

CARDINAL DRIVE BUSHLAND, ELLENBROOK

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

SECTION 1: LOCATION INFORMATION

Bush Forever Site no. 23

Area (ha): bushland 26.8

Map no. 31

Map sheet series ref. no. 2034-II NE

Other Names: Part Submission Area 116, part of Ellenbrook National Estate Area

Local Authorities (Suburb): Shire of Swan (Ellenbrook, The Vines)

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS

Bassendean Dunes

Bassendean Sands (Qpb: S8)

Bassendean Dunes/Pinjarra Plain

Bassendean Sands over Guildford Formation (Qpb/Qpa: S10)

Wetlands (within the Bassendean Dunes/Pinjarra Plain)

Holocene Swamp Deposits (Qhw: Cps)

VEGETATION AND FLORA

Vegetation Complexes

Pinjarra Plain

Yanga Complex (most southern occurrence)

Bassendean Dunes

Bassendean Complex — North

Combinations of Bassendean Dunes/Pinjarra Plain

Southern River Complex (most northern occurrence)

Floristic Community Types: *not sampled, types inferred

Supergroup 2: Seasonal Wetlands

5 Mixed shrub damplands

*18 Shrublands on calcareous silts

Supergroup 3: Uplands centred on Bassendean Dunes and Dandaragan Plateau

*21c Low-lying *Banksia attenuata* woodlands or shrublands

*23b Northern *Banksia attenuata* — *B. menziesii* woodlands

Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes

25 Southern *Eucalyptus gomphocephala* — *Agonis flexuosa* woodlands (atypical member of this type associated with Muchea Limestones)

REGIONAL WETLANDS

Wetland Types: palusplain, sumpland

Natural Wetland Groups

Bassendean—Pinjarra transition OR Bassendean with fluvial features

Muchea (B/P.3)

Wetland Management Objectives: Conservation (9.127ha), Multiple Use

Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Not determined, Endangered (Shrublands and woodlands on Muchea Limestones), Vulnerable (floristic community type 18)

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: Muchea Limestone, vegetated wetland, vegetated uplands

Vegetation and Flora: limited survey (DEP 1996 (Vines 01–02), DEP 1999, Weston 1999)

Structural Units: mapping (Weston 1999)

Uplands: Low Closed Woodlands to Low Open Woodlands of *Banksia attenuata*, *B. menziesii* or *B. ilicifolia* and combinations of these, sometimes with *Eucalyptus calophylla*; *Eucalyptus calophylla* Woodland

Wetlands: Closed Tall Scrubs to Tall Shrublands of *Acacia saligna*, *Melaleuca raphiophylla*, *M. viminea* and *M. huegelii* or combinations of these

Scattered Native Plants: not assessed

Vegetation Condition: >80% Very Good to Excellent, <20% Good to Degraded areas, with areas of severe localised disturbance associated with tracks (Weston 1999 and DEP 1999)

Total Flora: 427 native taxa, 50 weed taxa (Weston *et al.* 1993) (area greater than that of Site, estimated >50% not in Site)

Significant Flora: *Grevillea curviloba* subsp. *curviloba* (R) (largest population known in a bushland area, estimated to be less than 200 plants in the wild of this taxon); *Haloragis tenuifolia* (1), *Eryngium pinnatifidum* subsp. *palustre* (2), *Stylidium longitubum* (3); at least five taxa typical of Muchea Limestones *Grevillea curviloba* subsp. *curviloba*, *Melaleuca huegelii*, *Austrostipa flavescens*, *Anthocercis littorea*, *Daucus glochidiatus*; at least nine taxa typical of the heavy soils of the eastern side of the Swan Coastal Plain

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

Linkage: adjacent native vegetation to the north and west (connects to Site 300); part of Greenway 36 (Tingay, Alan & Associates 1998a); part of a regionally significant contiguous bushland/wetland linkage (Part A, Map 7)

Other Special Attributes: contains diversity of floristic community types (7) and mapped vegetation types (10, Weston *et al.* 1993); contains plant communities representative of the eastern side of the Swan Coastal Plain; contains the only intact area of Muchea Limestone communities known in the PMR and the largest known population of *Grevillea curviloba* subsp. *curviloba* which is only found on soils associated with Muchea Limestones; National Trust of Australia (WA) Classification; contains part of the area recommended for conservation by Semeniuk, V&C Research Group (1992)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

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

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

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

Recommendation: Urban Negotiated Planning Solution (see Table 3, Volume 1).

CARDINAL DRIVE BUSHLAND, ELLENBROOK

Boundary Definition: bushland taken to cadastre/conservation wetland boundary (boundary possibly subject to investigation)

SECTION 1: CADASTRAL INFORMATION

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

Bushplan Site no. 23 **Map no.** 41 **Map sheet series ref. no.** 2034-II NE

Other Names **Area (ha):** total 84.5; bushland 82.9

Part Submission Area 116

Local Authorities (Suburb)

Shire of Swan (Ellenbrook, The Vines)

Zoning

MRS: Urban Deferred, Urban, Rural

TPS: Special Purpose, Landscape

Lot/Location/Reserve numbers (Purpose),

Street name

3 Bordeaux L; 3 Cardinal Dr; 408 Millhouse Rd

SECTION 2: REGIONAL INFORMATION

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VEGETATION AND FLORA

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Yanga Complex (most southern occurrence)

Bassendean Dunes

Bassendean Complex - North

Combinations of Bassendean Dunes/Pinjarra Plain

Southern River Complex (most northern occurrence)

Floristic Community Types: *not sampled, types inferred

Supergroup 2: Seasonal Wetlands

5 Mixed shrub damplands

*18 Shrublands on calcareous silts

*S2 Northern *Pericalymma ellipticum* dense low shrublands

Supergroup 3: Uplands centred on Bassendean Dunes and Dandaragan Plateau

*21c Low lying *Banksia attenuata* woodlands or shrublands

*23b Northern *Banksia attenuata* — *B. menziesii* woodlands

Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes

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REGIONAL WETLANDS

Wetland Types: sumpland, palusplain

Natural Wetland Groups

Bassendean—Pinjarra transition OR Bassendean with fluvial features

Muchea (B/P.3)

Wetland Management Objectives: Conservation (25.8ha)

Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Not determined, Critically Endangered (Muchea Limestones), Vulnerable (floristic community type 18)

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: Muchea Limestone, vegetated wetland, vegetated uplands

Vegetation and Flora: DEP 1996 (Vines 01-02)

Structural Units: mapping (part Bushplan Site — Weston *et al.* 1993)

Uplands: Low Closed Woodlands to Low Open Woodlands of *Banksia attenuata*, *B. menziesii* or *B. ilicifolia* and combinations of these, sometimes with *Eucalyptus calophylla*; *Eucalyptus calophylla* Woodland

Wetlands: Low Closed Forests and Closed Forests to Woodlands of *Eucalyptus calophylla*, *E. rudis*, *Melaleuca preissiana*, *M. raphiophylla*, *Banksia littoralis* or *Acacia saligna* and combinations of these; Closed Tall Scrubs to Tall Shrublands of *Acacia saligna*, *Melaleuca raphiophylla*, *M. viminea* and *M. huegelii* or combinations of these; Open Heaths to Low Shrublands of *Astartea* aff. *fascicularis* and/or *Pericalymma ellipticum*; Mixed



Herblands of species of *Stylidium*, *Drosera* and Asteraceae species; Sedgelands of *Baumea* species and *Lepidosperma longitudinale*

Scattered Native Plants: not assessed

Vegetation Condition: >90% Excellent to Very Good, <10% Good to Degraded areas, with of severe localised disturbance associated with tracks

Total Flora: 427 native taxa, 50 weeds (Weston *et al.* 1993) (area greater than that of Bushplan Site, estimated <20% not in Site, estimated >85% expected flora)

Significant Flora: *Grevillea curviloba* subsp. *curviloba* (R) (largest population known in a bushland area, estimated to be less than 200 plants in the wild of this species), *Haloragis tenuifolia* (1), *Eryngium pinnatifidum* subsp. *palustre* (2), *Stylidium longitubum* (3), *Conospermum triplinervium*; at least five taxa typical of Muchea Limestones (*Grevillea curviloba* subsp. *curviloba*, *Melaleuca huegelii*, *Austrostipa flavescens*, *Anthocercis littorea*, *Daucus glochidiatus*); at least nine taxa typical of the heavy soils of the eastern side of the Swan Coastal Plain

Fauna: no systematic survey, known species list supplied in Watkins *et al.* (1993) for birds (57), native mammals (3), reptiles (31) and amphibians (9). Significant bird species: category 3 (10) and category 4 (10). Significant mammal species: Western Brush Wallaby and Quenda (Friend 1996 D). Significant reptile species: a legless lizard (*Pletholax gracilis*), Black-headed Snake (*Rhinoplocephalus gouldii*) and Black-striped Snake (*Simoselaps calonotus*).

Linkage: adjacent native vegetation to the north, south and west (connects to BS300 and BS22); part of proposed Greenway 37 (Tingay, Alan & Associates 1997a); part of a regionally significant contiguous bushland/wetland linkage (Volume 2A, Map 8)

Other Special Attributes: contains diversity of floristic community types (7) and mapped vegetation types (10, Weston *et al.* 1993); contains plant communities representative of the eastern side of the Swan Coastal Plain the area; contains the only intact area of Muchea Limestone communities known in the PMR and the largest known population of *Grevillea curviloba* subsp. *curviloba* which is only found on soils associated with Muchea Limestones; National Trust of Australia (WA) Classification; contains part of the area recommended for conservation by Semeniuk, V&C Research Group (1992)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed

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 Swan and Canning Rivers EPP; location of Declared Rare Flora, conservation category wetlands; under TPS Landscape Zoning

Constraints: private land; under MRS Urban Zoning and Urban Deferred Zoning, General Mineral Resource Area (sand)

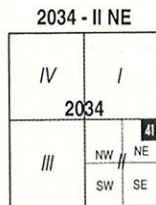
Recommendation: The most appropriate mechanism for the protection of this Bushplan Site be considered through the public comment period in consultation with the land owner(s).



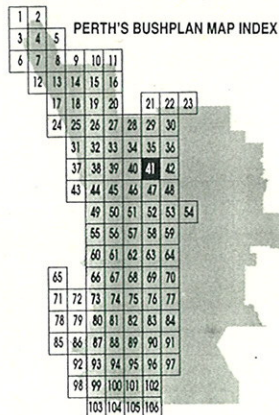


LEGEND

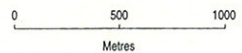
- 472** Bushplan Sites With Regionally Significant Bushland
- Other Native Vegetation
- Conservation Category Wetlands
- Bushplan Sites With Some Existing Protection
- 696 Lot Number, Location Number
- Channel Wetlands
- Local Government Boundary



1: 25 000 AMG Reference Grid showing Perth's Bushplan Map Sheet Breakdown



SCALE



Produced by Project Mapping Section
 Land Information Branch, Ministry for
 Planning, Perth W.A. November 1998
 ntw-map11/environ/bushplan/bushv2_41.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

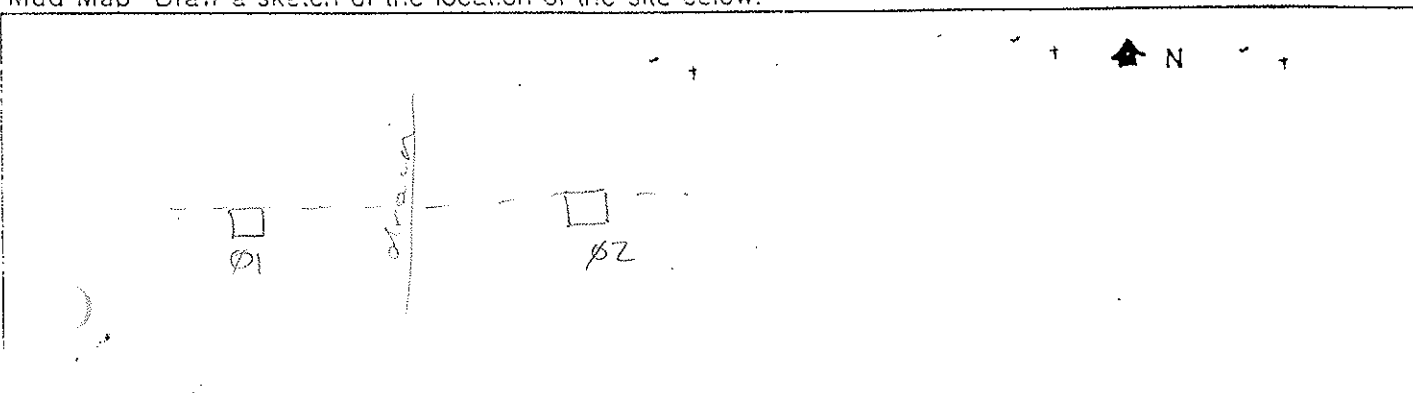
BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA NOJ TO JIMES SITE NUMBER VINE #2
 DATE TRIP 3-11-95 RECORDERS BTK, NCT, VE
 DATE TRIP _____ RECORDERS _____
 DATE TRIP _____ RECORDERS _____
 BOTANIST _____

From 'Bushtand Plant Survey' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 24 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.

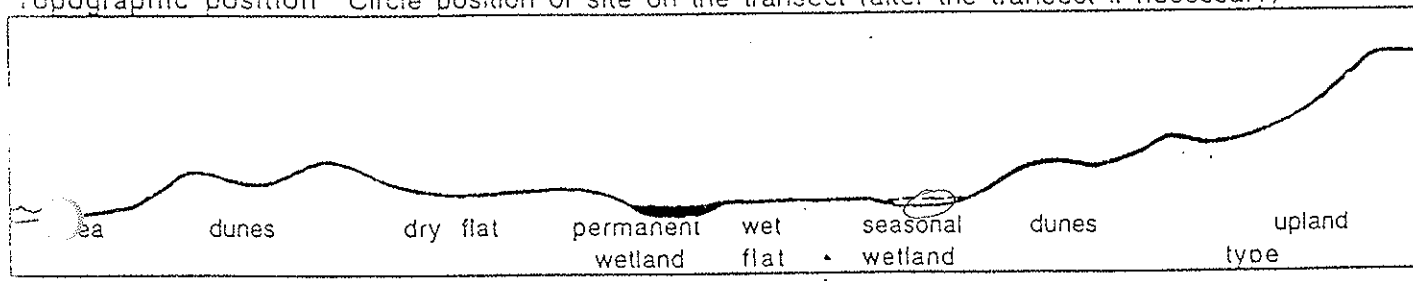


Road Location _____

Geographic Location Latitude 31° 45.663 S Longitude 115° 59.875 E Altitude Reference Map EPE ± 23m

Photograph _____ Photocracher's Name NCT Photo No 5

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat gentle steep Aspect N NE E SE S SW W NW

Surface Soil type clay Colour brown
 Exposed rock type _____ % surface _____

Sub-surface Soil Colour _____
 Rock type limestone depth to rock 20cm

Drainage well mod poor depth water _____ cm Wet all year winter/spring

Litter _____ % cover _____
 Depth upto 15 cm Bare Ground zero % cover

1/2 cm cover in most of quadrat but also dot of dead *Acacia saligna*


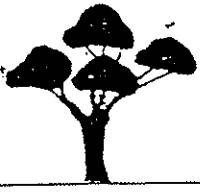



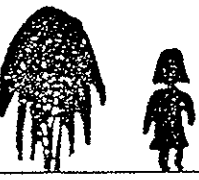






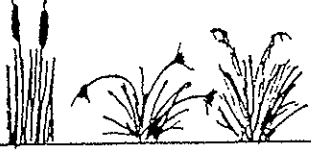
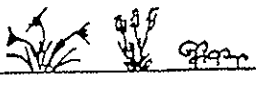
BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

3. VEGETATION STRUCTURE AND COVER

From 'Bushtand Plant Survey' written by B. Keighery (1994) and published by the Wildflower Society of WA Inc., PO Box 64 Nedlands WA 6008.

For each layer record - appropriate life form, cover class (see below) and dominant species in each layer.

Cover Class 2-10% 10-30% 30 - 70% over 70%

TREES			MALLEES		
over 30m	15 - 30m	5 - 15m under 5m	over 8m	under 8m	
					30m 10m
LIFE FORM					
COVER CLASS (%)					
DOMINANT SPECIES					
SHRUBS			SHRUBS		
over 2m	2m - 1.5m	1.5 - 1m	1 - 0.5m	under 0.5m	
Thicket 					2m 1m
LIFE FORM					
COVER CLASS (%)	30-70				
DOMINANT SPECIES	mel. rhamn Acacia saligna				
GRASSES	HERBS	SEDGES	over 0.5m	under 0.5m	
Very open grasses 	Herbs 			Very open low sedges 	1m
LIFE FORM					
COVER CLASS (%)	2-10	30-70		2-10	
DOMINANT SPECIES	Aira Velvet grass	Siloxenus hum Hyalosperma cahula		Leptocarpus roylei Lepid. long	

4. VEGETATION CONDITION

1	'PRISTINE'	COMMENTS
2	EXCELLENT	
3	VERY GOOD	
4	GOOD	
5	DEGRADED	

Creeklina

Cyath. kerete folia

KOJ

VINE $\phi 2 / \phi 2$

Daucus gschied.

Wartzia citrura.

Ranunculus cernuomum

? Helorajis ? knuitolia

KOJ

VINE $\phi 1$

North. Wetland

Kunzea littoralis

Myrsine areolaris

Eriger. pian. ssp. palustris

Podstepis gracilis 'swamp'

Sand over limestone.

Opercularia vaginata

Stipa flavescens

Anthocaris littorea.

Colandrinia linearifolia

Crochilla ? curvifolia ssp. curvifolia

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE

Label each plant with plants number, site code, date and plant's name or working name if required

SITE No VINE 02
 Date 3/11/95

Record on Sheet

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From 'Bushtland Plant Survey' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	FI	ID	SHRUBS (cont.)	No	FI	ID	HERBS (cont.)	No	FI	ID
								✓ <i>Cicendria liliif.</i>			
								✓ <i>Trachypogon pilosa</i>			
								✓ <i>Pod. gnaph.</i>			
								✓ <i>Millot. tenu.</i>			
				✓ <i>Uel. tenuifolia</i> RJK				✓ <i>Microglossum</i>			(VSP)
								✓ <i>Kaban!</i> ✓ <i>Stip.</i>			
								✓ <i>Job. tenu.</i>			
MALLEES								✓ <i>Cor. viscosa</i> (pink)			
								✓ <i>Billard. fax.</i>			
								✓ <i>Mon. con.</i>			
				GRASSES				✓ <i>Port. caland.</i>			
				✓ <i>Aira con.</i>				✓ <i>Galium discoloratum</i>			(VSP)
				✓ <i>Briza minima</i>				✓ <i>Micules ? media</i>			
				✓ <i>Briza mex.</i>							
				✓ <i>Ehr. caly.</i>				SEDGES			
				✓ <i>Stip. comp.</i>				✓ <i>Lepid. long.</i>			
				✓ <i>Valpa. myuros.</i>				✓ <i>Leptoc. rousei</i>			(VSP) ✓
								✓ <i>Cahro. arist.</i>			
SHRUBS				HERBS							
✓ <i>Mel. rheph.</i>				✓ <i>Hyp. glob.</i>							
✓ <i>Mel. linn.</i>				✓ <i>Stlox. humi.</i>							
✓ <i>Ast. aff. fascic.</i>				✓ <i>Stylid. long.</i>			(VSP)				
✓ <i>Heauia saligna</i>				✓ <i>Stylid. arce.</i>			(VSP)				
✓ <i>Hek. vasa.</i>				✓ <i>Stylid. (color pink, short hils)</i>			(VSP)				
✓ <i>Hibb. Skel. (yell. long)</i>				✓ <i>Stylid. rotund.</i>							
✓ <i>Celoth. (hard)</i> ✓ <i>Stylid. (yell. long)</i>				✓ <i>Stylid. vire.</i>							
✓ <i>Comph. long.</i>				✓ <i>Stylid. (color pink, short hils)</i>							
✓ <i>Acaltha. Canalic.</i>				✓ <i>Stylid. vire.</i>							
✓ <i>Leuco. prostr.</i>				✓ <i>Stylid. (color pink, short hils)</i>							
				✓ <i>Stylid. vire.</i>							
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				✓ <i>Stylid. vire.</i>							
				✓ <i>Stylid. (color pink, short hils)</i>							
				✓ <i>Stylid. vire.</i>							
				✓ <i>Stylid. (color pink, short hils)</i>							
				✓ <i>Stylid. vire.</i>							
				✓ <i>Stylid. (color pink, short hils)</i>							
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				✓ <i>Stylid. (color pink, short hils)</i>							
				✓ <i>Stylid. vire.</i>							
				✓ <i>Stylid. (color pink, short hils)</i>							
				✓ <i>Stylid. vire.</i>							
				✓ <i>Stylid. (color pink, short hils)</i>							
				✓ <i>Stylid. vire.</i>							
				✓ <i>Stylid. (color pink, short hils)</i>							
				✓ <i>Stylid. vire.</i>							
				✓ <i>Stylid. (color pink, short hils)</i>							
				✓ <i>Stylid. vire.</i>							
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				✓ <i>Stylid. (color pink, short hils)</i>							
				✓ <i>Stylid. vire.</i>							

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

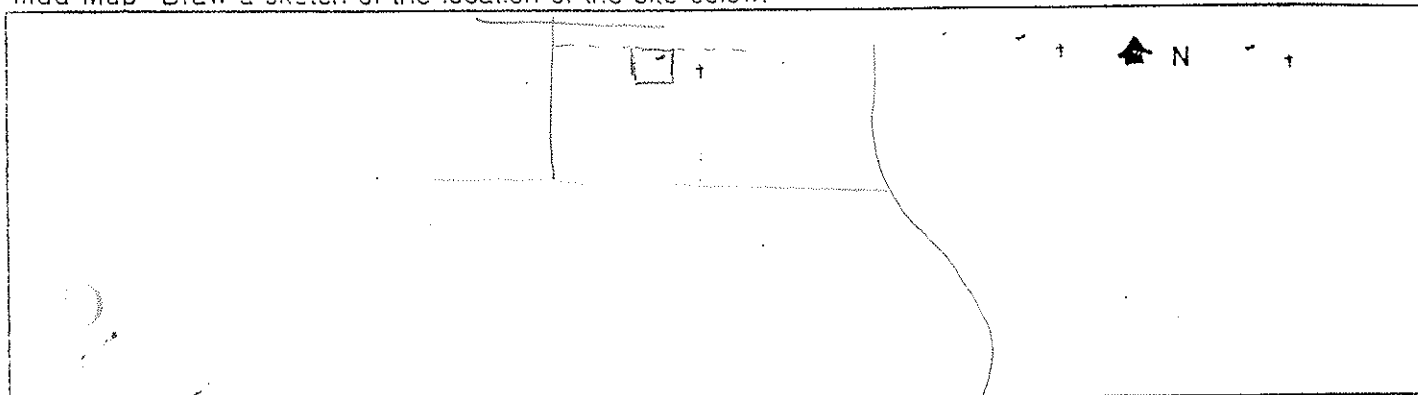
ADT-TO.

BUSHLAND AREA VINE SITE NUMBER VINE 01
 DATE TRIP 3-11-95 RECORDERS BTK, NCT, TE
 DATE TRIP _____ RECORDERS _____
 DATE TRIP _____ RECORDERS _____
 BOTANIST _____

From 'Bushland Plant Survey' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 2 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.

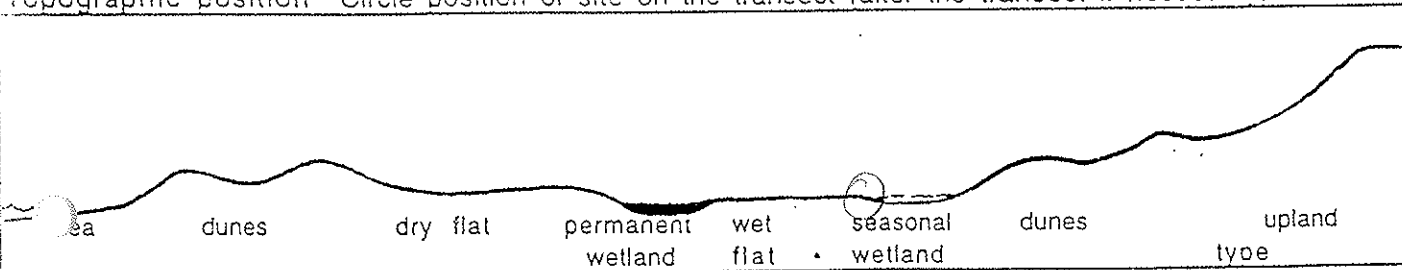


Road Location

Geographic Location Latitude 31°45.684 S Longitude 115°59.705 E Altitude
 Reference Map EP6 + 54m

Photograph _____ Photographer's Name NCT Photo No 4

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope	flat	<u>gentle</u>	steep	Aspect	<u>N</u>	NE	E	SE	S	SW	W	NW
Surface Soil	<u>loam</u>		Colour	<u>dark brown</u>								
Exposed rock	type		% surface									
Sub-surface Soil	<u>reddy sand</u>		Colour									
Rock	type <u>limestone</u>		depth to rock	<u>30cm</u>								
Drainage	<u>well</u>	mod	poor	depth water	cm	Wet	all year	winter/spring				
Litter	<u>70+</u>	% cover	Depth	<u>up to 10</u>	cm	Bare Ground	<u>zero</u>	% cover				

BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

From 'Bushland Plant Survey' written by B. Keighery (1994) and published by the Wildflower Society of WA Inc., PO Box 64 Nedlands WA 6008.

3. VEGETATION STRUCTURE AND COVER

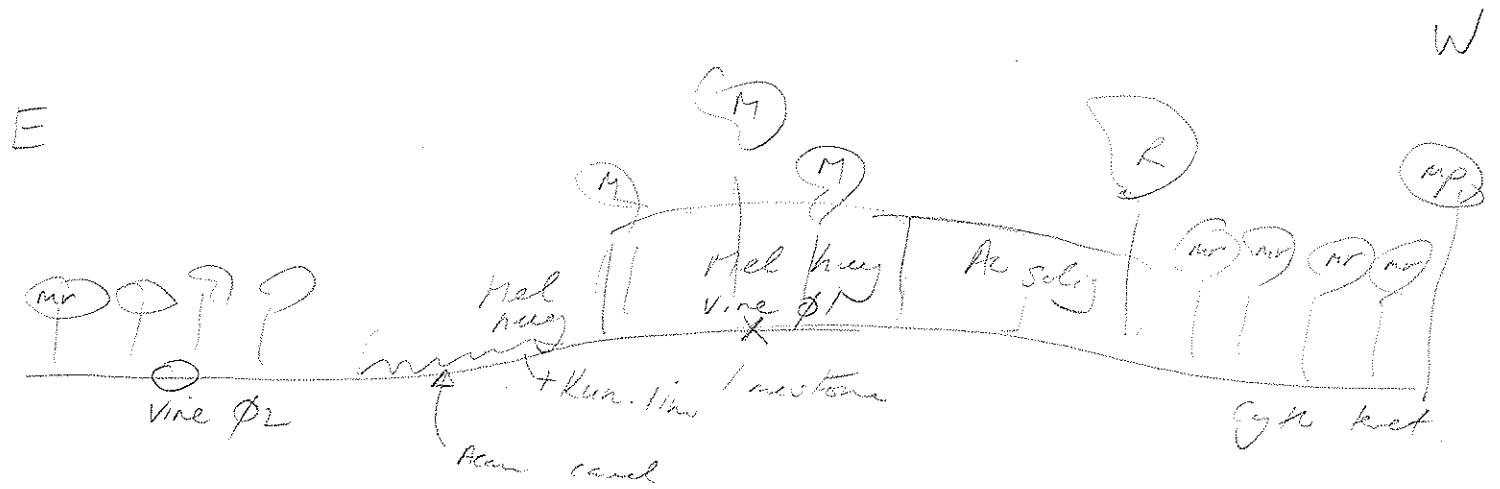
For each layer record - appropriate life form, cover class (see below) and dominant species in each layer.

Cover Class 2-10% 10-30% 30-70% over 70%

TREES			MALLEES	
over 30m	15-30m	5-15m under 5m	over 8m	under 9m
LIFE FORM				
COVER CLASS (%)		30-70		
DOMINANT SPECIES		E. calophylla		
SHRUBS			SHRUBS	
over 2m	2m - 1.5m	1.5 - 1m	1-0.5m	under 0.5m
LIFE FORM	Thicket 		Heath B 	Dwarf Scrub D
COVER CLASS (%)	30-70	30-70		10-30
DOMINANT SPECIES	Mel. huegelii Banksia (etc)	Xanthorrhoea preissii		Hibbertia
GRASSES		HERBS	SEDGES	over 0.5m
LIFE FORM		Open Herbs 		under 0.5m
COVER CLASS (%)		10-30		
DOMINANT SPECIES		Galium murale Daucus glaberrimus Trichocereus pilosus daisy (see list)		

4. VEGETATION CONDITION

1	'PRISTINE'	COMMENTS solid moss cover in places quite alot of weeds
2	EXCELLENT	
3	VERY GOOD ✓	
4	GOOD	
5	DEGRADED	



BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE

Label each plant with plants number, site code, date and plant's name or working name if required

SITE No *VINGS 01*
 Date *3/14/95*

Record on Sheet

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From 'Bushtand Plant Survey' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	FI	ID	SHRUBS (cont.)	No	FI	ID	HERBS (cont.)	No	FI	ID
<i>Euc. calophyl.</i>				HERBS				<i>Dioscorea (climb/glob.stk)</i>			
<i>Banksia litt.</i>				<i>Hyal. acutula</i>				<i>Dianella revoluta</i>			
				<i>Petrophagia velutina</i>				<i>Aralium campastre</i>			
				<i>Euc. ph. ssp palastra</i>				<i>Lalaca sp. (1st)</i>			report
				<i>Woodsia monantha</i>				<i>Hybanthus calycinus</i>			
				(single flower) - fruit.				<i>Murch's sp.</i>			
MALLEES								<i>Lomo nigricans</i>			
				GRASSES				<i>Dios. antho</i>			
				<i>Braea max</i>				<i>Strachey Spilosa</i>			
				<i>Stipa flav. ssp VINE ART</i>				<i>Psidium sp.</i>			
SHRUBS				<i>Murch. stip</i>				<i>Woodsia olear.</i>			
<i>Mel. hula</i>				<i>Ara. cony</i>				<i>Homa homa</i>			
<i>Hak. vart.</i>				<i>Braea tenu</i>				<i>Mitoh. tenu (1st)</i>			USP
<i>Hibb. hyp.</i>				<i>Antiox. odorat.</i>				SEDGES			
<i>Xanth. prassi</i>				<i>Valeria myros</i>				<i>Stor flex</i>			
<i>Phyll. caly.</i>								<i>Stepid ? angust.</i>			
<i>Lacc. pinnatus</i>				HERBS							
<i>Acacia saligna</i>				<i>Doccus glochid</i>							
<i>Hak. vart.</i>				<i>Galadina sp (sterile)</i>							
				<i>Galadina sp (1st only)</i>							
				<i>Pat. occid</i>							
				<i>Kenned. prost.</i>							
				<i>Coasia parvi</i>							
				<i>Homaria flaccida</i>							
				<i>Hyp. alabra</i>							
				<i>Phacelia elatior</i>							
				<i>Prunella sp</i>							
				<i>Katex. huay.</i>							
				<i>Gabum. mediale</i>							
				<i>Labellia ? tenu (ster)</i>							
								<i>Leptocercas manziesii</i>			✓AB
								ADJ			
								<i>Caladonia paludosa</i>			✓AB

BUSHLAND AREA VINES - LIMESTONE AREA SITES

YES/NO

DATE 4/1/96 RECORDERS

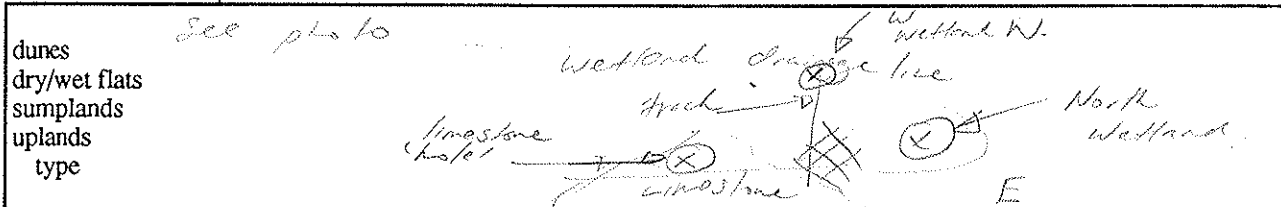
Observations edge transects

Geographic Location Latitude S Longitude E

Reference Map

Photograph Photographer's Name Photo No

Transect of landscape units



Soil orange sand (loamy in places) Colour
 Exposed rock limestone type limestone % area exposed occ in soil movement

VEGETATION

Eucalypts	<u>(E. calophylla)</u>	E. wandoo	E. marginata	E. todtiana	<u>(E. rudis)</u>
	E. decipiens	E. drummondii	E. haematoxylon	E. lanepolei	E. gomphocephala
	E. accedens	E. patens	E. laeliae	E. megacarpa	
Sheoaks	<u>(Allocasuarina fraserana)</u>	Casuarina obesa			
Banksia	<u>B. attenuata</u>	<u>B. menziesii</u>	B. prionotes	B. illicifolia	B. grandis B. littoralis
Melaleuca	<u>(M. preissii)</u>	<u>(M. raphiophylla)</u>	M. lanceolata	M. cuticularis	
Others	<u>Callitris preissii.</u>				
Mallees	Eucalypts	<u>E. arguitifolia</u>	E. petrensis	E. decurva	E. foecunda E. latens

Wet areas inspected it would not be expected that the other areas would differ significantly from Ellen brook area as described by Weston, Trudgen & Gatten (see sites also)

Vegetation Condition - Keighery 1994 (Trudgen 1993)

1 = 'Pristine' (Excellent)	
2 = Excellent (Very Good)	
3 = Very Good (Good)	<u>Post grazing appears evident patch clearing in North Wetland.</u>
4 = Good (Poor)	
5 = Degraded (Very Poor)	
6 = Completely Degraded	

partial clearing

weeds see sites

selective removal of species timber cutting mowing % dieback

fire frequency infrequent

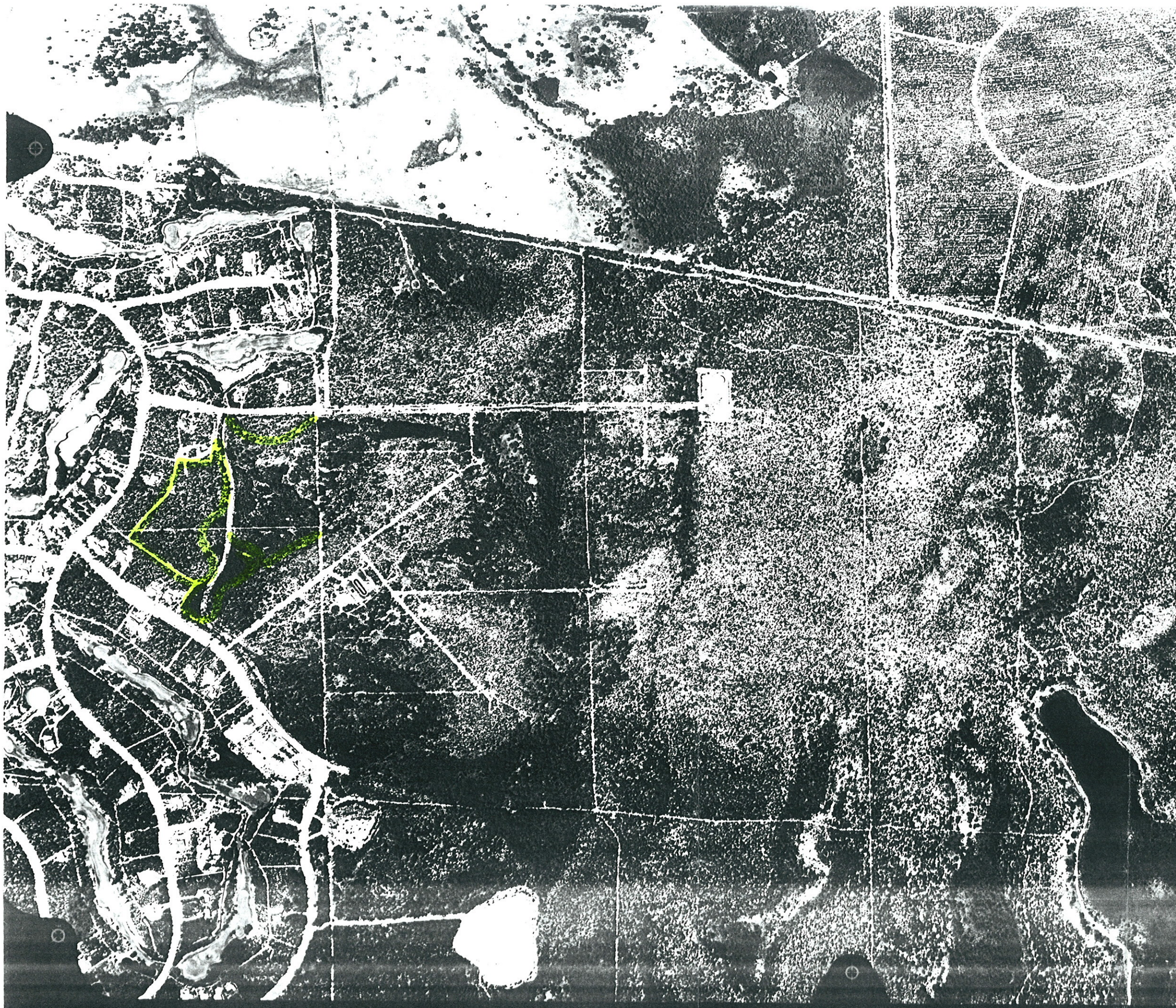
'enrichment plantings'

animal impact horse foxes rabbits cats dogs goats pigs overgrazing by native mammals
 soil movement mining dumping rubbish dumping roadworks
 changes in water regimes flooding drainage watering nutrient influx

Tracks (fire breaks) walk trails off road vehicle use animal tracks

Service corridors SEC Main Road; Water Authority. Telecom

Other



5068

WA 3169(C) METRO REGIONAL AREA & EXT. RUN 14 (5001-5081)

MULTIPLEX CONSTRUCTIONS PTY LTD

EGERTON

STRUCTURE PLAN

CONSULTATIVE ENVIRONMENTAL REVIEW

ALAN TINGAY & ASSOCIATES

FEBRUARY 1994

REPORT NO: 93/61

It is emphasised however, that this does not mean that houses should not be built on such sites. Rather, the land capability assessment indicates the natural features of the site that need to be managed or modified to make that site suitable for the proposed land use. Thus, in the above example, a site which is subject to waterlogging may be made suitable for house construction by appropriate filling, drainage and other measures.

A land capability assessment for the Shire of Swan has been prepared by McArthur (1985). This assessment includes the Egerton property. In addition, the Department of Agriculture is currently undertaking the Metropolitan Regional Soils Project which will include soils information on the rural areas on the outskirts of Perth. These two sources have been combined to produce the land capability map for Egerton shown in Figure 14.

The soils on the western side of the property belong to the Jandakot, Gavin and Joel Units, which are all Bassendean Sands. The Jandakot unit (Ja) predominates, and the soil is an iron podzol with a grey surface, an almost white subsurface and a yellow sandy subsoil at 1 to 2m.

Seasonal swamps (Ws), which are depressions that contain free water in winter, occur in the south western half of the property within the Jandakot unit. These seasonal swamps are characterised by humus podzols and peats.

The Joel unit (J), which often has a peaty surface and a black indurated hardpan, covers a small area in the south-west corner of the property. The Gavin (1) unit is an iron-humus podzol with a dark grey subsurface, and a dark brown, sometimes indurated, subsoil. There may also be iron concretions in the subsoil. This unit forms a small pocket at the southern end of the property.

A Drainage Line (DL) unit dissects the Jandakot unit at the base of the property and partially encloses the Gavin unit. Drainage Lines are characterised by broad shallow canals and peaty soils.

The remainder of the Egerton property is dominated by the Yanga unit (Ya), interspersed with pockets of the Jandakot unit (Ja), along the north to north-eastern edge of the property. The Yanga unit is characterised by variable soil types, and includes shallow sand over heavy clay, shallow sand over limestone, and deep sand.

Karrakatta sands (Ks) which are of aeolian origin, are deep sands with grey sand and organic matter to a depth of 30cm over yellow sand. These sands are found in the south-eastern corner of the property.

A small area of Muchea sand (Mus) occurs along the south eastern boundary of the property. Muchea sands are deep, light grey sands and are also of aeolian origin.

3.12 Flora and Vegetation

3.12.1 Introduction

The native vegetation on Egerton has largely been cleared with most of the sand ridges occupied by a pine plantation and much of the plain used for agricultural purposes. The

remaining native vegetation belongs to the Southern River Vegetation Complex as mapped by Heddle et al, (1980). This unit typically consists of open woodlands of Marri-Jarrah and *Banksia* species with fringing woodlands of Flooded Gum - Paperbark along creek beds. The *Banksia* Woodland in the north-west corner of the site is more closely aligned to vegetation of the Bassendean Complex North which abuts the property to the west.

A survey of the remnant native vegetation was undertaken in spring and early summer of 1993 with the aim of compiling a flora list and a vegetation map for this CER.

3.12.2 Methods

No previous flora or vegetation surveys have been undertaken at Egerton. Therefore a thorough field survey was initiated in September 1993.

Records of rare and priority species known to occur or likely to occur in the area were provided by CALM. In addition, advice was sought from CALM botanists familiar with the flora of the region.

The Flora and Vegetation report prepared by Weston et al, (1993) for the Ellenbrook Estate was used extensively in assessing the significance of the Egerton results.

Plant nomenclature follows that of Green (1985) in the Census of the Vascular Plants of Western Australia. The Priority flora were assessed using the most up to date list published by CALM (28 October 1992). Vegetation descriptions use the system of Beard as adapted by Aplin (1979).

3.12.3 Flora

(a) Flora Recorded

A total of 159 native species have been recorded in the Egerton property (Appendix 3). This total is comprised of 1 fern species, 1 Gymnosperm, 43 Monocotyledons and 114 Dicotyledons. The families represented by the most species include the Pea family (Papilionaceae - 21 species), Myrtle family (Myrtaceae - 19), Proteaceae (11), Orchid family (Orchidaceae - 9) and Heath family (Epacridaceae - 9).

The total number of 159 species is low compared to nearby Ellenbrook Estate (427 species), Melaleuca Park (at least 300 species) and Whiteman Park (at least 250 species) (Weston et al, 1993). The low number of species is considered to be related to the small area (approximately 106ha) of native vegetation remaining.

The distribution of the species according to habitat types (i.e. dryland, transitional, wetland), shows that the dry upland areas support more species (98 species) than the areas influenced by high water tables (53 species) and the fringing areas in between (24 species). Only one species, *Eucalyptus marginata*, was found in all three categories, although it does not occur where water is above ground level.

(b) Significant Species

No Declared Rare Flora species have been recorded at Egerton. Two species currently listed on the CALM Priority List occur on the property. *Aotus cordifolia* and *Conostephium minus* are Priority 3 species which means that they have several poorly known populations with some on conservation lands.

Aotus cordifolia is a straggling shrub that occurs in swamps on the Coastal Plain and Darling Range in the Perth Region from Ellenbrook Estate south to Dwellingup. At Egerton, the species occurs abundantly in the swampy areas. The largest population of hundreds, if not thousands, of individuals is located in the northern wetland under an *Agonis linearifolia* Scrub.

Conostephium minus is a much branched shrub up to 50cm high that occurs in sandy soils on the Coastal Plain from near Perth to Gingin. It extends outside this area north to Badgingarra. At Egerton, *Conostephium minus* has been located in two small populations in *Banksia attenuata* Low Woodland on dry sandy soil.

3.12.4 Vegetation

(a) Vegetation Recorded

A vegetation map for Egerton and a map of vegetation quality are provided in Figures 15 and 16 respectively. A total of 24 vegetation associations was recorded from the property (see Appendix 4).

The diversity of vegetation types is influenced predominantly by the relationship to groundwater levels.

The dry upland areas in the north-west corner of the property contain *Banksia attenuata*/*B. menziesii* Low Woodlands. *Eucalyptus tottiana* (Prickly Bark) is also present but not in such large numbers as to be co-dominant with the Banksias. The understorey of the dry *Banksia* Low Woodland consists of a Low Open Heath dominated by *Scholtzia involucreta*, *Eremaea pauciflora* and *Hibbertia hypericoides*.

Towards the bottom of the sand dunes the *Banksia* Low Woodlands give way to *Eucalyptus calophylla* (Marri) Woodlands and *E. marginata* (Jarrah) Woodlands with a sub-canopy including *Banksia grandis* (Bull Banksia), *B. ilicifolium*, and *Adenanthos cygnorum* (Woolly Bush). The shrub layer under the *Eucalypt* Woodlands is generally quite sparse with *Hibbertia hypericoides* common and a larger number of hardy liliaceous species such as *Xanthorrhoea preissii*, *Dasypogon bromeliifolius*, *Patersonia occidentalis* and *Phlebocarya ciliata*.

Downslope from the *Eucalyptus* Woodland and *Banksia* Low Woodlands, the vegetation changes usually fairly abruptly to *Melaleuca preissiana* (Moonah Paperbark) Low Open to Low Woodlands and a variety of Closed Heath and Scrub vegetation types. Areas that were dry at the time of survey but which had the water table close to the surface are dominated by *Pericalymma ellipticum* and *Astartea fascicularis* Closed Heath, often in association with *Hypocalymma angustifolium*. Some Heath areas also have scattered *Melaleuca preissiana* trees in a Low Open Woodland formation over the Closed Heath.

Pteridium esculentum (Bracken fern) is also common around the fringes of the *M. preissiana* Low Woodlands.

In one area only, *Eucalyptus rudis* (Flooded Gum) forms an Open Forest over a dry *M. preissiana* Low Woodland.

In areas where the water table was at or just above ground level during the survey the understorey of the *Melaleuca preissiana* Low Woodlands is dominated by *Agonis linearifolia* and *Juncus pallidus*. Towards the northern part of the property *Banksia littoralis* and *Eucalyptus rudis* are also dominant with *M. preissiana* in a Closed Forest type formation which is so dense in part as to preclude the development of much understorey.

Several areas of permanently wet drainage lines or seepage areas exist along the eastern part of the wetlands on the plain. These areas support *Melaleuca rhapsiophylla* (Swamp Paperbark) instead of the *M. preissiana* that occurs on drier swamp soils. The *M. rhapsiophylla* is present as a Low Closed Forest, often with *Eucalyptus rudis*. The understorey of these areas is limited due to the dense tree canopy, but occasionally includes stands of *Baumea articulata* and *Juncus pallidus*.

One large stand of *Baumea articulata* (Jointed Twig Rush) Sedgeland occurs in the central wetland within the Bassendean dunes. This area was reportedly excavated for peat more than 20 years ago. The surface level of the wetlands is now lower than normal and therefore is inundated to deeper levels and for longer periods than would have existed prior to removal of the peat. The *Baumea articulata* Sedgeland may not have been there previously and may have colonised the area following the altered hydrological regime.

Significant areas of palusplain have been severely impacted upon by grazing. These areas consist of *Melaleuca preissiana* Low Woodlands over an understorey almost entirely of *Juncus pallidus* and introduced pasture species. Further degradation of these areas has resulted in large areas of *Juncus pallidus* Sedgelands with the tree canopy completely removed.

One small area of *Acacia saligna* Low Woodland over *Agonis linearifolia* Open Heath occurs towards the southern part of the site. While other small stands of *Acacia saligna* occur between wetland areas and pine plantations, it is not clear whether these are natural associations or a part of the buffer rows of native trees planted around the pine plantation.

(b) Vegetation Condition

Most of the native vegetation at Egerton has been cleared or is in a severely degraded condition (Figure 16). The main areas considered to be in a near natural condition or to have a low degree of disturbance include the Banksia and Eucalypt Woodlands in the north-west corner and three wetland areas in the north-west, west and central west parts of the property. A narrow zone of Paperbark and Marri woodland in poor condition links the two wetland areas at the base of the dunes.

Other areas containing native vegetation have been disturbed by partial clearing of either the understorey (e.g. remnant Paperbark stands and drainage lines) or tree canopies (e.g.

Juncus Sedgeland) to assist grazing by cattle and sheep. As a result, these areas have an abundance of introduced pasture species.

The areas of good quality remnant vegetation are protected from stock grazing by a network of fences.

One small area was identified which has signs consistent with the presence of dieback caused by *Phytophthora cinnamomi*. The small pocket of Jarrah and *Banksia* woodland on the southern edge of the north-west wetland contains stag-horned Jarrah trees, dead *Banksia* trees and dying *Xanthorrhoea preissii* shrubs. A few other areas exist which have dead *Banksia* trees, however there are no additional signs which would indicate infection by dieback.

(c) Regional Significance

An assessment of the significance of the remnant vegetation at Egerton needs to consider the following points:

- Presence of rare, priority or unusual species,
- Diversity of native flora,
- Presence of unusual vegetation types,
- Representation of flora and vegetation in conservation reserves,
- Value of the area as a fauna habitat and/or wildlife corridor, and
- Condition of the vegetation.

While the area does not contain any known populations of Declared Rare Flora, the wetland heaths and Paperbark Woodlands and Forests contain possibly the largest known population of the Priority 3 species *Aotus cordifolius*.

The site does not have a high number of native species compared to the Ellenbrook Estate, Melaleuca Park, or Whiteman Park. This is due to the small area of native vegetation remaining and the low percentage of this which is species rich *Banksia* woodland. Only 6 of the 158 native species at Egerton have not been found at Ellenbrook, with 3 of these 6 possibly just differences in plant identification. Therefore only 3 species at Egerton, *Verrauxia reinwardtii*, *Burtonia conferta* and *Daviesia divaricata* do not occur at Ellenbrook. None of these species are considered rare or endangered, and all are represented in conservation reserves.

While a rigorous comparison of the vegetation at Egerton with other nearby areas has not been made it can be concluded that the vegetation types at Egerton are similar with regards to floristic composition to those at Ellenbrook.

Moreover, all of the associations are represented on the Ellenbrook Estate within the proposed conservation area (Weston et al, 1993). Conversely, particular associations considered to be important at Ellenbrook also occur at Egerton, namely:

- *Melaleuca preissiana* Low Woodland over *Agonis linearifolia* Closed Heath
- *Eucalyptus calpohylla* (Marri)/*M. preissiana* Woodland, and
- *Acacia saligna* Low Woodland.

Areas of *Melaleuca preissiana*/*Agonis linearifolia* occur in all three main wetland areas in good condition. They generally indicate the wettest phase of tolerance for *M. preissiana* compared to drier areas where *Pericalymma ellipticum* is dominant in the understorey.

The Marri - *M. preissiana* woodlands occur on the eastern margin of the wetland springs. They therefore tend to be in a disturbed condition due to partial clearing or from grazing pressures.

The *Acacia saligna* Low Woodland is a small, isolated stand which occurs towards the south-west of the property in a wetland palusplain largely cleared for grazing by sheep.

The diversity of vegetation types at Egerton is most noticeable in the north-west wetland or spring area where Closed Heaths and Low Closed Forests interchange within short distances. The variety of different formation types i.e., heath, woodland, forest, provides for a variety of fauna habitats as evidenced by the results of the fauna survey.

3.13 Vertebrate Fauna

A vertebrate fauna survey of the Egerton property was carried out by Alan Tingay & Associates in October 1993. The survey was designed to encompass the major habitat types on the property, and included pine plantation with an admixture of *Eucalyptus* spp., Heath, *Banksia* Woodlands, *Melaleuca* Woodland, and *Melaleuca* Forest.

Fifty species of indigenous (native) vertebrates were recorded during the survey including 5 species of frogs, 6 reptiles, 36 birds and 3 species of mammals. In addition, 4 introduced mammal species and 2 introduced bird species were encountered. A complete list of vertebrate species is provided in Appendix 5.

The largest number of vertebrate species was recorded on the farmland areas and included 20 species of birds and 1 mammal, the Western Grey Kangaroo (*Macropus fuliginosus*). The relatively high number of bird species reflects the diversity of habitats provided by open areas and remnant trees, and other vegetation.

The next largest number of native species was recorded in *Banksia* Woodland with 12 species of birds, 2 frogs, 2 reptiles and 2 mammals. Species number was relatively high also in the *Melaleuca* Forests associated with the sumplands (15 species), and in remnant native vegetation within the pine plantation (14 species). The distribution of fauna species according to the major habitat units is listed in Table 5.

APPENDIX 3

LIST OF NATIVE FLORA RECORDED AT EGERTON

Species	Dry	Transitional	Wet
FERNS			
Dennstaedtiaceae		x	x
<i>Pteridium esculentum</i>			
CYCADS			
Zamiaceae			
<i>Macrozamia riedlei</i>	x		x
MONOCOTYLEDONS			
Anthericaceae			
<i>Laxmannia squarrosa</i>	x		
<i>Thysanotus manglesianus</i>	x		
Colchicaceae			
<i>Burchardia umbellata</i>	x		
<i>Wurmbea dioica</i>			x
Cyperaceae			
<i>Baumea articulata</i>			x
<i>Isolepis marginata</i>	x		
<i>Lepidosperma angustatum</i>		x	
<i>Lepidosperma leptostachyum</i>	x		
<i>Mesomelaena pseudostygia</i>	x		
<i>Schoenus curvifolius</i>	x		
<i>Tetraria octandra</i>			x
Haemodoraceae			
<i>Anigozanthos humilis</i>	x		
<i>Anigozanthos manglesii</i>	x		
<i>Conostylis aculeata</i>	x		
<i>Conostylis aurea</i>	x		
<i>Conostylis juncea</i>		x	
<i>Haemodorum laxum</i>	x		
<i>Haemodorum paniculatum</i>	x		
<i>Phlebocarya ciliata</i>		x	
Iridaceae			
<i>Patersonia occidentalis</i>	x		
Potamogetonaceae			
<i>Potamogeton sp.</i>			x
Juncaceae			
<i>Juncus pallidus</i>			x
<i>Juncus planifolius</i>			x
Juncaginaceae			
<i>Triglochin procera</i>			x
Dasypogonaceae			
<i>Calectasia cyanea</i>	x		
<i>Dasypogon bromeliifolius</i>		x	
<i>Lomandra odera</i>			x

Species	Dry	Transitional	Wet
Orchidaceae			
<i>Caladenia flava</i>	x		
<i>Caladenia aff heugelii</i>			x
<i>Caladenia sp.</i>	x		
<i>Elythranthera brunonsis</i>	x		x
<i>Elythranthera emarginata</i>		x	
<i>Lyperanthus nigricans</i>			x
<i>Microtis unifolia</i>			x
<i>Pterostylis vittata</i>			x
<i>Pterostylis nana</i>			x
Restionaceae			
<i>Alexgeorgea nitens</i>	x		
<i>Hypolaena exsulca</i>			x
<i>Loxocarya flexuosa</i>	x		
<i>Loxocarya pubescens</i>	x		
<i>Lyginia barbata</i>	x		
<i>Restio sp.</i>	x		
Xanthorrhoeaceae			
<i>Xanthorrhoea preissii</i>		x	x
DICOTYLEDONAE			
Apiaceae			
<i>Trachymene pilosa</i>	x		
Asteraceae			
<i>Podotheca chrysantha</i>	x		
<i>Cotula coronopifolia</i>			x
<i>Lagenifera huegelii</i>	x	x	
<i>Millotia myosotidifolia</i>	x		
<i>Podotheca gnaphalioides</i>	x		
<i>Quinetia urvillei</i>	x		
Casuarinaceae			
<i>Allocasuarina fraseriana</i>	x		
<i>Allocasuarina humilis</i>	x		
Crassulaceae			
<i>Crassula colorata</i>	x		
Dilleniaceae			
<i>Hibbertia aurea</i>	x		
<i>Hibbertia huegelii</i>	x		
<i>Hibbertia hypericoides</i>	x		
<i>Hibbertia subvaginata</i>	x		x
<i>Hibbertia vaginata</i>	x		
<i>Hibbertia perfoliata</i>			x

Species	Dry	Transitional	Wet
Droseraceae			
<i>Drosera erythrorhiza</i>	x		x
<i>Drosera gigantea</i>			x
<i>Drosera macrantha</i>			x
<i>Drosera menziesii</i>	x		
<i>Drosera pulchella</i>			x
<i>Drosera sp</i>			x
Epacridaceae			
<i>Astroloma xerophyllum</i>			
<i>Brachyloma preissii</i>	x		
<i>Conostephium minus</i>	x		
<i>Conostephium pendulum</i>	x		
<i>Leucopogon australis</i>		x	x
<i>Leucopogon conostephioides</i>	x		
<i>Leucopogon gibbosus</i>	x		
<i>Leucopogon racemulosus</i>	x		
<i>Leucopogon sprengelioides</i>	x		
Goodeniaceae			
<i>Dampiera linearis</i>	x		x
<i>Lechenaultia floribunda</i>	x		
<i>Scaevola paludosa</i>	x		
<i>Verrauxia reinwardtii</i>	x		
Lamiaceae			
<i>Hemiandra pungens</i>	x		
Lauraceae			
<i>Cassytha racemosa</i>			x
<i>Cassytha glabella</i>	x		
Lentibulariaceae			
<i>Polypompholyx multifida</i>			x
Lobeliaceae			
<i>Lobelia tenuior</i>		x	
Loranthaceae			
<i>Nuytsia floribunda</i>	x		x
Menyanthaceae			
<i>Villarsia albiflora</i>			x
Mimosaceae			
<i>Acacia saligna</i>		x	
<i>Acacia sessilis</i>	x		
<i>Acacia huegelii</i>	x		
<i>Acacia pulchella</i>	x		
Molluginaceae			
<i>Macarthuria australis</i>	x		

Species	Dry	Transitional	Wet
Myrtaceae			
<i>Agonis linearifolia</i>			x
<i>Astartea fascicularis</i>	x		x
<i>Beaufortia elegans</i>	x		
<i>Calothamnus lateralis</i>			x
<i>Calythrix angulata</i>	x		
<i>Calythrix fraseri</i>	x		
<i>Eremaea pauciflora</i>	x		
<i>Eucalyptus calophylla</i>		x	
<i>Eucalyptus marginata</i>	x	x	x
<i>Eucalyptus rudis</i>			x
<i>Eucalyptus todtiana</i>	x		
<i>Hypocalymma angustifolium</i>		x	x
<i>Melaleuca preissiana</i>		x	x
<i>Melaleuca raphiophylla</i>			x
<i>Pericalymma ellipticum</i>			x
<i>Regelia inops</i>	x		
<i>Scholtzia involucrata</i>			x
<i>Verticordia nitens</i>	x		
Papilionaceae			
<i>Aotus cordifolius</i>			x
<i>Bossiaea eriocarpa</i>	x		
<i>Burtonia conferta</i>	x		
<i>Daviesia preissii</i>	x		
<i>Daviesia divaricata</i>	x		
<i>Daviesia triphylla</i>	x		
<i>Euchilopsis linearis</i>			x
<i>Eutaxia virgata</i>			x
<i>Gompholobium aristatum</i>	x		
<i>Gompholobium tomentosum</i>	x		
<i>Hovea pungens</i>	x		
<i>Hovea trisperma</i>	x		
<i>Jacksonia densiflora</i>	x		
<i>Jacksonia furcellata</i>	x		
<i>Jacksonia sternbergiana</i>		x	
<i>Kennedia prostrata</i>		x	
<i>Nemcia reticulata</i>		x	
<i>Oxylobium lineare</i>			x
<i>Pultenaea reticulara</i>	x	x	
<i>Sphaerolobium medium</i>			x
<i>Viminaria juncea</i>			x
Polygalaceae			
<i>Comesperma virgatum</i>			x
Proteaceae			
<i>Adenanthos cygnorum</i>	x	x	
<i>Banksia attenuata</i>	x		
<i>Banksia grandis</i>		x	
<i>Banksia ilicifolium</i>		x	
<i>Banksia littoralis</i>			x
<i>Banksia menziesii</i>	x		
<i>Conospermum stoechadis</i>	x		
<i>Persoonia saccata</i>	x		

Species	Dry	Transitional	Wet
<i>Petrophile linearis</i>	x		
<i>Stirlingia latifolia</i>	x		
<i>Synaphaea spinulosa</i>	x		
Rubiaceae			
<i>Opercularia hispidula</i>			x
Rutaceae			
<i>Eriostemon spicatus</i>	x		
<i>Boronia ramosa</i>			x
Stylidiaceae			
<i>Stylidium aff. piliferum</i>	x		
<i>Stylidium brunonianum</i>	x		
<i>Stylidium calcaratum</i>	x		
<i>Stylidium diuroides</i>	x		
<i>Stylidium junceum</i>			x
<i>Stylidium macrocarpum</i>	x		
<i>Stylidium repens</i>	x		
<i>Stylidium schoenoides</i>	x		
Thymeleaceae			
<i>Pimelea leucantha</i>	x		
Violaceae			
<i>Hybanthus calycinus</i>	x		
Stackhousiaceae			
<i>Stackhousia huegellii</i>			x

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SANWA PROPERTY GROUP

**SUBMISSION ON PERTH'S BUSHPLAN
SITE NO. 23**

(Cardinal Drive Bushland, Ellenbrook)

*Request for Waste
Report - not applied
as yet*

April 1999

MINISTRY FOR
PLANNING
5 MAY 1999
805-2-1-32 p#12
FILE

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1.0 INTRODUCTION

Sanwa Property Group Pty Ltd (Sanwa) is the owner of the Vines Residential/Golf Course Development and a joint venture partner in the Ellenbrook project. This submission refers to a parcel of land on the western side of the Vines Estate and is referred to in Bushplan as Site 23, Cardinal Drive Bushland, Ellenbrook (Figure 1).

This firm, in conjunction with Chappell and Lambert, Town Planning Consultants, has been commissioned by Sanwa to examine the implications of the Bushplan nomination of the Vines landholding and to assist in derivation of an appropriate response.

Sanwa believes that the critical environmental features of the land will be properly addressed in normal subdivisional planning. Prior to outlining these plans, important historical information is presented in Section 2.0 in order to appreciate the landowner's perspective.

2.0 BACKGROUND

Sanwa's response to the Bushplan nomination of its site is heavily influenced by the factors discussed below.

2.1 Sanwa's Previous Significant Contribution to Conservation of Bushland

Based on comprehensive studies during the period 1991 to 1994, Sanwa offered to set aside a substantial area (approximately 300 hectares) of its land for conservation purposes as part of planning for residential development in the locality, which includes Ellenbrook and the Vines. This land is mapped in Perth's Bushplan as Site 300. This site also includes Mt Lawley land to the west, which is understood to be subject to on-going negotiations (refer Figure 1).

The State Government confirmed the outcome of Sanwa's studies in its approval, which resulted in setting aside the Lexia Wetlands area and the Sawpit Gully area as regional conservation reserves, with the balance of land allocated for urban use. The Sawpit Gully conservation area is located a short distance to the north of the land subject of this submission, and occurs in the same geomorphic setting.

It must be recognised therefore that Sanwa has already made a substantial contribution to the conservation estate. Given that areas in excess of 100 hectares are generally considered the minimum requirement to maintain the full spectrum of biodiversity, Sanwa's contribution of nearly 300 hectares is a lasting and extremely valuable community asset.

In tandem with the previous conservation decision, the approval of adjacent land for urban use has led to this locality contributing significantly to the growth of Perth with all infrastructure planning and economic feasibilities based on current Urban and Urban Deferred zonings.

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2.2 Residential Development is Implicit to the Urban Deferred Zoning of the Site

The land nominated as Bushplan Site 23 is mostly zoned Urban Deferred due to the presence of a temporary sewerage treatment plant. It is intended that application will be made to lift the Urban Deferred status in December 1999.

The Water Corporation is committed to providing a reticulated sewerage connection for the locality. As part of the orderly provision of new infrastructure, the current wastewater treatment plant and disposal field, operated on the subject land, will be decommissioned in December 1999. This action removes the original constraint to Urban zoning of the site, enabling the lifting of Urban Deferred.



3.0 CONCERNS WITH BUSHPLAN IN ITS PRESENT FORM

Consideration of the Bushplan strategy from an affected landowner's perspective raises two key issues:

- equity; and
- uncertainty.

In addition, there are concerns with the manner in which information specific to Sanwa's site is presented. These aspects are discussed below:

3.1. Community Equity

The Bushplan strategy is stated as being for the benefit of the whole community but the manner in which it is presented to individual landowners signals the intention to impose the burden of environmental protection on the affected landowners. This is inequitable. There is no clear strategy for acquisition or compensation.

Investment decisions and the medium term financial planning of the Sanwa Property Group is reliant upon realisation of the subdivision potential of this land. Sanwa through the Vines and its share of Ellenbrook has already invested in excess of \$150 Million over the past 10 years in developing this corridor. Refusal of Sanwa's future subdivision plans will have severe economic impact upon Sanwa.

Bushplan is clearly a strategy which has been produced for the benefit of the whole community and therefore it should be wholly and equally funded by the broader community. The basis of any compensation payable, should follow the principle that the value of the land affected by Bushplan, is determined on the basis of the highest and best use for that land, prior to the implementation of Bushplan.

3.2 Bushplan does not Provide Certainty

Bushplan has been published on the basis that, once it is finalised, there will be certainty for landowners and developers with respect to the availability of land for residential

development when considered against environmental protection imperatives. In this regard, the draft Bushplan will fail to achieve this objective. For example, there are three aspects which would appear to have future implications on the amount of developable land. These are mentioned in Bushplan but not resolved, and include:

- Conservation category wetlands;
- Bushland with local conservation significance;
- Greenways and linkages.

It is apparent that these are further constraints which may be placed on Sanwa's land at a later stage.

Furthermore, there is considerable uncertainty that any outcome negotiated through the Bushplan consultation phase will be binding on the Environmental Protection Authority (EPA). Bushplan states that there will be a Memorandum of Understanding between the relevant government departments and statutory authorities. Until this matter is resolved however, there is little point in negotiating an outcome and an agreement if there is risk that the EPA could still undertake a separate formal environmental assessment of a planning proposal and apply the original Bushplan nomination as a basis of its assessment.

3.3 Incomplete Database and Boundary Definition

From the detailed description of Sanwa's land (Bushplan Site 23, refer pages 155 and 156 of Volume 2 Part B), it is clear that the information is of a very preliminary nature. For example, most of the floristic community types listed for the site are denoted as "*not sampled, types inferred*". In addition, the listing for threatened ecological communities states "*not assessed, not determined*", but also lists as present the critically endangered Muehea Limestones.

The boundary of the bushland site is arbitrary as it merely encompasses all of the land not currently subdivided on the western extremity of the Vines Estate. The detailed description in the bushplan document acknowledges this with the statement "*boundary possibly subject to investigation*".

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environmental protection requirements which are mentioned but not addressed in Bushplan and the failure to address the issue of acquisition and/or compensation.

In these circumstances, Sanwa's current response, as reflected in the preliminary Concept Plan, is a commendable and legitimate recognition of the Bushplan values within the urban context of the site.

The Path Forward

Sanwa requests that as it intends to address the critical environmental features of the land via the normal planning process, Site 23 be excluded from any further Bushplan processes and publications.

At the same time, Sanwa requests further discussions with Ministry for Planning on the most appropriate procedures for ensuring that the conservation objectives for the site are met in the future proposed development.

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5.0 CONCLUSION

Having regard to:

- (i) the extensive areas of bushland set aside by Sanwa for conservation purposes previously;
- (ii) the commitment by the Water Corporation to provide sewerage to the Vines, enabling the temporary treatment plant to be decommissioned in December 1999 and the Urban Deferred zoning to be lifted;
- (iii) the lack of community equity in the current strategic approach to the Perth's Bushplan initiative;
- (iv) the variation in vegetation and floristic values across Sanwa's land which is not recognised in the Bushplan mapping;
- (v) the large area of Banksia woodland on the site which is severely degraded in parts by tracks, firebreaks, the presence of a treatment plant and effluent disposal field and, in any event, is well represented in nearby conservation reserves; and
- (vi) the conduct of planning and economic feasibilities which have lead to formulation of a residential development proposal for the site which will integrate with the adjoining Ellenbrook community,

Sanwa believes it is not necessary to set aside the whole of its current developable land for conservation purposes, in response to the Bushplan nomination of the site.

In response to the issues, Sanwa has commissioned flora and vegetation assessments to assist with concept planning for the site. The preliminary Concept Plan (Figure 3) reflects Sanwa's response to Bushplan, in which the larger than normal open space allocations incorporate areas of the most significant flora and vegetation values.

In conclusion, our client is most reluctant to entertain further reductions in the area of developable land in view of the problems with the Bushplan strategy, notably the absence of community equity, the high degree of uncertainty in process, the prospect of additional

strong covenants to restrict clearing to minimal building envelopes adjacent to Bordeaux Lane.

The central, western parcel (approximately 5 hectares) will retain an area of dense *Acacia saligna* community which is understood to be under consideration for listing as a threatened ecological community.

It is also proposed to provide a range of larger allotments in the northern sector of the site, corresponding to vegetation area 1. Again, vegetation will be protected within these allotments by the use of covenants and building envelopes.

(ii) Interpretation

For the purpose of assisting concept planning for the site, the vegetation units identified by Weston were ranked in terms of their conservation significance. The objective was to compile a priority list in order to identify those areas of the site which should be given consideration for protection in the Concept Plan.

Five vegetation units were identified as high priority for protection, on the basis of absence of representation in the bushland further north previously set aside by Sanwa and the botanist's assessment of conservation significance. These vegetation units form three separate areas which are broadly indicated on Figure 2 and described as:

- Area 1 - northern sector of site: primarily *Melaleuca viminea* Open to Closed Tall Scrub.
- Area 2 - central, western sector of site: primarily *Acacia saligna* Open to Closed Tall Scrub
- Area 3 - southern sector of site: composite of *Eucalyptus (Corymbia)* Open Forest over *Melaleuca huegelii* Mixed Tall Open Scrub and *Bankia littoralis* Low Open Forest, *Melaleuca viminea* - *Acacia saligna* Open to Closed Tall Scrub, *Melaleuca viminea* - *Acacia saligna* Open to Closed Tall Scrub over *Caustophanes lateralis* Closed Heath and *Melaleuca viminea* Open to Closed Tall Scrub.

Spot 40
a.c.m.

Area 3 also contains the DRF. Area 1 in the northern sector is rated as lower priority than the other two areas because of the species' *Melaleuca viminea* representation in the Sawpit Gully area, although not the community. It occurs in mixed community in Area 3.

4.2 Preliminary Concept Plan

As shown on Figure 3, the Concept Plan allocates two areas of "conservation open space" which correspond to areas of priority vegetation. They are well-defined areas delineated with roads and seek to optimise "boundary-to-area" ratios.

The south-eastern parcel near Bordeaux Lane encompasses the DRF species as well as a representative area of important vegetation. Additional vegetation will be protected within the larger allotments (minimum lot size 4,000m²) on the southern boundary, which will have

09/0

4.0 RESPONSE TO BUSHPLAN

Sanwa intends to develop the site for urban purposes in a manner which addresses the environmental features of the land. In order to assist concept planning and in recognition of the Bushplan nomination, an investigation of the flora and vegetation values was conducted across the site.

4.1 Findings of Botanical Survey

(i) Description

Rare flora searches and a vegetation survey were conducted in March 1999 by Dr Arthur Weston, Consulting Botanist. Ten vegetation units were identified across the site and these are described as follows:

- Banksia Low Woodland
- *Acacia saligna* Open to Closed Tall Scrub
- *Melaleuca viminea* Open to Closed Tall Scrub
- *Melaleuca viminea* – *Acacia saligna* Open to Closed Tall Scrub
- *Melaleuca viminea* – *Acacia saligna* Open to Closed Tall Scrub over *Calothamnus lateralis* Closed Heath
- *Eucalyptus rudis* Open to Closed Forest
- *Melaleuca preissiana* Low Closed to Open Forest
- *Melaleuca raphiophylla* Low Closed Forest
- *Eucalyptus (Corymbia)* Open Forest over *Melaleuca huegelii* Mixed Tall Open Scrub and *Banksia littoralis* Low Open Forest
- *Phytolacca-Conyza-Chenopodium-Lepidium-Juncus* Closed Tall (1-2m) Herbland (weeds).

One Declared Rare Flora (DRF) subspecies, *Grevillea curviloba* subsp. *curviloba* was found in the south-eastern sector of the site. The location of this population is already known and marked by CALM. A smaller population also occurs in the Sawpit Gully conservation area.

No other significant flora species were observed during the survey.

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Bushplan makes no attempt to assign values within the site, despite the implicit variation in vegetation and flora characteristics, which clearly do not have equal significance or priority for conservation.

Despite these uncertainties, the whole site is listed for total protection within Perth's Bushplan. Therefore the onus is placed on Sanwa to conduct appropriate studies to confirm whether or not the land is suitable for residential development. By way of analogy, this is equivalent to being deemed guilty until proven innocent. This is a further example of the inequity of the Bushplan process.

3.4 Muchea Limestone Community

The Bushplan description states that this site contains the only intact area of Muchea Limestone community known in the Perth Metropolitan Region and also the largest known population of *Grevillea curviloba* subsp *curviloba* which is only found on soils associated with Muchea Limestones. This conflicts with the fact that the *Grevillea* is also known to occur in the Sawpit Gully conservation area immediately to the north. We have also been advised that Muchea Limestone community is obvious on the aerial photographs as areas of reddish soils. The occurrence of reddish soils can also be confirmed on the aerial photographs for the Sawpit Gully area. Therefore there is some doubt regarding the accuracy of the first statement. This is further confounded by the fact that flora species are listed as "indicator species" of the Muchea Limestones. There is apparent uncertainty regarding the composition of this vegetation community.

• does not combat, few plants at Sawpit Gully (<5 compared >50)

• Muchea limestone - series of communities, 'indicator species' refers to 'species associated with community'.

• Variety of wetlands here not addressed in this submission.
 • acknowledged failure to identify sample condition in site description

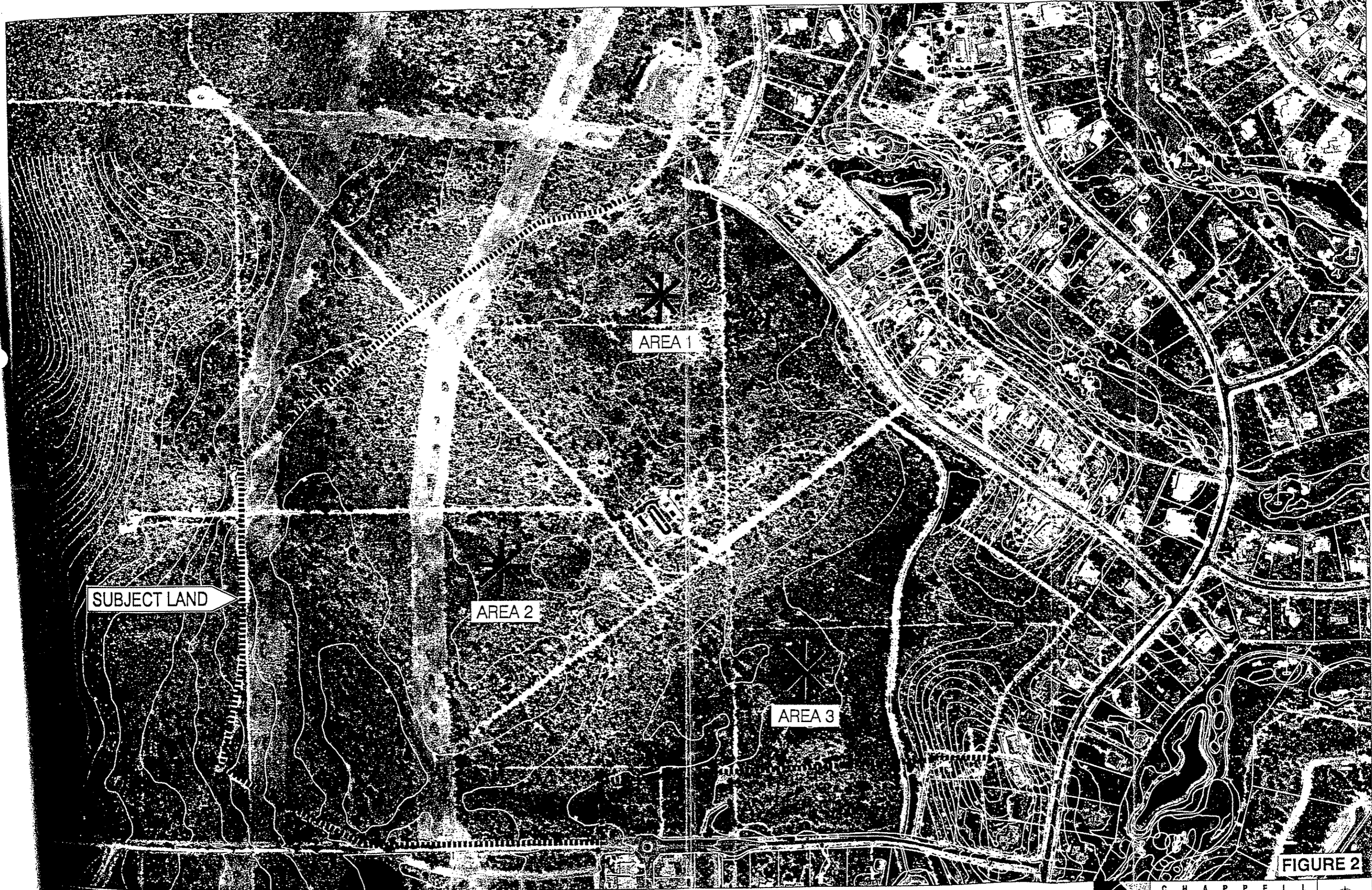
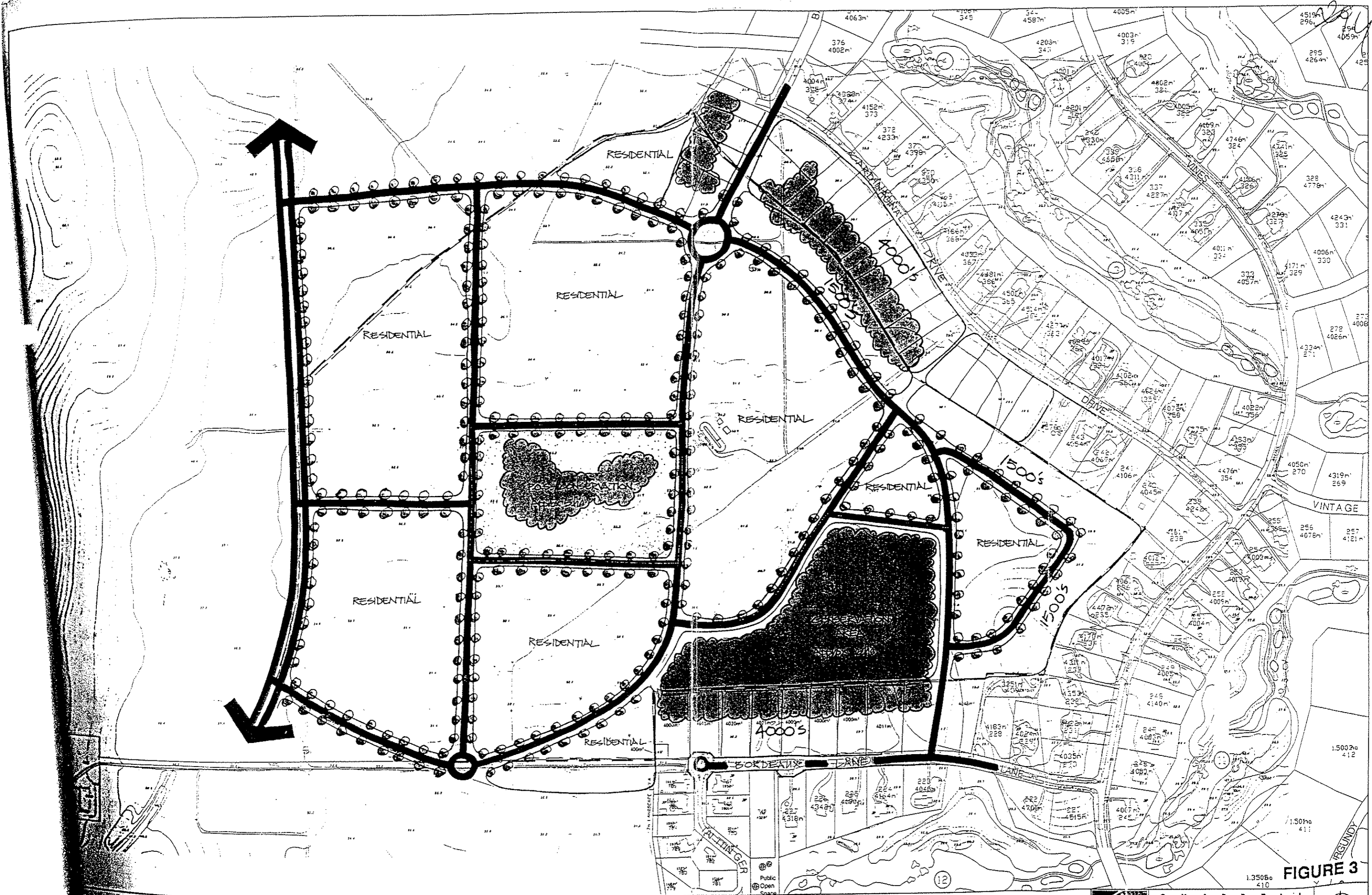


FIGURE 2

PRIORITY VEGETATION AREAS
 SWAN VALLEY - STAGE 5
 REGION OF SWAN

	CHAPPELL & LAMBERT TOWN PLANNING URBAN DESIGN <small>LEVEL 2, 36 ROMA ROAD STREET SURFACED SWAN 6008 PO BOX 498 SURFACED SWAN 6008 TELEPHONE: (08) 9382 1233 • FACSIMILE: (08) 9382 1177 EMAIL: chappell@clm.com.au</small>			
	SCALE N.T.S.	DATE 23.04.99	COMPILED C&L, MAPS	
			PLAN No. 554-54	



VISION CONCEPT PLAN
 STAGE 5
 OF SWAN

FIGURE 3

	CHAPPELL & LAMBERT TOWN PLANNING URBAN DESIGN				
	SCALE	DATE	COMPILED	REVISED	

WILD 1574 UAGA
Nº 13037 152.72

100039

- 5022 - 1 268 - 56 100 0160 0240 56 -

LS12 09 52 10 02 05 20 00 00 00 00





WILD 1574 UAGA
Nr 13037 152.72

100092

- 5022 - 1 267 - 57 100 0200 0220 56 -

9581 09 5210 22 502000 000000

WILD 1574 UAGA
N# 13037 152.72

000093

- 5 0 2 2 - 1 2 6 8 - 5 7 1 0 0 0 2 0 0 0 2 2 0 5 6 -

0 0 0 0 0 0 0 3 2 3 1 0 1 2 0 2 5 6 0 9 1 8 9 1



WILD 15/4 UAGA
Nr 13037 152 72

000094



- 5022 - 1 269 - 58 100 0200 0220 56 -

000000 003209 24 01 25 60 1858