

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 Bushplan Site are not accurately mapped.)

SECTION 1: CADASTRAL INFORMATION

(Lots, locations and derived information to be updated in the public submission period)

Bushplan Site no. 356 **Map no.** 87, 93, 99 **Map sheet series ref. no.** 2033-II NW, 2033-II SW
System 6 (1983): M103 area of bushland goes beyond System area boundaries, all bushland described

Other Names: not known

Area (ha): total 2727.6 (includes open water); bushland 1604.1

Local Authorities (Suburb)

Shire of Rockingham (Hillman, Coo loongup, Waikiki, Warnbro, Port Kennedy, Baldivis)

Zoning

MRS: Urban, Parks and Recreation, Rural, Public Purposes-Special Uses, Railways, Controlled Access Highways, Other Major Highways, Important Regional Roads, Public Purposes-Water Authority Of WA

TPS: Landscape, Public Open Space, Local Roads, Rural

Ownership Categories

State Government, Private (including commercial organisation)

Lot/Location/Reserve numbers (Purpose), Street name

0, 11 Day Rd; 11, 19, 20, 21, 317, 318, 319, 320, 327, 333, 334, 336, 338, 342, 583, 658, 757, 765, 766, 767, 785, 1114, 1126, 1286, 1287, 1331, 1387 Mandurah Rd; 328, 461, 1127, 1276 Safety Bay Rd; 2285, 2730 Elanora Dr; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 22, 4097 Dixon Rd; 451 Timberlane Loop; 321, 322, 636, 637, 638, 639, 640, 1309, 1310, 1329, 1330, 1332 Eighty Rd; 14, 314, 315, 316 Fifty Rd; 1, 2 Baldivis Rd; 542 Saltaire Wy; 2, 581, 582 Warnbro Sound Ave; 766, 768, 771, 796 Forty Rd; 1300 Stakehill Rd; 1, 19, 461 Ennis Ave; 1 Port Kennedy Dr; 0, 26, 1001 street not identified
Crown Reserve

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 Spearwood/Bassendean Dunes)

Holocene Swamp Deposits (Qhw: Cps, Cs1)

Lagoonal and Estuarine Deposits (within the Spearwood/Bassendean 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, type inferred

Supergroup 2: Seasonal Wetlands

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

19b Woodlands over sedgeland 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 southerly 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 + 48.8 = 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 Bushplan Site — Keighery, BJ, *et al.* 1997c, Tingay and Tingay 1977); limited survey (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 Bushplan Site — EPA and WAWA 1990, Keighery, BJ, *et al.* 1997c, Tingay and Tingay 1977)

Spearwood Dunes

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

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

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 exotics (part Bushplan 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: surveyed by RAOU (1996 D), 3 visits, and by A & SR Tingay (1977) for birds (73). Significant bird species: category 2 (6), category 3 (10), category 4 (5). Significant population of Black Swan. Limited survey by A & SR Tingay (1977) for native mammals (2), reptiles (1), amphibians (3) and fish (1). Significant mammal species: Western Brush Wallaby and Quenda (Friend 1996 D)

Linkage: adjacent bushland to the north (BS349, across road), south, east and west (BS377); part of proposed Greenways 98, 102, 138, 99 (Tingay, Alan & Associates 1997a); part of a regionally significant contiguous bushland/wetland linkage (Volume 2A, Map 8)

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 Bushplan 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 Bushplan Site (Lake Cooloongup and Lake Walyungup) — wetland of 'national significance'; part Bushplan 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 1997b); majority of Bushplan Site included in Port Kennedy and Rockingham Parks proposal (Tingay, Alan & Associates 1997b)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Listed on the Register of the National Estate; Location for JAMBA/CAMBA species

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

Opportunities and/or Constraints

Opportunities: Bushplan Site/part Bushplan Site subject to Peel-Harvey Estuary EPP/SPP, Swan Coastal Plain Lakes EPP; location of conservation category wetlands; under MRS Parks and Recreation Reservation and TPS Landscape Zoning and Public Open Space Zoning, Crown Reserve

Constraints: private land; under MRS Urban Zoning, MRD regional road requirements, Priority and General Mineral Resource Area (limestone), mining tenements M70/556 and M70/558

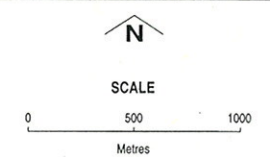
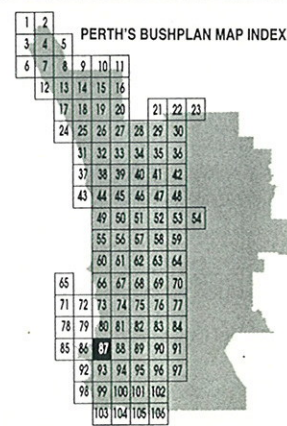
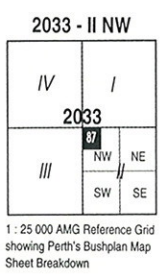
Recommendation: The care, control and management of this Bushplan Site for conservation purposes within Rockingham Lakes Regional Park is endorsed.



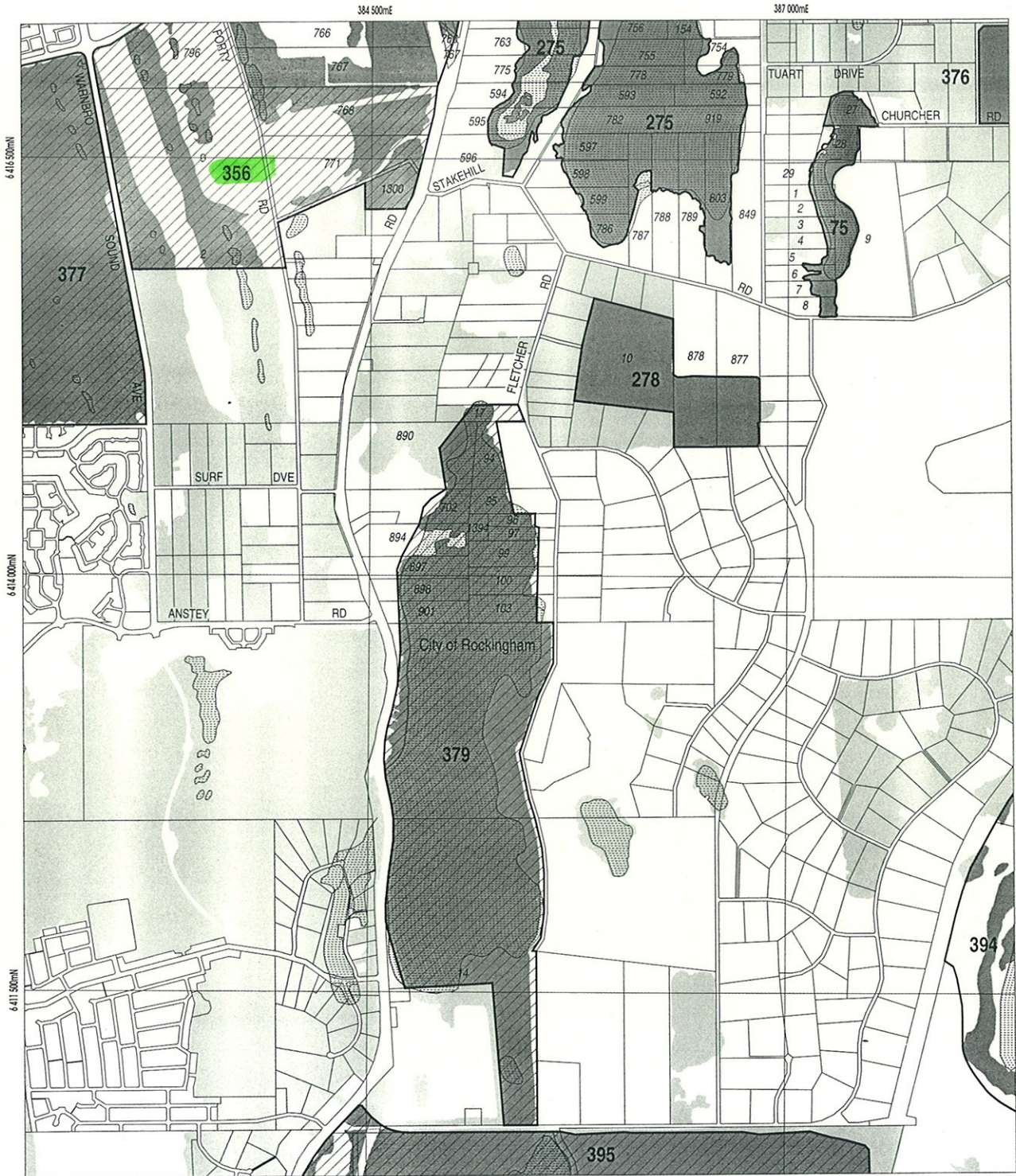


LEGEND


- 472 Bushplan Sites With Regionally Significant Bushland
- Other Native Vegetation
- Conservation Category Wetlands
- Bushplan Sites With Some Existing Protection
- 696 Lot Number, Location Number
- Channel Wetlands
- Local Government Boundary

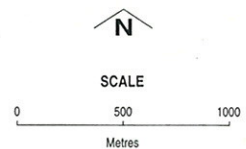
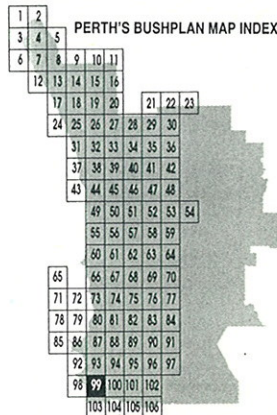
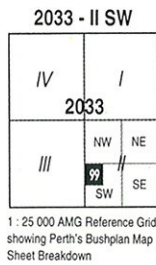


Produced by Project Mapping Section
Land Information Branch, Ministry for
Planning, Perth W.A. November 1998
ntw-map9/environ/bushplan/bushv2_87.dgn
Cadastral Data supplied by Department
of Land Administration, W.A.
Wetlands Data supplied by
Water and Rivers Commission
Native Vegetation Extent for Study Area
supplied by Agriculture Western Australia



LEGEND

-  Bushplan Sites With Regionally Significant Bushland
-  Other Native Vegetation
-  Conservation Category Wetlands
-  Bushplan Sites With Some Existing Protection
-  Lot Number, Location Number
-  Channel Wetlands
-  Local Government Boundary

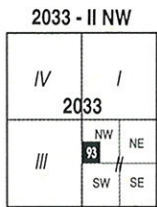


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 Land Information Branch, Ministry for
 Planning, Perth W.A. November 1998
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 of Land Administration, W.A.
 Wetlands Data supplied by
 Water and Rivers Commission
 Native Vegetation Extent for Study Area
 supplied by Agriculture Western Australia



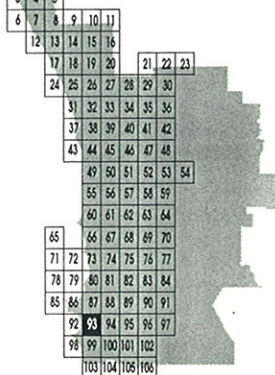
LEGEND

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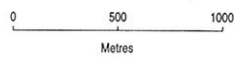


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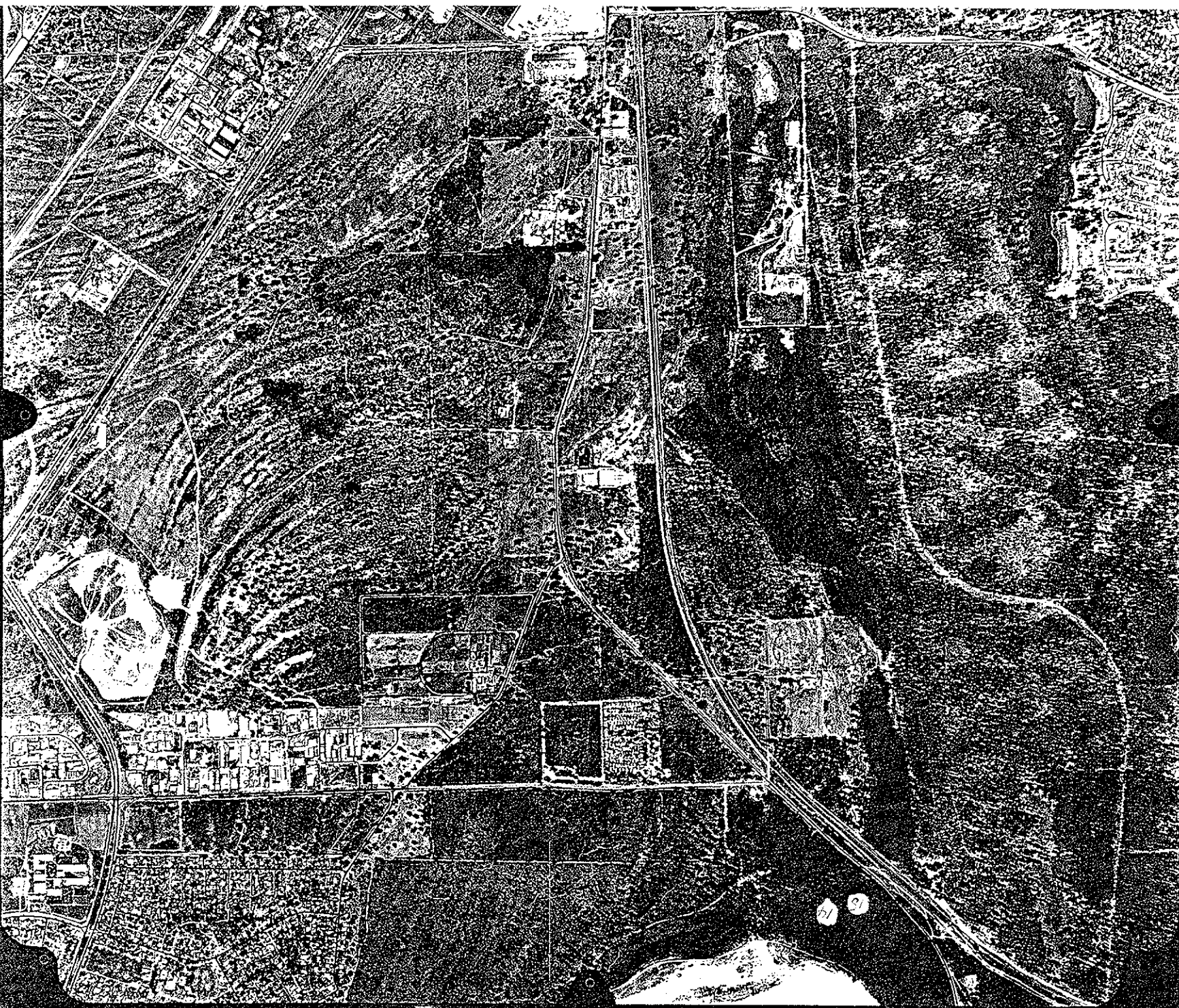
PERTH'S BUSHPLAN MAP INDEX



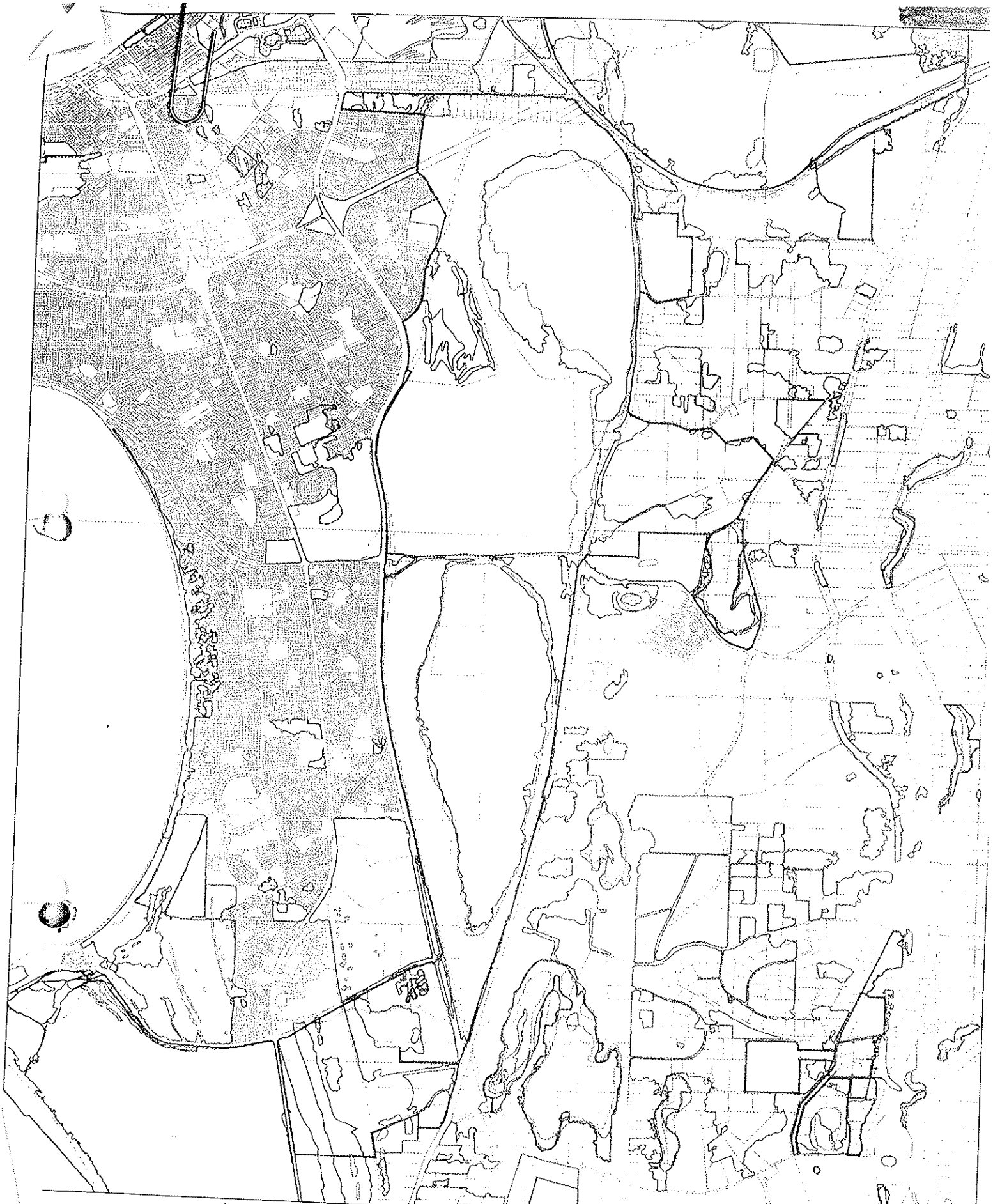
SCALE



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 Wetlands Data supplied by
 Water and Rivers Commission
 Native Vegetation Extent for Study Area
 supplied by Agriculture Western Australia



0.5K Lake Cooson.jpg



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BUSHPLAN SITES CORRECTED



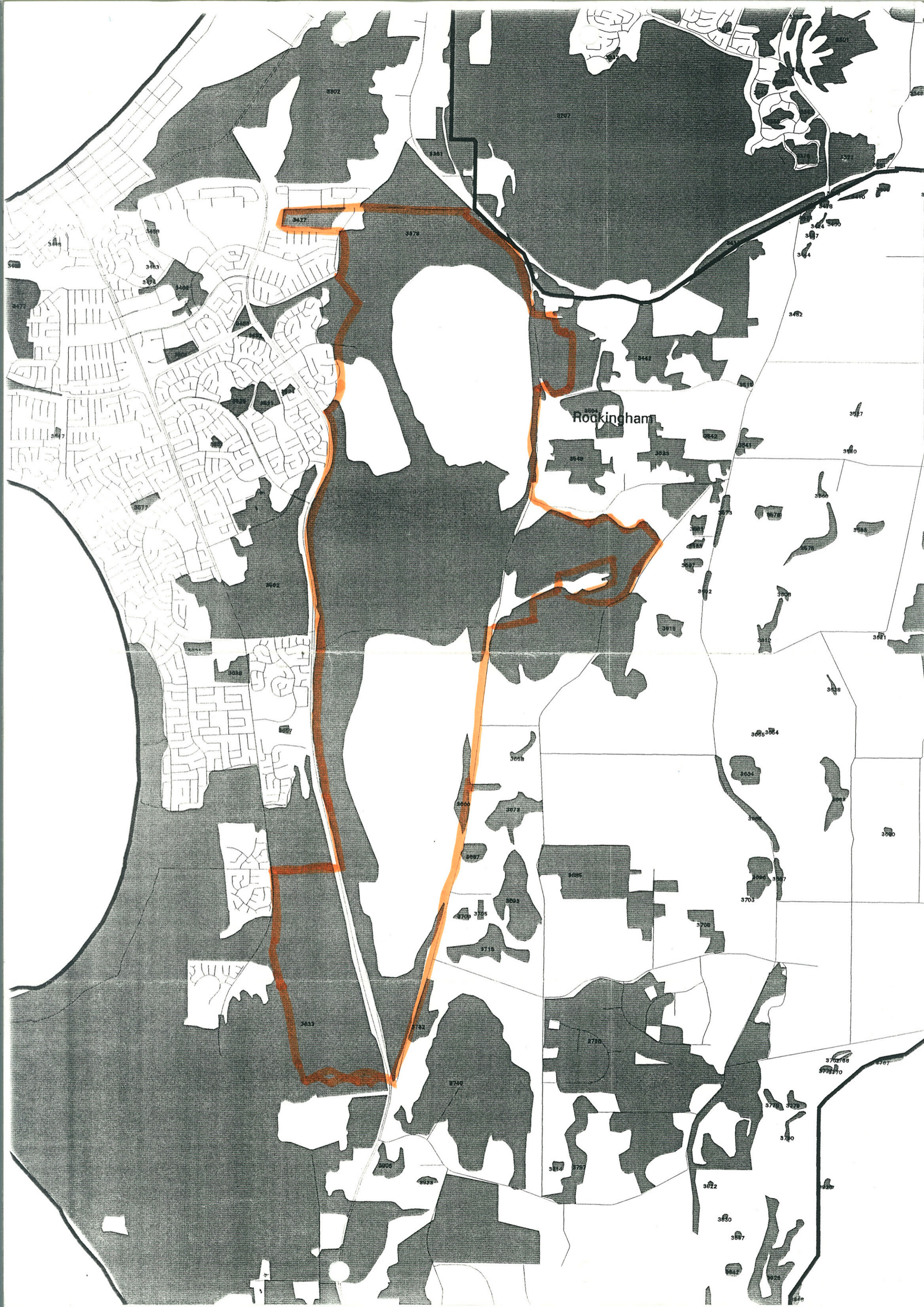
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AUSTRALIAN
PLANNING
COMMISSION



CUSTOMER
FOCUS
WESTERN AUSTRALIA

JTG 22/7/08





Rockingham

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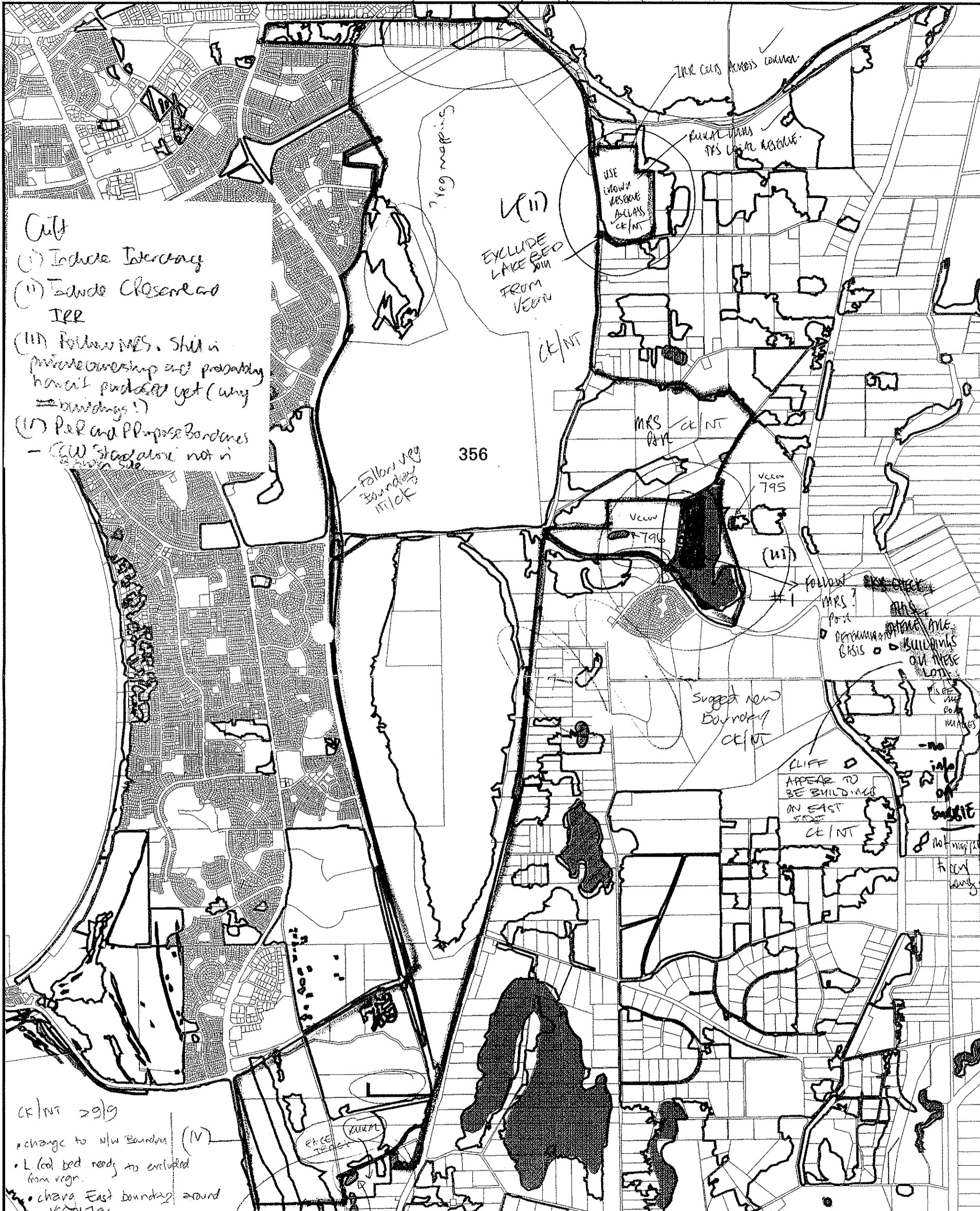
3630

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- Cut
- (i) Include Interchange
 - (ii) Exclude Closed road IRR
 - (iii) Follow MRS. Still in private ownership and probably haven't purchased yet (why buildings?)
 - (iv) Park and Propose Boundaries - CCW should also not in

- CK/NT 29/9
- change to NW Boundary (IV)
 - L. bed ready to excluded from veg.
 - change East boundary around VCCW 796
 - change mid west boundary

bp site 356

	AG VEG 1998 BOUNDARY THEME
	Cadastre
	Bushplan sites refno 1-500 SCP BOUNDARY THEME
	cons category wetlands
	Verified CCWs

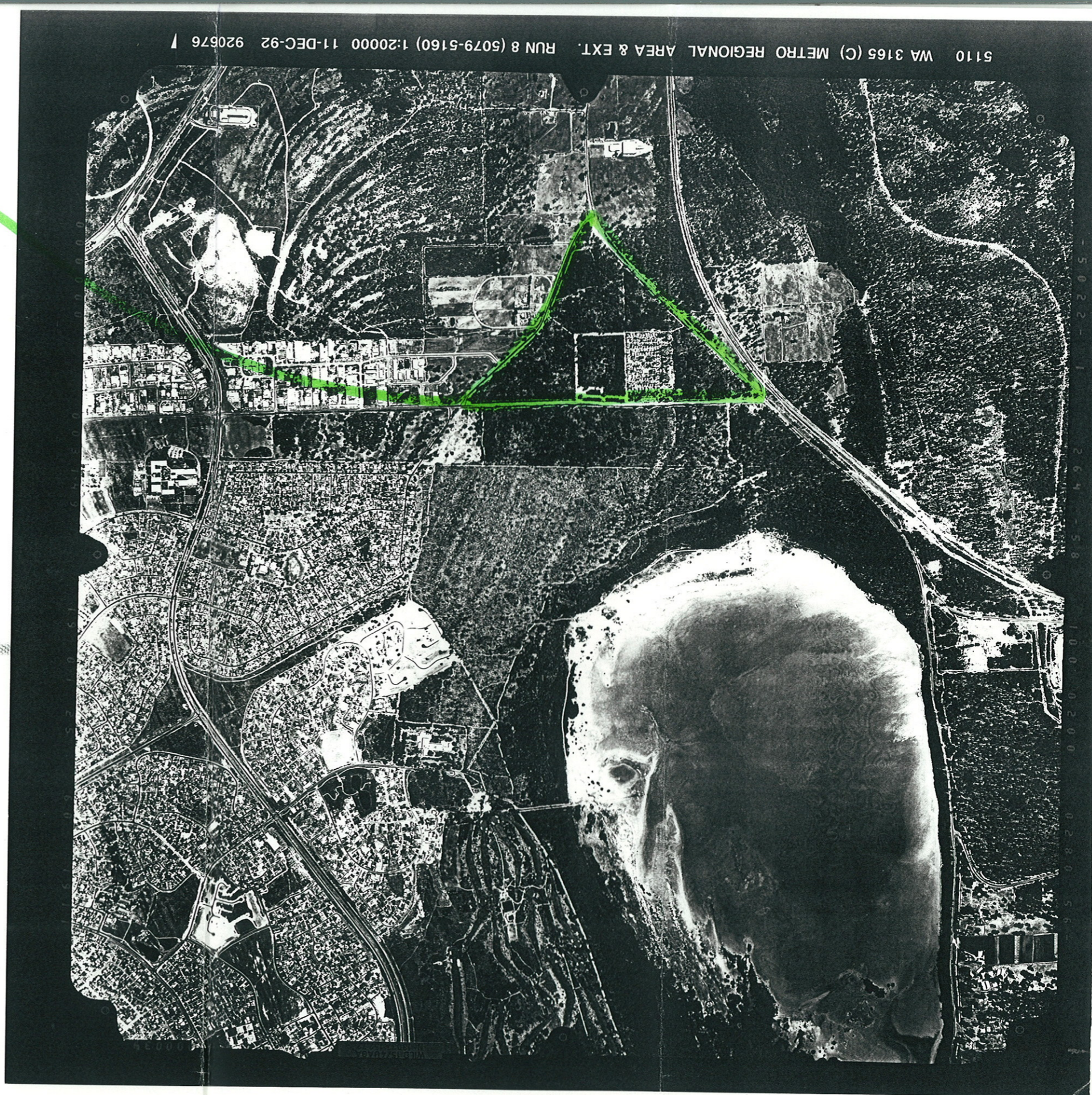
VCCW 796 -> not continuous with vegetation on Bushplan site.
 - 795 -> wetlands only [not included]
 - 891 NOT CONTINUOUS WITH VEGETATION IN 6E SITE SEPARATED BY CLEARWAY ROAD.
 - 846 - CHAIN OF WETLANDS EXTENDING TO SOUTH

KB SEE ME ON FT #1

Submission

? why not
included

BJK 5/5/97



SYSTEM 6 BUSHLAND SUBMISSION FORM FOR CONSIDERATION IN THE UPDATE PROGRAMME

If you wish to submit more than one area for consideration in the System 6 update, please use a separate form for each area.

Please fill in each section giving as much information as possible.

LOCATION, OWNERSHIP AND ZONING OF THE AREA

1. Location

Lark Hill Estate

Please give as accurate and detailed a description as possible of the site location

Please include either a hand drawn or copied map showing the area of the area

a) Bordering Roads: *Warrens Sound Ave Mandurah Rd.*

b) Nearest Corner:

c) Lot Number: Street Number:

d) Town/Suburb/Location:

e) Local Council:

f) Site Name (if any):

g) Approximate size of the area (ha):

h) Please locate the area on a map and give us map references if possible:

.....

i) Map: Streetsmart /UBD/Other:

j) Map no.:

k) Grid Ref:

l) Please give any other information that may help us to find the location:

Adjacent to Port Kennedy

m) Are you aware of any development proposals that are likely to affect the area?

.....

.....

NOTE: Areas that have already been given development APPROVAL should not be nominated

Aerial photo not found. It should be on run 8 # ~ 104 - 106

Please fill out those questions that you can answer

2. Who owns the area? (If owned by the person/s making the nomination please indicate) *Grant*

3. If you own the area, and may be interested in participating in conservation on private land initiatives please indicate (and leave your name and address at the end of this submission form)

4. What is the area zoned? (please indicate whether zoning is Town Planning Scheme or Metropolitan Region Scheme)

CAN YOU TELL US A LITTLE ABOUT THE PHYSICAL CHARACTERISTICS OF THE AREA

5. Why do you consider this area important? (Refer to Guiding Issues paper) *Recommended to be included in proposed Pent Kennedy Scientific Park (See EPA Rec.) + Section 6*

6. What is/are the soil type/s and colours ? *Area M106*
Type: Sand/Clay/Gravel/Loam/Silt
Colour: White/Grey/Brown/Orange/Yellow/Red/Black

7. Does the area have any special features such as unusual landforms / landscapes that still retain their natural vegetation? Yes/No
If yes, what are they?

8. Is the area a wetland or does it include a wetland?
If yes, what kind of a wetlands is it?
a) lake
b) river
c) stream
d) swamp
e) estuary
f) seasonally wet
g) other

9. What percentage of the wetland is open water in summer?

CAN YOU TELL US A LITTLE ABOUT THE VEGETATION /FAUNA ON THE NOMINATED AREA.

10. What percentage of the area is indigenous vegetation?

11. If the area includes regions cleared of native bushland please indicate reasons for the inclusion.

12. Has any previous flora or fauna survey work been done on the area?

..... *See MFP.*

If yes, please give details of the work

13. How would you rate the condition of the native bushland? (see attached table)

- a) pristine
- b) excellent
- c) very good
- d) good
- e) degraded
- f) completely degraded
- g) don't know

14. Please indicate the disturbances affecting the area and where appropriate the percentage of the area disturbed.

- a) Partial clearing
- b) fragmentation
- c) Selective removal of species: timber cutting, wildflower picking, mowing dieback and other plant diseases
- d) Fire regime, including intensity, season and frequency
- e) 'Enrichment plantings' that is plantings of species not found in that community
- f) Weed invasion
- g) Animal impact: horses, foxes, rabbits, cats, dogs, camels, goats etc
- h) Soil movement, both removal and dumping
- i) Changes in water regimes; flooding, drainage and watering
- j) Salinity
- k) Fertiliser drift and along waterways nutrient influx
- l) Mining, including that for road works

- m) Grazing: stock, overgrazing by feral or native mammals
- n) Proliferation of tracks, fire breaks and walk trails
- o) Off-road vehicle use
- p) Use as service corridors by the SEC, Main Roads, Water Authority.

(Source: B Keighery. Bushland Plant Survey, September 1994)

15. Does the area contain any plant species of special interest that you know of? (eg. declared rare flora, priority taxa, outlier populations)

Do you know what they are?

16. Do you know of any native animals that use the area?

Can you list those you know of? (birds, mammals, reptiles, amphibians etc)

17. Is the area used by any native animals of special interest? (eg. endangered species, large/important populations).....

If yes, please name them and indicate source of information

CAN YOU TELL US A LITTLE ABOUT THE SURROUNDING AREA

18. Are there any bushland areas (including wetlands) near to this area?

If yes, how close are they ?

Are they already conservation reserves?

What is their approximate size?

19. Does the submitted area link other bushland areas?

Please attach any additional information about the area which may be of use when assessing it.

Table 2: Vegetation Condition Scale

Modified from Trudgen 1991 by B. J. Keighery for the Swan Coastal Plain Survey 1993.

1 = 'Pristine'

Pristine or nearly so, no obvious signs disturbance.

2 = Excellent

Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species

For example damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.

3 = Very Good

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.

4 = Good

Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate to 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.

5 = Degraded

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.

6 = Completely Degraded

The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

Source: B Keighery. Bushland Plant Survey, September 1994

SYSTEM 6 BUSHLAND SUBMISSION FORM
FOR CONSIDERATION IN THE UPDATE PROGRAMME

If you wish to submit more than one area for consideration in the System 6 update, please use a separate form for each area.

Please fill in each section giving as much information as possible.

LOCATION, OWNERSHIP AND ZONING OF THE AREA

1. Location *Kerosene Lane Reserve*

Please give as accurate and detailed a description as possible of the site location

Please include either a hand drawn or copied map showing the area of the area

a) Bordering Roads: *Kerosene Lane / Mandurah Rd / Baldwins Rd.*

b) Nearest Corner:

c) Lot Number: Street Number:

d) Town/Suburb/Location:

e) Local Council: *Rockingham*

f) Site Name (if any): *Kerosene Lane Reserve A22429 +*

g) Approximate size of the area (ha): *40ha west of Ennis Ave SWest corner of R/len W. Park.*

h) Please locate the area on a map and give us map references if possible:
.....

i) Map: Streetsmart /UBD/Other:

j) Map no.:

k) Grid Ref:

l) Please give any other information that may help us to find the location:
.....

m) Are you aware of any development proposals that are likely to affect the area?
Industrial developments,
urban

NOTE: Areas that have already been given development APPROVAL should not be nominated

Please fill out those questions that you can answer

2. Who owns the area? (If owned by the person/s making the nomination please indicate) *Vested in Council / Govt / Private*

3. If you own the area, and may be interested in participating in conservation on private land initiatives please indicate (and leave your name and address at the end of this submission form)

4 .What is the area zoned? (please indicate whether zoning is Town Planning Scheme or Metropolitan Region Scheme) *Rural / Industry*
P+R.

CAN YOU TELL US A LITTLE ABOUT THE PHYSICAL CHARACTERISTICS OF THE AREA

5. Why do you consider this area important? (Refer to Guiding Issues paper)
① Good Wetland Values ② Part of interrelated wetland sites.

6. What is/are the soil type/s and colours ?
Type: Sand/Clay/Gravel/Loam/Silt
Colour: White/Grey/Brown/Orange/Yellow/Red/Black

7. Does the area have any special features such as unusual landforms / landscapes that still retain their natural vegetation? Yes/No
If yes, what are they?

8. Is the area a wetland or does it include a wetland?
If yes, what kind of a wetlands is it?
a) lake
b) river
c) stream
d) swamp
e) estuary
f) seasonally wet
g) other

9. What percentage of the wetland is open water in summer?

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10. What percentage of the area is indigenous vegetation?

11. If the area includes regions cleared of native bushland please indicate reasons for the inclusion.

12. Has any previous flora or fauna survey work been done on the area?

If yes, please give details of the work

13. How would you rate the condition of the native bushland? (see attached table)

a) pristine

b) excellent + variable

c) very good

d) good

e) degraded

f) completely degraded

g) don't know

14. Please indicate the disturbances affecting the area and where appropriate the percentage of the area disturbed.

a) Partial clearing

b) fragmentation

c) Selective removal of species: timber cutting, wildflower picking, mowing dieback and other plant diseases

d) Fire regime, including intensity, season and frequency

e) 'Enrichment plantings' that is plantings of species not found in that community

f) Weed invasion

g) Animal impact: horses, foxes, rabbits, cats, dogs, camels, goats etc

h) Soil movement, both removal and dumping

i) Changes in water regimes; flooding, drainage and watering

j) Salinity

k) Fertiliser drift and along waterways nutrient influx

l) Mining, including that for road works

- m) Grazing: stock, overgrazing by feral or native mammals
- n) Proliferation of tracks, fire breaks and walk trails
- o) Off-road vehicle use
- p) Use as service corridors by the SEC, Main Roads, Water Authority.

(Source: B Keighery. Bushland Plant Survey, September 1994)

15. Does the area contain any plant species of special interest that you know of?
(eg. declared rare flora, priority taxa, outlier populations)

Do you know what they are?

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Can you list those you know of? (birds, mammals, reptiles, amphibians etc)

17. Is the area used by any native animals of special interest? (eg. endangered species, large/important populations).....

If yes, please name them and indicate source of information

.....

CAN YOU TELL US A LITTLE ABOUT THE SURROUNDING AREA

18. Are there any bushland areas (including wetlands) near to this area?

.....

If yes, how close are they?

.....

Are they already conservation reserves?

What is their approximate size?

19. Does the submitted area link other bushland areas?

.....

Please attach any additional information about the area which may be of use when assessing it.

SYSTEM 6 BUSHLAND SUBMISSION FORM
FOR CONSIDERATION IN THE UPDATE PROGRAMME

If you wish to submit more than one area for consideration in the System 6 update, please use a separate form for each area.

Please fill in each section giving as much information as possible.

LOCATION, OWNERSHIP AND ZONING OF THE AREA

1. Location

Tamworth Swamp / Bushland.
+ Baldieis (Blue Heeler) Swamp, ~~Hodder~~ ^{swamp}

Please give as accurate and detailed a description as possible of the site location

Please include either a hand drawn or copied map showing the area of the area

a) Bordering Roads: Leighton Rd. Baldieis / Mandernah

b) Nearest Corner:

c) Lot Number: Street Number:

d) Town/Suburb/Location: Baldieis

e) Local Council: Rockingham

f) Site Name (if any): Tamworth Hill Reserve

g) Approximate size of the area (ha):

h) Please locate the area on a map and give us map references if possible:

.....

i) Map: Streetsmart /UBD/Other:

j) Map no.:

k) Grid Ref:

l) Please give any other information that may help us to find the location:

See S West + Corridor Structure Plan, W. Paper 3
Figures 10 + 11.

m) Are you aware of any development proposals that are likely to affect the area?

.....

Roadworks.

NOTE: Areas that have already been given development APPROVAL should not be nominated

Please fill out those questions that you can answer

2. Who owns the area? (If owned by the person/s making the nomination please indicate) *Govt + Private*

3. If you own the area, and may be interested in participating in conservation on private land initiatives please indicate (and leave your name and address at the end of this submission form)

4. What is the area zoned? (please indicate whether zoning is Town Planning Scheme or Metropolitan Region Scheme) *P+R + Rural.*

CAN YOU TELL US A LITTLE ABOUT THE PHYSICAL CHARACTERISTICS OF THE AREA

5. Why do you consider this area important? (Refer to Guiding Issues paper)

- ① Only area of upland vegetation of any size left
- ② Tanworth Swamp - sedge wetland, see EPA Bulletin recommending protection, other wetlands different

6. What is/are the soil type/s and colours? *in excellent condition*
Type: Sand/Clay/Gravel/Loam/Silt
Colour: White/Grey/Brown/Orange/Yellow/Red/Black

7. Does the area have any special features such as unusual landforms / landscapes that still retain their natural vegetation? Yes/No

If yes, what are they?

8. Is the area a wetland or does it include a wetland? Yes

If yes, what kind of a wetlands is it?

- a) lake
- b) river
- c) stream
- d) swamp
- e) estuary
- f) seasonally wet
- g) other

9. What percentage of the wetland is open water in summer?

CAN YOU TELL US A LITTLE ABOUT THE VEGETATION /FAUNA ON THE NOMINATED AREA.

10. What percentage of the area is indigenous vegetation?

11. If the area includes regions cleared of native bushland please indicate reasons for the inclusion.

12. Has any previous flora or fauna survey work been done on the area?

If yes, please give details of the work

Semenov, MFP-PEP, WANA Wetland Report etc

13. How would you rate the condition of the native bushland? (see attached table)

a) pristine

b) excellent

c) very good

d) good

e) degraded

f) completely degraded

g) don't know

14. Please indicate the disturbances affecting the area and where appropriate the percentage of the area disturbed.

a) Partial clearing

b) fragmentation

c) Selective removal of species: timber cutting, wildflower picking, mowing dieback and other plant diseases

d) Fire regime, including intensity, season and frequency

e) 'Enrichment plantings' that is plantings of species not found in that community

f) Weed invasion

g) Animal impact: horses, foxes, rabbits, cats, dogs, camels, goats etc

h) Soil movement, both removal and dumping

i) Changes in water regimes; flooding, drainage and watering

j) Salinity

k) Fertiliser drift and along waterways nutrient influx

l) Mining, including that for road works

- m) Grazing: stock, overgrazing by feral or native mammals
 - n) Proliferation of tracks, fire breaks and walk trails
 - o) Off-road vehicle use
 - p) Use as service corridors by the SEC, Main Roads, Water Authority.
- (Source: B Keighery. Bushland Plant Survey, September 1994)

15. Does the area contain any plant species of special interest that you know of?
 (eg. declared rare flora, priority taxa, outlier populations)

Do you know what they are?

16. Do you know of any native animals that use the area?

Can you list those you know of? (birds, mammals, reptiles, amphibians etc)

17. Is the area used by any native animals of special interest? (eg. endangered species, large/important populations).....

If yes, please name them and indicate source of information

CAN YOU TELL US A LITTLE ABOUT THE SURROUNDING AREA

18. Are there any bushland areas (including wetlands) near to this area?

If yes, how close are they?

Are they already conservation reserves?

What is their approximate size?

19. Does the submitted area link other bushland areas?

Please attach any additional information about the area which may be of use when assessing it.

SYSTEM 6 BUSHLAND SUBMISSION FORM FOR CONSIDERATION IN THE UPDATE PROGRAMME

If you wish to submit more than one area for consideration in the System 6 update, please use a separate form for each area.

Please fill in each section giving as much information as possible.

LOCATION, OWNERSHIP AND ZONING OF THE AREA

1. Location

Please give as accurate and detailed a description as possible of the site location

Please include either a hand drawn or copied map showing the area of the area

a) Bordering Roads: Darile St; Day Rd; Dixon Rd; Mandurah Rd.

b) Nearest Corner: Dixon Rd / Mandurah Rd.

c) Lot Number: Street Number:

d) Town/Suburb/Location: Hillman/ Cooloongup.

e) Local Council: City of Rockingham Council.

f) Site Name (if any): Hillman Public Purpose Reserve.

g) Approximate size of the area (ha): 80ha

h) Please locate the area on a map and give us map references if possible:

i) Map: PERTH 1994 Streetsmart / ~~LBD/Other~~

j) Map no.: 138

k) Grid Ref: 5,A;5,B.

l) Please give any other information that may help us to find the location:

It was in the original System 6 Proposal. The Top End of M103.

m) Are you aware of any development proposals that are likely to affect the area?

There is nothing that has been past for this area. It is earmarked for Sports and Recreational and may have the Garden Island Hwy pass through it.

NOTE: Areas that have already been given development APPROVAL should not be nominated

Please fill out those questions that you can answer

2. Who owns the area? (If owned by the person/s making the nomination please indicate) ...I'm not sure of the owner, I think it is crown land. There seem to be a vested interest from DPUD.

3. If you own the area, and may be interested in participating in conservation on private land initiatives please indicate (and leave your name and address at the end of this submission form)

4 .What is the area zoned? (please indicate whether zoning is Town Planning Scheme or Metropolitan Region Scheme) It was Parks & Recreation but I think it is now Public Purposes.

CAN YOU TELL US A LITTLE ABOUT THE PHYSICAL CHARACTERISTICS OF THE AREA

5. Why do you consider this area important? (Refer to Guiding Issues paper)

REFER TO ATTACHED SHEET

6. What is/are the soil type/s and colours ? ..Carbonate Sand; Quartz & Shelly sand, Type: Sand/Clay/Gravel/Loam/Silt some Mud, Shelly Mud and Limestone. Colour: White/Grey/Brown/Orange/Yellow/Red/Black QUINDALUP DUNES.

7. Does the area have any special features such as unusual landforms / landscapes that still retain their natural vegetation? Yes/No

If yes, what are they? ...The Occurrence of Tuart tall open woodland on Quindalup soils to be rare. Large least-disturbed stand of blackboys in the area

8. Is the area a wetland or does it include a wetland? ...YES

If yes, what kind of a wetlands is it?

- a) lake
b) river
c) stream
d) swamp
e) estuary
f) seasonally wet Buffer Zone For Lake Cooloongup.
g) other

9. What percentage of the wetland is open water in summer? Not Sure.....

CAN YOU TELL US A LITTLE ABOUT THE VEGETATION /FAUNA ON THE NOMINATED AREA.

10. What percentage of the area is indigenous vegetation? 95 - 98%.....

11. If the area includes regions cleared of native bushland please indicate reasons for the inclusion. It acts as a Buffer on the northern end and is only a small area.

It also has an Historic Building on this end.

12. Has any previous flora or fauna survey work been done on the area?

YES

If yes, please give details of the work

REFER TO ATTACHED.

13. How would you rate the condition of the native bushland? (see attached table)

a) pristine Mostly -Possibly 80%

b) excellent

c) very good Some has weed invasion and claearing 20%

d) good

e) degraded

f) completely degraded

g) don't know

14. Please indicate the disturbances affecting the area and where appropriate the percentage of the area disturbed.

a) Partial clearing 10%

b) fragmentation

c) Selective removal of species: timber cutting, wildflower picking, mowing dieback and other plant diseases

d) Fire regime, including intensity, season and frequency

e) 'Enrichment plantings' that is plantings of species not found in that community

f) Weed invasion 10% mostly around the fence boundary.

g) Animal impact: horses, foxes, rabbits, cats, dogs, camels, goats etc

h) Soil movement, both removal and dumping

i) Changes in water regimes; flooding, drainage and watering

j) Salinity

k) Fertiliser drift and along waterways nutrient influx

l) Mining, including that for road works

- m) Grazing: stock, overgrazing by feral or native mammals
 - n) Proliferation of tracks, fire breaks and walk trails Very Few
 - o) Off-road vehicle use
 - p) Use as service corridors by the SEC, Main Roads, Water Authority.
- (Source: B Keighery. Bushland Plant Survey, September 1994)

15. Does the area contain any plant species of special interest that you know of?
 (eg. declared rare flora, priority taxa, outlier populations)YES.....

Do you know what they are?REFER TO ATTACHED SHEET.....

16. Do you know of any native animals that use the area?Yes.....

Can you list those you know of? (birds, mammals, reptiles, amphibians etc)
REFER TO ATTACHED SHEET.....

17. Is the area used by any native animals of special interest? (eg. endangered species, large/important populations).....YES.....

If yes, please name them and indicate source of information

REFER TO ATTACHED SHEET.....

CAN YOU TELL US A LITTLE ABOUT THE SURROUNDING AREA

18. Are there any bushland areas (including wetlands) near to this area?
YES.....

If yes, how close are they?It Borders on the Lake Cooloongup Reserve.....

Are they already conservation reserves?YES.....

What is their approximate size?Not sure of size.....

19. Does the submitted area link other bushland areas?YES.....

Please attach any additional information about the area which may be of use when assessing it.

5. Why do you consider this area important?

I consider this area to be important because the Occurrence of Tuart tall open woodland on Quindalup soils to be Rare. This type of vegetation was quite possibly originally common across the area now part of Rockingham Urban area. It is of Very Good Condition. This area contains possibly the largest and least-disturbed stand of Black boys(Xanthorrhoea preissii) in the area. The occurrence of Banksia littoralis as an overstorey in swales is also very unusual on Quindalup soils, making this rare vegetation type with significant conservation value.

In the area is also significant fauna habitat value. With the vegetation having high structural complexity, comprising many old Tuart trees with hollow branches and a dense, diverse understorey. The area is therefore probably of high value as a nesting habitat for birds and other fauna. The **Southern Brown Bandicoot** (Isooden obesulus : a gazetted rare species) is an inhabitant of the area. Some Bandicoots have been found dead on the side of the road when the Cnr Day Rd and Dixon Rd was developed. Several Birds that are either rare or uncommon near Perth are also reported to occur in the area including the Golden Whistler, Scarlet Robin, Weebill, Splendid Fairy-wren, Barn Owl and Masked Owl. The Tuart woodland constitutes a significant proportion of a restricted habitat (Tuart on Quindalup Dunes). Its removal may have a significant impact on the populations of animals in the area that rely on this habitat type.

If the Hillman Reserve is removed from M103 it will probably have adverse ecological impact with reduction in area of rare vegetation and high quality fauna habitat. And if the Highway is constructed, it will diminish the values of the hillman area for fauna by isolation from Lake Cooloongup.

12. Has any previous flora or fauna survey work been done on this area? YES

If Yes, please give details of the work.

South-west Corridor Amendment Public Environmental Review
Survey of Fauna Habitats in the region of Lakes Cooloongup and Walyungup. Rockingham.
Prepared by: M.J. & A.R. BAMFORD

CONSULTING ECOLOGISTS.

Prepared For: BOWMAN BISHAW GORHAM
Environmental Management Consultants.

Botanical Survey Of Areas Affected By The Proposed South-West Corridor
Amendment With Comment On Conservation Values

Prepared By: Malcolm Trudgen
CONSULTANT BOTANIST

Prepared For: BOWMAN BISHAW GORHAM

Wetlands of The City Of Rockingham- Their Classification, Significance and
Management

Prepared By; V & C SEMENIUK RESEARCH GROUP
Prepared For: CITY OF ROCKINGHAM

HERITAGE COUNCIL OF WESTERN AUSTRALIA

Environmental And Landscape Audit of the Southwest, Northwest and Northeast
Corridors, Perth Metropolitan Area. Stage 2 Interim Report: The Southwest
Corridor Study.

Prepared By: V & C SEMENIUK RESEARCH GROUP
Prepared For: DEPT OF PLANNING AND URBAN DEVELOPMENT

15. Does the area contain any plant species of special interest that you know of? YES.

Do you know what they are? As mention in question 5., Rare vegetation types found on Quindalup soil with Tuart (*Eucalyptus gomphocephala*) forming an overstorey. This is quite unusual and rare vegetation types. It is in very Good Condition unlike some other areas of tuart which have been disturbed.

Good Condition stand of *Xanthorrhoea preissii* and the size make this a significant area of conservation.

Also Swales of *Banksia littoralis* forming the overstorey. Another very unusual feature on Quindalup soils and this is rare vegetation type.

Some other species recorded in the area are: *Acacia saligna*; *Acacia lasiocarpa*; *Acacia rostellifera*; *Lomandra maritima*; *Conostylis aculeata*; *Gannia trifida*; *Eremophila globra*; *Phyllanthus calycinus*; *Leucopogen parviflorus*; *Clematis microphylla*; *Hibbertia racemosa*; *Loxocarya flexuosa*; *Acanthocarpus preissii*; *Hardenbergia comptoniana*; *Lepidoserma angustatum*; *Kennedia prostrata* and *Poa p* *poiformis*.

16. Do you know of any native animals that use the area? YES.

Can you list those you know of? It has been suggested that there is 40-50 species of birds observed in the woodlands. Some of these are Common Bronzewing; Port Lincoln Ringneck; Scarlet Robin; Grey Shrike-thrush; Masked Owl; Barn Owl; Grey Fantail; Splendid Fairy-wren; Weebill; Western Gerygone; Yellow-rumped Thornbill; Varied Sittelly; Red Wattlebird; Strated Pardalate; Silvereye; Gey Butcherbird; Also Possibly Australian Raven; Australian Magpie; Kookaburra; Regent Parrot; Rainbow Bee-eater.

The area is home to the Southern Brown Bandicoot and several species of bats. As well there is the Brush-tail Possums and possibly a grazing area for the Western Grey Kangaroo and Western Brush Wallaby as they are found all around the lake area.

It is possible that there are 30 species of reptiles in the area. These include the known ones; Lined Skink (*Lerista lineata*), Elegant Skink (*Lerista elegans*), and the Bobtail (*Tiligua rugosa*).

17. Is the area used by any native animals of special interest? Yes.

If yes, please name them and indicate source of information.

Southern Brown Bandicoot (*Isodden obesulus*) is classed under Schedule 1. (likely to become extinct) of the Wildlife Conservation Act.

The small Lined Skink (*Lerista lineata*) which is confined to the coastal plain south of Perth.

The Masked Owl (*Tyto novaehollandiae*) is classed as rare by Garrett (1992). The Scarlet Robin, Weebill, Common Bronzewing and Splendid Fairywren are generally uncommon in the Perth urban area.

NOTE:

The value of the site for fauna can not be quantified. Due to upland vegetation types particularly Tuart woodlands it is expected to be important for the maintance of faunal diversity in the general region.

If this area is to decline in size and status the remaining habitat would be too small to support viable populations. The most significant species in this respect probably the Masked Owl and possibly the Southern Brown Bandicoot.

The reports quoted will possibly back up these facts.

1

2

3

4

5

6

7

8

9

10

EAST ROCKINGHAM
6168

ROCKINGHAM
6168

HILLMAN RESERVE
6168

COOLOONGUP
6168

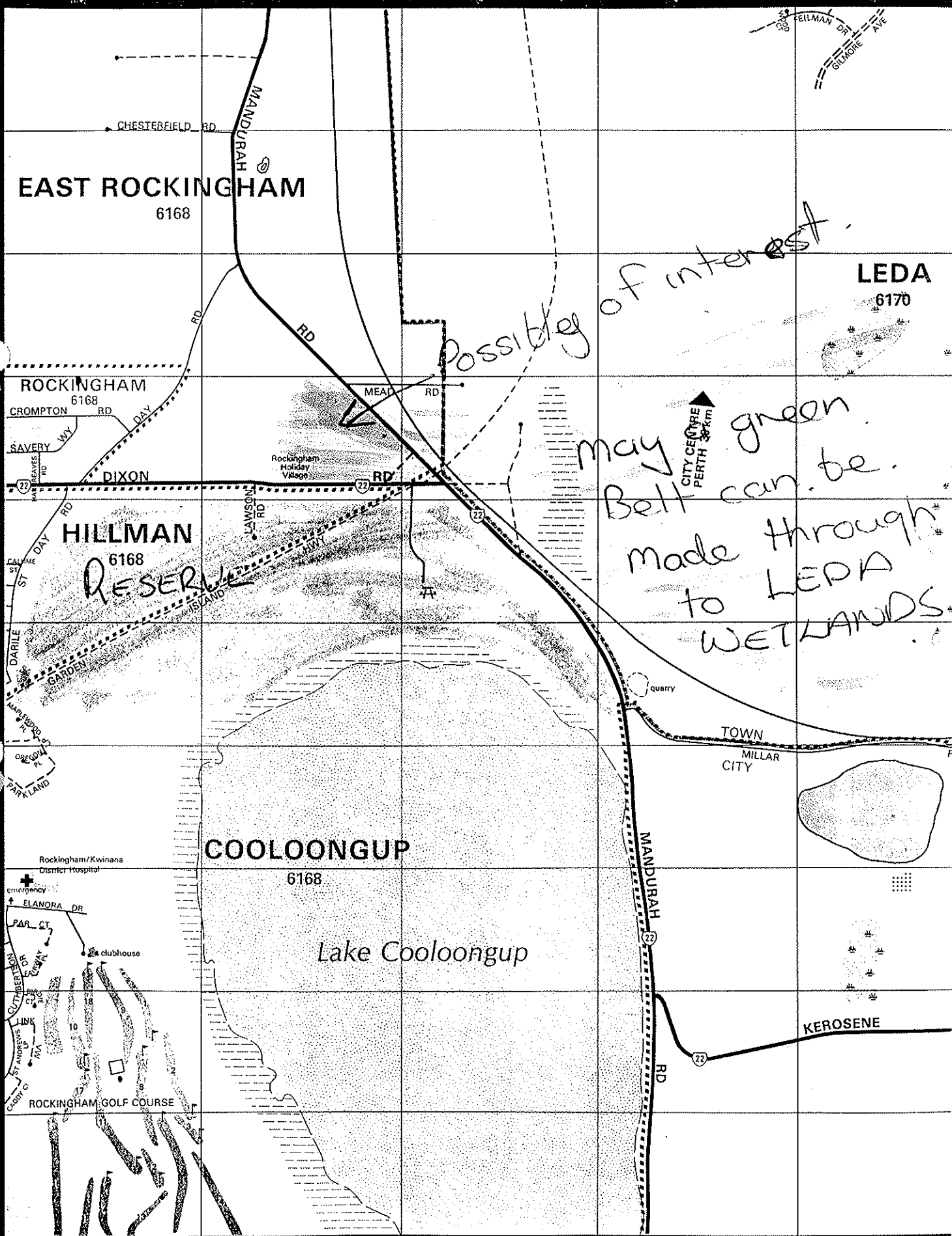
LEDA
6170

Lake Cooloongup

possibles of interest

*may green
Belt can be
made through
to LEDA
WETLANDS*

CITY CENTRE
PERTH
30 km





M103

197

CITY OF ROCKINGHAM

Civic Boulevard, Rockingham,
Western Australia

OUR REF: TP11-2-11 PM.mw

YOUR REF:

3rd October 1995

ENQUIRIES TO: Mr Monks

The System Six Study Team
Department of Environmental Protection
141 St George's Terrace
PERTH WA 6000

ATT: Mr K McAlpine

Dear Sir

Re: System Six Update

The current review of the System Six recommendations were considered by Council at its ordinary Meeting held on the 26th September 1995. Council resolved that the following modifications and additions to the System Six Areas be submitted for consideration:-

1. Modification of Existing System Six Areas

(i) M107 - Peelhurst, Singleton and Madora

The recommendations of the System Six Report have in part been overturned by the EPA and the Minister for the Environment in approving urban development at Singleton and Golden Bay.

It is recommended that the boundaries of this recommendation should be modified to exclude the east-west transects where urban development has been approved. It is desirable, however, that the System Six recommendations remain over the land currently zoned Rural in the Metropolitan Region Scheme and Special Rural under Town Planning Scheme No.1, this being the Peelhurst and Singleton Special Rural Zones (see attached plan).

(ii) Similarly M103 should be modified to delete the area between Green Meadows and the Port Kennedy Business Park recently rezoned to Urban and Industrial under the Metropolitan Region Scheme, a portion of which is currently being rezoned to Development Zone under Town Planning Scheme No.1. M103 should, however, be extended to take into account the MRS Parks and Recreation Reserve around Tamworth Swamp (see attached plan).

(iii) M106 at Port Kennedy should be modified to exclude that portion of Secret Harbour approved for urban development and to rationalise the boundaries to coincide with the boundaries of the 'Scientific Park' to the west of the Warnbro Sound Avenue extension (see attached plan).

The recommendations applicable to Garden Island, Cape Peron, Lake Richmond and the Serpentine River remain relevant and should remain.

2. Additional Areas to Be Included in System Six

- (i) An additional area within the City that should be investigated for possible inclusion within the System Six Report is the Paganoni and Anstey Swamp area which is a Regional Reserve for Parks and Recreation under the Metropolitan Region Scheme and classified by the National Trust.

The above wetland is currently protected by an Environmental Protection Policy, however, incorporating it into a System Six recommendation may provide additional benefits in terms of its protection.

Council also resolved to consider the recommendations contained within the Red Book (Status Report 1993) for System Six with the view towards pursuing those recommendations that remain outstanding. A submission on Council's approach to implementing the recommendations will be forwarded to you following consideration of the Report.

As Council does not have a copy of the above Report, could a copy be forwarded to Council so that this matter can be progressed.

Should you have any enquiries with respect to this advice please do not hesitate to contact Mr Peter Monks on 528 0330.

Yours faithfully


G G HOLLAND
CHIEF EXECUTIVE OFFICER

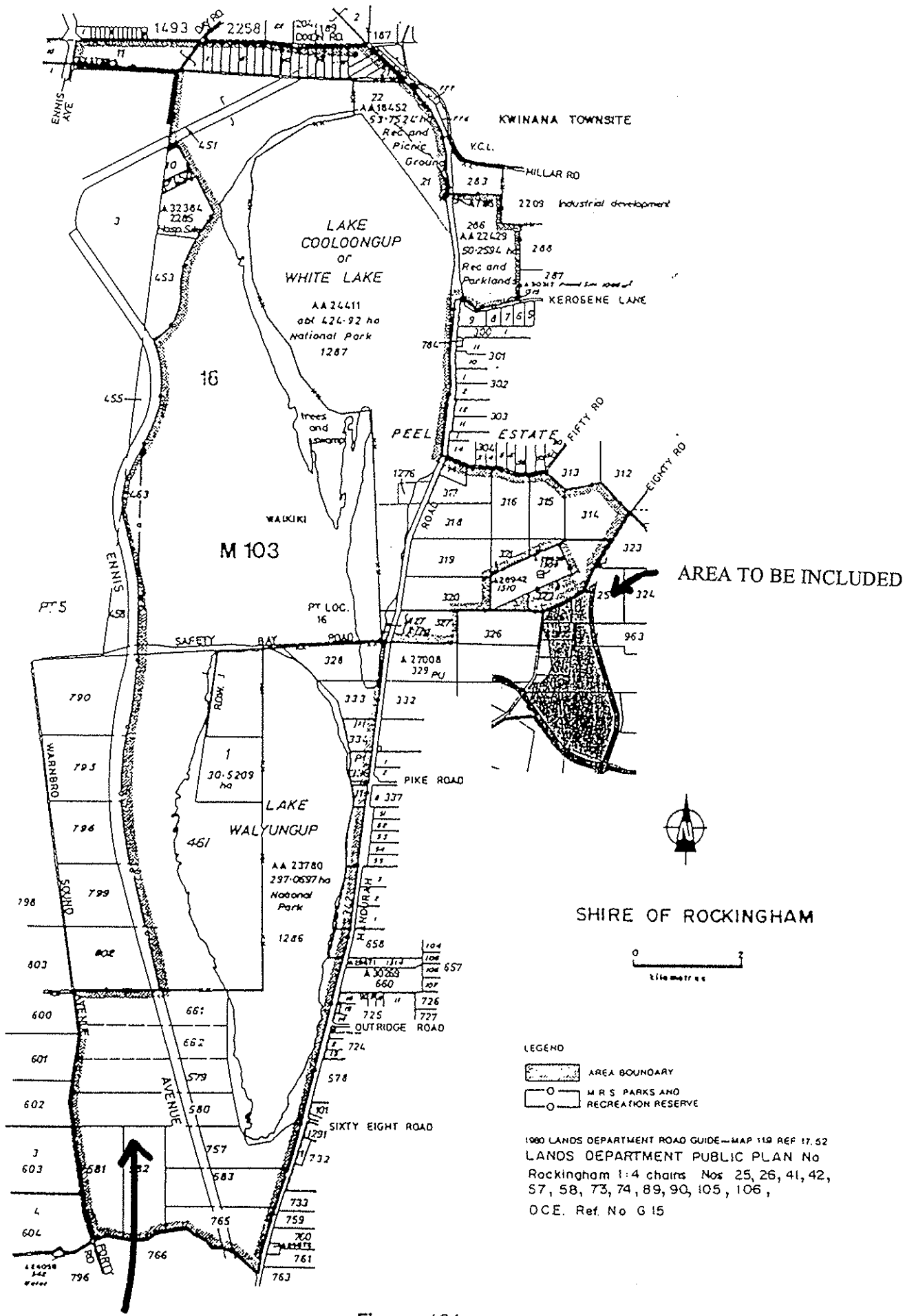


Figure 161

Bushplan Map 74 - South East Quadrant:-

Currently there is no bushland recommended for this portion which is on the lower eastern edge of the map between Gaebler Road. Once again its retention under Bushplan may help the long term ambition of preserving the Jandakot groundwater mound. The bush is typical Banksia Woodland.

Bushplan Map 74 - South East Quadrant:-

The more southerly part of the map adjoining the Kwinana Freeway on its eastern side includes some wetlands which are not recommended as a Bushplan site. These extend on to map 81, the bush has some intense thickets of Malalueca and Eucalyptus Rudis. ***I recommend its retention.***

Bushplan Map 74 - Site 390:-

This is situated in the north west quadrant of the map and abuts Fraser and Armadale Roads.

I am aware that some very rare species of orchids are on this site including ***Caladenia Huegelii*** which has been documented by CALM's herbarium. The balance of the land has a great abundance of quite different plants which is often seen in other parts of Jandakot. ***I strongly suggest it be properly surveyed by a botanist during spring to determine its importance.***

Site 390 is subject to a sand mining license and a logical outcome maybe to provide the licensee with another less ecologically important site for sand mining, or by compensation for loss of the site. It is understood that the owner of the land is Homeswest. The sandmining has been in progress and here is an example indicating the need for a moratorium on such activity on Bushplan sites to be implemented as a matter of urgency.

Map 88 - Bushplan Site 409:

I recommend that this site be extended further to the east to include the bushland just north of Millar Road and south east of the Leda Subdivision. The land is good quality Banksia Woodland.

Bushplan Site 702:

I recommend that Cardup Nature Reserve be extended to include Lot 701, 703 to 708 inclusive.

Bushplan Site 254:

The good quality Tuart Woodland on Lot 1387 Kerosene Lane should be included in the site.

Species from BPS 356 to the south of Dixon Road & about >200m west of Mandurah Road. (10-8-2000).

Eucalyptus gomphocephala woodland

Templetonia retusa
Lepidosperma ?drummondii
Leucopogon parviflorus
Acanthocarpus preissii
Conostylis setosa
Poa sp
Desmocladius flexuosus
Phyllanthus calycinus
Rhagodia baccata
Clematis microphylla
Acacia ?rostellifera
Hardenbergia comptoniana
Xanthorrhoea preissii

Swales/drainage depressions amongst the E. gomphocephala

Lepidosperma ?angustatum
Anthocercis ?littorea
Ghania trifida
Meeboldiana ?scariosa
Hardenbergia comptoniana
Thomasia ?triphyllo
Lepidosperma ?squamata (cf drummondii)

M103 Lakes Cooloongup and Walyungup
 Bulletin 678 (Saffey Bay Rd extension)

Friends Advocate Management

Other Names:

Specific Study/studies Miscellaneous studies

Flora

Vegetation Map 1 2 ? 3
 Flora list 1 2 3 4
 Significant Taxa done / suitable / doubtful

Fauna

Mammals 1 2
 Birds 1 2 RAOU
 Reptiles and Amphibia 1 2
 Invertebrates 1 2

Vegetation Condition Map Sites Comment

Disturbance Factors Comment Management

Swan Coastal Plain Floristic Survey 7

AHC: National Estate- Listed / Interim / Nominated / Notified NT (WA): Heritage Classification

Notes
<i>Rockingham Nats Club</i>

M103 Lakes Coolongup and Walyungup
Bulletin 678 (Saftey Bay Rd extesion)

M103.1 Regional park recommendations be applied to this area.

Unresolved Issues

Proposed to be a regional park in the Regional Parks Task Force Report and in Metroplan.

SHEET 1: System 6 - REPORT Information Search

Date 30/5/94

Please circle the appropriate response or respond in the space provided.

Area M G Name	<u>M104 (partial) M103 (N section spur to w) proposed swap for SW section M103</u>		
Title			
Published/Unpublished	<input checked="" type="radio"/> Unpublished	Date	<u>May 1992 Dec 1993</u>
Author/s	<u>Tredger</u>		
Location of Publication	<u>Author</u>		
Purpose (why was the report prepared?)			
Government			
Corporate			
Community Group			
Management Plan			

Soils			
Units	mapped	described	referenced

Landscape			
Features	described	referenced	

Flora			
Vegetation Map			
Units	<u>Aplin</u>	Site based (no)	
Mapped			
Veg Units	<u>Comparable Heddle et al</u>	Compared Heddle et al.	Unit not mapped by Heddle et al.
Flora list	<u>comment Significant Flora</u>		
Timing	%completion		<u>Significant Taxa</u>
	Trees Shrubs Herbs Sedges	Weeds	DRF CALM Priority Other

Fauna			
Timing	%completion		Significant Taxa
	Mammals	Birds	Sched1 Sched2 Other
	Reptiles	Invertebrates	

Vegetation Condition			
<input checked="" type="radio"/> Site based	Mapped	<input checked="" type="radio"/> Units	<u>Tredger</u>

Disturbance Factors			
Phytophthora	observed	Other	<u>Incidental</u>
	tested		itemised

Notes			

Please circle the appropriate response or respond in the space provided.

Area M103 Name	<i>Lakes Cooloongup and Walyungup</i>		
	<i>(The Lakes)</i>		
Title	<i>The Lakes Regional Open Space: biological survey, for the Shire of Rockingham.</i>		
Published/Unpublished		Date	
Author/s	<i>A. Tingay & S.R. Tingay</i>		
Location of Publication	<i>DEP</i>		
Purpose (why was the report prepared?)	<i>planning</i>		
Government	<i>Shire of Rockingham</i>		
Corporate			
Community Group			
Management Plan			

Soils			
Units	mapped	described	referenced

Landscape	
Features	described referenced

Flora	
Vegetation Map	
Units	Site based (no)
Mapped	<input checked="" type="checkbox"/> <i>detailed descriptions</i>
Veg Units	Comparable Heddle <i>et al</i> Compared Heddle <i>et al.</i> Unit not mapped by Heddle <i>et al.</i>
Flora list	
Timing	%completion
	Trees Shrubs Herbs Sedges Weeds Significant Taxa
	DRF CALM Priority Other

Fauna	
Timing	%completion
	Mammals Birds Significant Taxa
	Reptiles Invertebrates Sched1 Sched2 Other

Vegetation Condition	
Site based	Mapped Units

Disturbance Factors	
Phytophthora	observed Other incidental
	tested itemised

Notes	

(d) Tamworth Hill Swamp in Baldvis. This is part of the proposed Rockingham Lakes Regional park. It is fully documented in the ecological study of the Rockingham lakes carried out by V and C Semeniuk for the Australian Heritage Commission. It is zoned for Parks and Recreation in the MRS and it is affected by a mining claim.

(e) Anstey Swamp, Baldvis. This is also a part of the proposed Rockingham Lakes Regional Park. It is owned by the MFP and is zoned for Parks and Recreation. It is fully documented in the Semeniuk study and by the EPA in its original report on the Secret Harbour project.

(f) Paganoni Swamp, Baldvis. This wetland is an outstanding conservation area. It is owned by the MFP and is zoned for Parks and Recreation. It is fully documented in the Semeniuk study and in the Wildflower Society's nomination of this reserve to the Register of the National Estate.

(g) **Lark Hill wetlands**. This area lies adjacent to Port Kennedy M106 and contains some important wetlands and parallel dune formations. It is fully described by the Australian Heritage Commission in its listing of the area. The land is owned by the MFP and is zoned for Parks and Recreation. It is intended for inclusion in the Port Kennedy Scientific Park.

(h) Jandakot Botanical Park. This area is fully documented by the MFP in its Planning study for the Jandakot Botanical Park. It includes some areas such as M97, M98, M99 and M100 which are already in the System Six Red Book. However, there are several other important reserves in this area which should be included in the System Six Report. All of this land is reserved for Parks and Recreation and most of it is owned by the State.

(i) Piney Lake, Winthrop. This wetland was not included in System Six. However, it is part of the Beeliar Regional park and supports a diverse range of waterfowl and has some remnant vegetation. The City of Melville recently completed a management plan for this reserve.

(j) Blue Gum Swamp, Mt Pleasant. This wetland is an important wildlife refuge. It is well managed by the City of Melville and is being rehabilitated by a local group. It has a management plan, prepared by the City of Melville. It could be incorporated into M73 as it is very close to Booragoon Lake.

(k) Brixton Street Wetlands, Gosnells. These important wetlands should be added to M69. Their importance is well documented in the EPA assessment of the housing proposals for this area.

(l) Ken Hurst Park. Leeming. This is an important area of wetland and banksia woodland adjacent to M94. It contains declared rare flora as indicated in the Floristic Study of the Swan Coastal Plain. The Murdoch Branch of the Wildflower Society has done a detailed flora survey of the site. Contact Diana Corbyn for details.

A report

on the Flora

and Vegetation

of part of the "St Clair" Development area

Prepared for Peet and Co.

by

Malcolm Trudgen

Consultant Botanist

May 1992

* Recommended to be included in proposed Port Kennedy
Scientific Park

NOT PICKED UP

Mergew/MLOG

51 51

Suggested name of area (1996)

System 6 (1984)

Some Other Commonly used Names:

subm 12 Lark Hill wetlands

Area (ha):

Total 12, bushland 100% (GIS) MRA
1/96 run7 5117 (aerial photo)

Zoning (MRS & town planning)
Parks and Recreation

Local Authorities (Suburb)

City of Rockingham (Port Kennedy)

Ownership categories: Street name, Lot number

Ministry for Planning

LANDFORM AND SOIL

Landscape features: vegetated wetland , *important dunes*

Geomorphology and soils

Quindalup Dunes (Holocene dunes)

Safety bay sands (Qhs: S13)

Wetlands (within the Quindalup Spearwood Bassendean Dunes Pinjarra Plain)

Holocene swamp deposits (Qhw: Cps)

REGIONAL VEGETATION AND FLORA

Vegetation Complex

Spearwood Dunes

Cottesloe Complex - Central and South

Quindalup Dunes

Quindalup Complex

Floristic Community Types: not sampled types inferred, not sampled insufficient remnant vegetation, not sampled unable to infer types.

Supergroup 1 - Foothills/Pinjarra Plain

1a *E. haematoxylon* - *E. marginata* woodlands on Whicher foothills

1b Southern *E. calophylla* woodlands on heavy soils

2 Southern wet shrublands

3a *E. calophylla* - *Kingia australis* woodlands on heavy soils

3b *E. calophylla* - *E. marginata* woodlands on sandy clay soils

3c *E. calophylla*- *Xanthorrhoea preissii* woodlands and shrublands

S8 *E. wandoo* Woodlands (Scarp)

Supergroup 2: Seasonal Wetlands

4 *Melaleuca preissiana* damplands

5 Mixed shrub damplands

6 Weed dominated wetlands on heavy soils

7 Herb rich saline shrublands in clay pans

8 Herb rich shrublands in clay pans

9 Dense shrublands on clay flats

10a Shrublands on dry clay flats

10b Shrublands on southern ironstones

11 Wet forests and woodlands

12 *M. teretifolia* and / or *Astartea* aff. *fascicularis* shrublands

13 Deeper wetlands on heavy soils

14 Deeper wetlands on sandy soils

15 Forests and woodlands of deep seasonal wetlands

16 Highly saline seasonal wetlands

17 *M. raphiophylla* - *Gahnia trifida* seasonal wetlands

18 Shrublands on calcareous silts

19a Sedgeland in Holocene dune swales

19b Woodlands over sedgeland in Holocene dune swales

S1 *Astartea* aff. *fascicularis*/*Melaleuca* species dense shrublands

S2 northern *Pericalymma ellipticum* dense low shrublands

S3 Wet sedgeland on sandy clays

S4 *Regelia ciliata* Dandaragan Plateau wetlands

S5 *Acacia saligna* wetlands

S6 Northern dense low shrublands

S7 Northern woodlands to forests over tall sedgeland alongside permanent wetlands

S17 *Eucalyptus rudis*/*Agonis linearifolia* wetlands in Bassendean Dunes

S19 Dense tall shrublands

S20 Northern shrublands on sandy clays

Supergroup 3: Uplands, centred on Bassendean Dunes and the Dandaragan Plateau

- 20a *Banksia attenuata* woodlands over species rich dense shrublands
 20b Eastern *Banksia attenuata* and / or *E. marginata* woodlands
 20c Eastern shrublands and woodlands
 20d Dandaragan Plateau shrublands and woodlands
 21a Central *Banksia attenuata* - *E. marginata* woodlands
 21b Southern *Banksia attenuata* woodlands
 21c Low lying *Banksia attenuata* woodlands or shrublands
 22 *Banksia ilicifolia* woodlands
 23a Central *Banksia attenuata* - *B. menziesii* woodlands
 23b Northern *Banksia attenuata* - *B. menziesii* woodlands
 23c North-eastern *Banksia attenuata* - *B. menziesii* woodlands
 S9 *Banksia attenuata* woodlands over dense low shrublands
 S10 *Calothamnus sanguineus* dense low shrublands on sandy laterites
 S16 Mixed dense shrublands on yellow brown sands
 S18 *E. marginata*/*E. calophylla* Woodlands on laterites

Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes

- 24 Northern Spearwood shrublands and woodlands
 25 Southern *E. gomphocephala* - *Agonis flexuosa* woodlands
 26a *M. huegelii* - *M. acerosa* shrublands of limestone ridges
 26b Woodlands and mallees on limestone
 27 Species poor mallees and shrublands on limestone
 28 Spearwood *B. attenuata* or *B. attenuata* - *Eucalyptus* woodlands
 29a Coastal shrublands on shallow sands
 29b *Acacia* shrublands on taller dunes
 30a1 *Callitris preissii* forests
 30a2 Woodlands and shrublands on Holocene dunes (re-allocated from 30c)
 30b Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands
 S11 Northern *Acacia rostellifera* - *Melaleuca acerosa* shrublands
 S12 Rottnest Island *Callitris preissii* and/or *M. lanceolata* forests and woodlands
 S13 Northern *Olearia axillaris* - *Scaevola crassifolia* shrublands
 S14 *Spinifex longifolius* - *Tetragonia decumbens* low shrublands
- S15 Weed group, poorly allied

REGIONAL WETLANDS

Wetland Types: dampland

Consanguineous suite

Quindalup

Becher (Qu.2)

Wetland Management Objective: Conservation

Lake EPP: none identified

THREATENED COMMUNITIES/SPECIES

Not assessed, Presumed Totally Destroyed, Critically Endangered (floristic community type 3a, 3c, 10b, '19a', 20c, Perth to Gingin Ironstone Association, Communities of Tumulus Springs, Muchea Limestones, Stromatalite-like microbialite community of coastal freshwater lakes, Aquatic Mat Community of the Swan Coastal Plain, Stromatalite-like microbialite community dependant on fresh ground water of coastal brackish lakes), Endangered (floristic community type 2, 10a, 20a, 20b, '30a'), Vulnerable (floristic community type 1b, 3b, 7, 8, 9, 15, 18,), Data Deficient (14), Lower Risk

AREA DESCRIPTION

Vegetation and Flora

Structural units: not known, (limited survey), (detailed survey), (mapping)

Forest Woodland Shrubland Herbland Sedgeland Grassland

Eucalypts - *Eucalyptus calophylla*, *E. wandoo*, *E. marginata*, *E. todtiana*, *E. rudis*, *E. decipiens*, *E. lanepolei*, *E. haemotoxylon* and *E. gomphocephala*

Sheoaks - *Allocasuarina fraseriana* and *Casuarina obesa*

Banksias - *Banksia attenuata*, *B. menziesii*, *B. prionotes*, *B. ilicifolia*, *B. grandis* and *B. littoralis*

Melaleucas - *Melaleuca preissiana*, *M. raphiophylla* and *M. lanceolata*

Callitris preissii.

Jacksonia, *Viminaria*, *Daviesia*, *Leucopogon*, *Regelia*, *Banksia*, *Dryandra*, *Grevillea*, *Hakea*, *Petrophile*, *Stirlingia*, *Gompholobium*, *Calytrix*, *Verticordia*, *Pericalymma*, *Melaleuca*, *Hibbertia*, *Halosarcia*, *Sarcocornia*, *Xanthorrhoea*, *Kingia* and *Acacia*

*Borya, Phlebocarya, Lomandra, Anigozanthos, Conostylis, Patersonia, Drosera and Stylidium*⁵³
Baumea, Gahnia, Evandra, Schoenus, Mesomelaena, Alexgeorgia, Cyathochaeta, Loxocarya,
Leptocarpus, Restio and Juncus
Spinifex, Stipa, Danthonia and Poa.

Vegetation Condition: >30% >50% >75% >90% Pristine, Excellent, Very Good, Good, Degraded, Completely Degraded with % Pristine, Excellent, Very Good, Good, Degraded, Completely Degraded with areas of severe localised disturbance

Total Flora: not known, (estimated), (site generated list only), (estimated >50% expected flora), (estimated >75% expected flora), (estimated >90% expected flora)

DRF/Priority - GIS: none recorded

DRF/Priority and significant flora - not surveyed

Fauna

Mammals: adjacent Quenda (*Isoodon obesulus*)

Linkage: bushland linkage to west links to Port Kennedy

Special Attributes:

INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed *Register of the National Estate*

CONSERVATION RECOMMENDATIONS

Criteria met for inclusion: Representation of ecological communities, Diversity, Rarity, Maintaining ecological systems or natural processes, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation, Criteria not relevant to determination of conservation value, but which may be applied when evaluating areas having similar values

Constraints: Private land, MRS Urban zoning, Mineral Resource Area, Mineral Lease.

Recommendation:

Draft Only

LARI HILL ENVIRONMENTAL ISSUES TABLE

	Option 1 - Environmental	Option 2 - Preferred	Option 3 - Commercial
Wetlands	<p>Minor Impact :</p> <p>Retains the majority of Conservation category wetlands</p>	<p>Moderate Impact :</p> <p>Retains most conservation category wetlands contained within the Heritage area and includes the Paperbark wetland on northern boundary.</p>	<p>High Impact :</p> <p>Wetlands developed</p>
Perth Bushplan	<p>No Impact :</p> <p>Proposed Perth Bushplan area not developed.</p>	<p>No Impact :</p> <p>Perth Bushplan area partially developed</p>	<p>High Impact :</p> <p>Most of the Perth Bushplan area developed on the site.</p>
Heritage Registered Area	<p>No Impact :</p> <p>Heritage area preserved</p>	<p>No Impact :</p> <p>Heritage area preserved</p>	<p>High Impact :</p> <p>Heritage area developed</p>
Remnant Bush other than wetlands or Heritage area	<p>Minor Impact :</p> <p>Large tracts of dense bush retained</p>	<p>High Impact :</p> <p>Dense bush developed</p>	<p>High Impact :</p> <p>Dense bush developed</p>
Port Kennedy Scientific Park	<p>No Impact :</p> <p>Park boundary maintained</p>	<p>No Impact :</p> <p>Park boundary maintained</p>	<p>No Impact :</p> <p>Park boundary maintained</p>
Groundwater impact	To be determined by hydrological assessment	To be determined by hydrological assessment	To be determined by hydrological assessment
Approval Process	Informal assessment likely	Possible formal assessment	Formal assessment likely

Option 3 - Commercial

The philosophy behind the development of Option 3 was to approach Lark Hill Site as a clean slate. The resulting option only recognises the boundaries of the Port Kennedy Scientific Park as an environmental consideration.

All Conservation wetlands and areas of vegetation have been cleared for development on the site. The development allows for a 50 m buffer zone on the southern boundary of the site. This Option has residential stabling located within the proposed Perth Bushplan area in the top north-eastern corner of the site and in the Heritage Registered Area.

The environmental impact is greatest in this option and considered to be significant. As a result the adoption of Option 3 as the development plan is likely to require a formal assessment by the EPA.

LARK HILL FEASIBILITY STUDY - ENVIRONMENTAL ISSUES

Option 1 - Environmental

The philosophy behind the development of Option 1 was the preservation of the majority of conservation wetlands and areas of dense vegetation on the site, irrespective of its quality or viability of longer term preservation.

Option 1 is designed so playing fields and other facilities are located on the flat plain areas which presently have a high degree of disturbance. The development does not encroach on the boundaries of the Heritage Registered Area, the Port Kennedy Scientific Park or the proposed Perth Bushplan. Nearly all wetlands with a Conservation status have been retained. Some of the isolated wetlands would be bordered by playing fields and carparks. From a long term viewpoint these small areas may not retain their present condition.

The environmental impact of this option is considered to be low. Therefore, the adoption of Option 1 as the development plan is likely to require an informal assessment from the Environmental Protection Authority (EPA).

The Conservation Areas which have been retained in each option would need to be managed to preserve the attributes and functions of these areas. For example, fences would need to be constructed around all conservation areas to restrict horse and pedestrian access.

The three options will have a similar impact on the local groundwater hydrology. The potential impacts of the selected option will need to be assessed through a hydrological assessment.

Option 2 - Preferred

The philosophy behind the development of Option 2 was the preservation of selected wetlands and areas of high conservation value.

The Heritage Registered Area and a significant Paperbark wetland in the north have been preserved and boundaries of the Port Kennedy Scientific Park and proposed Perth Bushplan area are recognised and given conservation status.

Compared to Option 1, some areas of dense vegetation have been proposed for development. The vegetation to the north-east has been replaced with equestrian activities and the RSPCA site. The 50 m buffer on the southern boundary has been retained but the dense vegetation is now available for future expansion. The small Conservation category wetlands on the western boundary have been developed in this option.

The environmental impact of this option is considered to be moderate. Therefore, the adoption of Option 2 as the development plan could possibly require a formal assessment by the EPA.

The Conservation Areas identified would need to be managed to preserve the attributes and functions of these areas. For example, fences would need to be constructed around all conservation areas to restrict horse and pedestrian access.

WZD
TIMMY

SUMMARY OF OPTION THREE

Environmental

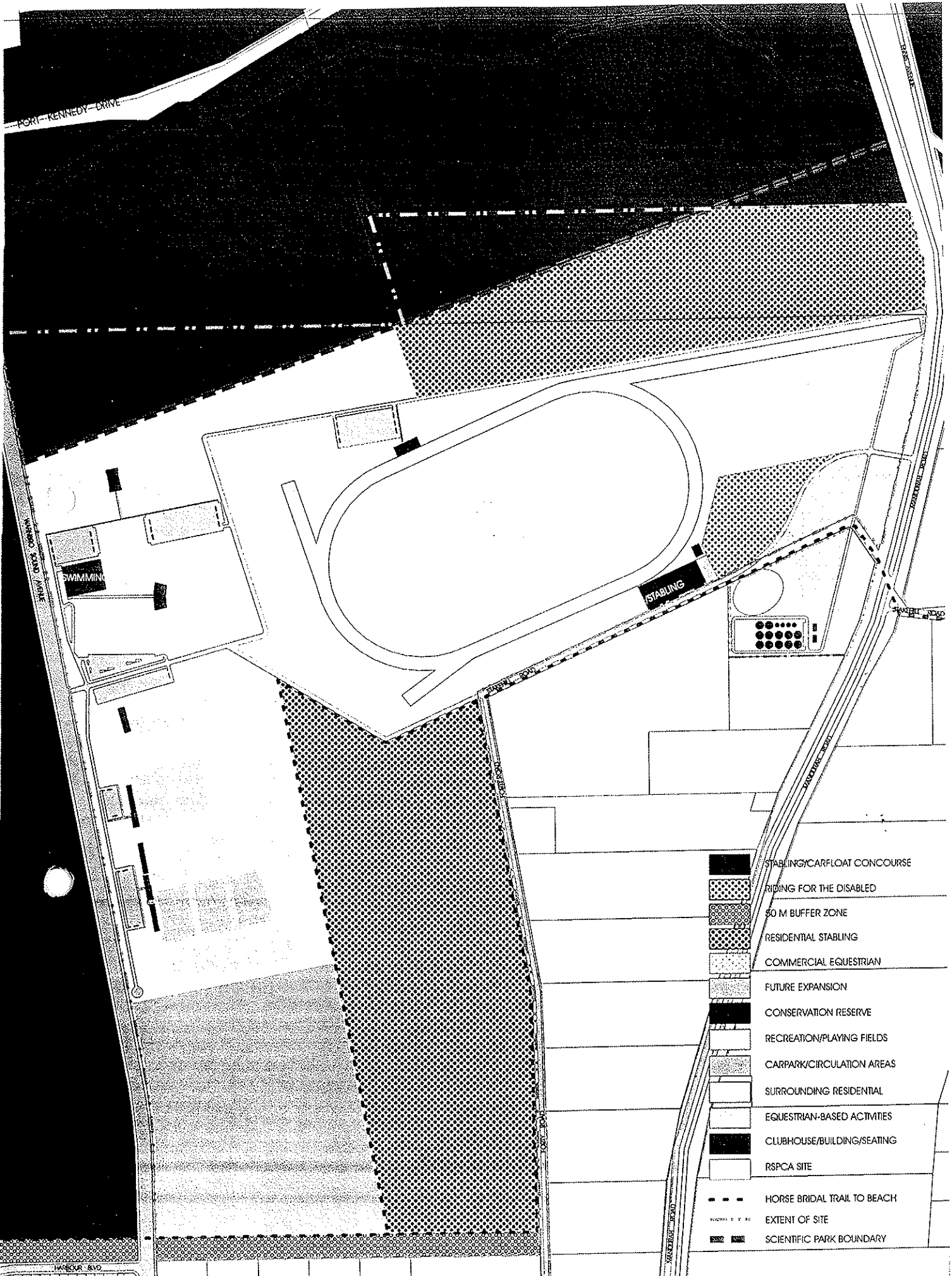
- Wetlands High Impact :
Wetlands developed
- Perth Bushplan High Impact :
Most of the Perth Bushplan area developed on the site
- Heritage Registered Area High Impact :
Heritage area developed.
- Remnant Bush other than wetlands or Heritage area High Impact :
Dense bush developed
- Port Kennedy Scientific Park No Impact :
Park boundary maintained
- Groundwater impact To be determined by hydrological assessment.
- Approval Process Formal assessment likely

Configuration of Areas

- All facilities identified have been catered for
- No facilities compromised
- Expansion area available
- 'Commercial Equestrian' dedicated areas are large

Site Access

All options access the site in the same way at two points, one off Warnbro Sound Avenue leading directly to the sporting facilities and internal access roads and the second access point from Mandurah Road accessing directly all equestrian facilities. While the road systems within the site are connected this separation in identity is important for both operational and traffic control reasons, particularly within the site.



- STABLING/CARFLOAT CONCOURSE
- RIDING FOR THE DISABLED
- 50 M BUFFER ZONE
- RESIDENTIAL STABLING
- COMMERCIAL EQUESTRIAN
- FUTURE EXPANSION
- CONSERVATION RESERVE
- RECREATION/PLAYING FIELDS
- CARPARK/CIRCULATION AREAS
- SURROUNDING RESIDENTIAL
- EQUESTRIAN-BASED ACTIVITIES
- CLUBHOUSE/BUILDING/SEATING
- RSPCA SITE
- HORSE BRIDAL TRAIL TO BEACH
- EXTENT OF SITE
- SCIENTIFIC PARK BOUNDARY

EDITORIAL



RICHARD CARDEU

This issue contains three papers from the RAPI Congress held in Perth 1996, namely those by Peter Dowding, Peter Hall and Leonie Sandercock. Further papers from the Congress will be published in future issues.

The passing of the *Threatened Species Act* 1995 in New South Wales has brought to prominence another environmental consideration in urban development which is affecting land use proposals in city and country areas, namely protection of endangered flora and fauna. Air and water pollution are widely accepted environmental issues, and procedures to deal with them are well established but the strength of recent legislation and its implementation is challenging the decision-making capacities of developers, consultants and approval authorities. Part of the reason for this is the culture of science and the status it has been granted in this issue. It is a complex issue that requires much more information in the public arena to ensure good intentions in legislation achieve the outcomes intended.

There has been pressure within the environmental community for science to have a stronger influence in decision-making with 'politics' (other interest groups in fact) being downplayed in those areas which appear to be scientific. An apparent outcome of this influence is the establishment of a Scientific Committee whose functions in relation to the *Threatened Species Act* include *inter alia*:

- determining which species are to be listed as threatened;
- determining which populations and ecological communities are to be listed as endangered;
- determining the threatening processes; and
- reviewing draft joint management agreements and the performance of parties under executed joint management agreements.

This Committee "is not subject to the control or direction of the Minister" (s135) or to important provisions of the *Public Sector Management Act* 1988, nor are their decisions open to appeal (Lim 1997). The scientists are in charge and

are able to make decisions on the basis of scientific principles unfettered. Well intentioned though this move is it runs counter to principles introduced into environmental planning as a result of influences from the environmental movement, namely public participation and public accountability. It also stretches the capacity of science further than is widely recognised.

There are several reasons for this. First, only a minority of all living things on this planet have been recorded by science. Second, the distributions of threatened and endangered species is not fully known; some threatened species may be reasonably numerous. Third, there has been an emphasis on vertebrate fauna, whereas the invertebrates may be more significant in ecological terms. Fourth, the ecology of many species has not been fully researched and aspects of population dynamics, especially migration and recruitment processes are often little understood, making, for example, the concept of wildlife corridors problematic. Fifth, the traditional science of taxonomy, the basis of species differentiation, is being challenged by advances in microbiology. Sixth, development and disturbance uncovers or creates opportunities for dormant rare species to remerge. More generally, environmental change is continuous if irregular, though there are differing views on the behaviour of ecosystems which have direct implications for environmental management.

Science, therefore, does not have clear answers to important questions which might arise, and in the face of uncertainty often acts conservatively and without reference to competing claims (e.g. social considerations). To have a process which can be determined by one issue or which grants dominance to one issue in development approval is rare in this democratic, pluralistic and multicultural age. Democratic processes do not lead to the best solutions from a scientific or any other perspective; they respect the will of the people. Better decisions from technical, logical and scientific viewpoints require better informed participants in the decision-making process coupled with appropriate legislation and adequate resources for implementation.

The problem with threatened species is compounded by the fact that the majority of those trained in urban planning have not been exposed to scientific perspectives and tend to be uncritical of science on the assumption that it is somehow more rigorous, more value free and subject to smaller ranges of error than measurement and knowledge in the social sciences and the humanities. In fact the reverse is more often the case. Consequently, development approval decisions may be made on false assumptions, or more commonly the process can be protracted due to uncertainty and negotiations strained because of inadequate understanding by the parties involved. These factors do not help the primary intention of good environmental management.

The existence of these problems is not a licence to avoid environmental responsibilities. Far from it. The problems simply make decisions about land use change more challenging and require professionals to exercise higher levels of judgement and read a wider range of literature than that to which they have been exposed, particularly the journals which scientists are inclined to publish in.

Implementation involves emphasis on protection of ecological processes and communities rather than just species, effective management and restoration, and recognition that the cohabitation of humans and threatened species may occur sometimes more readily than generally recognised. More emphasis will be needed on a regional perspective, not simply on a project basis.

In general terms there is a need for:

- a wider recognition of the existing state of scientific knowledge and its implication by all stakeholders;
- education of key professional groups so that they may make more informed decisions or know better the questions to ask; and
- general community education so that the trade-offs are better understood, perhaps a higher willingness to pay induced, and more effective management regimes put in place. ■

REFERENCE

Lim L (1997) The 10 Lords of the Universe - the New South Wales TSC Act's Scientific Committee. *Pacific Conservation Biology* 3:4-12

SUMMARY OF OPTION TWO -

Environmental

- Wetlands
Moderate Impact :
Retains most conservation category wetlands contained within the Heritage area and includes the Paperbark wetland on northern boundary.
- Perth Bushplan
No Impact :
Perth Bushplan area partially developed.
- Heritage Registered Area
No Impact :
Heritage area preserved.
- Remnant Bush other than wetlands or Heritage area
High Impact :
Dense bush developed.
- Port Kennedy Scientific Park
No Impact :
Park boundary maintained
- Groundwater Impact
To be determined by hydrological assessment.
- Approval Process
Possible formal assessment.

Configuration Of Areas

- All facilities identified have been catered for
- No facilities compromised
- Expansion area available
- Increased potential for 'commercial equestrian' activities for residential stabling and other uses

Site Access

All options access the site in the same way at two points, one off Warnbro Sound Avenue leading directly to the sporting facilities and internal access roads and the second access point from Mandurah Road accessing directly all equestrian facilities. While the road systems within the site are connected this separation in identity is important for both operational and traffic control reasons, particularly within the site.

OPTION THREE - 'COMMERCIAL'

The philosophy behind the development of Option Three was to approach the Lark Hill Site as a clean slate. The resulting option only recognises the boundaries of the Port Kennedy Scientific Park as an environmental consideration.

All Conservation wetlands and areas of vegetation have been cleared for development on the site. The development allows for a 50m buffer zone on the southern boundary of the site. This Option has residential stabling located within the proposed Perth Bushplan Area in the top north-eastern corner of the site and in the Heritage Registered Area.

















Areas dedicated to playing fields and future expansion remain relatively constant for all Options. As for Option One and Two, playing field areas shown represent all user groups surveyed, who have currently expressed interest in locating to the Site, either immediately or within five to ten years. As can be seen from the masterplan, the possibility for expansion on the site for whatever purpose is maintained. The configuration of playing fields in relation to the cricket and hockey fields to the north-west of the Site is efficient, working well in relation to the neighbouring swimming centre. The general configuration of playing fields between this Option and Option Two is consistent.

Compared with Options One and Two, the areas dedicated to equestrian-based activities have increased dramatically, probably being far in excess of present and likely future demands, particularly in relation to areas of residential stabling indicated on the masterplan. The large areas of residential stabling on the site represent a possible source of funding for the development of the site, although the actual cost of servicing and infrastructure to the residential stabling lots should be investigated. Total area dedicated to 'commercial equestrian' activities is consistent with Option Two, and may represent a source of revenue for the Site. This potential is currently being investigated.

The environmental impact is greatest in this option and considered to be significant. As a result the adoption of Option Three as the development plan is likely to require a formal assessment by the EPA.

PORT KENNEDY DRIVE

WIMMING

-  STABLING/CARFLOAT CONCOURSE
-  RIDING FOR THE DISABLED
-  50 M BUFFER ZONE
-  RESIDENTIAL STABLING
-  COMMERCIAL EQUESTRIAN
-  FUTURE EXPANSION
-  CONSERVATION RESERVE
-  RECREATION/PLAYING FIELDS
-  CARPARK/CIRCULATION AREAS
-  SURROUNDING RESIDENTIAL
-  EQUESTRIAN-BASED ACTIVITIES
-  CLUBHOUSE/BUILDING/SEATING
-  RSPCA SITE
-  HORSE BRIDAL TRAIL TO BEACH
-  EXTENT OF SITE
-  SCIENTIFIC PARK BOUNDARY



'LARKHILL' SPORTS COMPLEX
FEASIBILITY STUDY - OPTIONS

OPTION 2 - PROJECT TEAM PRELIMINARY

JONES COULTER YOUNG
321 Murray Street
Perth WA 6000
Telephone 09 481 1439
Facsimile 09 324 1816
Email: jcy@jcy.com.au
JCY Pty Ltd
ACN 009 149 216

OPTION TWO - 'PREFERRED'

The philosophy behind the development of Option Two is the preservation of selected wetlands and areas of high conservation value.

The Heritage Registered Area and a significant Paperbark wetland in the north have been preserved and the boundaries of the Port Kennedy Scientific Park and proposed Perth Bushplan Area are recognised and given conservation status.

Compared to Option One, some areas of dense vegetation have been proposed for development. The vegetation to the north-east has been replaced with equestrian activities and the RSPCA site. The 50m buffer on the southern boundary has been retained but the dense vegetation is now available for future expansion. The small Conservation category wetlands on the western boundary have been developed in this option.

The environmental impact of this option is considered to be moderate. Therefore, the adoption of Option Two as the development plan could possibly require a formal assessment by the EPA.

The Conservation Areas identified would need to be managed to preserve the attributes and functions of these areas. For example, fences would need to be constructed around all conservation areas to restrict horse and pedestrian access.

The Project Team believe that an option which sits somewhere between Options One and Three would be the most suitable masterplan for the future development of the Lark Hill Site. Option Two attempts to reach a compromise between various demands being placed on the Site.

As for Option One, playing field areas shown represent all user groups surveyed, who have currently expressed interest in locating to the Site, either immediately or within five to ten years. As can be seen from the masterplan, the possibility for expansion on the site for whatever purpose is maintained. The configuration of playing fields in relation to the cricket and hockey fields to the north-west of the Site is efficient, working well in relation to the neighbouring swimming centre. The general configuration of playing fields between this Option and Option Three is consistent.

Compared with Option One, the areas dedicated to equestrian-based activities has increased to a comfortable level. In comparison, areas dedicated to playing fields and future expansion remain relatively constant for all Options. Total area dedicated to 'commercial equestrian' activities is consistent with Option Three, and may represent a source of revenue for the Site.

As in Option One, residential stabling is proposed for strips of land on the site, that have no conservation value unto themselves, and would otherwise remain un-utilised. It remains the opinion of the Project Team that through the implementation of proper management strategies, residential stabling on the site would have no impact on adjacent conservation reserves. In effect, residential stabling on the Site can be thought of as being an extension of the residential stabling proposed for adjacent properties, and may provide a source of funding for the development of the site. This potential is currently being assessed.

SUMMARY OF OPTION ONE

Environmental

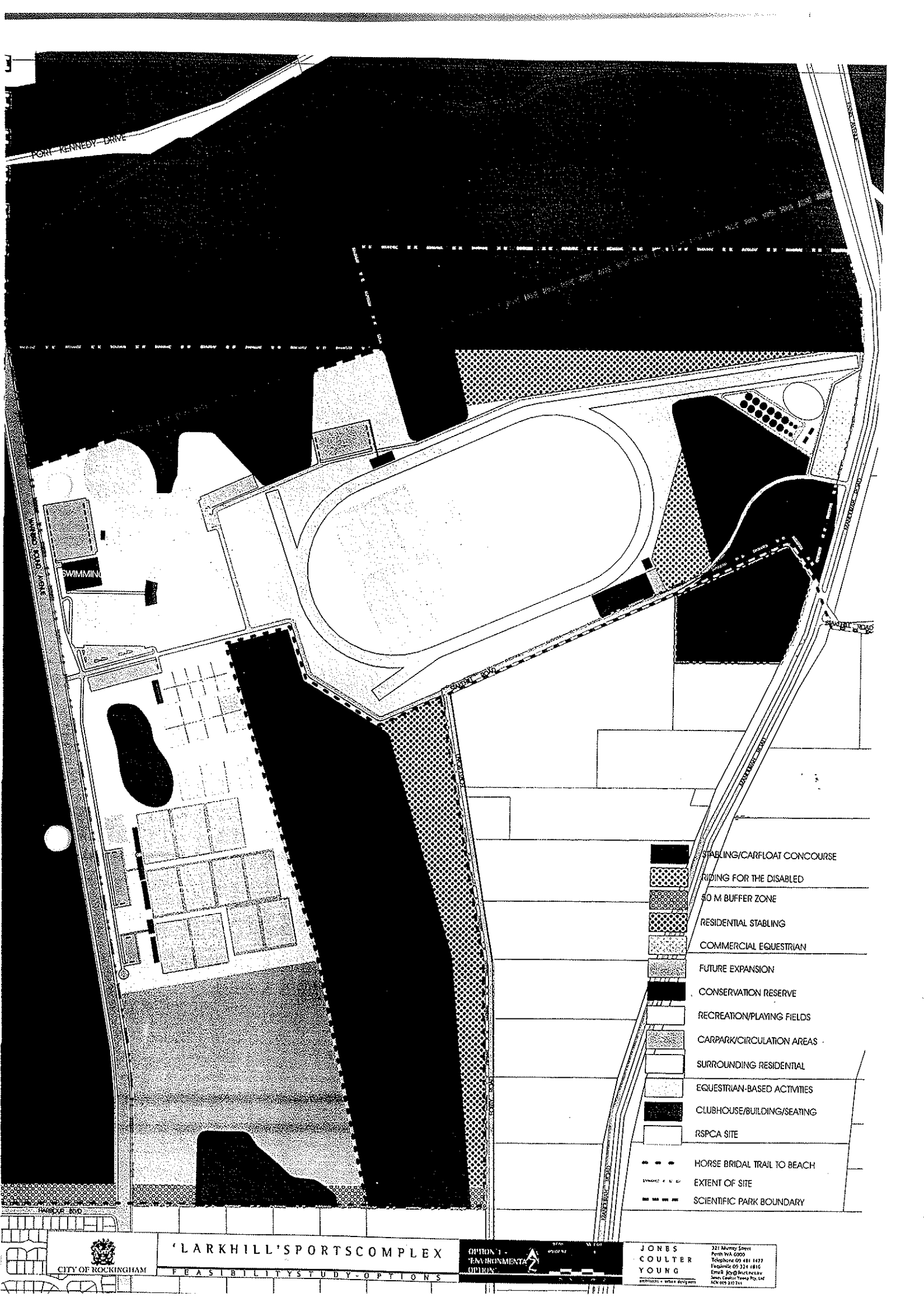
- Wetlands
Minor Impact :
Retains the majority of Conservation category wetlands
- Perth Bushplan
No Impact :
Proposed Perth Bushplan area not developed.
- Heritage Registered Area
No Impact :
Heritage area preserved.
- Remnant Bush other than wetlands or Heritage area
Minor Impact :
Large tracts of dense bush retained.
- Port Kennedy Scientific Park
No Impact :
Park boundary maintained.
- Groundwater impact
To be determined by hydrological assessment
- Approval Process
Informal assessment likely

Configuration of Areas

- All facilities identified have been catered for
- Some facilities compromised
- Expansion area available
- Equestrian based area-smaller
- 'Commercial Equestrian' dedicated areas less than other options however residential stabling still possible.

















Site Access

All options access the site in the same way at two points, one off Warnbro Sound Avenue leading directly to the sporting facilities and internal access roads and the second access point from Mandurah Road accessing directly all equestrian facilities. While the road systems within the site are connected, this separation in identity is important for both operational and traffic control reasons, particularly within the site.



PORT KENNEDY DRIVE

SWIMMING

-  STABLING/CAR/FLOAT CONCOURSE
-  RIDING FOR THE DISABLED
-  50 M BUFFER ZONE
-  RESIDENTIAL STABLING
-  COMMERCIAL EQUESTRIAN
-  FUTURE EXPANSION
-  CONSERVATION RESERVE
-  RECREATION/PLAYING FIELDS
-  CARPARK/CIRCULATION AREAS
-  SURROUNDING RESIDENTIAL
-  EQUESTRIAN-BASED ACTIVITIES
-  CLUBHOUSE/BUILDING/SEATING
-  RSPCA SITE
-  HORSE BRIDAL TRAIL TO BEACH
-  EXTENT OF SITE
-  SCIENTIFIC PARK BOUNDARY



'LARKHILL' SPORTS COMPLEX
FEASIBILITY STUDY - OPTIONS

OPTION 1 - ENVIRONMENTAL GUIDANCE

**JOBBS
COULTER
YOUNG**
221 Albany Street
Perth WA 6000
Telephone 09 481 1433
Facsimile 09 324 1816
Email Joy@PerthCaly.com.au
Site, Geology & Survey Pty Ltd
ACN 109 310344

OPTION 1 - 'ENVIRONMENTAL'

The philosophy behind the development of Option One is the preservation of the majority of conservation wetlands and areas of dense vegetation on the site, irrespective of its quality of viability of longer term preservation. These areas reflect the findings of Stage One of this feasibility.

Option 1 is designed so playing fields and other facilities are located on the flat plain areas which presently have a high degree of disturbance. The development does not encroach on the boundaries of the Heritage Registered Area, the Port Kennedy Scientific Park or the proposed Perth Bushplan Area. Nearly all wetlands with a Conservation status have been retained. Some of the isolated wetlands would be bordered by playing fields and carparks. From a long term viewpoint these small areas may not retain their present condition.

The environmental impact of this option is considered to be low. Therefore, the adoption of Option 1 as the development plan will be likely to require an informal assessment from the Environmental Protection Authority (EPA).

Conservation Areas which have been retained in each option would need to be managed to preserve the attributes and function of these areas. For example, fences would need to be constructed around all conservation areas to restrict horse and pedestrian access.

The three options will have a similar impact on the local groundwater hydrology. The potential impacts of the selected option will need to be assessed through a hydrological assessment.

Playing field areas shown in all options represent all user groups surveyed, who have currently expressed interest in locating to the Site, either immediately or within five to ten years. As can be seen from the masterplan, the possibility for expansion on the site for whatever purpose is maintained. The configuration of playing fields in relation to the cricket and hockey fields to the north-west of the Site is compromised because of the inclusion for preservation of a minor wetland area.

Compared with the other two options, the areas dedicated to equestrian-based activities has been reduced. In comparison, areas dedicated to playing fields and future expansion remain relatively constant. Total area dedicated to 'commercial equestrian' activities is significantly reduced, and this may have an impact on funding for the development of the site.

Residential stabling is proposed for selected strips of land on the site, that have no conservation value unto themselves, and would otherwise remain un-utilised. It is the opinion of the Project Team that through the implementation of proper management strategies, residential stabling on the site would have no impact on adjacent conservation reserves. In effect, residential stabling on the Site can be thought of as being an extension of the residential stabling proposed for adjacent properties, and could potentially provide a source of funding for the development of the site. This potential is currently being assessed.

*Maybe a better
option to preserve
commercial oppor. to
on private land*

-
- As previously reported, the Heritage Council of Western Australia have advised that no properties within the area have been entered in the Register of Heritage Places under the Heritage of Western Australia Act. However, it is confirmed that Conservation wetlands within the southern part of the study area are included in the Port Kennedy Area Listing for the Register of the National Estate. In addition, a portion of the study area to the north of the site has been recommended for inclusion in the Perth BushPlan.

MANAGEMENT OPTIONS

- This report refines the explanations of various management models and makes recommendations with respect to the preferred model. In essence, it is recommended that an independent formal entity be established to oversee the development and manage the strategic function of the facility. It is further recommended that membership of this entity should include representation from the City of Rockingham, the Ministry of Sport and Recreation, the Western Australian Planning Commission, major user groups and the general community.

FUNDING

- It has been confirmed that an amount of up to \$5 million may be contributed by the WAPC on a joint basis, for planning, design and infrastructure for the site. This does not require "dollar for dollar" funding as previously advised.
- Further funding may be available through the Ministry for Sport and Recreation 'WA Alive' program (CSRRF funding) dependant upon the level of contribution from other parties. The Ministry may contribute up to one-third of the total value of the project. ** however, it is unlikely that the Ministry will contribute more than 10% of the total cost.*
- Indications of funding available from user groups are not significant, with the exception of the RSPCA, which has indicated that it is prepared to contribute \$0.5 million to the establishment of its facilities.
- The Chief Executive of the Town of Kwinana has indicated that an invitation from the City of Rockingham to participate in the design and construction of the complex may receive a favourable response at this time. This may lead to the contribution of funds from the Council.
- The potential of revenue becoming available from the sale of land within the study area for commercial equestrian and / or residential stabling uses will be further investigated following the selection of the preferred development option.
- Costings for each option presented have been included in this report.

ALTERNATIVE DEVELOPMENT MODELS

- It is recommended that study tours be undertaken to the following venues prior to commencing detailed design for the complex:
- Chandler Sports Complex, Queensland (managed by the Brisbane City Council)
- Adelaide Aquatic Centre, South Australia (managed by the Adelaide City Council).

In addition, it may be of value to undertake an inspection of the new Melbourne Sports and Aquatic Centre which is scheduled to open this month. These tours can be arranged on behalf of the City should they be deemed necessary.

PROJECT SUMMARY

We have pleasure in presenting this progress report for the consideration of the Steering Committee for the Lark Hill Sports Complex Feasibility Study. A summary of achievements to date is presented below and detailed consultant reports are contained within the report.

USER GROUPS

- Further consultation with user groups has been carried out, including state sporting associations and community sporting groups. Additional consultation has also taken place with the City of Rockingham, the Ministry for Planning, The West Australian Football Commission, Peel Football Club, the City of Mandurah and the Town of Kwinana.
- Future land tenure arrangements have been given further consideration. In summary, it is recommended that the land be vested in the City of Rockingham.
- With the assistance of the City of Rockingham, a survey of residents has been carried out to ascertain public priorities with respect to provision of facilities at Lark Hill.
- Three development options are presented in this report, based on information gathered from potential user groups, and including facilities required to satisfy ascertained demand.

TRANSPORT & TRAFFIC ISSUES

- Further work will be undertaken with respect to the development of a traffic management strategy following the selection of the preferred development option.

ENVIRONMENTAL ISSUES

- Further consultation has been undertaken with relevant agencies, and previously identified environmental constraints associated with the site have been incorporated into the options presented in this report.

HERITAGE / ABORIGINAL SITES

- It is confirmed that the Department of Land Administration have advised that Native Title was extinguished over the site when Cockburn Loc 16 was granted to Thomas Peel. However, the National Native Tribunal advise that five native title claims currently exist which include the subject land. Details are included in the appendix to this report. It is recommended that Crown Law advice be sought by the City of Rockingham with respect to the status of these claims, and the ramifications they may have on development, given the advice received from these agencies.
- The Aboriginal Affairs Development advise that no known Aboriginal sites exist within the subject site, however there remains a possibility that such sites may exist without their knowledge. It is recommended that suitably qualified ethnographic and archeological consultants be engaged by the City of Rockingham to carry out surveys of the area to ascertain whether any sites do in fact exist.
- It is beyond the scope of this study to undertake any further work in the area of Native Title and Aboriginal sites.

DRAFT



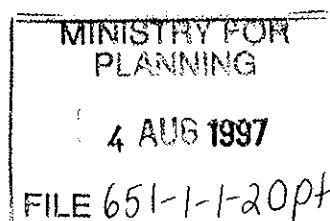
CITY OF ROCKINGHAM

LARKHILL REGIONAL SPORT
AND RECREATION COMPLEX
FEASIBILITY STUDY

STAGE TWO PROGRESS REPORT
TO PROJECT STEERING COMMITTEE
O P T I O N S

J U L Y 1 9 9 7









BENCHMARK DESIGN
AND DEVELOPMENT



JONES
COULTER
YOUNG

Architects
Urban Designers

Lark Hill Regional Sports Complex Perth's Bushplan

-  Bushplan Site Boundaries (Swan Coastal P)
-  Not Remnant Bushland
-  Other Remnant Bushland
-  Reg. Sig. Bushland - RECOMMENDED FOR
-  Regionally Significant Bushland - PROTECT
-  Remnant Bushland - PROTECTED
-  Bushplan Sites (Cons. Cat. Wetlands 1997)
-  Streets



Map Ident: plot970806_1
 Prepared By: lisa buckleton
 Prepared For: Bushplan Coordination Group
 Date: 06 Aug 97
 Scale 1:13600
 0 500 m



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DEPARTMENT OF
ENVIRONMENTAL PROTECTION
RECORDS SECTION

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NAME _____

**Declared Rare and Priority Flora Search
Dixon Road Duplication**





**Declared Rare and Priority Flora
Search
Dixon Road Duplication**

Prepared for: City of Rockingham

Prepared by: **BSD CONSULTANTS PTY LTD**
BSD Centre, 2 Bagot Road
PO Box 155, Subiaco WA 6904
Telephone (08) 9273 3888
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November 2003

DOCUMENT ISSUE AUTHORISATION

Issue	Rev	Date	Description	Checked By	Approved By
1	0	31/10/03	Declared Rare and Priority Flora Search Dixon Road Duplication		

The information contained in this document is solely for the use of the client identified for the purpose for which it has been prepared. It is not intended to be used by any third party and no responsibility is undertaken to any third party.

BSD Consultants Pty Ltd

EXECUTIVE SUMMARY

BSD Consultants were commissioned by the City of Rockingham in October 2003 to undertake a survey of Declared Rare Flora and Priority Flora species occurring within the Dixon Road duplication alignment.

Dixon Road is a regional road with a significant impact on the City of Rockingham's road network. The road has experienced an increase in traffic flow and as a direct result, it has been proposed to upgrade Dixon Road from a two-way to a dual carriageway. Dixon Road forms the northern boundary of land currently zoned as Bush Forever site 356 and the Rockingham Regional Park. As part of the duplication works, the area was assessed for flora and vegetation values by Ecoscape in 2000 and BSD Consultants in May 2003.

An element of the BSD Consultants report was a search for the presence of Declared Rare Flora (DRF) or Priority Flora (PF) species along the proposed road alignment. At the time of survey no DRF or PF were located although it was noted that the survey was undertaken at a suboptimal time. Further to this, the City of Rockingham requested BSD Consultants to undertake a targeted DRF and PF search of the proposed road alignment.

A botanist from BSD Consultants undertook the search for DRF and PF on 24th October 2003. The entire Dixon Road alignment was traversed by foot in two corridors. As the road alignment follows existing firebreaks, the firebreaks were traversed twice, once in one direction looking specifically at vegetation on one side and then reversed look at vegetation on the opposite side. The methodology ensured that the area was surveyed in detail, given the amount of weeds in the area likely to conceal any significant flora.

No Declared Rare or Priority Flora species, pursuant to subsection 2 of section 23F of the *Wildlife Conservation Act 1950* and listed by CALM (2003) were located during the survey. No endangered or vulnerable species, pursuant to section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* were located during the survey.

No constraints with regards to Declared Rare Flora or Priority Flora species were identified in the Dixon Road duplication alignment.

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1.2 PREVIOUS FLORA SURVEYS.....	1
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2. METHODS.....	3
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TABLES

- 1 Definition of Rare and Priority Flora Species (CALM 2003)
- 2 Categories of Threatened Species (EPBC Act, Section 179, 1999)

1. INTRODUCTION

BSD Consultants were commissioned by the City of Rockingham in October 2003 to undertake a survey of Declared Rare Flora and Priority Flora species occurring within the proposed Dixon Road duplication alignment.

Dixon Road is a regional road with a significant impact on the City of Rockingham's road network. The road has experienced a major increase in traffic flow and as a direct results, it is proposed to upgrade Dixon Road from a two-way to a dual carriageway. Dixon Road forms the northern boundary of land currently zoned as Bush Forever site 356 and the Rockingham Regional Park.

BSD Consultants were commissioned by the City of Rockingham in May 2003 to undertake a flora and vegetation assessment of the proposed road alignment. An element of this report was the presence of Declared Rare Flora (DRF) or Priority Flora (PF) species along the proposed road alignment and at the time of survey no DRF or PF were located, although it was noted that the survey was undertaken at a suboptimal time. Further to this, the City of Rockingham requested BSD Consultants to undertake a spring DRF and PF search of the proposed road alignment.

1.1 EXISTING ENVIRONMENT

The survey area lies of the Swan Coastal Plain Subregion of the Drummond Botanical Subdistrict within the South Western Botanical Province (Beard 1990). Soil-based vegetation complex mapping undertaken by Heddlé *et al.* (1980) mapped the vegetation in the area as Quindalup Complex. Floristic communities representative of the Quindalup Complex are a low closed forest of *Melaleuca lanceolata-Callitris preissii* and closed scrub of *Acacia rostellifera*.

1.2 PREVIOUS FLORA SURVEYS

As part of the duplication works, the area was assessed for flora and vegetation values by BSD Consultants in May 2003. In 1998, Ecoscape reviewed the flora and vegetation values of a bus transitway proposed for the area for the Department of Transport. Both reports rated the remnant vegetation along the road alignment as degraded and infested with invasive weed species.

An element of the BSD Consultants report in 2003 was the presence of DRF or PF species along the proposed road alignment. At the time of survey no DRF or PF were located although it was noted that the survey was undertaken at a suboptimal time.

1.3 DECLARED RARE AND PRIORITY FLORA

Species of flora or fauna acquire Declared Rare or Priority conservation status where populations are restricted geographically or threatened by local processes. The Department of Conservation and Land Management (CALM) recognise these threats and subsequently apply regulations towards population protection and species conservation.

CALM enforce regulations under the *Wildlife Conservation Act 1950* to conserve Declared Rare species and protect significant populations. Priority Flora species are potentially rare or threatened and are classified in order of threat. Declared Rare and Priority Flora category definitions are listed in **Table 1**.

Rare Flora species are gazetted under subsection 2 of section 23F of the *Wildlife Conservation Act 1950* and therefore it is an offence to “take” or damage rare flora without Ministerial approval. Section 23F of the Act defines “to take” as “... to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora to cause or permit the same to be done by any means”.

Table 1: Definition of Rare and Priority Flora Species (CALM 2003)

Conservation Code	Category
R	Declared Rare Flora – Extant Taxa. Taxa that 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.
P1	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. Such taxa are under consideration for declaration as ‘rare flora’, but are in urgent need of further survey.
P2	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 (i.e. not currently endangered). Such taxa are under consideration for declaration as ‘rare flora’, but urgently need further survey.
P3	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 need further survey.
P4	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.

A search of CALM’s Florabase database (WA Herbarium 1998) identified one Declared Rare, one Priority two and three Priority four species in the Rockingham area. All species descriptions are taken from WA Herbarium (1998).

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) promotes the conservation of biodiversity by providing strong protection for plants at a species level. Section 178 and 179 provides the lists and categories of threatened species under the Act each species and is presented in **Table 2**.

Table 2: Categories of Threatened Species (EPBC Act, Section 179, 1999)

Category
Extinct Taxa which is known only to survive in cultivation, in captivity or as a naturalised population, well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered Taxa which is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
Endangered Taxa which are not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable Taxa which is not endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation Dependant A species that is the focus of a specific conservation program; the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

2. METHODS

A botanist from BSD Consultants undertook the search for DRF and PF on 24th October 2003. The entire Dixon Road alignment was traversed by foot in two corridors. As the road alignment essentially follows existing firebreaks, the firebreaks were traversed twice, once in one direction looking specifically at vegetation on one side and then reversed look at vegetation on the opposite side. The methodology ensured that the area was surveyed in detail, given the amount of weeds in the area likely to conceal any significant flora.

All plant specimens collected during the field survey (i.e. voucher specimens believed to be Rare or Priority) were dried, pressed and then sorted in accordance with the requirements of the Western Australian State Herbarium. Identification of specimens occurred through comparison with named material and through the use of taxonomic keys. Where necessary, other botanists or plant taxonomists with specialist skills were consulted. Nomenclature of species used in this report follows current usage (Western Australia Herbarium 1998-2003).

3. RESULTS

A search of CALM's threatened species database revealed one Priority 4 species in the area. *Jacksonia sericea* (P4) is a low spreading shrub to 0.6 m high. It flowers between December and February with an orange pea-shaped flower. It is common in calcareous and sandy soils and has been recorded in the Rockingham area.

A further search of Florabase (WA Herbarium 1998-2003) revealed four additional significant species in the area, including one DRF species.

Verticordia plumosa var. *pleiobotrya* (R) is a shrub to 1.5m high with variable coloured flowers, most commonly white or pink. It is found on seasonally wet situations, rock outcrops, undulating plains,

hills and road verges. Florabase (WA Herbarium 1998-2003) has one record of this species on Mundijong Road in the Rockingham area. This species is listed as Declared Rare Flora within Western Australia and listed as Endangered under the EPBC Act (1999). The unique and significant composition of the Mundijong Road vegetation has been well documented (Government of WA 2000) and it is unlikely that this species would occur within the survey area.

Cardamine paucijuga (P2) is a slender annual herb to 0.4m high with white flowers. It is commonly found in moist to dry habitats. It is located within Rockingham Lakes Regional Park, and generally found in association with *Melaleuca* spp. One particular area of *Melaleuca raphiophylla* low forest, south adjacent to the road alignment, was targeted as potential habitat for this species. This species was not sighted during the search and the highly degraded state of the vegetation community suggests any occurrences are unlikely.

Grevillea olivacea (P4) is an erect non-lignotuberous shrub to 4.5m high with red or pink flowers. It is found on white or grey sand in coastal dunes or limestone rocks. It has been previously located at Woodman Point in Rockingham. Given the species preference to coastal habitats, it is unlikely to occur within the survey area.

Lepidium puberulum (P4) is an erect annual herb to 0.35m high with white or green flowers. It is commonly found in sandy soils and islands off the Western Australian coast. In the general Rockingham area, it has been located at Garden Island. A search of Florabase specimens (WA Herbarium 1998-2003) suggests that this species prefers habitats close to ocean and is unlikely to occur in the survey area.

No DRF or PF species, pursuant to subsection 2 of section 23F of the *Wildlife Conservation Act 1950* and listed by CALM (2003) were located during the survey. No Endangered or Vulnerable species, pursuant to section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* were located during the survey.

Bush Forever (Government of Western Australia 2000) lists a number of significant species within Bush Forever site 356 – Lake Cooloongup, Lake Walyungup and adjacent bushland, Hillman to Port Kennedy. Of these, *Jacksonia furcellata* was collected at the proposed Mandurah Road intersection however positive identification to the form referred to in Bush Forever was not possible.

4. CONCLUSIONS

The remnant vegetation condition of the proposed alignment of Dixon Road duplication is extremely degraded and the area is unlikely to support significant species due to the presence of a large number of highly invasive weeds.

No constraints with regards to Declared Rare Flora or Priority Flora species were identified in the Dixon Road duplication alignment.

5. REFERENCES

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M103

BS 356

Safety Bay Road extension, Baldivis

City of Rockingham

Report and recommendations
of the Environmental Protection Authority

**Full document
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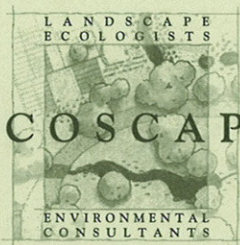
Environmental Protection Authority
Perth, Western Australia
Bulletin 678
April 1993

**Threatened Ecological
Community Survey,
Lake Coo loongup and
Lake Walyungup**

Department of Transport

**Full document
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• ECOSCAPE •



ECOSCAPE (AUST) PTY LTD ACN 070 128 675
21A PAKENHAM ST • FREMANTLE 6160
P.O. BOX 50 NORTH FREMANTLE 6159
PHONE (08) 9430 8955 • FACSIMILE (08) 9430 8977
EMAIL ECOSCAPE@WANTREE.COM.AU

PORT KENNEDY Q

BS 377

ANSTEY SWAMP Q

BS 379

Proposed Port Kennedy and Rockingham Parks Management Framework

Includes the Port Kennedy Scientific Park,
Lake Richmond, Anstey Swamp, Paganoni Swamp,
Tamworth Hill Swamp, Lake Cooloongup
and Lake Walyungup

PAGANONI SWAMP Q

BS 395

LAKES COOLOONGUP + WALYUNGUP Q

BS 356

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Prepared for



CITY OF ROCKINGHAM



WESTERN AUSTRALIAN
PLANNING COMMISSION



DEPARTMENT OF CONSERVATION
AND LAND MANAGEMENT

PORT KENNEDY
BOARD OF
MANAGEMENT

LAKE RICHMOND Q

BS 358

By

Alan Tingay
& Associates



August 1997

TAMWORTH HILL SWAMP Q

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THE LAKES REGIONAL OPEN SPACE

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BIOLOGICAL SURVEY

BS 356

for

THE SHIRE OF ROCKINGHAM

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A. and S. R. Tingay, 1976

BS# 356 (166)

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**A BOTANICAL SURVEY
OF AREAS AFFECTED BY THE PROPOSED
SOUTH-WEST CORRIDOR AMENDMENT
WITH COMMENT ON CONSERVATION VALUES**

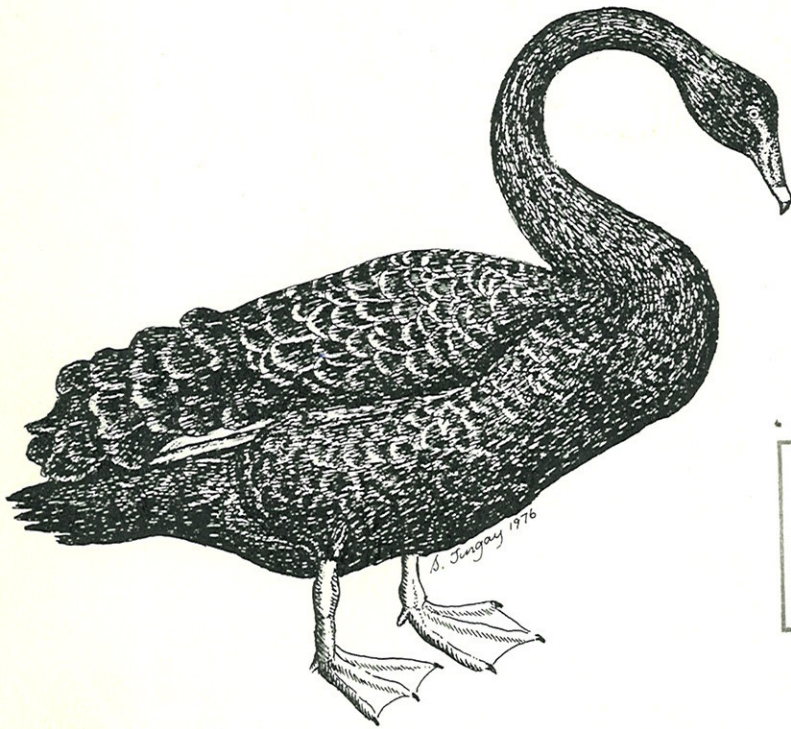
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Prepared by:

Malcolm Trudgen
Consultant Botanist
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WILLAGEE WA 6156

January 1994



**Full document
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**Biological Survey
for
The Shire of Rockingham**

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A. & S.R. Tingay

1977

⑧ M103 - Wetland in Sacle



① M103 - NW Areas - Current P & L Zoning

BP 356





