OUTER METROPOLITAN RING ROAD AND E6 TRANSPORT CORRIDOR

FLORA AND FAUNA DESKTOP REPORT

VicRoads

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1. EXECUTIVE SUMMARY

A desktop study was undertaken to provide a preliminary assessment of the potential impact of the proposed Outer Metropolitan Ring Road (OMR) and E6 Transport Corridor on native vegetation and threatened flora and fauna species, and related implications under relevant legislation and planning policies. The study involved reviewing vegetation mapping and historical threatened species records within the proposed OMR / E6 Right of Way (ROW) Boundary and up to one kilometre either side of this. It should be noted that E6 includes a Public Acquisition Overlay (PAO) from Findon Road to the Metropolitan Ring Road.

An additional assessment was undertaken comparing a range of alternative route options for both roads considered by VicRoads to review how the "avoid" and "minimise" principles of Victoria's Native Vegetation Management Framework had been taken into account in selecting the preferred route option.

The assessment of the preferred route identified the presence of 12 Ecological Vegetation Classes in the OMR ROW Boundary and eight (8) EVCs in the E6 ROW Boundary. The most common occurring EVC in the OMR ROW Boundary was Plains Grassland. Plains Grassy Woodland was the most commonly occurring EVC in the E6 ROW Boundary.

Net Gain accounting was undertaken to determine an initial offset target for the removal of all native vegetation within the OMR / E6 ROW Boundary. The total offset target for the OMR was 644.83 habitat hectares. The total offset target for the E6 was 59.11 habitat hectares. Based on a rule-of-thumb of an offset area totalling in hectares about five times the habitat hectare offset target (A. Webster, DSE, pers. comm.), approximately 3225 hectares of native vegetation, predominantly Plains Grassland would be required to achieve the offset target for the OMR ROW Boundary. An additional 300 hectares of native vegetation, predominantly Plains Grassy Woodland would be required to achieve the offset target for the E6 ROW Boundary. Therefore, a total of 3525 ha of native vegetation are required to offset the impact incurred within the OMR / E6 ROW Boundary. The final area would require confirmation of the habitat score of the proposed offset area and a full gain-scoring exercise as part of an offset plan.

One ecological community listed under the Commonwealth EPBC Act, the Natural Temperate Grassland of the Victorian Volcanic Plain, was considered likely to occur in the OMR / E6 ROW Boundary. Two threatened ecological communities listed under the FFG Act, the Western (Basalt) Plains Grasslands Community (within the OMR ROW Boundary) and the Western Basalt Plains (River Red Gum) Grassy Woodland Floristic Community (within E6 ROW Boundary) were also considered likely to occur in the OMR / E6 ROW Boundary. The exact areas of vegetation that qualify as these listed communities are not known.

Two threatened flora species listed on the EPBC Act were identified as being present within the OMR ROW Boundary in addition to two species listed on the FFG Act and six on the DSE List of Threatened Flora Species. Three threatened flora species listed on the EPBC Act were identified as potentially occurring within the OMR ROW Boundary, in addition to four listed on the FFG Act and eight on the DSE List of Threatened Flora Species.

No threatened flora species listed on the EPBC Act, FFG Act or DSE list of Threatened Species were identified as being present within the E6 ROW Boundary. Four threatened flora species listed on the EPBC Act were identified as potentially occurring within the E6 ROW Boundary, in addition to three listed on the FFG Act and nine on the DSE List of Threatened Flora Species.

One threatened fauna species listed on the EPBC Act, FFG Act and DSE List of Threatened Fauna Species was identified as being present within the OMR ROW Boundary, based on existing information. Fourteen threatened fauna species listed on the EPBC Act were identified as potentially occurring within the OMR ROW Boundary, in addition to 14 listed on the FFG Act and 24 on the DSE List of Threatened Fauna Species.

No threatened fauna species listed on the EPBC Act, FFG Act or DSE list of Threatened Species were confirmed to be present within the E6 ROW Boundary based on existing information. Ten threatened fauna species listed on the EPBC Act were identified as potentially occurring within the E6 ROW Boundary, in addition to 11 listed on the FFG Act and 20 on the DSE List of Threatened Fauna Species.

Future habitat assessments and targeted threatened species surveying is required to determine the occurrence of threatened communities, and flora and fauna species within the study area.

An EES Referral is being prepared for the project as works within the proposed OMR / E6 ROW Boundary are likely to remove more than 10 hectares of Endangered EVCs.

The current assessment was strictly limited to a desktop study and some threatened species may have been missed due to minimal previous research in some areas. For this reason, the broader search spanning two kilometres was used to further determine any additional species with potential to occur within the OMR / E6 ROW Boundary. The findings of this study should guide the scope of detailed field assessment of the project area.

A small proportion of the native vegetation mapping from DSE has been ground truthed. The remaining DSE mapping is based on modelling from Remote Sensing data. Notwithstanding this, it is more likely that the estimates of the area of vegetation in the OMR / E6 ROW Boundary will be conservative (i.e. over-estimates) based on on-ground experience of the EVC mapping used.

Wherever appropriate, a precautionary approach has been adopted in considering the potential occurrence of threatened flora and fauna.

2. INTRODUCTION

VicRoads engaged Brett Lane and Associates Pty Ltd to conduct a Desktop Assessment of native vegetation, flora and fauna for the proposed alignment of the Outer Metropolitan Ring (OMR) / E6 Transport Corridor. In addition, a review has been undertaken comparing alternative route options considered by VicRoads to determine how the "avoid" and "minimise" principles of Victorias Native Vegetation Management Framework had been taken into account in selecting the preferred route option (see Figures 1 and 2).

The OMR / E6 Transport Corridor would provide for an ultimate 8 lane freeway (4 lanes in each direction) and 4 rail lines within the median, and would extend from the Princes Freeway at Werribee to the Melbourne – Sydney rail line at Kalkallo. The E6 corridor would continue from the OMR at the Melbourne – Sydney rail line to the Metropolitan Ring Road at Thomastown. Together these would form an outer ring transport route of 93 kilometres from Werribee to Thomastown.

In addition to the corridor providing for freeway carriageways it would also enable the provision of auxiliary lanes where interchanges are closely spaced.

This report provides information on the occurrence of native vegetation within the OMR / E6 ROW Boundary and presents associated offset targets to compensate for the estimated removal of native vegetation. Detailed information on known and potential records of threatened flora and fauna within the OMR / E6 ROW Boundary are also presented and discussed.

The study area occurs across four bioregions, including the Victorian Volcanic Plain, Central Victorian Uplands, Highlands-Southern Fall and Otway Plain.

This report is divided into the following sections:

Section 3 describes the sources of information used in the assessment.

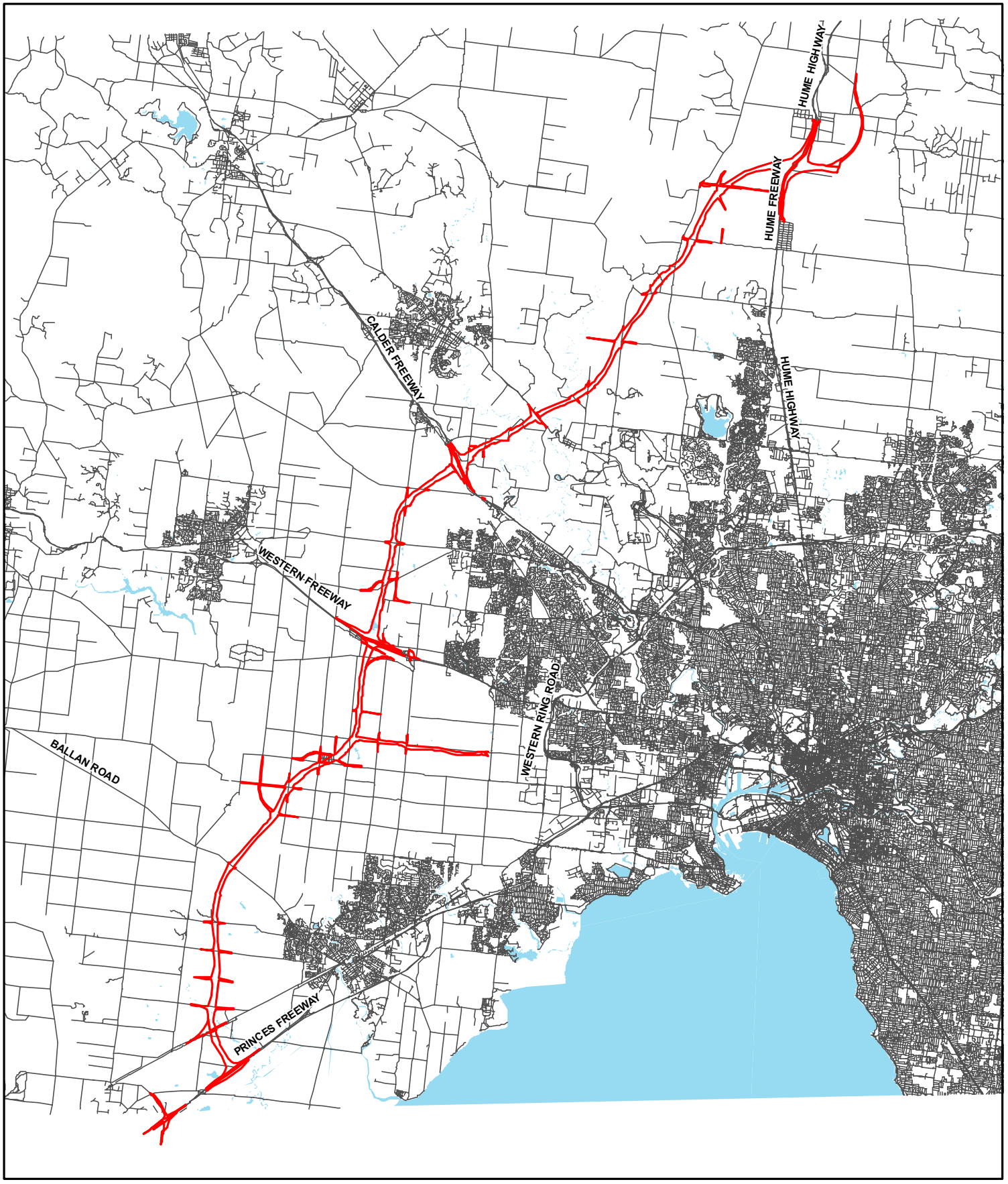
Section 4 provides an assessment of alternative alignments

Section 5 presents the results of the desktop assessment, namely native vegetation and threatened flora and fauna within the OMR and E6 ROW Boundary.

Section 6 discusses the implications of the findings under relevant Commonwealth, State and local legislation and policies.

Section 7 provides conclusions about the impacts of the project on native vegetation, flora and fauna.

This investigation was undertaken by a team from Brett Lane & Associates Pty Ltd, comprising Justin Sullivan (Botanist), Gabrielle Roy (Zoologist) and Brett Lane (Principal Consultant).



Legend

- Road Network
- Right of Way Boundary
- Water Bodies

0 2 4 8 12 16 20 Kilometers

Figure 1 : OMR Overview

OMR/E6 Transport Corridor - Flora & Fauna Desktop Assessment

Client: VicRoads

Project No.: 8254	Date: 28/05/2009	Created by: J. Sullivan / F. D'Elia

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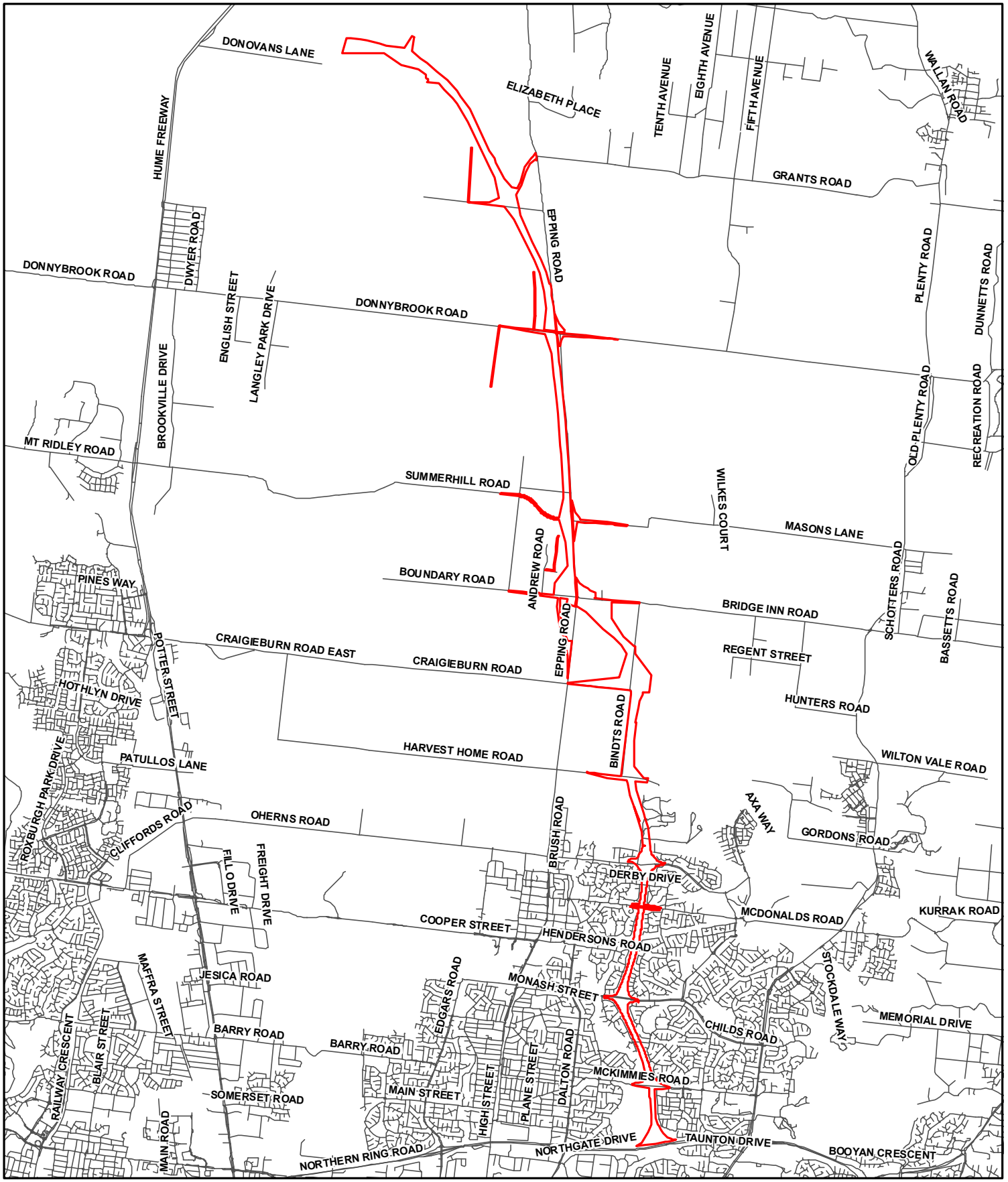

Note E6 includes a Public Acquisition Overlay from Findon Rd to the Metropolitan Ring Road

Kilometers

0 0.5 1 2 3 4 5

Legend

- Right of Way Boundary
- Road Network

Figure 2 : E6 Overview

OMR/E6 Transport Corridor - Flora & Fauna Desktop Assessment

Client: VicRoads

Project No.: 8254 | Date: 25/05/2009 | Created by: J. Sullivan / F. D'Elia

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3. SOURCES OF INFORMATION

This section identifies the sources of information used in the assessment.

3.1. Assessment of alternative OMR and E6 route alignments

Electronic footprints of varying levels of detail showing alternative alignments for the OMR / E6 Transport Corridor were provided by VicRoads. Alternative alignment footprints were overlayed on vegetation data to determine their location in relation to areas of modelled and mapped native vegetation.

In addition, discussions with VicRoads provided guidance on how each route option was evaluated. This assessment considers the area of native vegetation affected and areas of environmental significance, including occurrences of threatened species. For the purpose of the desktop study, the comparison of alternative route options was qualitative.

3.2. Detailed assessment of the preferred OMR / E6 Transport Corridor Alignment

3.2.1. Existing information

An electronic footprint of the preferred OMR / E6 Transport Corridor alignment was provided by VicRoads. This included the OMR / E6 ROW Boundary along the proposed road and connecting roads identified for upgrade.

Native Vegetation

Information on the occurrence of native vegetation was obtained from two sources. This included:

- Growth Areas Authority (GAA) data gathered in spring and summer 2008 - 2009; and
- Updated Department of Sustainability and Environment (DSE) detailed vegetation layer, a subset of which has been ground truthed by DSE.

All of this information identified areas of vegetation by Ecological Vegetation Class (EVC). All data included habitat scores for remnant EVCs. This was provided by on ground works in the GAA and DSE ground truthed data. Habitat scores in the remaining data were modelled using detailed mapping by DSE.

Defining and assessing native vegetation

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

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

These categories are described in detail below, together with the method DSE prescribes for their assessment. Only remnant patch vegetation is considered in the area totals of native vegetation provided in the results section.

Remnant Patch

Remnant patches of remnant native vegetation are composed of indigenous plant species considered part of a clearly definable Ecological Vegetation Class (EVC). Such vegetation includes remnant vegetation with the following attributes:

- Proportion of indigenous understorey species being greater than 25% total understorey cover (excluding bare ground); and/or
- Indigenous canopy trees with at least 20% projected foliage canopy cover (DSE 2007a).

Assessment of remnant patch vegetation involves the habitat scoring or habitat hectare method (Parkes *et al*. 2003; DSE 2004b). This entails assessing the components of native vegetation (e.g. tree canopy, understorey and ground cover) against a DSE-issued EVC benchmark (see appendices) that described the notional pre-European condition of that EVC. The score effectively measures the percentage resemblance of the vegetation to its original condition.

The habitat hectare score assists in defining the value of remnant native vegetation for assessing its conservation significance and for calculating offsets if removal of native vegetation is approved.

Scattered trees

Scattered trees comprise indigenous trees with projected foliage canopy cover less than 20% and total cover of indigenous species (excluding bare ground) is less than 25% (DSE 2007a).

Scattered trees are counted and their diameter recorded at 1.3 metres above ground level (diameter at breast height or DBH). The size class of scattered trees (based on DBH) is determined based on the large tree DBH in the relevant benchmark for the EVC to which it once belonged.

Degraded treeless vegetation

Degraded treeless vegetation comprises all other vegetation (DSE 2007a). This category includes the following:

- 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).

Threatened Flora and Fauna

Threatened species records were obtained from the Victorian Flora Information System (FIS), Victorian Fauna Database (VFD) and online *Environment Protection and Biodiversity Conservation Act 1999* Protected Matters Search Tool (DEWHA 2008). Further known records of threatened species were additionally obtained from the GAA data gathered in spring and summer 2008 – 2009 (ENSR, unpublished data).

Actual records within the OMR / E6 ROW Boundary were recorded as occurring in the area affected by the proposed road. In order to account for the possibility that additional threatened species may occur in the OMR / E6 ROW Boundary, an additional search area one kilometre either side of the road was created to ascertain if such species occurred in this zone and, therefore, had the potential to occur within in the OMR / E6 ROW Boundary.

Information on the location and characteristics of identified Biosites in the northern part of the investigation corridors was obtained from Merri Creek Management Committee (DSE unpublished data).

3.2.2. Limitations

This assessment was strictly limited to a desktop study of the preferred alignment of the OMR / E6 Transport Corridor and a qualitative comparison of alternative route alignments considered by VicRoads. Some threatened species may have been missed due to minimal previous research in some areas. For this reason, the broader search spanning two kilometres was used to further determine any additional species with potential to occur in the OMR / E6 ROW Boundary.

Not all native vegetation mapping from DSE has been ground truthed. It is based on updated modelling from detailed Remote Sensing data. It is noteworthy that field inspection by Brett Lane & Associates Pty Ltd of areas mapped by DSE as Plains Grassland have indicated that some mapped areas of grassland are exotic (introduced) pasture, while some areas not mapped by DSE contain remnant native grassland. Furthermore, a substantial proportion of the vegetation mapped by GAA was degraded treeless vegetation. The analysis of the location and area of native vegetation provided in this report must therefore be considered preliminary. Ground truthing and detailed vegetation assessment will be essential as part of a detailed flora and fauna study of the final ROW at a later stage.

This assessment presents data on the total area of native vegetation and the number of threatened species sites for the entire proposed OMR / E6 ROW Boundary. Experience of road project development suggests that a significant proportion of the OMR / E6 ROW Boundary may not be subject to disturbance and, if native vegetation occurs near work areas it can be protected through best practice construction environmental management measures.

For these reasons, it is more likely that the estimate of vegetation in the OMR / E6 ROW Boundary and the associated net gain analysis will be conservative (i.e. over-estimates).

The report has adopted a precautionary approach in considering the potential occurrence of native vegetation and threatened flora and fauna, and the potential impacts of the project on biodiversity.

4. ASSESSMENT OF ALTERNATIVE ALIGNMENTS FOR OMR AND E6

This section qualitatively contrasts alternative options for both the OMR and E6 alignments considered by VicRoads and reviews how the "avoid" and "minimise" principles of the Framework have been taken into account in selecting the preferred route options for both. This section has relied significantly on information provided by VicRoads but evaluated independently against the available vegetation mapping.

4.1. OMR Alternative Alignment Options

The selection of the final, preferred route for the OMR and E6 road corridors involved a staged analysis. Broad corridor options were reviewed initially, followed by high-level comparison of broad route options within the preferred corridor (i.e. Werribee to Craigieburn). This is described in more detail below.

4.1.1. Broad Corridor Options

Broad scale corridor options were originally considered for the OMR including the following:

- Geelong – Craigieburn;
- Werribee – Craigieburn;
- Werribee – Craigieburn: West of Deep Creek: North and South of Sunbury; and
- Hume Corridor (A – D).

Werribee – Craigieburn options north and south of Sunbury were not supported due to their greater impact on biodiversity across the additional creek crossings and the extended area covered by an Environmental Significance Overlay on Deep Creek in particular. Options west of Melton were not considered further between Geelong and Craigieburn and Werribee and Craigieburn (e.g. west of Deep Creek) due to their distance from likely future development areas west of Melbourne. For this reason, these routes failed to satisfy the overall objective of improving transport links within Melbourne's western region.

With respect to Hume Corridor, Option A was rejected due to the importance of the Mount Ridley Grassland and Woodland either side of the transmission line and the need to maintain a vegetated link between the two areas. This option also passed through the Hume ESO 5. This option passes through a biosite of regional significance and one of state significance.

Option B in the Hume Corridor was rejected due to a combination of engineering, functionality and existing land use constraints.

Option D was rejected due to potential impacts on Mount Ridley Conservation Reserve (south of Mount Ridley Road). As with Option A, this route passes through biosites of national and state significance. Following this stage the selected options took into consideration the location of Planning Scheme

overlays, including as Environmental Significance (ESO) and Vegetation Protection (VPO) overlays.

Option C in the Hume Corridor was carried forward for more detailed investigation (see options N1 – N6 below).

4.1.2. Preliminary OMR Route Options

Using the information reviewed for this assessment, the preliminary Werribee to Craigieburn (OMR) route options considered by VicRoads were compared for the current evaluation. This included the following options (notation follows VicRoads internal route option designations):

- Option 1 (Avalon to North of Kalkallo, south of Wallan) including five variations (a, b, c, d, e);
- Option 2 (East of Little River, south of Diggers Rest);
- Option 3 (West Werribee to Werribee River) including three variations (a, b, c);
- Option 4 including four variations (4W, 4E1, 4E2, 4E3); and
- Melton Corridor Options including five variations (M1, M2, M3, M4, M5).

Table 1 provides a qualitative description of the impacts of options on native vegetation. Each option is considered in three segments: northern, central and southern, as follows:

- Northern is between Calder Freeway to Melbourne – Sydney Railway line;
- Central is between Werribee River to Calder Freeway; and
- Southern is between Princes Freeway West to Werribee River

Note that in all tables in this section, the preferred route alignment is highlighted in light green.

Table 1: Preliminary Options for the OMR alignment

Option	Section	Sensitivity	Source	Avoid/Minimise
1	Northern	This proposed alignment goes through three areas of biodiversity significance (unpublished data provided by SMEC). The area between Bardwell Drive and south of Mount Ridley Road, Mickleham has no records of threatened flora or fauna. The area both sides of Deep Creek east of Sunbury Road and west of St Johns Road has six records of threatened fauna (one EPBC Act species, three FFG and six DSE) and no records of threatened flora. The area both sides of Jacksons Creek south of Bulla - Diggers Rest Road to Lehmans Road has no records of threatened flora and supports three threatened fauna species including Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory list), Brown Toadlet (FFG Act and DSE Advisory list) and Fat-tailed Dunnart (DSE Advisory list). This option crosses Jackson and Deep Creek ESOs and goes through a couple of modelled grassland / woodland areas. It also traverses the edge of Mount Ridley Grasslands and Woodlands.	SMEC (unpublished data), Biosis (2009), DSE (2009a)	Avoid: Rejected and remodelled to options 1e and 3c to minimise impacts on Jacksons and Deep Creek ESOs for bridge crossings. Minimise: Not relevant.
	Central	Proposed road alignment goes through two areas of biodiversity significance. The area south and west of Bulla Diggers Rest interchange on Calder Freeway has no threatened fauna and supports two threatened flora species including Large-headed Fireweed (EPBC Act, FFG Act and DSE Advisory list) and Plains Joyweed (DSE Advisory list). Area north west of Caroline Springs, south of Holden Road and east of Plumpton Road has no threatened fauna and supports two threatened flora species including Large-headed Fireweed (EPBC Act, FFG Act and DSE Advisory list) and Small Scurf-pea (FFG Act and DSE Advisory list). Data provided by Biosis identified the potential to affect 2 EPBC Act threatened flora species and two species listed on the FFG Act and five threatened fauna species listed on the EPBC Act and one listed on the FFG Act. Native grasslands will be impacted. Location of Mount Cottrell and Kororoit Creek Significant Landscape Overlay.	SMEC (unpublished data), Biosis (2009), DSE (2009a)	Avoid: All of option 1 has been rejected due to its impact on modelled areas of grassland. Minimise: Not relevant.
	Southern	According to the data provided by Biosis, this option has the potential to impact 17 fauna species listed on the EPBC Act. Native grasslands would be impacted.	Biosis (2009)	Avoid: Option avoided in part due to environmental constraints. Minimise: Not relevant.

Option	Section	Sensitivity	Source	Avoid/Minimise
1a	Central	This option goes through one area of biodiversity significance. The area north west of Caroline Springs, south of Holden Road and east of Plumpton Road. Within this area there are two threatened flora species including Large-headed Fireweed (EPBC Act, FFG Act and DSE Advisory list) and Small Scurf-pea (FFG Act and DSE Advisory list). There are no records of threatened fauna. Based on the data provided by Biosis, this option has the potential to impact one EPBC Act species. Crosses through an area of Vegetation Protection Overlay. Information from Biosis suggests that this route would traverse areas of native grasslands and woodlands and occasional wetlands.	SMEC (unpublished data), Biosis (2009), DSE (2009a)	Avoid: Developed to minimise environmental impacts on native grassland. Rejected due to impacts on Toolern Growth area. Minimise: Not relevant.
	Southern	This option has the potential to impact two threatened fauna species listed on the EPBC Act. Would pass through some areas of native grassland though these are quite small.	Biosis (2009)	Avoid: Rejected due to impacts on Toolern Growth area. Designed to avoid native grasslands Minimise: Not relevant.
1b	Central	Would impact Mount Cottrell and Kororoit Creek Significant Landscape Overlay (SLO). Passes through small patches of native vegetation.	Biosis (2009)	Avoid: Developed to minimise impact to native grasslands. Rejected due to impacts on Toolern Growth area. Minimise: Not relevant.
1c	Northern	This option goes through an Area north of Donnybrook Road, west of Mickleham Road where there are no records of threatened flora, and one record of threatened fauna, Brown Toadlet (FFG Act and DSE Advisory List). Route would impact Mount Ridley Grasslands and Woodlands.	SMEC (unpublished data)	Avoid: Rejected in part due to impacts on Mount Ridley Grassland and Woodland. Minimise: Not relevant.
1d	Northern	This option goes through Area north of Donnybrook Road, west of Mickleham Road where there are no records of threatened flora, and one record of threatened fauna, Brown Toadlet (FFG Act and DSE Advisory List). Route would impact Mount Ridley Grasslands and Woodlands.	SMEC (unpublished data)	Avoid: Option rejected due to engineering considerations. Minimise: Not relevant.

Option	Section	Sensitivity	Source	Avoid/Minimise
1e	Northern	This option passes through two areas of biodiversity significance. The area both sides of Jacksons Creek south of Bulla - Diggers Rest Road to Lehmans Road has no records of threatened flora and supports three threatened fauna species including Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory list), Brown Toadlet (FFG Act and DSE Advisory list) and Fat-tailed Dunnart (DSE Advisory list). The area on both sides of Deep Creek east of Sunbury Road and west of St John Road supports no species of threatened flora and six species of threatened fauna including Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory list), Fat-tailed Dunnart (DSE Advisory list), Brown Treecreeper (DSE Advisory List), Black-chinned Honeyeater (DSE Advisory List), Diamond Firetail (FFG Act and DSE Advisory list) and Speckled Warbler (FFG Act and DSE Advisory list). Within this area there are significant isolated sections of native grassland. This option passes through Jackson Creek / Deep Creek ESOs.	SMEC (unpublished data), Biosis (2009)	Avoid: Rejected in favour of 3c to avoid impacts on Jackson Creek ESO at gullies NW of Calder Freeway interchange. This ensured that crossings were developed at the narrowest points. Engineering considerations also taken into account.
				Minimise: Not relevant.
	Central	Passes through a significant area of native grasslands. And two areas of biodiversity significance. The area south and west of Bulla Diggers Rest interchange on Calder freeway has no threatened fauna and supports two threatened flora species including Large-headed Fireweed (EPBC Act, FFG Act and DSE Advisory list) and Plains Joyweed (DSE Advisory list). The area north west of Caroline Springs, south of Holden Road and east of Plumpton Road has no threatened fauna and supports two threatened flora species including Large-headed Fireweed (EPBC Act, FFG Act and DSE Advisory list) and Small Scurf-pea (FFG Act and DSE Advisory list).	SMEC (unpublished data), Biosis (2009)	Avoid: Rejected due to impacts to native grasslands.
				Minimise: Not relevant.
	Southern	Section passes through a significant area of native grassland.	Biosis (2009)	Avoid: Rejected in favour of 3c due to impact to native grasslands. However distance to Werribee a major factor.
				Minimise: Not relevant.
2	Central	Potential to impact 12 threatened fauna species listed on the EPBC Act and four listed on the FFG Act. Passes through Little River Creek and significant areas of native grassland.	Biosis (2009)	Avoid: Rejected due to significant impact on grasslands and impact on a quarry.
				Minimise: Not relevant.

Option	Section	Sensitivity	Source	Avoid/Minimise
	Southern	Potential to impact two EPBC Act and FFG Act threatened flora and 21 threatened fauna species listed on the EPBC Act. Route passes through significant sections of native grasslands and Wyndham ESOs.	Biosis (2009)	Avoid: Rejected due to significant impact on grasslands and impact on a quarry. Minimise: Not relevant.
3	Southern	Potential to impact one threatened flora species listed on the EPBC Act and eight species of threatened fauna listed on the EPBC act and two listed on the FFG Act. Passes through significant areas of native grassland.	Biosis (2009)	Avoid: Developed option 3a and 3b to reduce areas of native grassland potentially impacted. Minimise. Not relevant
3a	Central	Potential to impact two threatened fauna species listed on the EPBC Act. Passes through significant areas of native grassland.	Biosis (2009)	Avoid: Rejected due to significant impact on grasslands and impact on two quarries. Minimise: Not relevant.
	Southern	Passes through significant areas of native grassland. Passes through the northern boundary of Ramsar Wetland, but would not have a significant impact on its ecological character.	DSE (2009b), Biosis (2009)	Avoid: Rejected due to environmental impacts. Minimise: Not relevant.
3b	Central	The area on both sides of Deep Creek east of Sunbury Road and west of St John Road supports no species of threatened flora and six species of threatened fauna including Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory list), Fat-tailed Dunnart (DSE Advisory list), Brown Treecreeper (DSE Advisory List), Black-chinned Honeyeater (DSE Advisory List), Diamond Firetail (FFG Act and DSE Advisory list) and Speckled Warbler (FFG Act and DSE Advisory list). Passes through areas of biodiversity significance and severs significant areas of native grasslands.	SMEC (unpublished data), Biosis (2009)	Avoid: Due to environmental considerations, the preferred route within this section is CS5. Minimise: Not relevant
	Southern	Potential to impact one threatened fauna species listed on the EPBC Act. Passes through Ramsar Wetland and significant areas of native grassland, but would not have a significant impact on the ecological character of the wetlands.	DSE (2009b), Biosis (2009)	Avoid: Rejected due to environmental impacts. Minimise: Option has been discussed with DSE. Route passes through native grasslands, though these are considered to be of lower quality compared with alternative options. Implementation of best-practice measures during the construction phase would be included as part of the proposed mitigation measures.

Option	Section	Sensitivity	Source	Avoid/Minimise
3c	Northern	Impacts to River Red Gum north of Gunns Gully Road, Plains Grassy Woodland and Plains Grassland. Occasionally cuts through areas of Vegetation. Protection Overlays, though these are relatively minimal. Passes through five areas of biodiversity significance. These are the woodland / grassland north of Gunns Gully Road (with no threatened flora or fauna), area north of Donnybrook Road, west of Mickleham Road (with no threatened flora and one threatened fauna species, Brown Toadlet (FFG Act and DSE Advisory List), area between Bardwell Drive and south of Mount Ridley Road, Mickleham (with no threatened flora or fauna), the area on both sides of Deep Creek east of Sunbury Road and west of St John Road supports no species of threatened flora and six species of threatened fauna including Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory list), Fat-tailed Dunnart (DSE Advisory list), Brown Treecreeper (DSE Advisory List), Black-chinned Honeyeater (DSE Advisory List), Diamond Firetail (FFG Act and DSE Advisory list) and Speckled Warbler (FFG Act and DSE Advisory list) and the area on both sides of Jacksons Creek south of Bulla – Diggers Rest Road to Lehmans Road (with no threatened flora and three threatened fauna species including Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List), Fat-tailed Dunnart (DSE Advisory List) and Brown Toadlet (FFG Act and DSE Advisory List).	DSE (2009b), DSE (unpublished data), SMEC (unpublished data)	Avoid: Option designed in consultation with DSE. Preferred option within this area. Minimise: Not relevant.
	Central	This option goes through two sites of biodiversity significance. The area situated south and west of Bulla Diggers Rest interchange on Calder Freeway supports no threatened fauna and two threatened flora species including Large headed Fireweed (EPBC Act, FFG Act and DSE Advisory List) and Plains Joyweed (DSE Advisory List). The area north west of Caroline Springs, south of Holden Road and east of Plumpton Road supports no threatened fauna and two threatened flora species including Large headed Fireweed (EPBC Act, FFG Act and DSE Advisory List) and Small Scurf-pea (FFG Act and DSE Advisory List). Based on the information provided by Biosis, this option has the potential to impact EPBC Act threatened flora and fauna species. Impacts on native grassland block along Hopkins Road.	SMEC (unpublished data)	Avoid: Preferred option between Green's Road and Boundary Road. Option same as CS1 Minimise: Developed to avoid the maximum amount of native grasslands.
	Southern	Would sever a block of high value biodiversity grassland, Princes Freeway Interchange located in Lollypop Creek Floodplain ESO.	Biosis (2009)	Avoid: Rejected due to impact on future land use.

Option	Section	Sensitivity	Source	Avoid/Minimise
				Minimise: Developed to be as close as possible to Werribee whilst minimising impacts to the native grasslands.
4	Southern	Significant areas of native grassland within the Urban Growth Boundary (UGB), Princes Freeway interchange located at Lollypop Creek Floodplain ESO. Goes through northern border of Ramsar Wetland though not considered to have a significant impact on the ecological values.	DSE (2009b), Biosis (2009)	Avoid: Rejected due to poor link to Regional Rail Network. Environmental considerations secondary.
				Minimise: Not relevant.
4W	Central	Significant areas of native grassland within the Urban Growth Boundary (UGB).	Biosis (2009)	Avoid: Rejected due to environmental and future land use impacts.
				Minimise: Not relevant.
4-E1	Central	Potential to impact two flora species listed on the EPBC Act Impact on native grasslands. Would impact Mount Cottrell.	Biosis (2009)	Avoid: Rejected due to impacts on land use.
				Minimise: Not relevant.
4-E2	Central	Potential to impact two flora species listed on the EPBC Act and one species listed on the FFG Act. Would impact native grasslands to the north of the Boral quarry and within the quarry.	Biosis (2009)	Avoid: Rejected as options not technically feasible.
				Minimise: Not relevant.
4-E3	Central	Would impact native grasslands to the north of the Boral quarry and within the quarry.	Biosis (2009)	Avoid: Rejected as options not technically feasible.
				Minimise: Not relevant.
M1 = 1a	Central	This option goes through the area north west of Caroline Springs, south of Holden Road and east of Plumpton Road. Within this area there are no threatened fauna and two threatened flora species including Large headed Fireweed (EPBC Act, FFG Act and DSE Advisory List) and Small Scurf-pea (FFG Act and DSE Advisory List). Crosses through an area of Vegetation Protection Overlay. This route would traverse areas of native grasslands and woodlands and occasional wetlands.	SMEC (unpublished data), Biosis (2009), DSE (2009a)	Avoid: Developed to minimise environmental impacts on native grassland. Rejected due to impacts on Toolern Growth area. Designed to avoid native grasslands
				Minimise: Not relevant.

Option	Section	Sensitivity	Source	Avoid/Minimise
	Southern	Potential to impact two threatened fauna species listed on the EPBC Act. Would pass through some areas of native grassland though these are quite small.	Biosis (2009)	Avoid: Rejected due to impacts on Toolern Growth area. Designed to avoid native grasslands
				Minimise: Not relevant.
M2	Central	Based on the data provided by Biosis, this option has the potential to impact three flora species listed on the FFG Act and two threatened fauna species listed on the EPBC Act. Would pass through small areas of native grasslands though these are quite small.	Biosis (2009)	Avoid: Rejected due to impacts on Toolern Growth area.
				Minimise: Not relevant.
M3 = 1b	Central	Would impact Mount Cottrell and Kororoit Creek Significant Landscape Overlay. Information provided by Biosis suggests this route passes through small patches of native vegetation, though these are quite small.	Biosis (2009)	Avoid: Developed to minimise impact to native grasslands. Rejected due to impacts on Toolern Growth area.
				Minimise: Not relevant.
M4	Central	Potential to impact two flora species listed on the EPBC Act and two threatened fauna species listed on the EPBC Act. Passes through areas of native grassland of state / national importance supporting EPBC listed Spiny Rice Flower.	Biosis (2009)	Avoid: Developed due to impacts on Mount Cottrell, but mainly due to rail grade requirements. However, rejected due to impacts on northern section grasslands.
				Minimise: Not relevant.
M5 = 2	Southern	Potential to impact two EPBC Act and FFG Act threatened flora and 21 threatened fauna species listed on the EPBC Act. Route passes through significant sections of native grasslands and Wyndham ESOs.	Biosis (2009)	Avoid: Rejected due to significant impact on grasslands and impact on a quarry.
				Minimise: Not relevant.

Discussion

Northern

Options within this section were primarily discarded due to their impact on ESOs (Option 1), impacts to Mount Ridley Woodland and Grassland (Option 1c), engineering issues (Option 1d), river crossings (Option 1e) and impacts to native grasslands and threatened flora and fauna (Option 3c). Taking environmental requirements into consideration, Option 3c was selected as the favoured option. However, this option still passes through area biodiversity significance, namely that situated at the woodland / grassland north of Gunns Road, area north of Donnybrook Road, west of Mickleham Road, area between Bardwell Drive and south of Mount Ridley Road, Mickleham and the area on both sides of Deep Creek, east of Sunbury Road and west of St John Road. Of these, the area on both sides of Deep Creek east of Sunbury Road and west of St Johns Road has six records of threatened fauna and no records of threatened flora. A detailed analysis of this option is provided in Chapter 6.

Central

Natural Temperate Grasslands of the Victorian Volcanic Plains are listed on the EPBC Act as critically endangered and >1% of their former extent is remaining in Victoria. As such, this has been a determining factor for discounting route options within this section, where this type of grassland is abundant. Options 1, 1a, 1e, 2, 3a, 3c, 4W, 4E2, 4E3 and M4 were all discounted for their significant impact on this type of grassland. Whilst it is inevitable for some of this habitat to be lost as a result of the construction of the OMR Transport Corridor, Option 3c was considered to minimise the damage to this habitat, whilst taking into consideration other requirements.

Other options were discounted for their impacts on growth areas (Option 1b and M2), development within the existing Urban Growth Boundary (Options 4, 4W, 4E1 or engineering issues (Option 4E2 and 4E3).

Southern

As with central areas, Options within the southern section were primarily discounted due to their impacts on the native grasslands (1, 1e and 3a) and impacts on growth areas, distance to Werribee and the railway link (Options 1b, 1e and 4). The original preferred route was 3c, however, this was later changed to 3b. Whilst this option passes through native grasslands, these are considered to be of lower quality compared with alternative options. Implementation of best-practice measures during the construction phase would be included as part of the proposed mitigation measures.

Conclusion

Based on the information provided by VicRoads and the route alignment decisions made, it is clear, comparing vegetation mapping with the alignments considered, that impacts on native vegetation from the options were taken into consideration in a significant number of cases. In this respect the 'avoid' and 'minimise' principles were applied in the route selection process for this component of the development.

4.1.3. Northern Interchange Options

The crossing point of the Hume Freeway was further investigated by VicRoads. Five options (I1, I2a, I2b, I3 and 3c) were considered (Table 2). Option 3c is described in Table 1 as part of the discussion of Option 3c northern section.

Table 2: Northern Interchange Options for the OMR

Option	Section	Sensitivity	Source	Avoid/Minimise
I1	Northern	Passes through an area of biodiversity significance comprising the woodland / grassland north of Gunns Gully Road, though within this area there are no records of threatened flora or fauna.	SMEC (unpublished data)	Avoid: Option rejected due to engineering impacts on existing and proposed interchanges and proposed Beveridge / Donnybrook Interstate Rail Freight Terminal. This was considered to outweigh lesser environmental impacts.
				Minimise: Not relevant.
I2a	Northern	Passes through an area of biodiversity significance comprising woodland/grassland north of Gunns Gully Road, though within this area there are no records of threatened flora or fauna. Environmentally sensitive areas of Kalkallo Creek and Merri Creek.	SMEC (unpublished data)	Avoid: Although originally rejected for engineering constraints in relation to the OMR railway connection to the Melbourne - Sydney railway line, later work on E6 confirmed this as the option with the greatest environmental impact.
				Minimise: Not relevant.
I2b	Northern	Bald Hill and Environmentally sensitive areas of Kalkallo Creek and Merri Creek.	DSE (unpublished data)	Avoid: Rejected primarily of engineering constraints in relation to the railway connection to the Melbourne - Sydney railway line, which were considered to outweigh the lesser impact on the conservation area.
				Minimise: Not relevant.
I3	Northern	Passes through the area of biodiversity significance situated north of Donnybrook Road, west of Mickleham Road with no threatened flora species and one species of threatened fauna, Brown Toadlet (FFG Act and DSE Advisory List). Also passes through Merri Creek ESO and passes through native vegetation.	SMEC (unpublished data)	Avoid: Rejected primarily for impact on Kalkallo township, potential impacts on future quarry reserves and inability to provide for potential rail connections, environmental impacts on Kalkallo and Merri Creek were a significant factor.
				Minimise: Not relevant.

Discussion

All of these options are situated within the northern section of the OMR at the intersection of the OMR and the E6 at the Hume Freeway. The different options presented were situated in close proximity to each other and were primarily discounted due to engineering constraints and constraints on the connection with the railway line. Interchange I2b and I3 pass through areas of native vegetation, highlighted as being of high conservation significance. Whilst the remaining interchanges do not pass through such sensitive areas, their connection to E6 does. Whilst the preferred interchange option 3cI avoids passing through the area of high conservation significance at Kalkallo Creek, it would impact the Merri Creek Conservation Area. This impact would therefore require mitigation, in particular within the woodland north of Guns Gully Road, within Merri Creek Conservation Area and the grasslands north of Donnybrook Road.

4.1.4. Northern Corridor Options

Options for the corridor linking the OMR to the E6 arterial road in the northern part of the investigation area Donnybrook Road west of the Hume Freeway and Donnybrook Road east of the freeway were then investigated. Six options including N1 (3c/3cI), N2, N3, N4, N5 and N6 were considered (Table 3).

Table 3: Northern Corridor Options for OMR to E6

Option	Section	Sensitivity	Source	Avoid/Minimise
N1 = 3c / 3cI (northern portion)	Northern	At the interchange passes through a biosite of regional significance situated east of Hume Highway. Additionally, would impact Red Gum north of Gunns Gully Road, Plains Grassy Woodland and Plains Grassland. Occasionally cuts through areas of Vegetation Protection Overlays, though these are relatively minimal. This option also passes through an area supporting Swamp Fireweed, a species listed on the EPBC Act.	DSE (2009b), DSE (unpublished data)	Avoid: Not relevant. Minimise: Preferred option discussion with DSE. Most areas of Vegetation Protection Overlays have been avoided. The impact on the biosite of regional significance and the Swamp Fireweed population would need to be mitigated, as these cannot be avoided.
N2	Northern	Goes through a biosite of national significance, native vegetation and areas of recent records of Growling Grass Frog (EPBC Act listed species). Would also impact Merri Creek.	DSE (unpublished data)	Avoid: Rejected for reasons other than environmental sensitivities. Option not feasible as ring road and would still need railway to be in original N1 alignment, thus no major future land use advantages. Minimise: Not relevant
N3	Northern	Goes through a biosite of state significance, sites with recent records of Growling Grass Frog (EPBC Act listed species) and would also impact Merri Creek.	DSE (unpublished data)	Avoid: Rejected for reasons other than environmental sensitivities. Unacceptable outcomes for township of Beveridge, future land use impacts and the proposed Beveridge / Donnybrook Interstate Rail Freight Terminal. Minimise: Not relevant.
N4	Northern	Goes through two biosites of regional significance one biosite of national significance, recent records of Growling Grass Frog (EPBC Act listed species), and native vegetation. Would also impact Merri Creek.	DSE (unpublished data)	Avoid: Rejected for reasons other than environmental sensitivities. Unacceptable outcomes for township of Beveridge, future land use impacts and the proposed Beveridge / Donnybrook Interstate Rail Freight Terminal.

Option	Section	Sensitivity	Source	Avoid/Minimise
				Minimise: Not relevant.
N5	Northern	Passes through a biosite of national and regional significance and through areas with recent records of Growling Grass Frog (EPBC Act listed species). Would impact Merri Creek.	DSE (unpublished data)	Avoid: Rejected for reasons other than environmental sensitivities. Unacceptable outcomes for township of Beveridge, future land use impacts and the proposed Beveridge / Donnybrook Interstate Rail Freight Terminal.
				Minimise: Not relevant.
N6	Northern	Passes through a biosite of national and regional significance and through areas with recent records of Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List). Would impact Merri Creek. Passes through biodiversity Area west of Epping Road, south of Donnybrook Road, as defined by SMEC. This area supports no threatened fauna and one threatened flora species, Yarra Gum (DSE Advisory list). Would impact small areas of Plains Grassy Woodland.	DSE (unpublished data), SMEC (unpublished data), Biosis (2009)	Avoid: Only feasible if OMR railway line remains in N1 corridor thus no major advantage for future land use. These disadvantages are considered to outweigh lesser environmental impacts. This is the preferred option for DSE as it avoids areas of a quarry supporting grassy woodland and grassland, situated on either side of Merry Creek. This option would have avoided this whole area.
				Minimise: Not relevant.

Discussion

The options within this section were developed to resolve land use impacts, rather than address environmental concerns. From an environmental perspective, these options pass through biosites of national and regional significance, in addition to passing through areas populated by threatened flora and fauna species. The areas north of Donnybrook Road and east of the Hume Freeway support a number of habitats and species of conservation significance, including a significant population of Swamp Fireweed, of national significance, Merri Creek Conservation Area and biosites of national and state significance. Department of Sustainability and Environment identified Option N6 as being the preferred route as it avoided these areas of conservation significance and only crossed Merri Creek once. However, due to future land use restrictions, this option was not carried forward. Option N1, passing north of Gunns Gully Road is the preferred option for this section. Where impacts to the native vegetation occur, these will be mitigated.

4.1.5. Caroline Springs Options

Five routes including CS1, CS2, CS3, CS4 and CS5 were considered to provide options for development in the Caroline Springs area (Table 4).

Table 4: Caroline Springs Options for the OMR

Option	Section	Sensitivity	Source	Avoid/Minimise
CS1	Central	Potential to impact four flora species listed on the EPBC Act. Passes through a significant area of native vegetation. Detailed information on native grassland within this area has indicated that habitats are of lesser quality when compared with grassland west of Troups Road.	Biosis (2009)	Avoid: Not relevant. Minimise: Originally preferred as would minimise the amount of native vegetation destroyed.
CS2	Central	Potential to impact two flora species listed on the FFG Act. Passes through a very small amount of native grassland, which is of lesser quality when compared with the grassland situated west of Troups Road.	Biosis (2009)	Avoid: Not relevant. Minimise: Designed to avoid the most areas of native vegetation.
CS3	Central	Potential to impact three flora species listed on the FFG Act. Passes through a significant amount of native vegetation, which is considered to be of lesser quality than grasslands situated west of Troups Road.	Biosis (2009)	Avoid: Rejected due to very high impacts on Caroline Springs and Boral quarry. Minimise: Not relevant.
CS4	Central	This area passes through native grassland habitat, considered to be of lesser quality than that situated west of Troups Road. Whilst this is the case, habitat quality information has indicated a poor quality within habitat situated east of Troups Road, thereby making this option, in terms of biodiversity values, more favourable.	Biosis (2009)	Avoid: Rejected due to unworkable future land use. Minimise: Not relevant.
CS5	Central	Passes through areas of native vegetation though these are small and isolated patches, as with CS2.	BLA (2009)	Avoid: Not relevant. Minimise: Preferred option designed in consultation with DSE. Recent reassessment of environmental values of grassland allows superior future land use. VicRoads would mitigate impacts on Plains Grassy Woodland through net gain requirements.

Discussion

These options were primarily considered due to the impacts they had on native grasslands. Of particular concern was a large patch of native grassland situated south of the Western Freeway. This area of native grassland comprised patches of differing quality, whereby in general grasslands situated east of Troups Road were considered to be of lower habitat quality than that situated west of Troups Road. This information has enabled superior land use options as well as a different alignment for the OMR. The preferred route, designed in consultation with DSE option passes predominantly east of Troups Road, thereby avoiding the majority of sensitive areas of native grassland of superior quality west of Troups Road. The preferred option then crosses Troups Road at Middle Road where it impacts some areas of native grassland. The choice of this route option, although not avoiding impacts on native vegetation, has been able to minimise impacts on the most significant, larger remnants, leaving them comparatively intact, thereby minimising project impacts on native vegetation. Areas of native vegetation loss which cannot be avoided will be mitigated.

4.1.1. OMR Preferred route option

With some final changes based on discussions with DSE, the preferred route for the OMR is defined as 3bI with 3b in the Wyndham area and CS5 at Caroline Springs. The 'avoid' and 'minimise' principles of the state Native Vegetation Management Framework have significantly informed the choice of this alignment, although unavoidable vegetation removal will occur.

4.2. E6 Alternative Alignment Options

Four options for development of the E6 arterial road east of the OMR were initially developed (E6-1, E6-2, E6-3, E6-4) all of which would pass though environmentally significant Plains Grassy Woodland and a conservation area associated with the Merri Creek (Table 5).

Variation E6-2 involved changing the route to avoid Plains Grassy Woodland to pass through Plains Grassland. As both communities are threatened, the differences are not significant, with either EVC affected. The only difference is that Plains Grassland is already listed on the EPBC Act, although it is understood a nomination of plains Grassy Woodland under this Act is pending. Quantitative comparison, using accurate alignment designs might be more informative but this level of design was not available for comparison of these route options.

Table 5: E6 Alternative Alignment Options

Option	Section	Sensitivity	Data	Avoid/Minimise
E6-1	Northern	Plains grassy woodland and conservation area of Merri Creek passes through areas of native vegetation and a biosite of national significance. Also passes through a rural conservation area. Passes through areas of biodiversity significance situated north-west of Boral Wollert Quarry and along both sides of Bindts Road between Harvest Home Road and north of Lehmans Road. The area to the north-west of Boral Wollert Quarry supports no threatened flora and one threatened fauna species, the Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List). The area both sides of Bindts Road between Harvest Home Road and north of Lehmanns Road supports no threatened flora species, and 11 threatened fauna species including Spotted Harrier (DSE Advisory List), Diamond Firetail (FFG Act and DSE Advisory List), Fat-tailed Dunnart (DSE Advisory List), Bush Stone-curlew (FFG Act and DSE Advisory List), Superb Parrot (EPBC Act, FFG Act and DSE Advisory List), Brown Toadlet (FFG Act and DSE Advisory List), Southern Toadlet (DSE Advisory List), Speckled Warbler (FFG Act and DSE Advisory List), Common Dunnart (DSE Advisory List), Grey-crowned Babbler (FFG Act and DSE Advisory List) and Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List). Passes through the Merri Creek Conservation Area supporting five species of threatened flora (2 EPBC, 2 FFG and 5 DSE Advisory List) and five species of threatened fauna (2 FFG, 5 DSE Advisory List). Passes through the Merri Creek Has the potential to pass through sites supporting threatened flora and fauna. Passes through a biosite of national and regional significance.	SMEC (unpublished data), ENSR (unpublished data), MCMC (DSE unpublished data)	Avoid: Rejected primarily due to impacts on rural conservation areas. Also, not optimal for proposed future land use development. Minimise: Not relevant.
E6-2	Northern	Passes through a Red Gum Woodland, biosites of national and regional significance, passes through significant sites of biodiversity. The area to the north-west of Boral Wollert Quarry supports no threatened flora and one threatened fauna species, the Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List).	SMEC (unpublished data), ENSR (unpublished data), MCMC (DSE unpublished data), Ecology Partners (2009)	Avoid: Not relevant Minimise: Preferred option as would maximise area for future development and minimise undesirable

Option	Section	Sensitivity	Data	Avoid/Minimise
		The area both sides of Bindts Road between Harvest Home Road and north of Lehmanns Road supports no threatened flora species, and 11 threatened fauna species including Spotted Harrier (DSE Advisory List), Diamond Firetail (FFG Act and DSE Advisory List), Fat-tailed Dunnart (DSE Advisory List), Bush Stone-curlew (FFG Act and DSE Advisory List), Superb Parrot (EPBC Act, FFG Act and DSE Advisory List), Brown Toadlet (FFG Act and DSE Advisory List), Southern Toadlet (DSE Advisory List), Speckled Warbler (FFG Act and DSE Advisory List), Common Dunnart (DSE Advisory List), Grey-crowned Babbler (FFG Act and DSE Advisory List) and Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List). Area south of Bridge Inn Road, east of Epping Road supports no threatened flora species and one fauna species Spotted Harrier (DSE Advisory List). Area north of Boundary Road, west of Epping Road and part of Hanson Quarry and the area both sides of Epping Road, north of Summerhill Road support no threatened flora or fauna species. Finally, the area west of Epping Road, south of Donnybrook Road supports one threatened flora species, Yarra Gum (DSE Advisory List).		development along Epping Road. VicRoads would mitigate impacts on Plains Grassy Woodlands through net gain requirements'.
E6-3	Northern	Passes through Red Gum Woodland, native grassland, ESO, nationally and regionally significant biosites and native vegetation and rural conservation area. The area to the north-west of Boral Wollert Quarry supports no threatened flora and one threatened fauna species, the Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List). The area both sides of Bindts Road between Harvest Home Road and north of Lehmanns Road supports no threatened flora species, and 11 threatened fauna species including Spotted Harrier (DSE Advisory List), Diamond Firetail (FFG Act and DSE Advisory List), Fat-	SMEC (unpublished data), ENSR (unpublished data), MCMC (DSE unpublished data)	Avoid: Rejected due to impacts on rural conservation area. Also not optimal for proposed future land use development. Minimise: Not relevant.

Option	Section	Sensitivity	Data	Avoid/Minimise
		tailed Dunnart (DSE Advisory List), Bush Stone-curlew (FFG Act and DSE Advisory List), Superb Parrot (EPBC Act, FFG Act and DSE Advisory List), Brown Toadlet (FFG Act and DSE Advisory List), Southern Toadlet (DSE Advisory List), Speckled Warbler (FFG Act and DSE Advisory List), Common Dunnart (DSE Advisory List), Grey-crowned Babbler (FFG Act and DSE Advisory List) and Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List). Area south of Bridge Inn Road, east of Epping Road supports no threatened flora species and one fauna species Spotted Harrier (DSE Advisory List). Area north of Boundary Road, west of Epping Road and part of Hanson Quarry and the area both sides of Epping Road, north of Summerhill Road support no threatened flora or fauna species. Finally, the area west of Epping Road, south of Donnybrook Road supports one threatened flora species, Yarra Gum (DSE Advisory List). E6-3 and E6-2 will both significantly impact the environmentally sensitive habitats and species. Neither option is preferable.		
E6-4	Northern	Option passes through native vegetation, ESO and biosites of National and regional significance. This option also impacts Merri Creek and passes through a rural conservation area. Advised by DSE to avoid area. Potential to impact a number of threatened flora and fauna species. Passes through several areas of biodiversity significance. The area on both sides of Epping Road, north of Summerhill Road supports no records of threatened flora or fauna. The area both sides of Bindts Road between Harvest Home Road and north of Lehmanns Road supports no threatened flora species, and 11 threatened fauna species including Spotted Harrier (DSE Advisory List), Diamond Firetail (FFG Act and DSE Advisory List), Fat-tailed Dunnart (DSE Advisory List), Bush Stone-curlew (FFG Act and	SMEC (unpublished data), ENSR (unpublished data), MCMC (DSE unpublished data)	Avoid: Rejected primarily due to impacts on rural conservation areas. Also, not optimal for proposed future land use development. Minimise: Not relevant.

Option	Section	Sensitivity	Data	Avoid/Minimise
		DSE Advisory List), Superb Parrot (EPBC Act, FFG Act and DSE Advisory List), Brown Toadlet (FFG Act and DSE Advisory List), Southern Toadlet (DSE Advisory List), Speckled Warbler (FFG Act and DSE Advisory List), Common Dunnart (DSE Advisory List), Grey-crowned Babbler (FFG Act and DSE Advisory List) and Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List). The Area to the north-west of Boral Wollert Quarry supports no threatened flora and one threatened fauna species, Growling Grass Frog (EPBC Act, FFG and DSE Advisory List).		
V1E6-2	Northern	Avoids areas of biodiversity significance, still passes through areas of native vegetation and biosites of national and regional conservation importance. Route was originally aligned to avoid Plains Grassy Woodland, a state listed community. Altered alignment now passes through Plains Grassland, an ecological community of national significance.	SMEC (unpublished data), ENSR (unpublished data), MCMC (DSE unpublished data)	Avoid: Not relevant Minimise: VicRoads would mitigate impacts on Plains Grassland through net gain requirements'.
V2E6-2	Northern	Route realigned to provide regional connection to Merriang Road. Location controlled by topography of foothills. Passes through biosite of Regional and national significance and native vegetation.	SMEC (unpublished data), ENSR (unpublished data), MCMC (DSE unpublished data)	Avoid: Not relevant Minimise: Engineering requirements considered to outweigh any environmental impacts. VicRoads would mitigate impacts on Plains Grassy Woodlands through net gain requirements.
V3E6-2	Northern	Area both sides of Bindts Road between Harvest Home Road and north of Lehmanns Road supports no threatened flora species, and 11 threatened fauna species including Spotted Harrier (DSE Advisory List), Diamond Firetail (FFG Act and DSE Advisory List), Fat-tailed Dunnart (DSE Advisory List), Bush Stone-curlew (FFG Act and DSE Advisory List), Superb Parrot (EPBC Act, FFG Act and DSE Advisory	Ecology Partners (2009)	Avoid: Impacts on existing structure plan considered to outweigh any environmental impacts. VicRoads would mitigate impacts on Plains Grassy Woodland through net

Option	Section	Sensitivity	Data	Avoid/Minimise
		List), Brown Toadlet (FFG Act and DSE Advisory List), Southern Toadlet (DSE Advisory List), Speckled Warbler (FFG Act and DSE Advisory List), Common Dunnart (DSE Advisory List), Grey-crowned Babbler (FFG Act and DSE Advisory List) and Growling Grass Frog (EPBC Act, FFG Act and DSE Advisory List). Area south of Bridge Inn Road, east of Epping Road supports no threatened flora species and one fauna species, Spotted Harrier (DSE Advisory List). Route has been realigned to east side of Bindts Road between Harvest Home Road and Lehmans Road to avoid impacts on existing structure plan and proposed environmental mitigation.		gain analysis. Minimise: Not relevant.
VE6-3	Northern	Area south of Bridge Inn Road, east of Epping Road supports no threatened flora species and one fauna specie, Spotted Harrier (DSE Advisory List). Area north of Boundary Road, west of Epping Road and part of Hanson Quarry supports no threatened flora or fauna species. Impacts on ESO.	SMEC (unpublished data), ENSR (unpublished data), MCMC (DSE unpublished data)	Avoid: Engineering requirements considered to outweigh any environmental impacts. VicRoads would mitigate impacts on Plains Grassy Woodlands through net gain requirements. Minimise: Not relevant.

Discussion

Many of the habitats situated within the E6 area are environmentally sensitive and the route options pass through biosites of national, state and regional importance. Additionally, many of these options pass through areas of biodiversity significance and sensitive habitats, such as Red Gum Woodland and rural conservation areas. These impacts were considered unavoidable when other constraints in this region were considered. These engineering and land use constraints made it difficult to apply the 'avoid' and 'minimise' principles. In this respect, applying these principles proved difficult in this particular part of the project area.

4.2.1. East West Link (OMR to Deer Park Bypass)

One option for the East-West link (OMR to Deer Park Bypass) was considered.

Table 6: East West Link (OMR to Deer Park Bypass)

Option	Section	Sensitivity	Data	Avoid/Minimise
East-West Link	Central	Potential to impact one flora species listed on the EPBC Act and FFG Act. Passes through a block of native grassland.	Biosis (2009)	Avoid: Alignment constrained by Prison, Derrimut Grasslands and Boral Quarry west of Hopkins Road and by engineering constraints as link to OMR. VicRoads would mitigate impacts on Plains Grassland through net gain requirements.
				Minimise: Not relevant.

Discussion

This option passes through a significant block of native grasslands. This is necessitated due to the presence of existing approved land use constraints and engineering constraints. In this respect, applying the principles proved difficult in this particular part of the project area.

4.2.2. E6 Preferred route option

The preferred option for the E6 was E6-2 incorporating all variations V1E6-2, V2E6-2 and V3E6-2.

The preferred OMR/E6 Transport Corridor would provide for an ultimate 8 lane freeway (4 lanes in each direction) and 4 rail lines within the median, and would extend from the Princes Freeway at Werribee to the Melbourne – Sydney rail line at Kalkallo. The E6 corridor would continue from the OMR at the Melbourne – Sydney rail line to the Metropolitan Ring Road at Thomastown. Together these would form an outer ring transport route of 97 kilometres from Werribee to Thomastown (Figures 1 and 2).

In addition to the corridor providing for freeway carriageways it would also enable the provision of auxiliary lanes where interchanges are closely spaced.