12 sitting just outside the 2012 project area), with the data for 509 sites recorded across the Swan Coastal Plain in a broad survey by Gibson *et al.* (1994).

### 3.5.2 Data preparation

To conduct the analysis on the South Capel quadrat data, it was first necessary to reconcile the names used in that survey with those used in the Gibson *et al.* (1994) dataset. This was done by determining, for each taxa on the South Capel survey list, the equivalent taxa name applied in the Gibson *et al.* study. 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. 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). Weed species were included in the analysis.

### **3.5.3 Data compatibility**

The South Capel data, like the Gibson et al. (1994) data, was collected from quadrats of the same size (10 metres by 10 metres). However, the Gibson et al. (1994) quadrats were visited and recorded twice, including a Spring visit, compared to the single Spring recording for the 2012 South Capel survey sites. Weed species were included in both the Gibson et al. (1994) and South Capel datasets.

### **3.5.4 PATN analysis**

Mr Ted Griffin conducted the South Capel quadrat data analysis using numerical classification techniques (PATN) based on the similarity of the South Capel site floristics to the floristics of the SCP survey sites.

The details of the methods of the PATN analysis are set out in the report prepared by Mr Ted Griffin that is included in Appendix 8.

### **3.5.5 Limitations of the 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 that is added, the higher the level of disruption. This problem can make it difficult to assign the new sites to the Gibson et al. Floristic Community Types (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. Yet another limitation may arise if the sampled vegetation has been made species depauperate by past disturbance and high weed cover.

## **3.6 Identification of TECs and PECs.**

Once the South Capel quadrats were each assigned to a Floristic Community Type (FCT), a current table of FCTs on the Swan Coastal Plain and their Threatened Ecological Community (TEC) status (DEC website, 2012) was consulted to determine if any of the South Capel vegetation sites were TECs.

To determine if any of the South Capel FCTs were Priority Ecological Communities (PECs), a list of PECs was consulted (DEC website, 2012).

## 4 FLORA OF THE SOUTH CAPEL SURVEY AREA

### 4.1 Flora list for the survey area

Two hundred and ninety one (291) species of native flowering plants, one native fern, one native cycad (the Zamia Palm, *Macrozamia riedlei*) and one native conifer were recorded in the South Capel survey area. In addition, sixty nine (69) weed species and twenty four (24) revegetation species (plantings), native to Australia but not endemic to the South Capel area, were recorded. A list of species recorded in the South Capel survey area is presented in Appendix 4, with the area of record (SC PartA and/or SC PartB) indicated. The weed species listed for the South Capel survey area is comprehensive, but not exhaustive.

Non-endemic revegetation species were recorded predominantly in the SC PartA area (revegetation areas were not comprehensively surveyed in the SC PartB area as there were few mature plantings and revegetation areas were small in size). There are also likely to be numerous native species recorded in SC PartA area that are endemic to the locality, but were introduced to the survey area in revegetation plantings. These are not differentiated from other native species recorded in the survey area.

Of the total number of native flowering plant taxa recorded in the South Capel survey (291), 222 were recorded in SC PartB and 166 in SC PartA. The number of native taxa recorded in SC PartA, even though it is a much larger area (about 340 hectares), is larger than might have been expected, given that most of the area is revegetation after mining. Most of these native taxa have been recorded from the small areas of remnant vegetation (including regrowth areas). Numerous others are endemic to the South Capel area, but were probably introduced in revegetation (in revegetation habitat that wouldn't have been in the surveyed area previously, such as the numerous water bodies and their banks – see the list of Cyperaceae species).

**Table 3. Summary of taxa numbers recorded in SC PartA and SC PartB.**

Plant Group	Area	Native	Weed	Reveg Planting
Ferns:	SC PartA	1		
	SC PartB	1		
Cycads:	SC PartA	1		
	SC PartB	1		
Conifers:	SC PartA	1	1	1
	SC PartB			
Flowering Plants: (Angiosperms)	SC PartA	166	41	24
	SC PartB	222	52	0
	A & B	291	69	24



The flowering plant families that were well represented by native species in the total South Capel survey area were the:

- Myrtaceae (eucalypt family) with forty two (48) native species;
- Fabaceae (pea and *Acacia* family) with thirty (34) native species (including 11 *Acacia* species);
- Orchidaceae with twenty six (31) native species
- Proteaceae (Banksia family) with fourteen (15) native species;
- Cyperaceae (sedge family) with fourteen (15) native species;
- Asteraceae (daisy family) with thirteen (13) native species.

The 222 native species recorded in the SC PartB survey area, predominantly in the eastern bushland, was probably a moderate number for the size of that area. There were signs of past disturbance (especially grazing), even in some of the better remnant vegetation of the area, although open understory may just be typical of Banksia woodland vegetation in this habitat. The number of species recorded in the SC PartB area 2012 (eastern bushland) quadrats was reasonable (Table 4), but lower than mean species richness in most of the Gibson *et al.* (1994) Banksia woodland Floristic Community Types occurring in the region (FCTs 21a, 21b, 21c and 23a with mean species richness and mean weed frequency of 54.6 (4.2), 61.3 1.7), 40.5 (3.6) and 62.8 (5.2) respectively).

**Table 4. Numbers of taxa recorded in South Capel survey area detailed quadrats.**

Quadrat	Area	Number of taxa			Vegetation Type
		Natives	Weeds	Total	
CSQ1	SC PartA	18	12	30	<i>M. preissiana</i> wetland (MpKg)
CSQ2	SC PartA	18	12	30	<i>M. raphiophylla</i> wetland (Mr)
CSBQ1	SC PartB	31	10	41	Jarrah-Banksia woodland (EmBaAf)
CSBQ2	SC PartB	11	4	15	<i>M. preissiana</i> wetland (MpKg)
CSBQ3	SC PartB	34	9	43	Banksia lowland woodland (BaBiKg)
CSBQ4	SC PartB	33	3	36	<i>M. preissiana</i> wetland (MpKg)
CSBQ5	SC PartB	10	3	13	<i>M. raphiophylla</i> wetland (Mr)
CSBQ6	SC PartB	24	3	27	<i>M. preissiana</i> wetland (MpKg)
CSBQ7	SC PartB	43	10	53	Jarrah-Banksia woodland (EmBa)
CSBQ8	SC PartB	34	2	36	Jarrah-Banksia lowland woodland (Em)
CSBQ9	SC PartB	34	9	43	Banksia lowland woodland (BaBiKg)
CSBQ10	SC PartB	38	5	43	Jarrah-Banksia woodland (EmBa)
CSBQ11	SC PartB	37	6	43	<i>M. preissiana</i> wetland (MpKg) (transtnl)

## 4.2 Significant flora recorded in the survey area

### 4.2.1 Threatened Flora (also known as Declared Rare Flora) recorded in the survey area

One Threatened flora taxon, *Drakaea elastica*, was recorded in the South Capel survey area (Appendix 5).

*Drakaea elastica* (Glossy-leaved Hammer orchid) grows to about 30cm high in deep sand in Banksia woodland (Brown *et al.*, 2008). It is usually found in low-lying areas adjoining winter-wet swamps (Hoffman and Brown, 1998). It has been found between Cataby and Ruabon (south of Capel and about 6 km south of the survey area). It is distinguished by its shiny, light-green heart shaped leaf (Plate 1) and flower with a prominently hairy upper section to its labellum (Plate 2).

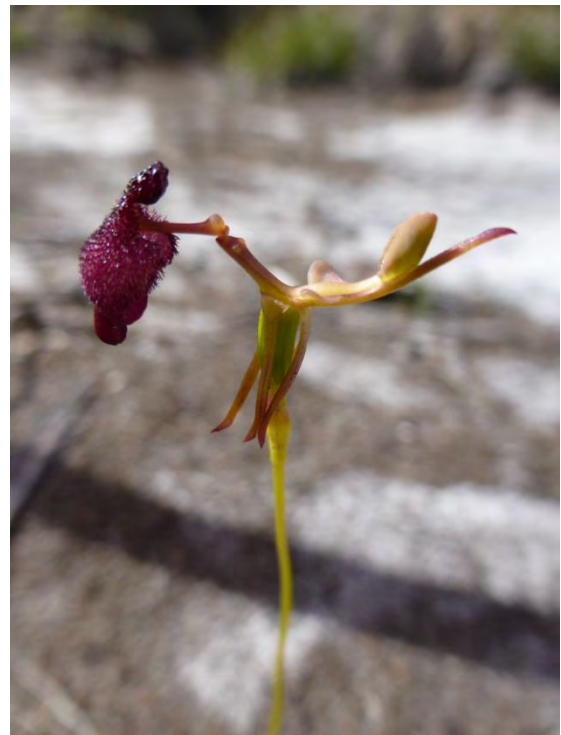
*Drakaea elastica* was found in remnant bushland in the eastern portion of the survey area in three main areas (Appendix 5, Figure 7a). There were no previous recordings in these areas (Figure 5), although there was one previous record from this eastern bushland, further north of the stands reported here. The 3 main *Drakaea elastica* stands were: around quadrat CSBQ11 in the southern part of SC PartB; along the sand track near quadrat CSBQ4 (edge of *Melaleuca preissiana* dampland area); and on the low sandy rise between the two. The common Hammer orchid, *Drakaea glyptodon*, was widespread in the same habitats (Plates 3 and 4). Where the sand track near quadrat CSBQ4 extends beyond the fenceline and into the somewhat more disturbed area to the west, this is also considered likely *Drakaea elastica* habitat.



Plate 1. The distinguishing shiny green basal leaf of *Drakaea elastica* (T).



Plate 2. The hairy upper section of the *Drakaea elastica* labellum.



Plates 3 and 4. *Drakaea glyptodon* (King-in-his-carriage Hammer orchid) in the South Capel survey area.

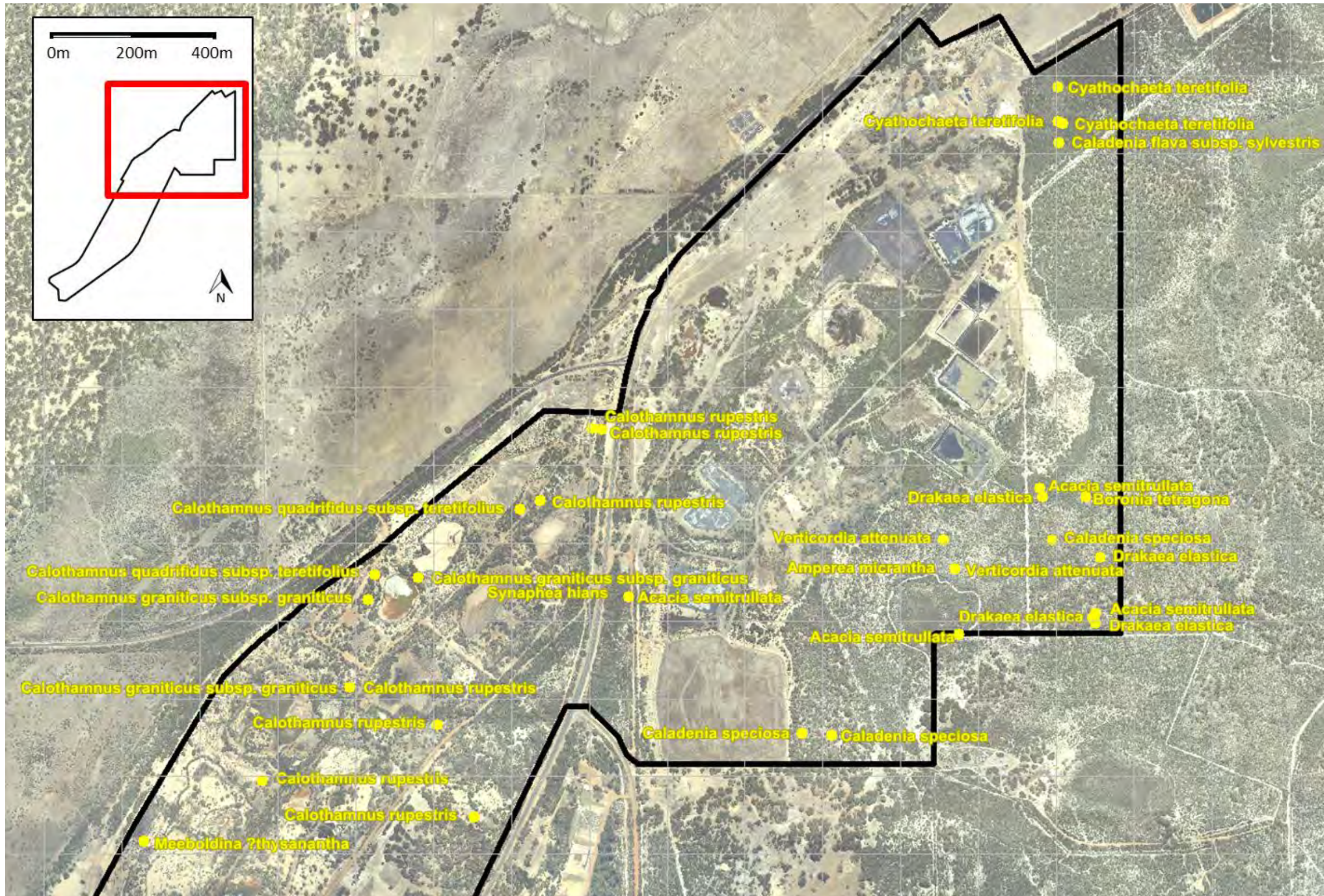


FIGURE 7a. Rare and Priority flora recorded during the survey (Survey area: North)

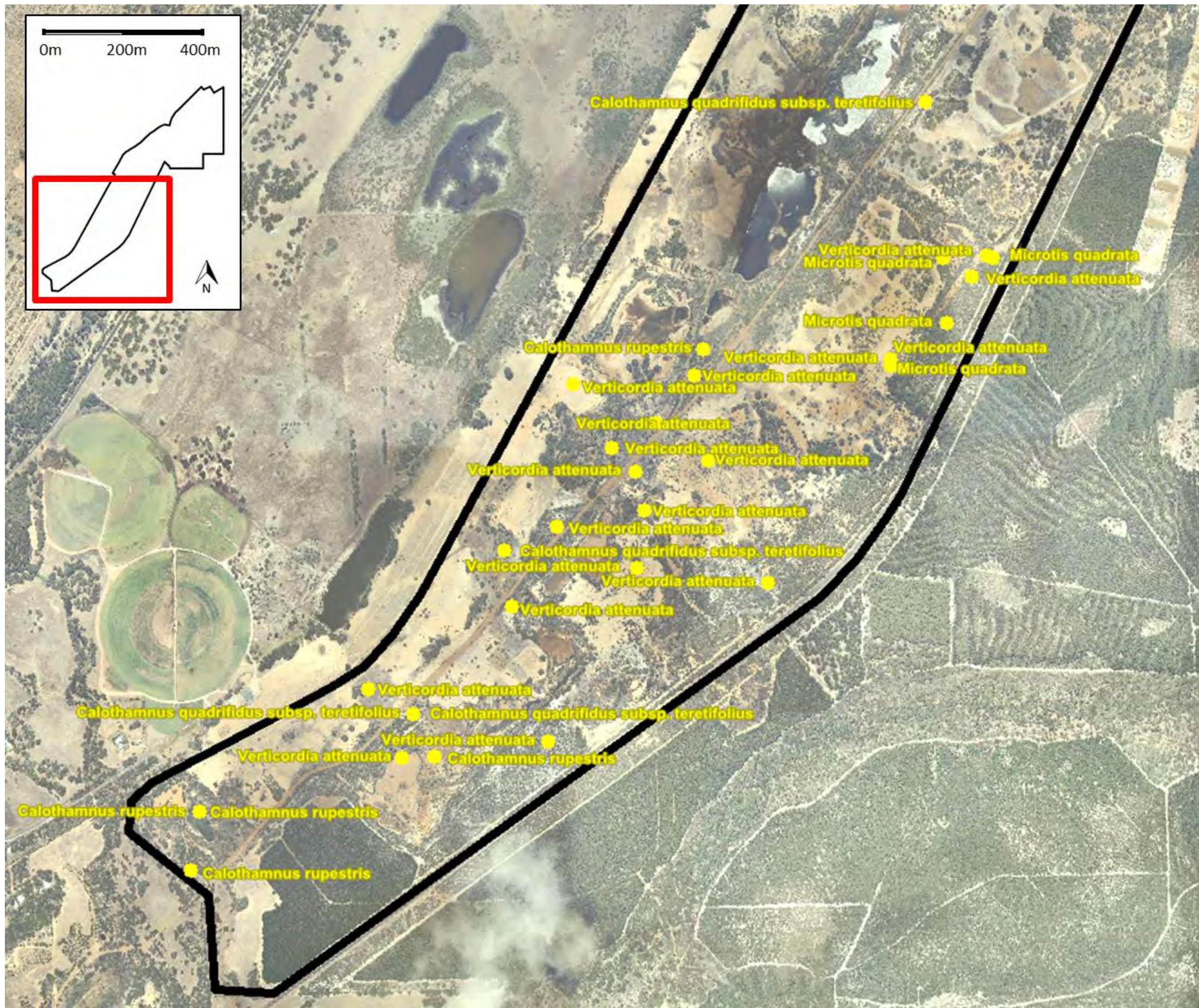


FIGURE 7b. Rare and Priority flora recorded during the survey (Survey area: South)

#### 4.2.2 Previously unknown taxa

Specimens were collected of three taxa of particular interest, with at least one of these (*Stylidium* sp.) likely to represent a new taxon. These species should be afforded some interim level of protection pending confirmation as new taxa or otherwise. These are discussed further in Section 4.4.

#### 4.2.3 Priority flora species recorded from the survey area

Thirteen Priority species were recorded in the South Capel survey area: *Amperea micrantha* (P2), *Boronia tetragona* (P3), *Cyathochaeta teretifolia* (P3), *Jacksonia gracillima* (P3), *Meeboldina thysanantha* (P3), *Synaphia hians* (P3), *Verticordia attenuata* (P3), *Acacia semitrullata* (P4), *Caladenia speciosa* (P4), *Calothamnus graniticus* subsp. *graniticus* (P4), *Calothamnus quadrifidus* subsp. *teretifolius* (P4), *Calothamnus rupestris* (P4) and *Microtis quadrata* (P4) (Figure 7; Appendix 5).

##### 4.2.3.1 *Amperea micrantha* (Priority 2)

*Amperea micrantha* is a small shrub that has clustered linear leaves and grows to 20 cm high (Wheeler *et al.*, 2002). It has mostly been recorded in the area between Capel and Margaret River, with a record also west of York.

It was recorded at one location in the eastern bushland of SC PartB survey area at quadrat CSBQ6 (Figure 7a; Appendix 5). It was in an area of *Melaleuca preissiana* seasonal dampland.

##### 4.2.3.2 *Boronia tetragona* (Priority 3)

*Boronia tetragona* is a perennial herb to 70cm that has pink to red flowers between October and December (Wheeler *et al.*, 2002). It is found in woodland on winter-wet flats between Bunbury and the Whicher Ranges (DEC FloraBase website, 2013). It is similar to *Boronia fastigiata* (also recorded in the survey area), but is differentiated by 4-angled young branchlets (Wheeler *et al.*, 2002).

*Boronia tetragona* was recorded from one location in the eastern bushland of SC PartB area at releve site CBR4, on the margins of *Melaleuca preissiana* seasonal dampland (Figure 7a; Appendix 5).

##### 4.2.3.3 *Cyathochaeta teretifolia* (Priority 3)

*Cyathochaeta teretifolia* is a “rhizomatous, clumped, robust perennial, sedge” that grows to 2 metres high (Paczkowska and Chapman, 2000). It has been recorded growing on sand and sandy clay in swamps and along creek edges.

*Cyathochaeta teretifolia* was recorded in the north-east corner of the survey area (Figure 7a; Appendix 5). Scattered plants were recorded in the ‘Degraded’ *Eucalyptus rudis*-*Melaleuca raphiophylla* low open forest dampland at site CBR1.

Areas of *Cyathochaeta teretifolia* sedgeland were recorded in the neighbouring *Melaleuca preissiana* low closed forest at CBR2 (Plate 5).



**Plate 5. *Cyathochaeta teretifolia* sedgeland under *Melaleuca preissiana* low closed forest at releve site CBR2.**

#### 4.2.3.4 *Jacksonia gracillima* (Priority 3)

*Jacksonia gracillima* is a low, spreading, compact shrub that has only recently been described (Plate 6; Chappill *et. al.*, 2007). It is a pea that flowers around October to November, with yellow-orange-red flowers. It occurs in shrublands on the edges of winter wet swamps. It is similar to *Jacksonia sericea* and *Jacksonia furcellata*. It differs from *Jacksonia sericea* by having a more upright habit and in the numerous pungent lateral branchlets and more swampy habitat and it differs from *Jacksonia furcellata* in generally being a low shrub less than 50 centimetres. It occurs in a 2-area distribution between Perth and Busselton, with the southern area lying between Bunbury and Busselton.

*Jacksonia gracillima* was collected at one location in the eastern bushland of SC PartB, near CSBQ3 (Appendix 5).



**Plate 6. *Jacksonia gracillima* (Priority 3). (Photograph sourced from the DEC FloraBase website, 2013).**

#### 4.2.3.5 *Meeboldina ?thysanantha* ms (Priority 3)

*Meeboldina thysanantha* ms is a rhizomatous, perennial rush that grows 0.4–1 m high (Paczkowska and Chapman, 2000). It produces brown flowers in December and is found growing on sand in swamps. It ranges from the Darling Range east of Bunbury south to the coast between Augusta and Walpole.

*Meeboldina ?thysanantha* ms was collected in an area of *Melaleuca raphiophylla* wetland on the western edge of the SC PartA survey area in what was thought to have been a small area of remnant vegetation. There was some degree of uncertainty with the identification of the specimen.

#### 4.2.3.6 *Synaphia hians* (Priority 3)

*Synaphia hians* is a prostrate to decumbent shrub that grows to 15 cm to 60 cm high on sandy soils (Plate 7). It occurs from Capel to Busselton and east to West Arthur (FloraBase, DEC website, 2013).

*Synaphia hians* was recorded at one location in the remnant vegetation between Bussell Highway and the former processing area, at site CBM15 in SC PartB (Figure 7a; Appendix 5).





**Plate 7. *Synaphea hians* (Priority 3). (Photograph sourced from the DEC FloraBase website, 2013).**

#### 4.2.3.7 *Verticordia attenuata* (Priority 3)

*Verticordia attenuata* is a shrub that grows to between 40 cm and 100 cm and has pink flowers in between December and May (Paczkowska and Chapman, 2000). It grows in white or grey sand in winter wet depressions between Harvey and Busselton (FloraBase, DEC website, 2013).

*Verticordia attenuata* was recorded on the *Melaleuca preissiana* seasonal dampland at sites CBM4 and CSBQ6 in the south-east corner of SC PartB (Figure 7a, Appendix 5). It was also observed to be widely distributed in the revegetation areas of SC PartA and was recorded there at 19 locations.

#### 4.2.3.8 *Acacia semitrullata* (Priority 4)

*Acacia semitrullata* is a slender, erect and pungent shrub, growing to between approximately 20 cm and 70 cm (150 cm) (Plate 8; Paczkowska and Chapman, 2000). It has densely hairy flower stalks and narrow phyllodes. It has been recorded between Mandurah and Margaret River and as far east as Collie (FloraBase, DEC website, 2013).

It was recorded from four main areas in SC PartB (Figure 7a; Appendix 5):

- CSBQ4 on the edge of *Melaleuca preissiana* seasonal damplands, central-eastern edge of SC PartB;

- CSBQ11 on the edge of a *Melaleuca preissiana* seasonal dampland, south-eastern corner of SC PartB;
- near releve site CBR9 on the edge of *Melaleuca preissiana* seasonal dampland close to the southern boundary of the survey area; and
- in the remnant vegetation between Bussell Highway and the former processing site at site CBM15.



**Plate 8. *Acacia semitrullata* (P3).** (Photograph sourced from the DEC FloraBase website, 2013).

#### 4.2.3.9 *Caladenia speciosa* (Priority 4)

*Caladenia speciosa* (Sandplain White Spider Orchid) grows to 80cm high with one to three flowers up to 15cm across (Brown *et al.*, 2008; Plate 9). It grows in sandy *Banksia*-Jarrah woodland on the Swan Coastal Plain as far south as Busselton. It is similar to the common spider orchid *C. longicauda*, but is distinguished from that species by its pink tinged flowers and prominently fringed labellum (Brown *et al.*, 2008).

*Caladenia speciosa* was recorded at three locations: in Jarrah-*Banksia attenuata* woodland near the south-eastern corner of SC PartB, and two sites near the central southern boundary of the SC PartB survey area near quadrat CSBQ7 (Figure 7a, Appendix 5).



Plate 9. *Caladenia speciosa* (P4). (Photograph sourced from the DEC FloraBase website, 2013).

#### 4.2.3.10 *Calothamnus graniticus* subsp. *graniticus* (Priority 4)

*Calothamnus graniticus* subsp. *graniticus* is an erect shrub that grows to about 200 cm high with long needle-like leaves (Wheeler *et al.*, 2002). It grows on granitic soil in coastal heath and is endemic to the Cape Naturaliste area and has therefore been treated as non-endemic in the South Capel survey area.

*Calothamnus graniticus* subsp. *graniticus* was recorded at three sites in the SC PartA revegetation areas (Figure 7b; Appendix 5). It was one of numerous *Calothamnus* spp. used in the revegetation and is likely to have been used more widely than the 3 records suggest.

#### 4.2.3.11 *Calothamnus quadrifidus* subsp. *teretifolius* (Priority 4)

*Calothamnus quadrifidus* subsp. *teretifolius* is a shrub to 5 metres tall with terete, glabrous leaves (George and Gibson, 2010). It is a newly described taxa resulting from a new treatment of *Calothamnus quadrifidus* by George and Gibson (2010). Glabrous leaves and glabrous hypanthium distinguish it from *Calothamnus quadrifidus* subsp. *quadrifidus*. It occurs between Capel and Nannup.

*Calothamnus quadrifidus* subsp. *teretifolius* was recorded at six locations in the SC PartA revegetation areas (Figure 7b; Appendix 5). It was one of numerous *Calothamnus* spp. used in the revegetation and may have been used more widely than the 6 records suggest.

#### 4.2.3.12 **\*\**Calothamnus rupestris*** (Priority 4)

**\*\**Calothamnus rupestris*** is an erect, compact or spreading shrub that grows 90 cm to 400 cm high and has red flowers between July and December (Plate 10; Paczkowska and Chapman, 2000). It has been recorded on gravelly soils along watercourses and associated with granite outcrops in the Darling Ranges (Marchant *et al.*, 1987) and has been treated as non-endemic in the South Capel survey area.

**\*\**Calothamnus rupestris*** was recorded at 12 locations in the SC PartA revegetation areas (Figure 7b; Appendix 5). It is similar to **\*\**Calothamnus graniticus*** subsp. *graniticus*, but is differentiated by its shorter, pungent leaves, hairy calyx tube and shorter petals. It was one of numerous *Calothamnus* spp. used in the revegetation.



**Plate 10. **\*\**Calothamnus rupestris*** (Priority 4). (Photograph sourced from the DEC FloraBase website, 2013).**

#### 4.2.3.13 ***Microtis quadrata*** (Priority 4)

***Microtis quadrata*** (South coast Mignonette orchid; formerly *M. media* subsp. *quadrata*), grows to about 60 cm high with greenish flowers (Plate11; Brown *et al.*, 2008). It has been recorded between Perth and Albany (DEC FloraBase website, 2013).

***Microtis quadrata*** was recorded at five locations in the SC PartA survey area, one in regrowth vegetation near CSQ1 near the central eastern boundary of SC PartA and the other four in revegetation areas nearby (Figure 7b, Appendix 5). Specimens collected in the SC PartA area represent records from a new locality for this taxa and will be lodged with the Western Australian Herbarium.



Plate 11. *Microtis quadrata* (Priority 4). (Photograph sourced from the DEC FloraBase website, 2013).

### 4.3 Other taxa of Regional Significance recorded in the survey area

Two other taxa, *Caladenia flava* subsp. *sylvestris* and *Beaufortia sparsa*, were not listed as Threatened or Priority Flora, but were considered to be of Regional Significance because they were at the northern end of their ranges.

#### 4.3.1 *Caladenia flava* subsp. *sylvestris*

*Caladenia flava* subsp. *sylvestris* is distinguished from the other subspecies by their pale creamy yellow and white coloration and elongated petals and sepals (Plate 12; Brown *et al.*, 2008). The specimen was collected on the edge of a *Melaleuca preissiana* low woodland in transitional vegetation, in the eastern bushland corridor in the north-east corner of the SC PartB survey area (Figure 7a; Appendix 5). It was a white flowered form.



Plate 12. *Caladenia flava* subsp. *sylvestris* (yellow flowered form). (Photograph sourced from the DEC FloraBase website, 2013).

#### 4.3.2 *Beaufortia sparsa*

*Beaufortia sparsa* is a tall shrub that was growing to 400 cm (Plate 13). It has red-orange flowers and has been recorded from swampy areas and river banks.

It was recorded at two sites in the eastern bushland corridor of the SC PartB area, near releve site CBR2. It was growing with *Melaleuca preissiana* woodland.



*Beaufortia sparsa*

Photos: M.Seale, J.F. Smith, & WA Herbarium

**Plate 13. *Beaufortia sparsa*. (Photograph sourced from the DEC FloraBase website, 2013).**

#### 4.4 Other species of interest recorded in the survey area

*Stylidium* sp. was a basal rosetted *Stylidium* (Trigger plant) with broad, rounded, spatulate glaucous leaves with a distinct petiole. The leaf surface was covered with 'obovate' hairs. The specimen was sterile, but differed from *S. pycnostachyum* (which has long acuminate basal leaves with slender linear hairs mostly on the margins and central vein) and differed from *S. carnosum* (which has glabrous leaves). It is likely to be a new taxon (Allen Lowrie, *pers. comm.*) and is being further investigated by Mr Allen Lowrie. It was collected at quadrat CSBQ11 in the south-east corner of the SC PartB eastern bushland.

A number of *Lepidosperma* spp. were collected in regrowth areas in SC PartA which were of interest. Two specimens of *Lepidosperma* ?aff. *calcicola* collected at releve site CAR1 were sterile, but considered to potentially be a new taxon (Dr Russell Barrett, *pers. comm.*). Another taxon, *Lepidosperma* sp., collected at mapping note site CAM17 in regrowth Marri woodland was also of interest and further collections were requested (Dr Russell Barrett, *pers. comm.*).

*Drosera* aff. *micrantha* was recorded in Jarrah-*Banksia attenuata* woodland at quadrat CSBQ7 in the SC PartB survey area. Whereas the upper stem and inflorescence of *Drosera micrantha* is glandular-hairy, *Drosera* aff. *micrantha* is glandular-hairy along the entire length of the stem (Allen Lowrie, *pers. comm.*). *Drosera* aff. *micrantha* was previously known from as far south as Yarloop and the Capel specimens represent a range extension (Allen Lowrie, *pers. comm.*).

*Caladenia attingens* subsp. *atingens* (Plate 14) was collected at numerous locations in SC PartA, in the bushland between Bussell Hwy and former processing area in SC PartB and in the north-east corner of the SC PartB survey area (Plate 14; Figure 7a; Appendix 5). These records are near the northern extent of its main range (Bunbury).



**Plate 14.** *Caladenia attingens* subsp. *atingens*.

#### 4.5 Weeds recorded in the survey area

Weed taxa recorded were given the prefix '\*'. Of the sixty nine (69) weed species recorded from the survey area, four (4) were listed as Declared weeds (Agricultural Protection Board, 2011). These were:

- \**Asparagus asparagoides* (Bridle creeper): recorded at one site in SC PartB ('Degraded' Marri woodland site CBR8). Recorded at many revegetation sites in SC PartA.
- \**Echium plantagineum* (Paterson's Curse): Recorded at two revegetation sites in area SC PartA (sites CAM4 and CAM47).
- \**Moraea flaccida* (Cape Tulip (formerly *Homeria flaccida*)): Recorded at one location in SC PartB, at quadrat CSBQ7.



- *Zantedeschia aethiopica* (Arum lily): Common in revegetation sites throughout SC PartA and also in SC PartB, especially in degraded damplands.

**\*\**Acacia pynantha***, which has been used in the revegetation mix in some areas, has become a weed in other revegetation areas and in some remnant vegetation areas of CS PartA. It appears to be a significant weed species in the area.

Other notable weed species included:

1. *Acacia longifolia* subsp. *longifolia*: Recorded in five quadrats in SC PartB and in several locations in the SC PartB bushland between the Bussell Hwy and the former processing area. Recorded at numerous locations in revegetation areas in CS PartA.
2. *Leptospermum laevigatum* (Victorian tea-tree): recorded at a few locations in SC PartA; potentially invasive in bushland.
3. *Acacia iteaphylla* (Flinders Range Wattle): recorded at four locations in SC PartB and one site in SC PartA; potentially invasive in bushland.

## 5 VEGETATION OF THE SURVEY AREA

### 5.1 Remnant vegetation

#### 5.1.1 Remnant vegetation description

##### 5.1.1.1 Introduction to the remnant vegetation descriptions

The vegetation units described are considered to be mostly described at the vegetation association level.

The vegetation unit codes that discriminate the mapped remnant vegetation units are derived from the generic and species names of the more abundant genera or species in the different strata present in each unit (see Table 5). For example, the vegetation unit 'CcEm' has its code derived from two of the dominant upper strata species in that unit: 'Cc' (*Corymbia calophylla*) and 'Em' (*Eucalyptus marginata* subsp. *marginata*).

**Table 5. Abbreviations for species names that were used in vegetation unit codes.**

Code	Species name	Code	Species name
Af	<i>Agonis flexuosa</i>	Em	<i>Eucalyptus marginata</i> subsp. <i>marginata</i>
Ba	<i>Banksia attenuata</i>		
Bi	<i>Banksia ilicifolia</i>	Kg	<i>Kunzea glabrescens</i>
Cc	<i>Corymbia calophylla</i>	Mp	<i>Melaleuca preissiana</i>
Er	<i>Eucalyptus rudis</i> subsp. <i>rudis</i>	Mr	<i>Melaleuca raphiophylla</i>

##### 5.1.1.2 Remnant vegetation of the South Capel survey area

Eleven vegetation units were described and mapped in the remnant bushland in the South Capel survey area (Figure 8a-e). These were organised into the following three broad vegetation groupings:

- Vegetation on low sandy rises;
- Wetland (seasonal dampland) vegetation;
- Vegetation on lowlying areas at the base of low rises and typically adjacent to damplands.

*Eucalyptus marginata* subsp. *marginata* (Jarrah)- *Banksia attenuata* woodland was the main vegetation type on the low rises, with *Agonis flexuosa* (Peppermint) part of the woodland in the north-east part of SC Part B. *Corymbia calophylla* (Marri) woodland occurred in small areas on the lower slopes or at the base of the low rises.

*Melaleuca preissiana* woodlands (*Melaleuca preissiana* low closed forest and *Melaleuca preissiana* low open woodland over *Kunzea glabrescens* scrub) was the most common remnant vegetation in the survey area damplands. *Melaleuca raphiophylla* low woodland also occurred in a dampland area in SC PartB and in a small dampland remnant in SC PartA. A small area of 'Degraded' *Eucalyptus rudis* subsp. *rudis* (Flooded Gum)-*Melaleuca raphiophylla* woodland occurred in the north-eastern corner of SC PartB.

*Banksia attenuata*-*Banksia ilicifolia* woodland typically fringed dampland areas. Areas of scattered *Eucalyptus marginata* subsp. *marginata* (Jarrah), sometimes with scattered *Banksia ilicifolia* over *Kunzea glabrescens* shrublands, also occurred in some lowland areas adjacent to damplands. Some areas of *Kunzea glabrescens* scrub were also recorded. This was in areas where there appeared to have been a greater amount of disturbance.

Only small areas of remnant vegetation were recorded in SC PartA survey area, mostly in the south-eastern parts on old \**Pinus pinaster* plantation sites that had been cut an estimated 15 to 20 years ago and left to become stands of regrowth bushland.

A large portion of SC PartB, covering the former processing area is substantially altered. Though there are some pockets where the vegetation communities that pre-existed prior to mining operations are regenerating in some form, for the most part, the structure is too substantially altered to be recognisable as a vegetation community. This area has been subject to informal walk throughs and opportunistic assessment to determine the likelihood of priority or threatened flora being present. Some of the species present are locally indigenous, while others are Western Australian and Australian native plants. As the planting or natural regeneration processes are insufficient to offer any semblance of the previous plant community these areas have not been mapped as vegetation communities.

Stands of regenerating bushland recorded at NSAQ1, NSAQ2 and NSAQ4 have been attributed to a vegetation community, however this should be considered indicative only, as they lack sufficient structure to be properly assessed as a vegetation community.

Details of the quadrat, releve and mapping note vegetation sample sites referred to in the following section can be found in Appendices 6 and 7.

### **(i) Vegetation of the low sandy rises**

**Cc**

*Corymbia calophylla* (Marri) open to closed forest over *Kunzea glabrescens* scattered tall shrubs over *Xanthorrhoea preissii* scattered shrubs

Habitat and soil: Swales and base of low rises. Grey sand.

Notes: This vegetation covered only small parts of the survey area. A small remnant of this vegetation was recorded at releve CBR8 in the southern part of SC PartB (Plate 15; Figure 8b) and several small remnant/regrowth areas were described in

SC PartA at mapping note sites CAM13 (regrowth in a cut pine plantation; Plate 16), CAM16, CAM17, CAM33 and CAM43 (Figures 8c, d, e). While most of these stands had a very open understory (CBR8, CAM13, CAM33 and CAM43), regrowth bush at CAM17 had a low shrubland understory in parts.



**Plate 15. Unit 'Cc' at releve site CBR8 in SC PartB.**



**Plate 16. Unit 'Cc' at mapping note site CAM13 in SC PartA.**

#### **CcEm**

*Corymbia calophylla* (Marri), *Eucalyptus marginata* subsp. *marginata* (Jarrah) woodland to open forest over *Kunzea glabrescens* high open shrubland over *Hibbertia hypericoides* scattered low shrubs

Habitat and soil: Gentle slope of low rise on plain. Grey sand (over yellow sand).

Notes: This vegetation was recorded in a small area of remnant in SC PartA at releve CAR1 (Plate 17; Figure 8d) and in a linear area along the base of a low rise in SC PartB at mapping note site CBM7 (Plate 18; Figure 8b).



**Plate 17. Vegetation unit 'CcEm' at releve site CAR1 (SC PartA).**



**Plate 18. Vegetation unit 'CcEm' at mapping note site CBM7 (SC PartB).**

## EmBa

*Eucalyptus marginata* subsp. *marginata* (Jarrah) woodland over *Banksia attenuata* low woodland over *Kunzea glabrescens* high open shrubland over *Hibbertia hypericoides* low shrubland.

Habitat and soil: Crest and slopes of low rise (dune) on plain. Grey-brown sand over yellow sand (from ant mounds).

Notes: This vegetation was recorded at quadrats CSBQ7 (Plate 20) and CSBQ10 (Plate 19) and at releves CBR6, CBR7 and CBR11. It covered a large part of the low rises in the southern and western parts of SC PartB (Figure 8b). *Banksia grandis* was associated with this unit and *Agonis flexuosus* (Peppermint) was generally absent. A small area of *Banksia attenuata* low woodland (no *Eucalyptus marginata* subsp. *marginata* in the area) occurred on the slopes north of CSBQ10, but was mapped as 'EmBa' because it didn't cover a sufficiently large area to confirm that it wasn't simply a small area of variation within the unit.



Plate 19. Vegetation unit 'EmBa' at quadrat CSBQ7 (SC PartB).



**Plate 20. Vegetation unit 'EmBa' at quadrat CSBQ10 (SC PartB).**

**EmBaAf**

*Eucalyptus marginata* subsp. *marginata* (Jarrah) open woodland over *Banksia attenuata*, *Agonis flexuosa* (Peppermint) low open forest over *Calytrix fraseri* open shrubland over *Hibbertia hypericoides* low shrubland.

Habitat and soil: Gentle, north facing, mid slope of low dune. Yellow-brown sand over yellow sand (note ant mounds).

Notes: This vegetation was recorded at quadrat CSBQ1 (Plate 21) and at releve CBR3 and covered a broad low rise in the north-eastern part of SC PartB (Figure 8a). It differed from the other common low rise unit, 'Em', by the presence of *Agonis flexuosa* (Peppermint) as a subdominant species.





**Plate 21. Vegetation unit 'EmBaAf' at quadrat CSBQ1 (SC PartB).**

## **(ii) Wetland (seasonal dampland) vegetation**

### **ErMr**

*Eucalyptus rudis* subsp. *rudis* scattered trees over *Melaleuca raphiophylla* low open forest over \**Arctotheca calendula* (Capeweed), \**Zantedeschia aethiopica* (Arum lily), \**Sonchus asper*, \**Cotula turbinata*, \**Cerastium glomeratum*, \**Ehrharta longiflora*, \**Galium murale* closed herbland/grassland of weeds.

Habitat and soil: Dampland on flat plain. Grey sand.

Notes: This vegetation was recorded at releve CBR1 (Plate 22). It only occurred at the northern end of SC PartB (Figure 8a) and was 'Degraded', with high weed cover.



**Plate 22. Vegetation unit 'ErMr' at releve site CBR1 (SC PartB).**

### **Mp**

*Melaleuca preissiana* low closed forest over *Kunzea glabrescens* scattered tall shrubs over *Astartea scoparia* open shrubland over an open sedgeland.

Habitat and soil: Seasonal dampland flat on plain. Grey sand.

Notes: This vegetation was recorded at relevés CBR9 (Plate 23) and CBR2 (with some *Agonis flexuosa* – transitional dryland species) (Plate 24) in SC PartB (Figures 8a and b). It was also described at two other degraded sites, mapping note sites CBM8 and CBM12, within the SC PartB Iluka land (Figure 8b). Stands of regenerating bushland on the historical processing site at NSAQ1,

NSAQ2 and NSAQ4 have been nominally ascribed to this group, though they are too substantially altered to be certain of the likely former vegetation complex of these areas.



**Plate 23. Vegetation unit 'Mp' at releve site CBR9 (SC PartB).**



**Plate 24. Vegetation unit 'Mp' at releve site CBR2 (SC PartB).**

## MpKg

*Melaleuca preissiana* low open woodland over *Kunzea glabrescens* closed scrub.

Habitat and soil: Flat (dampland) on plain. Grey sand (0-15cm).

Notes: This vegetation was recorded at quadrats CSBQ2, CSBQ4, CSBQ6 and CSBQ11 in SC PartB (Plates 25-27) and CSQ1 (Plate 28) in SC PartA (regrowth in a cut former pine plantation). It was also recorded at releve CSBR4 (SC PartB) and mapping notes CBM3, CBM4 and CBM13 (SC PartB) and CAM28 (SC PartA). 'MpKg' was a widespread wetland unit in the survey area and was characterized by a low cover of *Melaleuca preissiana* (mostly scattered) and a high cover of *Kunzea glabrescens*. Some sites had an *Astartea scoparia* open shrubland (CSBQ2) while drier sites had shrubs such as *Melaleuca thymoides* and *Hypocalymma angustifolium* with *Dasyogon bromeliifolius* open herbland (CSBQ4). Quadrat CSBQ6 represents an area of variation of this unit, with a high cover of *Verticordia attenuata*. Quadrat CSBQ11 appears to be more transitional, with more dryland species.



Plate 25. Vegetation unit 'MpKg' at quadrat CSBQ4 (SC PartB).



**Plate 26. Vegetation unit 'MpKg' at quadrat CSBQ6 (SC PartB).**



**Plate 27. Vegetation unit 'MpKg' at quadrat CSBQ11 (SC PartB).**



**Plate 28. Vegetation unit 'MpKg' at quadrat CSQ1 (SC PartA).**

**Mr**

*Melaleuca raphiopylla* low open forest over *Astartea scoparia*, (*Melaleuca teretifolia*) shrubland over open sedgeland.

Habitat and soil: Broad, shallow depression on plain. Grey sand.

Notes: This vegetation was described at quadrats CSQ2 in SC PartA (Plate 29) and CSBQ5 in SC PartB (Plate 30) (Figure 8b, e). There was considerable variation in the 'Mr' vegetation sampled at the two quadrats. Quadrat CSBQ2 was recorded on the edge of the 'Mr' unit and was dense scrub and did not include any *Melaleuca raphiopylla* trees, which occurred in a dense thicket in the central part of that area. Quadrat CSQ2 in SC PartA was in a more open area of *Melaleuca raphiopylla* low open forest that had young regrowth (?10 to 15 years) over old cut pine stumps in the surrounding part of the unit.



**Plate 29. Vegetation unit 'Mr' at quadrat CSQ2 (SC PartA).**



**Plate 30. Vegetation unit 'Mr' at quadrat CSBQ5 (in 'Resource enhancement wetland', SC PartB).**

**(iii) Vegetation on lowlying areas adjacent to damplands**

**Kg**

*Kunzea glabrescens* open scrub over *Xanthorrhoea preissii* *Calytrix fraseri* scattered low shrubs over *Dasyogon bromeliifolius* very open herbland.

Habitat and soil: Flats on plain. Grey sand.

Notes: This vegetation was recorded at mapping note sites CBM9 (Plate 31) and CBM5 (at the same location as the 2010-2011 quadrat NSAQ8). Vegetation unit 'Kg' was mapped over a small linear area around the base of a lower slope in the southern area of SC PartB (Figure 8b) and was also applied to an area of regrowth in SC PartA (Figure 8c). These stands were assessed as being in 'Good to Degraded' condition and appeared to be in areas with some past disturbance.



**Plate 31. Vegetation unit 'Kg' at mapping note site CBM9 (SC PartB).**



## Em

*Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered trees over *Banksia ilicifolia*, *Nuytsia floribunda* scattered low trees over *Kunzea glabrescens* high shrubland over *Melaleuca thymoides* scattered shrubs over *Dasypogon bromeliifolius* open herbland.

Habitat and soil: Gentle, west facing lower slope of low dune. Grey sand.

Notes: This vegetation was described at quadrat CSBQ8 (Plate 32), at releve CBR5 (Plate 33) and at mapping note sites CBM6 and CBM11. This unit was mapped around the margins of damplands (Figure 8b) and was very similar with unit 'BaBiKg'. It was differentiated by the presence of scattered *Eucalyptus marginata* subsp. *marginata* (Jarrah) trees in the upper strata. The vegetation in the area of quadrat CSBQ8 varied somewhat from the described unit, but was in a low part of the landscape and had common elements with other stands of 'Em' vegetation.



**Plate 32. Vegetation unit 'Em' at quadrat CSBQ8 (SC PartB).**



**Plate 33. Vegetation unit 'Em' at quadrat CSBQ8 (SC PartB).**

**BaBiKg**

*Banksia attenuata*, *Banksia illicifolia* low woodland over *Kunzea glabrescens* high open shrubland over *Calytrix fraseri*, *Eremaea pauciflora* var. *pauciflora* low shrubland.

Habitat and soil: Very gentle, south facing, lower slope of low dune (on edge of dampland flat). Grey sand.

Notes: This vegetation was recorded at quadrats CSBQ3 and CSBQ9 (Plates 34, 35), releve CBR10 and mapping note site CBM10. It was common around the margins of the wetlands in the south-eastern part of SC PartB (Figure 8b).



**Plate 34. Vegetation unit 'BaBiKg' at quadrat CSBQ3 (SC PartB).**



**Plate 35. Vegetation unit 'BaBiKg' at quadrat CSBQ9 (SC PartB).**

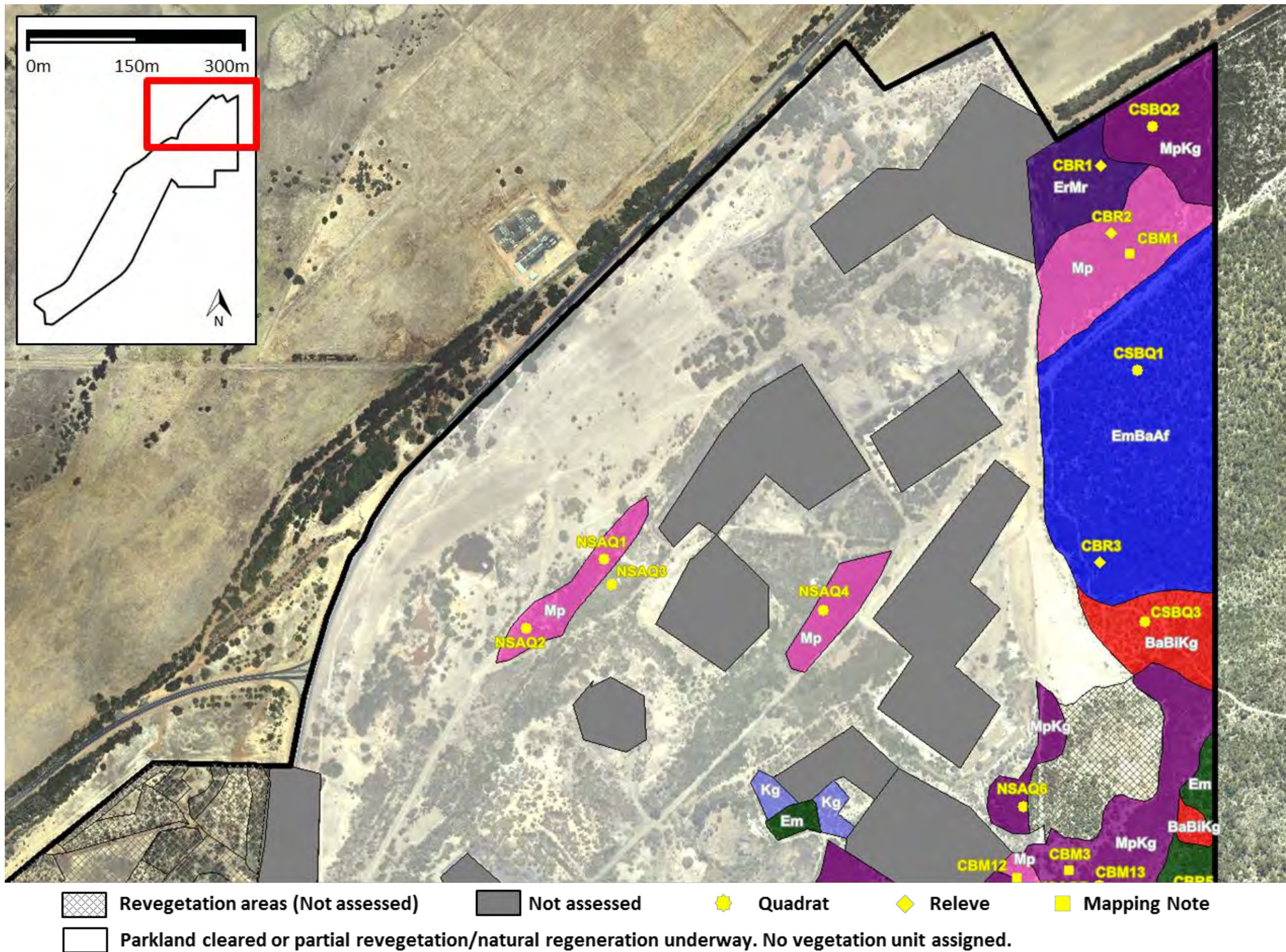


FIGURE 8a. Remnant vegetation unit mapping (SC PartB North)

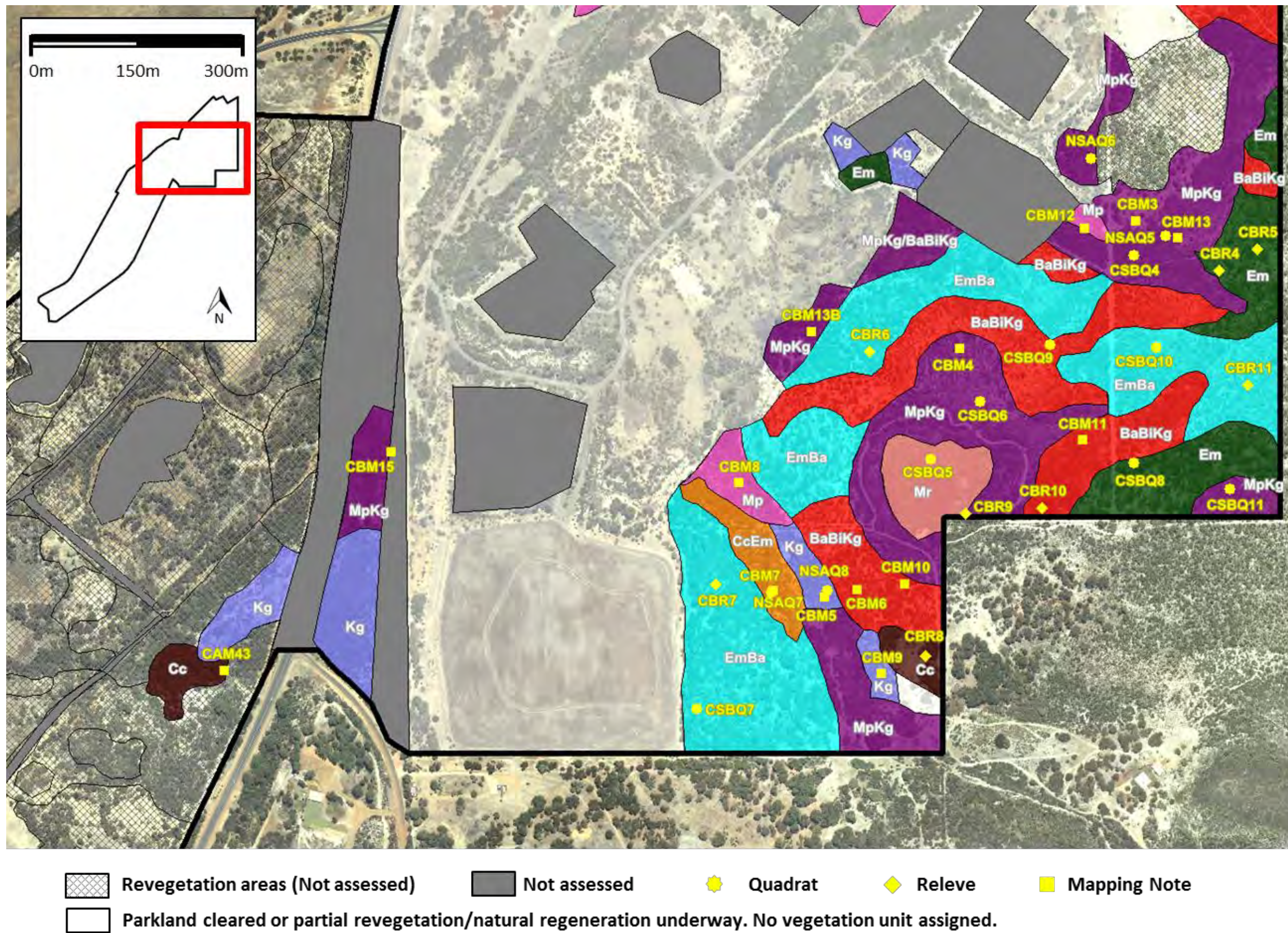
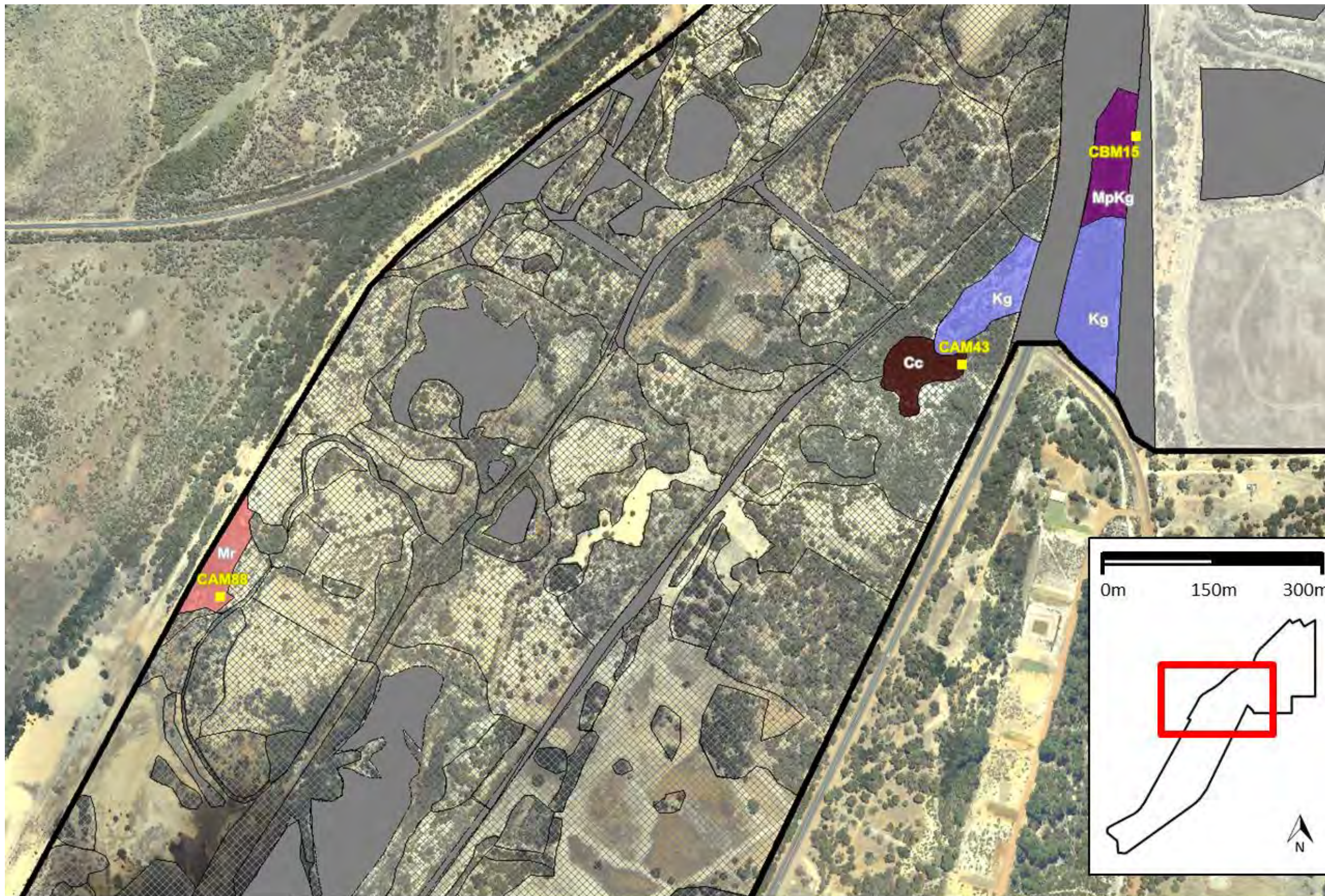


FIGURE 8b. Remnant vegetation unit mapping (SC PartB South)



- 
- Revegetation areas (Not assessed)
  Not assessed
  Quadrat
  Releve
  Mapping Note
- Parkland cleared or partial revegetation/natural regeneration underway. No vegetation unit assigned.

FIGURE 8c. Remnant vegetation unit mapping (SC PartA North)

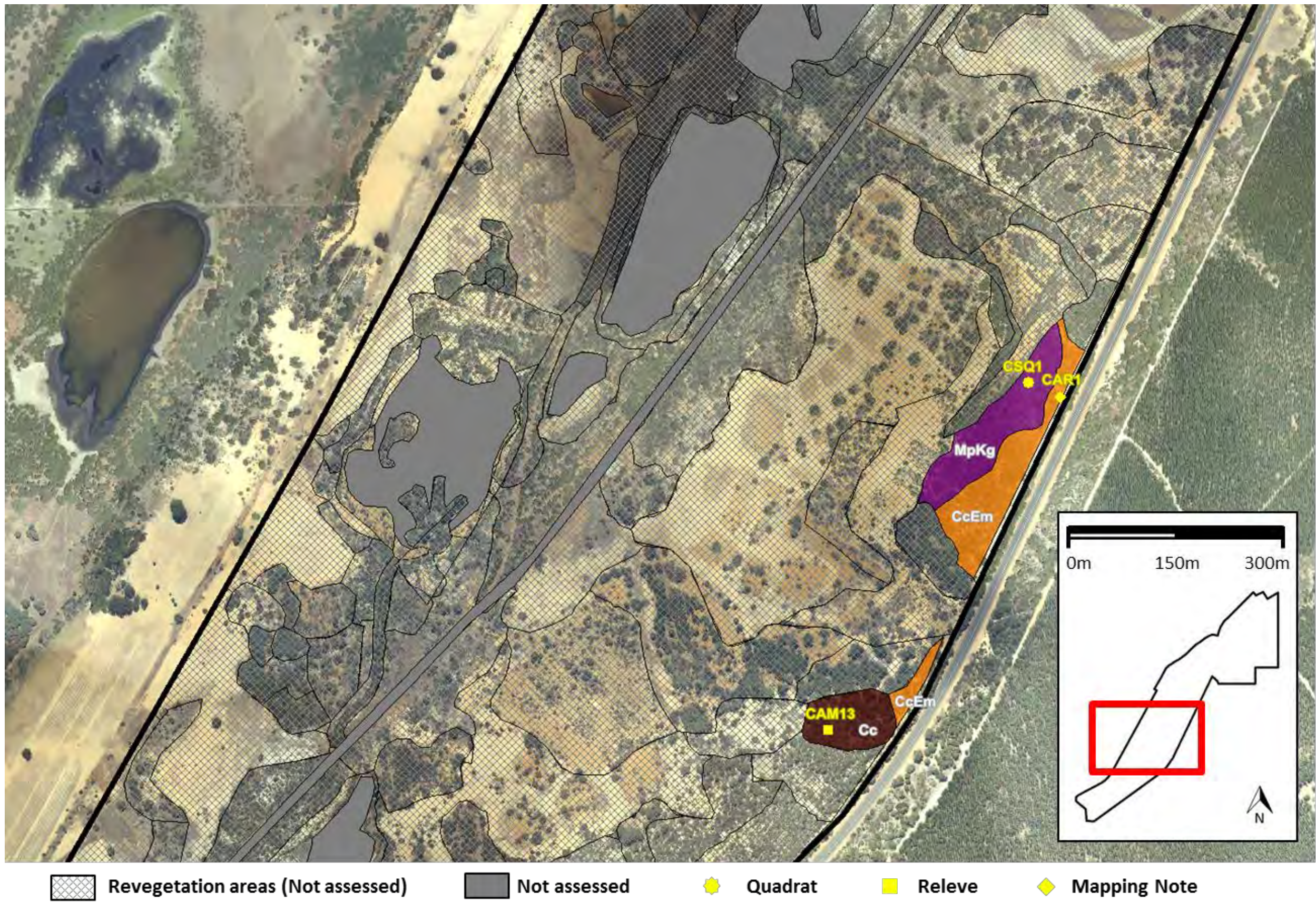


FIGURE 8d. Remnant vegetation unit mapping (SC PartA Central)

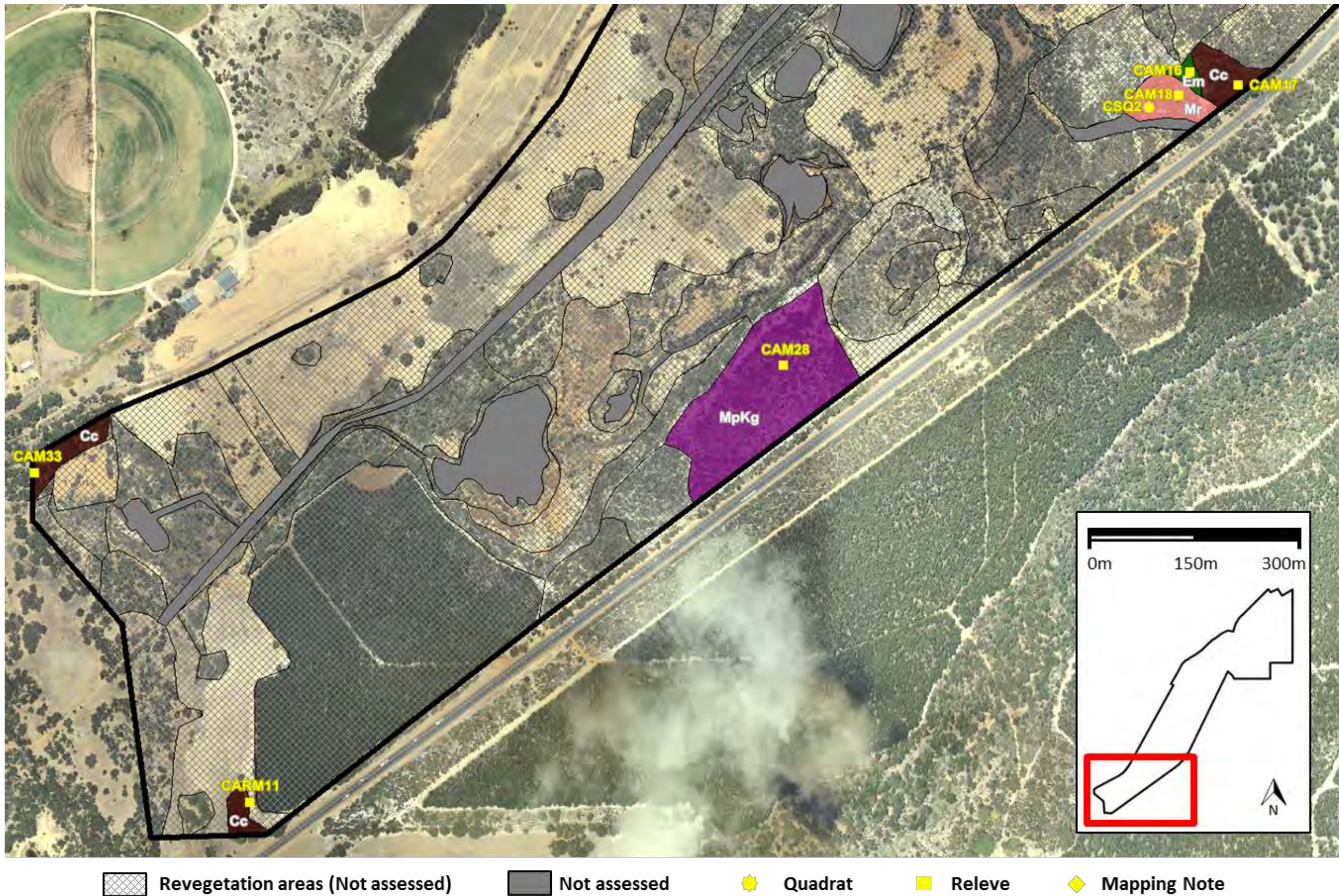


FIGURE 8e. Remnant vegetation unit mapping (SC PartA South)



**Legend: Remnant vegetation units of the South Capel survey area: Figure 7(a to e)**

**(i) Vegetation of the low sandy rises**

**Cc** *Corymbia calophylla* (Marri) open to closed forest over *Kunzea glabrescens* scattered tall shrubs over *Xanthorrhoea preissii* scattered shrubs

**CcEm** *Corymbia calophylla* (Marri), *Eucalyptus marginata* subsp. *marginata* (Jarrah) woodland to open forest over *Kunzea glabrescens* high open shrubland over *Hibbertia hypericoides* scattered low shrubs

**EmBa** *Eucalyptus marginata* subsp. *marginata* (Jarrah) woodland over *Banksia attenuata* low woodland over *Kunzea glabrescens* high open shrubland over *Hibbertia hypericoides* low shrubland.

**EmBaAf** *Eucalyptus marginata* subsp. *marginata* (Jarrah) open woodland over *Banksia attenuata*, *Agonis flexuosa* (Peppermint) low open forest over *Calytrix fraseri* open shrubland over *Hibbertia hypericoides* low shrubland.

**(ii) Wetland (seasonal dampland) vegetation**

**ErMr** *Eucalyptus rudis* subsp. *rudis* scattered trees over *Melaleuca raphiophylla* low open forest over \**Arctotheca calendula* (Capeweed), \**Zantedeschia aethiopica* (Arum lily), \**Sonchus asper*, \**Cotula turbinata*, \**Cerastium glomeratum*, \**Ehrharta longiflora*, \**Galium murale* closed herbland/grassland of weeds.

**Mp** *Melaleuca preissiana* low closed forest over *Kunzea glabrescens* scattered tall shrubs over *Astartea scoparia* open shrubland over an open sedgeland.

**MpKg** *Melaleuca preissiana* low open woodland over *Kunzea glabrescens* closed scrub.

**Mr** *Melaleuca raphiopylla* low open forest over *Astartea scoparia*, (*Melaleuca teretifolia*) shrubland over open sedgeland.

**(iii) Vegetation on lowlying areas adjacent to damplands**

**Kg** *Kunzea glabrescens* open scrub over *Xanthorrhoea preissii* *Calytrix fraseri* scattered low shrubs over *Dasyogon bromeliifolius* very open herbland.

**Em** *Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered trees over *Banksia ilicifolia*, *Nuytsia floribunda* scattered low trees over *Kunzea glabrescens* high shrubland over *Melaleuca thymoides* scattered shrubs over *Dasyogon bromeliifolius* open herbland.

**BaBiKg** *Banksia attenuata*, *Banksia illicifolia* low woodland over *Kunzea glabrescens* high open shrubland over *Calytrix fraseri*, *Eremaea pauciflora* var. *pauciflora* low shrubland.

## 5.1.2 Remnant vegetation condition

### 5.1.2.1 Overall vegetation condition

Large parts of the remnant bushland along the eastern part of SC PartB area were considered to be in 'Excellent' or 'Very Good to Excellent' condition, with low weed cover and intact structures (Figure 9a). Species numbers appeared to be a little low for vegetation types such as *Banksia* woodlands, compared to elsewhere on the Swan Coastal Plain, possibly as a result of historical grazing.

The 'EmBaAf' vegetation on the low sandy rise (low dune) in the north-eastern part of SC PartB was rated slightly lower, as 'Very Good' condition. While weed cover in this area was low, overall vegetation cover also appeared to be low, appearing as if there may have been some past grazing in the area. The vegetation on the low rise around CSBQ7 in the south-western part of SC PartB was also rated as being in 'Very Good' condition with low weed cover, being marked down due to a fairly open understory and an appearance of some past grazing. The vegetation condition in the 'EmBa' unit in the CSBQ7 area declined to 'Good' on the eastern side of a north-south fenceline to the east of CSBQ7 (Figure 9a). On the low rise in the central-western part of SC PartB, the understory was more open in parts, with an apparent loss of understory species and cover ('Good' condition, Figure 9a).

Part of the wetland area at the northern end of SC PartB, vegetation unit 'ErMr', was 'Degraded' with high weed cover in most parts (Figure 9a, Plate 22). The central part of the wetland in the southern part of SC PartB (vegetation unit 'Mr', at quadrat CSBQ5) was considered to be in 'Very Good' condition, with a thick scrub cover. However, under the scrub layer there were quite a lot of grass and herb weeds and quite a lot of old soil disturbance, suggesting some past disturbance in the area. Some of the *Melaleuca preissiana* wetland areas were rated as having 'Excellent' condition, with the dense scrub layer assisting in keeping weed cover low. Some *Melaleuca preissiana* woodland areas were in 'Degraded' or 'Good to Degraded' condition with evidence of considerable past disturbance and a high grassland/herbland weed cover. A difficulty in assessing vegetation condition of all wetland areas was having little information about how the hydrology of the area may have changed and impacts that may have had over the last 20 or 30 years.

The vegetation condition of remnants/regrowth in the SC PartA area was generally considered to be 'Good' (Figure 9b), with some apparent changes in structure and species cover, but with a good number of taxa seen in the areas and good overall cover. Much of the remnant area in the south-eastern part of SC PartA was regrowth in areas that were formerly pine plantation and were cut an estimated 15 to 20 (?) years ago.

### 5.1.2.2 Dieback (*Phytophthora* sp.)

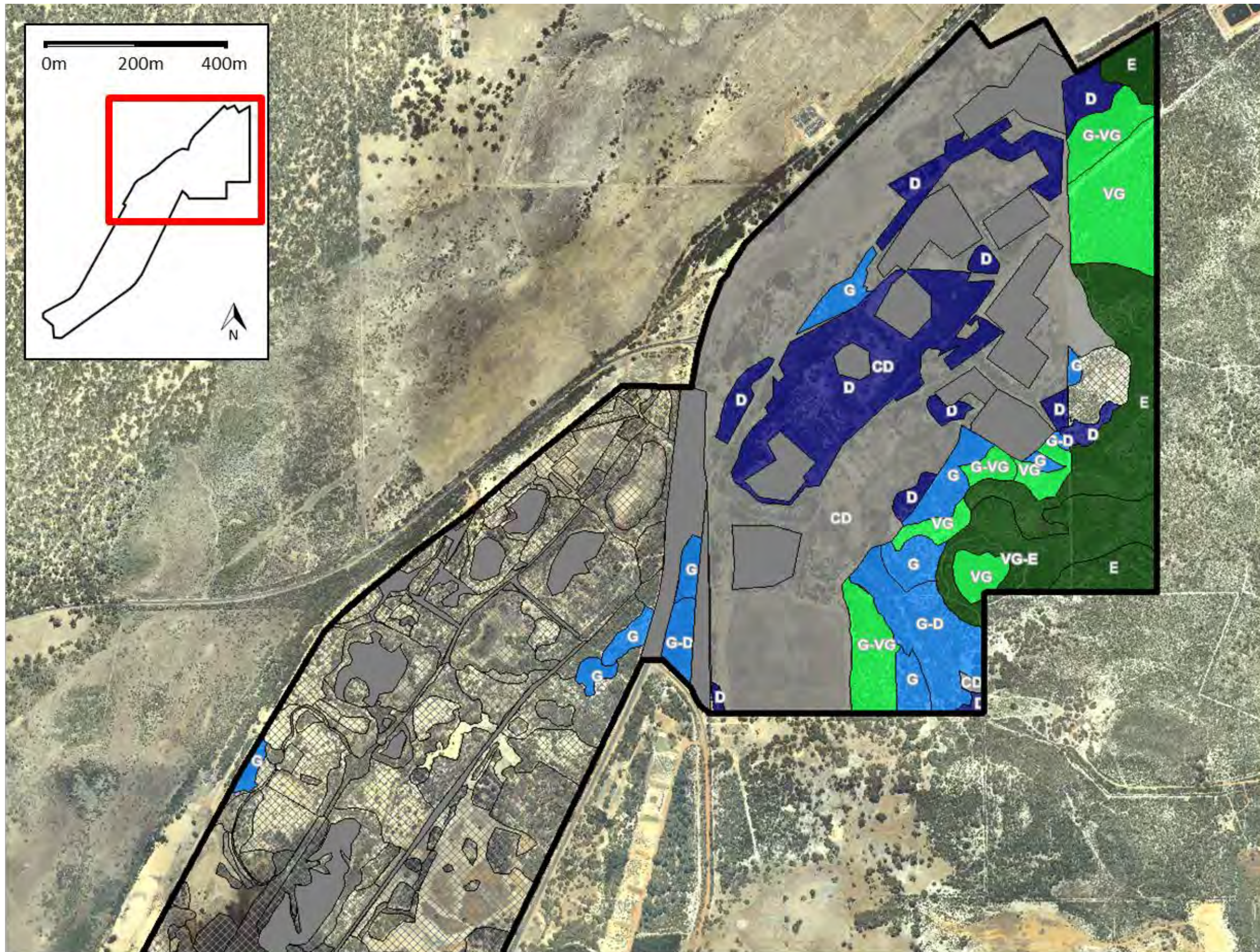
Some patches of *Banksia* spp. deaths were recorded at a number of locations in the SC PartB area. Three main areas of patch deaths were observed, all on the low sandy rises or lower slopes of the low rises. These areas were :

- over a wide area on the low rise in the vicinity of quadrat CSBQ7;
- on the crest and slopes of the low rise in the vicinity of quadrat CSBQ10;
- on the slopes in the vicinity of CSBQ9 (Plate 36).

The deaths and decline of *Banksia* trees may indicate the presence of the Dieback fungus *Phytophthora cinnamomi*. However, other agents such as fire and drought (including falling groundwater levels), as well as other pathogens, may also be responsible for *Banksia* spp. tree deaths. To determine if Dieback is present, a dieback survey by accredited 'dieback interpreter' would be required.



**Plate 36. A patch of *Banksia* spp. deaths 50 metres south of quadrat CSBQ9 in the SC PartB survey area.**



VEGETATION CONDITION







	Excellent		Good		Completely Degraded		Revegetation areas (Not assessed)
	Very Good		Degraded		Not assessed		

FIGURE 9a. Vegetation condition mapping using the Keighery classification (Bush Forever 2000) (Survey area: North)

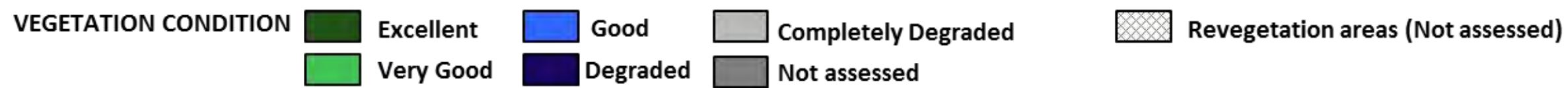
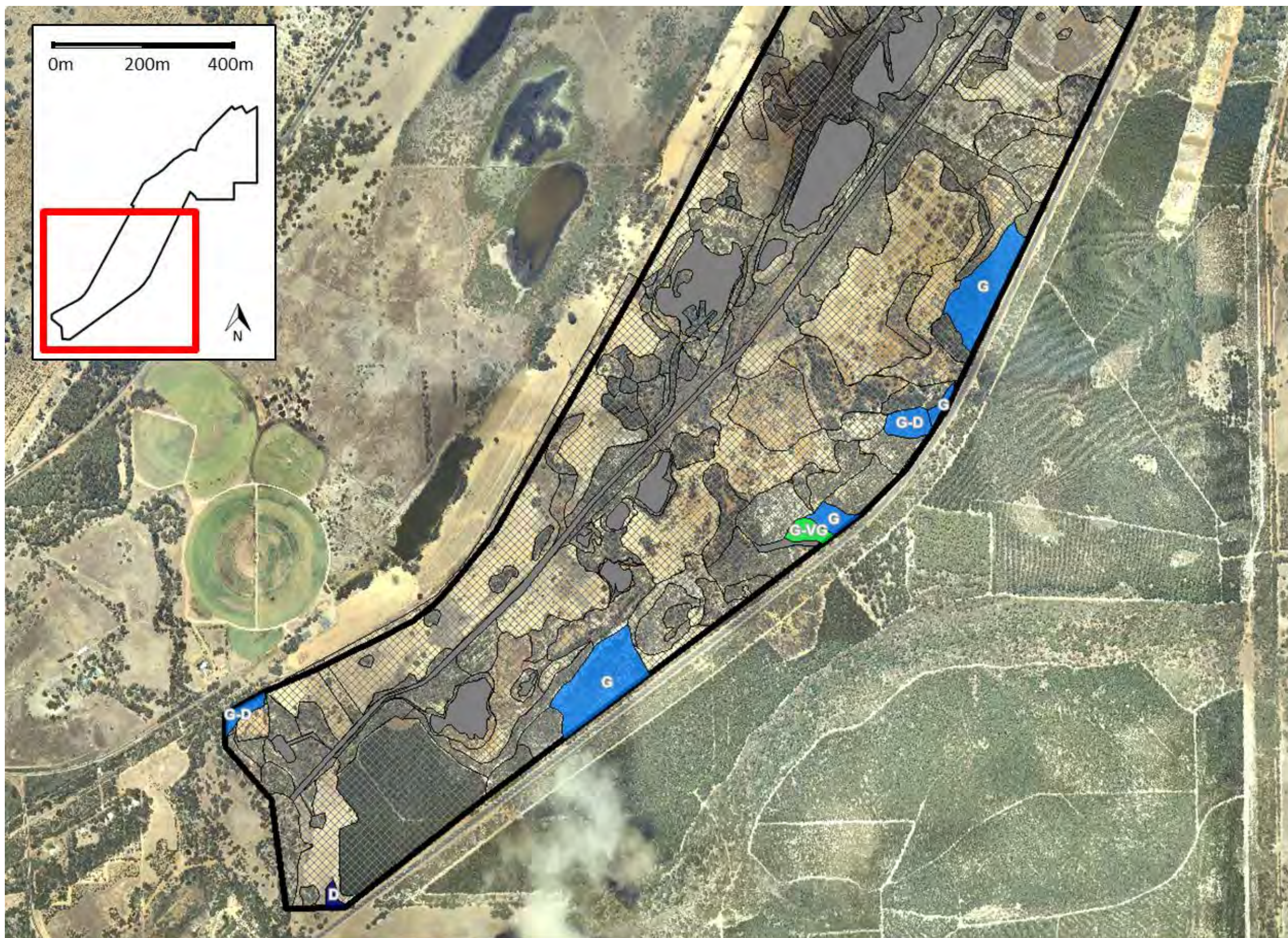


FIGURE 9b. Vegetation condition mapping using the Keighery classification (Bush Forever 2000) (Survey area: South)

## 5.2 Revegetation

### 5.2.1 Revegetation descriptions

#### 5.2.1.1 Introduction to the revegetation descriptions

The revegetation unit codes that discriminate the mapped revegetation units are derived from the generic and species names of the more abundant genera or species in the different strata present in each unit (see Table 6). For example, the revegetation unit 'Cc.Af.Kg' has its code derived from three of the dominant species in that unit: 'Cc' (*Corymbia calophylla*), 'Af' (*Agonis flexuosa*) and 'Kg' (*Kunzea glabrescens*).

**Table 6. Abbreviations for species names that were used in vegetation unit codes.**

Code	Species name	Code	Species name
Af	<i>Agonis flexuosa</i>	Em	<i>Eucalyptus marginata</i> subsp. <i>marginata</i>
Ap	** <i>Acacia pycnantha</i>		
As	<i>Astartea scoparia</i>	Er	<i>Eucalyptus rudis</i> subsp. <i>rudis</i>
Asa	<i>Acacia saligna</i>	Kg	<i>Kunzea glabrescens</i>
Cc	<i>Corymbia calophylla</i>	Mp	<i>Melaleuca preissiana</i>
Co	<i>Casuarina obesa</i>	Mq	** <i>Melaleuca quinquenervia</i>
Cp	** <i>Callistemon phoeniceus</i>	Mr	<i>Melaleuca raphiophylla</i>
Ec	** <i>Eucalyptus camaldulensis</i>	Mv	<i>Melaleuca viminea</i> subsp. <i>viminea</i>
Eg	<i>Eucalyptus gomphocephala</i>	Rc	<i>Regelia ciliata</i>

Note: '\*\*' denotes non-endemic taxa used in revegetation plantings.

#### 5.2.1.2 Revegetation of the South Capel survey area

Nineteen units were used to group the revegetation in the South Capel survey area, along with a number of very broad groups for the less common revegetation stands (Figure 10a-e). The detailed descriptions of revegetation referred to below, can be found in Appendix 7.

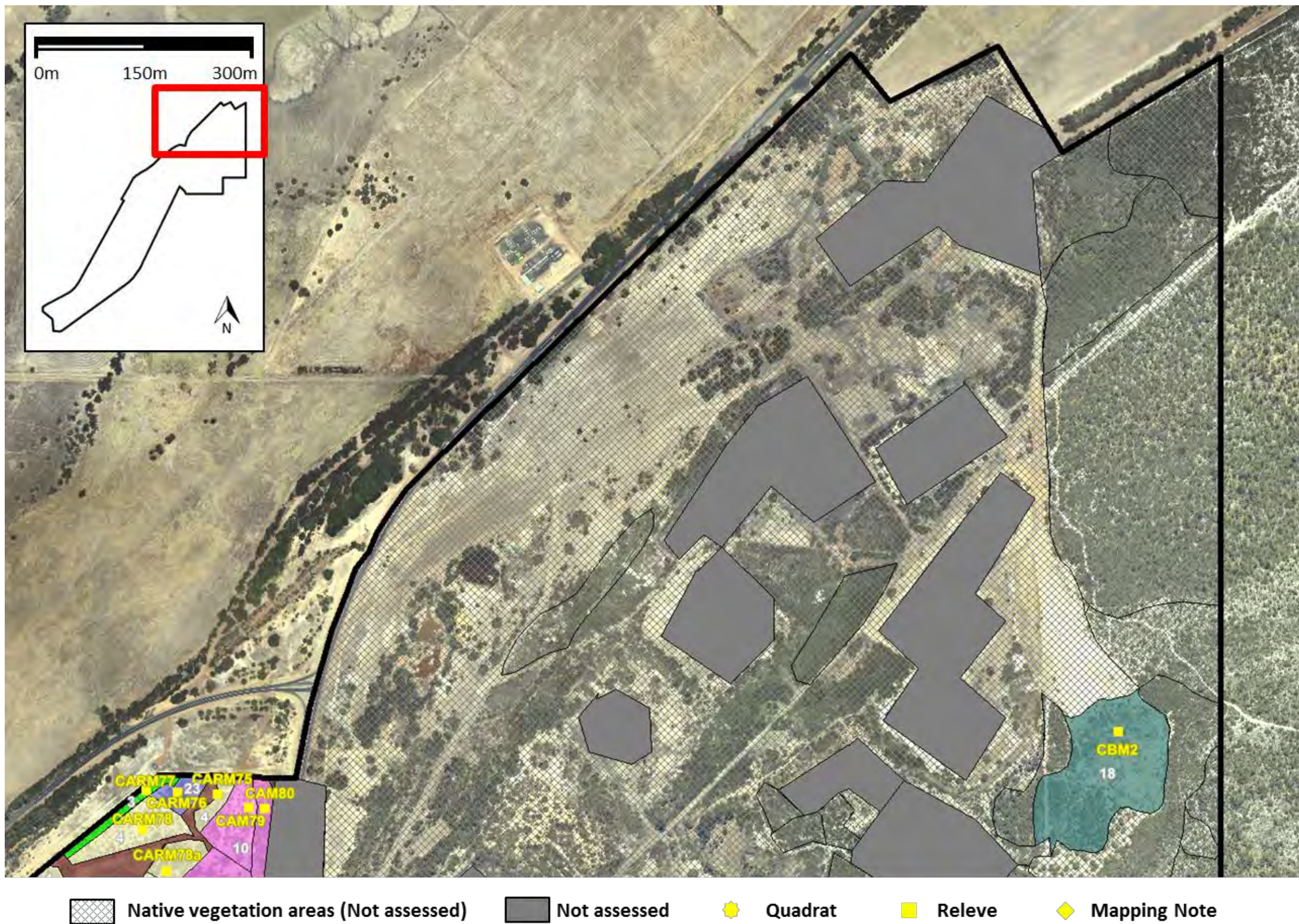


FIGURE 10a. Revegetation unit mapping: SC PartB North

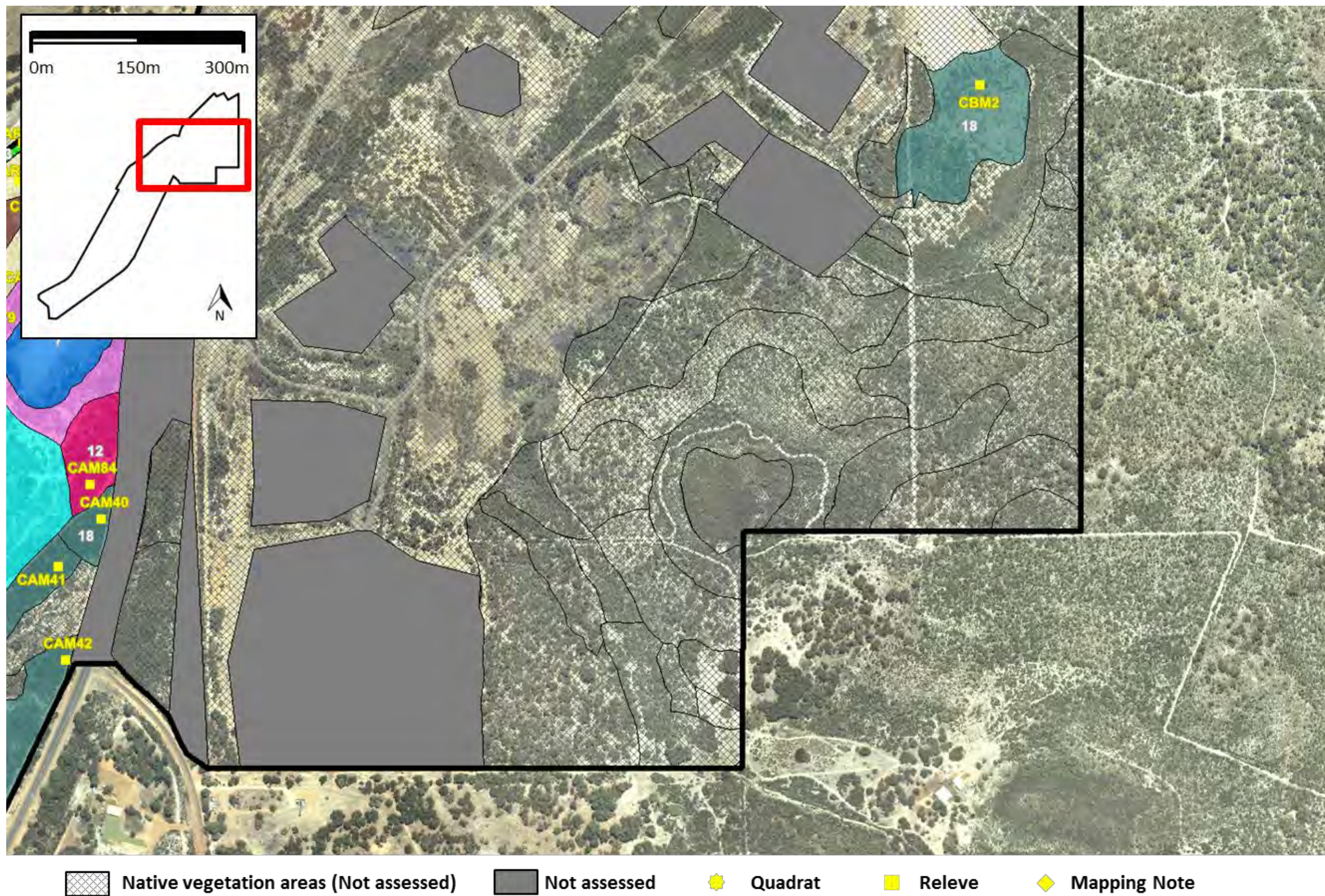
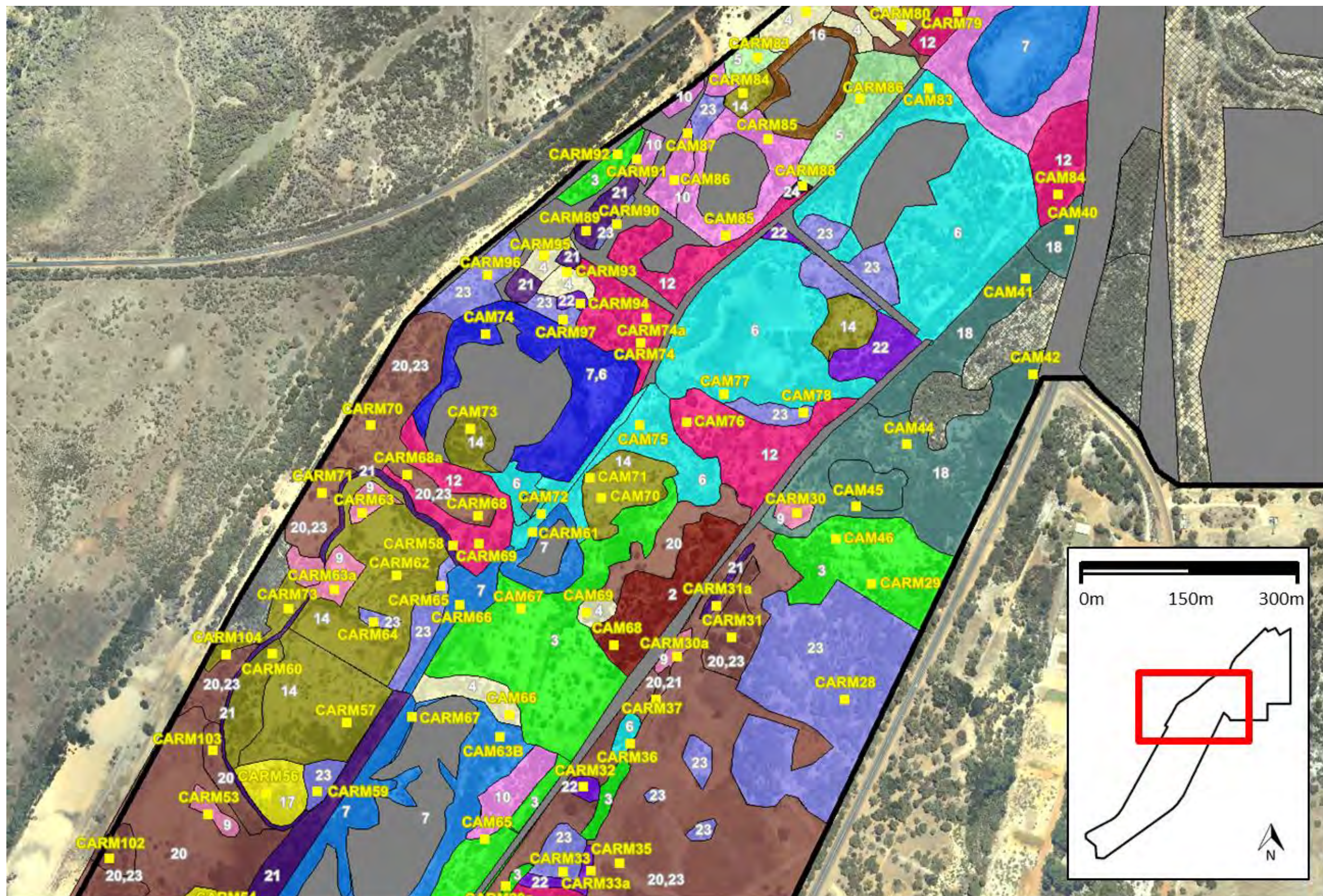


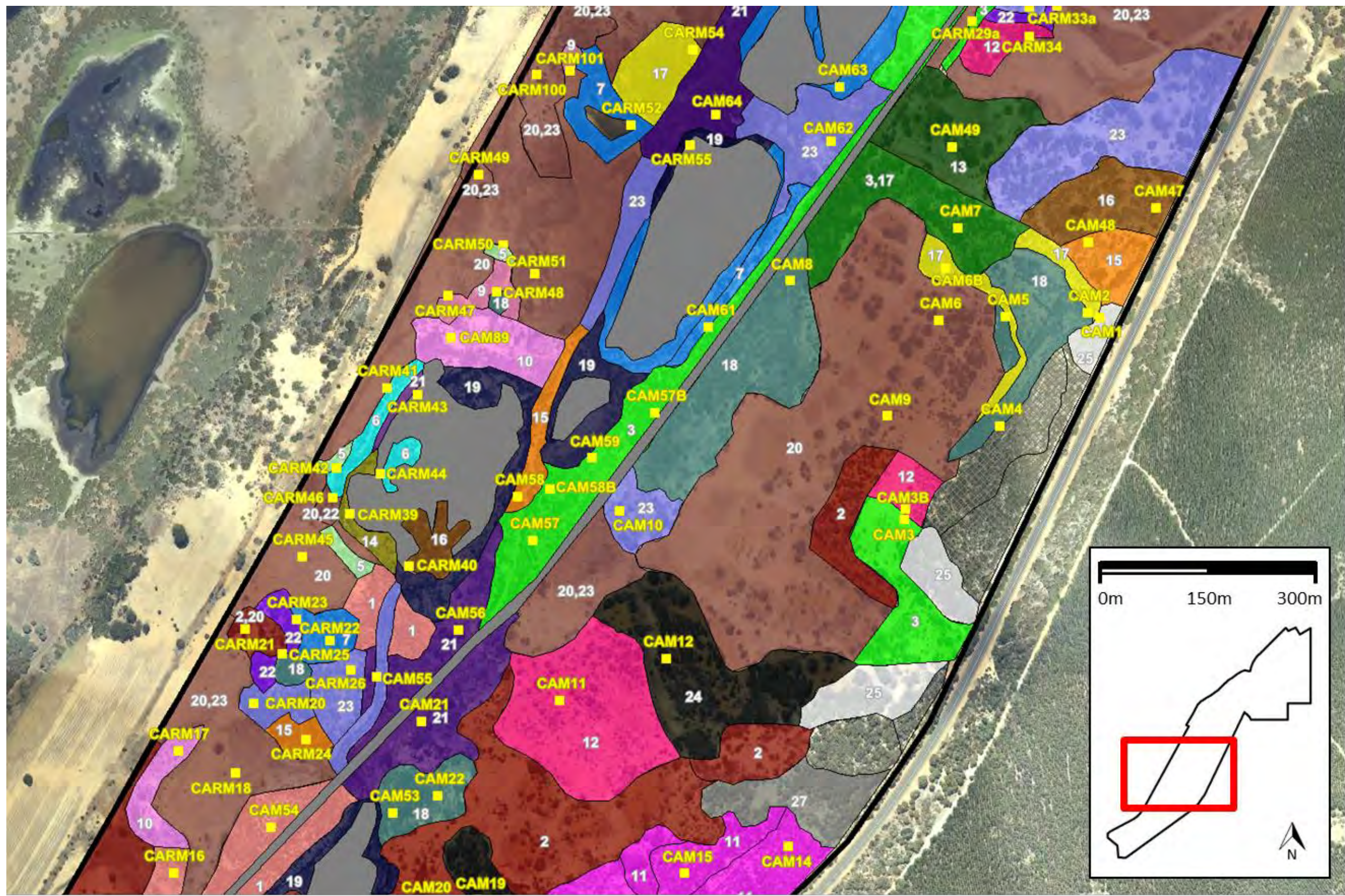
FIGURE 10b. Revegetation unit mapping: SC PartB South





Native vegetation areas (Not assessed)
  Not assessed
  Quadrat
  Releve
  Mapping Note

FIGURE 10c. Revegetation unit mapping: SC PartA North



Native vegetation areas (Not assessed)  
  Not assessed  
  Quadrat  
  Releve  
  Mapping Note

FIGURE 10d. Revegetation unit mapping: SC PartA Central



**Legend: Revegetation units of the South Capel survey area: Figure 10(a to e)**

**(i) Revegetation units**

- 1 **Ap.Kg** Consisted of a *Kunzea glabrescens* high shrubland or scrub with \*\**Acacia pycnantha* scattered low trees (mapping notes CAM51 and CAM54) to low woodland (mapping note CAM29).
- 2 **Asa** Typically a scattering of predominantly *Acacia saligna* shrubs with large areas of open grasslands/herblands of annual weeds or bare ground.
- 3 **Cc.Af.Kg** Included *Corymbia calophylla* and *Agonis flexuosa* in the upper strata and occurred on the flats.
- 4 **Cc.Kg** Included *Corymbia calophylla* (Marri) and *Kunzea glabrescens* as dominant or common species.
- 5 **Cc (Other)** This unit included varied vegetation, but with *Corymbia calophylla* as a dominant.
- 6 **Co** *Casuarina obesa* was the dominant species, often forming a low closed forest.
- 7 **Co.Ec.Mv** Included *Casuarina obesa*, \*\**Eucalyptus camaldulensis* and *Melaleuca viminea* subsp. *viminea* as dominants in the upper strata. It was recorded on wetland banks.
- 8 **Co.Mq.Kg** Had *Casuarina obesa*, \*\**Melaleuca quinquenervia* and *Kunzea glabrescens* as common dominants and was recorded in the southern part of the survey area on elevated flats.
- 9 **Ec** \*\**Eucalyptus camaldulensis* was dominant.
- 10 **Eg.Cc.Kg** Included *Eucalyptus gomphocephala* (Tuart), *Corymbia calophylla* and *Kunzea glabrescens* as dominants.
- 11 **Eg.Cc.Rc.Kg** Included *Eucalyptus gomphocephala* (Tuart), *Corymbia calophylla*, *Regelia ciliata* and *Kunzea glabrescens* as dominants. It was recorded on flats.
- 12 **Eg.Kg** Included *Eucalyptus gomphocephala* (Tuart) and *Kunzea glabrescens* as dominant species.
- 13 **Em.Kg** Included *Eucalyptus marginata* subsp. *marginata* (Jarrah).
- 14 **Er.Af.Mr.Mp.Mv** Revegetation unit with typically very open plantings of numerous (mostly endemic) species.
- 15 **Er.Ec** Consisted of mixed plantings of *Eucalyptus rudis* and \*\**Eucalyptus camaldulensis*.
- 16 **Er.Mr.As** Had *Eucalyptus rudis*, *Melaleuca raphiophylla* and *Astartea scoparia* as dominant taxa.
- 17 **Er Other** Other revegetation that had *Eucalyptus rudis* as a dominant in the overstorey.
- 18 **Mp.Mv.Kg** Revegetation with *Melaleuca preissiana*, *Melaleuca viminea* subsp. *viminea* and *Kunzea glabrescens* as dominants.
- 19 **Mq.Cp.Co** Typically included \*\**Melaleuca quinquenervia*, \*\**Callistemon phoeniceus* and *Casuarina obesa* as dominants and occurred on the banks of inundated wetland areas.

**(ii) Other Revegetation**

- 20 **BGAGH** (Bare ground and annual grassland and herbland of weeds)
- 21 **ENDO** (Endemic: Other)
- 22 **EXOTP** (Exotic plantings:Other)
- 23 **MENEX** (Mixed Endemic/Exotic plantings)
- 24 **PE** (Plantations: Exotic (\*\**Eucalyptus* sp.))
- 25 **PP** (Plantations: Exotic (\**Pinus pinaster*))
- 27 **PT** (Plantations: Tuart (*Eucalyptus gomphocephala*))

## (i) Revegetation units

### Ap.Kg

This revegetation consisted of a *Kunzea glabrescens* high shrubland or scrub with \*\**Acacia pycnantha* scattered low trees (mapping notes CAM51 and CAM54) to low woodland (mapping note CAM29). This revegetation was also recorded at site CARM16. The \*\**Acacia pycnantha* was probably not part of the revegetation plantings in these areas, but had spread there as a weed.

This revegetation was assessed as 'R2 to R3'. It had a good cover of native species, but was rated down because of the low number of native species present and the presence of the weed species \*\**Acacia pycnantha*.

### Asa

This revegetation type typically described areas on elevated ground that had not been successfully revegetated and had resulted in a scattering of predominantly *Acacia saligna* shrubs with large areas of open grasslands/herblands of annual weeds or bare ground (mapping note CAM25, Plate 37). There was one small area where the revegetation was an *Acacia saligna* scrub (mapping note CAM68). Another small area consisted of a large stockpile of yellow sand (about 7 metres high) with a cover of scattered *Acacia saligna* tall shrubs (mapping note CAM9).

These areas were mostly assessed as 'R2' to 'R1' because of the very low cover, low number of species and lack of structure.

### Cc.Af.Kg

This revegetation unit included *Corymbia calophylla* and *Agonis flexuosa* in the upper strata and occurred on the flats. It included a range of revegetation described at sites CAM37 (Plate 38), 66 and 69 and CARM14,75,78,80,81,82,93,and 95. While revegetation at site CAM37 was assessed as 'R3' with a good cover of endemic species, the other areas of this revegetation were assessed to be between 'R1 to R2' to 'R2 to R3'.

### Cc.Kg

This revegetation unit included *Corymbia calophylla* (Marri) and *Kunzea glabrescens* as dominant or common species. This unit included considerable variation in revegetation, from a *Corymbia calophylla* low woodland over a *Kunzea glabrescens* scrub (mapping note site CAM57B; Plate 39) to a site with sparse *Corymbia calophylla* scattered low trees to a low open woodland with little other vegetation and large open areas (CAM67; Plate 40). Other sites recorded in this unit were CAM3, CAM57 and 67 and CARM29, 77 and 92. While CAM57B was assessed as 'R3', most of these sites were assessed to be between 'R2' and 'R1'.



**Plate 37. 'Asa' revegetation area at CAM25 in the southern part of SC PartA.**



**Plate 38. Revegetation unit 'Cc.Af.Kg' at site CAM37.**



**Plate 39. Revegetation unit Cc.Kg at site CAM57B.**



**Plate 40. Revegetation unit Cc.Kg at site CAM67**

### **Cc (Other)**

This unit included revegetation described at 6 other sites with varied vegetation, but with *Corymbia calophylla* as a dominant. Sites recorded in this unit were CARM9, 42, 42a, 50, 83 and 86.

### **Co**

This revegetation had *Casuarina obesa* as the dominant species, often forming a low closed forest (CAM83, Plate 41). It mainly occurred on the banks of wetlands in the northern part of SC AreaA. It was also described at sites CAM71, 72, 75 and 77 and CARM36, 41 and 44. Assessment of this revegetation varied between 'R3' in the more complex stands to 'R2' and even 'R1'.

### **Co.Ec.Mv**

This revegetation typically included *Casuarina obesa*, *\*\*Eucalyptus camaldulensis* and *Melaleuca viminea* subsp. *viminea* as dominants in the upper strata. It was recorded on wetland banks, mostly in the central part of the survey area. It was assessed as 'R3' at sites CAM60, CAM63 (Plate 42) and CAM63B where there was a good cover of endemic taxa and a complex structure. At other sites (CAM82, CARM 22, 52, 61, 66 and 67) it was assessed between 'R2 to R3' and 'R2 to R1'.

### **Co.Mq.Kg**

This vegetation had *Casuarina obesa*, *\*\*Melaleuca quinquenervia* and *Kunzea glabrescens* as common dominants and was recorded in the southern part of the survey area on the elevated flats between wetlands at sites CAM27B (Plate 43) and CAM39. It was assessed to be 'R2' revegetation because of the many exotic species used and the low cover.

### **Ec**

Areas of revegetation where *\*\*Eucalyptus camaldulensis* was dominant. These were generally small areas. This revegetation unit was recorded at mapping note sites CARM6, 7, 30, 47, 53, 63 and 101. Most areas of this revegetation unit were assessed in the range 'R2' to 'R1'.





**Plate 41. Revegetation unit 'Co' at site CAM83.**



**Plate 42. Revegetation unit 'Co.Ec.Mv' at site CAM63.**



**Plate 43. Revegetation unit 'Co.Mq.Kg' at site CAM27B.**

#### **Eg.Cc.Kg**

This revegetation included *Eucalyptus gomphocephala* (Tuart), *Corymbia calophylla* and *Kunzea glabrescens* as dominants. It was recorded mostly on flats at sites CAM26, 65, 79, 80 (Plate 44), 81, 86 and 89 and CARM17 and 85. This revegetation unit was assessed to be in the range of 'R2' to 'R3'.

#### **Eg.Cc.Rc.Kg**

This revegetation included *Eucalyptus gomphocephala* (Tuart), *Corymbia calophylla*, *Regelia ciliata* and *Kunzea glabrescens* as dominants. It was recorded in the southern part of the survey area on flats. At mapping note sites CAM23B and CAM24 (Plate 45) it was assessed at between 'R3 to R4', with good cover of a good number of endemic species and a complex structure. At other revegetation sites it was assessed as 'R3' or 'R2 to R3' (CAM14, 15 and 30).

#### **Eg.Kg**

This revegetation unit included *Eucalyptus gomphocephala* (Tuart) and *Kunzea glabrescens* as dominant species. It was recorded on flats at sites CAM3B, 11, 76 and 84 and CARM3, 4, 34, 69, 74 and 79. This unit included a range of revegetation and was assessed to be between 'R3' and 'R1 to R2'.



**Plate 44. Revegetation unit 'Eg.Cc.Kg' at site CAM80.**



**Plate 45. Revegetation unit 'Eg.Cc.Rc.Kg' at site CAM24.**

### **Em.Kg**

The main occurrence of this unit was described at site CAM49 (Plate 46). It was an area with scattered *Eucalyptus marginata* subsp. *marginata* (Jarrah) (regrowth from stumps) and other scattered low trees. The areas around the Jarrah stumps had been mined and was mostly an annual grassland and herbland of weeds. It was assessed as 'R1 to R2'. An area of *Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered low trees over *Kunzea glabrescens* shrubland was recorded at CAM39B.

### **Er.Af.Mr.Mp.Mv**

This revegetation unit was typically very open plantings of numerous (mostly endemic) species. It was recorded at sites CAM70 (Plate 47), 73 and 85 and CARM39, 57, 60, 62, 73 and 84. Most sites were assessed as 'R2' or 'R1 to R2', due to the low cover, although the cover should improve moderately with age. The revegetation at site CAM85 was on the banks of a wetland area and was assessed as 'R3'.

### **Er.Ec**

This revegetation unit consisted of mixed plantings of *Eucalyptus rudis* and \*\**Eucalyptus camaldulensis*. It was recorded at sites CAM48, 58B and 61 and sites CARM1 and 24. Revegetation at most of these sites was assessed as 'R2'.

### **Er.Mr.As**

This revegetation had *Eucalyptus rudis*, *Melaleuca raphiophylla* and *Astartea scoparia* as dominant taxa. The best examples of this revegetation unit occurred in the south-western corner of the SC PartA survey area on wetland banks and surrounds and along drainage channel banks (mapping note sites CAM31, 32, 35 and 36 (Plate 48). Other sites where this revegetation unit was recorded were CAM47 and CARM40 and 87. Revegetation at 4 of these sites was assessed as 'R3' or better, with revegetation at CAM36 assessed as 'R3 to R4'. At these sites there was a good number of endemic species in the plantings, high cover and a complex structure.



**Plate 46. Revegetation unit 'Em.Kg' at site CAM49.**



**Plate 47. Revegetation unit 'Er.Af.Mr.Mp.Mv' at site CAM70.**

### **Er Other**

This unit included other revegetation that had *Eucalyptus rudis* as a dominant in the overstorey (CAM6B and 8B; CARM8, 54 and 56). It included a variety of vegetation types which were assessed as mostly 'R2 to R3' and 'R2'. Site CAM8B was assessed as 'R3 to R4' due to its high cover of endemic species with a complex structure.

### **Mp.Mv.Kg**

This revegetation had *Melaleuca preissiana*, *Melaleuca viminea* subsp. *viminea* and *Kunzea glabrescens* as dominants. It included revegetation of *Melaleuca preissiana* scattered low trees over *Kunzea glabrescens* closed scrub (mapping note CAM40, Plate 49), *Melaleuca preissiana* low closed forest (mapping note CAM5) and *Melaleuca viminea* subsp. *viminea* scrub (mapping note CAM23 (Plate 50) and CAM8). Other sites where this revegetation unit was recorded were CAM4, 41, 42, 44, 45 and 53; CARM 25 and 48 and CBM2 in SC PartB. A number of the areas were assessed as 'R3' revegetation.

### **Mq.Cp.Co**

This revegetation occurred on the banks of inundated wetland areas and typically included *Melaleuca quinquenervia*, *Callistemon phoeniceus* and *Casuarina obesa* as dominants. *Meeboldina roycei* rushes typically occurred on the banks. It was recorded at sites CAM27, CAM38 (Plate 51), CAM50 (Plate 52), CAM52, CAM59 and CARM55. Most areas of this revegetation were considered to be 'R3' because, despite the dominant non-endemic taxa, there was very high cover and a complex structure.

### **(ii) Other Revegetation**

#### **BGAGH (Bare ground and annual grassland and herbland of weeds)**

Some large parts of the SC PartA revegetation area had not been successfully revegetated and were mostly large areas of bare ground or open grasslands/herblands of annual weeds, with some scattered shrubs or sometimes patches of revegetation or revegetation in small depression areas.

#### **ENDO (Endemic: Other)**

Other revegetation dominated by endemic species.

#### **EXOTP (Exotic plantings: Other)**

Other revegetation dominated by exotic species.

#### **MENEX (Mixed Endemic/Exotic plantings)**

Other revegetation dominated by both endemic and exotic species.

**PE (Plantations: Exotic (\*\**Eucalyptus* sp.))**

Areas of \*\**Eucalyptus* sp. planted in a formal plantation grid. There were only a few small areas of this revegetation.

**PP (Plantations: Exotic (\**Pinus pinaster*))**

Areas of \**Pinus pinaster* plantations.

**PT (Plantations: Tuart (*Eucalyptus gomphocephala*))**

Planted *E. gomphocephala* in a formal plantation grid. Recorded in a single area only.



**Plate 48. Revegetation unit 'Er.Mr.As' at site CAM36.**



**Plate 49. Revegetation unit 'Mp.Mv.Kg' at site CAM40**



**Plate 50. Revegetation unit 'Mp.Mv.Kg' at site CAM23.**





**Plate 51. Revegetation unit 'Mq.Cp.Co' at site CAM38.**



**Plate 52. Revegetation unit 'Mq.Cp.Co' at site CAM50.**

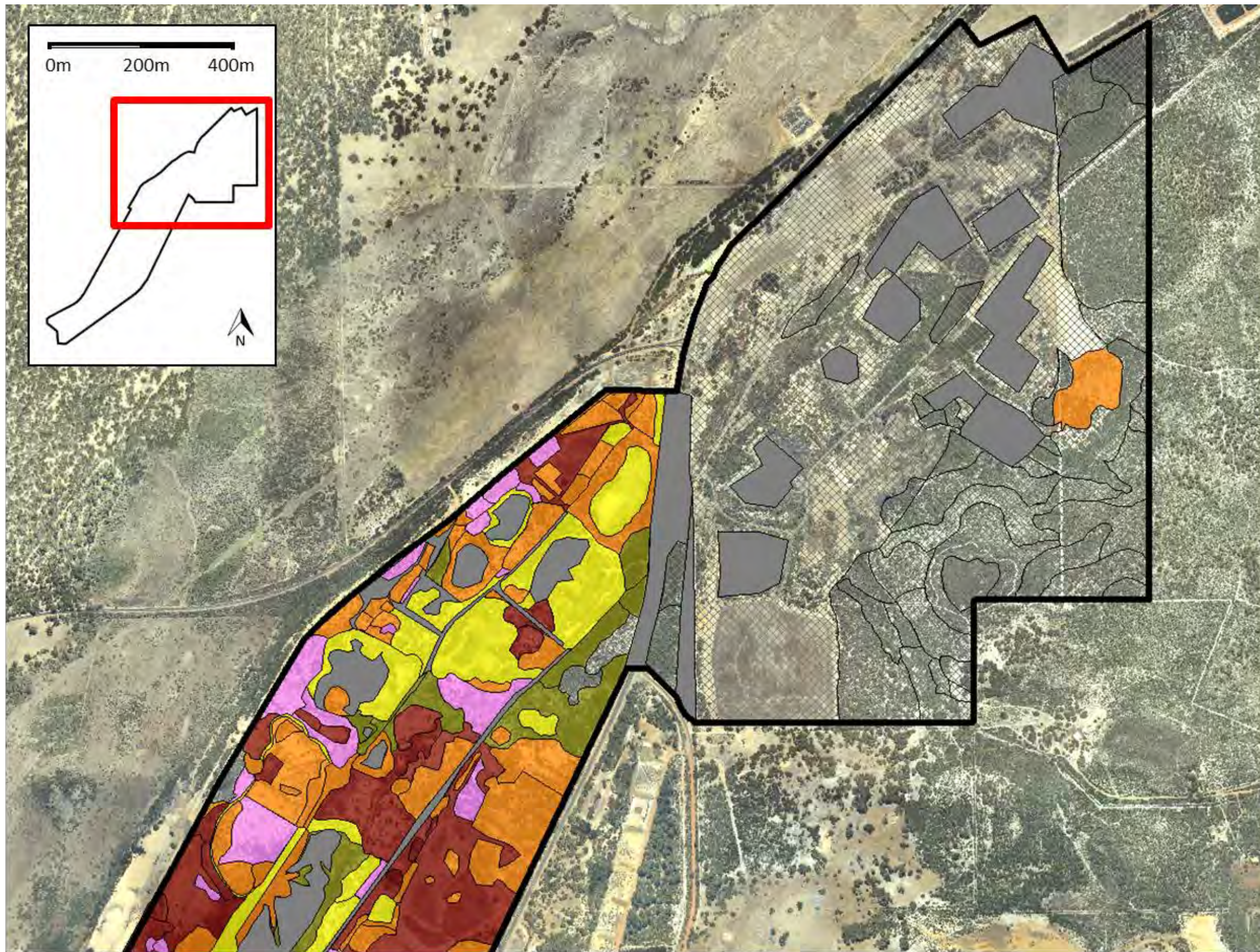
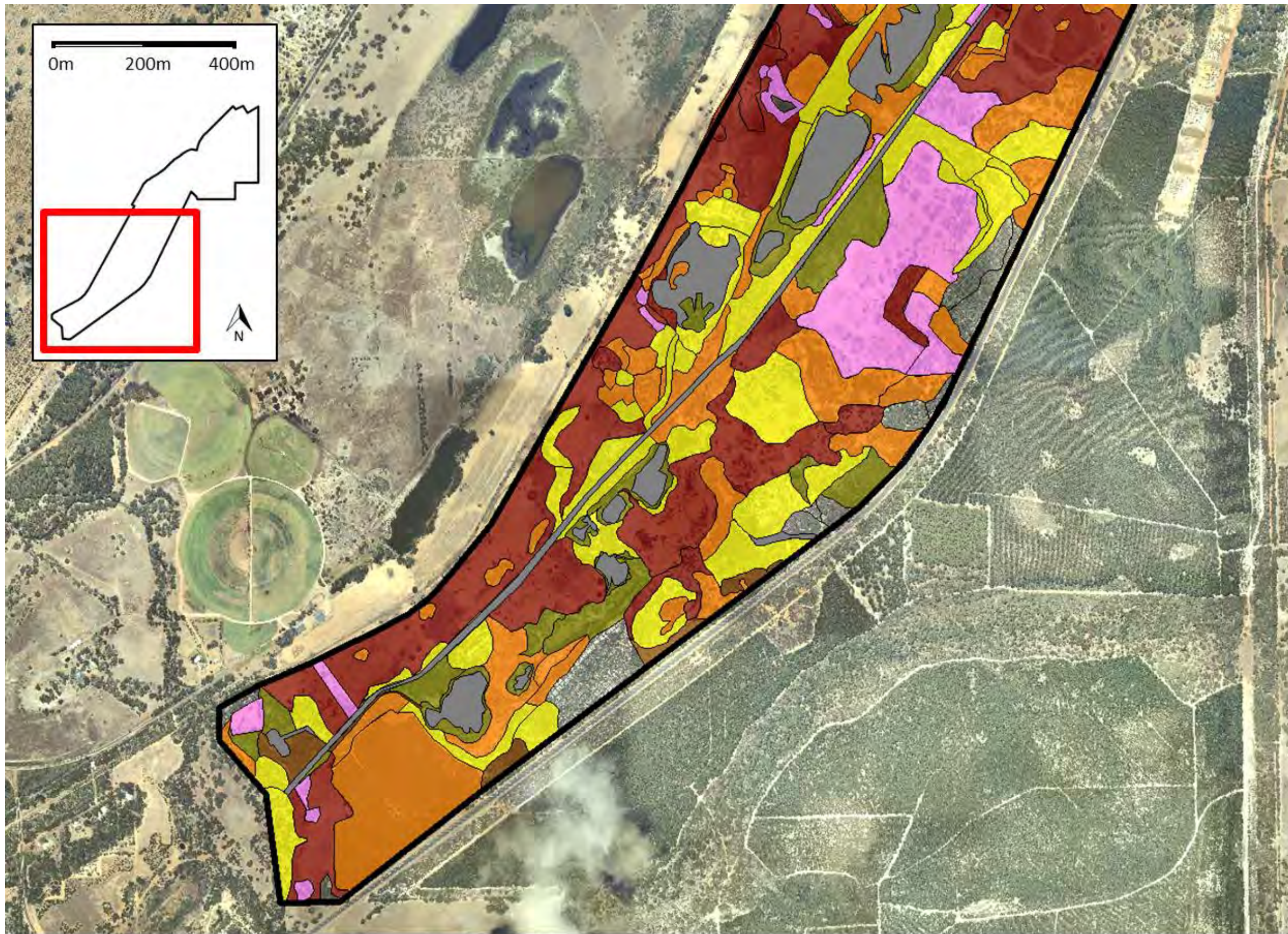


FIGURE 11a. Revegetation assessment map (Survey area: North).



REVEGETATION ASSESSMENT

 R1	 R2	 R3	 Not assessed	 Native vegetation areas (Not assessed)
 R1 – R2	 R2 – R3	 R3 – R4		

FIGURE 11b. Revegetation assessment map (Survey area: South).

### 5.2.2 Revegetation values

The revegetation values mapped and shown in Figure 11a and b are based on the criteria discussed in section 3.3.2.2. Any other values present in the revegetation in South Capel were not assessed.

Priority flora have been incorporated in some parts of the revegetation in the survey area and, while plantings of these rare flora can be of value, they are not considered in the opinion of the author, to have the values of natural populations of those taxa. Similarly revegetation stands would not have the value of rare vegetation stands in natural bushland. That is not to diminish an aspiration to replicate what are often complex natural vegetation stands.

Therefore the revegetation areas of SC PartA and SC PartB are not considered to currently have high conservation value.

## 5.3 Habitat values

### 5.3.1 *Lomandra hermaphrodita* occurrence: host plant of the Graceful Sun Moth

The Graceful Sun Moth (*Synemon gratiosa*, Family Castniidae) is endemic to Western Australia. It has been recorded between Leeman and Binningup (DEC, 2011) and is currently considered restricted to the Swan Coastal Plain. The Graceful Sun Moth is listed under the *Environment Protection and Biodiversity Conservation Act 1999* and is also currently listed on Schedule 1 (fauna that is rare or is likely to become extinct) of the *Western Australian Wildlife Conservation Act 1950*.

The Graceful Sun Moth is thought to breed exclusively on *Lomandra* species, probably *L. hermaphrodita*. Two known food plants for the Graceful Sun Moth are *Lomandra hermaphrodita* and *L. maritima* (McNamara 2009, cited on Department of the Environment, Water, Heritage and the Arts website). The Graceful Sun Moth is associated with two habitat types: coastal heathland on the Quindalup Dunes (where *L. maritima* is locally abundant); and Banksia woodland on the Spearwood and Bassendean Dunes (where *L. hermaphrodita* is widespread) (DEC, 2011).

*Lomandra hermaphrodita* plants were recorded only in remnant vegetation in the South Capel survey area. It was recorded at 4 quadrats in the southern part of SC PartB (quadrats CSBQ7, 8, 9 and 11) and one releve site in SC PartA (CAR1). It is likely to be scattered in areas of Jarrah-Banksia woodland in the survey area. *Lomandra maritima* was not recorded in the South Capel survey area.

### 5.3.2 Black Cockatoo

Three species of protected Black Cockatoo are known to occur on the Swan Coastal Plain and are likely to frequent the South Capel site, as some suitable habitat is present for foraging and potentially breeding of these species across both the native and revegetated areas of the South Capel site.

Carnaby's Cockatoo (*Calyptorhynchus latirostris*) is endemic to the south-west of Western Australia. This species is listed as Endangered under the Commonwealth

*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and listed as 'rare or likely to become extinct' under the *Western Australian Wildlife Conservation Act 1950*. Carnaby's forage on woodlands dominated by proteaceous species and pine plantations, and on the Swan Coastal Plain most nesting occurs in mature Tuart trees. The study site is within breeding range for the species.

The Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) and Baudin's Cockatoo (*Calyptorhynchus baudinii*) are listed as 'fauna that are rare or likely to become extinct' under the *Western Australian Wildlife Conservation Act 1950*, *Wildlife Conservation (Specially Protected Fauna) Notice 2010(2)* and as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*. Both species are known to breed in mature Eucalypt trees with suitable hollows. Similarly to Carnaby's, Baudin's Cockatoos forage in pine and woodlands dominated by proteaceous species. All three Black cockatoo species are also known to forage in Eucalypt woodlands.

Potentially significant vegetation for the three Black Cockatoo species at the study site includes areas of Banksia woodland (EmBa, EmBaAf, BaBiKg) and Eucalypt forest/ woodlands (Cc, CcEm, Em) in remnant areas. Also, isolated mature Eucalypt specimens located across the revegetation areas, in particular Tuart and Marri of more the 500mm diameter at breast height (considered to be of suitable diameter to develop a nest hollow) may offer potential breeding sites.

### 5.3.3 Western Ringtail Possum (WRP)

The Western Ringtail Possum (*Pseudocheirus occidentalis*), is listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and as 'fauna that is rare or likely to become extinct' under the *Western Australian Wildlife Conservation Act 1950*.

Western Ringtail Possums occur in and near coastal Peppermint Tree (*Agonis flexuosa*) forest and Tuart (*Eucalyptus gomphocephala*) dominated forest with a Peppermint Tree understorey and are known to occur in the Capel area.

Peppermint trees were recorded during the survey in the EmBaAf vegetation unit at the northern end of the eastern bushland, and at one location in the adjacent Mp vegetation unit. It is possible that this area represents suitable habitat for the WRP. Endemic has previously undertaken surveys in close proximity to this area, using infra-red cameras, trapping, scat and drey searches and spotlight searches, which did not reveal the presence of any WRPs (Endemic, Unpublished Report), however the EmBaAf vegetation unit was outside of the search area.

WRP prefer habitat with continuous interconnected canopy cover, as they prefer not to descend to the ground to traverse an area (arboreal species). The EmBaAf vegetation unit is an open woodland unit and therefore, while WRP may occur in the area, it is unlikely to represent prime WRP habitat.

Whilst some *Agonis* were recorded in revegetation on SC PartA it is unlikely that these would support a WRP population due to low canopy cover, immature plantings and scattered nature of Peppermints within the species mix.

## 6 FLORISTIC COMMUNITY TYPES (FCT'S), THREATENED ECOLOGICAL COMMUNITIES (TEC's) AND PRIORITY ECOLOGICAL COMMUNITIES (PEC's)

This section outlines the results of the floristic analysis conducted by Mr Ted Griffin using the 2012 South Capel survey data (thirteen quadrats) and the Gibson *et al.* (1994) Swan Coastal Plain data set. It is based on a report prepared by Mr Ted Griffin, which is attached in full in Appendix 8.

### 6.1 Floristic analysis

#### 6.1.1 Determination of Floristic Community Types (FCT)

Griffin concluded that the PATN nearest neighbour analysis results (Table 7) should be used rather than the dendrogram classification results (see Appendix 8). Many of the 2012 South Capel quadrats showed affinity to a number of FCTs (intermediate between FCTs). This is probably, in part, due to the subtle changes in habitat and soils in the survey area (little elevation difference between dampland and crest of low rises). A number of the quadrats were also in vegetation stands that appeared transitional between units (for example, included wetland species and dryland species, such as sites CSBQ6, CSBQ8 and CSBQ11).

The sites from the NSA set (2010/2011 quadrats) were found to have high dissimilarity with any SCP site. This is unsurprising given that these sites were found to be significantly altered and the low numbers of native species present.

Griffin concluded that the inferences for CSB and CS quadrats are modestly useful; some quite reasonable. However, for the NSA quadrats it was found to be almost speculative. These have therefore not been included in Table 7.

**Table 7. South Capel Floristic Community Types (FCTs) estimated from the PATN nearest neighbours analysis (NNB).**

Quadrat	NNB FCT	Status <sub>a</sub>	South Capel Vegetation Unit <sub>b</sub>
CSQ1	5		MpKg
CSQ2	5, ?12		Mr
CSBQ1	21c, 21a	PEC(3)	EmBaAf
CSBQ2	5		MpKg
CSBQ3	21b, 23a	PEC(3)	BaBiKg
CSBQ4	5		MpKg
CSBQ5	?12		Mr
CSBQ6	5, ?22	(?PEC(2))	MpKg
CSBQ7	21a		EmBa
CSBQ8	21b, 21a	PEC(3)	Em
CSBQ9	23a		BaBiKg
CSBQ10	23a, 21b	PEC(3)	EmBa
CSBQ11	21a		MpKg

*a* PEC: Priority Ecological Community. FCT21b (Priority3); FCT21c (Priority3); FCT22 (Priority2)

*b* See section 5.1 above; Figure 8a-e

The results can be generalized as follows:

- *Melaleuca raphiophylla* wetland vegetation unit (Mr): FCT12, 5
- *Melaleuca preissiana* wetland vegetation unit (MpKg): FCT5
- *Eucalyptus marginata* subsp. *marginata* (Jarrah)-*Banksia attenuata* woodlands on low rises (EmBa, EmBaAf): 21a, 21b, 21c, 23a
- *E. marginata* subsp. *marginata* and *Banksia* spp. lowland units (on margins of damplands; BaBiKg and Em): 21a, 21b, 23a

## 6.2 Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) in the South Capel survey area

The status of the South Capel vegetation sites based on the Floristic Community Types (FCTs), is shown in Table 7. Where a South Capel vegetation site showed affinity to one or more FCTs that were a PEC or TEC, that vegetation site was assigned the respective PEC/TEC status.

From Table 7 above and the listed generalised results, we can conclude that the dampland vegetation did not have any special vegetation rarity status and that the vegetation on the low rises and margins had PEC affinities (a measure of vegetation rarity). An exception to this generalization is the *Melaleuca preissiana* wetland area mapped as unit 'MpKg' around sites CBM4 and CSBQ6 (Figure 8b). It had some

unusual elements, such as the *Verticordia attenuata* low shrubland, and had an affinity to the lowland FCT22 (PEC2).

A number of mapped vegetation units, 'Cc', 'CcEm', 'ErMr', 'Kg' and 'Mp' were not sampled by detailed quadrats and therefore were not represented in the PATN analysis results. This is because, with one possible exception, they were in a 'Degraded' condition or small areas and not considered suitable for sampling. The 2010-2011 South Capel surveys sampled some of these units and it was hoped that analysis of those quadrats might assist with assigning FCTs. However, the results were not sufficiently robust to be useful (Appendix 8). Nevertheless, an FCT has been assigned to all but one of these degraded vegetation units, through a process of inference (using species characteristic of particular FCTs and landforms and soils associated with FCTs). The vegetation mapping units and their FCT affinities are summarized in Table 8.

**Table 8. South Capel survey mapping units, Floristic Community Types and their status.**

Mapping unit	PATN FCT	Inferred FCT	PEC/TEC status	Comments
BaBiKg	21b, 23a		PEC(3) affinities	
Cc				Degraded; very small area.
CcEm		21a		Small areas.
Em	21b, 21a		PEC(3) affinities	
EmBa	23a, 21b, 21a		PEC(3) affinities	
EmBaAf	21c, 21a		PEC(3) affinities	
ErMr		11/13/14		'Degraded' (not suitable for a quadrat).
Kg		?5		'Good to Degraded' condition. Probably 'MpKg' vegetation before disturbance.
Mp		4 or 5		Similar unit to 'MpKg'
MpKg	5			Exceptions around CSBQ11 and CBM4 area with FCT22 affinities (PEC2).
Mr	12,5			



## 7 FLORA AND VEGETATION CONSERVATION VALUES IN THE SURVEY AREA

Flora and vegetation values in the South Capel survey area were assessed for regional significance (Table 9) using the criteria for determination of regional significance of natural areas set out in the EPA Guidance Statement No. 10 (EPA, 2006). The assessment was applied to vegetation in the three main component areas within the South Capel survey area (SC PartA, SC PartB – former processing area; SC PartB – eastern bushland).

The SC PartB – eastern bushland was assessed as being Regionally Significant, while the SC PartA area and SC PartB former processing area were found not to be Regionally Significant. The assessment is summarized as follows:

(i) SC PartA area: Not Regionally Significant.

Low to moderate values for 'rarity' in its small remnant areas and moderate values for linkages.

(ii) SC PartB – Former processing area: Not regionally significant.

The Southern River complex is not adequately reserved within the Shire of Capel nor represented within the conservation estate. However, overall the remnant vegetation within the former processing area is severely lacking and is not representative of the vegetation communities comprising the Southern River complex, based on a comparison of the species present with the community data from Gibson et al (1994).

The majority of the remnants were disturbed and ranged from 'Completely Degraded' to 'Good'. There were only a few areas rating as 'Good'. Some parts have the potential for regeneration with revised land management and rabbit control.

(iii) SC PartB – eastern bushland corridor: Regionally Significant for

'Representation of ecological communities' (< 30% of Southern River vegetation complex remains and only 1.5% in secure tenure (EPA, 2006));

'Rarity' (extremely high Rarity values, with three stands of a threatened species);

'General criteria for protection of wetland, streamline, estuarine' - Conservation category wetland.

The SC PartB – eastern bushland corridor was also assessed as having high values for 'diversity' and 'maintaining ecological processes' (especially linkages) and moderate to high wetland values for a wetland area that DEC has classified as 'Resource enhancement', but which has good native vegetation values.

**Table 9. Regional Significance Assessment: remnant vegetation in SouthCapel survey area**

Criterion	Comments		
	SC PartA- remnant/regrowth areas	SC PartB –former processing area	SC PartB – eastern bushland corridor
<b>(i) Representation of ecological communities</b>			
% Remnant vegetation remaining (Vegetation complexes)	(System6+part System 1: Southern River Complex: 19.8% of pre-1750 extent; 1.5% in secure tenure (EPA, 2006)). At northern extremity of Guilford Complex. One of few areas of FCT20c (Talbot Rd). Less than the objective to retain at least 30% (EPA, 2006).		
Floristic community types	Uncertain	Uncertain	Contains PEC uplands and marginal lowlands around wetlands.
Size and shape	Small areas	Small areas	Large contiguous area and contiguous with large area of bushland to east. (Greater than preferred lower size limit of 20ha (Urban Bushland Strategy)).
Vegetation condition	Mostly 'Good'.	Mostly 'Completely Degraded' or 'Degraded'. Some small areas 'Good'.	Some areas 'Good'. Mostly 'Excellent' 'Very Good'
Uplands and wetlands	Small areas; discontinuous	Small areas; discontinuous	Several sets of upland, wetland and transitional areas
Conclusion	Not Regionally significant for representation of ecological communities	Not Regionally significant for representation of ecological communities	Regionally significant for representation of ecological communities
<b>(ii) Diversity</b>			
Vegetation Complexes	One Complex, : Southern River Complex.		
FCT's	Few; small areas	Few; small areas	Probably 4 to 6 FCTs represented (5,12, 21a,21b,21c,23a)
Vegetation units	Small areas of 'Mr', 'MpKg', 'CcEm', 'Cc'	Largely unidentifiable. Small areas attributed to 'Mp', 'Kg' and 'Em' units.	10 vegetation units (upland, wetland units). Great variation within some vegetation units.
Flora	Moderate numbers of species in some of the small regrowth areas	Low species numbers	Moderate numbers of species; orchid rich
Conclusion	Low values for diversity.	Low values for diversity	High values for diversity

**Table 9(cont). Regional Significance Assessment: remnant vegetation in SouthCapel survey area**

Criterion	Comments		
	SC PartA- remnant/regrowth areas	SC PartB – Former processing area	SC PartB – eastern bushland corridor
<b>(iii) Rarity</b>			
Flora	Most of Priority flora in SC PartA were in revegetation areas (plantings). Some interesting <i>Lepidosperma</i> spp. sedges in remnants.	No DRF or priority flora identified. The extent and intensity of previous disturbance makes it highly improbable that any taxa have survived in this area.	3 stands of <i>Drakaea elastica</i> (T) recorded and further areas of potential habitat (areas of co-occurring <i>D. glyptodon</i> and <i>Paracaleana nigrita</i> adjacent to known occurrences of <i>Drakaea elastica</i> in neighbouring area). 1xP2, 2xP3, 2xP4, 2xRS species found in this area. Possibly a new <i>Stylidium</i> sp. Significant occurrence of <i>Verticordia attenuata</i> (P3).
Vegetation :PECs/TECs	Uncertain	Uncertain	Upland and marginal dampland vegetation has affinity to FCT21b (PEC(3)), FCT21c (PEC(3)) and area of 'MpKg' vegetation around CSBQ6 is variant with affinity to FCT22 (PEC(2)).
Conclusion:	Low to moderate values in remnants.	Low values.	Extremely high Rarity values. Regionally Significant for Rarity.
<b>(iv) Maintaining ecological processes</b>			
Linkage	SC PartB has important linkage values with large remnant bushland to east which forms part of a significant east-west linkage. Important linkage values of revegetation areas with another east-west linkage corridor to south of SC PartA and linkage to wetlands to west (including McCarleys Swamp).		
Size of areas in natural condition	Small areas of remnant.	Small areas of regenerating remnants.	Large continuous area and continuous with large area of bushland to east. (Greater than preferred lower size limit of 20ha (Urban Bushland Strategy).
Conclusion:	Moderate values for maintaining ecological processes	Low values for maintaining ecological processes	High values for maintaining ecological processes
<b>(v) Scientific or evolutionary importance</b>			
Conclusion:	Low values for scientific or evolutionary importance in all areas.		
<b>(vi) General criteria for protection of wetland, streamline, estuarine</b>			
Conservation category wetlands	No conservation category wetlands in area.	No conservation category wetlands in area.	Conservation category wetland in center of area (Figure 6). Main wetland area mapped as 'Resource enhancement', but has high natural values.
Creekline/river/estuary	None	None	None
Conclusion:	Low values	Low values.	Regionally significant - Conservation category wetland.

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# **SOUTH CAPEL FLORA AND VEGETATION ASSESSMENT**

## **APPENDICES**

## **APPENDIX ONE. The Department of Environment and Conservation Declared Rare Flora and Priority Flora Categories (from Smith, 2010)**

### **Threatened Flora (Declared Rare Flora) - Extant Taxa**

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

### **Threatened Flora (Declared Rare Flora) - Presumed Extinct Flora**

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

### **Priority One - Poorly Known Taxa.**

Taxa which are known from one or a few (generally  $< 5$ ) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

### **Priority Two - Poorly Known Taxa.**

Taxa which are known from one or a few (generally  $< 5$ ) populations, at least some of which are not believed to be under immediate threat (ie. not currently endangered). Such taxa are under consideration for declaration as "rare flora", but are in urgent need of further survey.

### **Priority Three - Poorly Known Taxa.**

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally  $> 5$ ), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further study.

### **Priority Four - Rare Taxa.**

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.



**APPENDIX TWO. Vegetation structural table of Trudgen based on Aplin's (1979) modification of Specht's classification**

Life form and height of tallest stratum	Projective foliage cover of tallest stratum as %	Description
Trees over 30 metres	70 -100	High closed forest
	30 -70	High open forest
	10 - 30	high woodland
	2 -10	high open woodland
	under 2	Scattered tall trees
Trees 10 - 30 metres	70 -100	Closed forest
	30 -70	Open forest
	10 - 30	Woodland
	2 -10	Open woodland
	under 2	Scattered trees
Trees under 10 metres	70 -100	Low closed forest
	30 - 70	Low open forest
	10 - 30	Low woodland
	2 -10	Low open woodland
	under 2	Scattered low trees
Shrubs over 2 metres	70 - 100	Closed scrub
	30 - 70	Open scrub
	10 - 30	High shrubland
	2 -10	High open shrubland
	under 2	Scattered tall shrubs
Shrubs 1 - 2 metres	70 - 100	Closed heath
	30 - 70	Open heath
	10 - 30	Shrubland
	2 -10	Open shrubland
	under 2	Scattered shrubs
Shrubs under 1 metre	70 - 100	low closed heath
	30 - 70	low open heath
	10 - 30	low shrubland
	2 -10	Low open shrubland
	under 2	Low scattered shrubs
Herbs/Sedges/Grasses	70 - 100	Closed herb, sedge, grassland
	30 - 70	Herb, sedge, grassland
	10 - 30	Open herb, sedge, grassland
	2 -10	Very open herb, sedge, g'land
	under 2	Scattered herbs sedges, grasses

Grasslands then divided into:

Tussock grasslands (perennial tussock species, e.g. *Eragrostis* species);

Hummock grasslands (*Triodia* and *Plectrachne* species that form hummocks)

Curly spinifex grassland (*Plectrachne pungens*, which does not form hummocks) (follows J.S. Beard).

Annual tussock grassland (e.g. annual *Sorghum* species).

### **APPENDIX THREE. Vegetation condition scale and descriptions**

(from Keighery 1994, reproduced in Department of Environmental Protection 2000b)

**Pristine (1) :** Pristine or nearly so, no obvious signs of disturbance

**Excellent (2) :** Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.

**Very Good (3) :** Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

**Good (4) :** Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

**Degraded (5) :** Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

**Completely Degraded (6) :** The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

## APPENDIX FOUR. Flora list for the Capel South survey area

Notes:

1. Plant families are listed in alphabetical order within the main classification groups.
2. An asterisk (\*) beside the taxon name indicates an introduced species exotic to Western Australia (weed).
3. A double asterisk (\*\*) beside the taxon name indicates a revegetation (planting) species native to Australia, but not native to the survey area.
4. The 'status' column shows the conservation status of significant flora species on the list.  
T = Threatened (also Declared Rare Flora); P1 to P4 = Priority 1 to Priority 4 (see definitions in Appendix 1); RS = other regionally significant flora

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
<b>PTERIDOPHYTA (ferns)</b>				
<b>Class PTERIDOPSODA</b>				
DENNSTAEDTIACEAE				
Pteridium esculentum	X	X	Bracken	
<b>GYMNOSPERMAE</b>				
<b>Class CYCADOPSIDA (Cycads)</b>				
ZAMIACEAE				
Macrozamia riedlei	X	X	Zamia	
<b>Class PINOPSIDA (conifers)</b>				
CUPRESSACEAE				
**Callitris preissii	X		Rottneest Island Pine	
PINACEAE				
*Pinus pinaster	X			
PODOCARPACEAE				
Podocarpus drouynianus		X		
<b>ANGIOSPERMAE (flowering plants)</b>				
ANARTHRIACEAE				
Anarthria Gracilis		X		
Anarthria laevis		X		
Anarthria prolifera		X		
Anarthria scabra		X		
Lyginia barbata	X	X		
Lyginia imberbis		X		

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
APIACEAE				
Actinotus glomeratus		X		
Daucus glochidiatus	X	X		
Platysace filiformis		X		
Xanthosia huegelii		X		
APOCYNACEAE				
Alyxia buxifolia	X			
ARACEAE				
*Zantedeschia aethiopica	X	X	Arum lily	
ARALIACEAE				
Hydrocotyle callicarpa		X		
Trachymene pilosa	X	X		
ASPARAGACEAE				
*Asparagus asparagoides	X	X	Bridal Creeper	
Chamaescilla corymbosa var. corymbosa		X		
Lomandra caespitosa	X	X		
Lomandra hermaphrodita	X	X		
Lomandra nigricans		X		
Lomandra preissii		X		
Lomandra sericea		X		
Lomandra suaveolens		X		
Sowerbaea laxiflora	X	X		
Thysanotus manglesianus	X	X		
Thysanotus thyrsoideus	X	X		
ASTERACEAE				
*Arctotheca calendula	X	X	Capeweed	
Asteridea pulverulenta		X		
Brachyscome iberidifolia		X		
*Carduus pycnocephalus	X		Slender thistle	
*Cotula turbinata		X		
Craspedia variabilis	X	X		
*Dittrichia graveolens		X	Stinkwort	
*Hypochaeris glabra	X	X		
*Hypochaeris radicata		X	Flat weeds	
Lagenophora huegelii	X	X		

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
ASTERACEAE (cont)				
Millotia tenuifolia var. tenuifolia		X		
Podotheca angustifolia	X	X		
Quinetia urvillei		X		
Rhodanthe citrina	X	X		
Senecio quadridentatus	X			
Siloxerus humifusus	X			
*Soliva pterosperma		X	Bindii	
Sonchus asper		X		
*Sonchus oleraceus	X	X		
Trichocline spathulata		X		
*Tripteris clandestina		X	Stinking roger	
*Ursinia anthemoides	X	X		
*Vellereophyton dealbatum	X		Formerly Gnaphalium candidissimum	
Waitzia suaveolens var. suaveolens		X		
BORAGINACEAE				
*Echium plantagineum	X		Paterson's Curse	
BRASSICACEAE				
*Heliophila pusilla	X			
CAMPANULACEAE				
Lobelia anceps	X			
Lobelia rhytidosperma		X		
Lobelia tenuior		X		
*Wahlenbergia capensis	X	X		
Wahlenbergia preissii	X	X		
CARYOPHYLLACEAE				
*Cerastium glomeratum	X	X		
CASUARINACEAE				
Allocasuarina humilis	X			
**Casuarina equisetifolia	X			
Casuarina obesa	X		Salt Sheoak	
CENTROLEPIDACEAE				
Aphelia cyperoides	X	X		
Centrolepis aristata	X			

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
CENTROLEPIDACEAE (cont)				
Centrolepis drummondiana		X		
Centrolepis mutica	X			
COLCHICACEAE				
Burchardia congesta	X	X		
Burchardia umbellata		X	Milk maids	
COMMELINACEAE				
Cartonema philydroides	X			
CONVOLVULACEAE				
Cuscuta sp.		X		
*Cuscuta sp.		X		
CRASSULACEAE				
Crassula closiana	X	X		
Crassula colorata var. colorata	X	X		
CYPERACEAE				
Baumea articulata	X			
Baumea juncea	X			
**Baumea riparia	X			
Cyathochaeta avenacea	X			
Cyathochaeta teretifolia		X		<b>P3</b>
Ficinia nodosa	X			
Gahnia trifida	X			
*Isolepis marginata	X	X		
Isolepis oldfieldii		X		
Lepidosperma aff. calcicola	X			
Lepidosperma aff. obtusum	X			
Lepidosperma longitudinale	X	X		
Lepidosperma sp.	X	X		
Mesomelaena tetragona				
Schoenus subfascicularis	X			
Tetraria capillaris	X			
Tetraria octandra	X	X		
DASYPOGONACEAE				
Dasyogon bromeliifolius	X	X		

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
<b>DILLENACEAE</b>				
<i>Hibbertia cuneiformis</i>	X			
<i>Hibbertia hypericoides</i>	X	X		
<i>Hibbertia racemosa</i>	X	X		
<i>Hibbertia stellaris</i>		X		
<i>Hibbertia vaginata</i>	X	X		
<b>DROSERACEAE</b>				
<i>Drosera aff. macrantha</i>		X		
<i>Drosera erythrorhiza</i>	X	X		
<i>Drosera glanduligera</i>	X			
<i>Drosera menziesii</i> subsp. <i>penicillaris</i>	X	X		
<i>Drosera pallida</i>	X	X		
<i>Drosera parvula</i>		X		
<i>Drosera pulchella</i>	X			
<b>ELAEOCARPACEAE</b>				
<i>Platytheca galioides</i>		X		
<b>ERICACEAE</b>				
<i>Astroloma ?pallidum</i>		X		
<i>Brachyloma preissii</i>	X	X		
<i>Leucopogon australis</i>		X		
<i>Leucopogon capitellatus</i>	X			
<i>Leucopogon conostephioides</i>		X		
<i>Leucopogon cordatus</i>		X		
<i>Leucopogon glabellus</i>		X		
<i>Leucopogon oxycedrus</i>		X		
<i>Leucopogon polymorphus</i>		X		
<i>Leucopogon propinquus</i>		X		
<i>Lysinema ciliatum</i>		X	Curry flower	
<i>Lysinema pentapetalum</i>		X		
<b>EUPHORBIACEAE</b>				
<i>Amperea micrantha</i>		X		<b>P2</b>
<i>Monotaxis occidentalis</i>	X	X		
<b>FABACEAE</b>				
<i>Acacia acuminata</i>	X			
<i>Acacia alata</i> var. <i>alata</i>		X		
<i>Acacia cyclops</i>	X	X		
** <i>Acacia dealbata</i>	X			

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
**Acacia decurrens	X			
Acacia dentifera	X	X		
Acacia extensa	X			
*Acacia iteaphylla	X	X		
*Acacia longifolia subsp. longifolia	X	X		
*Acacia longifolia subsp. sophorae	X			
Acacia nervosa	X			
*Acacia paradoxa	X			
Acacia pulchella var. glaberrima	X	X		
Acacia pulchella var. pulchella	X			
**Acacia pycnantha	X			
Acacia rostellifera		X	Summer scented wattle	
Acacia saligna	X	X		
Acacia semitrullata		X		<b>P4</b>
Bossiaea eriocarpa		X		
Bossiaea sp. Waroona (B.J. Keighery & N. Gibson 229)	X			
Callistachys lanceolata		X	Native willow	
Daviesia angulata		X		
Daviesia decurrens		X		
Daviesia divaricata	X			
Daviesia inflata	X			
Daviesia physodes		X		
Dillwynia uncinata var. capel		X	Silky parrot pea	
Euchilopsis linearis		X		
Gastrolobium ebracteolatum		X		
Gastrolobium praemorsum	X			
Gompholobium capitatum		X		
Gompholobium tomentosum	X	X		
Hardenbergia comptoniana	X	X		
Hovea trisperma		X		
Jacksonia furcellata	X			
Jacksonia gracillima		X		<b>P3</b>
Jacksonia sternbergiana	X	X		
Kennedia prostrata	X	X		
*Lotus subbiflorus	X	X		
Mirbelia dilatata	X			
*Ornithopus compressus		X		
*Ornithopus sativus		X		



<b>FAMILY/TAXA</b>	<b>PART A</b>	<b>PART B</b>	<b>COMMON NAMES</b>	<b>STATUS</b>
FABACEAE (cont)				
Paraserianthes lophantha subsp. lophantha	X	X	Formerly Albizia lophanthe	
*Trifolium sp.		X		
Viminaria juncea	X			
GERANIACEAE				
*Erodium botrys	X	X		
*Erodium cicutarium		X	Common storksbill	
GOODENIACEAE				
Dampiera pedunculata		X		
Lechenaultia expansa	X			
Scaevola calliptera		X		
HAEMODORACEAE				
Conostylis aculeata subsp. aculeata	X	X		
Conostylis candicans subsp. calcicola	X			
Conostylis setigera		X	Bristly cottonhead	
Conostylis sp.		X		
Haemodorum simplex		X		
Phlebocarya ciliate		X		
HEMEROCALLIDACEAE				
Agrostocrinum hirsutum		X		
Agrostocrinum scabrum subsp. scabrum	X			
Arnocrinum preissii		X		
Caesia occidentalis		X		
Johnsonia acaulis		X		
Tricoryne elatior	X			
Tricoryne humilis		X		
HYPOXIDACEAE				
Hypoxis occidentalis var. quadriloba		X		
IRIDACEAE				
*Freesia sp.		X		
*Gladiolus sp.	X			
*Homeria flaccid		X	One leaf cape tulip	
*Moraea flaccida		X	Cape Tulip	
Patersonia occidentalis var. occidentalis	X	X		

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
IRIDACEAE (cont)				
* <i>Romulea rosea</i>		X	Guilford Grass	
JUNCACEAE				
<i>Juncus amabilis</i>	X			
* <i>Juncus articulatus</i>	X			
<i>Juncus kraussii</i> subsp. <i>australiensis</i>	X			
<i>Juncus pallidus</i>	X	X		
<i>Juncus subsecundus</i>		X	Finger rush	
JUNCAGINACEAE				
<i>Cycnogeton lineare</i>	X		Formerly <i>Triglochin lineare</i>	
<i>Triglochin striata</i>	X			
LAMIACEAE				
<i>Hemiandra pungens</i>	X	X		
LAURACEAE				
<i>Cassytha racemosa</i> forma <i>pilosa</i>		X		
LOGANIACEAE				
<i>Phyllangium divergens</i>	X	X		
<i>Phyllangium paradoxum</i>		X		
LORANTHACEAE				
<i>Nuytsia floribunda</i>	X	X	Christmas Tree	
MYRTACEAE				
<i>Agonis flexuosa</i>	X	X	Peppermint	
<i>Astartea affinis</i>	X	X		
<i>Astartea scoparia</i>	X	X		
<i>Baeckea camphorosmae</i>		X	Camphor myrtle	
<i>Beaufortia sparsa</i>		X	Swamp Bottlebrush	
<i>Callistemon glaucus</i>	X			
** <i>Callistemon phoeniceus</i>	X			
** <i>Calothamnus gilesii</i>	X			
** <i>Calothamnus graniticus</i> subsp. <i>graniticus</i>	X			P4
<i>Calothamnus lateralis</i>	X			
<i>Calothamnus quadrifidus</i>	X			
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	X			P4

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
MYRTACEAE (cont)				
**Calothamnus rupestris	X			<b>P4</b>
Calothamnus sanguineus	X			
Calytrix flavescens		X		
Calytrix fraseri	X	X		
Calytrix tenuiramea		X		
Calytrix tetragona		X	Common fringe-myrtle	
Corymbia calophylla	X	X	Marri	
Darwinia oederoides		X		
Eremaea pauciflora var. pauciflora		X		
**Eucalyptus botryooides	X		Southern Mahogany	
**Eucalyptus camaldulensis subsp. camaldulensis	X		River Red Gum	
**Eucalyptus camaldulensis subsp. obtusa	X		Northern River Red Gum	
**Eucalyptus conferruminata/lehmannii	X			
Eucalyptus cornuta	X		Yate	
Eucalyptus gomphocephala	X		Tuart	
**Eucalyptus leucoxylon	X			

Eucalyptus marginata subsp. marginata	X	X	Jarrah	
Eucalyptus patens	X		Blackbutt	
**Eucalyptus ?resinifera	X			
Eucalyptus rudis subsp. rudis	X	X	Flooded Gum	
**Eucalyptus rudis x camaldulensis	X			
Eucalyptus todtiana		X	Coastal blackbutt	
**Eucalyptus utilis	X		formerly E. platypus var. heterophylla	
Homalospermum firmum		X		
Hypocalymma angustifolium		X		
Hypocalymma ericifolium		X		
Hypocalymma robustum	X		Swan River Myrtle	
**Kunzea baxteri	X			
Kunzea glabrescens	X	X		
Kunzea micrantha	X			
Kunzea micrantha subsp. micrantha		X		
Kunzea recurva	X	X		
Kunzea rostrata	X	X		
*Leptospermum laevigatum	X		Victorian Tea-tree	

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
Melaleuca cuticularis	X		Saltwater Paperbark	
**Melaleuca hamulosa	X			
**Melaleuca huegelii subsp. huegelii	X		Chenille Honey Myrtle	
Melaleuca incana subsp. incana	X			
Melaleuca lanceolata	X		Rottneest Teatree	
Melaleuca lateritia	X	X	Robin Redbreast Bush	
**Melaleuca nesophila	X		Mindiyeed	
Melaleuca uncinata		X	Broom bush	
Melaleuca osullivanii	X			
Melaleuca preissiana	X	X	Modong	
**Melaleuca quinquenervia	X		Broad-leaved Paperbark	
Melaleuca raphiophylla	X	X	Swamp Paperbark	
Melaleuca systema	X			
Melaleuca teretifolia	X	X		
Melaleuca thymoides	X	X		
Melaleuca viminea subsp. viminea	X	X		
Pericalymma ellipticum	X	X		
Regelia ciliata	X			
Taxandria linearifolia	X			
Verticordia densiflora		X	Compacted featherflower	
Verticordia attenuata	X	X		<b>P3</b>
<b>ORCHIDACEAE</b>				
Caladenia attingens subsp. attingens	X	X	Forest mantis orchid	
Caladenia flava subsp. flava	X	X	Cowsip orchid	
Caladenia flava subsp. sylvestris		X		<b>RS</b>
Caladenia latifolia	X	X	Pink fairy orchid	
Caladenia marginata	X		White fairy orchid	
Caladenia speciosa		X		<b>P4</b>
Cryptostylis ovata	X	X	Slipper orchid	
Cyanicula gemmata		X	Blue china orchid	
Cyanicula sericea		X		
*Disa bracteata	X	X		
Diuris corymbosa		X	Common donkey orchid	
Diuris longifolia		X	Common donkey orchid	
Drakaea elastica		X	Glossy-leaved hammer orchid	<b>T</b>
Drakaea glyptodon		X		
Elythranthera brunonis	X	X	Purple enamel orchid	
Elythranthera emarginata		X	Pink enamel orchid	

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
multiflorus				
Leporella fimbriata	X	X	Hare orchid	
Lyperanthus serratus		X	Rattle Beak orchid	
Microtis media		X		
Microtis media subsp. media	X			
Microtis quadrata	X		formerly M. media subsp. quadrata	<b>P4</b>
Paracaleana nigrita		X	Flying Duck orchid	
Prasophyllum sp.		X	Leek orchid	
Pterostylis nana complex	X	X	Snail orchid	
Pterostylis recurva		X		
Pterostylis sanguinea		X		
Pterostylis vittata		X	Banded greenhood	
Pyrorchis nigricans	X	X	Red Beaks	
Thelymitra benthamiana	X			
Thelymitra crinita		X		
Thelymitra flexuosa	X	X		
Thelymitra paludosa	X	X		
Thelymitra vulgaris	X	X		
OROBANCHACEAE				
*Orobanche minor	X	X		
OXALIDACEAE				
*Oxalis corniculata		X		
*Oxalis glabra		X	Finger leaf oxalis	
*Oxalis purpurea		X		
PHYLLANTHACEAE				
Phyllanthus calycinus	X	X		
Poranthera microphylla	X	X		
PHYTOLACCACEAE				
*Phytolacca octandra		X	Red Ink plant	
PITTOSPORACEAE				
Billardiera laxiflora		X		
Marianthus drummondianus		X		
POACEAE				
*Aira caryophyllea		X		

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
POACEAE (cont)				
* <i>Aira cupaniana</i>	X	X		
* <i>Aira praecox</i>		X		
* <i>Anthoxanthum odoratum</i>	X			
<i>Aristida contorta</i>	X			
<i>Austrostipa compressa</i>	X	X		
<i>Austrostipa semibarbata</i>	X	X		
* <i>Avena barbata</i>	X			
* <i>Avena fatua</i>		X	Wild oats	
* <i>Briza maxima</i>	X	X	Blowfly grass	
* <i>Briza minor</i>	X	X		
* <i>Bromus diandrus</i>	X			
* <i>Cenchrus macrourus</i>		X	African feather grass (formerly <i>Pennisetum macrourum</i> ).	
* <i>Cynodon dactylon</i>	X	X	Couch	
* <i>Ehrharta longiflora</i>	X	X	Annual Veldt Grass	
* <i>Eragrostis curvula</i>		X	African love grass	
<i>Microlaena stipoides</i>	X	X		
<i>Neurachne alopecuroidea</i>	X	X		
* <i>Paspalum dilatatum</i>		X	Paspalum	
* <i>Pennisetum clandestinum</i>		X	Kikuyu	
* <i>Pennisetum macrourum</i>		X	African feather grass	
* <i>Pentameris airoides</i>	X		formerly * <i>Pentaschistis airoides</i> subsp. <i>airoides</i>	
* <i>Vulpia bromoides</i>	X	X		
* <i>Vulpia myuros</i> forma <i>myuros</i>	X	X		
POLYGALACEAE				
<i>Comesperma calymega</i>		X		
* <i>Polygala myrtifolia</i>	X			
POLYGONACEAE				
* <i>Acetosella vulgaris</i>		X		
<i>Muehlenbeckia adpressa</i>		X	Climbing lignum	
PRIMULACEAE				
* <i>Lysimachia arvensis</i>	X	X	Formerly <i>Anagallis arvensis</i>	
PROTEACEAE				
<i>Adenanthos meisneri</i>	X	X		
<i>Banksia attenuata</i>	X	X		

FAMILY/TAXA	PART A	PART B	COMMON NAMES	STATUS
PROTEACEA (cont)				
<i>Banksia grandis</i>	X	X		
<i>Banksia ilicifolia</i>		X		
<i>Banksia littoralis</i>		X	Swamp Banksia	
<i>Banksia menziesii</i>	X		Probably part of reveg?	
** <i>Banksia seminuda</i>	X		River Banksia	
<i>Conospermum teretifolium</i>		X		
<i>Dryandra lindleyana</i>		X	Couch honeypot	
<i>Grevillea manglesii</i> subsp. <i>manglesii</i>	X	X		
<i>Hakea amplexicaulis</i>	X			
<i>Hakea prostrata</i>	X			
<i>Persoonia longifolia</i>		X	Snottygobble	
<i>Petrophile linearis</i>		X		
<i>Stirlingia latifolia</i>	X	X		
<i>Synaphea hians</i>		X		<b>P3</b>
<i>Xylomelum occidentale</i>	X	X	Woody Pear	
RESTIONACEAE				
<i>Desmocladius fasciculatus</i>	X	X		
<i>Desmocladius flexuosus</i>	X	X		
<i>Hypolaena exsulca</i>	X	X		
<i>Meeboldina coangustata</i>		X		
<i>Meeboldina decipiens</i>	X			
<i>Meeboldina roycei</i>	X	X		
<i>Meeboldina ?thysanantha</i>	X			<b>P3</b>
RHAMNACEAE				
<i>Spyridium globulosum</i>	X			
RUBIACEAE				
* <i>Galium murale</i>	X	X		
<i>Opercularia hispidula</i>	X			
* <i>Sherardia arvensis</i>	X			
RUTACEAE				
<i>Boronia crenulata</i> subsp. <i>pubescens</i>		X		
<i>Boronia dichotoma</i>		X		
<i>Boronia fastigiata</i>		X		
<i>Boronia tetragona</i>		X		<b>P3</b>
<i>Philothea spicata</i>		X		

<b>FAMILY/TAXA</b>	<b>PART A</b>	<b>PART B</b>	<b>COMMON NAMES</b>	<b>STATUS</b>
SAPINDACEAE				
Dodonaea viscosa subsp. angustissima	X			
SOLANACEAE				
*Solanum nigrum	X		Blackberry Nightshade	
STYLIDIACEAE				
Levenhookia pusilla	X	X		
Levenhookia stipitata	X	X		
Stylidium androsaceum	X	X		
Stylidium araeophyllum	X	X		
Stylidium carnosum		X		
Stylidium paludicola		X		
Stylidium piliferum		X		
Stylidium repens		X		
Stylidium schoenoides		X		
Stylidium sp.		X		
TYPHACEAE				
*Typha orientalis	X		Bulrush	
URTICACEAE				
*Parietaria judaica		X		
VIOLACEAE				
Hybanthus floribundus subsp. floribundus		X		
XANTHORRHOEACEAE				
Xanthorrhoea brunonis	X	X		
Xanthorrhoea preissii	X	X		



**APPENDIX FIVE. Significant flora recorded in the South Capel survey**

<b>Taxon</b>	<b>Status<sub>a</sub></b>	<b>Easting</b>	<b>Northing</b>	<b>Number</b>	<b>Comments</b>
Drakaea elastica	T	364300	6283195	6	Near CSBQ11; Photo only BM663, 664, 665. CSBG113, CSBG114
Drakaea elastica	T	364314	6283363	10	Photo only BM667-669.CSBG115
Drakaea elastica	T	364293	6283207	5	CSBQ11
Drakaea elastica	T	364164	6283518	8	Glossy leaf (CSBG17; Photo532)
Amperea micrantha	P2	363939	6283332		CSBQ6-14
Boronia tetragona	P3	364277	6283518		CBR4-3
Cyathochaeta teretifolia	P3	364204	6284481		Near CBR2
Cyathochaeta teretifolia	P3	364218	6284477		CBR2-3B
Cyathochaeta teretifolia	P3	364204	6284572		CBR1
Jacksonia gracillima	P3	n/a	n/a		CSBG58 (Near CSBQ3)
Meeboldina ?thysanantha	P3	361856	6282633		CAM88-2
Synaphea hians	P3	363103	6283260		CBM15-14 (remnant west of Plant area; under powerlines).
Verticordia attenuata	P3	362320	6281815		CSAG18
Verticordia attenuata	P3	362358	6281872		CAM2-8
Verticordia attenuata	P3	362104	6281584		CAM3-3
Verticordia attenuata	P3	361625	6281333		CAM11-4
Verticordia attenuata	P3	361109	6280946		CAM50-6
Verticordia attenuata	P3	361268	6281533		CARM45-1
Verticordia attenuata	P3	363910	6283407		CBM4-1 (SC PartB)
Verticordia attenuata	P3	363939	6283332		CSBQ6-2 (SC PartB)
Verticordia attenuata	P3	362106	6281599		Reveg area: at CAM3B
Verticordia attenuata	P3	361783	6281010		CAM16
Verticordia attenuata	P3	361437	6281050		Reveg area: at CAM20
Verticordia attenuata	P3	361456	6281201		Reveg area: at CAM22
Verticordia attenuata	P3	361225	6281157		Reveg area: at CAM54
Verticordia attenuata	P3	360728	6280729		Reveg area: at CARM3
Verticordia attenuata	P3	361434	6281304		Reveg area: at CAM21
Verticordia attenuata	P3	361204	6280592		CAM28
Verticordia attenuata	P3	360903	6280553		Reveg area: at CAM39
Verticordia attenuata	P3	361371	6281366		Reveg area: at CAM55
Verticordia attenuata	P3	361485	6281431		Reveg area: at CAM56
Verticordia attenuata	P3	361588	6281555		Reveg area: at CAM57
Verticordia attenuata	P3	n/a	n/a		Reveg area: at CAM60
Acacia semitrullata	P4	363951	6283165	1	CSBG102 (near CBR9)
Acacia semitrullata	P4	364302	6283218	2	Near CSBQ11

Taxon	Status <sup>a</sup>	Easting	Northing	Number	Comments
<i>Acacia semitrullata</i>	P4	363103	6283260		CBM15-10 (remnant west of Plant area; under powerlines).
<i>Acacia semitrullata</i>	P4	364293	6283207	4	CSBQ11
<i>Acacia semitrullata</i>	P4	364157	6283540		CSBQ4-16
<i>Caladenia speciosa</i>	P4	363547	6282909	1	CSBG92
<i>Caladenia speciosa</i>	P4	363623	6282904	1	CSBG96
<i>Caladenia speciosa</i>	P4	364189	6283408	1	CSBQ10-10
<i>Calothamnus graniticus</i> subsp. <i>graniticus</i>	P4	362450	6283317		Reveg area: CAM87-2
<i>Calothamnus graniticus</i> subsp. <i>graniticus</i>	P4	362385	6283028		Reveg area: CARM74-1
<i>Calothamnus graniticus</i> subsp. <i>graniticus</i>	P4	362431	6283253		Reveg area: at CAM86
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	P4	360848	6280665		Reveg area: CARM14-4
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	P4	360848	6280665		Reveg area: CARM14-5
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	P4	361089	6281094		Reveg area: CARM16-2
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	P4	362198	6282276		Reveg area: CARM29a-1
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	P4	362823	6283485		Reveg area: CARM79-2
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i>	P4	362561	6283310		Reveg area: at CARM85
<i>Calothamnus rupestris</i>	P4	360285	6280407		Reveg area: CAM36-4
<i>Calothamnus rupestris</i>	P4	360262	6280253		Reveg area: CARM9-1
<i>Calothamnus rupestris</i>	P4	362704	6282695		Reveg area: CARM29-3
<i>Calothamnus rupestris</i>	P4	362160	6282788		Reveg area: CARM68-3
<i>Calothamnus rupestris</i>	P4	362385	6283028		Reveg area: CARM74-2
<i>Calothamnus rupestris</i>	P4	360818	6280549		Reveg area: at CAM38
<i>Calothamnus rupestris</i>	P4	360903	6280553		Reveg area: at CAM39
<i>Calothamnus rupestris</i>	P4	361612	6281627		Reveg area: at CAM58B
<i>Calothamnus rupestris</i>	P4	362610	6282931		Reveg area: at CAM78
<i>Calothamnus rupestris</i>	P4	363009	6283693		Reveg area: at CAM79
<i>Calothamnus rupestris</i>	P4	363032	6283692		Reveg area: at CAM80
<i>Calothamnus rupestris</i>	P4	362875	6283508		Reveg area: at CAM81
<i>Microtis quadrata</i>	P4	362252	6281703		CSG4; location approx.
<i>Microtis quadrata</i>	P4	n/a	n/a		CSAG17 (around CAM1)
<i>Microtis quadrata</i>	P4	362376	6281865		Reveg area: at CAM1
<i>Microtis quadrata</i>	P4	362104	6281584		Reveg area: at CAM3
<i>Microtis quadrata</i>	P4	362245	6281866		Reveg area: at CAM5
<i>Caladenia flava</i> subsp. <i>sylvestris</i>	RS	364206	6284429	6	Northern end of range; CSBG44

<sup>a</sup> T=threatened; P1 to P4 = Priority 1 to Priority 4; RS= other Regionally Significant flora

## APPENDIX SIX. Quadrat descriptions and species lists for the South Capel survey area

### (i) SOUTH CAPEL – PART A

#### South Capel Part A

**Described by** BRM **Site** CSQ1 **Date** 8/10/2012 **Type** Q **Uniformity** 10x10  
**Season**  
**Location** Part A  
**MGA Zone** 50 362274 mE 6281740 mN 115.515688 E -33.595072 S  
**Habitat** Broad flat plain.  
**Soil** Yellow sand with grey sand surface (mostly).  
**Rock Type**

**Vegetation** Melaleuca preissiana low open woodland over Kunzea glabrescens, Melaleuca viminea subsp. viminea, Astartea affinis closed scrub.

**Veg Condition** (BF) Very Good (low weed cover; quadrat on edge of old pine pltn (old cut stumps remain); appears to have been old disturbance of soil in area (old low mounding/remnant islands); unsure of changes in hydrology?)

**Fire Age** More than 10 years since fire.

**Notes** NB: some pine trees scattered in area; quite a lot of the area is Kunzea glab scrub (Mel preis doesn't occur throughout).

#### SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia pulchella var. pulchella	+		40	CSQ1-15	Acacia pulchella
Aira cupaniana	+		5	CSQ1-4	Aira
Arctotheca calendula	+		15		Cape weed
Astartea affinis	7		80-260	CSQ1-3	Astartea
Briza maxima	+		5(30)		Briza max
Caladenia flava subsp. flava	+		5	CSQ1-13	Caladenia flava
Crassula colorata var. colorata	+		2	CSQ1-21	Crassula
Disa bracteata	+		10	CSQ1-7	Weed orchid
Erodium botrys	+		6	CSQ1-22	Erodium
Galium murale	+		4	CSQ1-9	?Gallium
Gompholobium tomentosum	+		30		Gom tom
Hypochaeris glabra	+		5		Hypochaeris glabra
Kennedia prostrata	+		3		Kennedia prostrata (juv)
Kunzea glabrescens	60		400-600	CSQ1-1	Kunzea glabrescens
Levenhookia pusilla	+		3	CSQ1-11	Levenhookia
Lotus sp.	+		4	CSQ1-5	Trifolium (sterile)
Meeboldina roycei	+		90	CSQ1-8	Meeboldina
Melaleuca incana subsp. incana	0.5		230	CSQ1-26	Melaleuca cyl frts
Melaleuca preissiana	7		700		Melaleuca preissiana
Melaleuca viminea subsp. viminea	4		600	CSQ1-24	?Melaleuca viminea
Pentaschistis airoides subsp. airoides	+		12	CSQ1-18	Pentachistis
Phyllangium divergens	+		6	CSQ1-17	Phyllangium
Siloxerus humifusus	+			CSQ1-12	Calandrinia
Sowerbaea laxiflora	+		20	CSQ1-14	Sowerbayer laxiflora
Thelymitra flexuosa	+		30	CSQ1-16	Orchid narrow lf
Thelymitra vulgaris	+		25	CSQ1-2	Thelymitra narrow lf
Trachymene pilosa	+		4	(=CSAG14	Trachymene pilosa
Ursinia anthemoides	+		30		Ursinia
Vulpia myuros forma myuros	+		15	CSQ1-6	Vulpia
Wahlenbergia capensis	+		10	CSQ1-23	

**South Capel Part A**

**Described by** BRM **Date** 6/11/2012 **Site** CSQ2 **Type** Q **Uniformity** 10x10

**Season****Location** Part A**MGA Zone** 50 361725 mE 6280960 mN 115.509652 E -33.602034 S**Habitat** Shallow depression on plain.**Soil** (0-15cm) Grey sand.**Rock Type****Vegetation** Melaleuca raphiophylla low open forest over Astartea scoparia open scrub over Baumea juncea, Baumea articulata open sedgeland.**Veg Condition** (BF) Good (lot of disturbances around site (old pine plantation in surrounds; mining areas nearby); low weed cover)**Fire Age** More than 7 years since fire.**Notes** Elevation: 5m

Signs of old pine stumps in surrounding area with young regrowth (?10-15years) in those areas.

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia cyclops	1		180	CSQ2-10	Acacia long
Acacia pycnantha	1		350	CSQ2-15	Acacia pyr weed (3)
Aira cupaniana	+		15	CSQ2-7	Aira
Arctotheca calendula	+		10		Capeweed
Asparagus asparagoides	+		50		Bridle creeper
Astartea scoparia	35		190-270	(=	Astartea
Baumea articulata	6		45	CSQ2-1	Brumea artie
Baumea juncea	8-10		40	CSQ2-2	Lepidosperma
Briza maxima	+		30		Briza max
Cerastium glomeratum	+		10	CSQ2-13	Caryophyllaceae weed
Crassula closiana	+		3	CSQ2-6	Herb
Crassula colorata var. colorata	+		8	CSQ2-5	Crassula col
Galium murale	+		3	CSQ2-11	?Gallium (straggly aners grss???)
Hibbertia cuneiformis	1		70		Hibb cuneif
Hypochaeris glabra	+		1		Hypochaeris glabra
Kunzea glabrescens	1-3		330		Kunzea glab
Lepidosperma longitudinale	+		40	CSQ2-16	Lepidosperma long
Leucopogon capitellatus	+		15-30	CSQ2-3	Small shb Epacrid
Levenhookia stipitata	+		3		Levenhookia stip
Lysimachia arvensis	+		10		Anagallis arv
Meeboldina roycei	+		90-100	CSQ2-14	Meeboldina (?=CAM18-2)
Melaleuca raphiophylla	60		600	CSQ2-9	Melaleuca raph
Poranthera microphylla	+		3	(=	Poranthera mic
Regelia ciliata	1-2		190	CSQ2-8	Regelia
Rhodanthe citrina	+		5	CSQ2-4	Ylw daisy
Solanum nigrum	+		30	CSQ2-12	Solanum
Sonchus oleraceus	+		4		Sonchus olerac
Thysanotus manglesianus/patersonii	+		30		Thys mang/pat
Trachymene pilosa	+		10		Trachymene pilosa
Ursinia anthemoides	+		25		Ursinia

**(ii) SOUTH CAPEL – PART B (2012 data)****South Capel Part B**

Described by BRM

Date 9/10/2012 Site CSBQ1 Type Q

10x10

Season

Uniformity

Location Part B

MGA Zone 50 364256 mE 6284286 mN 115.537430 E -33.572370 S

Habitat Gentle, north facing, mid slope of low dune.

Soil Yellow-brown sand over yellow sand (from ant mounds).

Rock Type

Vegetation Eucalyptus marginata subsp. marginata (Jarrah) open woodland over Banksia attenuata, Agonis flexuosa low open forest over Calytrix fraseri open shrubland over Hibbertia hypericoides low shrubland.

Veg Condition (BF) Very Good (low weed cover, but open fairly bare, weedy understorey suggesting past grazing. Also less native species than expected).

Fire Age More than 10 years since fire.

Notes

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Agonis flexuosa	9		430		Agonis flexuosa
Aira cupaniana	+		12	CSBQ1-13	Pentachistis
Arctotheca calendula	+		10		Capeweed
Austrostipa compressa	+		30	CSBQ1-18	Austrostipa (annual)
Austrostipa semibarbata	+		35	CSBQ1-15	Austrostipa
Banksia attenuata	35-40		800		Banksia attenuata
Briza maxima	+		15		Briza max
Burchardia congesta	+		45		Burchardia congesta
Caladenia flava subsp. flava	+		5		Caladenia flava
Calytrix fraseri	2-3		190	CSBQ1-1	Calytrix
Chamaescilla corymbosa var. corymbosa	+		10	CSBQ1-5	Chamaescilla corymbosa
Cotula turbinata	+		8	CSBQ1-11	Cotularia
Drosera erythrorhiza	+		2		Drosera erythrorhiza
Drosera pallida	+		130	CSBQ1-10	Drosera pallida
Elythranthera brunonis	+		35		Pple enamel orchid
Eriochilus dilatatus subsp. multiflorus	+		6	CSBQ1-27	Spade orchid
Eucalyptus marginata subsp. marginata	3-4		550		Jarrah regrowth (old dead trunk)
Hibbertia hypericoides	25		45		Hibbertia hyper
Hybanthus floribundus subsp. floribundus	+		20	CSBQ1-21	Green herb /hybanthus
Hypochaeris glabra	+		2		Hypochaeris glabra
Kunzea glabrescens	4-5		450		Kunzea glabrescens
Levenhookia pusilla	+		5	CSBQ1-3	Levenhookia stipitata
Lomandra nigricans	+		30	CSBQ1-26	Lomandra hermaph
Lomandra suaveolens	+		20	CSBQ1-6	Lomandra
Lotus subbiflorus	+		10	CSBQ1-2	Lotus
Lysimachia arvensis	+		6		Anagallis arv blue
Macrozamia riedlei	+		20		Zamia (juv)
Microlaena stipoides	+		35	CSBQ1-24	Grass
Neurachne alopecuroidea	+		20	CSBQ1-9	Amphipogon
Ornithopus compressus				CSBQ1-14B	
Ornithopus sativus	+		30	CSBQ1-14A	Pea
Poranthera microphylla	+		4	CSBQ1-8	Herb
Pterostylis nana complex	+		15	CSBQ1-19	Pterostylis nana
Pterostylis recurva	+		20	CSBQ1-12	Pterostylis
Rhodanthe citrina	+		10	CSBQ1-7	Yellow fine lf daisy
Stylidium araeophyllum	+		3	CSBQ1-17	Stylidium striatum
Stylidium piliferum	+		2	CSBQ1-22	Stylid ?ciliatum
Thysanotus manglesianus	+		70	CSBQ1-16	Thysanotus pat/mang
Trachymene pilosa	+		6		Trachymene pilosa
Vulpia bromoides	+		15-20	CSBQ1-23	Vulpia
Waitzia suaveolens var. suaveolens	+		15	CSBQ1-4	Daisy

**South Capel Part B**

**Site** CSBQ2  
**Described by** BRM **Date** 9/10/2012 **Type** Q **Uniformity** 10x10  
**Season**  
**Location** Part B - bush  
**MGA Zone** 50 364277 mE 6284626 mN 115.537708 E -33.569307 S  
**Habitat** Flat (dampland) on plain.  
**Soil** Dark grey to black sand (humic).  
**Rock Type**  
**Vegetation** Melaleuca preisiana low open woodland over Kunzea glabrescens closed scrub over Astartea scoparia high open shrubland.  
**Veg Condition** (BF) ?Excellent (structure appears intact; ?hydrological impacts?)  
**Fire Age** More than 10 years since fire.  
**Notes** Caladenia flava just outside 10x10 quadrat.

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Agonis flexuosa	+		(20)150		Agonis flex
Aphelia cyperoides	+		3	CSBQ2-5	Centrolepis
Asparagus asparagoides	+		4	CSBQ2-11	?Bridle creeper (juv)
Astartea scoparia	5		300	CSBQ2-2	Astartea (5)
Boronia fastigiata	+		30	CSBQ2-9	Boronia
Dasyopogon bromeliifolius	+		15	CSBQ2-3	?Dasyopogon brom (grazed)
Drosera pallida	+		120	CSBQ2-8	Drosera pallida
Eriochilus dilatatus subsp. multiflorus	+		6	CSBQ2-6	Spade lf orchid
Hypochaeris glabra	+		3		Hypochaeris glabra
Kunzea glabrescens	90		500	CSBQ2-12	Kunzea glab
Lotus sp.	+		6	CSBQ2-10	Acacia seedling
Melaleuca preisiana	5		550-700		Melaleuca preisiana
Pterostylis nana complex	+		10	CSBQ2-1	Pterostylis nana
Sonchus oleraceus	+		3		Sonchus
Trachymene pilosa	+		4	CSBQ2-7	Trachymene caeruleascens

**South Capel Part B**

**Site** CSBQ3  
**Described by** BRM **Date** 15/10/2012 **Type** Q **Uniformity** 10x10  
**Season**  
**Location** Part B  
**MGA Zone** 50 364266 mE 6283935 mN 115.537484 E -33.575536 S  
**Habitat** Very gently sloping, south facing, lower slope of low dune (on edge of dampland flat).  
**Soil** Grey sand.  
**Rock Type**  
**Vegetation** Banksia attenuata, Banksia illicifolia low woodland over Kunzea glabrescens high open shrubland over Calytrix fraseri, Eremaea pauciflora var. pauciflora, Leucopogon cordatus low shrubland.  
**Veg Condition** (BF) Excellent (low weed cover; little sign of disturbance)  
**Fire Age** More than 10 years since fire.  
**Notes** Elevation: 11m

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Aira cupaniana	+		6	CSBQ3-20	Pentachistis
Arctotheca calendula	+		12		Cape weed
Austrostipa compressa	+		30	CSBQ3-9	Austrostipa (annual)
Banksia attenuata	15		600		Banksia attenuata
Banksia illicifolia	6		700		Banksia illicifolia
Briza maxima	+		15		briza max
Burchardia congesta	+		70	CSBQ3-5	Burchardia congesta
Caladenia flava subsp. flava	+		10	CSBQ3-8	Caladenia flava (also sited flrg specimen)
Calytrix flavescens	+		20	CSBQ3-28	Calytrix flavesc
Calytrix fraseri	13		120	CSBQ3-1	Calytrix (+6% dead cover)
Centrolepis drummondiana	+		3	CSBQ3-26	Centrolepis
Chamaescilla corymbosa var. corymbosa	+		10	CSBQ3-6	Chamaescilla
Comesperma calymega	+		15	CSBQ3-23	Comesperma

<i>Cotula turbinata</i>	+	6	CSBQ3-33	<i>Colutia</i>
<i>Crassula colorata</i> var. <i>colorata</i>	+	6	CSBQ3-25	<i>Crassula</i>
<i>Desmocladus flexuosus</i>	+	15	CSBQ3-15	<i>Desmocladus</i> ? <i>flex</i>
<i>Drosera menziesii</i> subsp. <i>penicillaris</i>	+	50	CSBQ3-14	<i>Drosera micrantha</i>
<i>Drosera parvula</i>	+	4	CSBQ3-30	<i>Drosera pygmaea</i>
<i>Eremaea pauciflora</i> var. <i>pauciflora</i>	1-2	70	CSBQ3-12	<i>Eremaea pauc</i>
<i>Erodium botrys</i>	+	5	CSBQ3-24	<i>Erodium</i>
<i>Hibbertia vaginata</i>	+	20	(=CBR3-4	<i>Hibbertia</i> ? <i>vag</i>
<i>Hypochaeris glabra</i>	+	1		<i>Hypochaeris glabra</i>
<i>Kunzea glabrescens</i>	8	430		<i>Kunzea glab</i>
<i>Leucopogon conostephioides</i>	+	20	CSBQ3-27	<i>Slyphelia</i> ??? (grazed)
<i>Leucopogon cordatus</i>	1-2	50	CSBQ3-3	<i>Leucopogon</i>
<i>Leucopogon polymorphus</i>	+	10	CSBQ3-11	? <i>Andersonia</i>
<i>Levenhookia pusilla</i>	+	3-4	CSBQ3-2	<i>Levenhookia stip</i>
<i>Lomandra caespitosa</i>	+	25	CSBQ3-10	<i>Lomandra caespitosa</i>
<i>Melaleuca thymoides</i>	+	130	(=CBR3-3	<i>Melaleuca thym</i>
<i>Millotia tenuifolia</i> var. <i>tenuifolia</i>	+	4	CSBQ3-32	<i>Millotia</i>
<i>Ornithopus compressus</i>	+	5	CSBQ3-29	<i>Lotus</i>
<i>Phyllangium divergens</i>	+	4	(=CSBG51	<i>Phyllangium</i>
<i>Podotheca angustifolia</i>	+	5	CSBQ3-22	<i>Podotheca</i>
<i>Poranthera microphylla</i>	+	2	CSBQ3-21	<i>Herb</i>
<i>Pyrorchis nigricans</i>	+	3	CSBQ3-17	<i>Pyrorchis nigricans</i> (lge lf)
<i>Rhodanthe citrina</i>	+	3	CSBQ3-13	<i>Ylw daisy</i>
<i>Sonchus oleraceus</i>	+	3-6		<i>Sonchus oleracea</i> (juv)
<i>Stirlingia latifolia</i>	+	60		<i>Stirlingia lat</i>
<i>Stylidium araeophyllum</i>	+	30	CSBQ3-18	<i>Stylid striat</i>
<i>Stylidium repens</i>	+	12	CSBQ3-7	<i>Stylidium repens</i>
<i>Thysanotus manglesianus</i>	+	170	CSBQ3-4	<i>Thys mang/pat</i>
<i>Trachymene pilosa</i>	+	4	CSBQ3-16	<i>Trachymene</i>
<i>Vulpia myuros</i> forma <i>myuros</i>	+	12	CSBQ3-19	<i>Vulpia</i>

## South Capel Part B

Described by BRM

Site CSBQ4

Date 15/10/2012 Type

Season

Uniformity

Location Part B

MGA Zone 50 364157 mE 6283540 mN 115.536250 E -33.579084 S

Habitat Flat (dampland) on plain.

Soil (0-15cm) Grey sand.

Rock Type

Vegetation *Melaleuca preissiana* low open woodland over *Kunzea glabrescens* closed scrub over *Melaleuca thymoides* scattered shrubs over *Hypocalymma angustifolium* low open shrubland over *Hypolaena exsulca* scattered sedges and *Dasypogon bromeliifolius* open herbland.

Veg Condition (BF) Excellent (low weed cover; structure intact; impacts on hydrology from mining??)

Fire Age More than 10 years since fire

Notes

### SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
<i>Acacia longifolia</i> subsp. <i>longifolia</i>	+		130	CSBQ4-19	<i>Acacia</i>
<i>Acacia semitrullata</i>	+		60	CSBQ4-16	<i>Acacia semistrulata</i> ???
<i>Acacia</i> sp.	+		2		<i>Acacia</i> juv (sterile)
<i>Aira cupaniana</i>	+		12	CSBQ4-11	<i>Aira</i>
<i>Aphelia cyperoides</i>	+		3	CSBQ4-10	<i>Aphelia</i>
<i>Arctotheca calendula</i>	+		12		<i>Capeweed</i>
<i>Arnocrinum preissii</i>	+		50	CSBQ4-26	<i>Stylid</i> <i>pauc/Agrostocrinum</i> ??
<i>Astartea scoparia</i>	+		140-170	CSBQ4-30	<i>Astartea</i>
<i>Caladenia flava</i> subsp. <i>flava</i>	+		20	CSBQ4-18	<i>Cowslip orchid</i>
<i>Centrolepis drummondiana</i>	+		3	CSBQ4-9	<i>Centrolepis</i>
<i>Dasypogon bromeliifolius</i>	11		30		<i>Dasypogon brom</i>
<i>Desmocladus flexuosus</i>	+		12	CSBQ4-15	<i>Desmocladus</i>
<i>Drosera pallida</i>	+		140	CSBQ4-5	<i>Drosera pallida</i>
<i>Eriochilus dilatatus</i> subsp. <i>multiflorus</i>	+		30	CSBQ4-13	<i>Spade lf orchid</i>
<i>Euchilopsis linearis</i>	+		50	CSBQ4-2	<i>E... pea</i>
<i>Hibbertia vaginata</i>	+		20	CSBQ4-3	<i>Hibbertia vag</i>
<i>Hydrocotyle callicarpa</i>	+		2	CSBQ4-20	<i>Hydrocotyl</i>
<i>Hypocalymma angustifolium</i>	4		40		<i>Hypocalymma angust</i>
<i>Hypochaeris glabra</i>	+		1		<i>Hypochaeris glab</i>

Hypolaena exsulca	0.5	30		Hypolaena exsulca
Kunzea glabrescens	80	600		Kunzea glab
Levenhookia stipitata	+	3	(=CSBQ3-2	Levenhookia stip
Lyginia imberbis	+	50	CSBQ4-27	Lyginia
Lysinema pentapetalum	+	130	CSBQ4-28	Lysinema
Melaleuca preissiana	7	300-700		Mel preis
Melaleuca thymoides	1-2	130-160	CSBQ4-4	Melaleuca thym
Patersonia occidentalis var. occidentalis	+	30	CSBQ4-29	Patersonia
Philotheca spicata	+	30	CSBQ4-7	Low shrub (Philotheca spic) (flrg just outside quadrat)????
Poranthera microphylla	+	4	(=CSBG50	Poranthera
Pterostylis nana complex	+	15-20	CSBQ4-22	Pterostylis nana
Pterostylis sanguinea	+	20	CSBQ4-1	Pterostylis ?nana
Sowerbaea laxiflora	+	25	CSBQ4-17	Terete leaf
Thelymitra flexuosa	+	30	CSBQ4-23	?Thelymitra
Thysanotus manglesianus	+	150	CSBQ4-24	Thysanotus mang/pat
Trachymene pilosa	+	6	CSBQ4-6	Trachymene pilosa
Xanthorrhoea preissii	1-2	90	CSBQ4-25	Xanthorrhoea preis (quite snappy, but 3 sill???)

### South Capel Part B

**Site** CSBQ5  
**Described by** BRM  
**Date** 16/10/2012 **Type** Q **Uniformity** 10X10  
**Season**  
**Location** Part B  
**MGA Zone** 50 363869 mE 6283250 mN 115.533103 E -33.581662 S  
**Habitat** Depression on plain.  
**Soil** Grey sand.  
**Rock Type**  
**Vegetation** Melaleuca teretifolia, Astartea scoparia closed scrub over Lepidosperma longitudinale open sedgeland.

**Veg Condition** (BF) Very Good (quite a lot of small grass weeds under scrub plus quite a lot of soil disturbance).

**Fire Age** Morethan 10 years since fire.

#### Notes

#### SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Aira caryophyllea	+		10	CSBQ5-7	Grass
Astartea scoparia	70-80		240	CSBQ5-4	Astartea
Cassytha racemosa	5-10		180	CSBQ5-2	Cassytha
Ehrharta longiflora	+		12	CSBQ5-9	Ehr long
Hypochaeris glabra	+		3		Hypochaeris glabra
Kunzea glabrescens	2-3		270-400		Kunzea glab
Lagenophora huegelii	+		6	CSBQ5-10	Lagenoflora huegelii
Lepidosperma longitudinale	20-30		70-160	CSBQ5-5	Lepidosperma long
Leucopogon australis	1		180	CSBQ5-8	Leucopogon aust
Levenhookia stipitata	+		2	(=	Levenhookia stip
Melaleuca lateritia	3-4		70	CSBQ5-3	Melaleuca ?lateritia
Melaleuca teretifolia	35-40		280-350	CSBQ5-1	Melaleuca teretifolia
Trachymene pilosa	+		2	CSBQ5-6	Trachymene

### South Capel Part B

**Site** CSBQ6  
**Described by** BRM  
**Date** 16/10/2012 **Type** Q **Uniformity** 10x10  
**Season**  
**Location** Part B  
**MGA Zone** 50 363939 mE 6283332 mN 115.533870 E -33.580932 S  
**Habitat** Flats (seasonal dampland) on plain.  
**Soil** Grey-brown sand.  
**Rock Type**  
**Vegetation** Melaleuca preissiana scattered low trees over Kunzea glabrescens high shrubland over Verticordia attenuata shrubland over Hypolaena exsulca very open sedgeland.

**Veg Condition** (BF) Excellent



**Fire Age** More than 10 years.

**Notes** Plants heavily grazed by kangaroos  
Elevation: 14m (-1.3)

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Adenanthos meisneri	+		3	CSBQ6-16	?Hakea (juv)
Amperea micrantha	+		6	CSBQ6-14	Herb
Austrostipa compressa	+		20	(=CBR6-3	Austrostipa
Boronia fastigiata	+		12	CSBQ6-13	?Boronia
Calytrix fraseri	+		35	CSBQ6-7	Calytrix
Centrolepis drummondiana	+		3	CSBQ6-10	Centrolepis
Conostylis sp.	+		12	CSBQ6-4	Conostylis/Phlebocarya
Disa bracteata	+		5	CSBQ6-18	Chamaescilla
Drosera parvula	+		3	CSBQ6-3	Drosera pygmy
Euchilopsis linearis	+		30	(=CSBQ4-	Euchilopsis (pea) orge flr
Hypochaeris glabra	+		1		Hypochaeris glabra
Hypolaena exsulca	9-10		45		Hypolaena exsulca
Johnsonia acaulis	+		6	CSBQ6-12	Johnsonia
Kunzea glabrescens	20		200-(500)	CSBQ6-1	Kunzea glab
Levenhookia stipitata	+		3	(=CSBQ3-	Levenhookia stip
Lomandra suaveolens	+		12	CSBQ6-17	Lomandra s
Lyginia imberbis	+		60	CSBQ6-9	Lyginia imberbis
Melaleuca preissiana	8		450		Melaleuca preis (but scattered in area)
Pericalymma ellipticum	+		70	CSBQ6-19	Leptospermum
Phyllangium divergens	+		4	(=CBSQ1-	Phyllangium
Styidium repens	+		5	CSBQ6-5	Styidium repens
Thysanotus manglesianus/patersonii	+		140		Thys mang/pat
Trachymene pilosa	+		10-12	(=CBR6-2	Trachymene
Ursinia anthemoides	+		20		Ursinia art
Verticordia attenuata	18-20		140	CSBQ6-2	?Verticordia
Vulpia bromoides	+		20	CSBQ6-6	Vulpia
Xanthosia huegelii	+		10	CSBQ6-15	Xanthosia

**South Capel Part B**

Described by	BRM	Date	17/10/2012	Site	CSBQ7	Type	Q	Uniformity	10x10
<b>Season</b>									
<b>Location</b>	Part B, southern block								
<b>MGA Zone</b>	50	363537	mE	6282895	mN	115.529472	E	-33.584821	S
<b>Habitat</b>	Crest of low rise (dune) on plain.								
<b>Soil</b>	Grey-brown sand over yellow sand (from ant mounds)								
<b>Rock Type</b>									
<b>Vegetation</b>	Eucalyptus marginata subsp. marginata (Jarrah) woodland over Banksia attenuata (Banksia grandis (not in quadrat)) low woodland over Kunzea glabrescens high open shrubland over Hibbertia hypericoides low shrubland.								

**Veg Condition** (BF) Very Good (moderate weed cover; ?Dieback in area; past grazing?)

**Fire Age** More than 7 to 10 years since fire.

**Notes**

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Arctotheca calendula	+		10		Capeweed
Astroloma ?pallidum	+		15	CSBQ7-34	Astroloma
Austrostipa compressa	+		20	CSBQ7-28	Austrostipa (annual)
Banksia attenuata	11-12		650		Banksia attenuata
Billardiera laxiflora	+		25	CSBQ7-15	Marianthus
Bossiaea eriocarpa	+		25		Bossiaea eriocarpa
Briza maxima	+		20		Briza max
Caladenia flava subsp. flava	+		12	CSBQ7-13	Pple enamel orchid? (base leaf only)
Caladenia latifolia	+		10	CSBQ7-24	?Orchid lf
Centrolepis drummondiana	+		3	CSBQ7-8	Centrolepis
Chamaescilla corymbosa var. corymbosa	+		4		Chamaescilla corym
Cotula turbinata	+		10	CSBQ7-12	Colutea
Craspedia variabilis	+		15	CSBQ7-19	Daisy weed
Crassula closiana	+		2	CSBQ7-22	Crassula nitens

Crassula colorata var. colorata	+	4	CSBQ7-6	Crassula colorata
Desmodium fasciculatum	+	5		Desmodium fasciculatum
Drosera erythrorhiza	+	1	CSBQ7-11	Drosera eryth
Drosera pallida	+	30	CSBQ7-33	Drosera pallida
Ehrharta longiflora	+	30		Ehrharta longiflora
Eriochilus dilatatus subsp. multiflorus	+	12	CSBQ7-18	Spade orchid
Eucalyptus marginata subsp. marginata	18-22	800-1100		Jarrah
Hardenbergia comptoniana	+	20		Hard camp
Hibbertia hypericoides	18-20	30-45		Hibbertia hyp
Hibbertia racemosa	+	6	CSBQ7-25	Hibbertia ?racemose
Hovea trisperma	+	10	CSBQ7-29	Hovea trisperma
Hypochaeris glabra	+/- 1	1		Hypochaeris glabra
Kennedia prostrata	+	5		Kennedia prostrata
Kunzea glabrescens	5	600		Kunzea glab
Lagenophora huegelii	+	5		Lagenophora hueg
Lepidosperma sp.	+	40	CSBQ7-27	Lepidosperma
Leucopogon propinquus	+	15	CSBQ7-17	Leucopogon propinquus??
Levenhookia pusilla	+	3	CSBQ7-1	Levenhookia stip
Lomandra caespitosa			CSBQ7-26B	
Lomandra hermaphrodita	+	30	CSBQ7-9	Lomandra hermaph
Lomandra nigricans	+	35	CSBQ7-26	Lomandra caespitose
Lomandra sericea	+	35	CSBQ7-10	Lomandra sericea
Millotia tenuifolia var. tenuifolia	+	4	CSBQ7-21	Millotia
Moraea flaccida	+	35	CSBQ7-7	Cape tulip
Ornithopus compressus	+	5	CSBQ7-30	?Lotus
Patersonia occidentalis var. occidentalis	+	12	CSBQ7-16	Patersonia occ
Pyrorchis nigricans	+	4		Pyrorchis nigricans
Romulea rosea	+	20		Romulea rosea
Sonchus oleraceus	+	15		Sonchus oleracea
Tetraria octandra	+	20	CSBQ7-14	Tetraria octandra
Thysanotus manglesianus/patersonii	+	5		Thysanotus mang/pat
Trachymene pilosa	+	12	CSBQ7-4	Trachymene
Trichocline spathulata	+	10	CSBQ7-23	Ptilotus mang
Tricoryne humilis	+	5	CSBQ7-31	Tricoryne
Ursinia anthemoides	+	25		Ursinia art
Wahlenbergia capensis	+	15	CSBQ7-2	Wahlenbergia capensis
Wahlenbergia preissii	+	20	CSBQ7-5	Wahlenbergia
Xanthosia huegelii	+	5	CSBQ7-32	Xanthosia
Zantedeschia aethiopica	+	6		Arum lily

## South Capel Part B

Described by BRM

Site CSBQ8  
Date 17/10/2012 Type Q

10x10

Season

Uniformity

Location Part B

MGA Zone 50 364157 mE 6283244 mN 115.536205 E -33.581753 S

Habitat Flat at base of low dune on plain.

Soil (0-15cm) Grey sand.

Rock Type

Vegetation Eucalyptus marginata subsp. marginata (Jarrah) woodland to open forest over Banksia attenuata, Banksia grandis (Melaleuca preissiana) low woodland over Kunzea glabrescens scattered tall shrubs over Hibbertia hypericoides low open shrubland over Anarthria scabra, Dasypogon bromeliifolius open herbland/sedgeland.

Veg Condition (BF) Excellent

Fire Age More than 10 years since fire

Notes Thick leaf litter.

### SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Anarthria scabra	22		30-55	CSBQ8-1	Sedge
Banksia attenuata	15		700-800		Banksia attenuata
Banksia grandis	3		280		Banksia grandis
Brachyloma preissii	+		10	CSBQ8-4	Epacrid
Briza maxima	+		20		Briza max
Caladenia flava subsp. flava	+		20	CSBQ8-3	Orchid (Cal ?flava)
Chamaescilla corymbosa	+		12		Chamaescilla corym
Dasypogon bromeliifolius	4		15-25		Dasypogon brom
Desmodium fasciculatum	+		10		Desmodium fasciculatum
Drosera erythrorhiza	+		1	CSBQ8-12	Drosera eryth

<i>Drosera pallida</i>	+	40	CSBQ8-8	<i>Drosera</i> climber
<i>Eriochilus dilatatus</i> subsp. <i>multiflorus</i>	+	15	CSBQ8-6	Orchid spade lf
<i>Eucalyptus marginata</i> subsp. <i>marginata</i>	50	1300-1400		Jarrah
<i>Hibbertia hypericoides</i>	5-6	30-55		Hib hyp
<i>Hibbertia racemosa</i>	+	25		<i>Hibbertia racemosa</i>
<i>Hibbertia vaginata</i>	+	20	CSBQ8-18	Hib vag
<i>Hovea trisperma</i>	+	12	CSBQ8-13	<i>Hovea trisperma</i>
<i>Hypochaeris glabra</i>	+	3		<i>Hypochaeris glab</i>
<i>Kunzea glabrescens</i>	+	120		<i>Kunzea glab</i>
<i>Lagenophora huegelii</i>	+	10		<i>Lagenophora hueg</i>
<i>Leucopogon propinquus</i>	+	35	CSBQ8-16	<i>Leucopogon propinquus</i>
<i>Lomandra hermaphrodita</i>	+	15	CSBQ8-7	<i>Lomandra hermaph</i>
<i>Lyginia barbata</i>	+	30	CSBQ8-2	<i>Lyginia imbirb</i>
<i>Melaleuca preissiana</i>	4	300		<i>Melaleuca preis</i>
<i>Monotaxis occidentalis</i>	+	5	CSBQ8-9	Herb
<i>Nuytsia floribunda</i>	1-2	350		<i>Nuytsia flor</i>
<i>Patersonia occidentalis</i> var. <i>occidentalis</i>	1-2	30	CSBQ8-11	<i>Patersonia occid</i>
<i>Petrophile linearis</i>	+	30		<i>Petrophile linearis</i>
<i>Platysace filiformis</i>	+	15	CSBQ8-15	<i>Platysace</i>
<i>Pterostylis sanguinea</i>	+	10	CSBQ8-10	<i>Pterostylis sang</i>
<i>Stirlingia latifolia</i>	3	60		<i>Stirlingia lat</i>
<i>Stylidium schoenoides</i>	+	15	CSBQ8-17	<i>Stylid ?schoenoides</i>
<i>Thelymitra paludosa</i>	+	30	CSBQ8-19	<i>Thelymitra</i>
<i>Trachymene pilosa</i>	+	6	CSBQ8-5	<i>Trachymene</i>
<i>Xanthorrhoea preissii</i>	3-4	90-160		<i>Xanthorrhoea preis</i>
<i>Xanthosia huegelii</i>	+	10	CSBQ8-14	<i>Xanthosia cil</i>

## South Capel Part B

Described by BRM

Site CSBQ9  
Date 17/10/2012 Type Q 10x10

Season

Uniformity

Location Part B

MGA Zone 50 364038 mE 6283412 mN 115.534948 E -33.580223 S

Habitat Very gentle, south facing slope of very low rise on plain.

Soil Grey sand.

Rock Type

Vegetation *Banksia attenuata*, *Banksia ilicifolia* low woodland over *Kunzea glabrescens* scattered tall shrubs over *Melaleuca thymoides*, *Calytrix fraseri*, *Eremaea pauciflora* var. *pauciflora* open heath over *Calytrix flavescens* low open shrubland.

Veg Condition (BF) Excellent?

Fire Age More than 10 years since fire.

Notes Recorded late in day, might have missed a few

Elevation: 16m(-1.3)

This was on northern edge of the *B. illic* unit (BQ3 is better example)

## SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
<i>Actinotus glomeratus</i>	+		10	CSBQ9-19	Apiaceae
<i>Aira cupaniana</i>	+		10	(=CSBQ4-	<i>Aira</i>
<i>Arctotheca calendula</i>	+		15		Capeweed
<i>Austrostipa compressa</i>	+		25-30	CSBQ9-3	<i>Austrostipa</i> (annual)
<i>Banksia attenuata</i>	11		500-700		<i>Banksia atten</i>
<i>Banksia ilicifolia</i>	2-3		450		<i>Banksia illic</i>
<i>Briza maxima</i>	+		10		<i>Briza max</i>
<i>Burchardia congesta</i>	+		40	CSBQ9-14	<i>Burchardia congesta</i>
<i>Caladenia flava</i> subsp. <i>flava</i>	+		5		<i>caladenia flava</i> (flrg)
<i>Calytrix flavescens</i>	5		25	(=CSBQ8-	<i>Calytrix flav</i>
<i>Calytrix fraseri</i>	10		120	CSBQ9-1	<i>Calytrix tall</i>
<i>Calytrix tenuiramea</i>	+		45	CSBQ9-18	Shrub
<i>Crassula colorata</i> var. <i>colorata</i>	+		3	CSBQ9-4	<i>Crassula col</i>
<i>Desmocladus flexuosus</i>	+		20	CSBQ9-20	<i>Desmocladus</i>
<i>Drosera pallida</i>	+		30	CSBQ9-6	<i>Drosera</i>
<i>Eremaea pauciflora</i> var. <i>pauciflora</i>	20		130	(=CSBQ3-	<i>Eremaea pauc</i>
<i>Gompholobium tomentosum</i>	+		30	CSBQ9-15	<i>Gom tom</i>
<i>Hibbertia racemosa</i>	+		10	CSBQ9-10	<i>Hibbertia racemosa</i>
<i>Hibbertia vaginata</i>	+		30	(=CSBQ8-18	<i>Hibbertia vag</i>
<i>Hypochaeris glabra</i>	+		2		<i>Hypochaeris glabra</i>
<i>Isolepis marginata</i>	+		3	CSBQ9-12	<i>Isolepis marg</i>

Jacksonia sternbergiana	+	130		Jacksonia stern
Kunzea glabrescens	1-2	(90)400		Kunzea glab
Leporella fimbriata	+	3	CSBQ9-2	Orchid
Levenhookia stipitata	+	3	(=	Levenhookia stip
Lomandra hermaphrodita	+	20	CSBQ9-16	Lomandra herm
Lyginia ?barbata	+	70	CSBQ9-8	Lyginia
Lysimachia arvensis	+	12		Anagallis arv (not flrg)
Melaleuca thymoides	1-2	190	(=	Mel thym
Millotia tenuifolia var. tenuifolia	+	6	CSBQ9-17	Millotia ten
Petrophile linearis	+	35		Petroph linearis
Phyllangium divergens	+	6	(=CSBQ3-	Phyllangium
Podotheca angustifolia	+	6	CSBQ9-13	Podotheca
Poranthera microphylla	+	3	CSBQ9-9	Crassula nutans
Quinetia urvillei	+	5	CSBQ9-5	Quinetia urv daisy
Rhodanthe citrina	+	6	(=CSBQ1-	Yellow daisy
Romulea rosea	+	10		Romulea rosea
Stirlingia latifolia	3-4	45		Stirlingia lat
Stylidium araeophyllum	+	2	CSBQ9-7	Stylid
Stylidium repens	+	10	(=CSBQ6-	stylid repens
Trachymene pilosa	+	10	CSBQ9-21	Trachymene
Ursinia anthemoides	+	25		Ursinia
Vulpia bromoides	+	12	CSBQ9-11	Vulpia

## South Capel Part B

Described by BRM

Site CSBQ10

Date 18/10/2012 Type Q

10x10

Season

Uniformity

Location Part B

MGA Zone 50 364189 mE 6283408 mN 115.536574 E -33.580278 S

Habitat Crest of low rise (dune) on plain.

Soil (0-15cm) Grey brown sand (over yellow sand (from ant mounds)).

Rock Type

Vegetation Eucalyptus marginata subsp. marginata (Jarrah) woodland (patchy) over Banksia attenuata, (Banksia grandis) low woodland over Kunzea glabrescens high open shrubland over Hibbertia hypericoides, Calytrix fraseri lomandra low open heath.

Veg Condition (BF) Very Good to Excellent (low weed cover, dieback in area)

Fire Age More than 10 years since fire.

Notes

### SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Aira cupaniana	+		15-20	CSBQ10-17	Aira
Arctotheca calendula	+		12		Capeweed
Austrostipa compressa	+		35	(=CSBQ9-	Austrostipa (annual)
Banksia attenuata	20		700	CSBQ10-13	Banksia atten
Banksia grandis	+		20		Banksia grandis (juv)
Briza maxima	+		30		Briza max
Burchardia congesta	+		20		Burchardia cong
Caladenia flava subsp. flava	+		5		Caladenia flava (flrg)
Caladenia speciosa	+		50	CSBQ10-10	Caladenia ?spic
Calytrix flavescens	+		15	(=CSBQ9-	Calytrix flavescens
Calytrix fraseri	1-2		35	CSBQ10-6	Calytrix
Chamaescilla corymbosa var. corymbosa	+		10		Chamaescilla corym
Desmocladius fasciculatus	+		15-30		Desmocladius fascic
Drosera erythrorhiza	+		1	CSBQ10-11	Drosera eryth
Drosera menziesii subsp. penicillaris	+		30	CSBQ10-9	Drosera macrantha (pk flr)
Ehrharta longiflora	+		15	CSBQ10-14	Ehrharta longiflora
Eucalyptus marginata subsp. marginata	15		1400		Jarrah
Gompholobium tomentosum	+		20		Gom tom
Hibbertia hypericoides	30		30-50	CSBQ10-21	Hib hyp
Hibbertia racemosa	+		15		Hibbertia racemosa
Hovea trisperma	+		4	CSBQ10-5	?Hovea trisperma
Hypochaeris glabra	+		2		Hypochaeris glabra
Kunzea glabrescens	3		300		Kunzea glab
Lagenophora huegelii	+		5	CSBQ10-12	Lagenophora heug
Levenhookia stipitata	+		3	(=	Levenhookia stip
Lomandra caespitosa	+		20	CSBQ10-3	Lomandra ?caes
Lomandra nigricans	+		20	CSBQ10-4	Lom ?nigricans

Lyginia barbata	+	35	(=CSBQ9-	Lyginia
Millotia tenuifolia	+	8	CSBQ10-16	Millotia
Nuytsia floribunda	+	20		Nuytsia flor (juv)
Ornithopus compressus	+	6	CSBQ10-15	Lotus
Patersonia occidentalis var. occidentalis	+	20		Patersonia occid
Phyllangium divergens	+	6	CSBQ10-8	Phyllangium paradoxum
Podotheca angustifolia	+	10	(=CSBQ9-	Podotheca
Poranthera microphylla	+	2	(=CSBQ3-	Poranthera mic
Pterostylis nana complex	+	5		Pterostylis ?nana (sterile)
Rhodanthe citrina	+	4	CSBQ10-19	Yellow daisy
Stirlingia latifolia	1	60	CSBQ10-22	Stirlingia lat
Stylidium araeophyllum	+	5	CSBQ10-7	Stylid ?striatum
Stylidium piliferum	+	2	CSBQ10-2	Stylid ciliate rosette
Thelymitra vulgaris	+	30	CSBQ10-18	Thelymitra narrow lf
Trachymene pilosa	+	10	CSBQ10-1	Trachymene
Wahlenbergia preissii	+	15	CSBQ10-20	Wahlenbergia

## South Capel Part B

Described by BRM

Site CSBQ11  
Date 18/10/2012 Type Q 10x10

Season

Uniformity

Location Part B

MGA Zone 50 364293 mE 6283207 mN 115.537664 E -33.582104 S

Habitat Very gentle, north facing slope on 'flat' on plain.

Soil Grey sand.

Rock Type

Vegetation Melaleuca preissiana sparsely scattered low trees over Kunzea glabrescens open scrub over Xanthorrhoea preissii open shrubland over Dasypogon bromeliifolius open herbland to herbland.

Veg Condition (BF) Excellent (low weed cover, structure probably intact)

Fire Age More than 10 years since fire

Notes

### SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia semitrullata	+		3		Acacia semitrel (juv) (4)
Acacia sp.	+		10	CSBQ11-17	Acacia (juv) (seedling)
Aira praecox	+		15	CSBQ11-13	?Vulpia
Arctotheca calendula	+		5		Capeweed
Austrostipa compressa	+		40	(=CSBQ9-	Austrostipa
Brachyloma preissii	+		8	(=CSBQ8-x1	Epacrid (juv)
Burchardia congesta	+		15		Burchardia congesta (not flrg)
Caladenia flava subsp. flava	+			CSBQ11-10	Orchid lf (?enamel orchid)
Calytrix flavescens	+		20	(=CSBQ9-	Calytrix flav
Chamaescilla corymbosa	+		5		Chamaescilla (sterile)
Cotula turbinata	+		12	CSBQ11-16	Colutea
Cyanicula sericea	+		4	CSBQ11-15	Basal lf ovate orchid (hry)
Dasypogon bromeliifolius	27-30		20	CSBQ11-26	Dasypogon brom
Drakaea elastica	+		30	CSBQ11-23	Drakee?? (x5)
Drosera erythrorhiza	+		1	(=CSBQ10-	Drosera eryth
Drosera pallida	+		20	CSBQ11-2	Drosera climber
Elythranthera brunonis	+		30		Pple enamel orchid
Eriochilus dilatatus subsp. multiflorus	+		10	CSBQ11-5	Spade lf orchid
Hibbertia hypericoides	+		30		Hib hypericoides
Hibbertia vaginata	+		15	CSBQ11-9	Hibbertia vag
Hypochaeris glabra	+		1		Hypochaeris glabra
Hypolaena exsulca	+		35	CSBQ11-21	Hypolaena exsulca
Kunzea glabrescens	50		650		Kunzea glab
Leucopogon glabellus	+		35	CSBQ11-20	?Acacia
Levenhookia stipitata	+		2	(=	Levenhookia stip
Lomandra caespitosa	+		35	CSBQ11-25	Lomandra ?micranth
Lomandra hermaphrodita	+		20	CSBQ11-6	Lomandra hermaph
Lotus subbiflorus	+		10	CSBQ11-24	Lotus #2
Lyginia barbata	+		30-45	(=CSBQ8-	Lyginia
Melaleuca preissiana	3-4				Mel preisiana
Melaleuca thymoides	+		320		Melaleuca thym

<i>Ornithopus compressus</i>	+	4	=CSBQ10-15 Lotus (?)
<i>Paracaleana nigrita</i>	+	15	Flying duck orchid
<i>Patersonia occidentalis</i> var. <i>occidentalis</i>	+	35	(=CSBQ8- Patersonia occid
<i>Philotheca spicata</i>	+	15	CSBQ11-11 Philotheca spicata
<i>Phyllangium divergens</i>	+	5	(=CSBQ10- Phyllangium
<i>Platytheca galioides</i>	+	10	CSBQ11-14 Platytheca (juv)
			(specimen from outside)
<i>Pterostylis nana</i> complex	+	20	CSBQ11-19 Pterostylis nana
<i>Stylidium araeophyllum</i>	+	30	CSBQ11-4 Stylid striatum
<i>Stylidium repens</i>	+	10	CSBQ11-7 Stylid repens
<i>Stylidium schoenoides</i>	+	15	CSBQ11-8 Stylid schoenoides
<i>Stylidium</i> sp.	+	2??	CSBQ11-27 Stylid ovate rosette
<i>Trachymene pilosa</i>	+	5	CSBQ11-1 Trachymene
<i>Xanthorrhoea preissii</i>	8-10	90-120	Xanth preis (easy snap)
<i>Xanthosia huegelii</i>	+	10	CSBQ11-3 Xanthosia

**(iii) SOUTH CAPEL – PART B (N. Siemons 2010 and 2011 data)**

**South Capel Part B**

<b>Described by</b>			<b>Date</b>	<b>Site</b>	<b>NSAQ2</b>	
<b>Season</b>					<b>Type Q</b>	10x10
<b>Location</b>					<b>Uniformity</b>	
<b>MGA Zone</b>	50	363404 mE	6283926 mN		115.528197 E	-33.575508 S

**SPECIES LIST:**

<b>Name</b>	<b>Cover</b>	<b>C Class</b>	<b>Height</b>	<b>Specimen</b>	<b>Notes</b>
Acacia longifolia					
Acacia pulchella					
Acacia saligna					
Agonis flexuosa					
Astartea scoparia					
Beaufortia elegans					
Drosera erythrorhiza subsp. erythrorhiza					
Hypocalymma angustifolium					
Lepidosperma longitudinale					
Lotus subbiflorus					
Melaleuca preissiana					
Melaleuca raphiophylla					
Melaleuca uncinata					
Oxalis glabra					
Paraserianthes lophantha					
Phlebocarya ciliata					
Regelia ciliata					
Viminaria juncea					
Zantedeschia aethiopica					

**South Capel Part B**

<b>Described by</b>			<b>Date</b>	<b>Site</b>	<b>NSAQ3</b>	
<b>Season</b>					<b>Type Q</b>	10x10
<b>Location</b>					<b>Uniformity</b>	
<b>MGA Zone</b>	50	363522 mE	6283987 mN		115.529478 E	-33.574973 S

**SPECIES LIST:**

<b>Name</b>	<b>Cover</b>	<b>C Class</b>	<b>Height</b>	<b>Specimen</b>	<b>Notes</b>
Acacia longifolia					
Agonis flexuosa					
Callistachys lanceolata					
Cenchrus macrourus					
Daviesia decurrens					
Eucalyptus rudis					
Hardenbergia comptoniana					
Hypocalymma angustifolium					
Kunzea glabrescens					
Kunzea micrantha					
Melaleuca incana					
Paraserianthes lophantha					
Pteridium esculentum					
Regelia ciliata					

**South Capel Part B**

<b>Described by</b>			<b>Date</b>	<b>Site</b>	<b>NSAQ4</b>	
<b>Season</b>					<b>Type Q</b>	10x10
<b>Location</b>					<b>Uniformity</b>	
<b>MGA Zone</b>	50	363818 mE	6283951 mN		115.532661 E	-33.575335 S

**SPECIES LIST:**

<b>Name</b>	<b>Cover</b>	<b>C Class</b>	<b>Height</b>	<b>Specimen</b>	<b>Notes</b>
Agonis flexuosa					
Astartea scoparia					
Caladenia flava subsp. flava					
Drakaea glyptodon					

Eucalyptus rudis  
 Kunzea glabrescens  
 Melaleuca incana  
 Melaleuca preissiana  
 Paraserianthes lophantha  
 Pteridium esculentum  
 Pterostylis nana complex  
 Pterostylis recurva  
 Pterostylis vittata  
 Regelia ciliata

**South Capel Part B**

<b>Described by</b>		<b>Date</b>	<b>Site</b>	NSAQ5	
<b>Season</b>				Type Q	10x10
<b>Location</b>				Uniformity	
<b>MGA Zone</b>	50	364202 mE	6283567 mN	115.536739 E	-33.578846 S

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia pulchella					
Arctotheca calendula					
Caladenia flava subsp. flava					
Hypocalymma angustifolium					
Kunzea glabrescens					
Kunzea micrantha					
Leptospermum erubescens					
Lomandra nigricans					
Melaleuca preissiana					
Pterostylis vittata					
Romulea rosea					
Trachymene pilosa					

**South Capel Part B**

<b>Described by</b>		<b>Date</b>	<b>Site</b>	NSAQ6	
<b>Season</b>				Type Q	10x10
<b>Location</b>				Uniformity	
<b>MGA Zone</b>	50	364096 mE	6283677 mN	115.535614 E	-33.577841 S

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia longifolia					
Arctotheca calendula					
Cenchrus macrourus					
Hypocalymma angustifolium					
Juncus pallidus					
Kunzea glabrescens					
Lagenophora huegelii					
Melaleuca preissiana					
Melaleuca uncinata					
Melaleuca viminalis					
Monoculus monstrosus					
Paraserianthes lophantha					
Phytolacca octandra					
Prasophyllum sp.					
Trachymene pilosa					
Zantedeschia aethiopica					



**South Capel Part B**

<b>Described by</b>		<b>Date</b>	<b>Site</b>	NSAQ7	
<b>Season</b>				Type Q	10x10
<b>Location</b>				Uniformity	
<b>MGA Zone</b>	50	363642 mE	6283061 mN	115.530629 E	-33.583337 S

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Arctotheca calendula					
Corymbia calophylla					
Dasyogon bromeliifolius					
Desmocladius fasciculatus					
Desmocladius flexuosus					
Drakaea glyptodon					
Drosera erythrorhiza subsp. erythrorhiza					
Eucalyptus marginata					
Hakea prostrata					
Hardenbergia comptoniana					
Hibbertia hypericoides					
Kennedia prostrata					
Kunzea glabrescens					
Lagenophora huegelii					
Microlaena stipoides					
Nuytsia floribunda					
Stylidium sp.					
Zantedeschia aethiopica					

**South Capel Part B**

<b>Described by</b>		<b>Date</b>	<b>Site</b>	NSAQ11	
<b>Season</b>				Type Q	10x10
<b>Location</b>				Uniformity	
<b>MGA Zone</b>	50	363274 mE	6282667 mN	115.526604 E	-33.586843 S

**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Agonis flexuosa					
Arctotheca calendula					
Asparagus asparagoides					
Avena fatua					
Caladenia flava subsp. flava					
Corymbia calophylla					
Desmocladius fasciculatus					
Desmocladius flexuosus					
Drosera erythrorhiza subsp. erythrorhiza					
Eucalyptus marginata					
Hardenbergia comptoniana					
Hibbertia hypericoides					
Hypocalymma angustifolium					
Kennedia prostrata					
Lagenophora huegelii					
Melaleuca incana					
Thysanotus manglesianus					
Trachymene pilosa					
Xanthorrhoea preissii					
Zantedeschia aethiopica					

**South Capel Part B****Described by****Season****Location****MGA Zone** 50 363297 **mE****Date**6282507 **mN****Site**

NSAQ12

**Type** Q**Uniformity**

10x10

115.526827 **E**-33.588288 **S****SPECIES LIST:**

<b>Name</b>	<b>Cover</b>	<b>C Class</b>	<b>Height</b>	<b>Specimen Notes</b>
Arctotheca calendula				
Banksia attenuata				
Banksia grandis				
Caladenia flava subsp. flava				
Chamaescilla corymbosa var. corymbosa				
Corymbia calophylla				
Drosera erythrorhiza subsp. erythrorhiza				
Drosera glanduligera				
Eucalyptus marginata				
Kunzea glabrescens				
Lagenophora huegelii				
Leptospermum laevigatum				
Ornithopus compressus				
Oxalis glabra				
Romulea rosea				
Ursinia anthemoides				
Zantedeschia aethiopica				

## APPENDIX SEVEN. Releve descriptions and species lists for the South Capel survey area

### APPENDIX SEVEN. Releve descriptions and species lists for the South Capel survey area

1/. Note: these site descriptions do not have a complete species list, but list representative species under 'Associated species'.

2/ An asterisk (\*) beside the taxon name indicates an introduced species exotic to Western Australia (weed).

3/ A double asterisk (\*\*) beside the taxon name indicates a revegetation (planting) species native to Australia, but not native to the survey area.

#### RELEVES: (i) SOUTH CAPEL PART A

##### South Capel Part A - Site CAR1

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM704

**AMG: Zone**50H 362327mE, 6281721mN (GDA94)

**Habitat:** Very gentle west facing slope on edge of flats

**Soil:** Yellow brown sand. Grey sand in parts.

**Vegetation:** *Corymbia calophylla* (Marri), *Eucalyptus marginata* subsp. *marginata* (Jarrah) low woodland over *Kunzea glabrescens* high shrubland to open scrub over *Hibbertia hypericoides* low open shrubland.

**Assoc. species:** *Lepidosperma* aff. *calcicola*, *Microlaena stipoides*, *Trachymene pilosa*, \**Hypochaeris glabra*, *Hibbertia cuneiformis*, *Xanthorrhoea brunonis*, \**Pinus pinaster*, \**Zantedeschia aethiopica* (Arum lily), \**Briza maxima*, *Pyrorchis nigricans*, *Drosera pallida*, *Dasyogon bromeliifolius*, *Stirlingia latifolia*, *Desmocladius fasciculatus*, *Caladenia flava* subsp. *flava*, *Thysanotus manglesianus/patersonii*, *Thysanotus thyrsoides*, *Neurachne alopecuroidea*, *Cryptostylis ovata*, *Leporella fimbriata*, *Chamaescilla corymbosa*, *Levenhookia stipitata*, *Tetraria octandra*, *Lomandra hermaphrodita*, *Lomandra caespitosa*, *Drosera menziesii* subsp. *penicillaris*, \**Briza minor*, \**Aira cupaniana*, \**Vulpia* sp., \**Ursinia anthemoides*, *Hardenbergia comptoniana*, *Stylidium androsaceum*, *Drosera erythrorhiza*, *Thelymitra benthamiana*, *Thelymitra paludosa*, *Cyathochaeta avenacea* (45cm), \**Ehrharta longiflora* (not much), *Pteridium esculentum* (Bracken), *Leschenaultia expansa*, *Kennedia prostrata*, *Lyginia barbata*, *Gompholobium tomentosum*, *Hibbertia vaginata*, \**Asparagus asparagoides* (Bridle creeper), *Hypocalymma robustum*, *Banksia grandis* (under pines south end), *Lagenophora huegelii*, *Banksia attenuata*, *Thysanotus manglesianus*, *Craspedia variabilis*, *Sowerbaea laxiflora*.

**Veg Condition** (BF): Good (mostly regrowth after cut pine plantation; lot of disturbance adjacent to track)

**Notes:** This area was not formerly mined. Old *Pinus* stumps in southern part of area – regrowth bush. 'Good' condition regrowth bush in old pine plantation (grey sand). Quite a few fallen trees.

#### RELEVES: (ii) SOUTH CAPEL PART B

##### South Capel Part B - Site CBR1

**Described by BM**      **Date** 9/10/2012

**Location:** Part B

**Photo:** BM521, 522

**AMG: Zone**50H 364204mE, 6284572mN (GDA94)

**Habitat:** Dampland on flat plain

**Soil:** Grey sand.

**Vegetation:** *Eucalyptus rudis* subsp. *rudis* scattered trees over *Melaleuca raphiophylla* low open forest over \**Arctotheca calendula* (Capeweed), \**Zantedeschia aethiopica* (Arum lily), \**Sonchus asper*, \**Cotula turbinata*, \**Cerastium glomeratum*, \**Ehrharta longiflora*, \**Galium murale* closed herbland/grassland of weeds.

**Assoc. species:** *Cyathochaeta teretifolia* (very few), \**Phytolacca octandra* (80cm), \*\**Paraserianthes lophantha* subsp. *lophantha*.

**Veg Condition (BF):** Degraded (high weed cover)

### South Capel Part B – Site CBR2

**Described by BM**      **Date** 9/10/2012

**Location:** Part B

**Photo:** BM523, 524

**AMG: Zone**50H 364218mE, 6284477mN (GDA94)

**Habitat:** Dampland on flats on plain.

**Soil:** Peaty Grey sand.

**Rock Type:**

**Vegetation:** *Melaleuca preissiana*, (*Agonis flexuosa*) low closed forest over *Astartea affinis* scattered shrubs over *Juncus pallida*, *Cyathochaeta teretifolia*, (*Lepidopsperma longitudinale*) sedgeland to closed sedgeland.

**Assoc. species:** *Melaleuca viminea* subsp. *viminea*, \**Ehrharta longiflora*, \**Hypochaeris glabra*, *Chamaescilla ?corymbosa*.

**Veg Condition (BF):** Good to Very Good (structure intact).

**Notes:** Transitions to CBM1 as go upslope (south)

1<sup>st</sup> transit: *Agonis flexuosa*, (*Melaleuca preissiana*) low closed forest over *Astartea* sp., *Beaufortia sparsa* scattered tall shrubs over *Cyathochaeta teretifolia* scattered sedges.

2<sup>nd</sup> transit (more upslope): *Corymbia calophylla* (Marri) scattered trees to open woodland over *Agonis flexuosa* (*Melaleuca preissiana*) low open forest over *Hypocalymma angustifolium* scattered low shrubs over \**Briza max*, *Dasyogon bromeliifolius*, \**Hypochaeris* grassland/herbland. Veg C= Good.

### South Capel Part B - Site CBR3

**Described by BM**      **Date** 15/10/2012

**Location:** Part B

**Photo:** BM581-583

**AMG: Zone**50H 364203mE, 6284018mN (GDA94)

**Habitat:** Gentle south facing lower slope of low dune

**Soil:** (0-15cm) Grey sand.

**Rock Type:** n.a.

**Vegetation:** *Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered trees over *Agonis flexuosa* low open forest over *Kunzea glabrescens* open scrub over *Melaleuca thymoides* scattered tall shrubs over *Hibbertia hypericoides* low open shrubland over *Dasyogon bromeliifolius* very open herbland.

**Assoc. species:** *Macrozamia riedlei* (*Zamia*), *Thysanotus manglesianus*, *Hovea trisperma*, *Petrophile linearis*, *Banksia grandis*, *Burchardia congesta*, *Bossiaea eriocarpa*, \**Hypochaeris* sp., *Trachymene pilosa*, *Stylidium schoenoides*, \**Ursinia anthemoides*, *Caladenia flava* subsp. *flava*, *Hardenbergia comptoniana*, *Levenhookia pusilla*, *Hibbertia vaginata*.

**Veg Condition (BF):** ?Excellent

**Fire Age:** No recent fire (more than 7 years since fire)

### South Capel Part B - Site CBR4

**Described by BM**      **Date** 16/10/2012

**Location:** Part B

**Photo:** BM605-608

**AMG:** Zone50 364277mE, 6283518mN (GDA94)

**Habitat:** Flat (seasonal dampland) on plain.

**Soil:** Grey sand.

**Rock Type:** n.a.

**Vegetation:** *Melaleuca preissiana*, *Nuytsia floribunda* scattered low trees over *Kunzea glabrescens* scattered tall shrubs to high open shrubland over *Xanthorrhoea preissii*, *Pericalymma ellipticum* scattered shrubs over *Hypocalymma ericifolium* (40-90cm), *Boronia tetragona* (quad stem, 40-50cm), *Hypocalymma angustifolium* low shrubland over *Dasypogon bromeliifolius* scattered herbs.

**Assoc. species:** *Darwinia oederoides*, *Trachymene pilosa*.

**Veg Condition (BF):** Excellent (low weed cover)

**Fire Age:** Greater than 7-10 years since fire (no recent fire)

### South Capel Part B - Site CBR5

**Described by BM**      **Date** 16/10/2012

**Location:** Part B

**Photo:** BM603, 604

**AMG:** Zone50 364331mE, 6283549mN (GDA94)

**Habitat:** Gentle, west facing lower slope of low dune.

**Soil:** Grey sand.

**Rock Type:** n.a.

**Vegetation:** *Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered trees over *Banksia ilicifolia*, *Nuytsia floribunda* scattered low trees over *Kunzea glabrescens* high shrubland over *Melaleuca thymoides* scattered shrubs over *Calytrix fraseri* scattered low shrubs over *Dasypogon bromeliifolius* open herbland.

**Assoc. species:** *Xanthorrhoea brunonis*, *Pyrorchis nigricans*, *Lyginia* sp.

**Veg Condition (BF):** Excellent (low weed cover)

**Fire Age:** More than 10 years since fire (no recent fire)

### South Capel Part B - Site CBR6

**Described by BM**      **Date** 16/10/2012

**Location:** Part B

**Photo:** BM619, 620

**AMG:** Zone50 363781mE, 6283403mN (GDA94)

**Habitat:** Crest of low dune.

**Soil:** Grey sand.

**Rock Type:** n.a.

**Vegetation:** *Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered trees over *Banksia attenuata*, (*Banksia ilicifolia*) low woodland over *Kunzea glabrescens* high open shrubland to high shrubland over *Macrozamia riedlei*, *Hibbertia racemosa* scattered low shrubs over \**Ursinia anthemoides*, \**Hypochaeris glabra*, *Asteridea pulverulenta*, *Trachymene pilosa* open herbland/grassland.

**Assoc. species:** *Austrostipa compressa*, *Stylidium araeophyllum*, \**Briza maxima*, *Levenhookia stipitata*, *Lagenophora huegelii*, *Pyrorchis nigricans*, *Caladenia flava*, *Agonis flexuosa* (Peppermint).

**Veg Condition (BF):** Good (appears to have lost understorey (?past grazing) but numerous species, including herbs, remain.)

**Fire Age:** More than 10 years since fire (no recent fire)

### South Capel Part B - Site CBR7

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM637-639

**AMG:** Zone50H 363563mE, 6283073mN (GDA94)

**Habitat:** Gentle, north facing slope of low rise on plain.

**Soil:** Yellow sand.

**Rock Type:** n.a.

**Vegetation:** *Eucalyptus marginata* subsp. *marginata* (Jarrah), *Corymbia calophylla* (Marri) open woodland over *Banksia attenuata*, (*Agonis flexuosa*) low woodland over *Kunzea glabrescens* high open shrubland over *Hibbertia hypericoides* scattered low shrubs to low open shrubland.

**Assoc. species:** *Trachymene pilosa*, *Lagenophora huegelii*, \**Hypochaeris glabra*, \**Briza maxima*, *Hardenbergia comptoniana*, \**Briza minor*, \**Arctotheca calendula* (Capeweed), *Kennedia prostrata*, *Thysanotus* sp., *Pyrorchis nigricans*, *Levenhookia stipitata*, *Banksia grandis*.

**Veg Condition** (BF): Good to Very Good (probably past grazing - unusually open understorey).

**Fire Age:** More than 10 years since fire (no recent fire)

### South Capel Part B - Site CBR8

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM644-646

**AMG:** Zone50 363860mE, 6282971mN (GDA94)

**Habitat:** Flat on broad plain.

**Soil:** Grey sand.

**Vegetation:** *Corymbia calophylla* (Marri, 15-16m) closed forest over *Kunzea glabrescens* scattered tall shrubs over *Xanthorrhoea preissii* scattered shrubs over \**Briza maxima*, \**Bromus diandrus*, *Dasyopogon bromeliifolius*, \**Ehrharta longiflora* grassland/herbland.

**Assoc. species:** \**Zantedeschia aethiopica* (Arum lily), *Acacia cyclops*, \**Asparagus asparagoides* (Bridle creeper), *Caladenia flava* subsp. *flava*, *Tetraria octandra*, *Conostylis aculeata* subsp. *aculeata*, *Jacksonia sternbergiana*, *Acacia cyclops* (400cm), *Caladenia latifolia*.

**Veg Condition** (BF): Good to Degraded.

### South Capel Part B - Site CBR9

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM648, 649

**AMG:** Zone50 363917mE, 6283173mN (GDA94)

**Habitat:** Seasonal dampland flat on plain.

**Soil:** Grey sand.

**Vegetation:** *Melaleuca preissiana* low closed forest over *Kunzea glabrescens* scattered tall shrubs over *Leucopogon australis*, *Astartea scoparia* open shrubland over *Meeboldina* sp. (15-20%, mostly dead) open sedgeland.

**Assoc. species:** *Trachymene pilosa*, \**Ehrharta longiflora*, \**Arctotheca calendula* (Capeweed), *Boronia dichotoma*, *Phyllangium paradoxum*, *Dampiera pedunculata*, *Levenhookia stipitata*.

**Veg Condition** (BF): Excellent.

### South Capel Part B - Site CBR10

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM650-652

**AMG:** Zone50 364026mE, 6283181mN (GDA94)

**Habitat:** Flat on plain.

**Soil:** Grey sand (over white sand (ant mounds)).

**Vegetation:** *Banksia attenuata*, *Banksia ilicifolia* low woodland over *Kunzea glabrescens* open scrub over *Melaleuca thymoides* scattered shrubs over *Macrozamia riedlei* (Zamia), *Hibbertia hypericoides*, *Hibbertia vaginata* scattered low shrubs over *Dasypogon bromeliifolius* (35-40%) herbland.

**Assoc. species:** *Nuytsia floribunda*, *Pyrorchis nigricans*, *Chamaescilla corymbosa*, *Drosera pallida*, *Calytrix flavescens*, *Persoonia longifolia* (Snotty gobbler) (400cm), *Philotheca spicata*, *Platytheca galioides*.

**Veg Condition (BF):** Very Good to Excellent (low weed cover).

### **South Capel Part B - Site CBR11**

**Described by BM**      **Date** 18/10/2012

**Location:** Part B

**Photo:** BM666

**AMG: Zone**50 364318mE, 6283356mN (GDA94)

**Habitat:** Crest of low sandy rise on plain.

**Soil:** Grey-brown sand.

**Vegetation:** *Banksia attenuata* low woodland over *Kunzea glabrescens* high open shrubland over *Melaleuca thymoides* scattered shrubs over *Hibbertia hypericoides* (9-10%), *Calytrix fraseri*, *Eremaea pauciflora* low shrubland.

**Assoc. species:**

**Veg Condition (BF):** Excellent (low weed cover)

**Fire Age:** More than 10 years since fire.

**Notes:** This unit similar to CSBQ10 but *Eucalyptus marginata* subsp. *marginata* (Jarrah) not present. Presence of *Calytrix* and *Eremaea* relates it to marginal dampland unit CSBQ3.

## MAPPING NOTES: (i) SOUTH CAPEL PART A

### South Capel Part A - Site CAM1

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM698

**AMG: Zone**50 362376mE, 6281865mN (GDA94)

**Habitat:**

**Soil:** Shallow yellow sand/clay

**Vegetation** (revegetation): \**Pinus pinaster* (mostly), *Agonis flexuosa* over *Kunzea glabrescens*, *Astartea scoparia*.

**Assoc. species:** \**Zantedeschia aethiopica* (Arum lily), \**Asparagus asparagoides* (Bridle creeper), *Caladenia attingens* subsp. *atingens*, *Caladenia flava* subsp. *flava*, *Microtis quadrata*, *Hibbertia cuneiformis*, *Trachymene pilosa*, *Daucus glochidiatus*.

**Reveg assessment:** R2 (mature vegetation, good cover, mostly exotics).

### South Capel Part A - Site CAM2

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM702 (Euc. rudis), 703 (Mel. vim scrub)

**AMG: Zone**50 362358mE, 6281872mN (GDA94)

**Soil:** Yellow brown clay.

**Vegetation** (revegetation): Mixed treatment including *Eucalyptus rudis* (patches), (\*\**Eucalyptus camaldulensis* subsp. *obtusata*) with areas of *Melaleuca viminea* subsp. *viminea* open shrubland to open scrub.

**Assoc. species:** \**Disa bracteata*, *Thelymitra vulgaris*, *Astartea scoparia*, *Trachymene pilosa*, \**Zantedeschia aethiopica* (Arum lily), *Daucus glochidiatus*, *Melaleuca raphiophylla*, \**Asparagus asparagoides* (Bridle creeper), *Kunzea* sp., *Kunzea recurva* (350cm), *Casuarina obesa*, *Agonis flexuosa*, *Verticordia attenuata*.

**Reveg assessment:** R2 to R3 (?) (exotic species and some native sp.; weed cover low to moderate (patchy), not many species, good cover; mostly good cover of ground).

### South Capel Part A - Site CAM3

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM709, 710

**AMG: Zone**50 362104mE, 6281584mN (GDA94)

**Soil:** Yellow sand

**Vegetation:** (revegetation/regrowth) *Corymbia calophylla* (Marri) low trees over *Kunzea glabrescens* tall shrubs over *Calothamnus* sp.

**Assoc. species:** *Acacia pulchella*, *Acacia saligna*, *Microtis quadrata*, *Brachyloma preissii*, *Thysanotus manglesianus/patersonii*, *Verticordia attenuata*, \**Wahlenbergia capensis*, \**Hypochaeris glabra*.

**Reveg assessment:** R2 to R1 (low weed cover; some native species, but only a few; mostly no structure; large open areas with no ground cover).

### South Capel Part A - Site CAM3B

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM711, 712

**AMG: Zone**50 362106mE, 6281599mN (GDA94)



**Vegetation** (revegetation): scattered *Eucalyptus gomphocephala* (Tuart) and *Agonis flexuosa* over *Kunzea glabrescens* high shrubland.

**Assoc. species:** *Banksia grandis*, \**Ursinia anthemoides*, \**Arctotheca calendula* (Capeweed), *Verticordia attenuata*

**Reveg assessment:** R2 (native reveg; large open areas with no ground cover (except old dead timber); low richness of native species; low weed cover).

#### South Capel Part A - Site CAM4

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM713, 714; BM718, 719

**AMG: Zone**50 362236mE, 6281714mN (GDA94)

**Habitat:** Old excavated area.

**Soil:** Yellow brown clay.

**Vegetation** (revegetation): *Melaleuca viminea* subsp. *viminea*, (*Kunzea glabrescens*) high shrubland over *Astartea* sp. open shrubland to shrubland.

**Assoc. species:** *Meeboldina roycei*, *Baumea juncea* (x1), *Thelymitra vulgaris*, *Drosera glanduligera*, \**Disa bracteata*, \**Echium plantagineum* (Paterson's Curse), \**Lotus subbiflorus*, \**Sherardia arvensis*.

**Reveg assessment:** R2 to R3 (R3? in well vegetated parts with some (few) native sp.; low weed cover. R2 in open areas on pit/dam floor (poor ground cover; few species; low weed cover)). (Photo, *Eucalyptus rudis*, *Kunzea glabrescens*, *Melaleuca viminea*, *Astartea* sp.)

#### South Capel Part A - Site CAM5

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM721

**AMG: Zone**50 362245mE, 6281866mN (GDA94)

**Habitat:** 'Wall' (high ground) around 'ponding area'.

**Soil:** (0-15cm) Yellow sand.

**Vegetation** (revegetation): *Melaleuca preissiana* low closed forest with *Kunzea glabrescens*, *Melaleuca viminea* subsp. *viminea* closed scrub around edges.

**Assoc. species:** \**Asparagus asparagoides* (Bridle creeper), *Microtis quadrata*, \**Zantedeschia aethiopica* (Arum lily), *Hibbertia cuneiformis*, *Trachymene pilosa*, \**Lysimachia arvensis*, *Eucalyptus rudis* (edges), *Caladenia flava* subsp. *flava*.

**Reveg assessment:** R3 (good ground cover; low species number; native species dominant).

#### South Capel Part A – Site CAM6

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM722-724, also 732 (Very Poor area)

**AMG: Zone**50 362152mE, 6281861mN (GDA94)

**Habitat:** Ex-mining area with elevated areas of yellow sand (60cm high) between excavated/?ponding areas.

**Soil:** Yellow-brown clay; yellow sand.

**Vegetation** (revegetation):

Elevated sandy parts: \**Ursinia anthemoides*., \**Aira* sp., \**Erodium* sp., \**Hypochaeris glabra*, \**Orobanche minor*, \**Arctotheca calendula* (Capeweed), very open herbland/grassland. NB: some parts have scattered *Kunzea glabrescens*, *Acacia saligna*.

Excavated areas: *Eucalyptus rudis*, *Acacia saligna*, *Kunzea glabrescens*, *Hibbertia cuneiformis*  
Assoc. sp.: *Levenhookia stipitata*, *Poranthera microphylla*, \**Arctotheca calendula* (Capeweed),

\**Hypochaeris* sp., \**Lysimachia arvensis*, \**Zantedeschia aethiopica* (Arum lily), \**Avena barbata*, \**Ehrharta longiflora*, \**Asparagus asparagoides* (Bridle creeper), \**Echium plantagineum* (Paterson's Curse), \**Heliophila pusilla*.

**Reveg assessment:**

Elevated area: R1 (high weed cover; poor ground cover; poor habitat; no/few natives)

Excavated area: R2 to R3 (some native species and reasonable cover; weed cover moderate; richness low; fairly open around trees).

**South Capel Part A - Site CAM6B**

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**AMG: Zone**50 362161mE, 6281933mN (GDA94)

**Habitat:** Excavated ('ponding?') area.

**Soil:** Yellow clay.

**Vegetation** (revegetation): *Eucalyptus rudis* scattered trees to open woodland over *Melaleuca viminea* subsp. *viminea*, *Acacia saligna* open scrub over *Hibbertia cuneiformis* scattered shrubs over \**Ehrharta longiflora*, \**Echium plantagineum* (Paterson's curse), \**Aira* sp. herbland/grassland.

**Reveg assessment:** R2 to R3

**South Capel Part A - Site CAM7**

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM725, 726

**AMG: Zone**50 362179mE, 6281989mN (GDA94)

**Habitat:** Man-made/modified drainage line and banks (including raised banks).

**Vegetation:**

Banks: *Corymbia calophylla* (Marri), *Eucalyptus marginata* subsp. *marginata* (Jarrah),

\*\**Eucalyptus camaldulensis* woodland over *Agonis flexuosa* (Peppermint) scattered low trees over *Kunzea glabrescens* high open shrubland.

Assoc sp.: *Trachymene* sp., \**Hypochaeris* sp., *Caladenia attingens* subsp. *attingens*, *Austrostipa* sp., *Macrozamia riedlei*, *Nuytsia floribunda*, *Hibbertia cuneiformis*, *Acacia cyclops*.

Drain: *Eucalyptus rudis* woodland over *Kunzea glabrescens* high shrubland over *Astartea* sp. shrubland.

Assoc sp.: \*\**Eucalyptus botryoides*, *Trachymene pilosa*, *Caladenia flava* subsp. *flava*, *Stylidium araeophyllum*, *Thysanotus manglesianus/patersonii*, *Tricoryne elatior*, \**Gladiolus* sp.

**Reveg assessment:**

Banks: R2 to R3 (good cover; low species number; some structure mix; low to moderate weed cover)

Drain: R2 to R3 (as above)

**South Capel Part A - Site CAM8**

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM730

**AMG: Zone**50 361945mE, 6281916mN (GDA94)

**Habitat:** Disturbed flat area with micro mounds.

**Soil:** Yellow brown clay.

**Vegetation** (revegetation): *Melaleuca viminea* subsp. *viminea* open to closed scrub over *Kunzea glabrescens*, *Astartea* sp. scattered shrubs (regrowth) over *Hibbertia cuneiformis* scattered low shrubs

over *\*Ursinia anthemoides*, *\*Lotus* sp., *\*Hypochaeris glabra*, *\*Briza minor*, *\*Galium murale*, *\*Lysimachia arvensis* open herbland/grassland

**Assoc. species:** *\*Aira* sp., *Trachymene pilosa*, *Meeboldina roycei*, *Eucalyptus rudis* (planted on edge and seeding), *Acacia saligna*, **\*\*Casuarina equisetifolia**, *Acacia pulchella*.

**Reveg assessment:** R3 (good cover; limited native sp., but high cover; low to moderate weed cover).

**Notes:** NB: Lot of *Melaleuca viminea* bush collapsed on ground (down for long time – long dead).

### South Capel Part A - Site CAM8B

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM735, 736

**Vegetation** (revegetation): *Eucalyptus rudis* scattered trees over *Acacia saligna*, *Melaleuca preissiana* low woodland over *Kunzea glabrescens* scattered tall shrubs over *Astartea* sp. closed heath.

**Reveg assessment:** R3 to R4 (low species richness; very good cover of native sp; low weed cover).

### South Capel Part A - Site CAM9

**Described by BM**      **Date** 19/10/2012

**Location:** Part A

**Photo:** BM733, 734

**AMG:** Zone50 362081mE, 6281728mN (GDA94)

**Habitat:** Large yellow sand stockpile (about 7m high)

**Soil:** Yellow sand

**Vegetation** (revegetation): *Acacia saligna* scattered tall shrubs

**Assoc. species:** *Hibbertia cuneiformis*

**Reveg assessment:** R1 (very few native sp; large open areas; no structure).

### South Capel Part A - Site CAM10

**Described by BM**      **Date** 20/10/2012

**Location:** Part A, at W Corp sheds.

**AMG:** Zone50 361709mE, 6281596mN (GDA94)

**Vegetation** (revegetation): plantings of **\*\*Eucalyptus botryoides** (15-16m), *Eucalyptus rudis*, *Eucalyptus gomphocephala* (Tuart), **\*\*Acacia pycnantha** (6m), **\*\*Eucalyptus leucoxylon**, *Paraserianthes lophantha* subsp. *lophantha* (250cm), with *Melaleuca viminea* subsp. *viminea*, *Acacia saligna*, *Agonis flexuosa*, with *Astartea* sp. scattered shrubs.

**Reveg assessment:** R2 (mixed planting; little structure; low percentage native species; moderate to high weed cover (mostly *\*Arctotheca calendula* (capeweed))); large open areas).

### South Capel Part A - Site CAM11

**Described by BM**      **Date** 20/10/201

**Location:** Part A

**Photo:** BM737, 738

**AMG:** Zone50 361625mE, 6281333mN (GDA94)

**Habitat:** Flat rehabilitated area

**Soil:** Yellow-brown clay

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart) low woodland over *Acacia saligna*, *Agonis flexuosa*, **\*\*Acacia acuminata** scattered low trees over *Melaleuca thymoides*, **\*\*Melaleuca hamulosa** open shrubland over *Verticordia attenuata* scattered low shrubs.

**Assoc. species:** *Pericalymma ellipticum* (juv), *Allocasuarina humilis*, *Levenhookia stipitata*, *\*Briza maxima*, *Kunzea recurva* (120), *Kunzea glabrescens*, *Acacia dentifera* (140cm), *Hibbertia cuneiformis*, *\*Arctotheca calendula* (capeweed), *Eucalyptus marginata* subsp. *marginata* (Jarrah).

**Reveg assessment:** R2 to R3 (Open areas R2) (has makings of basic structure – trees, low trees, shrubs; weed cover lower; low number of natives (missing top soil for herbs etc); signs of shallow rooting – 4m *Eucalyptus marginata* subsp. *marginata* (Jarrah) fallen over).

#### South Capel Part A - Site CAM12

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**Photo:** BM739, 740

**AMG: Zone**50 361773mE, 6281391mN (GDA94)

**Habitat:** Embankment and excavated drain.

**Soil:** Yellow-brown clay.

**Vegetation** (revegetation): \*\**Eucalyptus botryoides*, \*\**Melaleuca ?argentea.*, \*\**Acacia pycnantha*, \*\**Acacia acuminata*, *Corymbia calophylla* (Marri) (regrowth), *Kunzea glabrescens* (regrowth), with lower 'dry pit floor' plantings of \*\**Eucalyptus ?resinifera* (10m), \*\**Acacia decurrens*, \*\**Eucalyptus camaldulensis* subsp. *obtusata*, *Casuarina obesa*, *Acacia cyclops*, *Poranthera microphylla*, *Melaleuca cuticularis*.

**Reveg assessment:** Overall: R2 (mostly exotic plantings; poor structure; low weed cover; good canopy cover; tend to be mono plantings).

#### South Capel Part A - Site CAM13

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**Photo:** BM741, 742

**AMG: Zone**50 362004mE, 6281256mN (GDA94)

**Habitat:** Gentle north facing slope of low rise on plain.

**Soil:** Grey sand.

**Vegetation:** (regrowth in old cut *Pinus* plantation): *Corymbia calophylla* (Marri) (*\*Pinus pinaster*) closed forest over *Hibbertia cuneiformis* high open shrubland

**Assoc. species:** *\*Ehrharta longiflora*, *\*Asparagus asparagoides* (Bridle creeper), *\*Zantedeschia aethiopica* (Arum lily), *Agonis flexuosa*, *Hakea amplexicaulis*, *Banksia grandis*, *\*Briza maxima*, *\*Lysimachia arvensis*.

**Veg Condition** (BF): Good to Degraded (poor number of native species in regrowth; but dense cover).

#### South Capel Part A - Site CAM14

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**Photo:** BM743, 744

**AMG: Zone**50 361943mE, 6281130mN (GDA94)

**Habitat:** Flat to gentle, north-facing, slope.

**Soil:** (0-15) Yellow clayey sand.

**Vegetation** (Planting/revegetation in excavated area): *Eucalyptus gomphocephala* (Tuart), (*Corymbia calophylla* (Marri, regrowth), *Eucalyptus marginata* subsp. *marginata* (Jarrah) woodland over *Regelia ciliata*, *Kunzea glabrescens* open to closed scrub.

**Assoc. species:** *\*Disa bracteata*, *Pterostylis nana complex*, *\*Lotus* sp., *\*Hypochaeris* sp., *Agonis flexuosa*, *Gompholobium tomentosum*, *Banksia grandis*, *Melaleuca thymoides*, *Acacia pulchella*, *Acacia saligna* (350cm), *Drosera glanduligera*, *\*Vulpia* sp., *Acacia dentifera* (180cm), *Hakea amplexicaulis*.

**Reveg assessment:** R3 (very good cover; tree and shrub structure; some regeneration(?) of native sp (*Eucalyptus marginata* subsp. *marginata* (Jarrah), *Corymbia calophylla* (Marri), etc); little lower strata.

#### South Capel Part A - Site CAM15

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**Photo:** BM745, 746

**AMG: Zone**50 361799mE, 6281093mN (GDA94)

**Habitat:** Flat on plain (revegetated mining area?).

**Soil:** Yellow sand.

**Vegetation** (revegetation): \*\**Acacia pycnantha* low woodland over *Kunzea glabrescens*, *Regelia ciliata* open to closed scrub.

**Assoc. species:** *Gastrolobium praemorsum*, *Daviesia divaricata*, *Eucalyptus gomphocephala* (Tuart), \**Pinus pinaster*.

**Reveg assessment:** R2 to R3 (native species (except for dominant \*\**Acacia pycnantha*); low number native species; good cover; formerly pine plantation).

### South Capel Part A - Site CAM16

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**Photo:** BM747, 748

**AMG: Zone**50 361783mE, 6281010mN (GDA94)

**Habitat:** Gentle, south facing slope on plain.

**Soil:** Yellow sand.

**Vegetation** (Remnant with altered structure – upper storey trees gone (probably bush pushed over in past): \*\**Acacia pycnantha* low open woodland to low woodland over *Kunzea glabrescens* (regrowth) open shrubland over *Hibbertia hypericoides*, *Brachyloma preissii*, *Xanthorrhoea brunonis*, *Gastrolobium praemorsum*, *Adenanthos meisneri* low shrubland.

**Assoc. species:** *Caladenia flava* subsp. *flava*, *Trachymene pilosa*, \**Lysimachia arvensis*, *Verticordia attenuata*, *Conostylis aculeata* subsp. *aculeata*, *Desmocladus flexuosus*, *Hibbertia cuneiformis*, *Spyridium globulosum* (250cm), *Xylomelum occidentale* (Woody Pear)

**Veg Condition** (BF): Good (good number of remnant native species; loss of structure)

### South Capel Part A - Site CAM17

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**Photo:** BM751, 752

**AMG: Zone**50 361852mE, 6280992mN (GDA94)

**Habitat:** South facing slope of low rise.

**Soil:** Yellow sand.

**Vegetation** (Remnant regrowth bush after cut pine plantation): *Corymbia calophylla* (Marri), \*\**Acacia pycnantha* low open forest over *Hibbertia hypericoides*, *Xanthorrhoea brunonis* low shrubland.

**Assoc. species:** *Stylidium araeophyllum*, *Spyridium globulosum*, *Hibbertia cuneiformis*, *Hibbertia racemosa*, *Trachymene pilosa*, *Levenhookia stipitata*, *Tetraria capillaris*, *Bossiaea* sp. Waroona (B.J. Keighery & N. Gibson 229) (140cm), *Hardenbergia comptoniana*, *Caladenia flava*, *Thysanotus manglesianus/patersonii*, *Acacia nervosa* (20cm), *Acacia extensa* (60cm), *Lepidosperma* sp., *Brachyloma preissii*, *Gastrolobium praemorsum*.

### South Capel Part A - Site CAM18

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**Photo:** BM753-755

**AMG: Zone**50 361767mE, 6280977mN (GDA94)

**Habitat:** Flat on plain.

**Soil:** Grey sand.

**Vegetation:** *Melaleuca raphiophylla* low woodland over *Kunzea glabrescens* open scrub over *Astartea* sp. shrubland over *Baumea articulata*, *Meeboldina roycei* scattered sedges.

**Assoc. species:** \**Hypochaeris glabra*, *Hardenbergia comptoniana*, *Hibbertia cuneiformis*, \**Pinus pinaster*, \**Arctotheca calendula* (Capeweed), \*\**Acacia pycnantha*, \**Zantedeschia aethiopica* (Arum lily), *Cartonema philydroides*, *Acacia cyclops*.

**Note:** recorded near location of quadrat CSQ2.

**Vegetation condition (BF):** (?appears to be natural area) Good – Very Good (structure intact; low weed cover, but weedy (high cover) in outer parts of unit).

### **South Capel Part A - Site CAM19**

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**AMG: Zone50** 361512mE, 6281056mN (GDA94)

**Habitat:** Banks around depression in old mining landscape.

**Vegetation** (revegetation - mixed planting, with some regeneration): \*\**Eucalyptus* sp (eastern Australian exotic, 20m), \*\**Eucalyptus* sp 2, \*\**Acacia pycnantha*, *Corymbia calophylla* (Marri), \*\**Eucalyptus botryoides*, *Acacia cyclops*.

**Reveg assessment:** R2 (mostly mixed exotics; good upper canopy; no shrub layer; weed cover low).

### **South Capel Part A - Site CAM20**

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**Photo:** BM756

**AMG: Zone50** 361437mE, 6281050mN (GDA94)

**Habitat:** Flat post mining area.

**Soil:** Yellow brown clay.

**Vegetation** (revegetation): \*\**Eucalyptus botryoides*, *Casuarina obesa* low open woodland.

**Assoc. species:** *Verticordia attenuata*, *Kunzea glabrescens*, *Acacia saligna*

**Reveg assessment:** R1 (no complex structure; exotics and native species; large open ground areas).

### **South Capel Part A - Site CAM21**

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**AMG: Zone50** 361434mE, 6281304mN (GDA94)

**Habitat:** mining flats.

**Soil:** (0-10cm) Gravelly yellow clayey sand.

**Vegetation** (revegetation; possibly regrowth with invading weed acacia): \*\**Acacia pycnantha* scattered low trees over *Pericalymma ellipticum* heath (parts, with *Kunzea glabrescens* high shrubland in other parts) over *Verticordia attenuata* low shrubland).

**Reveg assessment:** R2 (poor native species diversity).

**Note:** Area of mixed vegetation.

### **South Capel Part A - Site CAM22**

**Described by BM**      **Date** 20/10/2012

**Location:** Part A

**AMG: Zone50** 361456mE, 6281201mN (GDA94)

**Habitat:** Depression on plain (after mining?).

**Soil:** Yellow-brown clay.

**Vegetation** (plantings/revegetation): *Melaleuca preissiana*, \*\**Melaleuca quinquenervia* (6-7m) over

*Melaleuca viminea* subsp. *viminea*, *Kunzea glabrescens* closed scrub.

**Assoc. species:** \*\**Eucalyptus utilis*, \*\**Eucalyptus botryoides*.

**Reveg assessment:** R2 to R3 (mostly introduced natives, but good cover).

**Note:** Very mixed revegetated area: *Verticordia attenuata* heath in parts and *Kunzea glabrescens* open heath in parts.

#### South Capel Part A - Site CAM23

**Described by BM**      **Date** 6/11/2012

**Location:** Part A

**Photo:** BM826, 827

**AMG: Zone**50 361683mE, 6280921mN (GDA94)

**Habitat:** Excavated depression.

**Soil:** Yellow brown clay.

**Vegetation** (revegetation): *Melaleuca viminea* subsp. *viminea* (600cm) open to closed scrub.

**Assoc. species:** *Melaleuca incana* subsp. *incana* (250cm), \**Disa bracteata*, *Astartea* sp. (very few).

**Reveg assessment:** R2 to R3 (mostly one native species (?not native to locality?) very few species, almost monoculture; poor structure/variation?; some habitat values and good cover).

**Notes:** Areas of CAM23 have scattered *Eucalyptus gomphocephala* (Tuart). In between/around areas of CAM23 on raised ground is *Kunzea glabrescens* shrubland (Poor to Good).

#### South Capel Part A - Site CAM23B

**Described by BM**      **Date** 6/11/2012

**Location:** Part A, small area between CAM23 and eastern fire break

**Photo:** BM

**AMG: Zone**50 361680mE, 6280861mN (GDA94)

**Habitat:** Flat on plain (higher ground than CAM23).

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart) scattered trees over *Acacia saligna* scattered low trees over *Hakea prostrata*, *Kunzea glabrescens*, *Regelia ciliata* closed scrub over *Melaleuca thymoides* scattered shrubs.

**Assoc. species:** *Corymbia calophylla* (Marri) (seedlings), *Kunzea rostrata* (60-120cm), *Conostylis candicans* subsp. *calcicola* (35cm), \**Leptospermum laevigatum* (Victorian Teatree).

**Reveg assessment:** R3 to R4 (good cover; local species; mixed structure; low weed cover).

#### South Capel Part A - Site CAM24

**Described by BM**      **Date** 6/11/2012

**Location:** Part A

**Photo:** BM828, 829

**AMG: Zone**50 361619mE, 6280819mN (GDA94)

**Habitat:** Plain.

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* subsp. *marginata* (Jarrah), *Corymbia calophylla* (Marri) open woodland over *Hakea prostrata*, *Regelia ciliata*, *Melaleuca thymoides*, *Acacia extensa* (210cm), *Kunzea glabrescens*, *Acacia dentifera* closed scrub.

**Assoc. species:** *Banksia grandis*, \**Pinus pinaster*, *Acacia pulchella*.

**Reveg assessment:** R3 to R4 (good cover; local species; mixed structure; low weed cover).

**Notes:** Revegetation age about 7-10 years?

#### South Capel Part A - Site CAM25

**Described by BM**      **Date** 6/11/2012

**Location:** Part A

**Photo:** BM830, 832

**AMG:** Zone50 361429mE, 6280803mN (GDA94)

**Habitat:** Undulating plain (after mining?).

**Vegetation** (revegetation): *Acacia saligna*, \*\**Acacia pycnantha* scattered low trees over *Kunzea glabrescens* scattered tall shrubs.

**Reveg assessment:** R1 (large open areas with high weed cover; exotic trees; very sparse native species).

#### **South Capel Part A - Site CAM26**

**Described by BM**      **Date** 6/11/2012

**Location:** Part A

**Photo:** BM833, 834

**AMG:** Zone50 361393mE, 6280731mN (GDA94)

**Habitat:** Excavated pit floor (1m deeper than surrounds).

**Soil:** Yellow brown clay.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart), *Corymbia calophylla* (Marri) (regrowth), \*\**Eucalyptus* sp. (exotic, not many) woodland over \*\**Acacia pycnantha* scattered low trees to low open woodland over *Melaleuca viminea* subsp. *viminea*, *Kunzea glabrescens* scattered tall shrubs over *Hibbertia cuneiformis* scattered shrubs.

**Reveg assessment:** R2 (very open understorey; low weed cover; very few species (including exotics)).

#### **South Capel Part A - Site CAM27**

**Described by BM**      **Date** 6/11/2012

**Location:** Part A

**Photo:** BM835, 836

**AMG:** Zone50 361183mE, 6280697mN (GDA94)

**Habitat:** Drainage line (man-made drain) with water body.

**Soil:** Mottled clay (with 'coffee rock' conglomerate pebbles).

**Vegetation** (revegetation): \*\**Eucalyptus botryoides*, *Casuarina obesa* (9m), \*\**Acacia pycnantha* low woodland over *Melaleuca incana* subsp. *incana* (400cm), \*\**Callistemon phoeniceus* (300-350) high shrubland to closed scrub (on edge of water body) over *Meeboldina roycei* sedgeland (on banks) with \**Typha orientalis* open sedgeland in water body.

**Assoc. species:** *Acacia extensa* (180cm).

**Reveg assessment:** R2 to R3 (good cover; a good structure; exotics).

#### **South Capel Part A - Site CAM27B**

**Described by BM**      **Date** 6/11/2012

**Location:** Part A

**Photo:** BM839, 840

**AMG:** Zone50 361018mE, 6280552mN (GDA94)

**Habitat:** Revegetation flats between dampland and water body/drain.

**Soil:** Yellow clayey sand with exposed conglomerate rock.

**Vegetation** (revegetation): *Casuarina obesa*, \*\**Melaleuca quinquenervia*, \*\**Eucalyptus conferruminata/lehmannii* (350-700cm) scattered low trees over \*\**Callitris preissi* (250-300), *Kunzea glabrescens*, \*\**Callistemon phoeniceus* open shrubland.

**Assoc. species:** \**Pinus* sp., *Thelymitra flexuosa*, \*\**Acacia pycnantha*, *Verticordia* sp.

**Reveg assessment:** R2 (very open; many exotic natives used; has low weed cover).

#### **South Capel Part A - Site CAM28**

**Described by BM**      **Date** 6/11/2012



**Location:** Part A

**Photo:** BM837, 838

**AMG:** Zone50 361204mE, 6280592mN (GDA94)

**Habitat:** Flat to gently sloping (west facing) plain.

**Soil:** Grey sand.

**Vegetation** (regrowth after pine plantation cut): \**Acacia pycnantha* scattered low trees over *Melaleuca preissiana*, *Kunzea glabrescens* open to closed scrub (variable) over *Adenanthos meisneri* (35cm) scattered low shrubs to low open shrubland (patches) over *Hypolaena exsulca* very open sedgeland.

**Assoc. species:** *Caladenia flava*, *Verticordia attenuata*, *Trachymene pilosa*, *Rhodanthe citrina*, *Dasyogon bromeliifolius*, \**Ursinia anthemoides*, \**Hypochaeris glabra*, *Austrostipa compressa*, *Kennedia prostrata*, *Brachyloma preissii* (45cm), *Hypocalymma angustifolium*, *Astartea* sp, *Jacksonia sternbergiana* (140cm).

**Veg Condition** (BF): Good

**Notes:** 1) *Kunzea glabrescens* scrub on higher ground on east side. 2) Areas of old *Melaleuca preissiana*.

### South Capel Part A - Site CAM29

**Described by BM**      **Date** 6/11/2012

**Location:** Part A

**AMG:** Zone50 361036mE, 6280387mN (GDA94)

**Vegetation** (revegetation): \*\**Acacia pycnantha*, (*Agonis flexuosa*) low open woodland over *Kunzea glabrescens* high shrubland over *Adenanthos meisneri*, *Hypocalymma angustifolium* low open shrubland over *Dasyogon bromeliifolius* scattered herbs to very open herbland.

**Assoc. species:** *Cartonema philydroides*, *Trachymene pilosa*, *Austrostipa compressa*, *Rhodanthe citrina*, *Nuytsia floribunda*.

**Reveg assessment:** R3 (some exotics).

### South Capel Part A - Site CAM30

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM841

**AMG:** Zone50 360364mE, 6280445mN (GDA94)

**Habitat:** Rehabilitated area around wetland drain (flats).

**Soil:** Yellow brown clay.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart) (reveg.), *Corymbia calophylla* (Marri) (regrowth) scattered trees over \*\**Melaleuca quinquenervia*, *Acacia saligna* scattered low trees over *Astartea scoparia*, *Melaleuca viminea* subsp. *viminea*, \*\**Grevillea manglesii* subsp. *manglesii* closed scrub.

**Assoc. species:** *Meeboldina roycei*, \**Lysimachia arvensis*, *Kunzea glabrescens*, \*\**Callistemon phoeniceus*, \**Asparagus asparagoides* (Bridle creeper), \**Briza maxima*, couch.

**Reveg assessment:** R2 to R3 (ground cover of natives (some not native to this area); very good cover; good structure; a number of exotic species).

**Notes:** birds seen inside thick scrub

### South Capel Part A - Site CAM31

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM842

**AMG:** Zone50 360254mE, 6280498mN (GDA94)

**Habitat:** Rehabilitated area: flats around small depression (inundated with surrounding revegetation).

**Vegetation** (revegetation):

Wetland: \**Typha orientalis* open tall sedgeland with *Cycnogeton lineare* open herbland  
Banks: *Eucalyptus rudis*, *Corymbia calophylla* (Marri) (regrowth) open woodland to woodland  
over *Astartea scoparia*, \*\**Grevillea manglesii* subsp. *manglesii*, *Taxandria linearifolia* scrub  
over \**Juncus articulatus*, \**Eragrostis curvula* (Africa Lovegrass), \**Vulpia bromoides*, \**Cynodon  
dactylon* (Couch) open sedgeland/grassland.

**Assoc. species:** *Meeboldina roycei*, *Phyllanthus calycina*, *Aphelia cyperoides*, \**Briza maxima*, \**Briza  
minor*, \**Lysimachia arvensis*, \**Sonchus oleracea*, \**Ehrharta longiflora*, \**Pinus pinaster*

**Reveg assessment:** R3 (very good cover; good structure; native sp; low weed cover).

#### **South Capel Part A - Site CAM32**

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM843

**AMG: Zone50** 360217mE, 6280456mN (GDA94)

**Habitat:** Flat excavated area (about 1m deep) – old mine area.

**Soil:** Yellow/brown gravelly clay.

**Vegetation** (revegetation): *Eucalyptus rudis* low open woodland over *Melaleuca raphiophylla* scattered  
low trees over *Astartea scoparia*, \*\**Grevillea manglesii* subsp. *manglesii* scrub (patches around trees).

**Reveg assessment:** R2 to R1 (poor cover (large open areas); native species; mostly no structure).

**Notes:** *Melaleuca raphiophylla* trees not doing well.

#### **South Capel Part A - Site CAM33**

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**AMG: Zone50** 360137mE, 6280439mN (GDA94)

**Habitat:** Flat plain (adjacent to old mine area).

**Vegetation:** *Corymbia calophylla* (Marri) open forest over *Astartea* sp. scattered tall shrubs over  
*Xanthorrhoea preissii* open shrubland over \**Briza maxima*, \**Avena barbata*, *Juncus* sp., *Meeboldina* sp.  
grassland/(sedgeland).

**Assoc. species:** *Kingia australis*, \**Asparagus asparagoides* (Bridle creeper), \**Zantedeschia aethiopica*  
(Arum lily).

**Veg Condition** (BF): Good (loss of structure; weedy).

#### **South Capel Part A - Site CAM34**

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM844, 845

**AMG: Zone50** 360120mE, 6280351mN (GDA94)

**Habitat:** Rehabilitated flats with small depressions.

**Vegetation** (revegetation): *Eucalyptus rudis* (Flooded Gum), (*Corymbia calophylla* (Marri)) open  
woodland over *Melaleuca raphiophylla* scattered low trees over \**Ehrharta longiflora*, \**Anthoxanthum  
odoratum*, \**Bromus diandrus* closed grassland.

**Reveg assessment:** R2 (low tree cover; poor structure; high weed cover). ('Very Good' pasture  
paddock revegetation).

#### **South Capel Part A - Site CAM35**

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM846

**AMG: Zone50** 360208mE, 6280354mN (GDA94)

**Habitat:** Rehabilitated mine site – flat.

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Eucalyptus rudis* (Flooded Gum) scattered trees to open woodland over *Melaleuca raphiophylla* scattered tall shrubs over *Astartea* sp. open scrub.

**Assoc. species:** *Acacia saligna*.

**Reveg assessment:** R3 (used native species; low numbers of species; poor structure (ground bare or with weed cover under *Astartea* sp.)).

### South Capel Part A - Site CAM36

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM847, 848

**AMG: Zone**50 360285mE, 6280407mN (GDA94)

**Habitat:** Wetland ‘pool’ (inundated) and banks.

**Vegetation** (revegetation): *Eucalyptus rudis* (Flooded Gum) open woodland over *Melaleuca raphiophylla* low open woodland over *Astartea* sp. closed scrub over *Meeboldina roycei* very open sedgeland.

**Assoc. species:** *Centrolepis* sp., *Lobelia anceps*, *Hypochaeris glabra*, couch, *Briza minor*, *Vulpia* sp., *Kunzea glabrescens* (nearby), *Grevillea manglesii* subsp. *manglesii*, *Acacia saligna* (nearby), *Taxandria linearis*, *Adenanthos meisneri*, *Gastrolobium praemorsum*, *Melaleuca incana* subsp. *incana* (banks of drain), *Jacksonia furcellata*, *Calothamnus rupestris*, *Melaleuca lateritia*.

**Reveg assessment:** R3 to R4 (good cover of local native species; good structure – some complexity).

**Notes:**

(i) *Typha orientalis* in corner of ‘pool’.

(ii) Some open areas, some exotic *Eucalyptus* sp. (upland areas).

(iii) Photos BM849-851 of drain veg (similar to CAM36) @ 360578, 6280501. Very good structure for fauna habitat and natives species (NB *Acacia pycnantha* scattered low trees in area). CAM36 similar to CAM31.

### South Capel Part A - Site CAM37

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM852, 853

**AMG: Zone**50 360690mE, 6280528mN (GDA94)

**Habitat:** Flat plain (rehabilitated).

**Soil:** Gravelly yellow brown sandy loam.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) scattered trees over *Agonis flexuosa*, *Acacia pycnantha* low open woodland over *Kunzea glabrescens* open to closed scrub.

**Assoc. species:** *Acacia saligna*, *Levenhookia puscilla*, *Lysimachia arvensis*, *Ursinia anthemoides*, *Levenhookia stipitata*, *Eucalyptus marginata* subsp. *marginata* (Jarrah), *Adenanthos meisneri*.

**Reveg assessment:** R3

### South Capel Part A - Site CAM38

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM861-864

**AMG: Zone**50 360818mE, 6280549mN (GDA94)

**Habitat:** Banks of wetland pool (inundated) in rehabilitated area.

**Vegetation** (revegetation): *Melaleuca quinquenervia*, (*Acacia pycnantha*, *Casuarina obesa*) low woodland over *Callistemon phoeniceus*, *Kunzea glabrescens*, *Melaleuca incana* subsp. *incana*, *Astartea*

*scoparia* high shrubland over *Meeboldina roycei* sedgeland.

**Assoc. species:** *Lobelia anceps*, *Agonis flexuosa*, *Hakea prostrata*, *Acacia saligna*, *Vellereophyton dealbatum*, *Calothamnus rupestris*.

**Reveg assessment:** R2 to R3 (use of exotic *Melaleuca* and *Callistemon* spp. etc; low weed cover; good cover/structure).

#### South Capel Part A - Site CAM39

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM865

**AMG: Zone**50 360903mE, 6280553mN (GDA94)

**Habitat:** Rehabilitated surface flat to very gently undulating.

**Soil:** Gravelly yellow sand with exposed hard (?rocky) surface.

**Vegetation** (revegetation): \*\**Acacia pycnantha*, \*\**Eucalyptus conferruminata/lehmannii*, \*\**Melaleuca quinquenervia* in some parts) scattered low trees over \*\**Calothamnus rupestris*, *Kunzea glabrescens* open shrubland.

**Assoc. species:** *Verticordia attenuata*, *Eucalyptus marginata* subsp. *marginata* (Jarrah) (2.5m), *Eucalyptus ?rudis* (1.4m), *Kunzea rostrata*, *Mesomelaena tetragona*, *Gastrolobium praemorsum*, *Corymbia calophylla* (Marri) (4m).

**Reveg assessment:** R2 (poor cover and poor number of species on difficult substrate; low weed cover).

**Notes:** Age about 5 to 7years. CAM39 similar to CAM27B (revegetation on higher ground between wetlands).

#### South Capel Part A - Site CAM39B

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**AMG: Zone**50 360987mE, 6280673mN (GDA94)

**Vegetation** (revegetation): *Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered low trees over *Kunzea glabrescens* shrubland

**Reveg assessment:** R3 (okay cover; young)

#### South Capel Part A - Site CAM40

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM866

**AMG: Zone**50 362978mE, 6283184mN (GDA94)

**Habitat:** Flat plain (some old pipe, machinery in area).

**Soil:** Grey sand.

**Vegetation** (revegetation/regrowth(?) after mining): *Melaleuca preissiana*, *Agonis flexuosa* scattered low trees over *Kunzea glabrescens* closed scrub.

**Assoc. species:** *Trachymene pilosa*, *Levenhookia stipitata*, \**Hypochaeris glabra*, *Thysanotus manglesianus/patersonii*, *Levenhookia puscilla*, *Gompholobium tomentosum*, *Thelymitra vulgaris*, *Jacksonia sternbergiana*, *Hypocalymma angustifolium*, *Meeboldina roycei*, *Astartea* sp., *Phyllangium paradoxum*.

**Reveg assessment:** R3 (good cover, native species).

**Notes:** Signs of earth movement in parts (small earth mounds).

#### South Capel Part A - Site CAM41

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**AMG: Zone50** 362916mE, 6283116mN (GDA94)

**Vegetation** (revegetation): *Agonis flexuosa*, (*Corymbia calophylla* (Marri) (regrowth), *Melaleuca preissiana* (scattered trees)) low open forest over *Kunzea glabrescens* high open shrubland.

**Assoc. species:** \*\**Eucalyptus* sp. (exotic with pink mottled bk, along track edge), *Opercularia hispidula*, *Lepidosperma longitudinale* (sedgeland in some places).

Good (low number of species; structure simple; good cover; dominants are native species).

#### **South Capel Part A - Site CAM42**

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**AMG: Zone50** 362927mE, 6282984mN (GDA94)

**Vegetation** (revegetation): *Melaleuca preissiana*, *Agonis flexuosa* scattered low trees over *Melaleuca viminea* subsp. *viminea* closed scrub (6m)

**Reveg assessment:** R3 (good cover; native species)

#### **South Capel Part A - Site CAM43**

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**AMG: Zone50** 362865mE, 6282949mN (GDA94)

**Habitat:** Flat area on plain.

**Soil:** Grey sand.

**Vegetation** (remnant): *Corymbia calophylla* (Marri) open forest over *Banksia grandis* scattered low trees over *Kunzea glabrescens* high shrubland over *Hibbertia cuneiformis* scattered shrubs over \**Ehrharta longiflora* very open grassland.

**Assoc. species:** \**Acacia decurrens*, *Trachymene pilosa*, *Kennedia prostrata*, \**Briza maxima*, *Levenhookia pusilla*, \**Arctotheca calendula* (Capeweed), *Thysanotus manglesianus/patersonii*, \**Zantedeschia aethiopica* (Arum lily) (>10), *Senecio quadridentatus* (1.3m).

**Veg Condition** (BF): Good (weedy understorey).

#### **South Capel Part A - Site CAM44**

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**AMG: Zone50** 362752mE, 6282887mN (GDA94)

**Photo:** BM867

**Habitat:** Plain (post mining).

**Soil:** Grey sand.

**Vegetation** (revegetation): mosaic of *Kunzea glabrescens* high shrubland with dampland patches of *Melaleuca viminea* subsp. *viminea*, *Kunzea glabrescens* scrub over *Astartea* sp. scattered shrubs to open shrubland over *Lepidosperma longitudinale* sedgeland.

**Assoc. species:** *Juncus pallidus*.

**Reveg assessment:** R2 to R3 (cover good; native species, but low number, some structure in parts).

**Notes:** Also in mosaic are patches of CAM43 (*Corymbia calophylla* (Marri) woodland over *Kunzea glabrescens* high shrubland areas)

#### **South Capel Part A – Site CAM45**

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM868, 869

**AMG: Zone50** 362682mE, 6282801mN (GDA94)

**Habitat:** Flats after mining.

**Vegetation** (revegetation): *Melaleuca preissiana* scattered low trees to low woodland over *Melaleuca viminea* subsp. *viminea* scrub over *Kunzea glabrescens* high open shrubland over *Hibbertia cuneiformis* scattered shrubs over *Ehrharta calycina*, *Briza minor*, *Zantedeschia aethiopica* (Arum lily), *Hypochaeris* sp. grassland/herbland of weeds.

**Reveg assessment:** R2 to R3 (thick cover; few sp; high weed cover in lower strata).

#### **South Capel Part A - Site CAM46**

**Described by BM**      **Date** 13/11/2012

**Location:** Part A

**Photo:** BM870, 871

**AMG: Zone**50 362654mE, 6282757mN (GDA94)

**Habitat:** Rehabilitated flats after mining.

**Soil:** Pale yellow sand.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) (regrowth), *Acacia decurrens*, *Eucalyptus camaldulensis* (8-10m) low open woodland over *Kunzea glabrescens*, *Kunzea micrantha*, *Melaleuca viminea* subsp. *viminea* (depressions) open shrubland to shrubland (with *Astartea* scrub in lower parts).

**Assoc. species:** *Melaleuca preissiana*, *Melaleuca quinquenervia*, *Agonis flexuosa*, *Astartea* sp., *Meeboldina roycei*.

**Reveg assessment:** R2 (patchy with introduced *Acacia* and *Eucalyptus* species).

#### **South Capel Part A - Site CAM47**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM872, 873

**AMG: Zone**50 362454mE, 6282017mN (GDA94)

**Habitat:** Post mining variable surface.

**Soil:** Yellow-brown clay.

**Vegetation** (revegetation): *Eucalyptus ?rudis* scattered trees to open woodland over *Melaleuca raphiophylla* low woodland over *Hibbertia cuneiformis* open shrubland over *Arctotheca calendula* (Capeweed), *Lysimachia arvensis*, *Zantedeschia aethiopica* (Arum lily), *Ursinia* sp. (?) *Galium murale*, *Ehrharta longiflora*, *Vulpia* sp. herbland/grassland

**Assoc. species:** *Acacia decurrens*, *Melaleuca preissiana*, *Kunzea glabrescens*, *Ehrharta calycina*, *Echium plantagineum* (Paterson's Curse).

**Reveg assessment:** R2 to R3 (use of some native species; but poor shrub layer; high weed cover; open areas between trees and surface poorly contoured)

**Fire Age:** Recently burnt, very good recruitment of *Eucalyptus camaldulensis* subsp. *camaldulensis*

**Notes:** Eastern area of unit becomes *Kunzea glabrescens* scrub over *Hibbertia cuneiformis* open shrubland.

#### **South Capel Part A - Site CAM48**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM874, 875

**AMG: Zone**50 362359mE, 6281970mN (GDA94)

**Habitat:** Rehabilitated mine area.

**Soil:** Yellow- brown clay.

**Vegetation** (revegetation): *Eucalyptus rudis*, *Eucalyptus camaldulensis* woodland to open forest over *Kunzea glabrescens* high open shrubland to high shrubland over *Hibbertia cuneiformis* scattered shrubs.

**Assoc. species:** *Acacia decurrens*.

**Reveg assessment:** R2 (poor structure; limited number species including dominant exotics; low weed

cover; good canopy cover)

#### South Capel Part A - Site CAM49

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM876, 877

**AMG: Zone50** 362171mE, 6282102mN (GDA94)

**Habitat:** Very gently undulating plain (old ex-mining surface).

**Soil:** Pale yellow sand.

**Vegetation** (revegetation): (\**Pinus pinaster*, \*\**Eucalyptus camaldulensis* subsp. *obtusata* scattered trees over) *Eucalyptus marginata* subsp. *marginata* (Jarrah) (regrowth from stumps), *Nuytsia floribunda*, *Agonis flexuosa* scattered low trees to low open woodland over *Kunzea glabrescens* scattered tall shrubs (high open shrubland in parts) over *Macrozamia riedlei* scattered shrubs over \**Pentameris airoides*, \**Vulpia* sp., \**Ursinia anthemoides*, \**Erodium* sp., \**Trifolium* sp., \**Ehrharta longiflora* (undercover), \**Hypochaeris glabra* grassland/herbland of weeds

**Assoc. species:** \**Asparagus asparagoides* (Bridle creeper), \**Heliophila pusilla*, \**Zantedeschia aethiopica* (Arum lily), \**Lysimachia arvensis*, \**Erodium botrys*.

**Reveg assessment:** R2 to R1 (very open; discontinuous structure; large open area).

#### South Capel Part A - Site CAM50

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM878-880

**AMG: Zone50** 361109mE, 6280946mN (GDA94)

**Habitat:** Banks (sandy and rocky) of wetland pool.

**Soil:** Yellow sand (rocky substrate exposed in parts).

**Vegetation** (revegetation): \*\**Melaleuca quinquenervia*, \*\**Acacia pycnantha* low woodland over *Kunzea glabrescens*, *Melaleuca viminea* subsp. *viminea* (2-2.5m), *Astartea* sp. high shrubland to open scrub over *Verticordia attenuata* scattered low shrubs over *Meeboldina roycei* sedgeland.

**Assoc. species:** *Taxandria linearis*, *Jacksonia furcellata*, *Centrolepis mutica*, *Drosera pulchella*.

**Reveg assessment:** R3 (exotic sp included as dominant; but good cover; good structure).

#### South Capel Part A - Site CAM51

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM881, 882

**AMG: Zone50** 361214mE, 6280920mN (GDA94)

**Habitat:** Old mining rehabilitation area – elevated surface between wetlands.

**Soil:** Pale yellow sand with cobbles of laterite.

**Vegetation** (revegetation): \*\**Acacia pycnantha* scattered low trees over *Kunzea glabrescens* open scrub.

**Assoc. species:** *Gastrolobium praemorsum*, *Daviesia inflata* (190cm).

**Reveg assessment:** R2 to R3 (good cover; few species and includes exotic *Acacia*; lot of bare ground; low weed cover).

#### South Capel Part A - Site CAM52

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**AMG: Zone50** 361194mE, 6280981mN (GDA94)

**Habitat:** Banks of artificial wetland pool (rehab).

**Soil:** Pale yellow sand with some lateritic cobbles.

**Vegetation** (revegetation): **\*\*Melaleuca quinquenervia**, (**\*\*Acacia pycnantha**, *Acacia saligna*) low open woodland to low woodland over *Melaleuca teretifolia*, *Melaleuca viminea* subsp. *viminea* (2.5-3m), *Melaleuca incana* subsp. *incana* high shrubland over *Astartea* sp. scattered shrubs to open shrubland over *\*Typha orientalis*, *Meeboldina roycei*, *Baumea juncea* sedgeland.

**Assoc. species:** *Casuarina obesa*, *Acacia extensa* (190cm), *Juncus pallidus*, *Thelymitra* sp., *Viminaria juncea*, *Drosera pulchella*, **\*\*Callistemon phoeniceus**.

**Reveg assessment:** R3 (good cover; good structure; some exotics; low weeds).

#### South Capel Part A - Site CAM53

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM883, 884

**AMG: Zone50** 361394mE, 6281177mN (GDA94)

**Habitat:** Old rehabilitated area, with flats and drains.

**Soil:** Yellow-brown (?)sandy clay.

**Vegetation** (revegetation): **\*\*Eucalyptus botryoides**, **\*\*Acacia pycnantha** low open woodland over *Melaleuca preissiana*, *Melaleuca viminea* subsp. *viminea*, *Kunzea glabrescens*, *Taxandria linearifolia* scrub over *Melaleuca lateritia* heath on drainage floor.

**Assoc. species:** **\*\*Melaleuca quinquenervia**.

**Reveg assessment:** R2 to R3 (a very mixed area).

**Notes:** Looks like old wet area/ heaver soils area.

#### South Capel Part A - Site CAM54

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM885, 886

**AMG: Zone50** 361225mE, 6281157mN (GDA94)

**Habitat:** Plain (post mining?).

**Soil:** Grey sand.

**Vegetation** (revegetated): **\*\*Acacia pycnantha** scattered low trees over *Kunzea glabrescens* high shrubland over *Verticordia attenuata*, *Adenanthos meisneri* scattered shrubs

**Reveg assessment:** R2 to R3 (mostly native species; low number of species; low weed cover).

#### South Capel Part A - Site CAM55

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM887

**AMG: Zone50** 361371mE, 6281366mN (GDA94)

**Habitat:** Man made drain and banks in rehabilitated area.

**Soil:** Yellow brown sandy clay (?).

**Vegetation** (revegetation): **\*\*Eucalyptus** sp. (stringy bark; 12m), **\*\*Eucalyptus botryoides**, *Corymbia calophylla* (Marri) woodland to open forest over **\*\*Acacia pycnantha** scattered low trees over *Astartea* sp., *Kunzea glabrescens*, *Taxandria* sp. scrub over *Meeboldina roycei* sedgeland.

**Assoc. species:** **\*\*Grevillea manglesii** subsp. *manglesii*, *Verticordia attenuata*, *Gastrolobium praemorsum*.

**Reveg assessment:** R2 to R3 (?) (good cover; good structure; low weed cover; but exotic species dominant).

#### South Capel Part A - Site CAM56

**Described by BM**      **Date** 14/11/2012



**Location:** Part A

**Photo:** BM888

**AMG:** Zone50 361485mE, 6281431mN (GDA94)

**Habitat:** Rehabilitated flats.

**Soil:** Pale Yellow sand.

**Vegetation** (revegetation): \*\**Acacia pycnantha* scattered low trees over *Kunzea glabrescens* scattered tall shrubs over *Verticordia attenuata* low shrubland to low open heath.

**Assoc. species:** *Acacia saligna*, *Aristida contorta*, \**Ursinia anthemoides* subsp. *anthemoides*, *Gastrolobium praemorsum*, *Trachymene pilosa*.

**Reveg assessment:** R2 (low weed cover; low number species; poor structure – not complex).

#### **South Capel Part A - Site CAM57**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM889

**AMG:** Zone50 361588mE, 6281555mN (GDA94)

**Habitat:** Rehab surface after mining.

**Soil:** Yellow-brown sandy clay loam (?) with 'lateritic' cobbles and rocks.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri), (\*\**Acacia pycnantha*) low woodland over *Kunzea glabrescens*, \*\**Calothamnus ?rupestris*, *Melaleuca incana* subsp. *incana* scattered tall shrubs to high shrubland (patches of *Calothamnus* along track edge) over *Pericalymma ellipticum* var. *ellipticum*, *Verticordia attenuata* scattered shrubs.

**Reveg assessment:** R2 to R3 (fairly open; native species present (tough substrate); low weed cover).

#### **South Capel Part A - Site CAM57B**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM892

**AMG:** Zone50 361758mE, 6281733mN (GDA94)

**Habitat:** Rehabilitated flats.

**Soil:** Yellow brown sandy loam with gravelly mantle.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) low woodland (young) over *Kunzea glabrescens*, (\*\**Calothamnus ?rupestris*) closed scrub.

**Assoc. species:** *Agonis flexuosa*, *Acacia saligna*, *Eucalyptus ?rudis*, *Acacia pulchella* var. *glaberrima*, *Acacia alata*, \**Acacia iteaphylla* (numerous seen as walked).

**Reveg assessment:** R3 (*Corymbia calophylla* (Marri) and *Kunzea glabrescens* dominant; low weed cover; good structure; some exotic plantings).

#### **South Capel Part A - Site CAM58**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM

**AMG:** Zone50 361567mE, 6281616mN (GDA94)

**Habitat:** Banks of track.

**Vegetation** (revegetation): \*\**Eucalyptus leucoxylon* (7m), \*\**Acacia pycnantha* planting.

**Assoc. species:** *Austrostipa semibarbata* (150cm), *Hibbertia cuneiformis*.

**Reveg assessment:** R2 to R1 (exotic dominants; low weed cover).

#### **South Capel Part A - Site CAM58B**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**AMG: Zone**50 361612mE, 6281627mN (GDA94)

**Vegetation** (revegetation): *Eucalyptus rudis* subsp. *rudis*, \*\**Eucalyptus camaldulensis* open woodland over \*\**Acacia pycnantha* scattered low trees over \*\**Calothamnus rupestris*, *Kunzea glabrescens* high open shrubland.

**Notes:** Messy area

**Reveg assessment:** R2 (exotic dominants; low weed cover).

#### **South Capel Part A - Site CAM59**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM890, 891

**AMG: Zone**50 361671mE, 6281670mN (GDA94)

**Habitat:** Broad banks/adjacent gentle slope beside rehab wetland.

**Soil:** Pale yellow sand with conglomerate/'coffee rock'/lateritic gravel/cobbles.

**Vegetation** (revegetation): \*\**Melaleuca quinquenervia*, *Casuarina obesa*, \*\**Acacia pycnantha*, *Eucalyptus rudis* (young trees) over *Melaleuca viminea* subsp. *viminea* high open shrubland over *Astartea* sp., *Melaleuca incana* subsp. *incana* open to closed heath over *Meeboldina* sp. scattered sedges.

**Reveg assessment:** R3 (use of exotic dominant; low weed cover; good structure).

#### **South Capel Part A - Site CAM60**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM893, 894 (sedgeland in 895)

**AMG: Zone**50 mE, mN (GDA94)

**Habitat:** Broad of rehab wetland.

**Vegetation:** (revegetation) *Casuarina obesa*, \*\**Eucalyptus ?camaldulensis*, *Agonis flexuosa* scattered low trees over *Melaleuca viminea* subsp. *viminea*, *Melaleuca raphiophylla*, *Astartea* sp., *Melaleuca incana* subsp. *incana* scrub over *Baumea articulata*, *Baumea riparia* sedgelands (patches).

**Assoc. species:** *Phyllanthus calycinus*, *Verticordia attenuata*, *Acacia saligna*, *Kunzea glabrescens*, *Viminaria juncea*, *Banksia littoralis* (upslope of bank), *Banksia grandis* (juv).

**Reveg assessment:** R3 (low weeds; good cover; good structure; native species, but some exotics?).

#### **South Capel Part A - Site CAM61**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM896

**AMG: Zone**50 361832mE, 6281852mN (GDA94)

**Habitat:** Rehabilitated flats above wetland bank.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis*, \*\**Eucalyptus leucoxylon* (7m), *Eucalyptus rudis* open forest over *Melaleuca viminea* subsp. *viminea* scattered tall shrubs over *Acacia cyclops*, *Melaleuca teretifolia* scattered tall shrubs over *Hibbertia cuneiformis* scattered shrubs over \**Ehrharta longiflora*, \**Lysimachia arvensis* open herbland/grassland.

**Reveg assessment:** R2 (exotics dominant; weedy understorey; structure not great).

#### **South Capel Part A - Site CAM62**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM897

**AMG: Zone**50 362003mE, 6282110mN (GDA94)

**Habitat:** Drainage lines and depressions around rehabilitated wetland.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *obtusa* (15m), \*\**Acacia decurrens* open forest over *Agonis flexuosa*, *Corymbia calophylla* (Marri) (regrowth) scattered low trees to low open woodland over *Melaleuca viminea* subsp. *viminea*, *Kunzea glabrescens* high shrubland over *Astartea* sp. open shrubland.

**Reveg assessment:** R2 (exotics dominant; poor structure)

#### South Capel Part A - Site CAM63

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM898

**AMG: Zone**50 362015mE, 6282185mN (GDA94)

**Habitat:** Gently sloping banks of rehabilitated wetland.

**Soil:** Pale yellow white sand.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis*, *Casuarina obesa*, \*\**Acacia decurrens*, *Agonis flexuosa* low woodland over *Melaleuca viminea* subsp. *viminea*, *Acacia saligna* high open shrubland over *Astartea* sp. open scrub to closed scrub over *Baumea riparia*, *Typha* sp. (in inundated areas) sedgeland (patches).

**Assoc. species:** \*\**Melaleuca quinquenervia*.

**Reveg assessment:** R3 (good cover; structure; native sp; low weed cover; exotic species in reveg).

#### South Capel Part A - Site CAM63B

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM900 (looking south)

**AMG: Zone**50 362190mE, 6282483mN (GDA94)

**Vegetation** (revegetation): *Casuarina obesa*, \*\**Acacia decurrens*, \*\**Melaleuca quinquenervia* low open forest to low closed forest over *Kunzea glabrescens* scattered tall shrubs over *Astartea* sp. closed scrub.

**Reveg assessment:** R3

#### South Capel Part A - Site CAM64

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM

**AMG: Zone**50 361842mE, 6282147mN (GDA94)

**Vegetation** (mixed revegetation):

Drainage lines: *Casuarina obesa*, *Agonis flexuosa*, \*\**Eucalyptus* sp. low open woodland to low woodland over *Astartea* sp., (*Kunzea glabrescens*) scrub.

Uplands: *Eucalyptus rudis*, *Corymbia calophylla* (Marri), *Eucalyptus marginata* subsp. *marginata* (Jarrah) open woodland over *Agonis flexuosa*, *Banksia menziesii* low woodland to low open forest over *Kunzea glabrescens*, *Hakea prostrata* high open shrubland.

**Assoc. species:**

Drainage lines: *Taxandria linearifolia* (2.1m), *Melaleuca viminea* subsp. *viminea*, *Melaleuca cuticularis*.

Uplands: *Banksia attenuata*, *Banksia littoralis*.

**Reveg assessment:** R2 to R3

#### South Capel Part A - Site CAM65

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**Photo:** BM899

**AMG: Zone**50 362169mE, 6282341mN (GDA94)

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart), (*Corymbia calophylla* (Marri)) open forest over *Kunzea glabrescens* high open shrubland over *Acacia cyclops*, *Hibbertia cuneiformis* scattered shrubs over *\*Ehrharta longiflora* very open grassland.

**Assoc. species:** *\*Hypochaeris glabra*, *\*Ursinia anthemoides*, *\*Asparagus asparagoides* (Bridle creeper), *\*Zantedeschia aethiopica* (Arum lily).

**Reveg assessment:** R2 to R3 (very simple structure; moderate weedy understorey; good tree cover; dominant native trees).

#### **South Capel Part A - Site CAM66**

**Described by BM**      **Date** 14/11/2012

**Location:** Part A

**AMG: Zone**50 362203mE, 6282513mN (GDA94)

**Habitat:** Drain and banks.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) open forest (patchy) over *Agonis flexuosa*, *Banksia littoralis* low woodland.

**Assoc. species:** *Hakea prostrata*, *Melaleuca thymoides*.

**Reveg assessment:** R2 to R3

#### **South Capel Part A - Site CAM67**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM901, 902

**AMG: Zone**50 362220mE, 6282660mN (GDA94)

**Habitat:** Plain after mining rehab.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) low open woodland over *Kunzea glabrescens*, *Acacia saligna* scattered tall shrubs over *\*Vulpia* sp., *\*Ursinia anthemoides* open grassland/herbland.

**Assoc. species:** *Banksia attenuata*, *Kunzea glabrescens*, *Banksia grandis*.

**Reveg assessment:** R1 (large open areas; no structure; few species).

#### **South Capel Part A - Site CAM68**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM903 (nearby same veg).

**AMG: Zone**50 362348mE, 6282610mN (GDA94)

**Habitat:** Rise on plain after mining rehab.

**Soil:** Grey sand.

**Vegetation** (revegetation): *Acacia saligna* open scrub over *Hibbertia cuneiformis* open shrubland over *\*Ehrharta longiflora*, *\*Vulpia* sp., *\*Ursinia anthemoides* grassland/herbland of weeds.

**Assoc. species:** *\*Zantedeschia aethiopica* (Arum lily).

**Reveg assessment:** R2 (few species; high weed cover in lower strata).

#### **South Capel Part A - Site CAM69**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**AMG: Zone**50 362309mE, 6282655mN (GDA94)

**Vegetation** (revegetation): *Corymbia calophylla* (Marri), **\*\****Acacia decurrens* closed forest over *Agonis flexuosa* low woodland over *\*Ehrharta longiflora* grassland.

**Reveg assessment:** R2

### South Capel Part A - Site CAM70

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM904

**AMG: Zone50** 362331mE, 6282814mN (GDA94)

**Vegetation** (revegetation): *Eucalyptus rudis* (4-6m), *Agonis flexuosa* low open woodland over *Kunzea glabrescens*, \*\**Melaleuca hamulosa*, *Melaleuca raphiophylla*, *Melaleuca viminea* subsp. *viminea*, *Melaleuca preissiana*, \*\**Callistemon phoeniceus* open shrubland.

**Assoc. species:** *Acacia saligna*, *Hakea prostrata*.

**Reveg assessment:** R1 (unsuccessful revegetation; very open; OK species mix?; low weed cover).

### South Capel Part A - Site CAM71

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM905

**AMG: Zone50** 362315mE, 6282841mN (GDA94)

**Habitat:** Drain and banks.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart), *Casuarina obesa* woodland over *Agonis flexuosa* low open woodland to low open forest over \*\**Melaleuca nesophila*, *Acacia cyclops*, *Calothamnus* sp. high open shrubland.

**Reveg assessment:** R3 (good cover and structure; low weed cover).

### South Capel Part A - Site CAM72

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM906, 907

**AMG: Zone50** 362247mE, 6282791mN (GDA94)

**Habitat:** Banks (high and moderately steep) of rehabilitated wetland.

**Vegetation** (revegetation): *Casuarina obesa*, (\*\**Melaleuca quinquenervia*) open forest to closed forest over *Astartea* sp. scattered shrubs (heath in small patches) over *Baumea riparia*, *Baumea juncea* closed sedgeland (covering about ¼ of banks).

**Assoc. species:** \*\**Acacia decurrens*.

**Reveg assessment:** R3 (good cover; structure; banks too steep; low weed cover).

### South Capel Part A - Site CAM73

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM908

**AMG: Zone50** 362149mE, 6282909mN (GDA94)

**Habitat:** Elevated 'peninsula' adjacent to lake.

**Soil:** Pale yellow sand.

**Vegetation** (revegetation): High shrubland of *Eucalyptus ?rudis*, *Agonis flexuosa*, *Acacia saligna*, *Melaleuca raphiophylla*, *Melaleuca preissiana*, *Dodonaea viscosa* subsp. *angustissima*, *Melaleuca cuticularis*, *Taxandria linearifolia* over *Hibbertia cuneiformis* scattered shrubs over \**Vulpia* sp., \**Ursinia anthemoides* open grassland/herbland.

**Assoc. species:** *Juncus* sp., *Callistemon glaucus*.

**Reveg assessment:** R2 (good number of natives; little structure; moderate weed cover in lower strata).

### South Capel Part A - Site CAM74

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM909, 910 (looking northwest from western bank)

**AMG: Zone**50 362171mE, 6283040mN (GDA94)

**Habitat:** Banks of rehabilitated wetland (after mining).

**Soil:** Yellow sand.

**Vegetation** (revegetation (variable)): woodlands of *Casuarina obesa*, \*\**Melaleuca quinquenervia*, \*\**Eucalyptus camaldulensis* over *Melaleuca raphiophylla*, *Acacia saligna* low woodland (in patches) over *Kunzea glabrescens*, *Taxandria linearifolia*, *Melaleuca teretifolia* scattered tall shrubs to high shrubland over *Astartea* sp. scattered shrubs to shrubland (patchy) over *Ficinia nodosa*, *Juncus kraussii* subsp. *australiensis*, *Baumea articulata* open sedgeland with *Triglochin striata* herblands on water's edge.

**Reveg assessment:** R2 to R3 (very variable and not adjacent to lower water levels; mix of native species; good structure present in parts).

### **South Capel Part A - Site CAM75**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**AMG: Zone**50 362383mE, 6282914mN (GDA94)

**Habitat:** Banks (high and moderately steep) of rehabilitated wetland.

**Vegetation** (revegetation): *Casuarina obesa*, \*\**Melaleuca quinquenervia* closed forest.

**Reveg assessment:** R2 to R3 (changing water levels).

**Notes:**

- (i) This was wetland bank vegetation similar to CAM72.
- (ii) Wet areas around this location are now dried up.

### **South Capel Part A - Site CAM76**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM911

**AMG: Zone**50 362448mE, 6282918mN (GDA94)

**Habitat:** Past mining rehab flats.

**Soil:** Pale yellow/white sand.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart) woodland over *Agonis flexuosa*, *Acacia saligna* scattered low trees to low woodland (few patches) over *Kunzea glabrescens*, *Hakea prostrata* scattered tall shrubs (in patches) over *Hibbertia cuneiformis* scattered shrubs over \**Vulpia* sp. grassland.

**Reveg assessment:** R2 to R1 (parts very open or only *Eucalyptus gomphocephala* (Tuart)).

### **South Capel Part A - Site CAM77**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM912, 913

**AMG: Zone**50 362500mE, 6282956mN (GDA94)

**Habitat:** Banks of rehabilitated lake.

**Soil:** Yellow-brown clay.

**Vegetation** (revegetation): *Casuarina obesa*, \*\**Melaleuca quinquenervia* closed forest over *Melaleuca preissiana* scattered low trees to low open woodland (patches) over *Astartea* sp. heath (few patches) over *Typha* sp. sedgeland (inundated area).

**Reveg assessment:** R2 to R3 (fairly simple bank vegetation; few species; ground cover; low weed cover).

**South Capel Part A - Site CAM78**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM914

**AMG: Zone50** 362610mE, 6282931mN (GDA94)

**Habitat:** Rehabilitated flats near rehabilitated lake after mining.

**Soil:** Pale yellow/white sand.

**Vegetation** (revegetation): *Agonis flexuosa* low open woodland over *Melaleuca raphiophylla*, **\*\*Calothamnus rupestris**, **\*\*Callistemon** sp., *Kunzea glabrescens* high shrubland over *Vulpia* sp. grassland.

**Reveg assessment:** R2 (large open areas; poor (open) structure; weedy ground cover).

**South Capel Part A - Site CAM79**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM915

**AMG: Zone50** 363009mE, 6283693mN (GDA94)

**Habitat:** Rehabilitated undulating plain.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri), *Eucalyptus gomphocephala* (Tuart), *Agonis flexuosa* low open woodland over **\*\*Calothamnus rupestris**, *Kunzea glabrescens*, **\*\*Callistemon phoeniceus** high open shrubland (plantings) over *Vulpia* sp., *Arctotheca calendula* (Capeweed) grassland/herbland.

**Reveg assessment:** R2 (poor structure; weedy; large open areas).

**South Capel Part A - Site CAM80**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM916

**AMG: Zone50** 363032mE, 6283692mN (GDA94)

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart), (*Corymbia calophylla* (Marri)) woodland over *Kunzea glabrescens*, **\*\*Calothamnus rupestris**, *Hakea prostrata*.

**Assoc. species:** *Banksia grandis*, *Agonis flexuosa*.

**Reveg assessment:** R2 to R3 (better structure; more species).

**South Capel Part A - Site CAM81**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**AMG: Zone50** 362875mE, 6283508mN (GDA94)

**Vegetation** (revegetation - mixed rehabilitation plantation): *Eucalyptus gomphocephala* (Tuart), *Corymbia calophylla* (Marri), *Eucalyptus rudis* (Flooded gum), **\*\*Eucalyptus** sp. woodland over *Agonis flexuosa* scattered low trees to low woodland over *Kunzea glabrescens*, **\*\*Calothamnus rupestris**, **\*\*Acacia longifolia** subsp. *sophorae*, **\*\*Callistemon phoeniceus** scattered tall shrubs to high open shrubland.

**Reveg assessment:** R2.

**South Capel Part A - Site CAM82**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM917

**AMG: Zone50** 362925mE, 6283532mN (GDA94)

**Vegetation** (revegetation - variable bank vegetation. At sample site:) **\*\*Eucalyptus camaldulensis** (Red River Gum), *Eucalyptus rudis* (Flooded gum), *Casuarina obesa*, **\*\*Eucalyptus** sp. (grey mottled) scattered trees to closed forests over *Melaleuca lateritia*, *Taxandria linearifolia*, *Astartea* sp. high shrubland (patches scrub) with *\*Typha* sp. sedgeland in inundated area.

**Reveg assessment:** R2 to R3

#### **South Capel Part A - Site CAM83**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM918, 919; 920, 921 on lake edge

**AMG: Zone50** 362783mE, 6283380mN (GDA94)

**Habitat:** Banks of rehabilitation lake (after mining).

**Soil:** Yellow-brown clay (at lake edge).

**Vegetation** (revegetation): *Casuarina obesa*, (**\*\*Eucalyptus** sp., *Eucalyptus ?rudis* (*Eucalyptus* spp. along lake edge), **\*\*Acacia decurrens**) closed forest over *Melaleuca raphiophylla*, (*Agonis flexuosa*) scattered low trees to low woodland (patches) over *\*Typha* sp. sedgeland (inundated area).

**Assoc. species:** *Melaleuca teretifolia*, **\*\*Melaleuca quinquenervia**, *Melaleuca preissiana*, *\*Sonchus oleracea*, *\*Zantedeschia aethiopica* (Arum lily).

**Reveg assessment:** R2 to R3 (very simple reveg. with few species; mixed exotics/natives; good cover).

#### **South Capel Part A - Site CAM84**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**AMG: Zone50** 362961mE, 6283233mN (GDA94)

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart) open forest to closed forest over *Agonis flexuosa* low open woodland over *Kunzea glabrescens*, *Acacia cyclops*, *Hakea prostrata* high open shrubland to high shrubland.

**Reveg assessment:** R3

#### **South Capel Part A - Site CAM85**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM922, 923 (along wetland edge)

**AMG: Zone50** 362503mE, 6283176mN (GDA94)

**Habitat:** Banks of wetland area on a rehabilitated former mine site.

**Soil:** Pale yellow sand.

**Vegetation** (revegetation): *Eucalyptus rudis* scattered low trees over *Agonis flexuosa*, *Calothamnus ?rupestris*, *Hakea prostrata*, **\*\*Callistemon phoeniceus** open shrubland with wetland edge vegetation of *Melaleuca raphiophylla*, *Melaleuca preissiana*, *Melaleuca teretifolia* scrub over *Baumea articulata* (dead), *Ficinia nodosa*, *Baumea riparia* sedgelands (patches).

**Assoc. species:** *Acacia saligna*, *Dodonaea viscosa* subsp. *angustissima*, *Juncus pallidus*.

**Notes:** Few bits of *\*Typha* sp. in lake. *Eucalyptus rudis* in woodland to open forest on west side.

**Reveg assessment:** R3

#### **South Capel Part A - Site CAM86**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**Photo:** BM924

**AMG: Zone50** 362431mE, 6283253mN (GDA94)



**Habitat:** Rehabilitated flats near wetland.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart) woodland over *Corymbia calophylla* (Marri) scattered low trees (regrowth) over *Kunzea glabrescens*, *Hakea prostrata*, \*\**Calothamnus graniticus* subsp. *graniticus* high shrubland to open scrub.

**Assoc. species:** \*\**Melaleuca hamulosa*, *Agonis flexuosa*.

**Reveg assessment:** R3

**South Capel Part A - Site CAM87**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**AMG: Zone**50 362450mE, 6283317mN (GDA94)

**Vegetation** (revegetation): *Eucalyptus cornuta* low woodland over \*\**Calothamnus graniticus* subsp. *graniticus* open shrubland with \*\**Eucalyptus conferruminata/lehmannii* at north end.

**Reveg assessment:** R2

**South Capel Part A - Site CAM88**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**AMG: Zone**50 361856mE, 6282633mN (GDA94)

**Habitat:** Wetland (remnant/reveg?) on western boundary of survey area.

**Vegetation** (remnant?): (*Eucalyptus gomphocephala* (Tuart) scattered low trees) over *Melaleuca raphiophylla* scattered low trees over *Melaleuca viminea* subsp. *viminea* open scrub over *Astartea* sp. open shrubland to closed scrub over *Gahnia trifida*, *Meeboldina ?thysanantha*, *Meeboldina roycei* scattered sedges to very open sedgeland.

**Assoc. species:** \**Lysimachia arvensis*, \**Sonchus oleracea*, *Hibbertia cuneiformis*, *Kunzea glabrescens*.

**Vegetation condition:** (?appears to be natural area) Good (structure intact(?)); low weed cover, but weedy (high cover) in outer parts of unit). Somewhat strange species mix that may be affected by presence of limestone/process of drying.

**South Capel Part A - Site CAM89**

**Described by BM**      **Date** 15/11/2012

**Location:** Part A

**AMG: Zone**50 361475mE, 6281837mN (GDA94)

**Habitat:** Area of rehabilitated plain adjacent to drain.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* (Tuart), \*\**Eucalyptus* spp (exotics), *Eucalyptus marginata* subsp. *marginata* (Jarrah), *Corymbia calophylla* (Marri) scattered low trees to woodland over *Kunzea glabrescens*, *Hakea prostrata*, *Calothamnus ?rupestris* shrubland.

**Reveg assessment:** R2 to R3 (mixed revegetation area).

\*\*\*\*\*

**South Capel Part A - Site: CARM1**

**Described by:** RO      **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01017, DSC01016

**AMG: Zone**50 361017mE, 6280948mN (GDA94)

**Habitat:** Previously mined landform. Vegetated shallow depressions along a drainage line, surrounded by cleared flats.

**Soil:** Orange loam with gravel.

**Vegetation** (revegetation): *Eucalyptus rudis* and \*\**Eucalyptus camaldulensis* subsp. *camaldulensis* over

**\*\*Acacia pycnantha, Acacia saligna and Agonis flexuosa**

**Assoc. species:** *Hibbertia cuneiformis*, *Casuarina obesa*, *Astartea* sp., *Kunzea glabrescens*, *Microtis media* subsp. *media*, *\*Disa bracteata*, *Callistemon glaucus*, *\*Asparagus asparagoides* (Bridle creeper), *\*Zantedeschia aethiopica* (Arum lily).

**Reveg assessment:** R2 (upper canopy cover but limited ground cover; small area; no understorey or proper structure; lots of self-seeded Acacia's and other weeds).

**South Capel Part A - Site:** CARM2

**Described by:** RO **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 360929mE, 6280908mN (GDA94)

**Habitat:** Previously mined landform. Cleared sandy rises.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Patchy *\*Ursinia* ground cover and scattered shrubs.

**Assoc. species:** **\*\*Acacia pycnantha, Acacia saligna, Kunzea glabrescens, Eucalyptus gomphocelphala, Regelia ciliata, \*Orobanche minor, Adenanthos meisneri.**

**Reveg assessment:** R1 (large open areas of bare sand with occasional shrubs; patchy groundcover of weed species).

**South Capel Part A - Site:** CARM3

**Described by:** RO **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01014, DSC01015

**AMG: Zone**50 360728mE, 6280729mN (GDA94)

**Habitat:** Small area of historically mined profile with a large amount of coffee rock at the surface.

**Soil:** Brown gravelly loam.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* over *Kunzea glabrescens* over *Verticordia attenuata*.

**Assoc. species:** *Gastrolobium praemorsum*, *Phyllanthus calycinus*, 1 *Pinus pinaster*

**Reveg assessment:** R2 (overstorey cover and moderate structure; low species diversity; weedy understorey).

**South Capel Part A - Site:** CARM4

**Described by:** RO **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 360622mE, 6280532mN (GDA94)

**Habitat:** Flat plain (rehabilitated).

**Vegetation** (revegetation): *Eucalyptus gomphocephala* and **\*\*Acacia pycnantha** over *Kunzea glabrescens* over *Gastrolobium praemorsum* and *Verticordia* sp.

**Assoc. species:** **\*\*Eucalyptus leucoxylon, Thelymitra vulgaris.**

**Reveg assessment:** R2 to R3 (narrow band of vegetation with moderate cover and structure, low weed cover; low species diversity).

**NOTE:** This area alongside the track is most likely the same as that opposite, described by BM- CAM37.

**South Capel Part A - Site:** CARM5

**Described by:** RO **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 360463mE, 6280495mN (GDA94)

**Habitat:** Previously mined landform. Flat area. Appears to be trial site for various tree species.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Planted rows of various species with no understorey.

**Assoc. species:** *Eucalyptus gomphocephala* (Tuart), *Corymbia calophylla* (Marri), *Agonis flexuosa*, *Eucalyptus marginata*, *Casuarina obesa*, *Banksia grandis*, *Eucalyptus rudis*.

**Reveg assessment:** R1 to R2 (patchy weed groundcover; no structure; some cover).

**South Capel Part A - Site:** CARM6

**Described by:** RO **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01011

**AMG: Zone50** 360351mE, 6279980mN (GDA94)

**Habitat:** Previously mined landform. Shallow depression.

**Soil:** Yellow sand.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *camaldulensis* and *Callistemon* sp. over \**Zantedeschia aethiopica* (Arum lily) and weed groundcover species.

**Reveg assessment:** R1 to R2 (weedy understorey; no structure; some cover).

**South Capel Part A - Site:** CARM7

**Described by:** RO **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 360362mE, 6280225mN (GDA94)

**Habitat:** Previously mined landform. Shallow drainage line.

**Soil:** Yellow sand.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *camaldulensis* over *Astartea* sp. and weed groundcover species.

**Reveg assessment:** R1 to R2 (weedy understorey; no structure; some canopy cover).

**South Capel Part A - Site:** CARM8

**Described by:** RO **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01013 and DSC01012

**AMG: Zone50** 360320mE, 6280113mN (GDA94)

**Habitat:** Creekline.

**Soil:** Orange-brown loamy clay.

**Vegetation:** (revegetation): *Eucalyptus rudis*, *Corymbia calophylla* (Marri) and *Melaleuca raphiophylla* over weed groundcover.

**Assoc. species:** *Astartea* sp., *Juncus amabilis*, *Lepidosperma* aff. *obtusum*, *Juncus pallidus*, *Meeboldina decipiens*, *Hibbertia cuneiformis*.

**Reveg assessment:** R2 to R3

**Note:** Possibly remnant or natural regrowth

**South Capel Part A - Site:** CARM9

**Described by:** RO **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01020 and DSC01021

**AMG: Zone50** 360262mE, 6280253mN (GDA94)

**Soil:** Orange loamy clay with gravel.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri), over *Acacia saligna* and \*\**Calothamnus rupestris*

**Reveg assessment:** R2 to R3 (low number of species; good canopy cover; moderate structure)

**South Capel Part A - Site: CARM10**

**Described by:** RO      **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**Photo:**

**AMG: Zone50** 360435mE, 6280463mN (GDA94)

**Habitat:** Flat rise. Previously mined and re-contoured landform.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Patchy weed groundcover.

**Assoc. species:** *Acacia saligna*.

**Reveg assessment:** R1 (cleared yellow sand area with weed groundcover and scattered shrubs; no cover or structure).

**South Capel Part A - Site: CARM11**

**Described by:** RO      **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01018 and DSC01019

**AMG: Zone50** 360443mE, 6279970mN (GDA94)

**Habitat:** Poor.

**Soil:** Grey sand.

**Vegetation** : *Corymbia calophylla* (Marri) over \**Zantedeschia aethiopica* (Arum lily) and other weed species.

**Assoc. species:** *Banksia grandis*, 1 *Pinus pinaster*.

**Overall Rating:** R2or Keighery: Degraded (some canopy cover with no structure)

**Note:** Possibly remnant or natural regrowth?

**South Capel Part A - Site: CARM12**

**Described by:** RO      **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 360427mE, 6280084mN (GDA94)

**Habitat:** Re-contoured landform with gentle slope.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Patchy weed groundcover.

**Reveg assessment:** R1 (cleared flat).

**South Capel Part A - Site: CARM13**

**Described by:** RO      **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01023 and DSC01024

**AMG: Zone50** 360952mE, 6280741mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Hill crest and gentle to moderate sloped sides.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Patchy weed groundcover.

**Assoc. species:** *Casuarina obesa*, *Melaleuca systena*, *Calothamnus sanguineus*, *Kunzea glabrescens*, *Regelia ciliata*, *Acacia saligna*, \*\**Acacia pycnantha*.

**Reveg assessment:** R2 to R1 (large cleared areas with scattered shrubs; no canopy cover or structure).

**South Capel Part A - Site: CARM14**

**Described by:** RO      **Date:** 6/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01027 and DSC01029

**AMG: Zone50** 360848mE, 6280665mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Relatively flat with planting furrows.

**Soil:** Yellow sand with large gravel/rocks at surface.

**Vegetation** (revegetation): Mixed shrubland of: *Corymbia calophylla* (Marri) (juvenile), *Agonis flexuosa*, \*\**Acacia pycnantha*, *Acacia saligna*, *Paraserianthes lophantha* subsp. *lophantha*, *Kunzea glabrescens*, *Melaleuca thymoides*, *Kunzea recurva*, *Regelia ciliata*, *Hakea prostrata*, *Calothamnus quadrifidus* subsp. *teretifolius* over weed groundcover.

**Reveg assessment:** R2 to R3 (moderate canopy cover and some structure developing; weed groundcover; low number of species).

**South Capel Part A - Site:** CARM16

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01031

**AMG: Zone50** 361089mE, 6281094mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Low rise with one small steep sided pit.

**Soil:** Brown sandy clay with large gravel/rock at surface.

**Vegetation** (revegetation): \*\**Acacia pycnantha* over *Kunzea glabrescens* and *Verticordia* sp. over weed groundcover.

**Assoc. species:** *Gastrolobium praemorsum*, *Calothamnus quadrifidus* subsp. *teretifolius*.

**Reveg assessment:** R2 to R3 (some open areas; low number of species; moderate weed cover; poor to moderate canopy cover).

**South Capel Part A - Site:** CARM17

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01030 and DSC01032

**AMG: Zone50** 361096mE, 6281263mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Low rise.

**Soil:** Brown gravelly clay and yellow sand areas.

**Vegetation** (revegetation): *Eucalyptus gomphocephala*, *Corymbia calophylla* (Marri) and \*\**Acacia pycnantha* over *Kunzea glabrescens* and *Verticordia* sp.

**Assoc. species:** *Astartea* sp., *Stirlingia latifolia*, \*\**Grevillea manglesii* subsp. *manglesii*, *Adenanthos meisneri*, *Agonis flexuosa*.

**Reveg assessment:** R2 to R3 (some open areas; low number of species; moderate to low weed cover; poor to moderate canopy cover).

**South Capel Part A - Site:** CARM18

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361175mE, 6281232mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Gently undulating.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Patchy weed groundcover.

**Assoc. species:** *Kunzea glabrescens*, \*\**Acacia pycnantha*, *Eucalyptus gomphocephala*, \*\**Eucalyptus camaldulensis* subsp. *camaldulensis*.

**Reveg assessment:** R1 (large cleared area with occasional scattered shrubs/trees).

**South Capel Part A - Site:** CARM20

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01033

**AMG:** Zone50 361201mE, 6281330mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Gentle depression.

**Soil:** Orange clay.

**Vegetation** (revegetation): *Eucalyptus gomphocephala* and **\*\*Eucalyptus botryoides** over *Agonis flexuosa* and **\*\*Acacia pycnantha**.

**Assoc. species:** *Hibbertia cuneiformis*.

**Reveg assessment:** R2 (moderate canopy cover; little structure; no understorey; low weed cover).

**South Capel Part A - Site:** CARM21

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 361189mE, 6281432mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Crest of low rise.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Patchy weed groundcover.

**Assoc. species:** *Acacia saligna*

**Reveg assessment:** R1 (open cleared areas with occasional scattered shrubs)

**South Capel Part A - Site:** CARM22

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 361189mE, 6281432mN (GDA94)

**Habitat:** Low lying clay depression.

**Soil:** Orange clay.

**Vegetation** (revegetation): Mixed open overstorey of *Casuarina obesa*, *Melaleuca raphiophylla*, *Eucalyptus rudis*, *Melaleuca viminea* subsp. *viminea*, **\*\*Eucalyptus camaldulensis** subsp. *camaldulensis*.

**Reveg assessment:** R2 (mostly open ground; no weeds; moderate canopy cover; low number of species)

**South Capel Part A - Site:** CARM23

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 361260mE, 6281445mN (GDA94)

**Vegetation** (revegetation): **\*\*Eucalyptus camaldulensis** subsp. *camaldulensis* and **\*\*Eucalyptus botryoides** overstorey over *Acacia cyclops*, **\*\*Acacia pycnantha**, and *Melaleuca* spp.

**Assoc. species:** *Hibbertia cuneiformis*, *Agonis flexuosa*, *Callitris preissii*, *Callistemon glaucus*.

**Reveg assessment:** R2 (good canopy cover but weedy understorey; low number of species)

**South Capel Part A - Site:** CARM24

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 361274mE, 6281278mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Gentle depression.

**Vegetation** (revegetation): **\*\*Eucalyptus camaldulensis** subsp. *camaldulensis*, *Eucalyptus rudis* and **\*\*Acacia pycnantha** over *Verticordia* sp.

**Assoc. species:**

**Reveg assessment:** R2 to R3 (open ground with low-no weed cover; moderate canopy cover).

**South Capel Part A - Site:** CARM25

**Described by:** RO      **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 361240mE, 6281398mN (GDA94)

**Habitat:** Low lying clay depression.

**Soil:** Orange clay.

**Vegetation** (revegetation): Dense thicket of *Melaleuca viminea* subsp. *viminea* over *Astartea* sp.

**Assoc. species:** *Kunzea glabrescens*, *Hibbertia cuneiformis*, *Meeboldina roycei*.

**Reveg assessment:** R2 to R3 (good cover; low number of species).

**South Capel Part A - Site:** CARM26

**Described by:** RO      **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01033

**AMG:** Zone50 361336mE, 6281376mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Depression.

**Soil:** Orange clay.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) and \*\**Eucalyptus botryoides* over *Agonis flexuosa* and \*\**Acacia pycnantha*.

**Assoc. species:** *Verticordia*, *Daviesia divaricata*.

**Reveg assessment:** R2 (moderate canopy cover; little structure; no understorey; low weed cover).

**South Capel Part A - Site:** CARM28

**Described by:** RO      **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01036

**AMG:** Zone50 362666mE, 6282534mN (GDA94)

**Habitat:** Previously mined and re-contoured landform with scattered low bund structures throughout.

**Soil:** Brown loam.

**Vegetation** (revegetation): Plantation of *Eucalyptus gomphocephala*, \*\**Eucalyptus camaldulensis* subsp. *camaldulensis* over *Hibbertia cuneiformis*, \**Zantedeschia aethiopica* (Arum lily) and weed groundcover.

**Assoc. species:** \*\**Acacia decurrens*, *Agonis flexuosa*, *Corymbia calophylla* (Marri), *Casuarina obesa*.

**Reveg assessment:** R2 (good canopy cover; no structure; low number of species)

**South Capel Part A - Site:** CARM29

**Described by:** RO      **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01035

**AMG:** Zone50 362704mE, 6282695mN (GDA94)

**Habitat:** Previously mined and re-contoured landform.

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) over *Kunzea glabrescens*.

**Assoc. species:** *Hibbertia cuneiformis*, \*\**Acacia decurrens*, *Eucalyptus cornuta*, \*\**Calothamnus rupestris*, *Viminaria juncea*.

**Reveg assessment:** R2 (patchy cover, denser in places; low number of species)

**South Capel Part A - Site:** CARM29a

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01038

**AMG:** Zone50 362198mE, 6282276mN (GDA94)

**Habitat:** In and alongside steep drainage line and bund.

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) over *Kunzea glabrescens* and *Astartea* sp.

**Assoc. species:** *Hibbertia cuneiformis*, *Calothamnus quadrifidus* subsp. *teretifolius*.

**Reveg assessment:** R2 (small narrow band in drainage line; good cover; some structure).

**South Capel Part A - Site:** CARM30

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362600mE, 6282793mN (GDA94)

**Habitat:** Small raised mound.

**Soil:** Yellow sand.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *obtusata* over *Hibbertia cuneiformis* and weeds.

**Assoc. species:** *Astartea* sp.

**Reveg assessment:** R2 (small area; moderate canopy cover; no structure).

**South Capel Part A - Site:** CARM30a

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362435mE, 6282593mN (GDA94)

**Habitat:** Small area in steep sided drain.

**Soil:** Yellow sand.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *obtusata* over *Hibbertia cuneiformis* and weeds.

**Assoc. species:** *Astartea* sp.

**Reveg assessment:** R2 (moderate canopy cover; no structure)

**South Capel Part A - Site:** CARM31

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01037

**AMG: Zone50** 362510mE, 6282620mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Scattered *Agonis flexuosa*, \*\**Melaleuca quinquenervia* and \*\**Eucalyptus leucoxylon* over \**Zantedeschia aethiopica* (Arum lily) and other paddock weeds.

**Assoc. species:** *Hibbertia cuneiformis*.

**Reveg assessment:** R1 to R2 (scattered trees in open paddock).

**South Capel Part A - Site:** CARM31a

**Described by:** RO **Date:** 13/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01037

**AMG: Zone50** 362489mE, 6282664mN (GDA94)

**Habitat:** Small area in drain.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Mixed *Agonis flexuosa* and *Kunzea glabrescens*.

**Assoc. species:** *Hibbertia cuneiformis*.

**Reveg assessment:** R2 (some canopy cover; no structure).



**South Capel Part A - Site:** CARM32

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362306mE, 6282413mN (GDA94)

**Habitat:** Small area of previously mined and re-contoured landform.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Small number of *Acacia decurrens* and introduced *Acacia dealbata* over paddock grasses.

**Assoc. species:** *Hibbertia cuneiformis*.

**Reveg assessment:** R1 (small area of scattered trees in open paddock).

**South Capel Part A - Site:** CARM33

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01040

**AMG: Zone50** 362277mE, 6282295mN (GDA94)

**Habitat:** Steep sided pit.

**Soil:** Orange clay with gravel.

**Vegetation** (revegetation): Planting of mixed: *Eucalyptus botryoides*, *Melaleuca quinquenervia*, *Melaleuca viminea*, *Casuarina obesa*, *Kunzea glabrescens*, *Astartea* sp.

**Assoc. species:** *Acacia decurrens*, *Hibbertia cuneiformis*, *Agonis flexuosa*, *Verticordia* sp..

**Reveg assessment:** R2 to R3 (mixed planting in clay bottomed pit with good cover in parts).

**South Capel Part A - Site:** CARM33a

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362316mE, 6282298mN (GDA94)

**Habitat:** At the edge of a steep sided pit.

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Eucalyptus leucoxylon*.

**Reveg assessment:** R2 (single species; some canopy cover; no structure).

**South Capel Part A - Site:** CARM34

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01041

**AMG: Zone50** 362278mE, 6282255mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Depression.

**Soil:** Orange clay.

**Vegetation** (revegetation): Open planting of *Eucalyptus gomphocephala*.

**Assoc. species:** *Kunzea glabrescens*.

**Reveg assessment:** R2 (bare ground with single species planting).

**South Capel Part A - Site:** CARM35

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362356mE, 6282308mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Gentle slope with occasional contour bunds.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Weedy herb layer groundcover.

**Assoc. species:** *Macrozamia riedlei*, *Kunzea glabrescens*, *Eucalyptus gomphcephala*, \**Pinus pinaster*, *Corymbia calophylla* (Marri), \*\**Eucalyptus* sp. (stringy bark).

**Reveg assessment:** R1 (large open expanses with occasional scattered trees/shrubs).

**South Capel Part A - Site:** CARM36

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01039

**AMG: Zone50** 362370mE, 6282474mN (GDA94)

**Habitat:** Small broad area along a drainage line.

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Casuarina obesa* and *Melaleuca viminea*.

**Assoc. species:** *Astartea* sp.

**Reveg assessment:** R1 (small area surrounded by open paddock).

**South Capel Part A - Site:** CARM37

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:**

**AMG: Zone50** 362406mE, 6282534mN (GDA94)

**Habitat:** Moderately steep sided drainage line.

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Kunzea glabrescens*.

**Assoc. species:** Pasture/weed species.

**Reveg assessment:** R1 (small patch of shrubs in drainage line surrounded by open paddock)

**South Capel Part A - Site:** CARM39

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361335mE, 6281592mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Banks of wetland with moderate slope.

**Soil:** Orange clay.

**Vegetation** (revegetation): Mixed open planting of *Eucalyptus rudis*, *Melaleuca ?rhapsiophylla*, *Melaleuca lanceolata*, *Astartea* sp., *Melaleuca osullivanii*, *Melaleuca cuticularis*.

**Reveg assessment:** R1 (sparse planting on bare clay area)

**South Capel Part A - Site:** CARM40

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361417mE, 6281519mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Raised mound adjacent to wetland banks.

**Soil:** Orange clay.

**Vegetation** (revegetation): *Eucalyptus rudis* over *Melaleuca rhapsiophylla*, *Melaleuca lanceolata*, *Melaleuca teretifolia*.

**Assoc. species:** *Astartea scoparia*.

**Reveg assessment:** R3 (good canopy cover; moderate structure)

**South Capel Part A - Site:** CARM41

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361386mE, 6281767mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Steep slope adjacent to wetland.

**Soil:** Orange clay.

**Vegetation** (revegetation): Planted rows of *Casuarina obesa*.

**Assoc. species:** *Verticordia* sp., *Melaleuca raphiophylla*, *Melaleuca osullivanii*, *Kunzea glabrescens*, *Astartea scoparia*, *Melaleuca lanceolata*, *Agonis flexuosa*.

**Reveg assessment:** R2 (low to moderate canopy cover; some open patches).

**South Capel Part A - Site:** CARM42

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361316mE, 6281655mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Hillslope.

**Vegetation** (revegetation): Sparse *Corymbia calophylla* (Marri) over *Verticordia* sp.

**Assoc. species:** \*\**Acacia pycnantha*.

**Reveg assessment:** R2 (moderate canopy cover; no structure)

**South Capel Part A - Site:** CARM42a

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** mE, mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Narrow bank of breakaway.

**Soil:** Orange sand with large rocks at surface.

**Vegetation** (revegetation): Sparse *Corymbia calophylla* (Marri) over *Verticordia* sp.

**Assoc. species:** \*\**Acacia pycnantha*.

**Reveg assessment:** R1 to R2 (low cover and number of species; narrow band of vegetation with open areas)

**South Capel Part A - Site:** CARM43

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361428mE, 6281758mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Wetland seasonally inundated flats.

**Soil:** Orange clay.

**Assoc. species:** Occasional patches of *Juncus pallidus* and *Baumea juncea*.

**Reveg assessment:** N/A (seasonally submerged land)

**South Capel Part A - Site:** CARM44

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361377mE, 6281647mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Island.

**Soil:** Orange clay.

**Vegetation** (revegetation): Mixed *Casuarina obesa* and *Eucalyptus rudis*.

**Reveg assessment:** R2 (moderate cover with very low number of species)

**NB:** Island area assessed from some distance away.

**South Capel Part A - Site:** CARM45

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands  
**AMG: Zone50** 361268mE, 6281533mN (GDA94)  
**Habitat:** Previously mined and re-contoured landform. Undulating.  
**Soil:** Yellow sand.  
**Vegetation** (revegetation): Large open cleared areas with patchy weed groundcover.  
**Assoc. species:** Occasional scattered: *Kunzea glabrescens*, \*\**Acacia pycnantha*, *Verticordia attenuata*.  
**Reveg assessment:** R1 (large cleared area).

**South Capel Part A - Site:** CARM46  
**Described by:** RO **Date:** 14/11/2012  
**Location:** Part A, Capel Wetlands  
**AMG: Zone50** 361310mE, 6281615mN (GDA94)  
**Habitat:** Previously mined and re-contoured landform. Hillslope.  
**Vegetation** (revegetation): \*\**Acacia pycnantha* and \*\**Eucalyptus* sp. (stringy bark).  
**Reveg assessment:** R1 to R2 (no understorey; mix of two introduced species only)

**South Capel Part A - Site:** CARM47  
**Described by:** RO **Date:** 14/11/2012  
**Location:** Part A, Capel Wetlands  
**AMG: Zone50** 361471mE, 6281895mN (GDA94)  
**Habitat:** Previously mined and re-contoured landform. Gentle slope.  
**Soil:** Orange sand.  
**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *obtusata* over \**Acacia longifolia* and *Phyllanthus calycinus*.  
**Assoc. species:** *Hibbertia cuneiformis*, \*\**Acacia decurrens*, *Juncus pallidus*, *Schoenus subfascicularis*.  
**Reveg assessment:** R2 (moderate canopy cover; some structure; low number and introduced species).

**South Capel Part A - Site:** CARM48  
**Described by:** RO **Date:** 14/11/2012  
**Location:** Part A, Capel Wetlands  
**AMG: Zone50** 361538mE, 6281901mN (GDA94)  
**Habitat:** Previously mined and re-contoured landform. Small depression.  
**Vegetation** (revegetation): *Melaleuca viminea* over *Astartea* sp.  
**Assoc. species:** *Hibbertia cuneiformis*.  
**Reveg assessment:** R2 to R3 (moderate to good cover; few species; small area only)

**South Capel Part A - Site:** CARM49  
**Described by:** RO **Date:** 14/11/2012  
**Location:** Part A, Capel Wetlands  
**AMG: Zone50** 361513mE, 6282063mN (GDA94)  
**Habitat:** Small area of previously mined and re-contoured landform. Gentle slope.  
**Soil:** Yellow sand.  
**Vegetation** (revegetation): \*\**Eucalyptus* sp. (stringy bark) and *Melaleuca viminea*.  
**Assoc. species:** \**Acacia longifolia*.  
**Reveg assessment:** R1 (scattering of trees and shrubs in open paddock).

**South Capel Part A - Site:** CARM50  
**Described by:** RO **Date:** 14/11/2012  
**Location:** Part A, Capel Wetlands  
**AMG: Zone50** 361547mE, 6281965mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Small shallow depression.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) over \**Acacia longifolia*.

**Assoc. species:** *Hibbertia cuneiformis*.

**Reveg assessment:** R2 (small area of trees and shrubs over weedy ground cover, surrounded by open paddock).

**South Capel Part A - Site:** CARM51

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361591mE, 6281926mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Undulating dunes.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Open cleared areas with patchy weed groundcover.

**Assoc. species:** Occasional scattered *Regelia ciliata* and *Hakea prostrata*.

**Reveg assessment:** R1

**South Capel Part A - Site:** CARM52

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361724mE, 6282133mN (GDA94)

**Habitat:** Banks surrounding open water area.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Mixed canopy of \*\**Eucalyptus camaldulensis*, *Casuarina obesa*, \*\**Melaleuca quinquenervia*, *Agonis flexuosa*, \**Leptospermum laevigatum* over *Verticordia* sp. and *Astartea* sp.

**Assoc. species:** *Regelia ciliata*.

**Reveg assessment:** R2 to R1 (open with poor cover and low number of species).

**South Capel Part A - Site:** CARM53

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01055

**AMG: Zone50** 361787mE, 6282375mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Small depression.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *obtusata* over \**Acacia longifolia* and *Hibbertia cuneiformis* over weed groundcover species.

**Reveg assessment:** R2 to R1 (small area surrounded by open paddock; low number of species).

**South Capel Part A - Site:** CARM54

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01042

**AMG: Zone50** 361810mE, 6282237mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Depression.

**Soil:** Yellow sand surrounding open water areas.

**Vegetation** (revegetation): *Eucalyptus* sp., juvenile *Eucalypt rudis* and *Melaleuca viminea* over *Astartea* sp. and *Baumea articulata*.

**Reveg assessment:** R2 (open with some cover and limited structure; low number of species).

**South Capel Part A - Site:** CARM55

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 361807mE, 6282105mN (GDA94)

**Habitat:** Riparian zone surrounding open water.

**Soil:** Orange loamy sand.

**Vegetation** (revegetation): \*\**Melaleuca quinquenervia*, *Casuarina obesa*, *Agonis flexuosa* and *Kunzea glabrescens* over \**Acacia longifolia*, *Astartea* sp., *Meeboldina roycei* and *Baumea juncea*.

**Reveg assessment:** R2 to R3

**South Capel Part A - Site:** CARM56

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 361868mE, 6282405mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat area contained by a steep sided bunded drain.

**Soil:** Orange clay loam.

**Vegetation** (revegetation): Mixed open canopy of *Eucalyptus rudis* subsp. *rudis* and *Corymbia calophylla* (Marri).

**Assoc. species:** *Hakea prostrata*.

**Reveg assessment:** R2 (low to moderate canopy cover; low number of species present; little structure).

**South Capel Part A - Site:** CARM57

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01054

**AMG:** Zone50 361978mE, 6282502mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat area contained within a steep sided bunded drain.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Appears to be similar mix to CARM39. Open planting of: *Eucalyptus rudis* subsp. *rudis*, *Regelia ciliata*, *Melaleuca viminea*, *Kunzea glabrescens*, *Melaleuca teretifolia*, *Melaleuca incana* subsp. *incana*, *Melaleuca raphiophylla*, *Astartea* sp., *Acacia saligna*, *Melaleuca thymoides*, *Melaleuca* sp.

**Assoc. species:** *Baumea juncea*, *Lepidosperma longitudinale*.

**Reveg assessment:** R1 to R2 (sparsely planted; large areas of bare open ground).

**South Capel Part A - Site:** CARM58

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01051

**AMG:** Zone50 362125mE, 6282748mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Narrow, steep sided bunded drain.

**Soil:** Orange clay.

**Vegetation** (revegetation): Mixed planting of shrubs including *Acacia saligna*, *Kunzea glabrescens*, *Melaleuca viminea* subsp. *viminea*, *Melaleuca raphiophylla*, *Kunzea* sp., *Melaleuca thymoides*, *Taxandria linearifolia*.

**Assoc. species:** *Lepidosperma longitudinale*.

**Reveg assessment:** R2 to R3 (good cover and mix of species; very narrow band of vegetation in a steep sided drainage line)

**South Capel Part A - Site:** CARM59

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 361938mE, 6282408mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat area contained by a steep sided bunded drain.

**Vegetation** (revegetation): *Eucalyptus cornuta* and *Eucalyptus* sp. over *Acacia* sp. and *Hibbertia cuneiformis*.

**Reveg assessment:** R2 (good canopy cover; no structure; low number of species)

**South Capel Part A - Site:** CARM60

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 361875mE, 6282598mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat area contained by a steep sided bunded drain.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Mixed planting of shrubs *Melaleuca raphiophylla*, *Melaleuca teretifolia*, **\*\*Callistemon phoeniceus**, **\*\*Melaleuca hamulosa**, *Melaleuca incana* subsp. *incana*, *Agonis flexuosa*, *Calothamnus quadrifidus*, *Eucalyptus rudis* subsp. *rudis*, *Kunzea glabrescens*, *Regelia ciliata*.

**Reveg assessment:** R2 (sparsely planted with large areas of bare open ground)

**South Capel Part A - Site:** CARM61

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 362235mE, 6282765mN (GDA94)

**Habitat:** Riparian area surrounding lake.

**Vegetation** (revegetation): Mix of *Eucalyptus rudis*, *Casuarina obesa*, *Melaleuca raphiophylla*, **\*\*Melaleuca quinquenervia**, **\*\*Eucalyptus ?camaldulensis**, *Acacia* **\*\*pycnantha** over *Astartea* sp.

**Assoc. species:** *\*Typha* sp.

**Reveg assessment:** R2 (moderate cover; little structure; few species).

**South Capel Part A - Site:** CARM62

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 362048mE, 6282765mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat area contained by a steep sided bunded drain, with numerous shallow linear drains and one large shallow trench.

**Soil:** Yellow sand.

**Vegetation** (revegetation):

High areas of sand: scattered *Eucalyptus gomphocephala*.

In lower areas: *Corymbia calophylla* (Marri), *Melaleuca raphiophylla*, *Taxandria linearifolia*, *Melaleuca viminea* and *Kunzea glabrescens* over *Melaleuca cuticularis*, *Melaleuca teretifolia*, *Astartea* sp., *Verticordia* sp.

**Assoc. species:** *Meeboldina* sp., *Calothamnus lateralis*.

**Reveg assessment:** R2 (large open sand areas; poor cover; little structure)

**South Capel Part A - Site:** CARM63

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 362000mE, 6282792mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Slight depression contained by a steep sided bunded drain.

**Soil:** Yellow sand.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *obtusa* over *Kunzea glabrescens* and *Astartea* sp.

**Assoc. species:** *Hibbertia cuneiformis*, *Meeboldina roycei*.

**Reveg assessment:** R2 (moderate to good canopy cover; little structure; few species).

**South Capel Part A - Site:** CARM63a

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands.

**AMG: Zone50** 361962mE, 6282686mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Slight depression contained by a steep sided banded drain.

**Soil:** Yellow sand.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *obtusa* over *Kunzea glabrescens* and *Astartea* sp.

**Assoc. species:** *Hibbertia cuneiformis*, *Meeboldina roycei*, \*\**Callistemon phoeniceus*.

**Reveg assessment:** R1 (little cover or structure; few species).

**South Capel Part A - Site:** CARM64

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362016mE, 6282642mN (GDA94)

**Habitat:** Small raised mounds between dug out trenches.

**Soil:** Yellow sand.

**Vegetation** (revegetation): \*\**Acacia acuminata*.

**Reveg assessment:** R2

**South Capel Part A - Site:** CARM65

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362108mE, 6282691mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Narrow strip contained by a steep sided banded drain.

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) and \*\**Eucalyptus camaldulensis* subsp. *obtusa* over *Hakea prostrata*, \*\**Callistemon phoeniceus* and *Calothamnus quadrifidus*.

**Reveg assessment:** R2 (low to moderate cover and structure; few species).

**South Capel Part A - Site:** CARM66

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362135mE, 6282665mN (GDA94)

**Habitat:** Plantings along steep sided banded drain.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Mixed planting of *Eucalyptus cornuta*, *Casuarina obesa*, *Corymbia calophylla* (Marri) and \*\**Eucalyptus camaldulensis* subsp. *obtusa* over *Kunzea glabrescens* and *Astartea* sp.

**Reveg assessment:** R2 (good canopy cover; few species; little structure).

**South Capel Part A - Site:** CARM67



**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 362068mE, 6282510mN (GDA94)

**Habitat:** Riparian zone surrounding open water.

**Soil:** Yellow sand.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *obtusata*, *Casuarina obesa* and \*\**Acacia pycnantha* over *Melaleuca viminea* and *Melaleuca raphiophylla* over *Kunzea glabrescens* and *Astartea* sp.

**Assoc. species:** ?*Juncus* sp. in open water?

**Reveg assessment:** R2

**South Capel Part A - Site:** CARM68

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01050

**AMG:** Zone50 362160mE, 6282788mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Shallow depression.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Young open planting of *Agonis flexuosa*, \*\**Calothamnus rupestris*, \*\**Ficinia nodosa*, *Dodonaea viscosa* subsp. *angustissima*, *Eucalyptus* sp., *Eucalyptus cornuta*.

**Reveg assessment:** R1 (large open areas; no cover).

**South Capel Part A - Site:** CARM68a

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 362062mE, 6282846mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Shallow depression.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Young open planting of *Hakea prostrata*, *Eucalyptus* sp., *Kunzea glabrescens*.

**Reveg assessment:** R1 (large open areas; no cover).

**South Capel Part A - Site:** CARM69

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG:** Zone50 362161mE, 6282750mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Raised mound.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Mixed canopy of *Eucalyptus gomphocephala*, *Casuarina obesa*, *Kunzea glabrescens* and *Agonis flexuosa* over weed groundcover.

**Assoc. species:** *Hibbertia cuneiformis*, \*\**Melaleuca quinquenervia*, *Acacia saligna*.

**Reveg assessment:** R1 to R2 (open weedy areas; low cover; no structure).

**South Capel Part A - Site:** CARM70

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01052, DSC01057

**AMG:** Zone50 362012mE, 6282913mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Mostly flat, with some shallow furrows.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Young plantings of *Kunzea glabrescens*, *Kunzea* sp., *Hakea prostrata*,

*Eucalyptus* sp. (juvenile), *Calothamnus* sp., *Acacia saligna*, *Eucalyptus cornuta* (juvenile), *Agonis flexuosa*.

**Reveg assessment:** R1 to R2 (large open sand areas; poor cover; little structure).

**South Capel Part A - Site:** CARM71

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 361944mE, 6282820mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Gentle slope.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Large open areas of sand and patchy weed groundcover with occasional scattered shrubs.

**Assoc. species:** *Corymbia calophylla* (Marri), *Banksia grandis*, *Acacia saligna*, *Kunzea glabrescens*, *Banksia seminuda*.

**Reveg assessment:** R1 .

**South Capel Part A - Site:** CARM73

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 361898mE, 6282660mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Shallow trench.

**Soil:** Yellow sand.

**Vegetation** (revegetation): Mixed planting of shrubs: *Hypocalymma angustifolium*, *Melaleuca cuticularis*, *Melaleuca teretifolia*, *Melaleuca raphiophylla*, *Astartea* sp., *Kunzea recurva*.

**Assoc. species:** *Meeboldina roycei*.

**Reveg assessment:** R1 to R2 (sparsely planted with large areas of bare open ground).

**Note:** Planting mix looks similar to CARM57.

**South Capel Part A - Site:** CARM74

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01058

**AMG: Zone**50 362385mE, 6283028mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Mixed canopy of *Eucalyptus gomphocephala*, *Eucalyptus cornuta*, *Eucalyptus rudis* over *Agonis flexuosa* over *Kunzea glabrescens*, *Hakea prostrata*, \*\**Calothamnus graniticus* subsp. *graniticus*, \*\**Calothamnus rupestris*, over weedy herb layer.

**Assoc. species:** \*\**Acacia pycnantha*, *Banksia grandis*, \*\**Banksia seminuda*, *Acacia cyclops*.

**Reveg assessment:** R2 to R3 (moderate canopy cover and structure; few species).

**South Capel Part A - Site:** CARM74a

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 362393mE, 6283062mN (GDA94)

**Habitat:** Dug out pits within CARM74.

**Soil:** Yellow sand.

**Vegetation** (revegetation): *Astartea* sp. and *Verticordia* sp. over *Meeboldina roycei* and *Baumea juncea*.

**Reveg assessment:** R1 to R2 (sparsely planted with areas of bare ground; few species).

**South Capel Part A - Site:** CARM75

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362966mE, 6283711mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri) and *Agonis flexuosa* over *Kunzea glabrescens* over paddock weeds.

**Reveg assessment:** R2 (moderate cover; few species; little structure).

**South Capel Part A - Site:** CARM76

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362910mE, 6283714mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Mixed planted *Eucalyptus* sp. with *Kunzea glabrescens* and *Calothamnus* sp. over pasture species.

**Reveg assessment:** R2 (moderate cover; few species; little structure).

**South Capel Part A - Site:** CARM77

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362866mE, 6283717mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Drainage line.

**Vegetation** (revegetation): Mixed planting of juvenile *Corymbia calophylla* (Marri), *Kunzea glabrescens*, *Hakea prostrata*.

**Reveg assessment:** R2 (narrow planting along a small drainage line).

**South Capel Part A - Site:** CARM78

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362861mE, 6283663mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Mixed planting of *Corymbia calophylla* (Marri), *Eucalyptus gomphocephala* other *Eucalyptus* spp., *Callistemon* sp., *Calothamnus* sp., *Agonis flexuosa*.

**Reveg assessment:** R2 (open mixed planting over pasture species).

**South Capel Part A - Site:** CARM78a

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362894mE, 6283604mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Mixed planting of *Corymbia calophylla* (Marri), *Eucalyptus gomphocephala* other *Eucalyptus* spp., *Callistemon* sp., *Calothamnus* sp., *Agonis flexuosa*.

**Reveg assessment:** R2 to R3 (mixed planting over pasture species; moderate canopy cover).

**South Capel Part A - Site:** CARM79

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362823mE, 6283485mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Tall woodland of *Eucalyptus gomphocephala* and another *Eucalyptus* sp. over

\**Acacia paradoxa*, *Hakea prostrata*, *Calothamnus quadrifidus* subsp. *teretifolius*.

**Reveg assessment:** R2 (good cover; little structure; few species).

**South Capel Part A - Site:** CARM80

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01059

**AMG: Zone50** 362745mE, 6283465mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Mixed young planting of *Corymbia calophylla* (Marri) (juvenile), *Agonis flexuosa*, *Kunzea glabrescens*.

**Reveg assessment:** R2 (sparsely planted with areas of bare ground).

**South Capel Part A - Site:** CARM81

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** DSC01959

**AMG: Zone50** 362700mE, 6283550mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Mixed planting of *Corymbia calophylla* (Marri), *Agonis flexuosa*, *Calothamnus* sp., *Regelia* sp.

**Assoc. species:** *Eucalyptus cornuta*.

**Reveg assessment:** R1 to R2 (sparsely planted with areas of bare ground and pasture weeds).

**South Capel Part A - Site:** CARM82

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362613mE, 6283485mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Mixed low planting of *Corymbia calophylla* (Marri), *Kunzea glabrescens*, *Agonis flexuosa*, *Hakea prostrata*, *Regelia ciliata*, *Kunzea baxteri*.

**Reveg assessment:** R2 to R1 (sparsely planted with areas of bare ground and pasture weeds).

**South Capel Part A - Site:** CARM83

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362546mE, 6283422mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Mixed planting of *Agonis flexuosa*, *Corymbia calophylla* (Marri), other juvenile *Eucalyptus* spp., *Hakea prostrata*, *Calothamnus* sp., *Regelia* sp.

**Reveg assessment:** R1 to R2 (sparsely planted with areas of bare ground and pasture weeds).

**South Capel Part A - Site:** CARM84

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362526mE, 6283373mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Low lying depression.

**Vegetation** (revegetation): Mixed planting of *Melaleuca raphiophylla*, *Kunzea glabrescens*, *Eucalyptus rudis*, \**Acacia paradoxa*, *Calothamnus* sp.

**Reveg assessment:** R1 to R2 (sparsely planted with areas of bare ground).

**South Capel Part A - Site:** CARM85

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362561mE, 6283310mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Mound between wetland areas.

**Vegetation** (revegetation): Mixed Eucalypts including *Eucalyptus rudis*, *Corymbia calophylla* (Marri), *Eucalyptus gomphocephala*, *Eucalyptus cornuta* over *Calothamnus quadrifidus* subsp. *teretifolius*, *Kunzea recurva* and *Kunzea glabrescens*.

**Reveg assessment:** R2

**South Capel Part A - Site:** CARM86

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362688mE, 6283365mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat and then gently sloping towards wetland.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri), *Eucalyptus rudis*, other *Eucalyptus* sp., *Hakea prostrata*, *Callistemon* sp., *Calothamnus* sp.

**Reveg assessment:** R2 (sparsely planted with areas of bare ground and pasture weeds).

**South Capel Part A - Site:** CARM87

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** mE, mN (GDA94)

**Habitat:** Riparian zone around wetland.

**Vegetation** (revegetation): *Eucalyptus rudis*? over *Melaleuca teretifolia*, *Kunzea glabrescens*, *Melaleuca raphiophylla*, *Melaleuca hamulosa*.

**Reveg assessment:** R2 to R3 (moderate cover and structure).

**South Capel Part A - Site:** CARM88

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362608mE, 6283245mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Slight depression.

**Vegetation** (revegetation): Grove of *Eucalyptus* sp.

**Reveg assessment:** R1 to R2 (grove of single species over open ground).

**South Capel Part A - Site:** CARM89

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362309mE, 6283182mN (GDA94)

**Habitat:** Steep sided pits.

**Vegetation** (revegetation): Mixed planting of *Kunzea glabrescens*, *Melaleuca raphiophylla*, *Melaleuca viminea* subsp. *viminea*, *Acacia saligna*, *Eucalyptus rudis*?

**Reveg assessment:** R2 (sparsely planted with areas of bare ground).

**South Capel Part A - Site:** CARM90

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362352mE, 6283192mN (GDA94)

**Habitat:** At edge of steep sided pit.

**Vegetation** (revegetation): Planted line of mixed *Eucalypts* and *Agonis flexuosa*.

**Reveg assessment:** R1 to R2 (narrow band of moderate canopy cover; no structure; few species).

**South Capel Part A - Site:** CARM91

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 362380mE, 6283282mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Mixed *Eucalyptus* spp. with *Agonis flexuosa* and *Acacia saligna*.

**Reveg assessment:** R1 to R2 (moderate cover but no structure; few species).

**South Capel Part A - Site:** CARM92

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 362353mE, 6283289mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat

**Vegetation** (revegetation): Mixed planting of *Corymbia calophylla* (Marri), *Eucalyptus* sp., *Acacia saligna*, *Kunzea glabrescens*, *Calothamnus* sp., *Hakea prostrata*.

**Reveg assessment:** R1 to R2 (little cover; no structure; few species).

**South Capel Part A - Site:** CARM93

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 362283mE, 6283126mN (GDA94)

**Habitat:** Small shallow pit.

**Vegetation** (revegetation): *Corymbia calophylla* (Marri), *Agonis flexuosa*, *Banksia grandis*, \**Acacia longifolia*, *Acacia saligna*, *Kunzea glabrescens*.

**Reveg assessment:** R2

**South Capel Part A - Site:** CARM94

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone**50 362302mE, 6283081mN (GDA94)

**Habitat:** Small flat area

**Vegetation** (revegetation): Overstorey of introduced \*\**Acacias* sp. and *Eucalyptus* sp., including \*\**Acacia decurrens*.

**Reveg assessment:** R1 to R2 (good canopy cover; no structure; few species).

**South Capel Part A - Site:** CARM95

**Described by:** RO **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**Photo:** No

**AMG: Zone**50 362251mE, 6283148mN (GDA94)

**Habitat:** Small area of steep sided pit.

**Vegetation** (revegetation): Mixed planting of *Corymbia calophylla* (Marri), *Acacia saligna*, *Eucalyptus rudis?*, *Agonis flexuosa*.

**Reveg assessment:** R2 (sparse planting with areas of bare ground; few species).

**South Capel Part A - Site:** CARM96

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362173mE, 6283121mN (GDA94)

**Habitat:** Small shallow pit and adjacent flat area.

**Vegetation** (revegetation): *Agonis flexuosa*, *Calothamnus* sp., *Acacia saligna*, *Hakea prostrata*,  
\*\**Callistemon phoeniceus*, *Kunzea glabrescens* and mixed *Eucalypus* sp.

**Reveg assessment:** R2 (sparse planting with areas of bare ground; few species).

**South Capel Part A - Site:** CARM97

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362278mE, 6283059mN (GDA94)

**Habitat:** Small shallow pit and surrounding banks.

**Vegetation** (revegetation): Mixed shrubs including *Calothamnus* sp., *Agonis flexuosa*, *Hakea prostrata*,  
*Kunzea glabrescens*.

**Reveg assessment:** R2 (sparse planting with areas of bare ground; few species)

**South Capel Part A - Site:** CARM100

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361594mE, 6282202mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Steep sloped mounds.

**Vegetation** (revegetation): Scattered *Regelia ciliata* and *Eucalypt gomphocephala* in open paddock.

**Reveg assessment:** R1 (mostly open bare ground and pasture/ weed groundcover species)

**South Capel Part A - Site:** CARM101

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361640mE, 6282207mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Sloping bank of wetland area.

**Vegetation** (revegetation): \*\**Eucalyptus camaldulensis* subsp. *obtusa* over *Regelia ciliata*.

**Reveg assessment:** R2 to R1 (moderate to good canopy cover; small area; few species).

**South Capel Part A - Site:** CARM102

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361650mE, 6282315mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Scattered *Eucalyptus gomphocephala* and *Eucalyptus marginata* surrounded  
by open paddock.

**Assoc. species:** *Hibbertia cuneiformis*, *Verticordia* sp.

**Reveg assessment:** R1 (mostly open bare ground and pasture/ weed groundcover species).

**South Capel Part A - Site:** CARM103

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361793mE, 6282464mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Scattered *Agonis flexuosa* in open paddock.

**Reveg assessment:** R1 (mostly open bare ground and pasture/ weed groundcover species).

**South Capel Part A - Site: CARM104**

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 361812mE, 6282597mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Scattered *Corymbia calophylla* (Marri), *Agonis flexuosa*, *Melaleuca rhapsiophylla* in open paddock.

**Assoc. species:** *Kunzea glabrescens*, *Hibbertia cuneiformis*.

**Reveg assessment:** R1 (mostly open bare ground and pasture/ weed groundcover species).

**South Capel Part A - Site: CARM105**

**Described by:** RO      **Date:** 14/11/2012

**Location:** Part A, Capel Wetlands

**AMG: Zone50** 362786mE, 6283517mN (GDA94)

**Habitat:** Previously mined and re-contoured landform. Flat.

**Vegetation** (revegetation): Pasture species with one large *Eucalyptus* sp.

**Reveg assessment:** R1 (mostly pasture/ weed groundcover species).



## **MAPPING NOTES: (ii) SOUTH CAPEL PART B**

An asterisk (\*) beside the taxon name indicates an introduced species exotic to Western Australia (weed); A double asterisk (\*\*) beside the taxon name indicates a revegetation (planting) species native to Australia, but not native to the survey area.

### **South Capel Part B – Site CBM2**

**Described by BM**      **Date** 16/10/2012

**Location:** Part B

**Photo:** BM611-614

**AMG: Zone**50 364221mE, 6283799mN (GDA94)

**Habitat:** Flat plain (after mining)

**Soil:** Shallow grey sand with orange brown conglomerate lumps and clayey sand.

**Vegetation** (revegetation): *Melaleuca preissiana* scattered low trees over *Melaleuca viminea* subsp. *viminea*, *Kunzea glabrescens* high open shrubland over *Vulpia* sp. open grassland.

**Assoc. species:** *Calothamnus quadrifidus* (plantings), *Pteridium esculentum* (Bracken), *Banksia littoralis* (plantings), *Acacia saligna*.

**Reveg assessment:** R2 (poor ground cover; native species used, but low number of species; no structure).

### **South Capel Part B – Site CBM3**

**Described by BM**      **Date** 16/10/2012

**Location:** Part B

**Photo:** BM615-616

**AMG: Zone**50 364160mE, 6283588mN (GDA94)

**Habitat:** Flat on plain –past sand mining area?

**Vegetation** (remnant): *Melaleuca preissiana* scattered low trees to low open woodland over *Kunzea glabrescens* scattered shrubs.

**Veg Condition** (BF): Degraded (not revegetated).

### **South Capel Part B – Site CBM4**

**Described by BM**      **Date** 16/10/2012

**Location:** Part B

**Photo:** BM621, 622

**AMG: Zone**50 363910mE, 6283407mN (GDA94)

**Habitat:** Very gentle, south facing slope to flat area on plain (seasonal dampland).

**Vegetation:** *Melaleuca preissiana* scattered low trees over *Kunzea glabrescens* high shrubland (~15-20%) over *Astartea* sp. shrubland (about 20-30%) over *Verticordia attenuata* low open shrubland.

**Assoc. species:** *Trachymene pilosa*, *Pericalymma ellipticum*.

**Veg Condition** (BF): Very Good? (open understorey; low weed cover; may have altered hydrology).

**Fire Age:** More than 10years since fire.

### **South Capel Part B - Site CBM5**

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM625, 626

**AMG: Zone**50 363717mE, 6283054mN (GDA94)

**Habitat:** Flat plain.

**Soil:** Grey sand.

**Vegetation:** *Kunzea glabrescens* open scrub over \**Hypochaeris glabra* very open herbland/grassland of weed spp.

**Assoc. species:**

**Veg Condition (BF):** Good to Degraded.

### **South Capel Part B – Site CBM6**

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM628

**AMG: Zone**50 363764mE, 6283064mN (GDA94)

**Habitat:** Very gently undulating plain.

**Soil:** Grey sand.

**Vegetation:** *Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered trees over *Kunzea glabrescens* high shrubland over *Melaleuca thymoides* scattered shrubs over *Dasyogon bromeliifolius*, \**Hypochaeris glabra*, *Vulpia* sp. herbland/grassland.

**Veg Condition (BF):** Good to Degraded (past grazing in area – quite weedy).

### **South Capel Part B – Site CBM7**

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM629-632

**AMG: Zone**50 363645mE, 6283063mN (GDA94)

**Habitat:** Gentle, north-east slope of very low rise on plain.

**Soil:** (0-15cm) Grey sand (over yellow sand (ant nest mounds)).

**Vegetation:** *Corymbia calophylla* (Marri), *Eucalyptus marginata* subsp. *marginata* (Jarrah) woodland to open forest over *Kunzea glabrescens* high open shrubland over *Hibbertia hypericoides* scattered low shrubs over *Hypochaeris* sp., *Trachymene pilosa*, \**Briza maxima* open herbland/grassland.

**Assoc. species:** *Lagenophora huegelii*, *Caladenia flava* subsp. *flava*, *Levenhookia stipitata*, *Daucus glochidiatus*, \**Zantedeschia aethiopica* (Arum lily), *Xylomelum occidentale* (Woody pear), *Kennedia prostrata*.

**Veg Condition (BF):** Good? (or Good to Degraded) (formerly grazed, quite weedy with loss of understory shrubs).

### **South Capel Part B - Site CBM8**

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM634-636

**AMG: Zone**50 363596mE, 6283216mN (GDA94)

**Habitat:** Flat at base of low dune.

**Soil:** Brown sandy clay.

**Vegetation:** *Melaleuca preissiana*, (*Agonis flexuosa*) low open forest to low closed forest over *Kunzea glabrescens* high open shrubland over *Astartea* sp. scattered shrubs to open shrubland over \**Briza minor*, \**Hypochaeris* sp., \**Arctotheca calendula* (Capeweed), *Trachymene pilosa*, \**Vulpia* sp. herbland/grassland.

**Assoc. species:** *Lagenophora huegelii*, \**Lysimachia arvensis*, \**Zantedeschia aethiopica* (Arum lily), *Levenhookia stipitata*, *Aira* sp.

**Veg Condition (BF):** Good to Degraded (very weedy, mostly with some residual native herbs in places).

**Fire Age:** More than 10 years since fire.

**Notes:** Similar to CSBQ2.

### **South Capel Part B – Site CBM9**

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM642, 643

**AMG:** Zone50 363798mE, 6282945mN (GDA94)

**Habitat:** Flats on plain.

**Soil:** Grey sand.

**Vegetation:** *Kunzea glabrescens* open scrub over *Xanthorrhoea preissii*, *Calytrix fraseri* scattered low shrubs over *Dasypogon bromeliifolius* very open herbland.

**Assoc. species:**

**Veg Condition (BF):** Good to Degraded (quite high weed cover, past grazing)

### **South Capel Part B - Site CBM10**

**Described by BM**      **Date** 17/10/2012

**Location:** Part B

**Photo:** BM647

**AMG:** Zone50 363832mE, 6283073mN (GDA94)

**Habitat:** Flat plain.

**Soil:** Grey sand.

**Vegetation:** *Banksia attenuata*, *Banksia ilicifolia* scattered low trees over *Kunzea glabrescens* open scrub, *Hibbertia racemosa* scattered low shrubs over *\*Hypochaeris* sp., *\*Briza maxima*, *\*Ursinia anthemoides*, *\*Vulpia* sp. open herbland/grassland.

**Assoc. species:**

**Veg Condition (BF):** Degraded (moderate to high weed cover - loss of low shrub, herb layers).

### **South Capel Part B - Site CBM11**

**Described by BM**      **Date** 18/10/2012

**Location:** Part B

**Photo:** BM681, 682

**AMG:** Zone50 364084mE, 6283277mN (GDA94)

**Elevatn:** 13m

**Habitat:** Dampland 'flat' on plain.

**Soil:** Grey sand.

**Vegetation:** *Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered trees (sparsely scattered) over *Banksia ilicifolia*, *Melaleuca preissiana* scattered low trees over *Kunzea glabrescens* open to closed scrub over *Melaleuca thymoides* scattered tall shrubs over *Xanthorrhoea preissii* open shrubland over *Dasypogon bromeliifolius* open herbland.

**Assoc. species:** *Acacia pulchella*, *Hibbertia vaginata*, *Hypocalymma angustifolium*.

**Veg Condition (BF):** Very Good to Excellent (low weed cover)

### **South Capel Part B - Site CBM12**

**Described by BM**      **Date** 18/10/2012

**Location:** Part B

**Photo:** BM683 (looking east)

**AMG:** Zone50 364087mE, 6283578mN (GDA94)

**Habitat:** Dampland 'flat' on plain.

**Soil:** Brown clay.

**Vegetation:** *Melaleuca preissiana* low closed forest (patches low open forest) over *Kunzea glabrescens* scattered tall shrubs.

**Assoc. species:** *Rhodanthe citrina*, *Trachymene pilosa*, *\*Arctotheca calendula* (Capeweed), *Aira* sp., *\*Lotus subbiflorus*, *Aira* sp., *Juncus pallidus*.

**Veg Condition (BF):** Good to Degraded (quite weedy).

**Elevtn:** 19m (-1.3m)

**South Capel Part B - Site CBM13**

**Described by BM**      **Date** 18/10/2012

**Location:** Part B

**AMG: Zone50** 364202mE, 6283563mN (GDA94)

**Vegetation:** *Melaleuca preissiana* low open woodland over *Kunzea glabrescens* open to closed scrub over *Hypocalymma angustifolium* low open shrubland

**Veg Condition (BF):** Very Good (low weed cover).

**Notes:** Recorded at the NSAQ5 site.

**South Capel Part B - Site CBM13B**

**Described by BM**      **Date** 18/10/2012

**Location:** Part B

**Photo:** BM684-687

**AMG: Zone50** 363699mE, 6283431mN (GDA94)

**Habitat:** Gentle west facing lower slope of low rise.

**Vegetation:** *Eucalyptus marginata* subsp. *marginata* (Jarrah) scattered trees over *Kunzea glabrescens* closed scrub.

**Assoc. species:** *Macrozamia riedlei* (Zamia), *Hypochaeris* sp., *Trachymene pilosa*, *Caladenia flava* subsp. *flava*.

**Veg Condition (BF):** Degraded? (lot of excavation/mounding soil disturbance in area, which is immediately adjacent to dam wall).

**South Capel Part B - Site CBM15**

**Described by BM**      **Date** 18/10/2012

**Location:** Part B (western external)

**Photo:** BM688, 689, also further south 692

**AMG: Zone50** 363103mE, 6283260mN (GDA94)

**Habitat:** Regrowth under and adjacent to power lines.

**Soil:**

**Rock Type:**

**Vegetation:** *Melaleuca preissiana*, *Agonis flexuosa*, *Acacia saligna* low open woodland over *Kunzea glabrescens* high open shrubland over *Astartea* sp. open to closed heath.

**Assoc. species:** *Acacia longifolia* subsp. *longifolia*, *Thysanotus manglesianus/patersonii*, *Patersonia occidentalis*, *Hypocalymma angustifolium*, *Meeboldina* sp. (140cm), *Lepidosperma longitudinale*, *Dasypogon bromeliifolius*, *Hibbertia hypericoides*, *Hibbertia vaginata*, *Lyginia* sp., *Calytrix fraseri*, *Acacia dentifera*, *Pinus* sp., *Acacia alata* var. *alata*, *Acacia semitrullata* (x1 + juv), *Caladenia attingens* subsp. *attingens*, *Gompholobium tomentosum*, *Grevillea manglesii* subsp. *manglesii* (180cm), *Conostylis aculeata* subsp. *aculeata*, *Meeboldina roycei*, *Hypolaena exsulca*, *Kunzea micrantha* subsp. *micrantha* (110cm), *Anigozanthos manglesii* subsp. *manglesii*, *Adenanthos meisneri*, *Lyperanthus serratus*, *Synaphea hians*.

**Veg Condition (BF):** mostly regrowth and patchy remnant after disturbance clearing from Bussell Hwy works and powerline works.

**Notes:** Also a lot of vegetation in this area is *Kunzea glabrescens* scrub. \**Acacia longifolia* subsp. *longifolia* scattered or denser throughout area.

**APPENDIX EIGHT. Report on the “FCT Analysis South Capel Sites” by Mr Ted Griffin**

## **1.0 INTRODUCTION**

### **1.1 Purpose of this report**

The current report is intended to help clarify the assignment of Floristic Community type (FCT) designation to vegetation community (site) data. FCTs were defined by Gibson et al (1994) based on site data collected from vegetation on the Swan Coastal Plain. In particular, the potential that a Threatened Ecological Community (English and Blyth 1997) is represented by the data collected needs to be clarified.

### **1.2 Location of South Capel Sites**

The sites were south of Capel near the Bussell Highway.

### **1.3 Brief background to floristic analysis of vegetation on the Swan Coastal Plain**

Floristic analysis (ie., analysis of variation in vegetation based on the species present, rather than description of structural variation and dominance) as a significant component of the understanding of the variation present in the native vegetation of the Swan Coastal Plain dates to Gibson *et al* (1994 – all references to the SCP survey in the current report refer to this publication), the first publication to document the floristics of the vegetation of a large part of the Swan Coastal Plain. While the SCP survey is based on a very significant amount of work, it must be viewed as a “first pass” survey, limited, in the context of the great variety of vegetation present in the very large area surveyed, by the relatively limited number (509) of sites (quadrats) it is based on. To a limited degree, this limitation has subsequently been addressed in an “update” to the work of the SCP survey (which describes additional units). However, there is no detailed publication of the results of this update available and the additional data used are not readily available in an appropriate form (ie., one that would enable ready comparison of new data to the overall data set).

The units described by the SCP survey are a series of “floristic community types”, a “unit” whose rank is defined by the use within a study. The SCP survey surveyed a very large survey area and defined a relatively small number of floristic community types. Consequently, the floristic community types they have described are of a very high order (see Trudgen 1999, volume 1, for further discussion of this point). This is an extremely important point to fully grasp in interpreting the analysis presented by the SCP survey and in understanding the meaning of analysis of other data sets when they are compared to the floristic community types of the SCP survey.

The important effects of the limited size data set used by the SCP survey and of the relatively small number of floristic community types defined by them, can be summarised by the following points:

1. the definition of all but two of the Threatened Ecological Communities for vegetation on the Swan Coastal Plain (English and Blyth 1997) has been based on the floristic community types of the SCP survey. It therefore follows, that with two exceptions, only vegetation units from one study that are different at a very high order of floristics are treated as rare by Government. No account is taken of other important differences, such as differences in structure and dominance;

2. for the definition of floristic community types to be robust, a sufficient sized database is needed to give adequate precision in their definition. About half of the floristics community types (or sub types) of the SCP survey are based on less than 10 sites. It is likely that with a larger data set there would be significant alteration in the classification of those floristic community types from the SCP survey based on small numbers of sites.
3. as noted above, many (if not most) of the floristic community types defined by the SCP survey are very broad. They contain very significant variation in floristics, structure and dominance. Some (or in more highly cleared parts of the Swan Coastal Plain much) of this variation may be rare by any reasonable definition, but it is currently “buried” within larger groups;
4. there is likely to be significant variation not sampled by the SCP survey. This includes some variation at a high level of floristic difference (see Trudgen 1999, volume 1, for an example of this) and undoubtedly quite significant (large!) amounts of variation at “medium” and “low” levels.
5. the document, and its use by Government, has focussed attention in the environmental impact assessment process on the high level of units described, deflecting attention from the layers of variation beneath these units that also have significant conservation value.

From these points it is obvious that there is a need for a major “upgrade” to the floristic analysis of the vegetation of the Swan Coastal Plain to provide a more detailed floristic classification that considers not only more of the variation present, but explicitly recognises more of the variation present in formally described units.

Obviously, such a reworking would have some effect on what vegetation is considered rare on the Swan Coastal Plain. It needs to be stressed that it would be very unlikely to find that any of the vegetation currently considered to be rare on the basis of the SCP survey’s classification was not rare. On the other hand, it is likely that such a review would very probably consider to be rare some vegetation which is not currently considered rare.

#### **1.4 Data provided**

It is very important in comparing different sets of floristic data that they are comparable in the application of names, in the intensity of the survey (ie., the effort of searching resulting in similar proportion of the flora at sites being recorded) and in the size of the site recorded. If the data from different data sets is not comparable in these ways, it reduces the clarity of the results of the analyses carried out. If the discrepancy in the comparability of the data sets is large, the results may become meaningless.

A brief observation (Table 3) suggested that these South Capel sites had a wide range of species richness.

The CSB quadrats tended to be similar the SCP sites in richness but slightly more weeds.

The two CS were low in species and high in weeds. Of the families often “difficult to find”, some lilies and annual dicots were low.

The NAS quadrats were very low in species although the weeds were similar to the SCP sites. Of the families often “difficult to find”, most were low.

It is not possible to conclude whether these data are a reflection of differences in the condition of the sites or the quality of the survey. However, caution should be used when relating any FCT to these data, especially the NAS and maybe the CS quadrats.

## **2.0 METHODS**

### **2.1 Data Preparation**

The data from the South Capel sites were provided into a standard MS Access based database designed for this type of data. One virtue of the database is that the species recorded at each site are stored against standard codes (numbers, those used by the Western Australian Herbarium) for each species. This facilitates ready comparison of data from different surveys stored in the same system.

After the data were incorporated into the database (containing the data from other projects), a process of reconciliation of flora species names with those used in the SCP survey was undertaken. This step was necessary at least because of changes in nomenclature over the last ten years and the potential of survey specific variations in the application of names. 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 species had only been identified to genus).

The reconciliation process was relatively straight forward as most of the names had already been standardised. Most reconciliation was to conform with the methods that the SCP survey used to manage confusing taxa plus some nomenclatural changes (see Appendix).

### **2.2 Comparability of datasets**

It was concluded that on the basis of richness and names that the datasets were probably reasonably compatible to obtain adequate determinations.

### **2.3 Comparisons made**

The data from the 21 sites plus the 509 sites from the SCP survey of the southern part of the Swan Coastal Plain (south of Gingin) were combined. This enabled various analyses to be performed.

The main purpose was intended to assign the individual sites to the Floristic Community Types (FCTs) defined in the SCP survey.

These data are provided in BRM\_H\_S\_Capel.mdb.)

### **2.4 Analyses carried out**

The approach was the use of numerical classification techniques (PATN) based on the similarity of the floristic composition of the South Capel sites to sites in the SCP survey data set.



### **2.4.1 PATN**

Several modules of the numerical classification package PATN (Belbin 1987) were used for the analyses. The parameter values were the same as used by the SCP survey used to ensure consistency of analysis with that study.

The PATN modules used were ASO (calculation of similarity matrix), FUSE (classification based on the results of ASO), DEND (representation of classification) and NNB (determination of sites most similar to each site – nearest neighbours). The results of the analyses were imported into a database (BM\_Eglington.mdb) so that site characteristics and previous classifications (eg., Floristic Community Types derived in earlier classifications) could be associated and various analyses based on these data could be performed.

The assignment of floristic community types to the South Capel sites was made by summarising the results of two different methods:

- the classification, and
- the ten nearest neighbours.

Experience demonstrates that the results of these are likely to vary, but that from nearest neighbours is likely to make more sense.

To the classification dendrogram of the combined dataset the FCT assigned by the SCP survey was associated with the SCP survey sites. The apparent FCTs were assigned to the South Capel sites by interpreting the position of these sites in the dendrogram (particularly by the way they joined to the SCP sites).

The 10 sites in the combined data set that were most similar to each of the South Capel sites were obtained from the nearest neighbour method (NNB). By associating those nearest neighbours from the SCP survey, the most likely FCTs for each of the South Capel sites were determined.

An attempt was then made to reconcile these different assignments of a Floristic Community Type.

### **3.0 LIMITATIONS**

It has been found in earlier projects that the addition of new sites to the SCP survey data set to produce a combined classification disrupts the original classification. The more data added, the higher the level of the disruption. This problem can make it difficult to assign Floristic Community Types to new sites using this method.

Secondly, it is common for new data to group to their cohorts. In some cases this has proven to result from common deficiencies in the data, ie. whole groups of species missing. This absence tends to draw them together. The more sites in the added batch, the tighter they draw together.

The analyses are conducted without personal knowledge of the sites and no photographs were provided.

### 4.0 RESULTS

#### 4.1 Determination of floristic community type by classification

The classifications suggested that the sites appeared to belong to a wide range of FCTs, mainly 12, 14, 5, 20a, 21a and 21b (Figure 1). While they combine with SCP sites in various portions of the dendrogram, that they tend to join to each other first provides a major caution about inferring a FCT from this method.

Figure 1. Relevant portions of Dendrogram

site	FCT	NO	data				
			0.2050	0.3633	0.5217	0.6800	0.8383
CAPEL-1	21b	58					
CSBQ8		36					
GUTHR-6	21a	56					
CARB-3	21b	48					
MANEA-2	21a	63					
AUSTB-4	5	28					
AUSTB-6	5	32					
CSQ1		30					
CSQ2		30					
CSBQ6		27					
HARRY-3	5	25					
MILT-1	5	37					
GUTHR-2	5	39					
GUTHR-4	5	36					
MODO-2	21c	35					
PLINE-7	21c	32					
PLINE-5	5	23					
CSBQ1		42					
CSBQ10		43					
CSBQ3		43					
CSBQ9		43					
CSBQ7		53					
CSBQ11		45					
CSBQ4		36					
CSBQ2		16					
MILT-5	14	15					
NSAQ2		19					
NSAQ5		12					
NSAQ6		16					
NSAQ3		14					
NSAQ4		14					
YAN-21	14	18					
NSAQ11		20					
NSAQ7		18					
NSAQ12		17					
CAPEL-6	12	36					
CAPEL-8	12	41					
CAPEL-9	12	26					
CSBQ5		13					
FL-10	12	17					
RIVD-1	12	10					

South Capel sites CSBQ\*, CSQ\* and NSAQ\*

Table 2 provides a summary of the “most likely” FCT for this classification.

#### 4.2 Determination of floristic community type using Nearest Neighbour method

The nearest neighbour analysis suggests that the sites also belong to a number of communities but principally FCT 11, 12, 13, 14, 21a, 21b, 22, 23a, 28, 3b, 4, and 5.

Table 1. Results of Nearest Neighbour analysis

s	s1	f1	v1	s2	f2	v2	s3	f3	v3	s4	f4	v4	s5	f5	v5
CSBQ1	CSBQ10		0.476	CSBQ3		0.553	CSBQ11		0.571	low06a	21c	0.571	CSBQ7		0.587
CSBQ2	CSBQ4		0.542	NSAQ4		0.63	GUTHR-4	5	0.68	CSBQ5		0.704	CSQ2		0.714
CSBQ3	CSBQ9		0.388	CSBQ10		0.459	CAPEL-2	21b	0.532	low13b	23a	0.541	CSBQ1		0.553
CSBQ4	CSBQ11		0.5	CSBQ2		0.542	GUTHR-2	5	0.562	low07	21c	0.6	GUTHR-4	5	0.6
CSBQ5	CSQ2		0.659	FL-10	12	0.667	CAPEL-8	12	0.704	CSBQ2		0.704	WATER-1	13	0.704
CSBQ6	GUTHR-2	5	0.594	BANK-1	22	0.623	MILT-1	5	0.645	MODO-6	4	0.66	CSBQ4		0.661
CSBQ7	CSBQ10		0.5	CSBQ8		0.535	AUSTRA-1	21a	0.569	CAPEL-7	21a	0.571	REDL-1	21a	0.573
CSBQ8	CAPEL-1	21b	0.447	CSBQ10		0.513	CSBQ11		0.513	AUSTRA-1	21a	0.523	CSBQ7		0.535
CSBQ9	CSBQ3		0.388	CSBQ10		0.452	YULE-1	23a	0.49	YULE-2	23a	0.515	HARRY-5	21a	0.532
CSBQ10	CSBQ9		0.452	CSBQ3		0.459	CSBQ1		0.476	YULE-1	23a	0.49	YULE-2	23a	0.495
CSBQ11	CSBQ4		0.5	CSBQ8		0.513	NINE-2	21a	0.542	CSBQ10		0.548	GUTHR-6	21a	0.551
CSQ1	CSQ2		0.607	AUSTB-6	5	0.633	low08	5	0.642	CSBQ3		0.662	CSBQ4		0.677
CSQ2	CSQ1		0.607	AUSTB-6	5	0.633	CSBQ9		0.657	CSBQ5		0.659	CAPEL-8	12	0.681
NSAQ2	NSAQ6		0.692	TWIN-11	11	0.7	KOOLJ-1	4	0.73	NSAQ4		0.733	hymus01	11	0.737
NSAQ3	NSAQ4		0.478	NSAQ5		0.727	NSAQ11		0.733	NSAQ2		0.778	NSAQ6		0.79
NSAQ4	NSAQ3		0.478	CSBQ2		0.63	MELA-1	4	0.667	NSAQ5		0.68	MILT-5	14	0.714
NSAQ5	NSAQ6		0.524	NSAQ4		0.68	CSQ1		0.7	MILT-5	14	0.704	NSAQ12		0.714
NSAQ6	NSAQ5		0.524	NSAQ11		0.655	NSAQ12		0.68	NSAQ2		0.692	NSAQ7		0.692
NSAQ7	NSAQ11		0.405	NSAQ12		0.576	NSAQ6		0.692	CSBQ8		0.698	CSBQ7		0.702
NSAQ11	NSAQ7		0.405	NSAQ12		0.611	NSAQ6		0.655	CSBQ7		0.657	KOOLJ-5	3b	0.667
NSAQ12	NSAQ7		0.576	NSAQ11		0.611	CSBQ7		0.636	CSBQ10		0.655	NSAQ6		0.68

Table 1 (cont)

s	s1	f1	v1	s2	f2	v2	s3	f3	v3	s4	f4	v4	s5	f5	v5
CSBQ1	CSBQ9		0.595	low07	21c	0.615	REDL-1	21a	0.615	low01	21c	0.62	YAN-3	28	0.622
CSBQ2	CSQ1		0.714	CSBQ11		0.714	hymus01	11	0.714	CSBQ8		0.72	MHENRY-1	30c	0.73
CSBQ3	YULE-2	23a	0.56	BULLER-3	21c	0.563	low07	21c	0.571	AUSTB-6	5	0.573	low01	21c	0.575
CSBQ4	CSBQ8		0.629	low06b	21c	0.63	BULLER-3	21c	0.632	MODO-2	21c	0.652	CSBQ9		0.658
CSBQ5	GUTHR-4	5	0.714	MODO-3	11	0.724	NSAQ6		0.727	RIVD-1	12	0.739	CAPEL-9	12	0.744
CSBQ6	MODO-2	21c	0.667	CSBQ9		0.672	CSBQ11		0.672	HARRY-3	5	0.68	low08	5	0.688
CSBQ7	GUTHR-5	21a	0.579	CSBQ1		0.587	CSBQ3		0.591	MANEA-3	21b	0.593	CRAMPT-2	21a	0.593
CSBQ8	GUTHR-6	21a	0.544	low06b	21c	0.566	HARRY-5	21a	0.568	KEME-2	21a	0.571	CAPEL-7	21a	0.571
CSBQ9	AUSTB-6	5	0.541	low13b	23a	0.556	hymus03	21c	0.556	MILT-1	5	0.57	CAPEL-2	21b	0.57
CSBQ10	MANEA-3	21b	0.5	CSBQ7		0.5	CAPEL-3	21a	0.511	CSBQ8		0.513	low13b	23a	0.519
CSBQ11	CSBQ1		0.571	low06b	21c	0.573	BULLER-3	21c	0.579	RUAB-1	21b	0.583	rowe02	4	0.587
CSQ1	CAPEL-8	12	0.681	low09b	5	0.686	CSBQ9		0.686	NSAQ5		0.7	GUTHR-2	5	0.702
CSQ2	CSBQ3		0.69	TWIN-1	6	0.702	MHENRY-2	30c	0.705	CLIF-3	26a	0.706	CSBQ4		0.71
NSAQ2	MILT-5	14	0.75	MELA-1	4	0.75	hymus02	11	0.756	welr 01	9	0.767	FL-9	4	0.769
NSAQ3	MILT-2	13	0.8	hymus01	11	0.807	MELA-1	4	0.818	CSBQ2		0.833	MILT-5	14	0.84
NSAQ4	MODO-3	11	0.724	NSAQ2		0.733	MILT-2	13	0.739	CSQ1		0.756	KOOLJ-1	4	0.758
NSAQ5	NSAQ3		0.727	CSBQ4		0.739	NSAQ11		0.75	hymus01	11	0.758	CSBQ2		0.769
NSAQ6	CSBQ5		0.727	hymus01	11	0.733	CSBQ2		0.739	CSBQ4		0.767	YAN-21	14	0.778
NSAQ7	hymus04	21c	0.721	CSBQ10		0.729	KOOLJ-5	3b	0.746	YAN-3	28	0.754	low12b	21a	0.758
NSAQ11	DEPOT-1	28	0.688	YAN-3	28	0.706	CARB-2	1b	0.709	TWIN-8	21c	0.71	CSBQ8		0.714
NSAQ12	CSBQ8		0.692	NSAQ5		0.714	low06b	21c	0.714	low10a	21a	0.718	low07	21c	0.719

s – the site being compared

s1 to s10 – the 1<sup>st</sup> to 10<sup>th</sup> most similar sites

f1 to f10 – the FCT of the similar sites (only for SCP sites)

v1 to v10 – the dissimilarity value between the site and the similar sites (values above 0.6 tend to indicate low similarity)

### 4.3 Combining the results

It is common for the classification to indicate a simple result and the nearest neighbour analysis to be less conclusive. This is more a product of the classification process often suggesting an over simplified view than of inconsistency of the analyses.

The clustering of all new sites together and that they are all more similar to each other suggests that there is something in this area, possibly disturbance history. In these cases the inference from the NNB is more reliable than from classification. Note, most “single-site insertion” classifications are closer to the NNB than multi-site (as

done here) where local (and survey related) similarities tend to draw new sites together.)

Thus no attempt has been made to reconcile the results from the two methods and the column from NNB (Table 2) should be used.

Table 2 Summary of results

Site	Dendrogram FCT	NNB FCT	min dissim to any New site
CSBQ1	5	21c,21a	0.5714
CSBQ2	5	5	0.68
CSBQ3	5	21b,23a	0.5319
CSBQ4	5	5	0.5616
CSBQ5	12	?12	0.6667
CSBQ6	5	5,?22	0.5938
CSBQ7	5	21a	0.5686
CSBQ8	21b,21a	?21b,21a	0.4468
CSBQ9	5	23a	0.4898
CSBQ10	5	23a,21b	0.4898
CSBQ11	5	21a	0.5417
CSQ1	5	5	0.6333
CSQ2	5	5,?12	0.6333
NSAQ2	14	??11,4	0.7
NSAQ3	14	?13,11	0.8
NSAQ4	14	?4,14	0.6667
NSAQ5	14	??14	0.7037
NSAQ6	14	?11	0.7333
NSAQ7	14	?21c,3b	0.7209
NSAQ11	14	?3b,28	0.6667
NSAQ12	14	??21c,21a	0.7143

Most sites are not clearly in a specific FCTs as the analyses suggest they are intermediate between a number. The dissimilarity to the nearest SCP site for some is reasonable to suggest reliability, some are modest but not strong enough to be confident and others are low to be quite unconfident (see shading in Table 2).

Table 3 shows some differences between these sites and the suggested FCTs. As suggested in the Section 1.4 there are significant variations in the species richness of datasets and sites. It is clear that these have significant influence on the analysis. Largely, those sites with low numbers of native species have high dissimilarity with any SCP site. This is typically those sites from the NSA set.

It is concluded that the inferences for CSB and CS are modestly useful; some quite reasonable. However, for the NSA it almost speculative.

Table 3 Richness of new sites against “nearest” FCTs.

FCT New	#sites	#Tot	#Nat	#weeds		
11	13	26.38	17.92	8.46		
12	5	26.00	19.80	6.20		
13	9	16.56	12.56	4.00		
14	2	16.50	13.50	3.00		
21a	39	54.54	49.02	5.51		
21b	12	60.17	57.53	2.64		
21c	16	40.31	35.91	4.40		
22	11	32.45	30.88	1.57		
28	38	55.11	46.13	8.97		
3b	8	60.38	54.13	6.25		
4	16	36.25	31.39	4.86		
5	15	38.20	31.87	6.33		
					NNB FCT	min dissim to SCP site
CSBQ1	1	42	32	10	21c,21a	0.5714
CSBQ2	1	16	12	4	5	0.68
CSBQ3	1	43	34	9	21b,23a	0.5319
CSBQ4	1	36	32	4	5	0.5616
CSBQ5	1	13	10	3	?12	0.6667
CSBQ6	1	27	23	4	5,?22	0.5938
CSBQ7	1	53	41	12	21a	0.5686
CSBQ8	1	36	34	2	?21b,21a	0.4468
CSBQ9	1	43	34	9	23a	0.4898
CSBQ10	1	43	37	6	23a,21b	0.4898
CSBQ11	1	45	39	6	21a	0.5417
CSQ1	1	30	18	12	5	0.6333
CSQ2	1	30	18	12	5,?12	0.6333
NSAQ2	1	19	15	4	??11,4	0.7
NSAQ3	1	14	11	3	?13,11	0.8
NSAQ4	1	14	14	0	?4,14	0.6667
NSAQ5	1	12	10	2	??14	0.7037
NSAQ6	1	16	10	6	??11	0.7333
NSAQ7	1	18	16	2	?21c,3b	0.7209
NSAQ11	1	20	16	4	?3b,28	0.6667
NSAQ12	1	17	10	7	??21c,21a	0.7143

#### 4.0 REFERENCES

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## 5.0 APPENDIX

Appendix 1 Species combinations made to assist in reconciling taxonomic changes and identification difficulties between this survey and SCP data.

Fcode	name	Lookup
031	<i>Aira caryophyllea</i>	<i>Aira caryophyllea/cupaniana</i> group
031	<i>Aira cupaniana</i>	<i>Aira caryophyllea/cupaniana</i> group
031	<i>Austrostipa semibarbata</i>	<i>Austrostipa semibarbata/campylachne</i>
031	<i>Avena fatua</i>	<i>Avena barbata/fatua</i>
031	<i>Cenchrus macrourus</i>	omitted
031	<i>Pentameris airoides</i> subsp. <i>airoides</i>	<i>Pentaschistis airoides/pallida</i>
031	<i>Pentaschistis airoides</i> subsp. <i>airoides</i>	<i>Pentaschistis airoides/pallida</i>
031	<i>Rytidosperma setaceum</i>	<i>Austrodanthonia setacea</i>
031	<i>Vulpia myuros</i> forma <i>myuros</i>	<i>Vulpia myuros</i>
032	<i>Lepidosperma pubisquamum</i>	<i>Lepidosperma angustatum/squamatum</i>
032	<i>Lepidosperma</i> sp.	omitted
039	<i>Leptocarpus roycei</i>	<i>Meeboldina roycei</i>
039	<i>Lyginia</i> ? <i>barbata</i>	<i>Lyginia barbata</i>
039	<i>Lyginia imberbis</i>	<i>Lyginia barbata</i>
054B	<i>Myrsiphyllum asparagoides</i>	<i>Asparagus asparagoides</i>
054F	<i>Chamaescilla corymbosa</i>	<i>Chamaescilla spiralis/corymbosa</i>
054F	<i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>	<i>Chamaescilla spiralis/corymbosa</i>
054F	<i>Thysanotus manglesianus</i>	<i>Thysanotus patersonii/manglesianus</i>
054F	<i>Thysanotus manglesianus/patersonii</i>	<i>Thysanotus patersonii/manglesianus</i>
054J	<i>Burchardia congesta</i>	<i>Burchardia umbellata/congesta</i>
055	<i>Conostylis aculeata</i> subsp. <i>cygnorum</i>	<i>Conostylis aculeata</i>
055	<i>Conostylis setigera</i> subsp. <i>setigera</i>	<i>Conostylis setigera</i>
055	<i>Conostylis</i> sp.	omitted
060	<i>Moraea flaccida</i>	<i>Moraea flaccida</i>
060	<i>Patersonia occidentalis</i> var. <i>occidentalis</i>	<i>Patersonia occidentalis</i>
060	<i>Patersonia occidentalis</i> var. <i>occidentalis</i>	<i>Patersonia occidentalis</i>
060	<i>Patersonia</i> sp. Swamp form (N.Gibson & M.Lyons 544)	<i>Patersonia occidentalis</i>
066	<i>Caladenia flava</i> subsp. <i>flava</i>	<i>Caladenia flava</i>
066	<i>Caladenia sericea</i>	<i>Cyanicula sericea</i>
066	<i>Caladenia</i> sp.	omitted
066	<i>Eriochilus dilatatus</i> subsp. <i>multiflorus</i>	<i>Eriochilus dilatatus</i>
066	<i>Monadenia bracteata</i>	<i>Disa bracteata</i>
066	<i>Prasophyllum</i> sp.	omitted
066	<i>Pterostylis nana</i> complex	<i>Pterostylis</i> aff. <i>nana</i>
066	<i>Pterostylis nana</i> complex	<i>Pterostylis</i> aff. <i>nana</i>
066	<i>Thelymitra benthamiana/crinita</i>	<i>Thelymitra crinita</i>
066	<i>Thelymitra paludosa</i>	<i>Thelymitra</i> aff. <i>holmesii</i>
090	<i>Banksia dallanneyi</i> var. <i>dallanneyi</i>	<i>Dryandra nivea</i>
143	<i>Drosera erythrorhiza</i> subsp. <i>erythrorhiza</i>	<i>Drosera erythrorhiza</i>
143	<i>Drosera parvula</i>	<i>Drosera paleacea</i>
143	<i>Drosera</i> sp.	omitted
149	<i>Crassula colorata</i> var. <i>colorata</i>	<i>Crassula colorata</i>
152	<i>Billardiera laxiflora</i>	omitted
152	<i>Billardiera</i> sp.	omitted
163	<i>Acacia appplanata</i>	<i>Acacia willdenowiana</i>
163	<i>Acacia longifolia</i>	omitted
163	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	omitted
163	<i>Acacia pulchella</i> var. <i>pulchella</i>	<i>Acacia pulchella</i>
163	<i>Acacia pycnantha</i>	omitted
163	<i>Acacia</i> sp.	omitted
165	<i>Callistachys lanceolata</i>	omitted
165	<i>Daviesia nudiflora</i> subsp. <i>nudiflora</i>	<i>Daviesia nudiflora</i>
165	<i>Desmodium biarticulatum</i>	<i>Desmocladus fasciculatus</i>
165	<i>Hovea trisperma</i>	<i>Hovea trisperma</i> var. <i>trisperma</i>
165	<i>Lotus</i> sp.	omitted
165	<i>Lotus suaveolens</i>	<i>Lotus subbiflorus</i>
165	<i>Nemcia capitata</i>	<i>Gastrolobium capitatum</i>
165	<i>Paraserianthes lophantha</i>	omitted
175	<i>Boronia fastigiata</i>	omitted
185	<i>Monotaxis grandiflora</i> var. <i>grandiflora</i>	<i>Monotaxis grandiflora</i>
185	<i>Poranthera</i> sp.	<i>Poranthera microphylla</i>

FCODE	name	Lookpu
243	<i>Hybanthus floribundus</i> subsp. <i>floribundus</i>	<i>Hybanthus floribundus</i>
263	<i>Pimelea suaveolens</i> subsp. <i>suaveolens</i>	<i>Pimelea suaveolens</i>
273	<i>Astartea</i> aff. <i>fascicularis</i>	<i>Astartea affinis</i>
273	<i>Astartea scoparia</i>	<i>Astartea affinis</i>
273	<i>Calytrix tenuiramea</i>	omitted
273	<i>Eremaea pauciflora</i> var. <i>pauciflora</i>	<i>Eremaea pauciflora</i>
273	<i>Eucalyptus calophylla</i>	<i>Corymbia calophylla</i>
273	<i>Eucalyptus marginata</i> subsp. <i>marginata</i>	<i>Eucalyptus marginata</i>
273	<i>Kunzea ericifolia</i>	<i>Kunzea glabrescens</i>
273	<i>Leptospermum laevigatum</i>	omitted
273	<i>Melaleuca incana</i> subsp. <i>incana</i>	<i>Melaleuca incana</i>
273	<i>Melaleuca viminalis</i>	omitted
273	<i>Melaleuca viminea</i> subsp. <i>viminea</i>	<i>Melaleuca viminea</i>
281	<i>Platysace filiformis</i>	<i>Platysace compressa</i>
288	<i>Astroloma</i> ? <i>pallidum</i>	<i>Astroloma pallidum</i>
288	<i>Lysinema ciliatum</i>	<i>Lysinema pentapetalum</i>
293	<i>Anagallis arvensis</i>	<i>Lysimachia arvensis</i>
302	<i>Phyllangium divergens</i>	<i>Phyllangium paradoxum</i>
339	<i>Wahlenbergia gracilentia</i>	<i>Wahlenbergia preissii</i>
341	<i>Scaevola repens</i>	<i>Scaevola repens</i> var. <i>repens</i>
343	<i>Stylidium androsaceum</i>	<i>Stylidium calcaratum</i>
343	<i>Stylidium araeophyllum</i>	<i>Stylidium brunonianum</i>
343	<i>Stylidium araeophyllum</i>	<i>Stylidium brunonianum</i>
343	<i>Stylidium mimeticum</i>	<i>Stylidium calcaratum</i>
343	<i>Stylidium</i> sp.	omitted
343	<i>Stylidium striatum</i>	<i>Stylidium brunonianum</i>
345	<i>Aster subulatus</i>	omitted
345	<i>Conyza albida</i>	<i>Conyza bonariensis</i>
345	<i>Craspedia</i> sp.A Perth Flora	<i>Craspedia variabilis</i>
345	<i>Lagenifera huegelii</i>	<i>Lagenophora huegelii</i>
345	<i>Millotia tenuifolia</i> var. <i>tenuifolia</i>	<i>Millotia tenuifolia</i>
345	<i>Monoculus monstrosus</i>	omitted
345	<i>Waitzia suaveolens</i> var. <i>suaveolens</i>	<i>Waitzia suaveolens</i>