

## POINT PERON AND ADJACENT BUSHLAND, PERON/SOALWATER BAY

**Boundary Definition:** protected area/management taken to coastline boundary (Areas of bushland within the boundaries of the Site are not accurately mapped. The boundary has been drawn to include any unmapped bushland.)

### SECTION 1: LOCATION INFORMATION

**Bush Forever Site no.** 355

**Area (ha):** bushland 107.1

**Map no.** 68, 69

**Map sheet series ref. no.** 2033-III NE

**Other Names:** part of Rockingham Lakes Regional Park

**Local Authorities (Suburb):** City of Rockingham (Peron)

**Includes CALM Managed Land:** Marine Reserve 5 (Marine Park)

### SECTION 2: REGIONAL INFORMATION

#### LANDFORMS AND SOILS

##### Spearwood Dunes

Tamala Limestone (Qtl: LS1)

##### Quindalup Dunes (Holocene dunes)

Safety Bay Sands (Qhs: S1, S2, S13)

##### Lagoon and Estuarine Deposits (within the Quindalup Dunes)

Lagoon and Estuarine Deposits (Vasse) (Qhg: M5)

#### VEGETATION AND FLORA

##### Vegetation Complexes

###### Quindalup Dunes

Quindalup Complex

**Floristic Community Types:** \*not sampled, types inferred

##### Supergroup 2: Seasonal Wetlands

- \*16 Highly saline seasonal wetlands (*Frankenia pauciflora* and *Sarcocornia blackiana* Low Open Shrubland on Tamala Limestone Cliffs)

##### Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes

- \*29a Coastal shrublands on shallow sands  
\*29b *Acacia* shrublands on taller dunes  
\*S13 Northern *Olearia axillaris* — *Scaevola crassifolia* shrublands  
\*S14 *Spinifex longifolius* grasslands and low shrublands

#### WETLANDS

**Wetland Types:** artificial channel

##### Natural Wetland Groups

###### Quindalup

Becher (Qu.2)

**Wetland Management Objectives:** not assessed

**Swan Coastal Plain Lakes EPP:** none identified

#### THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Not determined

### SECTION 3: SPECIFIC SITE DETAIL

**Landscape Features:** ocean — limestone cliff, vegetated uplands

**Vegetation and Flora:** detailed survey (Keating and Trudgen 1986)

**Structural Units:** mapping (Keating and Trudgen 1986)

Spearwood Dunes

Uplands — Tamala Limestone: *Frankenia pauciflora* and *Sarcocornia blackiana* Low Open Shrubland; Open Heaths dominated by *Templetonia retusa* and *Melaleuca huegelii*

Quindalup Dunes

Uplands — Youngest dunes: Shrublands dominated by *Acacia rostellifera* and *Jacksonia furcellata* sometimes with *Leucopogon parviflorus* or *A. rostellifera* and *Calothamnus quadrifidus*; Closed Heaths to Shrublands dominated by *Acacia rostellifera*, *Olearia axillaris* or *Alyxia buxifolia* and combinations of these; Closed to Open Scrub dominated by *Acacia rostellifera* and *Melaleuca huegelii* or *A. rostellifera* and *Olearia axillaris*

Uplands — Strand: *Spinifex longifolius* Open Grassland

**Scattered Native Plants:** not assessed

**Vegetation Condition:** >50% Very Good to Good, <50% Degraded, with areas of severe localised disturbance

**Total Flora:** 69 native taxa (Keating and Trudgen 1986, excluding obvious wetland taxa of Site 358) (estimated >60% expected flora)

**Significant Flora:** none identified

**Fauna:** limited survey for reptiles (16 species) (WA Naturalists' Club pers. comm.). Significant reptile species: Carpet Python (*Morelia spilota*) and Lined Skink (*Lerista lineata*)

**Linkage:** adjacent bushland to the east (Site 358, across road); part of Greenways 1, 93, 97 (Tingay, Alan & Associates 1998a)

#### Other Special Attributes

Meets six specific coastal reserve criteria —

- (i) Quindalup Dune types: youngest, older and beach ridge plain
- (ii) Continuing natural processes: 174.5ha (106.1ha bushland) of Quindalup Dunes extending to 3.1km inland from the point
- (iii) Shoreline: soft (sandy) and hard (rocky)
- (iv) Linkage: contains Quindalup/Spearwood Dunes (Tamala Limestone) interface; roads and developments fragment Site
- (v) Vegetation: typical Quindalup/Spearwood units
- (vi) Habitats: see Fauna section above;

Isolated rocky headland displaying excellent exposures of the aeolian phase of Tamala Limestone, connected to the mainland by a series of Holocene beach-sand and dune-sand ridges of the Safety Bay Sands. Raised and submerged sea erosional terraces and beach deposits along the foreshore are thought to indicate past still-stands of sea level at 3, 1.5 and 0.6 metres above present sea level during the Holocene and this evidence has been used for world-wide eustatic correlations (Lemmon *et al.* 1979); majority of Site included in Port Kennedy and Rockingham Parks proposal (Tingay, Alan & Associates 1997, WA Cabinet Minute, 5 May 1997)

### SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed

### SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

**Criteria:** Representation of ecological communities, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation. Criteria not relevant to determination of regional significance, but which may be applied when evaluating areas having similar values

**Recommendation:** Site with Some Existing Protection; the care, control and management of this Site for conservation purposes within Rockingham Lakes Regional Park is endorsed. Part: Other Government Land Mechanism (see Table 3, Volume 1).

## LAKE RICHMOND, ROCKINGHAM

**Boundary Definition:** protected area/bushland (part taken to cadastre) boundary (part eastern boundary subject to Ministerial Condition No. 486, 18 September 1998)

### SECTION 1: LOCATION INFORMATION

**Bush Forever Site no.** 358

**Area (ha):** bushland 28.7 (Site also includes open water.)

**Map no.** 69

**Map sheet series ref. no.** 2033–III NE

**Other Names:** part of Rockingham Lakes Regional Park

**Local Authorities (Suburb):** City of Rockingham (Rockingham, Peron, Shoalwater)

**System 6 (1983):** M102 part System area bushland, only bushland described



## SECTION 2: REGIONAL INFORMATION

### LANDFORMS AND SOILS

**Quindalup Dunes** (Holocene dunes)

Safety Bay Sands (Qhs: S13)

**Lagoonal and Estuarine Deposits (within the Quindalup Dunes)**

Lagoonal and Estuarine Deposits (Vasse) (Qhg: M5)

### VEGETATION AND FLORA

#### Vegetation Complexes

##### Quindalup Dunes

Quindalup Complex

#### Floristic Community Types

##### Supergroup 2: Seasonal Wetlands

19a Sedgelands in Holocene dune swales (DEP 1996, equivalent to 19 in Gibson *et al.* 1994, English and Blyth 1997)

##### Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes

29a Coastal shrublands on shallow sands

### WETLANDS

**Wetland Types:** lake, artificial channel, damplands/sumplands

#### Natural Wetland Groups

##### Quindalup

Cooloongup (Qu.1)

Becher (Qu.2)

**Wetland Management Objectives:** Conservation (59.2ha)

**Swan Coastal Plain Lakes EPP:** 53.3ha

### THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Critically Endangered (floristic community type 19 (as defined by Gibson *et al.* 1994), Stromatolite-like microbialite community of coastal freshwater lakes)

## SECTION 3: SPECIFIC SITE DETAIL

**Landscape Features:** open water, vegetated wetlands

**Vegetation and Flora:** detailed survey (Keating and Trudgen 1986), part Site — Bowman Bishaw Gorham 1997a&b; limited survey (DEP 1996 (Rich 01–02), DEP 1998)

**Structural Units:** mapping (Keating and Trudgen 1986; part Site — Bowman Bishaw Gorham 1997a&b)  
Quindalup Dunes

Uplands: *Acacia rostellifera*, *Leucopogon parviflorus* and *Jacksonia furcellata* Shrubland; *Olearia axillaris* Shrubland; *Acacia saligna* and *Jacksonia furcellata* Shrubland; *Lomandra maritima* Herbland

Wetlands: *Melaleuca raphiophylla* Low Woodland to Low Forest; Shrubland dominated by *Acacia saligna* or *Xanthorrhoea preissii* and combinations of these; Closed Sedgelands dominated by *Juncus pallidus*, *J. kraussii*, *Isolepis nodosa*, *Lepidosperma gladiatum*, *Typha ?domingensis* and *Baumea juncea* and combinations of these; Sedgelands dominated by *Gahnia trifida* or *Isolepis nodosa*

**Scattered Native Plants:** *Melaleuca* Shrubland; areas with scattered native species

**Vegetation Condition:** >50% Very Good to Excellent, <50% Good to Degraded, with areas of severe localised disturbance

**Total Flora:** 61 native taxa, 24 (Bowman Bishaw Gorham 1997a&b, DEP 1996, Keating and Trudgen 1986) (estimated >65% expected flora)

**Significant Flora:** none identified

**Fauna:** limited surveys for birds (100 species) (RAOU 1996 D, 1 visit; WA Naturalists' Club and Tingay, Alan & Associates 1997). Significant bird species: category 2 (1) and category 4 (1). Limited survey for native mammals, reptiles, amphibians (5) and fish (several) (Tingay, Alan & Associates 1997)

**Linkage:** adjacent bushland/scattered native plants to the east and west (Site 355, across road); part of Greenways 93, 97 (Tingay, Alan & Associates 1998a)

#### Other Special Attributes

Meets five of the six specific coastal reserve criteria —

- (i) Quindalup Dune types: beach ridge plain
- (ii) Continuing natural processes: 21.9ha (15.5ha bushland) of Quindalup Dunes extending to 1.7kms inland
- (iv) Linkage: links to coast through Site 355
- (v) Vegetation: wetland and upland units; rare communities
- (vi) Habitats: see Fauna section above;

Wetland of 'regional significance' (Semeniuk, V&C Research Group 1991b); contains examples of microbialites, organo-sedimentary structures formed by microorganisms, the oldest life-form on survey (Tingay, Alan & Associates 1997); majority of Site included in Port Kennedy and Rockingham Parks proposal survey (Tingay, Alan & Associates 1997); '...the deepest lake on the coastal plain, which has marine origins (Fairbridge 1941 in EPA and WAWA 1990)

#### **SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE**

Entered in the Register of the National Estate; location for JAMBA/CAMBA species; subject to protection under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

#### **SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS**

**Criteria:** Representation of ecological communities, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation

**Recommendation:** Site with Some Existing Protection; the care, control and management of this Site for conservation purposes within Rockingham Lakes Regional Park is endorsed (see Table 3, Volume 1).

## LAKE COOLOONGUP, LAKE WALYUNGUP AND ADJACENT BUSHLAND, HILLMAN TO PORT KENNEDY

**Boundary Definition:** protected area/bushland (part taken to cadastre) boundary (Areas of bushland within the boundaries of the Site are not accurately mapped.)

### SECTION 1: LOCATION INFORMATION

**Bush Forever Site no.** 356

**Area (ha):** bushland 1617.5 (Site also includes open water.)

**Map no.** 69, 70, 74, 75

**Map sheet series ref. no.** 2033-II NW, 2033-II SW

**Other Names:** White Lake, Salt Lake, Lark Hill, Tamworth Hill, part of Rockingham Lakes Regional Park

**Local Authorities (Suburb):** Shire of Rockingham (Hillman, Cooloongup, Waikiki, Warnbro, Port Kennedy, Baldivis)

**System 6 (1983):** M103 area of bushland goes beyond System area boundaries, all bushland described

### SECTION 2: REGIONAL INFORMATION

#### LANDFORMS AND SOILS

##### Bassendean Dunes

Bassendean Sands (Qpb: S8)

##### Spearwood Dunes

Sands derived from Tamala Limestone (Qts: S7)

Tamala Limestone (Qtl: LS1)

##### Quindalup Dunes (Holocene dunes)

Safety Bay Sands (Qhs: S13, LS4)

##### Wetlands (within the Quindalup/Spearwood Dunes)

Holocene Swamp Deposits (Qhw: Cps, Cs1)

##### Lagoonal and Estuarine Deposits (at or near interface of Quindalup/Spearwood Dunes)

Lagoonal and Estuarine Deposits (Vasse) (Qhg: M5)

#### VEGETATION AND FLORA

##### Vegetation Complexes

###### Spearwood Dunes

Karrakatta Complex — Central and South

Cottesloe Complex — Central and South

###### Quindalup Dunes

Quindalup Complex

**Floristic Community Types:** \*not sampled, types inferred

##### Supergroup 2: Seasonal Wetlands

17 *Melaleuca raphiophylla* — *Gahnia trifida* seasonal wetlands

\*19a Sedgelands in Holocene dune swales (DEP 1996, equivalent to 19 in Gibson *et al.* 1994, English and Blyth 1997)

19b Woodlands over sedgelands in Holocene dune swales (DEP 1996, equivalent to 19 in Gibson *et al.* 1994, English and Blyth 1997)

##### Supergroup 3: Uplands centred on Bassendean Dunes and Dandaragan Plateau

21a Central *Banksia attenuata* — *Eucalyptus marginata* woodlands

##### Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes

24 Northern Spearwood shrublands and woodlands (most southern occurrence)

\*29b *Acacia* shrublands on taller dunes

#### WETLANDS

**Wetland Types:** lake, sumpland, dampland, artificial lake

##### Natural Wetland Groups

###### Spearwood Dunes

Stakehill (S.4)

###### Quindalup

Cooloongup (Qu.1)

Becher (Qu.2)

**Wetland Management Objectives:** Conservation (1462.3ha)

**Swan Coastal Plain Lakes EPP:** 312.8ha + 24.2ha + 438.6ha + 48.8ha = 824.4ha (total)

#### THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Critically Endangered (floristic community type 19 as defined by Gibson *et al.* 1994)

### SECTION 3: SPECIFIC SITE DETAIL

**Landscape Features:** open water, vegetated wetlands, vegetated uplands

**Vegetation and Flora:** detailed survey (part Site — Keighery, BJ, *et al.* 1997c, Tingay and Tingay 1977); limited survey (DEP 1999, EPA and WAWA 1990, Gibson *et al.* 1994 (Tam 01, Cool 01–04, 08–09, 11, Kero 01–02), Keighery, GJ, 1996 D (Cool 14–15))



**Structural Units:** mapping (part Site — EPA and WAWA 1990, Keighery, BJ, *et al.* 1997c, Tingay and Tingay 1977)

Spearwood Dunes

Uplands — Sands derived from Tamala Limestone: *Banksia attenuata* and *B. menziesii* Low Woodland; *Eucalyptus gomphocephala*, *E. marginata* and *Banksia attenuata* Open Forest; *Grevillea vestita* Closed Heath; *Hibbertia hypericoides* Open Low Heath

Quindalup Dunes

Uplands — Beach ridge plain: *Eucalyptus gomphocephala* Woodland to Forest; *Acacia rostellifera* Tall Open Scrub; *Jacksonia furcellata* and *Acacia rostellifera* Shrubland; *Acacia saligna* Low Open Woodland to Low Woodland; *Xanthorrhoea preissii* Open Heath

Wetlands (at or near the interface of the Quindalup and Spearwood Dunes): Open to Closed Sedgeland dominated by *Baumea juncea*, *Gahnia trifida*, *Lepidosperma longitudinale*, *Juncus kraussii* or *Baumea vaginalis* or combinations of these; *Banksia littoralis* Low Woodland; *Melaleuca raphiophylla* Low Woodland to Forest; *Eucalyptus gomphocephala* Woodland to Forest

Wetlands — Beach ridge plain: *Isolepis nodosa* and *Baumea juncea* Closed to Open Sedgeland, generally with an overstorey of *Xanthorrhoea preissii*

**Scattered Native Plants:** *Eucalyptus gomphocephala* Woodland; *Acacia saligna* Low Woodland;

*Xanthorrhoea preissii* Open Heath

**Vegetation Condition:** >60% Very Good to Pristine, <40% Good to Degraded, with areas of severe localised disturbance

**Total Flora:** 174 native taxa, 82 weed taxa (part Site — Keighery, BJ, *et al.* 1997c) (>85% of expected flora)

**Significant Flora:** Keighery, BJ, *et al.* 1997c — *Trachymene coerulea*, *T. pilosa* (distinct form found also at Rottnest Island), *Sonchus hydrophilus* (at risk), *Atriplex suberecta* (not previously recorded on the Swan Coastal Plain), *Linum marginale* (rarely recorded on Quindalup dunes), *Acacia pulchella* var. *goadbyi* (only known occurrence on the Swan Coastal Plain), *Eremophila glabra* subsp. *albicans*, *Jacksonia furcellata* (floriferous shrub form), *Kennedia coccinea* (becoming increasingly uncommon on the western margins of the Plain)

**Fauna:** multiple surveys for birds (73 species) (Tingay and Tingay 1977; RAOU 1996 D, 3 visits), limited survey for native mammals (2 species), reptiles (1 species), amphibians (3 species) and fish (1 species) (Tingay and Tingay 1977). Significant bird species: category 2 (6), category 3 (10), category 4 (5). Significant population of Black Swan. Significant mammal species: Western Brush Wallaby and Quenda (Friend 1996 D)

**Linkage:** adjacent bushland to the north (Site 349, across road), south, east and west (Site 377, across road); part of Greenways 83, 85, 86, 89, 122 (Tingay, Alan & Associates 1998a); part of a regionally significant contiguous bushland/wetland linkage (Part A, Map 7)

#### **Other Special Attributes**

Meets five of the six specific criteria for coastal reserves—

- (i) Quindalup Dune types: beach ridge plain and older dunes
- (ii) Continuing natural processes: 1079.4ha (837.4 bushland) of Quindalup Dunes extending to 8.8km inland (through Site 377 to coast)
- (iv) Linkage: Quindalup/Spearwood Dunes (Tamala Limestone) interface
- (v) Vegetation: five regional floristic groups, one of which is a threatened community
- (vi) Habitats: see Fauna section above;

Part Site (Lake Cooloongup and Lake Walyungup) — wetland of 'national significance'; part Site (Tamworth Lakes) — wetland of 'regional significance' (Semeniuk, V&C Research Group 1991b); contains examples of microbialites, organo-sedimentary structures formed by microorganisms, the oldest life-form on earth (Tingay, Alan & Associates 1997); majority of Site included in Port Kennedy and Rockingham Parks proposal (Tingay, Alan & Associates 1997)

### **SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE**

Entered in the Register of the National Estate; location for JAMBA/CAMBA species; subject to protection under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

### **SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS**

**Criteria:** Representation of ecological communities, Diversity, Rarity, Maintaining ecological processes or natural systems, Scientific or evolutionary importance. General criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation

**Recommendation:** Part A: Site with Some Existing Protection; the care, control and management of this Site for conservation purposes within Rockingham Lakes Regional Park is endorsed. Part B: Other Government Land Mechanism. Part C: Proposed Parks and Recreation Reservation (see Table 3, Volume 1).

## PORT KENNEDY

**Boundary Definition:** protected area/bushland (part taken to cadastre) boundary (Areas of bushland within the boundaries of the Site are not accurately mapped. The boundary has been drawn to include any unmapped bushland.)

### SECTION 1: LOCATION INFORMATION

**Bush Forever Site no.** 377

**Area (ha):** bushland 674.9

**Map no.** 74, 79

**Map sheet series ref. no.** 2033-II SW, 2033-III NE, 2033-III SE

**Other Names:** Becher Point Wetlands, part of Port Kennedy and Rockingham Lakes Regional Parks

**Local Authorities (Suburb):** City of Rockingham (Port Kennedy, Secret Harbour)

**Includes CALM Managed Land:** Nature Reserve 44077 (Conservation of Flora and Fauna), 45041 (Conservation of Flora and Fauna)

**System 6 (1983):** Part M106 area of bushland goes beyond System area boundaries, only bushland described

### SECTION 2: REGIONAL INFORMATION

#### LANDFORMS AND SOILS

**Quindalup Dunes** (Holocene dunes)

Safety Bay Sands (Qhs: S2, S13)

**Wetlands (within the Quindalup Dunes)**

Holocene Swamp Deposits (Qhw: Cps)

#### VEGETATION AND FLORA

**Vegetation Complexes**

**Quindalup Dunes**

Quindalup Complex

**Floristic Community Types:** \*not sampled, types inferred

**Supergroup 2: Seasonal Wetlands**

19a Sedgelands in Holocene dune swales (DEP 1996, equivalent to 19 in Gibson *et al.* 1994, English and Blyth 1997)

**Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes**

29b *Acacia* shrublands on taller dunes

\*S13 Northern *Olearia axillaris* — *Scaevola crassifolia* shrublands

\*S14 *Spinifex longifolius* grassland and low shrubland

#### WETLANDS

**Wetland Types:** dampland, sumpland

**Natural Wetland Groups**

**Quindalup**

Cooloongup (Qu.1)

Becher (Qu.2)

Peelhurst (Qu.3)

**Wetland Management Objectives:** Conservation (19.5ha)

**Swan Coastal Plain Lakes EPP:** none identified

#### THREATENED ECOLOGICAL COMMUNITIES

Not assessed. Critically Endangered (floristic community type 19 as defined by Gibson *et al.* 1994), Not determined

### SECTION 3: SPECIFIC SITE DETAIL

**Landscape Features:** coastal dunes

**Vegetation and Flora:** detailed survey (Keighery, GJ, and Keighery 1993c; part Site — Trudgen 1989); limited survey (Gibson *et al.* 1994 (PB 01–06))

**Structural Units:** mapping (part Site — Trudgen 1989)

Quindalup Dunes

Uplands — Beach ridge plain: *Olearia axillaris* Open Shrubland to Closed Heath to Closed Tall Scrub; *Scaevola crassifolia* and *Olearia axillaris* Low Open heath to Closed Heath to Open Scrub; Open Heath to Open Low Heaths dominated by *Acacia rostellifera*, *A. lasiocarpa* var. *lasiocarpa*, *Melaleuca systema*, *Olearia axillaris*, *Jacksonia furcellata* and combinations of these over *Austrostipa flavescens* Grassland

Wetlands — Beach ridge plain: *Juncus kraussii* Closed Sedgeland, at times over *Sarcocornia quinqueflora* Closed Herbland; *Isolepis nodosa* and *Baumea juncea* Closed to Open Sedgeland, generally with an overstorey of *Xanthorrhoea preissii*

Strand: *Spinifex longifolius* Grassland

**Scattered Native Plants:** not assessed

**Vegetation Condition:** >60% Very Good to Pristine, <40% Good to Degraded, with areas of severe localised disturbance



**Total Flora:** 172 native taxa, 68 weed taxa (Keighery, GJ, and Keighery 1993) (estimated >90% expected flora)

**Significant Flora:** Keighery, GJ, and Keighery 1993 — *Cryptandra mutila* and *Zygophyllum fruticosum* (southern range end), *Hibbertia cuneiformis* (most northern known population); *Jacksonia furcellata* (floriferous shrub form)

**Fauna:** limited surveys for birds (22 species), native mammals (5 species), reptiles (7 species) and amphibians (3 species) (Binnie & Partners 1988, Tingay, Alan & Associates 1997). Significant mammal species: Western Brush Wallaby and Quenda

**Linkage:** adjacent bushland to the north and east (Site 356, across road); part of Greenways 1, 83 (Tingay, Alan & Associates 1998a); part of a regionally significant fragmented bushland/wetland linkage (Part A, Map 7)

**Other Special Attributes**

Meets all six of the specific criteria for coastal reserves —

- (i) Quindalup Dune types: beach ridge plain
- (ii) Continuing natural processes: 764.2ha (657.9ha bushland) of Quindalup Dunes extending to 4km inland
- (iii) Shoreline: soft (sandy)
- (iv) Linkage: through adjacent Site 356 to Spearwood Dunes
- (v) Vegetation: two regional floristic groups, one of which is a threatened community, areas of vegetation in apparently Pristine condition
- (vi) Habitats: see Fauna section above;

Part Site recommended to be declared an A-class Nature Reserve for the protection of flora and fauna in Gibson *et al.* (1994); wetlands of 'national and international significance' (Semeniuk, V&C Research Group 1991b); majority of Site included in Port Kennedy and Rockingham Parks proposal (Tingay, Alan & Associates 1997)

**SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE**

Directory of Important Wetlands in Australia; Entered in the Register of the National Estate; subject to protection under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

**SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS**

**Criteria:** Representation of ecological communities, Diversity, Rarity, Maintaining ecological processes or natural systems, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation

**Recommendation:** Site with Some Existing Protection; the care, control and management of this Site (Reserves 44077, 45041) for conservation purposes within Port Kennedy and Rockingham Lakes Regional Park is endorsed (see Table 3, Volume 1).



## PAGANONI SWAMP AND ADJACENT BUSHLAND, KARNUP

**Boundary Definition:** protected area/bushland (part taken to cadastre) boundary (Boundary adjusted after vegetation survey and negotiations with land owner(s) in response to a submission to draft *Perth's Bushplan*.)

### SECTION 1: LOCATION INFORMATION

**Bush Forever Site no.** 395

**Area (ha):** bushland 705.5 (Site also includes open water.)

**Map no.** 79, 80

**Map sheet series ref. no.** 2033-II SW

**Other Names:** part of Rockingham Lakes Regional Park, Submission Area 266 and Submission Area 151, Lot 1 cnr Paganoni and Mandurah Rds

**Local Authorities (Suburb):** City of Rockingham (Karnup)

### SECTION 2: REGIONAL INFORMATION

#### LANDFORMS AND SOILS

##### Pinjarra Plain

Guildford Formation (Qha: Cp) (associated with Serpentine River)

##### Bassendean Dunes

Bassendean Sands (Qpb: S8)

##### Spearwood Dunes

Sands derived from Tamala Limestone (Qts: S7)

Tamala Limestone (Qtl: LS1)

##### Wetlands (within the Spearwood Dunes)

Holocene Swamp Deposits (Qhw: Scp, Cps)

#### VEGETATION AND FLORA

##### Vegetation Complexes

###### Spearwood Dunes

Karrakatta Complex — Central and South

Cottesloe Complex — Central and South

###### Wetlands

Herdsmen Complex

**Floristic Community Types:** \*not sampled, types inferred

##### Supergroup 2: Seasonal Wetlands

17 *Melaleuca raphiophylla* — *Gahnia trifida* seasonal wetlands

##### Supergroup 3: Uplands centred on Bassendean Dunes and Dandaragan Plateau

21a Central *Banksia attenuata* — *Eucalyptus marginata* woodlands

##### Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes

\*24 Northern Spearwood shrublands and woodlands

25 Southern *Eucalyptus gomphocephala* — *Agonis flexuosa* woodlands

#### WETLANDS

**Wetland Types:** sumpland, dampland

##### Natural Wetland Groups

###### Bassendean Dunes

Gnangara (B.2)

###### Spearwood Dunes

Stakehill (S.4)

###### Coastal Plain Rivers

Goegrup (R.4)

**Wetland Management Objectives:** Conservation (107.8ha)

**Swan Coastal Plain Lakes EPP:** 4.5ha + 9.6ha + 4.1ha + 0.3ha = 18.5ha (total)

#### THREATENED ECOLOGICAL COMMUNITIES

Not assessed

### SECTION 3: SPECIFIC SITE DETAIL

**Landscape Features:** open water, vegetated uplands, dune crest, limestone ridge

**Vegetation and Flora:** limited survey (DEP roadside survey 1998, DEP 1999, Gibson *et al.* 1994 (Paga 01–08)); detailed survey (Keighery, GJ, 1996, Semeniuk, V&C Research Group 1991d, part Site — Tingay 1999c)

**Structural Units:** mapping (Semeniuk, V&C Research Group 1991d)

Uplands — Sands derived from Tamala Limestone: *Eucalyptus gomphocephala* Forest to Woodland; Woodlands dominated by *Banksia attenuata* with scattered emergent *Eucalyptus marginata* and *E. gomphocephala* mixed with varying proportions of *Banksia ilicifolia*, *B. grandis*, *B. menziesii*, *Allocasuarina fraseriana* and *Xylomelum occidentale*; *Eucalyptus decipiens* Shrub Mallee; Mixed Low Heaths with a variety of dominants such as *Melaleuca huegelii*, *Grevillea preissii* and *Hakea trifurcata*

Uplands — Tamala Limestone: Low heath dominated by *Olearia axillaris*, *Melaleuca systema*, *Acacia truncata*, *A. cyclops* and *A. saligna*

Wetlands: Woodlands to Forests dominated by *Eucalyptus rudis*, *E. calophylla* or *E. gomphocephala*; *Melaleuca preissiana*, *Banksia littoralis* and *Acacia saligna* Low Woodland; *Melaleuca raphiophylla* Low Forest; Closed Scrub to Open Scrub dominated by *Melaleuca teretifolia* or *M. viminea*; Closed to Open Heath dominated by *Pericalymma ellipticum* alone or in combination with *Hakea varia*, *Calothamnus lateralis* and *Aotus* species; *Astartea* aff. *fascicularis* Heath; Sedgeland dominated by *Lepidosperma longitudinale*, *Baumea articulata*, *B. juncea* or *Gahnia trifida*

**Vegetation Condition:** >75% Excellent to Very Good, <25% Good to Degraded

**Total Flora:** 305 native taxa, 45 weed taxa (Keighery, GJ, 1996, Semeniuk, V&C Research Group 1991d) (estimated >80% expected flora)

**Significant Flora:** *Lasiopetalum membranaceum* (2) (Tingay 1999), *Hibbertia spicata* subsp. *leptotheca* (3), *Acacia benthamii* (3) (Keighery, GJ, 1999), *Dillwynia dillwynioides* (3); *Jacksonia calcicola* (most southern population), *Trachymene coerulea*, *Mesomelaena tetragona* (most western record, generally associated with eastern side of the Swan Coastal Plain), *Senecio ramosissimus* (one of two populations known in the PMR, Keighery, GJ, 1996), *Pterostylis* sp. cauline leaves (NG & ML 1490), *Pterostylis* sp. crinkled leaf (GJK 13426); typical Tamala Limestone taxa (DEP 1999 and Tingay 1999) — *Melaleuca huegelii*, *Grevillea preissii*, *Trymalium ledifolium* subsp. *ledifolium*, *Diplopeltis huegelii* subsp. *huegelii*, *Eucalyptus foecunda*, *Jacksonia calcicola*

**Fauna:** Significant mammal species: Quenda (Friend 1996 D)

**Linkage:** adjacent bushland to the north (Site 379, across road), east (to Serpentine River) and west; part of Greenways 89, 123 (Tingay, Alan & Associates 1998a); part of a regionally significant contiguous bushland/wetland linkage (Part A, Map 7)

**Other Special Attributes:** Paganoni wetland is the largest in the Stakehill Suite; wetland of 'regional to international significance' (Semeniuk, V&C Research Group 1991e); majority of Site included in Port Kennedy and Rockingham Parks proposal (Tingay, Alan & Associates 1997b)

### SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Entered in the Interim List of the Register of the National Estate

### SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

**Criteria:** Representation of ecological communities, Diversity, Rarity, Maintaining ecological processes or natural systems, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation

**Recommendation:** Part A: Site with Some Existing Protection; the care, control and management of this Site for conservation purposes within Rockingham Lakes Regional Park is endorsed. Part B: Urban Negotiated Planning Solution (see Table 3, Volume 1).



## ANSTEY SWAMP, KARNUP

**Boundary Definition:** protected area boundary

### SECTION 1: LOCATION INFORMATION

**Bush Forever Site no.** 379

**Area (ha):** bushland 270.2 (Site also includes open water.)

**Map no.** 75, 80

**Map sheet series ref. no.** 2033-II SW

**Other Names:** Submission Area 10; part of Rockingham Lakes Regional Park

**Local Authorities (Suburb):** City of Rockingham (Karnup)

### SECTION 2: REGIONAL INFORMATION

#### LANDFORMS AND SOILS

##### Spearwood Dunes

Sands derived from Tamala Limestone (Qts: S7)

Tamala Limestone (Qtl: LS1)

##### Wetlands (within the Spearwood Dunes)

Holocene Swamp Deposits (Qhw: Sep)

#### VEGETATION AND FLORA

##### Vegetation Complexes

###### Spearwood Dunes

Karrakatta Complex — Central and South

Cottesloe Complex — Central and South

###### Wetlands

Herdsmen Complex

**Floristic Community Types:** \*not sampled, types inferred

##### Supergroup 2: Seasonal Wetlands

\*17 *Melaleuca raphiophylla* — *Gahnia trifida* seasonal wetlands

##### Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes

\*24 Northern Spearwood shrublands and woodlands

\*25 Southern *Eucalyptus gomphocephala* — *Agonis flexuosa* woodlands

#### WETLANDS

**Wetland Types:** sumpland, dampland

##### Natural Wetland Groups

###### Spearwood Dunes

Stakehill (S.4)

**Wetland Management Objectives:** Conservation (216.6ha)

**Swan Coastal Plain Lakes EPP:** 1.1ha + 45.6ha = 46.7ha (total)

#### THREATENED ECOLOGICAL COMMUNITIES

Not assessed

### SECTION 3: SPECIFIC SITE DETAIL

**Landscape Features:** limestone area, open water, vegetated wetland, vegetated uplands

**Vegetation and Flora:** limited survey (DEP 1998, EPA and WAWA 1990, Keighery, GJ, 1996, Semeniuk, V&C Research Group 1991b)

**Structural Units:** mapping (EPA and WAWA 1990, Semeniuk, V&C Research Group 1991b)

Uplands — Sands derived from Tamala Limestone: *Eucalyptus gomphocephala* Forest to Woodland; Woodlands dominated by *Banksia attenuata* with scattered emergent *Eucalyptus marginata* and *E. gomphocephala* mixed with varying proportions of *Banksia ilicifolia*, *B. grandis*, *B. menziesii* and *Allocasuarina fraseriana*

Uplands — Tamala Limestone (possibly outside Site boundary): *Eucalyptus decipiens* Open Tree Mallee; Low Heath dominated by *Melaleuca systema*, *Acacia rostellifera*, *A. cyclops* and *Allocasuarina humilis*

Wetlands: Woodlands to Forests dominated by *Eucalyptus rudis* or *E. gomphocephala*; *Melaleuca preissiana*, *Banksia littoralis* and *Acacia saligna* Low Woodland; *Melaleuca raphiophylla* Low Forest dominated by *Melaleuca teretifolia* or *M. viminea*; Sedgelands dominated by *Lepidosperma longitudinale*, *Typha domingensis*, *Baumea articulata*, *B. juncea* or *Gahnia trifida*

**Vegetation Condition:** >75% Excellent to Very Good, <25% Good to Degraded, with areas of severe localised disturbance (GJ Keighery pers. comm.)

**Total Flora:** 200 native taxa (Keighery, GJ 1996) (estimated >60% expected flora)

**Significant Flora:** not surveyed

**Fauna:** not known

**Linkage:** adjacent bushland to the south (Site 395, across road) and west (across road); part of Greenways 85, 89 (Tingay, Alan & Associates 1998a); part of a regionally significant contiguous bushland/wetland linkage (Part A, Map 7)

**Other Special Attributes:** wetland of 'regional significance' (Semeniuk, V&C Research Group 1991b); majority of Site included in Port Kennedy and Rockingham Parks proposal (Tingay, Alan & Associates 1997)



#### ***SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE***

Not listed: Indicative place (AHC 2000 D)

#### ***SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS***

**Criteria:** Representation of ecological communities, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation

**Recommendation:** Site with Some Existing Protection; the care, control and management of this Site for conservation purposes within Rockingham Lakes Regional Park is endorsed (see Table 3, Volume 1).