BIOSIS
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Officer Structure Plan:

Flora and fauna assessment

DRAFT REPORT

22 March 2006

Jeff Yugovic, Daniel Gilmore
and Renée Nicholson

Natural & Cultural Heritage Consultants 38 Bertie Street (PO Box 489) Port Melbourne Victoria 3207

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Report to Cardinia Shire Council

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Melbourne:
38 Bertie Street, Port Melbourne VIC 3207
Ph: (03) 9646 9499 Fax: (03) 9646 9242
email: melbourne@biosisresearch.com.au

Sydney:
15-17 Henrietta Street, Chippendale NSW 2008
Ph: (02) 9690 2777 Fax: (02) 9690 2577
email: sydney@biosisresearch.com.au

Ballarat:
449 Doveton Street North, Ballarat VIC 3354
Ph: (03) 5331 7000 Fax: (03) 5331 7033
email: ballarat@biosisresearch.com.au

Queanbeyan:
55 Lorn Road, Queanbeyan NSW 2620
Ph: (02) 6284 4633 Fax: (02) 6284 4699

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Natural & Cultural Heritage Consultants

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ABBREVIATIONS

AVW	Atlas of Victorian Wildlife (DSE)
DSE	Department of Sustainability & Environment, Victoria formerly NRE (Department of Natural Resources & Environment)
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological vegetation class
FFG	*Flora and Fauna Guarantee Act 1988* (Vic.)
FIS	Flora Information System (DSE)
IUCN	International Union for the Conservation of Nature
PMST	Protected Matters Search Tool (EPBC Act)
sp.	Species (one species)
spp.	Species (more than one species)

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1.0 INTRODUCTION

1.1 Project Background

Biosis Research Pty Ltd was commissioned by Cardinia Shire Council to undertake a flora and fauna assessment of Officer area in relation to the Officer Structure Plan being prepared by the Council.

1.2 Objectives

The aim of this study is to identify and analyse opportunities and constraints for biodiversity conservation as they relate to land use planning in the study area.

The major objectives are to:

- Review existing information.
- Undertake flora and fauna survey, excluding aquatic species and Growling Grass Frog, and not including trapping or spotlight survey.
- Assess conservation significance and map significant features.
- Review the consultant report on 325 Princes Highway.
- Make recommendations for protection of biodiversity as appropriate.

1.3 Study Area

The study area is located in the Officer area (Figure 1).

The majority of the study area is cleared agricultural land. Native vegetation is widespread, particularly on road reserves and north of the Princes Highway.

The hills in the north of the study area are within the Highlands – Southern Fall Bioregion while the plains in the south are within the Gippsland Plain Bioregion. These areas are distinct in terms of geology, ecology and landscape.
Web reference:
http://nremap-sc.nre.vic.gov.au/MapShare.v2/imf.jsp?site=bnr-v1

2.0 METHODS

2.1 Taxonomy

Common and scientific names for plants and terrestrial vertebrate fauna (mammals, birds, reptiles, amphibians) follows the Flora Information System (FIS) 2005 Version and the Atlas of Victorian Wildlife (AVW) of the Department of Sustainability and Environment (DSE).

2.2 Literature and Database Review

Pre-existing information in the FIS and AVW databases was reviewed. Relevant literature sources were also reviewed.

2.3 Field Survey

Brief reconnaissance-level survey was undertaken. Lists of indigenous flora and fauna species were compiled. The composition, structure and condition of the vegetation and fauna habitat were assessed.

Field survey took place in November 2005.

2.4 Limitations

This assessment is an overview rather than a detailed investigation. Not all scattered native vegetation such as isolated trees have been mapped. Site survey and assessment is appropriate where clearance of native vegetation is proposed.

2.5 Defining Significant Species and Communities

A number of categories and criteria are formally applied to assess the conservation significance of flora and fauna and sites supporting flora and fauna. The definition and application of the criteria are detailed in Appendix 1.

3.0 RESULTS

3.1 Flora

3.1.1 Species

A total of 199 indigenous flora species, subspecies and varieties has been recorded from the study area. This includes records in the DSE Flora Information System and records made during the present study (Appendix 2).

3.1.2 Ecological Vegetation Classes

Classification of native vegetation in Victoria follows a typology in which ecological vegetation class (EVC) is the primary level of classification. Each EVC contains one or more floristic communities (Oates and Taranto 2001).

Much of the study area supports predominantly introduced vegetation due to past drainage, clearance and agricultural land use over a long period of time.

Nine ecological vegetation classes are recorded from the study area (Figure 2):

- Grassy Forest EVC 128
- Gully Woodland EVC 902
- Grassy Woodland EVC 175
- Swampy Woodland EVC 937
- Swamp Scrub EVC 053
- Plains Grassy Wetland EVC 125
- Plains Grassland EVC 132
- Plains Grassy Woodland EVC 055
- Shrubby Gully Forest EVC 938 (confirmation needed)

Grassy Forest EVC 128

Vulnerable in Highlands – Southern Fall Bioregion

General description for Highlands – Southern Fall Bioregion:

'Low growing forest to 20 m tall with an understorey of small and medium shrubs and a rich diversity of herbs. Large shrubs and understorey trees may also be conspicuous. Often grows in areas transitional between drier box stringybark forests and taller, herb-rich forests typical of more favourable environments.'
DSE web site reference:

http://www.dse.vic.gov.au/conserv/EVC-PDF/HSF_0128.pdf

In the Officer area, this forest is co-dominated by Bundy *Eucalyptus goniocalyx* and Narrow-leaf Peppermint *Eucalyptus radiata*. Green Scentbark *Eucalyptus fulgens*, which is rare in Victoria, is occasionally present.

The early survey map of Callanan (1859) describes the hills north of the Princes Highway as 'Medium pasture land thickly timbered with Messmate Peppermint Cherry & Shea-oak' indicating that this area naturally supports forest vegetation.

Grassy Forest is restricted to the hills in the north of the study area, and has some relatively large and undisturbed examples, virtually all on private land (Figure 2).

Gully Woodland EVC 902

Endangered in Highlands – Southern Fall Bioregion

General description for Highlands – Southern Fall Bioregion:

'Woodland or open forest to 20 m tall occurring along moderately steep gullies. Soils are mostly colluvial deposits of sands and silts. Characterised by a medium dense small tree and shrub layer above a grassy/sedgy understorey, often rich in herbs within the inter-tussock spaces.'
DSE web site reference:
http://www.dse.vic.gov.au/conserv/EVC-PDF/HSF_0902.pdf

Gully Woodland is restricted to gullies in the north of the study area, and has some relatively undisturbed examples, virtually all on private land (Figure 2).

Grassy Woodland EVC 175

Endangered in Gippsland Plain Bioregion
Depleted in Highlands – Southern Fall Bioregion

General description for Gippsland Plain Bioregion:

'A variable open eucalypt woodland to 15 m tall or occasionally Sheoak woodland to 10 m tall over a diverse ground layer of grasses and herbs. The shrub component is usually sparse. It occurs on sites with moderate fertility on gentle slopes or undulating hills on a range of geologies.'
DSE web site reference:
http://www.dse.vic.gov.au/conserv/EVC-PDF/GipP0175.pdf
http://www.dse.vic.gov.au/conserv/EVC-PDF/HSF_0175.pdf

In the Officer area this vegetation community is dominated by Narrow-leaf Peppermint *Eucalyptus radiata* and Swamp Gum *Eucalyptus ovata* and does not

occur as Sheoak woodland.

The early survey map of Callanan (1859) describes the area south of the Princes Highway as 'Sandy flats lightly timbered medium pasture' indicating that this area naturally supports structurally open vegetation including woodland.

Grassy Woodland has restricted occurrences on the lower slopes of the northern hills and on the southern plain (Figure 2).

Swampy Woodland EVC 937

Endangered in Gippsland Plain Bioregion

General description for Gippsland Plain Bioregion:

'Open eucalypt woodland to 15 m tall with ground-layer dominated by tussock grasses and/or sedges and often rich in herbs. Occurs on poorly drained, seasonally waterlogged heavy soils, primarily on swamp deposits but extending to suitable substrates within some landscapes of sedimentary origin.'
DSE web site reference:
http://www.dse.vic.gov.au/conserv/EVC-PDF/GipP0937.pdf

In the Officer area this vegetation community is dominated by Swamp Gum *Eucalyptus ovata* and has a Swamp Paperbark *Melaleuca ericifolia* understorey.

Swampy Woodland has restricted occurrences on the southern plain (Figure 2).

Swamp Scrub EVC 053

Endangered in Gippsland Plain Bioregion

General description for Gippsland Plain Bioregion:

'Closed scrub to 8 m tall at low elevations on alluvial deposits along streams or on poorly drained sites with higher nutrient availability. The EVC is dominated by Swamp Paperbark *Melaleuca ericifolia* (or sometimes Woolly Tea-tree *Leptospermum lanigerum*) which often forms a dense thicket, out-competing other species. Occasional emergent eucalypts may be present. Where light penetrates to ground level, a moss/lichen/liverwort or herbaceous ground cover is often present. Dry variants have a grassy/herbaceous ground layer.'
DSE web site reference:
http://www.dse.vic.gov.au/conserv/EVC-PDF/GipP0053_61.pdf

In the Officer area this vegetation community is dominated by Swamp Paperbark *Melaleuca ericifolia*.

The early survey map of Callanan (1859) depicts belts of 'Tea Tree' along watercourses such as Gum Scrub Creek indicating that these watercourses naturally support scrub vegetation including Swamp Scrub.

Swamp Scrub has restricted occurrences on the southern plain (Figure 2).

Plains Grassy Wetland EVC 125

Endangered in Gippsland Plain Bioregion

General description for Gippsland Plain Bioregion:

'This EVC is usually treeless, but in some instances can include sparse River Red Gum *Eucalyptus camaldulensis* or Swamp Gum *Eucalyptus ovata*. A sparse shrub component may also be present. The characteristic ground cover is dominated by grasses and small sedges and herbs. The vegetation is typically species-rich on the outer verges but is usually species-poor in the wetter central areas.'
DSE web site reference:
http://www.dse.vic.gov.au/conserv/EVC-PDF/GipP0125.pdf

In the Officer area this vegetation community is dominated by grasses and small sedges and (in relatively intact examples) forbs. The vegetation is typically species-rich on the outer verges and species-poor in the wetter central areas, where Common Spike-sedge *Eleocharis acuta*, or Australian Sweet-grass *Glyceria australis* may form virtually monospecific stands, sometimes with aquatic herbs such as Floating Pondweed *Potamogeton tricarinatus* and Water-milfoil *Myriophyllum* spp. Major grasses include Brown-back Wallaby-grass *Austrodanthonia duttoniana*, Common Swamp Wallaby-grass *Amphibromus nervosus*, Australian Sweet-grass *Glyceria australis* and Common Tussock-grass *Poa labillardierei* (Mueck and Smales 2005).

Plains Grassy Wetland has restricted occurrences on the southern plain (Figure 2). A large example occurs on VicUrban land (Mueck and Smales 2005). A very small example occurs on 280 Princes Highway where it was probably originally extensive along a drainage line but has been largely replaced by pasture.

Plains Grassland EVC 132

Endangered in Gippsland Plain Bioregion

General description for Gippsland Plain Bioregion:

Treeless or with occasional scattered trees above a largely grassy and sedgy understorey in areas of impeded drainage. Shrubs may be also occasionally present.
DSE web site reference:
http://www.dse.vic.gov.au/conserv/EVC-PDF/GipP0132_62.pdf

In the Officer area, while often treeless, this vegetation community may support scattered trees with a total cover of less than 10%. There may be scattered shrubs of Prickly Tea-tree *Leptospermum continentale*. Grasses dominate and these include Kangaroo Grass *Themeda triandra*, Smooth Wallaby-grass *Austrodanthonia laevis*, Weeping Grass *Microlaena stipoides*, Wetland Wallaby-grass *Notodanthonia semiannularis*, Common Love-grass *Eragrostis brownii*, Common Tussock-grass *Poa labillardierei*, Five-awned Spear-grass *Pentapogon quadrifidus* and Spear-grass *Austrostipa* species (Mueck and Smales 2005).

In the Officer area, Plains Grassland has restricted occurrences on the southern plain (Figure 2) on VicUrban land (Mueck and Smales 2005).

Plains Grassy Woodland EVC 55

Endangered in Gippsland Plain Bioregion

General description for Gippsland Plain Bioregion:

An open, eucalypt woodland to 15 m tall occurring on a number of geologies and soil types. Occupies poorly drained, fertile soils on flat or gently undulating plains at low elevations. The understorey consists of a few sparse shrubs over a species-rich grassy and herbaceous ground layer.
DSE web site reference:
http://www.dse.vic.gov.au/conserv/EVC-PDF/GipP0132_62.pdf

In the Officer area, this vegetation community is dominated by Swamp Gum *Eucalyptus ovata*. Although DSE maps the vegetation as Swampy Woodland, Mueck and Smales (2005) consider it to be Plains Grassy Woodland.

Plains Grassy Woodland has restricted occurrences on the southern plain (Figure 2) on VicUrban land (Mueck and Smales 2005).

Other Ecological Vegetation Classes

DSE maps Shrubby Gully Forest in the north-west of the study area. However the two accessible mapped occurrences in the extreme north-west are Swampy Woodland. The other stand (130 Whiteside Road) could not be accessed as permission to enter the land could not be obtained. From adjacent vegetation this occurrence is more likely to be Gully Woodland or Grassy Forest. Hence the occurrence of Shrubby Gully Forest in the study area is not confirmed.

Many farm dams have fringing vegetation that could be classified as Aquatic Herbland or Aquatic Sedgeland. However, as this farm dam vegetation is both common and artificial it is not considered here to have flora conservation significance as a plant community and is not subject to further investigation.

3.2 Fauna

3.2.1 Species

Records from present assessment

A total of 79 indigenous fauna species has been recorded from the study area. This includes records in the DSE Atlas of Victorian Wildlife and records made during the present assessment (Appendix 3).

3.2.2 Habitats

Fauna habitats within the study area consist essentially of the following:

- Remnants of woodland and forest, ranging from near-natural to highly modified
- Remnants of Swamp Scrub
- Agricultural land, comprised of pasture with scattered indigenous and exotic trees, including windbreak plantations
- Gardens around dwellings and farm buildings and other structures
- Wetlands consisting of modified natural drainage lines, artificial drains, farm dams
- Remnants of Plains Grassy Wetland and Plains Grassland indigenous vegetation

The majority (>90%) of the study area land has been developed for agriculture and urban development. This has resulted in the removal of much of the original fauna habitat, and what little remains has been modified to varying degrees. As such, populations of many fauna species have been diminished and some species are now locally extinct. Conversely, populations of species adapted to living in agricultural and urban systems have benefited from these landscape changes and such species are now widespread and locally abundant. Examples of these species include Australian Magpie, Galah, Richard's Pipit and Little Raven.

The most valuable remnant habitats within the study area are grassy forests and woodlands. The best examples of these habitats are concentrated north of the Princes Highway, particularly in the north-west. These habitats support the richest faunal assemblages and many species such as Shining Bronze-Cuckoo, Crested Shrike-tit and Echidna were recorded only from these areas.

Remnant and/or regrowth swampy woodland is concentrated in the north-west of the study area, on the VicUrban land and in narrow corridors along roadsides and some drainage lines. It is modified due to past and current management, including grazing and soil compaction. Nonetheless, it is one of the riches wildlife habitats within the study area. Some small bird species that require indigenous trees and

shrubs, such as the Brown Thornbill and White-browed Scrubwren were commonly observed in this environment. Swampy Woodland is suitable habitat for Swamp Skink, a lizard listed as vulnerable in Victoria. Although modified, remnants of this habitat are of considerable value to fauna that are specialist inhabitants of it, particularly in the context of a landscape from which it has largely removed.

The wetlands of the study area are either artificial (dams) or modified. They vary widely in their value to fauna, principally due to the fact that some have been protected from stock trampling and erosion, whilst others have not. Those that have been protected support indigenous aquatic plant communities that, in turn, provide useful habitat for some wetland birds, frogs and turtles. The nationally significant Growling Grass Frog occurs in a number of such wetlands.

Remnants of Plains Grassy Wetland and of Plains Grassland indigenous vegetation communities, as found on the VicUrban land, provide a far higher level of diversity than exotic pasture. They can also be expected to support a variety of indigenous invertebrate and vertebrate fauna that has evolved with them and that is not supported by exotic pasture. It is notable, and probably indicative of its moderately high value to fauna, that this was the habitat in which a number of Latham's Snipe were found. Latham's Snipe is of state significance and is listed as near threatened in Victoria (DSE 2003).

4.0 ECOLOGICAL SIGNIFICANCE

From the available information, native vegetation and habitat within the study area has varying levels of significance for biodiversity, from local to national (Figure 2). These areas make a substantial contribution to biodiversity.

The large majority of the study area has little or no significance for biodiversity.

Native vegetation and habitat within the study area are significant for the following reasons:

- Presence of a remnant native vegetation in a region that is heavily cleared. It is noted that all of the vegetation types on the plain are listed as endangered by the State Government.
- Presence of two recorded flora species of national significance:
  Matted Flax-lily *Dianella amoena*
  Maroon Leek-orchid *Prasophyllum frenchii*
- Presence of one fauna species of national significance:
  Growling Grass Frog *Litoria raniformis*
- Presence of four recorded flora species of state significance:
  Veined Spear-grass *Austrostipa rudis* subsp. *australis*
  Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra)
  Purple Diuris *Diuris punctata* (presumed extinct)
  Green Scentbark *Eucalyptus fulgens*
- Presence of one fauna species of state significance:
  Latham's Snipe *Gallinago hardwickii*
- Presence of 69 recorded flora species of regional significance.
- Presence of a range of locally significant flora and fauna species that are rare within the Officer area.

4.1 Previous Assessments

Large studies of the Westernport catchment as a whole by Opie et al. (1984) and Andrew et al. (1984) provide limited information on the study area.

The forested north-west of the study area is part of a site of regional zoological significance identified by Andrew et al. (1984): 'Beaconsfield Reservoir'. The site is significant due to the presence of nine species of native mammal and over 52 species of native birds.

Assessments of the VicUrban land and adjacent road and rail reserves in the south-east of the study area have been undertaken by Mueck (2005) and Mueck and Smales (2005). The results of those investigations are included here.

4.2 Significant Flora

4.2.1 National significance

Two flora species of national significance are recorded from the study area:

Matted Flax-lily *Dianella amoena*
(Endangered in Australia)

This species is a rhizomatous, mat-forming lily. Due to its listing as endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) it has national significance. Previously common in grasslands and grassy woodlands of south-eastern Australia it is now endangered in Australia.

Matted Flax-lily occurs on the rail reserve and also on road reserves in the south of the study area (Mueck 2005, Mueck and Smales 2005) (Figure 3).

One other flora species of national significance is recorded from within 5 km of the study area (DSE Flora Information System): Maroon Leek-orchid *Prasophyllum frenchii* (Appendix 2). This species is associated with grasslands and woodlands and may occur on the plain especially on the VicUrban land.

Maroon Leek-orchid *Prasophyllum frenchii*
(Endangered in Australia)

This spring flowering orchid occurs in grasslands, grassy woodlands and heaths on fertile sandy and clay loam soils (Backhouse and Jeanes 1996). It has been recorded from the northern part of the study area, but this is a 1940 record with an accuracy of ± 4 km (Figure 3). The species is more typical of the plain to the south.

It is not known whether this species still occurs within the study area.

Four other EPBC-listed flora species are predicted to occur, or their habitat is predicted to occur, within 5 km of the study area (Appendix 2). There is a low likelihood of these species occurring in the study area, except for River Swamp Wallaby-grass *Amphibromus fluitans* and *Swamp Everlasting Xerochrysum palustre*, which could occur in drains or wetland areas (Appendix 2).

4.2.2 State significance

Four flora species of state significance are recorded from the study area:

Veined Spear-grass *Austrostipa rudis* subsp. *australis*
(Rare in Victoria)

This tufted perennial grass grows to 1.3 metres and is distinguished by the long awn on its seeds which are mostly longer than 65 mm (Walsh 1994).

This subspecies species is recorded from several locations on the southern plain, generally on the rail reserve and road reserves. The typical subspecies *Austrostipa rudis* subsp. *rudis* occurs on the northern hills.

Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra)
(Vulnerable in Victoria)

This large tufted lily is recorded from a number of locations in the south-east of the study area, generally on the rail reserve and road reserves (Mueck 2005, Mueck and Smales 2005) (Figure 3).

Purple Diuris *Diuris punctata*
(Vulnerable in Victoria)

This spectacular spring flowering orchid occurs in grasslands and grassy woodlands on rich heavy sandy loam soils that may be inundated during winter months (Backhouse & Jeans 1996). It has been recorded from the rail reserve (1982–1986 FIS records) but was not found during the present survey and is presumed extinct.

Green Scentbark *Eucalyptus fulgens*
(Rare in Victoria)

This forest tree to 20 metres tall occurs east from Healesville and Wooro Yallock to the Latrobe Valley near Driffield (Brooker and Slee 1996). Scattered individuals of this species occur on the northern hills within the study area (Figure 3).

Nine other flora species of state significance are recorded from within 5 km of the study area. Seven of these are considered to possibly occur on the northern hills within the study area (Appendix 2).

4.2.3 Regional significance

Sixty-nine of the recorded flora species have regional significance (Appendix 2).

4.2.4 Significant Plant Communities

All of the plant communities are significant for conservation due to the depletion of native vegetation in the Officer area and in West Gippsland generally:

Table 1. Bioregional conservation status of EVCs (DSE listings)

EVC	Bioregional conservation status
Grassy Forest EVC 128	Vulnerable in Highlands – Southern Fall Bioregion
Gully Woodland EVC 902	Vulnerable in Gippsland Plain Bioregion
Grassy Woodland EVC 175	Endangered in Gippsland Plain Bioregion; Depleted in Highlands – Southern Fall Bioregion
Swampy Woodland EVC 937	Endangered in Gippsland Plain Bioregion
Swamp Scrub EVC 053	Endangered in Gippsland Plain Bioregion
Plains Grassy Wetland EVC 125	Endangered in Gippsland Plain Bioregion
Plains Grassland EVC 132	Endangered in Gippsland Plain Bioregion
Plains Grassy Woodland EVC 055	Endangered in Gippsland Plain Bioregion

Web reference:
http://www.dse.vic.gov.au/dse/nrence.nsf/LinkView/43FE7DF24A1447D9CA256EE6007EA8788062D358172E420C4A256DEA0012F71C

It is noted that all of the EVCs on the plain are listed as endangered, and that EVCs on the northern hills are either vulnerable or depleted.

4.3 Significant Fauna

Significant species recorded within the study area during the present survey, recorded in the local area (AVW) or predicted to occur in the local area (EPBC Act Protected Matters Search Tool) are discussed in this section.

4.3.1 National significance

One fauna species of national conservation significance is recorded from the study area.

Growling Grass Frog *Litoria raniformis*
(Vulnerable in Australia)

This species is largely associated with wetlands. Due to its listing as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) it has national significance.

This species has been previously recorded from a dam south of the railway reserve along Harold Street (Mueck and Smales 2005). It is also widespread to the east and south-east of the study area. No populations have been recorded north of the Princes Highway, however survey has not been as intensive as that undertaken south of the highway.

Five other fauna species of national significance are recorded from within 5 km of the study area (DSE Atlas of Victorian Wildlife): Superb Parrot *Polytelis swainsonii*, Swift Parrot *Lathamus discolor*, Brown Treecreeper *Climacteris picumnus*, Australian Grayling *Prototroctes maraena* and Dwarf Galaxias *Galaxiella pusilla* (Appendix 3). Of these species, Swift Parrot may occasionally visit patches of woodland and urban environments during winter, while Brown Treecreeper may be resident in the large woodland patch in the north-west. Australian Grayling and Dwarf Galaxias may inhabit drainage lines and streams. Superb Parrot is not indigenous to Officer and is a likely aviary escapee.

Seven EPBC-listed fauna species are predicted to occur, or their habitat is predicted to occur, within 5 km of the study area (Appendix 3). There is a low likelihood of these species occurring in the study area. Possible exceptions include Southern Brown Bandicoot *Isoodon obesulus obesulus*, which may be resident in the larger woodland remnants in the north-west and Grey-headed Flying-fox *Pteropus poliocephalus*, which may rarely visit flowering and fruiting trees (Appendix 3).

4.3.2 State significance

One fauna species of state significance is recorded from the study area:

Latham's Snipe *Gallinago hardwickii*
(Near-threatened in Victoria)

This species is recorded from Plains Grassy Wetland EVC on the VicUrban Land.

Thirteen other fauna species of state significance are recorded from within 5 km of the study area. Most of these species are considered to have potential to occur within the study area (Appendix 3).

5.0 PLANNING ISSUES AND RECOMMENDATIONS

Several flora and fauna conservation issues arise in relation to the Officer Structure Plan. These issues are briefly discussed in this section and recommendations are made where appropriate.

Since the fauna assessment of Andrew et al. (1984), the natural values of the Officer area have declined markedly, as vegetation clearance and development continued through the 1980s and 90s. A total of 88 hectares of native vegetation remains in the study area, comprising 9.4% of the original extent of native vegetation.

Recent research indicates that the woodland bird community collapses where native vegetation cover is less than 10%. In mosaics with 10–20% native vegetation cover many species are in decline but this is enough habitat to support sustainable populations of some species (Radford et al. 2004). This research is likely to be applicable to the Officer area although the exact figures may vary.

The Officer area is at serious risk of losing its Australian biodiversity and landscape character as biodiversity declines, the urban area expands with lot sizes that do not have space for trees, and exotic trees are planted in rural areas.

Accordingly, it is recommended here that increased protection be given to the vestiges of the natural environment in the Officer area. Stringent controls should be placed on further clearance of native vegetation. Residential development within the areas supporting the remnants should not be permitted, and purchase of strategic remnants should be undertaken. A strong planning framework is needed to arrest and reverse environmental degradation in the area and to protect remaining native vegetation and habitat.

Protection of native vegetation

Relatively little native vegetation remains within the study area, particularly on the plain (Figure 2). West Gippsland generally is a heavily cleared area.

The forested north-west of the study area is part of a site of regional zoological significance identified by Andrew et al. (1984): ‘Beaconsfield Reservoir’.
The site is significant due to the presence of nine species of native mammal and over 52 species of native birds.

Andrew et al. (1984) recommend:

> Further fragmentation and destruction of native vegetation included in this site should be avoided, and as much as possible of existing vegetation should be protected.

This site of significance is reflected in the Cardinia Planning Scheme by Environmental Significance Overlay 1 (Northern Hills) which specifically refers to sites of zoological significance, and by the Local Planning Policy Framework.

Environmental Significance Overlay 1 (Northern Hills)

This ESO has the following environmental objective to be achieved:

- To protect the significant environmental and landscape values in the northern hills area.
- To ensure that the siting and design of buildings and works does not adversely impact on environmental values including the diverse and interesting landscape, areas of remnant vegetation, habitat of botanical and zoological significance and water quality.
- To ensure that the siting and design of buildings and works addresses environmental hazards including slope, erosion and fire risk.

It is noted that ESO1 covers almost all of the land north of the Princes Highway and not just the documented site of significance.

Local Planning Policy Framework

The Local Planning Policy Framework identifies long term directions about land use and development in the municipality and provides the rationale for the zone and overlay requirements and particular provisions in the scheme.

Clause 21.09-4 (Vegetation and areas of botanical and zoological significance) has the objective:

- To protect areas of existing vegetation, recognising its environmental and landscape value, especially areas of botanical and zoological significance.
- Strategies in relation to this clause include:
- Retain and re-establish native vegetation to protect areas of habitat and landscape value.
- Protect areas of botanical and zoological significance as shown on the mapped information provided by the Department of Natural Resources and Environment.
- Ensure that the siting of buildings and works avoids or minimises the removal or fragmentation of native vegetation, especially in areas of botanical and zoological significance, and where appropriate, building envelopes should be approved as part of subdivision plans to minimise the removal of vegetation.

Draft Port Phillip and Westernport Native Vegetation Plan

The Draft Port Phillip and Westernport Native Vegetation Plan (PPWCLPB 2000) has a strategic and coordinated approach to the problem of the continuing decline in quantity and quality of native vegetation in the Port Phillip and Westernport region.

The Native Vegetation Plan (NVP) describes the biodiversity values of the Region, and provides guidance to local government on how clearing applications should be assessed, based on regional priorities.

The vision of the NVP is that *native vegetation will be protected from further decline, its quality will be enhanced and fragmentation will be reduced through revegetation of priority areas with indigenous species.*

Formal protection targets have been identified for remnant vegetation in the region. As the Gippsland Plain Bioregion is classed as fragmented, targets for protection of remnant vegetation in this bioregion are raised accordingly.

Recommendations

1. **Protect remaining native vegetation using regulatory mechanisms.**
2. **Encourage conservation covenants on existing titles with native vegetation, through incentives.**
3. **Acquire areas of significant native vegetation as appropriate in order to consolidate community environmental assets.**
4. **Co-ordinate the provision of services to minimise environmental impacts.**
5. **Protect and manage native vegetation in accordance with biodiversity legislation and state and local government policy.**

Conservation reserve design

The northern part of the study area includes the first foothills of the ranges (Highlands – Southern Fall Bioregion) as they arise somewhat abruptly from the plain (Gippsland Plain Bioregion). As the foothills and plains have markedly different biodiversity and ecology, we recommend the establishment of viable and representative conservation reserves in each bioregion.

Conservation reserves within or near native vegetation or wildlife corridors should be designed to be ecologically viable in terms of:

- area
- dimensions
- location
- non-natural runoff or drainage from adjacent areas
- buffering, preferably by open space or then by formed roads
- connectivity with other areas

Foothills

The foothills provide extensive views over the plain to the south and, with the rise in elevation and thus rainfall, a major change in biodiversity, essentially from grassy woodland to grassy forest. This general area has been identified as significant since Andrew et al. (1984) recommended its protection. It is given recognition in the Cardinia planning scheme (Environmental Significance Overlay 1 (Northern Hills), Local Planning Policy Framework clause 21.09-4 Vegetation and areas of botanical and zoological significance). Consistent with this, ERM (2004) recommend reservation of the northern wooded part of 325 Princes Highway.

We recommend a substantial and ecologically viable conservation reserve in the foothills to include the site of significance of Andrew et al. (1984), consisting of the northern part of 325 Princes Highway, the northern part of 70 Whiteside Road and 180 Whiteside Road. Green Scentbark *Eucalyptus fulgens* (rare in Victoria) is one of the many natural features of this proposed reserve.

The proposed reserve is particularly well buffered by the powerline easement on the northern upslope edge and thus has inherent viability not normally found in reserves of this size. The easement protects the sensitive upslope edge of the area from the adverse impacts of housing or roading which include high nutrient and water flow, weed invasion, dog and cat predator pressure, physical disturbance and rubbish dumping. This explains the relatively intact vegetation right to the northern fence at present. The easement provides a wildlife corridor which facilitates movement of flora and fauna in and out of the reserve and to other parts of the Shire.

Plain

West Gippsland is one of the most cleared parts of Victoria and all remaining native vegetation is significant for biodiversity. Particularly rare ecosystems are grasslands and woodlands on the Gippsland Plain. Plains Grassland, Plains Grassy Wetland, Plains Grassy Woodland, Swamp Scrub and Swampy Woodland on the VicUrban land are all critically endangered ecosystems (Figure 2). The high conservation value of this land is analysed in Mueck and Smales (2005).

The small example of Grassy Woodland on Tivendale Road should be reserved. Among other values it appears to support the state significant Green Scentbark *Eucalyptus fulgens* (access was not obtained during this study).

The giant Swamp Gum *Eucalyptus ovata* beside McMullen Road (Figure 3) should be brought into public ownership. This appears to be the largest indigenous tree in Officer. Stringent protection and sound arboricultural management of this tree is needed. The tree should not be given publicity due to vandalism concerns.

Recommendation

6. Establish a strategic conservation reserve system based on remaining areas of native vegetation in the foothills and on the plain.

7. Include ecological design criteria as above in the establishment of reserves.

Roadside vegetation

Roadside vegetation is significant for flora and fauna and requires protection and management. The emphasis should be on natural regeneration rather than planting, in order to preserve the ecological integrity and authenticity of native vegetation rather than turning the vegetation into a man-made plantation.

Recommendations

8. Maintain and enhance roadside vegetation where possible.

9. Protect roadside vegetation using signage and fencing where appropriate.

Subdivision

In areas supporting native vegetation, further subdivision would have permanent, major adverse effects on biodiversity. Increases in population density and associated housing, gardens, roading, road widening and services inevitably lead to increased invasion by introduced plants and animals, wildlife road kills, cat and dog predation, and habitat fragmentation. Local extinction and almost complete replacement by introduced species is the general experienced in residential areas. Protection of biodiversity and further subdivision are not compatible in such areas. The remnant forest in the north-western area is particularly significant for flora and fauna, although all remaining native vegetation is important.

Incorporation of trees into house blocks is not a viable long-term option for tree conservation, since (1) trees are likely to be removed over time due to real or perceived risks to life and property, and (2) there is seldom any seedling regeneration due to garden and lawn maintenance practices.

In certain areas, there are few or no remaining natural values. Allotment size in such areas is a town planning issue rather than a biodiversity issue.

Recommendation

10. Prevent further subdivision and further clearance within precincts with areas of high conservation value (all native vegetation).

Environmental awareness

Council should promote the environmental values of the area and encourage environmentally responsible attitudes and behaviour from the community. Community groups need Council support and technical advice. Projects undertaken by community groups require some level of supervision.

Recommendations

11. Promote the environmental values of the Officer area.

12. Encourage environmentally responsible attitudes and behaviour from the community.

13. Support community projects, consistent with principles of ecological restoration (site-indigenous species, appropriately sourced provenances, management for regeneration rather than planting).

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APPENDICES

APPENDIX 1
Significance Assessment

The common language meaning of significance is 'importance; consequence' (Macquarie Dictionary). While the general meaning of this is clear, in natural resource assessment and management this meaning needs to be defined in scientific terms.

A1.1 Significant Species and Communities

Species and community conservation significance is defined as follows:

A taxon or community is significant at a particular geographic level (national, state, regional, local) when it is considered to be rare or threatened at that level.

A taxon is an officially recognised species, subspecies or variety of a species.
The significance of a taxon or community is a function of its rarity within a specified geographic context: nation, state, region, local area. In each context a taxon or community has a conservation status: not rare, rare, vulnerable, endangered, extinct. 'Threatened' is a combination of the 'vulnerable' and 'endangered' categories.

The significance of the taxon or community is the largest geographic context in which it is at least rare. For example, if a species is uncommon in a state and rare within a region of that state, it has regional significance within that region.

Species listed as 'poorly known' are not considered rare or threatened at present and are assigned an intermediate rating. For example, a species listed as poorly known in a state list has potential state significance and is assigned 'regional/state' significance.

A1.2 Sites

Site conservation significance is defined as follows:

A site is significant at a particular geographic level (national, state, regional, local) when it is considered to make a substantial contribution to biodiversity at that level.

As a guideline, one per cent of the total extant population of a significant species within a specified geographic area or of the total extant area of a significant ecological community within a specified geographic area is a threshold for 'substantial contribution'. Comprehensive data are not always available for such assessments and interpretation of available data and information is usually required.

In some cases a site may be small when viewed in isolation but it forms an integral and functional part of a larger site of significance. If there is no ecological reason to divide the larger site, then the rating that applies to the larger site applies to the smaller site.

Sites with a particularly high level of local or regional significance are assigned 'high local' or 'high regional' significance, respectively. These terms are not applied to state and national levels of significance or to species and communities.

To determine whether a site makes a 'substantial contribution' to biological conservation, it is assessed against the following criteria:

- Size – overall size of site or habitats/vegetation communities within the site.
- Significant species and populations – number of significant species or populations known or likely to occur on the site.
- Significant habitat or vegetation communities – presence and extensiveness of significant habitats and vegetation communities on the site.
- Ecological integrity – degree of intactness, level of past disturbance (such as weed invasion) and overall condition of vegetation communities on the site.
- Richness and diversity – quantity of species, vegetation communities and habitats.
- Connectivity – Quality and quantity of linkages between site and adjacent areas of native vegetation/habitat (wildlife corridor value).
- Viability – level of existing and/or future disturbances, degree of existing and/or future fragmentation.
- Distribution – proximity of the site to known distribution limits for significant species, populations, habitats and/or vegetation communities.
- Level of conservation – representation of site attributes in conservation reserves.

As a guideline, *one per cent* of the total extant population of a significant species within a specified geographic area or of the total extant area of a significant ecological community within a specified geographic area is a threshold for 'substantial contribution'. Comprehensive data are seldom available and interpretation of limited available data and information is usually required.

A1.3 Scale: Geographic Context

Significance is determined within specified geographic contexts:

- Australia
- State Victoria
- Region Gippsland Plain (DSE Flora Information System)
- Local area Officer area (within 5 km of the study area)

A1.4 Conservation Status: Degree of Threat

Official government lists define species and communities that are rare or threatened (and thus significant) at *national* and/or *state* levels. Most of these lists appear as schedules under legislation and are followed unless further evidence is available.

Species and communities that are rare or threatened at *regional* and *local* levels are determined from the available literature, data and information, and consultation with relevant individuals where relevant reports and government listings are not available.

National Significance

Species

Species of national significance are either:

- Flora or fauna listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent under the *Environment Protection and Biodiversity Conservation Act 1999*.

- Flora listed as rare in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
- Fauna listed as extinct, endangered, vulnerable or rare in Australia in an Action Plan published by Environment Australia.

Communities

Ecological communities of national significance are either:

- Listed as critically endangered, endangered or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999.*
- Considered to be rare or threatened in Australia by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Ecological communities include flora and/or fauna communities.

State Significance

Species

Species of state significance in Victoria are either:

- Flora or fauna listed as threatened under the *Flora and Fauna Guarantee Act 1988.*
- Flora listed as extinct, endangered, vulnerable or rare in Victoria in the DSE Flora Information System 2002 Version.
- Flora listed as poorly known in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
- Listed as extinct, critically endangered, endangered or vulnerable in *Threatened Vertebrate Fauna in Victoria – 2003* (DSE 2003).

Communities

Ecological communities of state significance in Victoria are either:

- Listed as threatened under the *Flora and Fauna Guarantee Act 1988.*
- Considered to be rare or threatened in Victoria by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Regional Significance

Species

Species of regional significance are:

- Flora recorded from less than 5% of documented sites (quadrats/defined area lists) from the Gippsland Plain Bioregion, or from less than 1% of documented sites from the Highlands – Southern Fall Bioregion, in the DSE Flora Information System unless there is reason to believe they are undersampled in the available data.
- Fauna listed as data deficient or lower risk – near threatened in *Threatened Vertebrate Fauna in Victoria – 2003* (DSE 2003).
- Fauna considered to be rare or threatened at the bioregional level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Communities

Ecological communities of regional significance in Victoria are:

- Listed as an endangered, vulnerable or depleted ecological vegetation class within a particular bioregion in a Draft Native Vegetation Plan.
- Considered to be rare or threatened at the bioregional level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Local Significance

Species

Species of local significance are:

- Flora or fauna considered to be rare or threatened at the local level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

Communities

Ecological communities of local significance are:

- Considered to be rare or threatened at the local level by Biosis Research using IUCN criteria where applicable (IUCN 2000).

No Significance

Species and ecological communities are not significant when they are considered not to be rare or threatened at any geographic level by Biosis Research using IUCN criteria where applicable (IUCN 2000). Species that are not indigenous to a given site are not significant. Plantings are generally not significant.

APPENDIX 2
Flora Results

A2.1 Flora species recorded from study area

Table A2.1. Indigenous flora recorded from study area

Sources: DSE Flora Information System 2005 Version, this study

Significance/status of species:
N national
S state
R regional; recorded from less than 5% of documented sites in Gippsland Plain Bioregion or less than 1% of documented sites in Highlands – Southern Fall Bioregion
r local; recorded from less than 5% of documented sites in Gippsland Plain Bioregion or less than 1% of documented sites in Highlands – Southern Fall Bioregion, but considered more common than present records indicate

Note: Species recorded in this study have been assigned regional significance appropriate to the bioregion in which they were recorded. Species records retrieved from the FIS (2005) are assigned regional significance if they meet the above criteria in either bioregion.

All other indigenous species have local significance

FFG FFG protected flora (roadsides only)

1 Additional record from this study
2 Additional record from Mueck (2005), Mueck and Smales (2005)

Status	Scientific name	Common name
R	*Acacia dealbata*	Silver Wattle
	Acacia mearnsii	Black Wattle
	Acacia melanoxylon	Blackwood
	Acacia mucronata subsp. *longifolia*[1]	Narrow-leaf Wattle
	Acacia paradoxa	Hedge Wattle
R	*Acacia stricta*	Hop Wattle
	Acacia verticillata	Prickly Moses
R	*Acaena echinata*	Sheep's Burr
	Acaena novae-zelandiae	Bidgee-widgee
	Acrotriche prostrata	Trailing Ground-berry
	Adiantum aethiopicum[1]	Common Maidenhair
r	*Alisma plantago-aquatica*	Water Plantain
	Allocasuarina littoralis[1]	Black Sheoak
	Allocasuarina paludosa	Scrub Sheoak
R	*Amphibromus archeri*	Pointed Swamp Wallaby-grass
R	*Amphibromus nervosus*	Common Swamp Wallaby-grass
	Amyema pendula	Drooping Mistletoe

Status	Scientific name	Common name
R	*Arthropodium fimbriatum*	Nodding Chocolate-lily
	Arthropodium strictum	Chocolate Lily
R	*Asperula conferta*	Common Woodruff
	Austrodanthonia caespitosa	Common Wallaby-grass
	Austrodanthonia geniculata[1]	Kneed Wallaby-grass
R	*Austrodanthonia laevis*	Smooth Wallaby-grass
R	*Austrodanthonia penicillata*	Slender Wallaby-grass
	Austrodanthonia pilosa[1]	Velvet Wallaby-grass
	Austrodanthonia racemosa	Stiped Wallaby-grass
	Austrodanthonia setacea	Bristly Wallaby-grass
R	*Austrofestuca hookeriana*	Hooker Fescue
S	*Austrostipa rudis* subsp. *australis*	Veined Spear-grass
	Austrostipa rudis subsp. *nervosa*	Veined Spear-grass
	Austrostipa rudis subsp. *rudis*	Veined Spear-grass
r	*Azolla filiculoides*	Pacific Azolla
R	*Baumea rubiginosa* s.l.	Soft Twig-rush
	Billardiera scandens	Common Apple-berry
	Bossiaea prostrata	Creeping Bossiaea
	Brunonia australis[1]	Blue Pincushion
R	*Bulbine bulbosa*	Bulbine Lily
	Burchardia umbellata	Milkmaids
	Bursaria spinosa[1]	Sweet Bursaria
R	*Caesia parviflora*	Pale Grass-lily
R	*Carex appressa*	Tall Sedge
	Carex breviculmis	Common Grass-sedge
r	*Carex inversa*	Knob Sedge
	Cassinia aculeata[1]	Common Cassinia
	Cassinia arcuata[1]	Drooping Cassinia
	Cassytha melantha[1]	Coarse Dodder-laurel
	Centella cordifolia	Centella
R	*Centrolepis strigosa*	Hairy Centrolepis
R	*Chiloglottis valida*	Common Bird-orchid
	Clematis microphylla[1]	Small-leaved Clematis
	Coprosma quadrifida	Prickly Currant-bush
	Correa reflexa[1]	Common Correa
r	*Crassula helmsii*[1]	Swamp Crassula
	Cyathea australis[1]	Rough Tree-fern
	Daviesia latifolia	Hop Bitter-pea

Status	Scientific name	Common name
	Daviesia leptophylla	Narrow-leaf Bitter-pea
N	*Dianella amoena*	Matted Flax-lily
S	*Dianella* sp. aff. *longifolia* (Benambra)[2]	Arching Flax-lily
R	*Dianella longifolia var. longifolia*[1]	Pale Flax-lily
	Dianella revoluta var. *revoluta* s.l.	Black-anther Flax-lily
	Dichondra repens	Kidney-weed
R	*Dillwynia cinerascens*	Grey Parrot-pea
S	*Diuris punctata* var. *punctata*	Purple Diuris
R	*Doodia caudata*[1]	Small Rasp-fern
	Drosera peltata subsp. auriculata[1]	Tall Sundew
R	*Drosera peltata* subsp. *peltata*	Pale Sundew
	Drosera whittakeri	Scented Sundew
r	*Eleocharis acuta*	Common Spike-sedge
r	*Eleocharis sphacelata*	Tall Spike-sedge
R	*Elymus scaber*	Common Wheat-grass
	Epacris impressa	Common Heath
r	*Epilobium billardierianum*	Variable Willow-herb
r	*Epilobium hirtigerum*	Hairy Willow-herb
r	*Eragrostis brownii*	Common Love-grass
R	*Eryngium vesiculosum*	Prickfoot
	Eucalyptus camaldulensis	River Red-gum
	Eucalyptus dives[1]	Broad-leaved Peppermint
S	*Eucalyptus fulgens*[1]	Green Scentbark
R	*Eucalyptus goniocalyx*	Bundy
	Eucalyptus melliodora[1]	Yellow Box
	Eucalyptus obliqua[1]	Messmate Stringybark
	Eucalyptus ovata	Swamp Gum
	Eucalyptus radiata	Narrow-leaf Peppermint
	Eucalyptus viminalis	Manna Gum
r	*Euchiton collinus*	Creeping Cudweed
r	*Euchiton involucratus*	Star Cudweed
	Exocarpos cupressiformis	Cherry Ballart
R	*Exocarpos strictus*	Pale-fruit Ballart
	Gahnia radula	Thatch Saw-sedge
R	*Geranium* sp. 5	Naked Cranesbill
R	*Glyceria australis*	Australian Sweet-grass
	Glycine clandestina[1]	Twining Glycine
	Gonocarpus tetragynus	Common Raspwort

Status	Scientific name	Common name
R	*Goodenia humilis*	Swamp Goodenia
	Goodenia lanata[1]	Trailing Goodenia
	Goodenia ovata	Hop Goodenia
r	*Gratiola peruviana*[1]	Austral Brooklime
R	*Hakea nodosa*	Yellow Hakea
R	*Haloragis heterophylla*	Varied Raspwort
	Hardenbergia violacea[1]	Purple Coral-pea
R	*Hemarthria uncinata*	Mat Grass
R	*Hovea heterophylla*	Common Hovea
	Hydrocotyle hirta[1]	Hairy Pennywort
	Hydrocotyle spp.	Pennywort
	Hypericum gramineum	Small St John's Wort
R	*Hypoxis hygrometrica* var. *hygrometrica*	Golden Weather-glass
R	*Imperata cylindrica*	Blady Grass
	Indigofera australis[1]	Austral Indigo
R	*Isolepis cernua* var. *cernua*	Nodding Club-sedge
R	*Isolepis cernua* var. *platycarpa*	Broad-fruit Club-sedge
R	*Isolepis fluitans*	Floating Club-sedge
r	*Isolepis hookeriana*	Grassy Club-sedge
r	*Isolepis inundata*	Swamp Club-sedge
	Joycea pallida[1]	Silvertop Wallaby-grass
r	*Juncus amabilis*	Hollow Rush
r	*Juncus bufonius*	Toad Rush
r	*Juncus gregiflorus*	Green Rush
r	*Juncus holoschoenus*	Joint-leaf Rush
	Juncus pallidus	Pale Rush
r	*Juncus planifolius*	Broad-leaf Rush
r	*Juncus procerus*[1]	Tall Rush
r	*Juncus sarophorus*	Broom Rush
r	*Juncus subsecundus*	Finger Rush
	Kennedia prostrata[1]	Running Postman
	Kunzea ericoides spp. agg.	Burgan
	Lachnagrostis filiformis	Common Blown-grass
R	*Lagenophora gracilis*	Slender Bottle-daisy
r	*Lemna disperma*	Common Duckweed
R	*Lepidosperma elatius*	Tall Sword-sedge
	Lepidosperma laterale var. *laterale*[1]	Variable Sword-sedge
R	*Lepidosperma laterale* var. *majus*[1]	Variable Sword-sedge

Status	Scientific name	Common name
R	*Leptorhynchos tenuifolius*	Wiry Buttons
	Leptospermum continentale	Prickly Tea-tree
R	*Leptospermum lanigerum*	Woolly Tea-tree
R	*Lobelia anceps*	Angled Lobelia
	Lomandra filiformis	Wattle Mat-rush
R	*Lomandra filiformis* subsp. *filiformis*	Wattle Mat-rush
	Lomandra longifolia	Spiny-headed Mat-rush
r	*Lythrum hyssopifolia*	Small Loosestrife
	Melaleuca ericifolia	Swamp Paperbark
	Melicytus dentatus[1]	Tree Violet
	Microlaena stipoides	Weeping Grass
r	*Microtis parviflora*	Slender Onion-orchid
R	*Notodanthonia semiannularis*	Wetland Wallaby-grass
R	*Opercularia ovata*	Broad-leaf Stinkweed
	Opercularia varia[1]	Variable Stinkweed
	Oxalis exilis	Shady Wood-sorrel
R	*Oxalis perennans*	Grassland Wood-sorrel
	Ozothamnus ferrugineus	Tree Everlasting
	Pandorea pandorana[1]	Wonga Vine
R	*Patersonia occidentalis*	Long Purple-flag
R	*Pentapogon quadrifidus*	Five-awned Spear-grass
r	*Persicaria decipiens*	Slender Knotweed
R	*Persicaria hydropiper*	Water Pepper
	Phragmites australis	Common Reed
	Pimelea humilis[1]	Common Rice-flower
	Platylobium obtusangulum	Common Flat-pea
R	*Poa clelandii*	Noah's Ark
	Poa labillardierei	Common Tussock-grass
	Poa morrisii	Soft Tussock-grass
R	*Poa rodwayi*	Velvet Tussock-grass
	Poa sieberiana[1]	Grey Tussock-grass
R	*Poa tenera*	Slender Tussock-grass
	Poranthera microphylla	Small Poranthera
r	*Potamogeton tricarinatus* s.l.	Floating Pondweed
r	*Pseudognaphalium luteoalbum*[1]	Jersey Cudweed
	Pteridium esculentum	Austral Bracken
R	*Pterostylis melagramma*	Tall Greenhood
	Pultenaea gunnii[1]	Golden Bush-pea

Status	Scientific name	Common name
R	*Ranunculus glabrifolius*	Shining Buttercup
R	*Ranunculus inundatus*	River Buttercup
R	*Ranunculus lappaceus*	Australian Buttercup
R	*Rubus parvifolius*	Small-leaf Bramble
	Schoenus apogon	Common Bog-sedge
R	*Schoenus tesquorum*	Soft Bog-sedge
R	*Selaginella gracillima*	Tiny Selaginella
	Senecio glomeratus	Annual Fireweed
R	*Senecio hispidulus* s.l.	Rough Fireweed
R	*Senecio minimus*	Shrubby Fireweed
r	*Senecio quadridentatus*	Cotton Fireweed
R	*Senecio tenuiflorus* s.l.	Slender Fireweed
R	*Solanum* spp.	Kangaroo Apple
	Solenogyne dominii[1]	Smooth Solenogyne
	Stackhousia monogyna[1]	Creamy Stackhousia
R	*Stylidium graminifolium* s.l.	Grass Triggerplant
R	*Thelymitra holmesii*	Blue-star Sun-orchid
r	*Thelymitra* sp.[1]	Sun Orchid
	Themeda triandra	Kangaroo Grass
	Tricoryne elatior	Yellow Rush-lily
	Triglochin striata	Streaked Arrowgrass
r	*Typha domingensis*	Narrow-leaf Cumbungi
r	*Typha orientalis*	Broad-leaf Cumbungi
R	*Veronica gracilis*	Slender Speedwell
R	*Veronica plebeia*	Trailing Speedwell
R	*Villarsia reniformis*	Running Marsh-flower
	Viola hederacea sensu Entwisle (1996)	Ivy-leaf Violet
	Wahlenbergia gracilis[1]	Sprawling Bluebell
R	*Wahlenbergia multicaulis*	Branching Bluebell
	Xanthorrhoea minor subsp. *lutea*	Small Grass-tree

A2.2 Significant flora species

Table A2.2. Flora of national or state significance recorded from within 5 km of the study area

Sources: DSE Flora Information System 2005 Version
DEH Protected Matters Search Tool (indicated by EPBC)
Biosis Research (Mueck 2005, Mueck and Smales 2005) (indicated by BR)

Australian status:
X Listed under EPBC Act as extinct
C Listed under EPBC Act as critically endangered
E Listed under EPBC Act as endangered
V Listed under EPBC Act as vulnerable

Victorian status (DSE Flora Information System 2005 Version):
e Endangered
v Vulnerable
r Rare
x Extinct
k Insufficiently known
L Listed as threatened under *Flora and Fauna Guarantee Act 1988* (Vic.)

Scientific name	Common name	Aust. status	Vic. status	FFG	Likelihood of occurrence
National significance:					
Amphibromus fluitans (EPBC)	River Swamp Wallaby-grass	V			Possible
Caladenia fragrantissima subsp. *orientalis* (EPBC)	Cream Spider-orchid	E	e	L	Low
Dianella amoena	Matted Flax-lily	E	e		**Recorded**
Prasophyllum frenchii	Maroon Leek-orchid	E	e	L	**Recorded**
Thelymitra epipactoides (EPBC)	Metallic Sun-orchid	E	e	L	Nil
Xerochrysum palustre (EPBC)	Swamp Everlasting	V	v	L	Possible
State significance:					
Prasophyllum pyriforme	Silurian Leek-orchid		e		Possible
Caladenia oenochila	Wine-lipped Spider-orchid		v		Possible
Diuris punctata	Purple Diuris		v	L	**Recorded (extinct)**
Austrostipa rudis australis	Veined Spear-grass		r		**Recorded**
Burnettia cuneata	Lizard Orchid		r		Unlikely
Carex alsophila	Forest Sedge		r		Unlikely
Corybas aconitiflorus	Spurred Helmet-orchid		r		Possible
Dianella sp. aff. *longifolia* (Benambra) (BR)	Arching Flax-lily		v		**Recorded**
Eucalyptus fulgens	Green Scentbark		r		**Recorded**
Leionema bilobum	Notched Leionema		r		Possible
Pterostylis grandiflora	Cobra Greenhood		r		Possible
Pterostylis X *ingens*	Sharp Greenhood		r		Possible
Tetratheca stenocarpa	Long Pink-bells		r		Possible

APPENDIX 3
Fauna Results

A3.1 Fauna species recorded from study area

Table A3.1. Indigenous fauna recorded from study area

Sources: DSE Atlas of Victorian Wildlife 2005 Version, this study

1 Additional record from this study
2 Additional record from Mueck and Smales (2005)

Common name	Scientific name
Common Bronzewing	*Phaps chalcoptera*[1]
Crested Pigeon	*Ocyophaps lophotes*[1]
Dusky Moorhen	*Gallinula tenebrosa*[1]
Purple Swamphen	*Porphyrio porphyrio*[1]
Australasian Grebe	*Tachybaptus novaehollandiae*[1]
Little Pied Cormorant	*Phalacrocorax melanoleucos*[1]
Australian Pelican	*Pelecanus conspicillatus*[1]
Silver Gull	*Larus novaehollandiae*[1]
Masked Lapwing	*Vanellus miles*[2]
Latham's Snipe	*Gallinago hardwickii*[2]
Australian White Ibis	*Threskiornis molucca*[2]
Straw-necked Ibis	*Threskiornis spinicollis*[1]
White-faced Heron	*Egretta novaehollandiae*[2]
Australian Wood Duck	*Chenonetta jubata*[2]
Pacific Black Duck	*Anas superciliosa*[2]
Nankeen Kestrel	*Falco cenchroides*[1]
Brown Goshawk	*Accipiter fasciatus*
Wedge-tailed Eagle	*Aquila audax*
Black-shouldered Kite	*Elanus axillaris*[2]
Southern Boobook	*Ninox novaeseelandiae*[2]
Rainbow Lorikeet	*Trichoglossus haematodus*[1]
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*[2]
Little Corella	*Cacatua sanguinea*[1]
Galah	*Cacatua roseicapilla*[2]
Crimson Rosella	*Platycercus elegans*[1]
Eastern Rosella	*Platycercus eximius*[1]
Laughing Kookaburra	*Dacelo novaeguineae*[1]
Pallid Cuckoo	*Cuculus pallidus*[1]
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*[1]
Welcome Swallow	*Hirundo neoxena*
Grey Fantail	*Rhipidura fuliginosa*[2]
Willie Wagtail	*Rhipidura leucophrys*[2]

Eastern Yellow Robin	*Eopsaltria australis*[1]
Golden Whistler	*Pachycephala pectoralis*[1]
Rufous Whistler	*Pachycephala rufiventris*[1]
Grey Shrike-thrush	*Colluricincla harmonica*[1]
Magpie-lark	*Grallina cyanoleuca*
Crested Shrike-tit	*Falcunculus frontatus*[1]
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
Striated Thornbill	*Acanthiza lineata*[1]
Yellow Thornbill	*Acanthiza nana*[1]
Brown Thornbill	*Acanthiza pusilla*[2]
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*[1]
Flame Robin	*Petroica phoenicea*
White-browed Scrubwren	*Sericornis frontalis*[2]
Clamorous Reed Warbler	*Acrocephalus stentoreus*[1]
Golden-headed Cisticola	*Cisticola exilis*[1]
Superb Fairy-wren	*Malurus cyaneus*[2]
Mistletoebird	*Dicaeum hirundinaceum*[1]
Spotted Pardalote	*Pardalotus punctatus*[1]
Silvereye	*Zosterops lateralis*[1]
White-naped Honeyeater	*Melithreptus lunatus*[1]
Brown-headed Honeyeater	*Melithreptus brevirostris*[1]
White-plumed Honeyeater	*Lichenostomus penicillatus*
New Holland Honeyeater	*Phylidonyris novaehollandiae*[1]
Bell Miner	*Manorina melanophrys*[1]
Noisy Miner	*Manorina melanocephala*[2]
Little Wattlebird	*Anthochaera chrysoptera*[1]
Red Wattlebird	*Anthochaera carunculata*[2]
Red-browed Finch	*Neochmia temporalis*[1]
Grey Currawong	*Strepera versicolor*[1]
Grey Butcherbird	*Cracticus torquatus*[1]
Australian Magpie	*Gymnorhina tibicen*
Australian Raven	*Corvus coronoides*[2]
Little Raven	*Corvus mellori*[1]
Rock Dove	*Columba livia**[2]
Striated Pardalote	*Pardalotus* striatus[1]
Spotted Turtle-Dove	*Streptopelia chinensis**[2]
Common Blackbird	*Turdus merula**[2]
Skylark	*Alauda arvensis**[2]
House Sparrow	*Passer domesticus**[2]
European Goldfinch	*Carduelis carduelis**[2]
European Greenfinch	*Carduelis chloris**[1]
Common Myna	*Acridotheres tristis**[2]
Common Starling	*Sturnus vulgaris**[2]
Short-beaked Echidna	*Tachyglossus aculeatus*[1]
Common Brushtail Possum	*Trichosurus vulpecula*

Common Ringtail Possum	*Pseudocheirus peregrinus*
Black Wallaby	*Wallabia bicolor*[1]
White-striped Freetail Bat	*Tadarida australis*[2]
House Mouse	*Mus musculus**[1]
European Rabbit	*Oryctolagus cuniculus**[2]
Brown Hare	*Lepus capensis**[2]
Red Fox	*Canis vulpes**[1]
Garden Skink	*Lampropholis guichenoti*[2]
Southern Bullfrog	*Limnodynastes dumerilii*[1]
Striped Marsh Frog	*Limnodynastes peronii*[1]
Spotted Marsh Frog	*Limnodynastes tasmaniensis*[2]
Common Froglet	*Crinia signifera*[2]
Southern Brown Tree Frog	*Litoria ewingii*[1]
Growling Grass Frog	*Litoria raniformis*[2]
Whistling Tree Frog	*Litoria verreauxii verreauxii*[2]

A3.2 Significant fauna species

Table A3.2. Terrestrial vertebrate fauna of national or state significance recently recorded, or predicted to occur, within 5km of the study area

Source: DSE Atlas of Victorian Wildlife 2005 version, DEH database

Status of species:
CR critically endangered
EN endangered
VU vulnerable
NT near threatened
DD data deficient (insufficient known)
R rare or insufficient known
L listed under Flora and Fauna Guarantee Act

Sources used to derive species status:
EPBC *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
DSE Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2003)
FFG *Flora and Fauna Guarantee Act 1988* (Vic.)
Action Plans: Maxwell et al. (1996) for marsupials and monotremes, Duncan et al. (1999) for bats, Lee (1995) for rodents, Garnett and Crowley (2000) for birds, Cogger et al. (1993) for reptiles, Tyler (1997) for amphibians.
# denotes species predicted to occur or with habitat predicted to occur in the local area (DEH database)

Common name	Scientific name	Most recent AVW record	EPBC	DSE	FFG	Action Plan	Likelihood of Occurrence
National significance							
Australian Painted Snipe	*Rostratula australis*	#	VU	CR	L	VU	Unlikely
Superb Parrot	*Polytelis swainsonii*	1997	VU	EN	L	VU	Aviary Escapee
Swift Parrot	*Lathamus discolor*	1989	EN	EN	L	EN	Migrant visitor
Brown Treecreeper	*Climacteris picumnus*	2000		NT		NT	Possible
Regent Honeyeater	*Xanthomyza phrygia*	#	EN	CR	L	EN	Unlikely
Spot-tailed Quoll	*Dasyurus maculatus maculatus*	#	EN	EN	L	VU	Unlikely
Southern Brown Bandicoot	*Isoodon obesulus obesulus*	#	EN	NT		NT	Possible
Long-nosed Potoroo (SE mainland)	*Potorous tridactylus tridactylus*	#	VU	EN	L	VU	Unlikely
Grey-headed Flying-fox	*Pteropus poliocephalus*	#	VU	VU	L	VU	Rare visitor
Smoky Mouse	*Pseudomys fumeus*	#	EN	EN	L	R	Unlikely
Growling Grass Frog	*Litoria raniformis*	2003	VU	EN	L	VU	**Confirmed resident**
Australian Grayling	*Prototroctes maraena*	1985	VU	VU	L	VU	Possible
Dwarf Galaxias	*Galaxiella pusilla*	1999	VU	VU	L	VU	Possible
State significance							
Pied Cormorant	*Phalacrocorax varius*	1997		NT			Likely
Latham's Snipe	*Gallinago hardwickii*	2002		NT			**Recorded**
Royal Spoonbill	*Platalea regia*	2001		VU			Likely

Intermediate Egret	*Ardea intermedia*	1998	CR	L	Possible
Great Egret	*Ardea alba*	1995	VU	L	Likely
Australasian Shoveler	*Anas rhynchotis*	2002	VU		Likely
Freckled Duck	*Stictonetta naevosa*	2002	EN	L	Possible
Hardhead	*Aythya australis*	2002	VU		Likely
Blue-billed Duck	*Oxyura australis*	2002	EN	L	Likely
Musk Duck	*Biziura lobata*	1992	VU		Likely
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	1997	VU	L	Rare visitor
Powerful Owl	*Ninox strenua*	2003	VU	L	Likely
Sooty Owl	*Tyto tenebricosa*	1992	VU	L	Unlikely
Southern Toadlet	*Pseudophryne semimarmorata*	1981	VU		Possible

APPENDIX 4
Review of consultant report

Review of biological features report: 325 Princes Highway, Officer

As part of this planning study, Biosis Research was requested by Cardinia Shire Council to review the consultant report on 325 Princes Highway, Officer.

As part of this review, the site was briefly inspected on 15 March 2006.

The document reviewed here is:

ERM 2004. Biological features – Timbertop Estate.
Environmental Resources Management Australia, South Melbourne, July 2004.

Comments in relation to flora:

P 6. The report does not state how many indigenous species were recorded, as per standard practice. It is tedious to work out from Annex D that 26 indigenous species are recorded and this requires skill as several species listed as indigenous are introduced. It is unbalanced to present on the next page the full site weed list. In that case the shorter full indigenous flora list should also be presented.

P 6. During the site visit undertaken by Biosis Research an additional 24 indigenous flora species missed by the consultant were found. Note this was a reconnaissance level survey only and that it was conducted in autumn, not in spring when more species are likely to be found. This almost doubles the number of indigenous species, indicating the limitations of the consultant survey.

Species missed include the abundant canopy tree species Broad-leaved Peppermint *Eucalyptus dives*, the widespread and common Weeping Grass *Microlaena stipoides*, and the state significant Green Scentbark *Eucalyptus fulgens* (see later). Messmate *Eucalyptus obliqua* was not found and it is suggested that this may be a misidentification of Green Scentbark on the part of the consultant.

P 6. Table numbering is wrong. All but one table in the report have an incorrect reference in the text. The tables are out of order and there are two table 5.2s.

P 8. Gully Woodland. The report states ‘Information regarding the likely occurrence of specific Ecological Vegetation Classes (EVC) on the site was inferred from EVC mapping layers provided by the Department of Sustainability and Environment (DSE)’. However, the mapping of Gully Woodland in the northern part of the site by DSE is not referred to in the report. In fact Gully Woodland does

not occur on the site but this should be discussed in the report.

P 10. The habitat hectare calculation (Table 5.2) has errors and significantly underestimates the habitat score:

- The habitat zone is contiguous with vegetation to the west and north so the patch size is >20 hectares resulting in a patch size score is 8 not 2. The report appears to use an incorrect definition of patch. A patch includes all contiguous vegetation including any adjacent to the site under assessment (DSE 2004).
- It is highly unlikely that the organic litter score was 0, as this would mean less than 4% organic litter cover despite a full canopy score. At the time of the Biosis Research survey, organic litter cover was high and the score was 5.
- Other scores that appear to be are underestimated are lack of weeds and logs. Weeds had <25% cover in much of the northern part of the habitat zone at the time of survey. Logs are present in much of the area although heaped in piles.

P 11. The report states 'Table 4.2 lists those species flora that are recorded or likely to occur within the vicinity of the study site. The current and historic land use will not provide suitable habitat for any of these species. Most of the potential habitat has been grossly modified, making the remaining habitat unsuitable.' The table (actually table 5.3) lists Green Scentbark. This species occurs on the site in suitable habitat and it appears to be capable of long term survival on the site (see below).

P 14. The report states that 'No significant species of flora or fauna were located on the site.' The state significant Green Scentbark *Eucalyptus fulgens* is present. The species is listed as 'rare' in Victoria by DSE. A total of 15 trees was located by Biosis Research, and as this was not a targeted survey, more trees may be present.

P 14. Significance not defined in the report, so the statement that no significant species were located is open to question (apart from Green Scentbark which is state significant). Some if not all of the indigenous species may be considered to have local significance given the depletion of native vegetation in the Officer area.

P 14. The site cannot be in the same catchment of the two Ramsar sites, namely Edithvale Seaford Wetlands and Western Port, as these Ramsar sites are in different catchments themselves. The site is within the catchment of the Westernport Ramsar site.

P 16. The consultant states: *It is recommended that all existing indigenous trees be retained on site wherever practical and safe. These trees generally occur in the northwest corner of the property in Quality Zone 1.*
The presence of Green Scentbark supports this recommendation.

P 18. The report states: 'In the longer term, the retention of small isolated areas of exotic vegetation does not greatly contribute to the sustainability of the biodiversity of the site. It is better to incorporate larger areas of revegetation that can be effectively managed than have several small areas of planting. This is a confused statement and it is suggested that 'exotic vegetation' is not actually meant here.

Annex D. *Eucalyptus botryoides*, *Eucalyptus leucoxylon*, *Melaleuca armillaris* and *Myosotis* sp. are introduced species. These errors make it impossible for the untrained reader to work out how many indigenous are recorded from the site.

Comments in relation to fauna:

The assessment of the site in relation to Growling Grass Frog *Litoria raniformis* generates some uncertainties. The following points are noted:

- It is not clear how many surveyors there were at each water body or the duration of each spotlight survey. Studies have shown that at least 90 person minutes should be spent spotlighting a site before a reasonable conclusion of occurrence can be made.

- It is unclear from the report what the weather conditions were like at the time of the frog surveys. Weather has a profound effect frog activity, particularly ambient temperature. It is possible that weather conditions at the time of the assessments were not optimal for Growling Grass Frog survey.

- The survey was undertaken too early in the season for the result to be meaningful. Survey would have been best undertaken from October to early December when breeding activity is at its peak.

- It is notable that no Growling Grass Frogs were recorded from Dam 4 (a known locality). This suggests that timing and weather may have been inappropriate, which in turn brings the results of the site surveys into question. Growling Grass Frogs were recorded at Dam 4 in December 2004 and again in December 2005 (D. Gilmore pers. obs.).

- P 5. The dam at Harold Street is known, not potential habitat.

- P 12. 'If frogs were present at the dam it would require a number of other dams in the vicinity to support a population'. Dam 2 does have a number of dams in the vicinity so the significance of this statement is unclear.

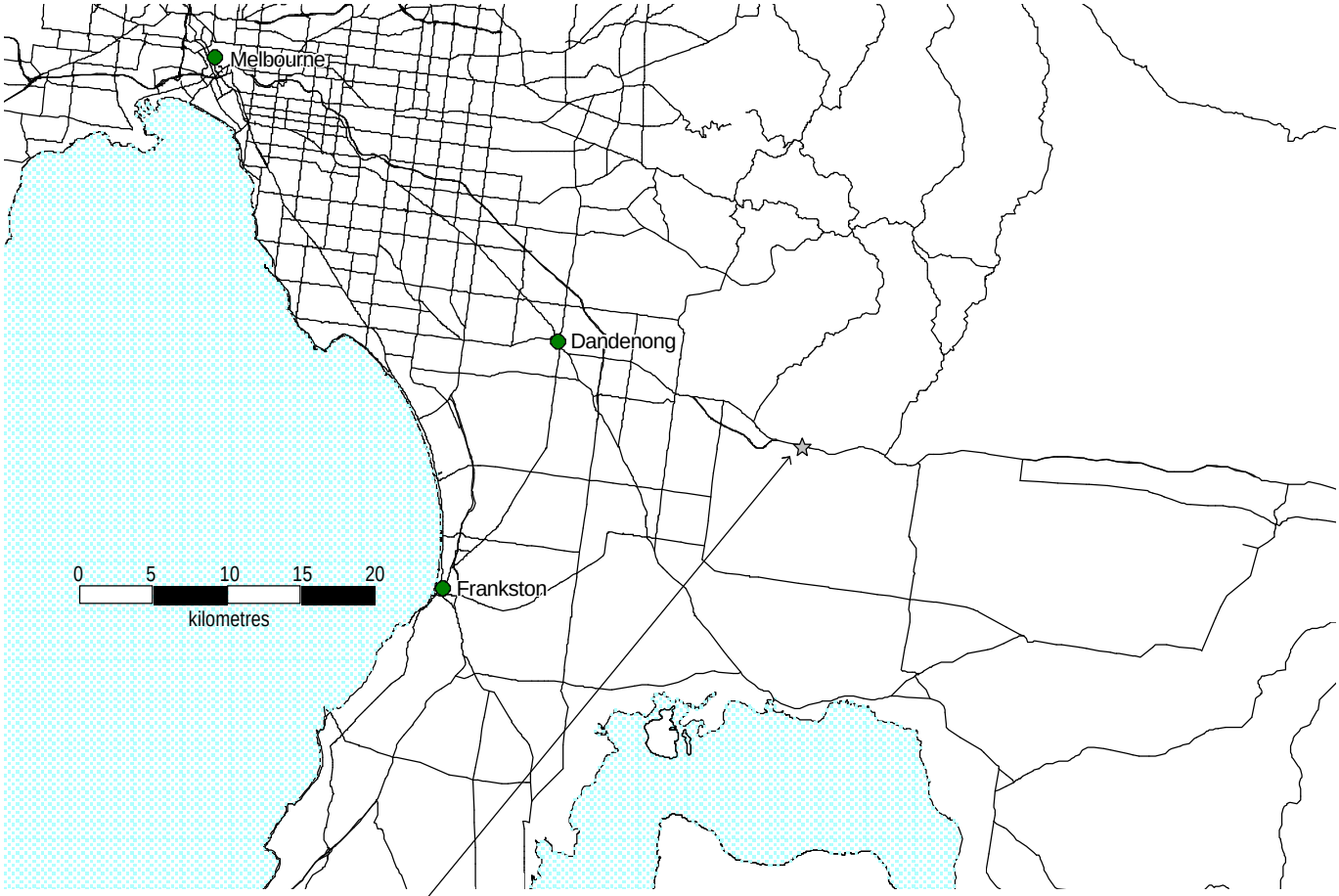
- P 12. Dam 3 is good quality Growling Grass Frog habitat (D. Gilmore pers. obs). It contains key habitat features including emergent vegetation (Common Reed *Phragmites australis*) and submergent vegetation (*Potamageton* sp.). No justification is given as to why the dam is not suitable Growling Grass Frog breeding habitat. Of all the dams on the property, this dam is considered most likely to harbour Growling Grass Frogs.

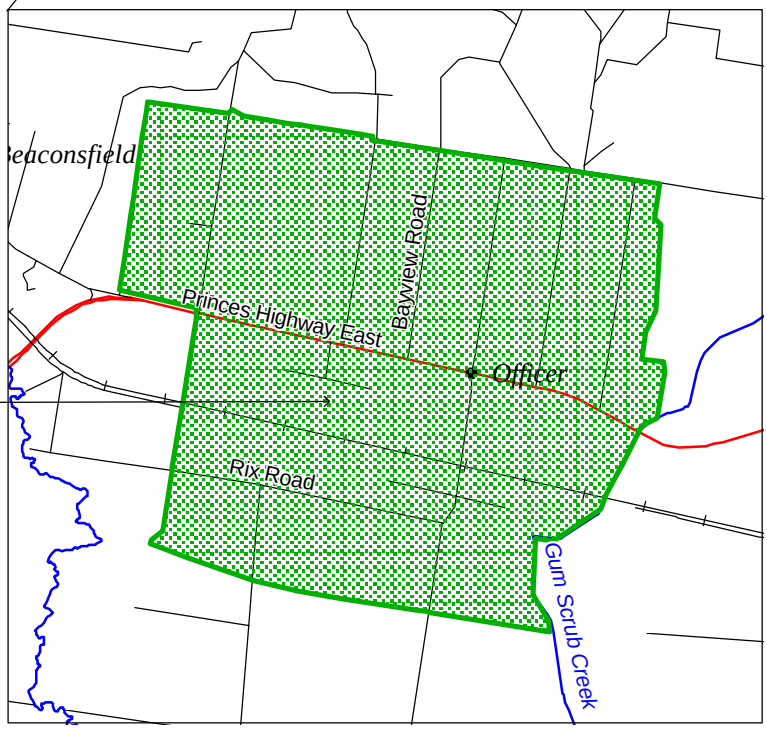
Conclusion

The consultant report is not an accurate or adequate description of the vegetation of the site. It contains many errors and omissions and is not of an acceptable standard. From the surveys undertaken, a valid assessment of the potential of the site to support a population of Growling Grass Frog is not possible. Further nocturnal survey for Growling Grass Frog during the peak of the breeding season is recommended. Survey should take place from October through to early December and be over several nights when weather conditions are optimal for GGF activity.

FIGURES

1 Location of study area, Officer





Study area

Acknowledgement: VicRoads

Biosis Research Pty. Ltd.
38 Bertie Street
(PO Box 489)
Port Melbourne
VICTORIA 3207

Figure 1: Location of the study area, Officer

DATE: 9 March 2006
Checked by: JY
File number: 5315
Location: P:\MRG 5300s\5315\Mapping\5315 Fig 1.wor

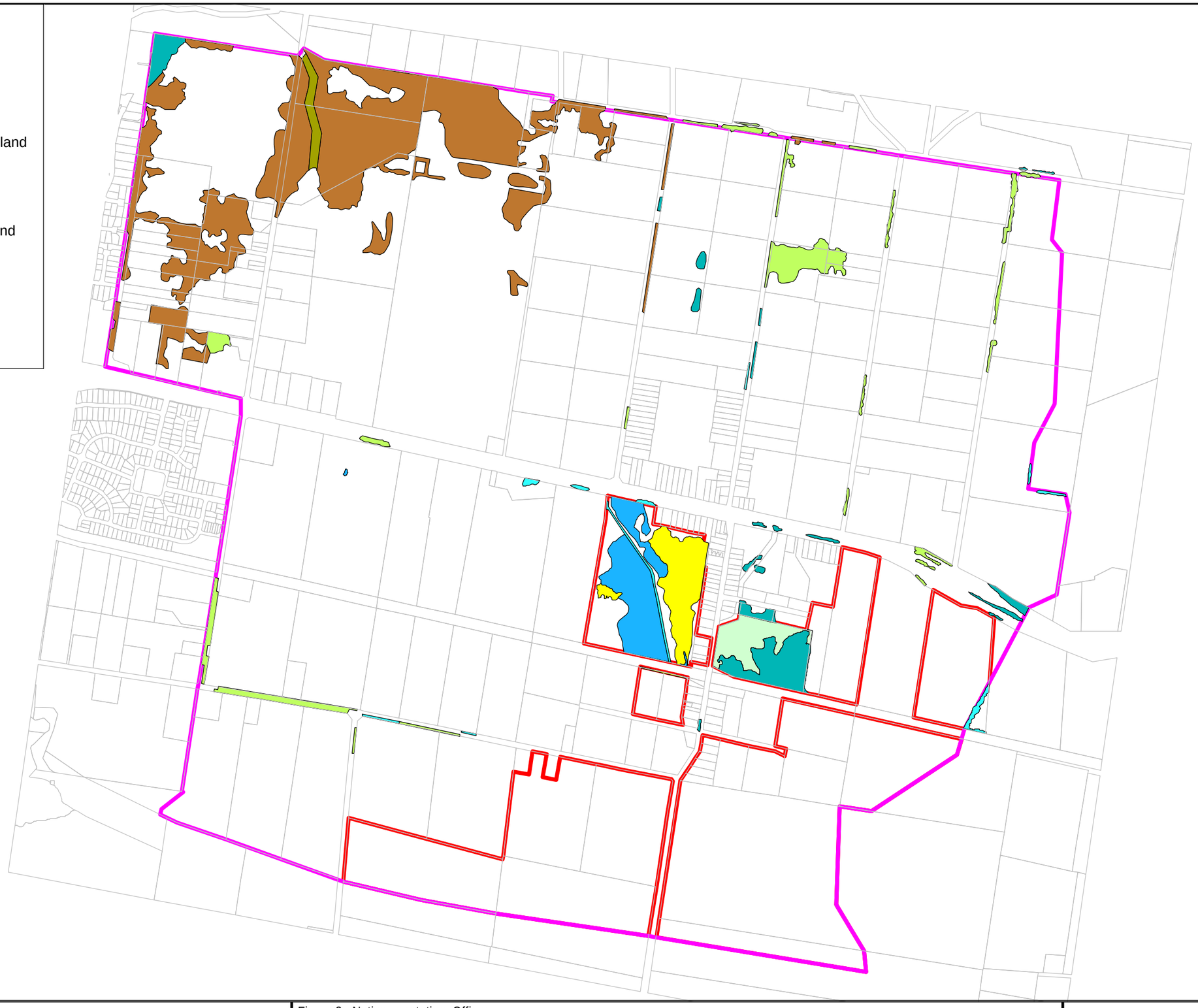
Scale: 0 0.5 1.0 1.5 2.0 kilometres

N W E S

2 Vegetation, Officer

EVCs

- Swampy Woodland
- Grassy Woodland
- Swamp Scrub
- Plains Grassy Woodland
- Grassy Forest
- Plains Grassland
- Plains Grassy Wetland
- Gully Woodland
- Study area
- VicUrban land



Biosis Research Pty. Ltd.

38 Bertie Street
(PO Box 489)
Port Melbourne
VICTORIA 3207

Figure 2: Native vegetation, Officer

DATE: 22 March 2006

Checked by: JY

File number: 5315

Location: ..\MRG 5300s\5315\Mapping\5315 Fig 2.wor

Scale: 0 150 300 450 600 750 metres

N W E S

Figure 2: Native vegetation, Officer

3 Significant species, Officer

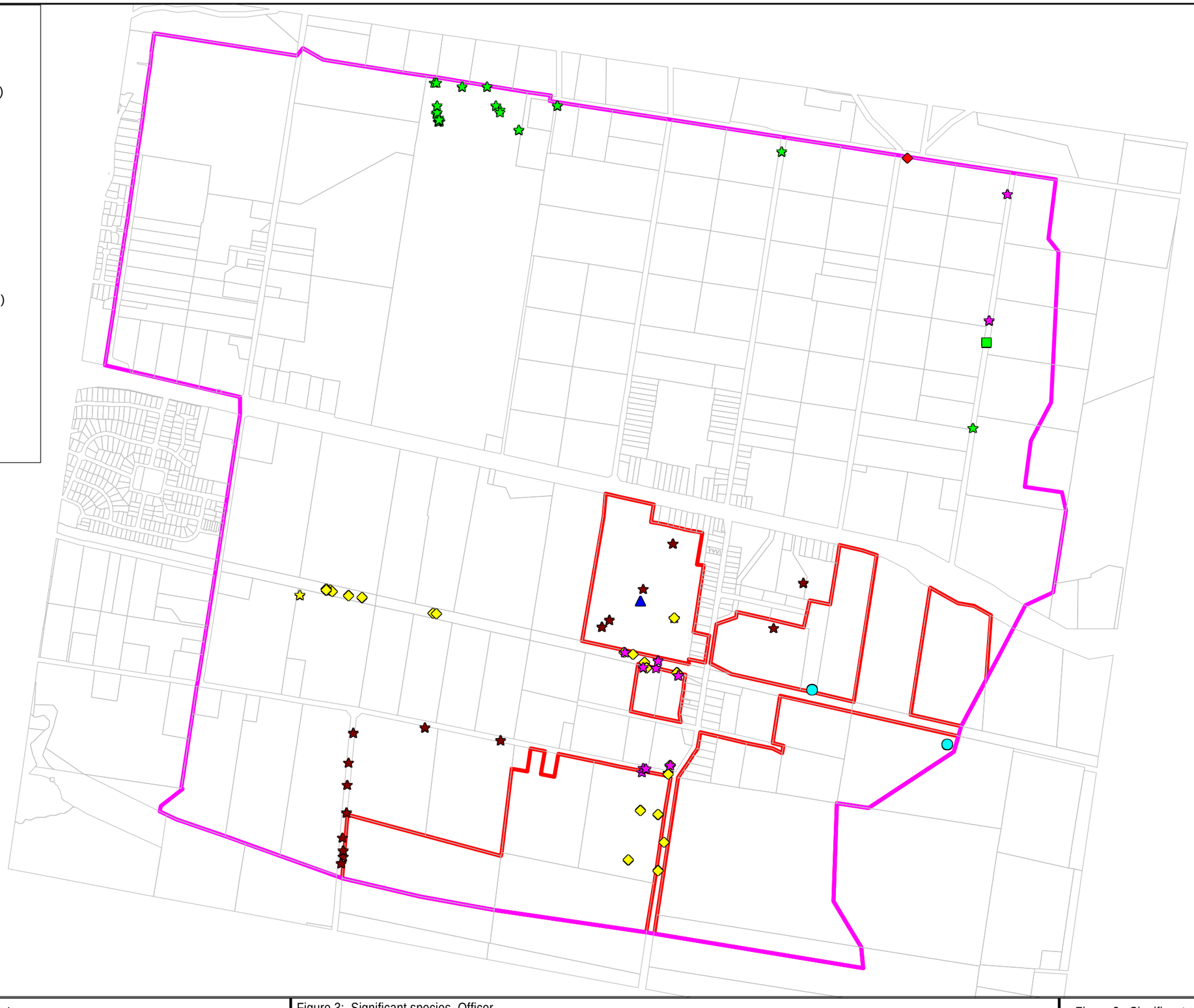
Significant Flora

- Matted Flax-lily (National)
- Maroon Leek-orchid (National)
- Arching Flax-lily (State)
- Green Scentbark (State)
- Purple Diuris (State)
- Veined Spear-grass (State)
- Giant Swamp Gum (Local)

Significant Fauna

- Growling Grass Frog (National)
- Lathams Snipe (State)

- VicUrban land
- Study area



Biosis Research Pty. Ltd.

38 Bertie Street
(PO Box 489)
Port Melbourne
VICTORIA 3207

Figure 3: Significant species, Officer

DATE: 22 March 2006

Checked by: JY

File number: 5315

Location: ..\MRG 5300s\5315\Mapping\5315 Fig 3.wor

Scale: 0 150 300 450 600 750 metres

N W E S

Figure 3: Significant species, Officer