DINGLEY CORRIDOR – WARRIGAL ROAD TO WESTALL ROAD

HABITAT HECTARE AND NET GAIN ASSESSMENT

VicRoads Eastern Projects

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ISSUE AND REVISION RECORD

Revision	Date	Author/s	Reviewer	Revisions
1.0	19/5/11	Justin Sullivan	Alan Brennan	Initial Draft
1.1	01/06/11	Bill Wallach	Annabelle Stewart	Updating the report to include client comments.

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1. EXECUTIVE SUMMARY

VicRoads Eastern Projects engaged BL&A to conduct a habitat hectare and net gain assessment for a number of parcels of land along a six kilometre proposed road corridor from Warrigal Road to Westall Road Extension, Dingley, southeast of Melbourne.

A previous flora and fauna assessment report was prepared by BL&A in December 2010. The database searches and results of this initial assessment form part of the basis of this report. Revisions to the mapping of native vegetation were undertaken as part of this assessment and all areas of native vegetation within the study area were assessed in detail.

A total of nine remnant patches of native vegetation totalling 3.28 habitat hectares (8.02 hectares) were recorded in the study area. Native vegetation recorded in these areas belonged to four Ecological Vegetation Classes (EVCs) including Damp Sands herb-rich Woodland (EVC 3), Swamp Scrub (EVC 53), Plains Grassy Woodland (EVC 55) and Creekline Grassy Woodland (EVC 68).

Three small areas of Degraded Treeless Vegetation totalling 0.71 hectares were also recorded on areas of artificial substrate within the study area.

The following recommendations are provided for the project to meet the principles of the Framework:

- Avoid and minimise the removal of native vegetation in the form of remnant patches and scattered trees where possible;
- Where any removal of native vegetation cannot be avoided, provide compensation for the removal in the form of native vegetation offsets.

As a detailed design for the project has not yet been finalised, offset targets have been provided in this report based on the removal of all native vegetation in the study area.

These targets provide a conservative worst case scenario of the actual offsets that would be required. Once a design has been finalised, it is likely that a significant proportion of native vegetation will be retained.

The following implications would pertain to the current development proposal:

- A planning permit is required for the removal of native vegetation within the proposed road corridor for this project.
- The current proposal would trigger a referral to DSE if the following native vegetation is proposed for removal:
    - More than 0.5 hectares of vulnerable or endangered remnant patch vegetation; and
    - More than five scattered trees of DBH 40 centimetres or greater.
- The following offset targets, meeting like-for-like rules, would be required for the removal of all native vegetation within the study area (Note that these are indicative offset targets only and that accurate offset targets will be provided once a detailed design has been prepared for the project):

- 0.08 habitat hectares for the removal of 0.08 habitat hectares (0.43 hectares) of medium conservation significance Damp Sands Herb-rich Woodland(EVC 3);
- 3.04 habitat hectares for the removal of 2.03 habitat hectares (4.50 hectares) of high conservation significance Damp Sands Herb-rich Woodland (EVC 3);
- 0.19 habitat hectares for the removal of 0.13 habitat hectares (0.63 hectares) of high conservation significance Swamp Scrub (EVC 53);
- 0.22 habitat hectares for the removal of 0.14 habitat hectares (0.44 hectares) of high conservation significance Creekline Grassy Woodland (EVC 68);
- 0.07 habitat hectares for the removal of 0.04 habitat hectares (0.16 hectares) of high conservation significance Plains Grassy Woodland (EVC 55);
- 1.72 habitat hectares for the removal of 0.86 habitat hectares (1.86 hectares) of Very High conservation significance Swamp Scrub (EVC 53);
- The protection of 28 large trees and recruitment of 140 new plants for the removal of large trees from Habitat Zones B, F and I.
- The protection of 3 medium trees and recruitment of 283 new plants OR the recruitment of 343 new plants for the removal of 15scattered trees.

2. INTRODUCTION

VicRoads Eastern Projects engaged BL&A to conduct a habitat hectare and net gain assessment for a number of parcels of land along a six kilometre proposed road corridor from Warrigal Road to Westall Road Extension, Dingley, southeast of Melbourne.

A previous flora and fauna assessment report was prepared by BL&A in December 2010. The database searches and results of this initial assessment form part of the basis of this report. Revisions to the mapping of native vegetation were undertaken as part of this assessment and all areas of native vegetation within the study area were assessed in detail.

This investigation was commissioned to provide information on the implications for the removal of native vegetation within the study area under Victoria's Native Vegetation Management Framework (DNRE 2002), referred to herein as the 'Framework'.

Specifically, the scope of the investigation included:

- A site survey involving:
    - Identification of the extent and type of any remnant vegetation and the mapping of habitat zones and scattered trees;
    - Habitat scoring to ascertain vegetation condition in each habitat zone, consistent with the methodology required for net gain analysis under the state vegetation planning provisions; and
    - Searches for rare and threatened flora species within areas of remnant native vegetation that may be affected by the proposed development (subject to seasonal constraints);
- Preparation of a map of the site, showing the results of the native vegetation assessment.

This report is divided into the following sections:

Section 3 describes the sources of information, including the methods used for the field survey.

Section 4 provides an overview of the characteristics of the study area.

Section 5presents the results of the habitat hectare assessment.

Section 6 discusses the implications of the findings, including indicative offset targets for the removal of native vegetation within the study area.

Section 7 provides recommendations to inform the design process and assist the development of a minimum impact proposal.

This investigation was undertaken by a team from Brett Lane & Associates Pty. Ltd., comprising Justin Sullivan (Botanist), Davide Coppolino (Botanist) and Alan Brennan (Senior Ecologist& Project Manager).

3. SOURCES OF INFORMATION

3.1. Existing information

Existing information regarding flora, fauna andnative vegetation utilised as part of this investigation is described below. Note that 'study area' refers to the six kilometre proposed route for the Dingley Corridor between Warrigal Road and Westall Road Extension.

Existing information for this assessment was initially obtained during the previous flora and fauna assessment undertaken by BL&A in December 2010 and was reviewed for the purpose of this assessment. This information was obtained from a wider area, termed the 'search region' defined for this assessment as an area with radius five kilometres along the proposed alignmentof coordinates: latitude37˚56' 19" S and longitude 145˚ 04' 47" E to latitude37˚58' 07" S and longitude 145˚ 08' 07" E. Further details of existing information utilised for this assessment is provided in the previous flora and fauna assessment report:

- Dingley Corridor – Warrigal Road to Westall Road: Flora and Fauna Assessment, BL&A Report 8094 (8.1), December 2010.

3.1.1. Ecological Vegetation Classes

Pre-1750 (pre-European settlement) vegetation mapping was reviewed to determine the type of native vegetation likely to occur in the study area. Information on Ecological Vegetation Classes was obtained from published EVC benchmarks. These sources included:

- Relevant EVC benchmarks for the Gippsland Plain bioregion[1] (DSE 2011a); and
- Biodiversity Interactive Maps (DSE 2011b).

3.2. Field methodology

The initial flora and fauna assessment was undertaken by a botanist and zoologist from BL&A on the 28th September 2010.Duringthis assessment, the study area was inspected initially by vehicle and areas supporting remnant native vegetation and/or fauna habitat were surveyed in more detail on foot.

The habitat hectare assessment was undertaken by two botanists from BL&A on the 13th May 2011. During this assessment all sites mapped in the initial flora and fauna assessment as areas supporting native vegetation were visited. Mapping and classification were reviewed and habitat hectare/scattered tree assessments were undertaken where required. Habitat hectare and scattered tree assessments were only undertaken for native vegetation within the study area boundary.

[1]A bioregion is defined as "a geographic region that captures the patterns of ecological characteristics in the landscape, providing a natural framework for recognising and responding to biodiversity values". In general bioregions reflect underlying environmental features of the landscape (DNRE 1997).

3.2.1. Flora

Incidental records of flora species were made based on intuitive sampling methods within all vegetation types and landforms. Specimens requiring identification using laboratory techniques were collected.

3.2.2. Native vegetation

Native vegetation in Victoria has been defined by the DSE as belonging to three categories:

- Remnant patch;
- Scattered trees; and
- Degraded treeless vegetation.

A description of these is provided below with the prescribed DSE methods to assess them.Wetlands are not assessed as native vegetation under the Framework.

Remnant patch

Remnant patches of native vegetation comprise indigenous plant species considered part of a clearly definable EVC and are defined by the DSE as:

- An area of native vegetation, with or without trees, where at least 25% of the understorey cover is indigenous (excluding bare ground); and/or
- "Agroup (i.e. three or more) of trees where the tree canopy cover is at least 20%" (DSE 2007a).

Scattered trees

DSE (2007a) define scattered trees as indigenous canopy trees with a diameter at breast height (1.3 metres) (DBH) greater than ten centimetres "within an area where at least 75% of the total understorey plant cover is introduced vegetation and the overall canopy cover for a group (i.e. three or more) of treesis less than 20%".

Degraded treeless vegetation

Degraded treeless vegetation comprises all other vegetation (DSE 2007a) including:

- Treeless vegetation with less than 25% total cover of indigenous species (excluding bare ground); or
- Treeless vegetation that has greater than 25% total cover of indigenous species (excluding bare ground) but is dominated by a small number of opportunistic native species which were unlikely to have been dominant prior to a disturbance event (e.g. cropping).

3.3. Limitations of field assessment

Where feasible, all efforts are made to schedule native vegetation surveys in optimal weather conditions and times of year. Nevertheless, field surveys usually fail to record all species present for various reasons, including the seasonal

absence of some species and short survey duration. Rare or cryptic species are often missed in short surveys.

The habitat hectare assessment was carried out in autumn, when many spring-emergent plant species may have been in the senescent stage of their life-cycle and lacking essential identification characteristics. The timing of the survey and condition of vegetation was otherwise considered suitable to ascertain the extent and quality of native vegetation.

As the primary purpose of the investigation was to assess the extent and quality of native vegetation in the study area, the review of existing information, combined with the field survey were sufficient to complete this aspect of the assessment.

Wherever appropriate, a precautionary approach has been adopted in the discussion of implications. That is, where insufficient evidence is available on the occurrence or likelihood of occurrence of a species, it is assumed that it could be in an area of suitable habitat. The implications under legislation and policy are considered accordingly.

4. SITE DESCRIPTION

The study area for this investigation (Figure 1) is a six kilometre long proposed road corridor from Warrigal Road to Westall Road Extension, Dingley, approximately 20 kilometres south east of Melbourne.

The study area comprises various land uses, including farming (mainly cropping) and existing roads and adjacent road reserves. Vegetation within farm properties is limited to planted crop, introduced pasture grasses and weeds. Few scattered indigenous trees and shrubs were recorded in these areas. Few small patches of native vegetation were recorded within existing road reserves, including a large area of remnant vegetation on the western side of Westall Road (Springvale Road).

Surrounding land predominantly supports current residential developments and market gardens.The study area supported sandy soils on a mainly flat landscape. A large dam was present in the western part of the study area adjacent to an existing quarry.

Native vegetation within the study area consisted of various types of woodland, as well as swamp scrub and a small area of wetland. The main type of vegetation present was Damp Sands Herb-rich Woodland which was dominated by Coast Manna-gum (*Eucalyptus viminalis*subsp. *pryoriana*) and also comprised various native understorey species including Sallow Wattle and Thatch Saw-sedge. Austral Bracken was common in the understorey in this vegetation along with a high cover of introduced grasses. Indigenous River Red-gums and Swamp Gums formed the canopy component of other types of woodland within the study area. Scrubby vegetation was distinguished in the study area by the dense canopy of Swamp Paperbark.

The study area lies within the Gippsland Plain bioregionand falls within the Port Phillip and Westernportcatchment. It is currently zoned Road Zone – Category 1 (RDZ1) in the Kingston and Greater Dandenong Planning Scheme. No overlays relevant to flora, fauna or native vegetation cover the study area.

5. ASSESSMENT RESULTS

5.1.1. Flora species

A total of 84 plant species were recorded within the study area during the flora and fauna assessment and the habitat hectare assessment. Of these, 32 (38%) were indigenous and 52 (62%)were introduced or non-indigenous native in origin (Appendix 1).

FIS records (Viridans Biological Databases 2010a) and the EPBC Protected Matters Search Tool (DEWHA 2010) indicate that within the search region there are records of, or there occurs potential suitable habitat for, 39rare or threatened flora species. Of these, seven species were listed under the federal EPBC Act, nine on the state *Flora and Fauna Guarantee Act 1988*(FFG Act) and 38 on DSE's Advisory List for Rare and Threatened Flora (DSE 2005). Norare or threatened flora species were detected during the current field survey.

The likelihood of occurrence in the study area of threatened species listed under the FFG Act or the EPBC Act has been addressed in the initial flora and fauna assessment and is not discussed further in this report.

5.1.2. Ecological Vegetation Classes

Pre–European EVC mapping (DSE 2011b) indicates that the study area and surrounds would have supported several different EVCs prior to European settlement based on modelling of factors including rainfall, aspect, soils and remaining vegetation.

Evidence on site, including floristic composition and soil characteristics, suggested Damp Sands herb-rich Woodland (EVC 3), Swamp Scrub (EVC 53), Plains Grassy Woodland (EVC 55) and Creekline Grassy Woodland (EVC 68) were present within the study area.

Damp Sands herb-rich Woodland (EVC 3)has a vulnerable conservation status in the Gippsland Plain bioregion. The benchmark for this EVC describes it as "A low, grassy or bracken-dominated eucalypt forest or open woodland to 15 m tall with a large shrub layer and ground layerrich in herbs, grasses, and orchids. [It] occurs mainly on flat or undulating areas on moderately fertile, relatively well-drained, deepsandy or loamy topsoils over heavier subsoils (duplex soils)." (Appendix 4).

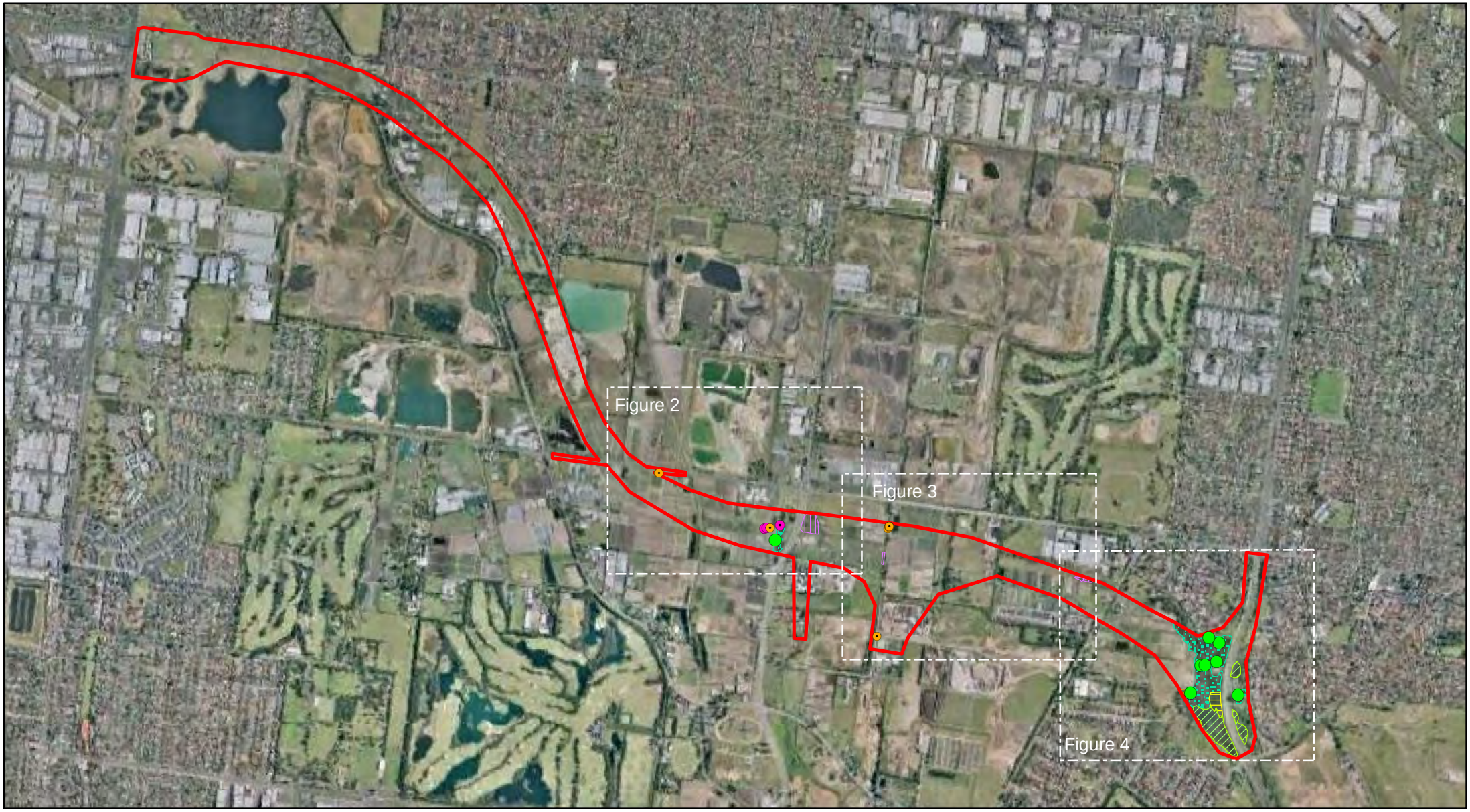
Swamp Scrub (EVC 53)has an endangered conservation status in the Gippsland Plain bioregion. The benchmark for this EVC describes it as "Closed scrub to 8 m tall at low elevations on alluvial deposits along streams or on poorly drained sites with higher nutrientavailability. The EVC is dominated by Swamp Paperbark Melaleuca ericifolia (or sometimes Woolly Tea-tree Leptospermumlanigerum) 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 havea grassy/herbaceous ground layer" (Appendix 4).

Plains Grassy Woodland (EVC 55)has an endangered conservation status in the Gippsland Plain bioregion. The benchmark for this EVC describes it as "An open, eucalypt woodland to 15 m tall occurring on a number of geologies and soil types. [It] occupies poorly drained, fertilesoils on flat or gently undulating plains at low

elevations. The understorey consists of a few sparse shrubs over a species-richgrassy and herbaceous ground layer" (Appendix 4).

Creekline Grassy Woodland (EVC 68) has an endangered conservation status in the Gippsland Plain bioregion. The benchmark for this EVC describes it as "Eucalypt-dominated woodland to 15 m tall with occasional scattered shrub layer over a mostly grassy/sedgy to herbaceousground-layer. Occurs on low-gradient ephemeral to intermittent drainage lines, typically on fertile colluvial/alluvial soils, on a wide range of suitably fertile geological substrates. These minor drainage lines can include a range of graminoid and herbaceous species tolerant of waterlogged soils, and are presumed to have sometimes resembled a linear wetland or systemof interconnected small ponds" (Appendix 4).

A total of nine remnant patches (referred to herein as habitat zones) comprising the abovementioned EVCs were identified in the study area (Table 1). Labelling of Habitat Zones is based on the labels used in the initial flora and fauna assessment. Additional Habitat Zones were defined during this assessment and are presented here also. The location of each of these habitat zones is shown in Figures 1 to 4.



Legend

- Study Area
- Large Trees in Habitat Zones

Scattered Trees

- Medium
- Small

Native Vegetation

- Creekland Grassy Woodland (EVC 68)
- Damp Sands Herb-rich Woodland (EVC 3)
- Plains Grassy Wetland (EVC 125)
- Plains Grassy Woodland (EVC 55)
- Swamp Scrub (EVC 53)
- Degraded Treeless Vegetation

0 250 500 1,000 Meters

Figure 1: Study Area and Native vegetation - Overview

Project: Dingley Corridor - Warrigal Rd to Westall Rd

Client: VicRoads Eastern Projects

Project No.: 8094	Date: 17/05/2011	Created By: J.Sullivan/ M.Ghasemi

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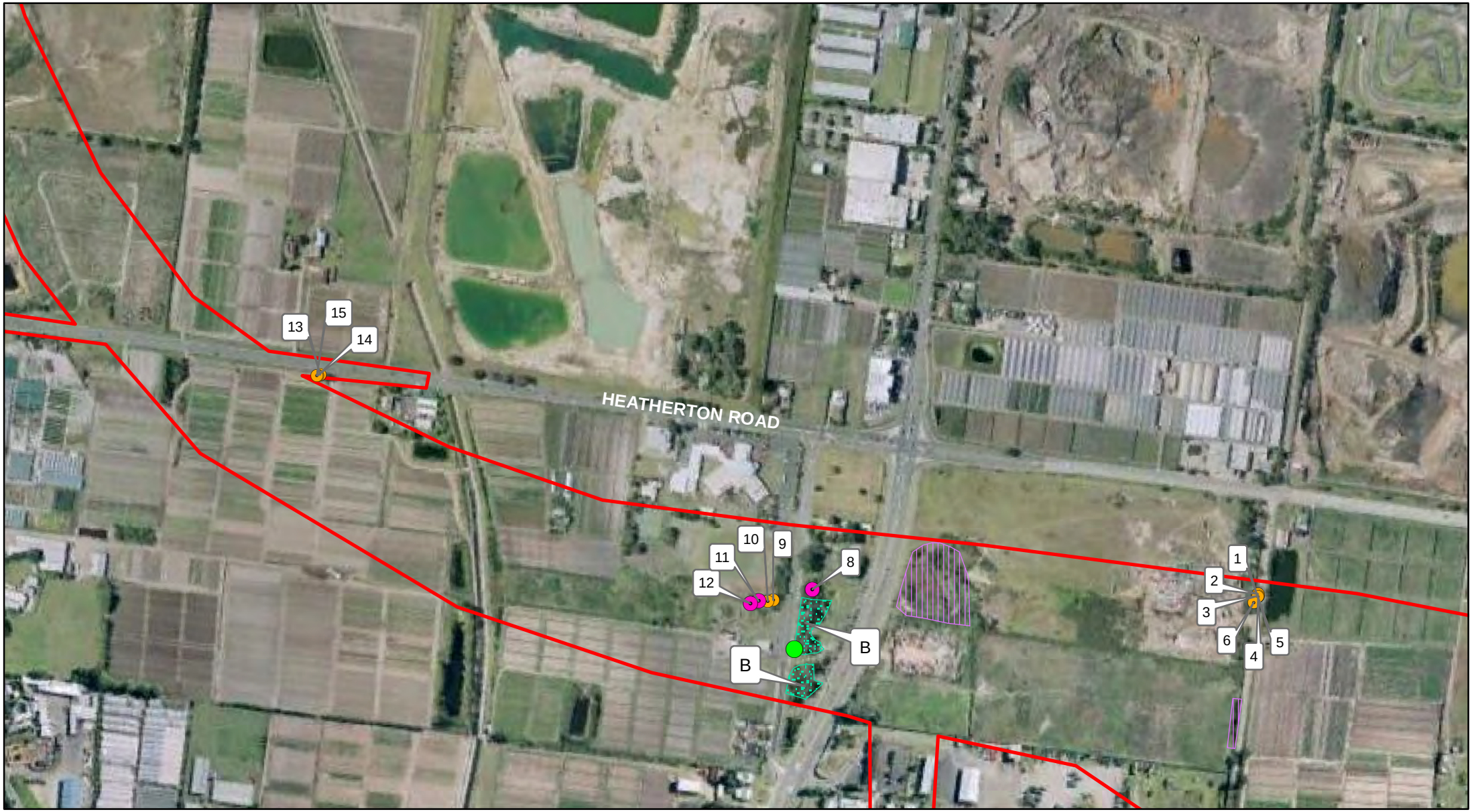

Legend

- Study Area
- Large Trees in Habitat Zones

Scattered Trees

- Medium
- Small

Native Vegetation

- Creekland Grassy Woodland (EVC 68)
- Damp Sands Herb-rich Woodland (EVC 3)
- Plains Grassy Wetland (EVC 125)
- Plains Grassy Woodland (EVC 55)
- Swamp Scrub (EVC 53)
- Degraded Treeless Vegetation

A — Native Vegetation lables

2 — Tree Numbers

0 50 100 200 Meters

Figure 2: Study Area and Native vegetation

Project: Dingley Corridor - Warrigal Rd to Westall Rd

Client: VicRoads Eastern Projects

Project No.: 8094.8	Date: 17/05/2010	Created By: J.Sullivan/ M.Ghasemi

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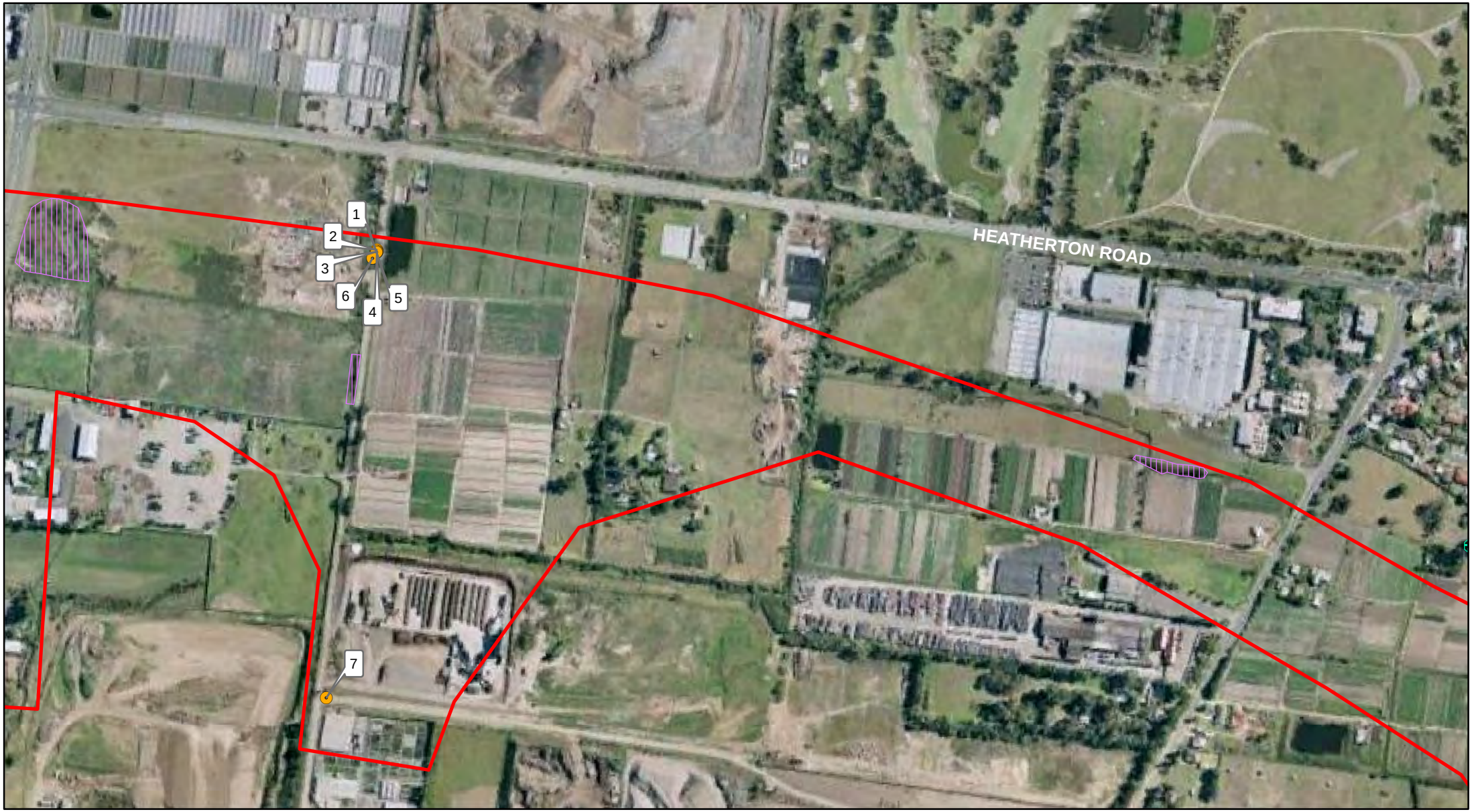

Legend

- Study Area
- Large Trees in Habitat Zones

Scattered Trees

- Medium
- Small

Native Vegetation

- Creekland Grassy Woodland (EVC 68)
- Damp Sands Herb-rich Woodland (EVC 3)
- Plains Grassy Wetland (EVC 125)
- Plains Grassy Woodland (EVC 55)
- Swamp Scrub (EVC 53)
- Degraded Treeless Vegetation

A — Native Vegetation lables

2 — Tree Numbers

0 50 100 200 Meters

Figure 3: Study Area and Native vegetation

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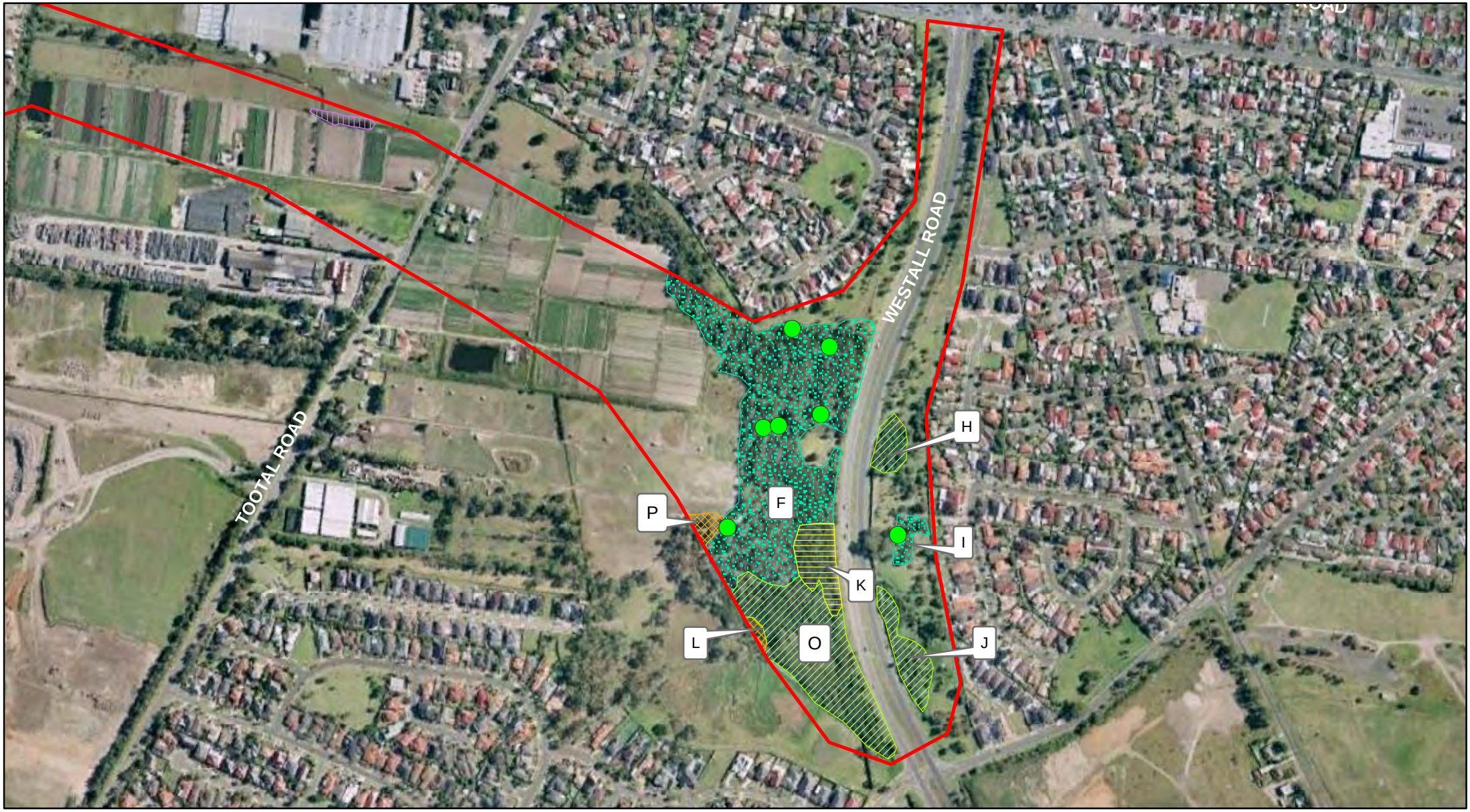

Legend

- Study Area
- Large Trees in Habitat Zones

Scattered Trees

- Medium
- Small

Native Vegetation

- Creekland Grassy Woodland (EVC 68)
- Damp Sands Herb-rich Woodland (EVC 3)
- Plains Grassy Wetland (EVC 125)
- Plains Grassy Woodland (EVC 55)
- Swamp Scrub (EVC 53)
- Degraded Treeless Vegetation

A Native Vegetation lables

2 Tree Numbers

0 50 100 200 Meters

Figure 4: Study Area and Native vegetation

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Table 1: Description of habitat zones in the study area

Habitat Zone#	EVC	Bioregional Conservation Status	Description
B	Damp Sands Herb-rich Woodland (EVC 3)	Vulnerable	Small patches of open woodland on eastern side of Old Boundary Road dominated by Coast Manna-gum. Sallow Wattle present in mid-layer. Ground cover consists namely of introduced grasses and Blackberry.
F*	Damp Sands Herb-rich Woodland (EVC 3)	Vulnerable	Large patch of woodland on western side of Westall Road (Springvale Road). Dominant native species include Coast Manna-gum, Sallow Wattle and Thatch Saw-sedge. While various indigenous understorey species occur at low cover levels, the understorey consists of a high weed cover, including Annual Veldt-grass, Panic Veldt-grass and Flax-leaf Broom. Leaf litter is very high in this area of vegetation.
H	Swamp Scrub (EVC 53)	Endangered	Patch of Swamp Scrub dominated by a dense cover of Swamp Paperbark. Few other indigenous species, including Sallow Wattle occur in this area. The understorey consists entirely of introduced grasses (Kikuyu) and weeds (Blackberry).
I	Damp Sands Herb-rich Woodland (EVC 3)	Vulnerable	Small patch of woodland dominated by Coast Manna-gum and Sallow Wattle. Some planted trees including Southern Mahogany occur in this area. The understorey consists mainly of introduced grasses.
J	Swamp Scrub (EVC 53)	Endangered	Patch of Swamp Scrub dominated by a dense cover of Swamp Paperbark. No other indigenous species were recorded in this area. The understorey consists entirely of introduced grasses (Kikuyu) and weeds (Blackberry).
K	Creekline Grassy Woodland (EVC 68)	Endangered	Occurs along an existing drainage line in which a small amount of water was present at the time of surveying. Swamp Gum was the dominant canopy species and Black Wattle was common in dense cover. Woody weeds such as Sweet Pittosporum as well as a high cover of introduced grasses were present in this area.

Habitat Zone#	EVC	Bioregional Conservation Status	Description
L	Plains Grassy Woodland (EVC 55)	Endangered	Small area of woodland distinguished by a canopy of River Red-gum. Sallow Wattle was common within this habitat zone as well as Knob Sedge, an indigenous graminoid species. While recruitment of the canopy species was evident, the area consisted of a high cover of high threat weeds, namely Sweet Pittosporum and Bridal Creeper.
O	Swamp Scrub (EVC 53)	Endangered	Large area of Swamp Scrub distinguished by a dense cover of Swamp Paperbark. Sallow Wattle and Blackwood were common throughout. Weed cover was high in this habitat zone and consisted mostly of high threat weeds, namely Blackberry and Sheep Sorrel.
P	Plains Grassy Woodland (EVC 55)	Endangered	Small area of woodland distinguished by a canopy of River Red-gum. Few Coast Manna-gum and Swamp Gum individuals were also present in this habitat zone as it occurs partly in a transition zone between this vegetation type and Damp-Sands Herb-rich Woodland. Some water was present in this area at the time of the survey and various aquatic plants were recorded in the understorey including Water Ribbons. While recruitment of the canopy species was evident, the area consisted of a high cover of high threat weeds, namely Gorse and Blackberry.

= Habitat Zone labels follow labelling from initial flora and fauna assessment report (BL&A 2010); * = Several changes have been made to Habitat Zone F since the original BL&A Report 8094 (8.1). It has been separated into different patches and EVCs based on species composition and quality.

The habitat hectare assessment results for these habitat zones are provided in Table 2, including any large trees in habitat zones.More detailed habitat scoring results are presented in Appendix 2.

Table 2: Summary of habitat hectare assessment results

Habitat Zone	EVC no.	Area (ha)	Habitat Score (out of 100)	Habitat Hectare (Hha)	Conservation Significance	No. of large trees in habitat zone
B	Damp Sands Herb-rich Woodland	0.25	16	0.04	Medium	1
F	Damp Sands Herb-rich Woodland	4.50	45	2.03	High	6
H	Swamp Scrub	0.23	15	0.03	High	0
I	Damp Sands Herb-rich Woodland	0.17	22	0.04	Medium	1
J	Swamp Scrub	0.39	24	0.09	High	0
K	Creekline Grassy Woodland	0.44	33	0.14	High	0
L	Plains Grassy Woodland	0.05	22	0.01	High	0
O	Swamp Scrub	1.86	46	0.86	Very High	0
P	Plains Grassy Woodland	0.11	30	0.03	High	0
Totals		**8.02**		**3.28**		**8**

Note: Habitat Zones follow labelling from initial flora and fauna assessment report (BL&A 2010); Habitat Zones O and P are new zones that were identified during the habitat hectare assessment.

The conservation significance of habitat zones is based on the bioregional conservation status of the EVCs, habitat score of the vegetation, any significant site attributes and the results of the best / remaining 50% habitat assessment, presented in Appendix 5.

The assessment for best / remaining 50% of habitat has been undertaken for each Victorian listed flora and fauna species that has been recorded or is likely to occur in each habitat zone (DSE 2007a).

5.1.3. Scattered trees

Scattered trees recorded in the study area would have once comprised the canopy component of Damp Sands Herb-rich Woodland (EVC 3) and Plains Grassy Woodland (EVC 55). A total of 15 scattered trees occurred in the study area (Figure 1), of which three were medium and 12 were small. Size classes for

scattered trees are based on the benchmark large tree diameter at breast height (DBH) for the EVC for which it once belonged. The benchmark large tree diameter for Damp Sands Herb-rich Woodland (EVC 3) is 70 centimetres and Plains Grassy Woodland (EVC 55) is 80 centimetres (Appendix 4). Scattered trees are listed in Appendix 3and summarised in Table 3.

Table 3: Summary of scattered trees in the study area

Size Class	Representative EVC	DBH range (cm)	Conservation Significance	Number of trees
Medium	Damp Sands Herb-rich Woodland	53 to 69	Medium	3
Small	Damp Sands Herb-rich Woodland	17 to 52	Low	3
	Plains Grassy Woodland	20 to 59	Low	9

Medium scattered trees in the study area are assigned a medium conservation significance based on the bioregional conservation status of the EVC to which they once belonged, as presented in Table 3. Small scattered trees are defined as having low conservation significance according to the Framework.

5.1.4. Degraded treeless vegetation

Three small areas of vegetation (DTV)totaling 0.71 hectares within the study area have been defined as degraded treeless vegetation (see Figures 2 and 3). The two smaller areas mapped as DTV consist of linear patches of Swamp Paperbark growing in ditches on artificial substrate. The larger area of DTV is a cluster of Sallow Wattles which have grown on a large soil stockpile.

All three of these areas are considered to be occurring on artificial substrate and consist of a small number of opportunistic species that were unlikely to have been the dominant species prior to disturbance. This meets the definition of Degraded Treeless Vegetation.

6. IMPACTS AND REGULATORY IMPLICATIONS

6.1. Proposed development and direct impacts

The proposed development will involve the development of a road corridor from Warrigal Road to Westall Road Extension.

The proposed development would potentially impact on the following native vegetation:

- Nine patches of remnant vegetation including Damp Sands Herb-rich Woodland (EVC 3), Swamp Scrub (EVC 53); Plains Grassy Woodland (EVC 55) and Creekline Grassy Woodland (EVC 68).
- Fifteenscattered trees.

6.2. Planning controls

Destruction, lopping or removal of native vegetation on allotments of 0.4 hectares or more requires a planning permit under Clause 52.17 of all Victorian Planning Schemes. This includes the removal of dead trees with a DBH of 40 centimetres or greater, native degraded treeless vegetation and/or any individual scattered native plants.

A planning permit is required for the removal of native vegetation within the proposed road corridor for this project.

Before issuing a planning permit, Responsible Authorities are obligated to refer to Clause 12.01 (Biodiversity) in the Planning Scheme. This refers in turn to Victoria's Native Vegetation Management Framework – a Framework for Action, discussed in the following section.

6.3. Native VegetationManagement Framework

6.3.1. How the Framework operates

Any proposal to remove native vegetation from the study area must demonstrate that the three-step approach of 'Net Gain' outlined in the Framework has been applied. This approach is hierarchical and includes the following steps:

- Step 1: As a priority, ***avoid*** adverse impacts on native vegetation, particularly through clearance;

If the removal of native vegetation is unable to be avoided:

- Step 2: ***Minimise*** impacts through appropriate consideration in the planning process andexpert input to project design or management; and
- Step 3: Identify appropriate ***offset*** options.

A combination of project design and offsetting should aim to achieve a net gain in the area and quality of native vegetation across Victoria.

Responses to planning permit applications to remove native vegetation vary depending on the conservation significance of the vegetation proposed for removal. Conservation significance determines both the likelihood of approval and, importantly, the scale of the required offset. This is summarised in Table 4.

Table 4: Likely response to applications for removal of intact native vegetation

Framework conservation significance	Likely response to application for clearing	Likely offset requirements
VERY HIGH	Clearing not permitted unless exceptional circumstances apply. Offset Management Plan to be submitted with application.	Substantial Net Gain At least 2 X calculated loss in habitat hectares plus a large tree protection and replacement offset if any large trees are removed
HIGH	Clearing generally not permitted	Net Gain At least 1.5 X calculated loss in habitat hectares plus a large tree protection and replacement offset if any large trees are removed
MEDIUM	Clearing generally not permitted	Equivalent Gain At least 1 X calculated loss in habitat hectares plus a large tree protection and replacement offset if any large trees are removed
LOW	Clearing may be permitted but only as part of an appropriate sustainable use response	Equivalent Gain At least 1 X calculated loss in habitat hectares

Offset targets are directly related to the habitat hectare value of the removed vegetation. They can comprise indigenous vegetation retained for conservation purposes within the study area, or vegetation elsewhere, secured on a case-by-case basis by the proponent or through the DSE Bush Broker scheme.

Clause 66.02 of the planning scheme determines the role of the DSEin the assessment of indigenous vegetation removal planning permit applications. If an application is referred to the DSE then the Responsible Authority must follow that department's recommendation in relation to that permit application. The criteria presented in Table 5 indicate when the DSE becomes a referral authority.

Table 5: Application referral criteria

Applications will be referred to the Department of Sustainability and Environment under the following circumstances:
Scattered Trees ▪ To remove more than 15 native or indigenous trees of DBH less than 40 centimetres ▪ To remove more than fivenative or indigenous trees of DBH 40 centimetres or greater (DBH = diameter at 1.3 metres above ground)
Remnant Patch Vegetation (may include trees) ▪ To remove more than 0.5 hectares of vegetation in an EVC with Bioregional Conservation Status of Endangered, Vulnerable or Rare. ▪ To remove more than one hectare of vegetation in an EVC with Bioregional Conservation Status of Depleted or Least Concern.

The current proposal would triggera referral to DSE if the following native vegetation is proposed for removal:

- More than0.5 hectares of vulnerable or endangered remnant patch vegetation; and
- More than five scattered trees of DBH 40 centimetres or greater.

6.3.2. Design recommendations

The following recommendations for the project to meet the principles of the Framework:

- Avoid and minimise the removal of native vegetation in the form of remnant patches and scattered trees where possible;
- Where any removal of native vegetation cannot be avoided, provide compensation for the removal in the form of native vegetation offsets.

6.3.3. Indicative Offset Targets

As a detailed design for the project has not yet been finalised, offset targets have been provided in this section based on the removal of all native vegetation in the study area. It is to be noted that these offset targets only provide an indicator of the actual offsets that would be required once a detailed design has been finalised. It is recommended that the proposed development retains as much native vegetation in the form of remnant patches and scattered trees within the study area as possible. This would therefore result in a lower offset requirement than provided below.

6.3.3.1. Offset targets for removalfrom habitat zones

Offsets for the removal of native vegetation from habitat zones are directly related to the habitat hectare value of the removed vegetation. These may include the permanent protection (e.g. Section 173 agreement under the *Planning and Environment Act 1987*) for conservation purposes of other existing remnant vegetation. Offsets are planned to be secured in perpetuity offsite. Offsite offsets may be identified on a case-by-case basis by the proponent or through the DSE Bush Broker scheme.

Offsets must be of a like-for-like nature as outlined in the Framework. Like-for-like requirements are summarised in Table 6.

Table 6: Like-for-like requirements for offsetting removal of remnant patch native vegetation

Like-for-like criteria	Conservation significance			
	Very high	High	Medium	Low
Type of vegetation that may be used for offsets	Same EVC	Same EVC OR *very high* conservation significance vegetation within the same bioregion	Any EVC in the same bioregion OR *very high* or *high* conservation significance vegetation in an adjacent bioregion	
Minimum quality of the existing vegetation proposed	90% of the quality in the area being	75% of the quality in the area being lost	50% of the quality in the area being lost	

Like-for-like criteria	Conservation significance			
	Very high	High	Medium	Low
as the basis of an offset	lost			
Maximum proportion of the offset target (in Habitat Hectares) that may be achieved through revegetation	10%	25%	50%	100%

Indicative offset targetsfor the removal of remnant patches of native vegetation within the study area are presented in Table 7.

Table 7: Offset targets for removal from habitat zones

Habitat Hectares Target							Large Tree Target				
								Protect		Recruit^	
Habitat Zone	Conservation Significance	EVC	Area of Habitat Zone in Study area (ha)	Habitat Hectares (Hha)	Net Gain Multiplier*	Net Gain Target (Hha) per 0.1 hectares of removal	Total Losses	Multiplier*	Target (trees)	Multiplier*	Target (plants)
B	Medium	Damp Sands Herb-rich Woodland	0.25	0.04	x 1	0.04	1	x 2	2	x 10	10
F	High	Damp Sands Herb-rich Woodland	4.50	2.03	x 1.5	3.04	6	x 4	24	x 20	120
H	High	Swamp Scrub	0.23	0.03	x 1.5	0.05	0	-	-	-	-
I	Medium	Damp Sands Herb-rich Woodland	0.17	0.04	x 1	0.04	1	x 2	2	x 10	10
J	High	Swamp Scrub	0.39	0.09	x 1.5	0.14	0	-	-	-	-
K	High	Creekline Grassy Woodland	0.44	0.14	x 1.5	0.22	0	-	-	-	-
L	High	Plains Grassy Woodland	0.05	0.01	x 1.5	0.02	0	-	-	-	-
O	Very high	Swamp Scrub	1.86	0.86	x 2	1.72	0	-	-	-	-
P	High	Plains Grassy Woodland	0.11	0.03	x 1.5	0.05	0	-	-	-	-
Totals			**8.02**	**3.28**		**5.31**	**8**		**28**		**140**

***** = These multipliers relate to Table 6 of the Framework and may be varied by the Regional Vegetation Plans; **^** = 15% of plants recruited must be canopy trees

The process of calculating offsets is highly complex. The area required to achieve the offset target is based on vegetation quality within the offset site and the proposed management, tenure and security. An appropriate third party offset site (i.e. site located on another property) would need to be identified through discussions with the Responsible Authority or with the DSE BushBroker coordinator. Financial contribution to the local government may also be used to account for part, or all, of the required offset. The cost of such an offset would require detailed negotiations with the relevant municipality.

Additional offset targets for removal of large trees from habitat zonesapply to any such approved removal under the Framework and the Port Phillip and Westernport Native Vegetation Plan (PPWCMA 2006) as presented in Table 7.

These offsets contain both a protection and recruitment component, whereby a prescribed number of existing trees must be protected for conservation purposes, and a prescribed number of new indigenous plants must be successfully recruited through planting and/or assisted natural regeneration.

6.3.4. Offset targets for removal of scattered trees

Any approved removal of scattered trees will attract an offset target comprising protection and recruitment components, whereby a prescribed number of trees of the same size class must be protected and recruitment (planting or assisted regeneration) of indigenous plants undertaken. The scale of the offset is determined by the size class of the trees proposed to be removed. Alternatively, in the event that the protection of existing trees is considered not to be feasible, a 'recruit only' offset for tree removal may apply, subject to negotiation with the Responsible Authority.

Indicative offset targets for the removal of scattered trees,as determined by the Framework and the Port Phillip and Western Port Native Vegetation Plan (PPWCMA 2006), are presented in Table 8.

Table 8: Summary of offset targets for scattered tree removal

Conservation Significance	Size Class	No. Trees to be Removed	Protect and Recruit Option				Recruit Only Option*
			Protect (No. of Trees)		Recruit (No. of Plants)*		
			Multiplier*	Offset Total	Multiplier*	Offset Total	
Medium	Medium	3	x 1	3	x 15	45	105
Low	Small	12	N/A	N/A	Variable #	238	238
Totals		**15**		**3**		**283**	**343**

***** = 15% of plants recruited must be canopy trees only (PPWCMA 2006), **# =** Offsets for the removal of small scattered trees are calculated based on the specific DBH of the tree. Tree replacement numbers are sourced from Section 3.4.4 (Figure 7) of the Port Phillip and Western Port CMA Native Vegetation Plan (2006).

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

The following implications would pertain to the current development proposal:

- A planning permit is required for the removal of native vegetation within the proposed road corridor for this project.
- The current proposal would trigger a referral to DSE if the following native vegetation is proposed for removal:
    - More than 0.5 hectares of vulnerable or endangered remnant patch vegetation; and
    - More than five scattered trees of DBH 40 centimetres or greater.
- The following offset targets, meeting like-for-like rules, would be required for the removal of all native vegetation within the study area (Note that these are indicative offset targets only and that accurate offset targets will be provided once a detailed design has been prepared for the project):
    - 0.08 habitat hectares for the removal of 0.08 habitat hectares(0.43 hectares) of medium conservation significance Damp Sands Herb-rich Woodland(EVC 3);
    - 3.04 habitat hectares for the removal of 2.03 habitat hectares (4.50 hectares) of high conservation significance Damp Sands Herb-rich Woodland (EVC 3);
    - 0.19 habitat hectares for the removal of 0.13 habitat hectares (0.63 hectares) of high conservation significance Swamp Scrub (EVC 53);
    - 0.22 habitat hectares for the removal of 0.14 habitat hectares (0.44 hectares) of high conservation significance Creekline Grassy Woodland (EVC 68);
    - 0.07 habitat hectares for the removal of 0.04 habitat hectares (0.16 hectares) of high conservation significance Plains Grassy Woodland (EVC 55);
    - 1.72 habitat hectares for the removal of 0.86 habitat hectares (1.86 hectares) of Very High conservation significance Swamp Scrub (EVC 53);
    - The protection of 28 large trees and recruitment of 140 new plants for the removal of large trees from Habitat Zones B, F and I.
    - The protection of 3 medium trees and recruitment of 283 new plants OR the recruitment of 343 new plants for the removal of 15scattered trees.

7.2. Mitigation Recommendations

Consideration should be given to including the mitigation measures described below in a construction and operational environmental management plan for the project:

Pre-construction:

- Avoid disturbing the remnant patch native vegetation and scattered trees where feasible;
- In accordance with the *Catchment and Land Protection Act 1994*, the noxious weed species listed below, which were recorded in the study area, must be controlled using precision methods that minimise off-target kills (e.g. spot spraying). This method of control will be implemented throughout the project.
  - African Box-thorn;
  - Angled Onion;
  - Fennel;
  - Flax-leaf Broom;
  - Gorse; and
  - Montpellier Broom.
- The proposed development should be designed in a way that does not alter the site's hydrology in areas that support native vegetation;
- Construction contractors should be inducted into an environmental management program for construction works; and
- All environmental controls should be checked for compliance on a regular basis.

Construction phase:

- Environmentally sensitive areas should be securely fenced off at least one metre from the perimeter and appropriately signed. All machinery and earthworks are to be excluded from these areas;
- Any tree pruning should be undertaken by an experienced arborist to prevent disease or unnecessary damage to the tree or disturbance to understorey vegetation during tree trimming;
- Any stockpiling will occur outside of environmentally sensitive areas;
- All machinery should enter and exit works sites along defined routes that do not impact on native vegetation or cause soil disturbance and weed spread;
- All machinery brought on site should be weed and pathogen free. This is important for environmental and agricultural protection.
- All machinery wash down, lay down and personnel rest areas should be defined (fenced) and located in disturbed areas; and
- Best practice erosion control should be installed where an erosion hazard is identified, erosion control activities should include:
  - The use of sediment fences down slope of exposed soil and stockpiles;
  - Bunding of stockpiles; and
  - Minimisation of the area of disturbed soil at any one time.

Post-construction phase:

- Weed control, by an experienced bush regenerator, is to be carried out along disturbed areas after construction to control any weed outbreaks in bushland or wetland areas;
- A thirty metre buffer area along rivers, creeks and significant drainage lines should be revegetated with appropriate indigenous plants of local genetic provenance; and
- The use of local indigenous plant species, of local genetic provenance, should be considered in the landscaping of any development on the site. Locally indigenous species generally have low water-use requirements, high survival rates and provide habitat to local fauna species.

8. REFERENCES

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Appendix 1: Flora species recorded in the study area and threatened species known (or with the potential) to occur in the search region

Origin	Common Name	Scientific Name	Family Name	EPBC	FFG	DSE	Recorded
*	African Box-thorn	*Lyciumferocissimum*	Solanaceae				X
*	Angled Onion	*Allium triquetrum*	Alliaceae				X
*	Angled Onion	*Allium triquetrum*	Alliaceae				X
*	Annual Veldt-grass	*Ehrhartalongiflora*	Poaceae				X
	Austral Bracken	*Pteridiumesculentum*	Dennstaedtiaceae				X
	Austral Toad-flax	*Thesiumaustrale*	Santalaceae	V	f	v	
*	Bastard's Fumitory	*Fumariabastardii*	Fumariaceae				X
*	Black Nightshade	*Solanumnigrums.s.*	Solanaceae				X
	Black Roly-poly	*Sclerolaenamuricata var. muricata*	Chenopodiaceae			k	
	Black Wattle	*Acacia mearnsii*	Mimosaceae				X
*	Blackberry	*Rubusfruticosus spp. agg.*	Rosaceae				X
	Blackwood	*Acacia melanoxylon*	Mimosaceae				X
	Bog Gum	*Eucalyptus kitsoniana*	Myrtaceae			r	
	Bog-sedge	*Schoenus spp.*	Cyperaceae				X
*	Bridal Creeper	*Asparagus asparagoides*	Asparagaceae				X
*	Cape Weed	*Arctotheca calendula*	Asteraceae				X
*	Carrot	*Daucuscarota*	Apiaceae				X
*	Chickweed	*Stellaria media*	Caryophyllaceae				X
*	Cleavers	*Galiumaparine*	Rubiaceae				X
	Clover Glycine	*Glycine latrobeana*	Fabaceae	V	f	v	
	Coast Manna-gum	*Eucalyptus viminalis subsp. pryoriana*	Myrtaceae				X
	Coast Saltwort	*Salsola tragus subsp. pontica*	Chenopodiaceae			r	
	Coast Stackhousia	*Stackhousiaspathulata*	Stackhousiaceae			k	
#	Coast Tea-tree	*Leptospermum laevigatum*	Myrtaceae				X

Origin	Common Name	Scientific Name	Family Name	EPBC	FFG	DSE	Recorded
	Common Apple-berry	*Billardierascandenss.l.*	Pittosporaceae				X
*	Common Prickly-pear	*Opuntiastricta*	Cactaceae				X
*	Common Sow-thistle	*Sonchusoleraceus*	Asteraceae				X
	Common Spike-sedge	*Eleocharisacuta*	Cyperaceae				X
*	Common Vetch	*Vicia sativa*	Fabaceae				X
	Common Water-ribbons	*Triglochinproceras.s.*	Juncaginaceae				X
*	Common Water-starwort	*Callitrichestagnalis*	Veronicaceae				X
	Cotton Fireweed	*Senecioquadridentatus*	Asteraceae				X
*	Couch	*Cynodondactylon var. dactylon*	Poaceae				X
	Cream Spider-orchid	*Caladeniapatersoniis.s.*	Orchidaceae			e	
	Dodder Laurel	*Cassytha spp.*	Lauraceae				X
*	Drain Flat-sedge	*Cyperuseragrostis*	Cyperaceae				X
*	Fennel	*Foeniculumvulgare*	Apiaceae				X
*	Flax-leaf Broom	*Genistalinifolia*	Fabaceae				X
	Frankston Spider-orchid	*Caladeniarobinsonii*	Orchidaceae	E	f	e	
	Fringed Helmet-orchid	*Corybasfimbriatus*	Orchidaceae			r	
*	Galenia	*Galeniapubescens var. pubescens*	Aizoaceae				X
	Golden Cowslips	*Diurisbehrii*	Orchidaceae			v	
*	Gorse	*Ulexeuropaeus*	Fabaceae				X
*	Great Brome	*Bromusdiandrus*	Poaceae				X
	Green-top Sedge	*Carexchlorantha*	Cyperaceae			k	
	Grey Billy-buttons	*Craspediacanens*	Asteraceae		f	e	
	Groundsel	*Senecio spp.*	Asteraceae				X
	Half-bearded Spear-grass	*Austrostipahemipogon*	Poaceae			r	
	Ivy-leaf Violet	*Viola hederaceasensuEntwisle (1996)*	Violaceae				X

Origin	Common Name	Scientific Name	Family Name	EPBC	FFG	DSE	Recorded
*	Japanese Honeysuckle	*Lonicera japonica*	Caprifoliaceae				X
	Joint-leaf Rush	*Juncusholoschoenus*	Juncaceae				X
	Kangaroo Apple	*Solanumaviculare*	Solanaceae				X
*	Kikuyu	*Pennisetumclandestinum*	Poaceae				X
*	Large Quaking-grass	*Briza maxima*	Poaceae				X
	Large River Buttercup	*Ranunculus papulentus*	Ranunculaceae			k	
	Large White Spider-orchid	*Caladeniavenusta*	Orchidaceae			r	
*	Lemon-scented Gum	*Corymbiacitriodora subsp. citriodora*	Myrtaceae				X
	Lightwood	*Acacia implexa*	Mimosaceae				X
	Lizard Orchid	*Burnettiacuneata*	Orchidaceae			r	
	Loosestrife	*Lythrum spp.*	Lythraceae				X
	Maroon Leek-orchid	*Prasophyllumfrenchii*	Orchidaceae	E	f	e	
	Melbourne Yellow-gum	*Eucalyptus leucoxylon subsp. connata*	Myrtaceae			v	
	Mentone Greenhood	*Pterostylis X toveyana*	Orchidaceae			v	
	Metallic Sun-orchid	*Thelymitraepipactoides*	Orchidaceae	E	f	e	
*	Mirror Bush	*Coprosmarepens*	Rubiaceae				X
*	Montpellier Broom	*Genistamonspessulana*	Fabaceae				X
	Narrow-lip Spider-orchid	*Caladenialeptochila*	Orchidaceae			k	
	Netted brake	*Pteriscomans*	Pteridaceae			r	
*	Onion Grass	*Romulearosea*	Iridaceae				X
*	Ox-tongue	*Helminthothecaechioides*	Asteraceae				X
	Pale Rush	*Juncuspallidus*	Juncaceae				X
	Pale Swamp Everlasting	*Helichrysumaff. rutidolepis (Lowland Swamps)*	Asteraceae			v	
*	Palm Lily	*Yucca gloriosa*	Agavaceae				X
*	Pampas Lily-of-the-Valley	*Salpichroaoriganifolia*	Solanaceae				X

Origin	Common Name	Scientific Name	Family Name	EPBC	FFG	DSE	Recorded
*	Panic Veldt-grass	*Ehrhartaerecta var. erecta*	Poaceae				X
	Pondweed	*Potamogeton spp.*	Potamogetonaceae				X
*	Prairie Grass	*Bromuscatharticus*	Poaceae				X
	Prawn Greenhood	*Pterostylispedoglossa*	Orchidaceae			v	
*	Prickly Lettuce	*Lactucaserriola*	Asteraceae				X
	Prickly Moses	*Acacia verticillata*	Mimosaceae				X
	Purple Blown-grass	*Lachnagrostispunicea subsp. filifolia*	Poaceae		f	r	
	Purple Diuris	*Diurispunctata var. punctata*	Orchidaceae		f	v	
*	Rat-tail Grass	*Sporobolusafricanus*	Poaceae				X
*	Rat-tail Grass	*Sporobolusafricanus*	Poaceae				X
*	Red-ink Weed	*Phytolaccaoctandra*	Phytolaccaceae				X
	River Red-gum	*Eucalyptus camaldulensis*	Myrtaceae				X
	River Swamp Wallaby-grass	*Amphibromusfluitans*	Poaceae	V			
	Rough Daisy-bush	*Olearіaasterotricha*	Asteraceae			r	
	Sallow Wattle	*Acacia longifolia subsp. longifolia*	Mimosaceae				X
#	Sallow Wattle	*Acacia longifolia*	Mimosaceae				X
*	Sheep Sorrel	*Acetosella vulgaris*	Polygonaceae				X
P	Sheoak	*Allocasuarina spp.*	Casuarinaceae				X
	Silky Golden-tip	*Goodialotifolia var. pubescens*	Fabaceae			r	
	Small Poranthera	*Porantheramicrophyllas.l.*	Euphorbiaceae				X
	Snowy Mint-bush	*Prostantheranivea var. nivea*	Lamiaceae			r	
*	Soursob	*Oxalis pes-caprae*	Oxalidaceae				X
#	Southern Mahogany	*Eucalyptus botryoides*	Myrtaceae				X
	Southern Spider-orchid	*Caladeniaaustralis*	Orchidaceae			k	
*	Sowbane	*Chenopodiummurale*	Chenopodiaceae				X

Origin	Common Name	Scientific Name	Family Name	EPBC	FFG	DSE	Recorded
	Spiny-headed Mat-rush	*Lomandralongifolia*	Xanthorrhoeaceae				X
	Studley Park Gum	*Eucalyptus X studleyensis*	Myrtaceae			e	
	Swamp Gum	*Eucalyptus ovata*	Myrtaceae				X
	Swamp Paperbark	*Melaleucaericifolia*	Myrtaceae				X
	Swamp Wallaby-grass	*Amphibromus spp.*	Poaceae				X
#	Sweet Pittosporum	*Pittosporumundulatum*	Pittosporaceae				X
	Sword Sedge	*Lepidosperma spp.*	Cyperaceae				X
	Tasman Flax-lily	*Dianellatasmanica*	Hemerocallidaceae				X
	Thatch Saw-sedge	*Gahnia radula*	Cyperaceae				X
*	Tree Lucerne	*Chamaecytisuspalmensis*	Fabaceae				X
*	Tree Lucerne	*Chamaecytisuspalmensis*	Fabaceae				X
*	Turnip	*Brassica spp.*	Brassicaceae				X
	Tussock Grass	*Poa spp.*	Poaceae				X
	Veined Spear-grass	*Austrostiparudis subsp. australis*	Poaceae			r	
	Wallaby Grass	*Austrodanthonia spp.*	Poaceae				X
	Water Blinks	*Montiafontana subsp. amporitana*	Portulacaceae			k	
	Water Parsnip	*Berulaerecta*	Apiaceae			k	
	Weeping Grass	*Microlaenastipoides var. stipoides*	Poaceae				X
	Western Water-starwort	*Callitrichecyclocarpa*	Veronicaceae	V	f	v	
*	White Arum-lily	*Zantedeschiaaethiopica*	Araceae				X
	Wine-lipped Spider-orchid	*Caladeniaoenochila*	Orchidaceae			v	
	Woolly Waterlily	*Philydrumlanuginosum*	Philydraceae			v	
	Yarra Gum	*Eucalyptus yarraensis*	Myrtaceae			r	
*	Yorkshire Fog	*Holcuslanatus*	Poaceae				X

***** = introduced species; **#** = native species occurring outside of natural range; **P** = planted; **L** =listed as threatened;**EPBC** = status under EPBC Act; **DSE** = status under DSE's Advisory List; **C** = critically endangered; **E, e** = endangered; **V, v** = vulnerable; **R, r** = rare; **k** = insufficiently known

Appendix 2: Detailed habitat hectare assessment results

Habitat Zone			B	F	H	I	J
EVC Name (Initials)			DSHrW	DSHrW	SS	DSHrW	SS
EVC Number			3	3	53	3	53
Total area of Habitat Zone (ha)			0.25	4.50	0.23	0.17	0.39
Site Condition	Large Old Trees	/10	3	2	N/A	3	N/A
	Canopy Cover	/5	4	5	3	4	5
	Lack of Weeds	/15	0	0	0	0	0
	Understorey	/25	5	15	5	5	5
	Recruitment	/10	0	10	0	0	5
	Organic Matter	/5	3	3	3	5	3
	Logs	/5	0	5	N/A	4	N/A
	Total site condition score		15	40	11	21	18
	Possible site condition score		75	75	60	75	60
	*Adjusted site condition score**		*15*	*40*	*14*	*21*	*23*
Landscape Context	Patch Size	/10	1	4	1	1	1
	Neighbourhood	/10	0	1	0	0	0
	Distance to Core	/5	0	0	0	0	0
	Landscape context subtotal		*1*	*5*	*1*	*1*	*1*
Total Habitat Score		**/100**	**16**	**45**	**15**	**22**	**24**
Habitat score out of 1			0.16	0.45	0.15	0.22	0.24
Habitat Hectares in Habitat Zone#			**0.04**	**2.03**	**0.03**	**0.04**	**0.09**
Bioregion			Gipp Plain	Gipp Plain	Gipp Plain	Gipp Plain	Gipp Plain
EVC Conservation Status			Vulnerable	Vulnerable	Endangered	Vulnerable	Endangered
Conservation Significance	Conservation Status x Habitat Score		Medium	High	High	Medium	High
	Threatened Species Rating		N/A	N/A	N/A	N/A	N/A
	Other Site Attribute Rating		N/A	N/A	N/A	N/A	N/A
	Overall Conservation Significance (highest)		**Medium**	**High**	**High**	**Medium**	**High**
No. Large Old Trees^ in Habitat Zone			1	6	N/A	1	N/A

Habitat Zone			K	L	O	P
EVC Name (Initials)			CGW	PGWood	SS	PGWood
EVC Number			68	55	53	55
Total area of Habitat Zone (ha)			0.44	0.05	1.86	0.11
Site Condition	Large Old Trees	/10	0	0	N/A	0
	Canopy Cover	/5	4	3	5	4
	Lack of Weeds	/15	0	0	4	0
	Understorey	/25	15	5	15	15
	Recruitment	/10	0	6	6	3
	Organic Matter	/5	5	3	3	3
	Logs	/5	4	0	N/A	0
	Total site condition score		28	17	33	25
	Possible site condition score		75	75	60	75
	*Adjusted site condition score**		*28*	*17*	*41*	*25*
Landscape Context	Patch Size	/10	4	4	4	4
	Neighbourhood	/10	1	1	1	1
	Distance to Core	/5	0	0	0	0
	Landscape context subtotal		*5*	*5*	*5*	*5*
Total Habitat Score		**/100**	**33**	**22**	**46**	**30**
Habitat score out of 1			0.33	0.22	0.46	0.30
Habitat Hectares in Habitat Zone#			**0.14**	**0.01**	**0.86**	**0.03**
Bioregion			Gipp Plain	Gipp Plain	Gipp Plain	Gipp Plain
EVC Conservation Status			Endangered	Endangered	Endangered	Endangered
Conservation Significance	Conservation Status x Habitat Score		High	High	Very High	High
	Threatened Species Rating		N/A	N/A	N/A	N/A
	Other Site Attribute Rating		N/A	N/A	N/A	N/A
	Overall Conservation Significance (highest)		**High**	**High**	**Very High**	**High**
No. Large Trees in Habitat Zone			0	0	N/A	0

* = Modified approach to habitat scoring - refer to Table 14 of DSE's Vegetation Quality Assessment Manual (DSE, 2004); # = Habitat hectares (habitat score/100 X area [ha]

Appendix 3: Scattered trees in the study area

Tree no.	HZ/Scat	Common Name	DBH (cm)	Size Class	Conservation Significance	Remove/Retain	Offset target if removed		
							Protect and Recruit		Recruit Only (no. plants)*
							Protect (no. trees)	Recruit (no. plants)*	
1	Scat	River Red-gum	30	Small	Low	Remove	N/A	12	12
2	Scat	River Red-gum	28	Small	Low	Remove	N/A	10	10
3	Scat	River Red-gum	26	Small	Low	Remove	N/A	8	8
4	Scat	River Red-gum	35	Small	Low	Remove	N/A	20	20
5	Scat	River Red-gum	26	Small	Low	Remove	N/A	8	8
6	Scat	River Red-gum	37	Small	Low	Remove	N/A	25	25
7	Scat	Coast Manna-gum	50	Small	Low	Remove	N/A	30	30
8	Scat	Coast Manna-gum	69	Medium	Medium	Remove	1	15	35
9	Scat	Coast Manna-gum	40	Small	Low	Remove	N/A	30	30
10	Scat	Coast Manna-gum	34	Small	Low	Remove	N/A	20	20
11	Scat	Coast Manna-gum	56	Medium	Medium	Remove	1	15	35
12	Scat	Coast Manna-gum	57	Medium	Medium	Remove	1	15	35
13	Scat	Swamp Gum	32	Small	Low	Remove	N/A	15	15
14	Scat	Swamp Gum	52	Small	Low	Remove	N/A	30	30
15	Scat	Swamp Gum	55	Small	Low	Remove	N/A	30	30
Totals							**3**	**283**	**343**

DBH = Diameter at breast height (130 cm from the ground)

Appendix 4: EVC Benchmarks

- Gippsland Plain:
    - Damp Sands herb-rich Woodland (EVC 3);
    - Swamp Scrub (EVC 53);
    - Plains Grassy Woodland (EVC 55); and
    - Creekline Grassy Woodland (EVC 68).

EVC/Bioregion Benchmark for Vegetation Quality Assessment

Gippsland Plain bioregion

EVC 3: Damp Sands Herb-rich Woodland

Description:
A low, grassy or bracken-dominated eucalypt forest or open woodland to 15 m tall with a large shrub layer and ground layer rich in herbs, grasses, and orchids. Occurs mainly on flat or undulating areas on moderately fertile, relatively well-drained, deep sandy or loamy topsoils over heavier subsoils (duplex soils).

Large trees:

Species	DBH(cm)	#/ha
Eucalyptus spp.	70 cm	15 / ha

Tree Canopy Cover:

%cover	Character Species	Common Name
15%	*Eucalyptus viminalis* ssp. *pryoriana*	Rough-barked Manna Gum

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Understorey Tree or Large Shrub	1	5%	T
Medium Shrub	5	25%	MS
Small Shrub	3	5%	SS
Prostrate Shrub	1	1%	PS
Large Herb	2	5%	LH
Medium Herb	8	15%	MH
Small or Prostrate Herb	5	10%	SH
Large Tufted Graminoid	2	10%	LTG
Large Non-tufted Graminoid	1	1%	LNG
Medium to Small Tufted Graminoid	4	10%	MTG
Medium to Tiny Non-tufted Graminoid	2	10%	MNG
Ground Fern	1	15%	GF
Bryophytes/Lichens	na	10%	BL

EVC 3: Damp Sands Herb-rich Woodland - Gippsland Plain bioregion

LF Code	Species typical of at least part of EVC range	Common Name
T	*Acacia mearnsii*	Black Wattle
T	*Acacia melanoxylon*	Blackwood
MS	*Epacris impressa*	Common Heath
MS	*Leptospermum continentale*	Prickly Tea-tree
MS	*Banksia marginata*	Silver Banksia
MS	*Leptospermum myrsinoides*	Heath Tea-tree
SS	*Leucopogon virgatus*	Common Beard-heath
SS	*Dillwynia glaberrima*	Smooth Parrot-pea
SS	*Amperea xiphoclada* var. *xiphoclada*	Broom Spurge
PS	*Astroloma humifusum*	Cranberry Heath
MH	*Gonocarpus tetragynus*	Common Raspwort
MH	*Drosera peltata* ssp. *auriculata*	Tall Sundew
MH	*Viola hederacea* sensu Willis (1972)	Ivy-leaf Violet
MH	*Geranium solanderi* s.l.	Austral Cranesbill
SH	*Hydrocotyle laxiflora*	Stinking Pennywort
SH	*Opercularia varia*	Variable Stinkweed
SH	*Dichondra repens*	Kidney-weed
SH	*Poranthera microphylla*	Small Poranthera
LTG	*Lomandra longifolia*	Spiny-headed Mat-rush
LTG	*Austrostipa mollis*	Supple Spear-grass
LNG	*Tetrarrhena juncea*	Forest Wire-grass
MTG	*Lepidosperma concavum*	Sandhill Sword-sedge
MTG	*Dianella revoluta* s.l.	Black-anther Flax-lily
MTG	*Lomandra filiformis*	Wattle-headed Mat-rush
MTG	*Poa sieberiana*	Grey Tussock-grass
MNG	*Microlaena stipoides* var. *stipoides*	Weeping Grass
GF	*Pteridium esculentum*	Austral Bracken

Recruitment:
Continuous

Organic Litter:
40 % cover

Logs:
15 m/0.1 ha.

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
MH	*Hypochoeris radicata*	Cat's Ear	high	low
LTG	*Anthoxanthum odoratum*	Sweet Vernal Grass	high	high
LNG	*Holcus lanatus*	Yorkshire Fog	high	high

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EVC/Bioregion Benchmark for Vegetation Quality Assessment

Gippsland Plain bioregion

EVC 53_61: Swamp Scrub

Description:

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.

Canopy Cover:

% cover	Character Species	Common Name
50%	*Leptospermum lanigerum*	Woolly Tea-tree
	Melaleuca ericifolia	Swamp Paperbark

Understorey:

Life form	# Spp	% Cover	LF code
Medium Shrub	2	10%	MS
Small Shrub	2	1%	SS
Large Herb	2	5%	LH
Medium Herb	3	15%	MH
Small or Prostrate Herb	2	5%	SH
Large Tufted Graminoid	2	10%	LTG
Large Non-tufted Graminoid	3	10%	LNG
Medium to Small Tufted Graminoid	2	5%	MTG
Medium to Tiny Non-tufted Graminoid	2	15%	MNG
Ground Fern	1	5%	GF
Scrambler or Climber	1	1%	SC
Bryophytes/Lichens	na	20%	BL

LF Code	Species typical of at least part of EVC range	Common Name
MS	*Coprosma quadrifida*	Prickly Currant-bush
MS	*Leptospermum continentale*	Prickly Tea-tree
LH	*Lycopus australis*	Australian Gipsywort
LH	*Lythrum salicaria*	Purple Loosestrife
LH	*Persicaria praetermissa*	Spotted Knotweed
MH	*Hydrocotyle pterocarpa*	Wing Pennywort
MH	*Stellaria angustifolia*	Swamp Starwort
MH	*Lobelia anceps*	Angled Lobelia
SH	*Crassula helmsii*	Swamp Crassula
LTG	*Juncus procerus*	Tall Rush
LTG	*Poa labillardierei*	Common Tussock-grass
LNG	*Gahnia radula*	Thatch Saw-sedge
LNG	*Phragmites australis*	Common Reed
LNG	*Baumea rubiginosa* s.l.	Soft Twig-rush
MTG	*Triglochin procerum* s.l.	Water Ribbons
MTG	*Juncus gregiflorus*	Green Rush
MNG	*Eleocharis acuta*	Common Spike-sedge
GF	*Blechnum cartilagineum*	Gristle Fern
SC	*Calystegia sepium*	Large Bindweed

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EVC 53_61: Swamp Scrub - Gippsland Plain bioregion

Recruitment:
Continuous

Organic Litter:
40 % cover

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
MH	*Hypochoeris radicata*	Cat's Ear	high	low
LNG	*Holcus lanatus*	Yorkshire Fog	high	high

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EVC/Bioregion Benchmark for Vegetation Quality Assessment

Gippsland Plain bioregion

EVC 55: Plains Grassy Woodland

Description:
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.

Large trees:

Species	DBH(cm)	#/ha
Eucalyptus spp.	80 cm	10 / ha

Tree Canopy Cover:

%cover	Character Species	Common Name
20%	*Eucalyptus tereticornis* ssp. *mediana*	Gippsland Red-gum
	Eucalyptus camaldulensis	River Red-gum

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Understorey Tree or Large Shrub	1	5%	T
Medium Shrub	2	10%	MS
Small Shrub	1	1%	SS
Prostrate Shrub	1	1%	PS
Large Herb	1	5%	LH
Medium Herb	10	20%	MH
Small or Prostrate Herb	3	5%	SH
Large Tufted Graminoid	2	5%	LTG
Large Non-tufted Graminoid	1	10%	LNG
Medium to Small Tufted Graminoid	9	35%	MTG
Medium to Tiny Non-tufted Graminoid	2	10%	MNG
Bryophytes/Lichens	na	10%	BL

LF Code	Species typical of at least part of EVC range	Common Name
T	*Allocasuarina littoralis*	Black Sheoak
T	*Acacia mearnsii*	Black Wattle
T	*Acacia melanoxylon*	Blackwood
MS	*Kunzea ericoides*	Burgan
SS	*Pimelea humilis*	Common Rice-flower
PS	*Bossiaea prostrata*	Creeping Bossiaea
MH	*Hypericum gramineum*	Small St John's Wort
MH	*Oxalis perennans*	Grassland Wood-sorrel
SH	*Dichondra repens*	Kidney-weed
SH	*Poranthera microphylla*	Small Poranthera
LTG	*Austrostipa rudis*	Veined Spear-grass
LNG	*Gahnia radula*	Thatch Saw-sedge
MTG	*Themeda triandra*	Kangaroo Grass
MTG	*Carex breviculmis*	Common Grass-sedge
MTG	*Lomandra filiformis*	Wattle Mat-rush
MTG	*Schoenus apogon*	Common Bog-sedge
MNG	*Microlaena stipoides* var. *stipoides*	Weeping Grass

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Recruitment:
Continuous

Organic Litter:
10 % cover

Logs:
10 m/0.1 ha.

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
LH	*Plantago lanceolata*	Ribwort	high	low
MH	*Hypochoeris radicata*	Cat's Ear	high	low
MH	*Centaurium erythraea*	Common Centaury	high	low
LNG	*Holcus lanatus*	Yorkshire Fog	high	high
MTG	*Anthoxanthum odoratum*	Sweet Vernal-grass	high	high
MNG	*Romulea rosea*	Onion Grass	high	low
MNG	*Briza maxima*	Large Quaking-grass	high	low
MNG	*Briza minor*	Lesser Quaking-grass	high	low

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EVC/Bioregion Benchmark for Vegetation Quality Assessment

Gippsland Plain bioregion

EVC 68: Creekline Grassy Woodland

Description:
Eucalypt-dominated woodland to 15 m tall with occasional scattered shrub layer over a mostly grassy/sedgy to herbaceous ground-layer. Occurs on low-gradient ephemeral to intermittent drainage lines, typically on fertile colluvial/alluvial soils, on a wide range of suitably fertile geological substrates. These minor drainage lines can include a range of graminoid and herbaceous species tolerant of waterlogged soils, and are presumed to have sometimes resembled a linear wetland or system of interconnected small ponds.

Large trees:

Species	DBH(cm)	#/ha
Eucalyptus spp.	80 cm	15 / ha

Tree Canopy Cover:

%cover	Character Species	Common Name
15%	*Eucalyptus camaldulensis*	River Red Gum
	Eucalyptus ovata	Swamp Gum

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Understorey Tree or Large Shrub	2	10%	T
Medium Shrub	2	5%	MS
Small Shrub	2	1%	SS
Large Herb	2	5%	LH
Medium Herb	8	15%	MH
Small or Prostrate Herb	1	1%	SH
Large Tufted Graminoid	3	15%	LTG
Medium to Small Tufted Graminoid	12	20%	MTG
Medium to Tiny Non-tufted Graminoid	3	15%	MNG
Bryophytes/Lichens	na	10%	BL

LF Code	Species typical of at least part of EVC range	Common Name
T	*Acacia mearnsii*	Black Wattle
MS	*Ozothamnus ferrugineus*	Tree Everlasting
MS	*Acacia pycnantha*	Golden Wattle
SS	*Pimelea humilis*	Common Rice-flower
MH	*Gonocarpus tetragynus*	Common Raspwort
MH	*Acaena echinata*	Sheep's Burr
SH	*Hydrocotyle laxiflora*	Stinking Pennywort
LTG	*Carex appressa*	Tall Sedge
LTG	*Poa labillardierei*	Common Tussock-grass
MTG	*Elymus scaber var. scaber*	Common Wheat-grass
MTG	*Lachnagrostis filiformis*	Common Blown-grass
MNG	*Microlaena stipoides var. stipoides*	Weeping Grass

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Recruitment:
Continuous

Organic Litter:
40% cover

Logs:
20m/0.1 ha

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
LH	*Sonchus oleraceus*	Common Sow-thistle	high	low
LH	*Cirsium vulgare*	Spear Thistle	high	low
LH	*Plantago lanceolata*	Ribwort	high	low
MH	*Hypochoeris radicata*	Cat's Ear	low	low
MH	*Anagallis arvensis*	Pimpernel	low	low
LTG	*Phalaris aquatica*	Toowoomba Canary-grass	low	high
MNG	*Briza maxima*	Large Quaking-grass	high	low
MNG	*Romulea rosea*	Onion Grass	high	low
MNG	*Vulpia bromoides*	Squirrel-tail Fescue	high	low
MNG	*Briza minor*	Lesser Quaking-grass	high	low
MNG	*Aira elegantissima*	Delicate Hair-grass	high	low

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Appendix 5: Best / Remaining 50% habitat assessment for rare and threatened species

Species	Conserv. Status (DSE)	Habitat Zones	Assessment Process	Outcome	Conservation significance	Justification
Swift Parrot	e	F	A, D, No	No further consideration	N/A	The species is not likely to make significant use of the site in the medium term as it is only expected to past through the area.
Grey-headed Flying-fox	v	F	A, D, No	No further consideration	N/A	The species is not likely to make significant use of the site in the medium term as it is only expected to past through the area.

Notes: For habitat zones refer to Figure 2; Assessment process refers to Table 2 in the Guide for Assessment of referred planning permit applications (DSE 2007)