

6. Project Description

6.1 Introduction

The Project has been developed taking into account the Project objectives, constraints and the risks and impacts identified through the EES process. This has been an iterative process as the project alignment has been refined through the EES process as information on environmental values and impacts have progressively become available.

This chapter provides a description of the Project by outlining the physical footprint and relevant design elements, and an indicative construction methodology. The Project description, together with VicRoads standard environment protection measures for construction (refer to Chapter 21 (Environmental Management Framework)), has formed the basis for the impact and environmental risk assessment.

The Project Description considers two potential alignments: Option 1 (alternative) and Option 2 (preferred), as described in Chapter 5 (Project Alternatives).

The Project Description also considers the two project stages with initial upgrade proposed to VicRoads Access Management Policy (AMP) road category 3 AMP3 – divided rural highway standard (interim upgrade) and then ultimately to category 1 AMP1 – freeway standard (ultimate upgrade).

The objective of the EES is to assess the largest potential impact resulting from the Project, therefore most assessments have focused on the ultimate upgrade of an AMP1 freeway as it would result in a larger footprint and the greatest change to access arrangements.

6.2 Project Timing

Once planning and environmental approvals are obtained, the two main activity sequences which follow are pre-construction and construction.

The pre-construction phase would involve detailed site investigations, land acquisition and detailed design, and take around six months to complete. Depending on the method of construction delivery, e.g. construct only, or design and construct, detailed design may be undertaken concurrently with land acquisition.

Tendering the contract for construction would take around six months until award. Construction of Section 2 of the Project is expected to take up to three years, subject to project funding. Construction would be broken up into stages, Beaufort to Buangor then Buangor to Ararat, to align with project funding.

6.3 Project Stages

The initial duplication of the Western Highway would be to VicRoads road category 3 AMP3 – divided rural highway standard, with most local roads and property accesses remaining.

Funding may be provided for upgrading the AMP3 highway to AMP1 freeway standard in the future. The timing for this is unknown and subject to future funding programs, however it is expected to be at least 20 years away.

The ultimate upgrade to an AMP1 freeway would result in a larger footprint with grade-separated interchanges and service roads. It is the ultimate upgrade that would also result in the most amount of change to arrangements for accessing the highway (e.g. it would not allow direct access to the highway to or from adjacent properties). The assessments for the EES have therefore focused on AMP1 as the objective is to assess the largest potential impact resulting from the Project.

The proposed Planning Scheme Amendment will be based on the AMP1 footprint to provide the extent of the Public Acquisition Overlay on land required for the ultimate upgrade.

Some specialist studies however consider both the interim upgrade to AMP3 highway as well as the ultimate upgrade of an AMP1 freeway standard configuration as the highway would operate as AMP3 for a number of years. These assessments include traffic and transport, economic and social impact assessments.

6.3.1 Interim Upgrade – Divided Highway

The proposed interim upgrade involves duplication of the Western Highway to AMP3 – divided rural highway standard. Wide median intersection treatments are proposed at:

- Martins Lane
- Eurambeen-Raglan Road / Eurambeen-Streatham Road
- Ferntree Gully Road / Goulds Lane
- Peacocks Road
- Hillside Extension Road
- Langi Ghiran Picnic Ground Road
- Brady Road / Hillside Road (West)
- Warrayatkin Road.

Through Box's Cutting the existing highway is proposed to become a service road that connects to a wide median intersection at Martins Lane.

The majority of the remaining intersecting roads and property access would be restricted to 'left-in' and 'left-out' except where local roads are proposed to be truncated thereby restricting access the highway.

In these locations, service roads have been proposed.

The proposed access arrangements for roads that intersect the existing highway are outlined in Table 6-1 which shows intersection and access treatments for the interim and ultimate upgrades.

6.3.2 Ultimate Upgrade - Freeway

The proposed ultimate upgrade is to AMP1 – freeway standard. Under the ultimate upgrade, access to the freeway would be provided via grade-separated interchanges connected to the local road network by service roads. The grade separated interchanges would be located at:

- Eurambeen-Raglan Road / Eurambeen-Streatham Road
- Peacocks Road
- Hillside Road
- Langi Ghiran Picnic Ground Road.

The access arrangements for all other intersections and roads that meet the existing highway are outlined in Table 6-1.

6.4 Design Guidelines and Basic Parameters

In July 2010, VicRoads adopted the Austroads Guide to Road Design series, as modified by VicRoads supplements. The design standards used for the Project were therefore based on the Austroads Guide to Road Design series and VicRoads Supplements (July 2010) because further information on the potential bypass of Beaufort has become available since the Project was formulated.

The Project (both the interim and the ultimate upgrade) provides two lanes in each direction and associated intersection upgrades, with sealed road shoulders and a central median. The Project is proposed in order to improve road safety and facilitate the efficient movement of traffic.

Section 2 of the Project commences at the railway overpass west of Old Shirley Road, Beaufort, and extends for approximately 38 kilometres (km) to Heath Street, Ararat. In both alignment options, no works would be undertaken for the first approximate 840 metres (m) of the project area from the railway bridge to just east of McKinnon Lane, Beaufort. This is to allow for future bypass works around Beaufort.

As outlined in Section 6.3, the interim upgrade involves duplication of the Western Highway to AMP3 – divided rural highway standard and the ultimate upgrade is proposed for AMP1 – freeway standard.

The interim upgrade to AMP3 – divided rural highway – standard would be undertaken from just west of McKinnon Lane, Beaufort to Heath Street, Ararat.

The ultimate upgrade to AMP1 – freeway standard would also be undertaken from just west of McKinnon Lane, Beaufort to Warrayatkin Road. However, the last length from Warrayatkin Road to Heath Street, Ararat would remain as AMP3 – divided rural highway standard with direct access to the highway.

The alignment and geometry of the proposed carriageways would be the same for the interim and ultimate upgrades. The ultimate upgrade works would therefore be primarily associated with changes the intersections and construction of service roads, as outlined in Table 6-1.

6.4.1 Posted Speed Limits

The proposed posted (signed) speed limit is 110 kilometres per hour (km/h) on the main carriageways from just west of McKinnon Lane to Warrayatkin Road.

The posted speed is proposed to be 100km/h for the sections from the railway bridge to the east of McKinnon Lane, Beaufort and from Warrayatkin Road to Heath Street, Ararat.

The proposed posted speed limit on access ramps and crossroads is 90km/h and 70km/h on service roads.

These posted speed limits would apply to both the interim and ultimate upgrade for the Project.

6.4.2 Design for Vehicle Movements

Intersections and turning movements for both the interim and ultimate upgrade have been designed to cater for vehicles likely to legally use the Western Highway. This includes a standard 25m B-Double truck configuration (a vehicle consisting of a prime mover and two trailers linked together). This was considered by VicRoads and resulted in adopting a typical median width of 30m.

6.4.3 Gradeline

The main carriageways for both the interim and ultimate upgrade have been designed to be 1m above the 1 in 100 year flood level. In some locations the existing highway does meet this requirement and the existing pavement is not likely to be able to be retained. In these cases fill and new pavement will be required.

6.5 Consideration of Infrastructure in Design

Transportation infrastructure and utilities in the vicinity of the Western Highway Project corridor were considered as part of the design development process.

Key considerations for the proposed alignments included:

- a potential bypass of Beaufort;
- a bypass of the Buangor township; and
- a crossing of the Ballarat to Ararat Railway.

Relocation and/or protection of utilities such as electricity and telecommunications services has been allowed for within the construction area identified for the Project as described below.

6.6 Proposed Alignment Options

6.6.1 Project Area Conditions

The topography and constraints of the project area have been considered in the development of the preferred and alternate alignment options assessed in this EES.

The topography of the project area has steep grades from Beaufort through to near Fiery Creek. There are slight grades for around 18km beyond Fiery Creek. To the west of Buangor, the topography undulates as it passes to the south of Langi Ghiran State Park.

From the west side of Langi Ghiran State Park through to Ararat, the topography levels out once again. Apart from the Langi Ghiran State Park and small areas of remnant native vegetation, the surrounding land use is predominantly agricultural (grazing and cropping).

The existing Western Highway crosses the Ballarat to Ararat Railway, six rivers/creeks and twelve minor tributaries/drainage lines within the project area.

The width of the project area would vary, reflecting a variable median width between the carriageways, location of service roads and intersection treatments.

6.6.2 Proposed Alignments

The preferred (Option 2) and alternative (Option 1) alignment options are shown in Figure 6-1, and shown in more detail together with associated construction areas in Technical Appendix A to the EES:

- Mapbook A – Proposed and alternate alignment options
- Mapbook B – Construction area showing areas that could be impacted and avoided

Following selection of the proposed preferred and alternate options, the alignments have been refined through the EES assessment process. Further information about the refinement can be found in Section 6.17.

The preferred and alternative options are approximately 38km in length. Both alignment options commence just east of Martins Lane, Beaufort.

The options follow the same alignment until Andersons Road at Buangor. For the first length past Box's Cutting, new dual carriageways are proposed to be located in cleared land to the north and a new cutting. The existing highway is proposed to become a service road.

Both of the proposed options bypass Buangor to the north and cross Peacocks Road at about the same location. The proposed alignment options then differ from Peacocks Road to Langi Ghiran Picnic Ground Road. The options then follow the same alignment for the remaining length to Ararat.

New dual carriageways are proposed for the bypass of Buangor and the existing highway to revert to a local road servicing the township.

From Peacocks Road Option 1 travels south to re-join the existing highway alignment at Buangor-Ben Nevis Road. After a short section following the existing highway, Option 1 travels southwest crossing the railway in the vicinity of Hillside Road. Option 1 then travels west for approximately 650m to the south of the existing highway and re-joins the existing highway again just before Langi Ghiran Picnic Ground Road.

From Peacocks Road Option 2 travels west to cross Buangor-Ben Nevis Road approximately 600m north of the existing highway. After crossing Buangor-Ben Nevis Road, Option 2 travels south-west crossing the existing highway and then the railway line. Option 2 then curves to the north and follows the railway line, crosses Hillside Road and joins with the existing highway alignment just west of Hillside Road Extension.

The alignment options are shown in Figure 6-1.

6.7 Construction Area

A construction area has been defined for the Project, which is the potential area of direct impact for the both the initial highway and ultimate freeway upgrade. The construction area is contained within the project area.

The construction area, described in more detail below, includes the following areas:

- Existing and new carriageways and medians.
- Grade-separated intersections and wide median intersections.
- Service roads and rest areas.
- Clear zones extending a minimum 10m either side of the edge of the traffic lanes (except where constraints are located).
- Construction buffers beyond the clear zone, which have been included to accommodate relocated services and potential changes to batter slopes.

Refer to Figure 6-4, Figure 6-5 and Figure 6-6 for typical cross sections of the proposed alignments including the carriageways, median and clear zones.

Where sections of the proposed alignments utilise the existing road, the objective has been to convert the existing two-way road to two lanes in one direction, and a new parallel carriageway would be constructed to serve traffic in the other direction.

In some cases however, the alignment has been selected to minimise impacts on vegetation and/or landowners, so whilst the alignment follows the existing highway the pavement cannot be retained.

The following generally applies to the construction area:

- The construction area required for a new dual carriageway is approximately 110m wide. This includes the pavement, clear zone and construction buffer areas identified. Depending upon topography, in some instances a wider area may be required.
- Where the existing roadway is utilised, depending on the condition of the existing roadway and its gradeline, pavement rehabilitation might be required. Otherwise, where the existing pavement can be utilised, the only construction works on the existing roadway would involve drainage improvement, shoulder construction and removal of hazards within the clear zone. For the purposes of the EES, the same construction corridor has been assumed for areas where the new carriageway alignments follow the existing highway to allow for these works. This is conservative, but it at least accounts for potential impacts which could be reduced through the detailed design process and management during construction.

The construction area does not include space for construction site compounds as these are typically determined by the construction contractor. However, the EES has considered areas where site compounds should not be located due to environmental or cultural sensitivity. Refer Section 6.18.8.

6.7.1 Refinements through Detailed Design

At this stage of the Project, a full survey of the land features and detailed design of the Project has not been completed. A conservative yet reasonable approach has been taken to the design so that the final design in most instances should be able to be retained within the construction area defined for the Project.

There is however, a possibility that the construction area may need to be widened slightly in some areas. The objective in these instances would be to minimise landowner impacts and native vegetation losses. In this case, there would be no additional properties acquired. There are a number of ways this might be achieved as described in the following sections.

6.7.2 Protection of Hazards in Clear Zone

The clear zone either side of the traffic lanes is an area which is ideally kept clear of hazards and is within a recovery area beside a traffic lane required for run off road vehicles to stop safely or be brought under control.

The construction area defined for the existing and new carriageways, as described above, includes clear zones which generally extend a minimum of 10m either side of the edge of the traffic lanes. For operational safety reasons these clear zones are to be free of hazards, such as trees or power poles, so existing trees would be removed or protected, and the power poles relocated.

Where considered feasible, protection of hazards with safety barriers may be possible. This would be considered during the detailed design phase of the Project.

In addition, native vegetation within clear zones that does not constitute a hazard (e.g. grassland) and is not impacted by the construction activity would be retained. These measures would lead to reduced native vegetation loss.

6.7.3 Construction Buffers

A preliminary assessment of batter slopes for the main carriageways and service roads, and the location of services has been undertaken for the EES. This would be considered further in the detailed design to confirm the extents and locations.

In some areas, construction buffers have been included in the construction area to allow enough room for wider batter slopes, provision for drainage and relocation of services.

The construction buffers that are part of the construction area for the proposed alignments include:

- 0m in a few locations with constraints immediately adjacent to the road reserve as outlined further below;
- 4m in areas with social and environmental constraints identified through the EES assessment;
- 10m in areas where there are not likely to be constraints or services (this would also be the clear zone);
- 15m in areas where there are services to be relocated; and
- 20m in a few locations that may require additional space following completion of the detailed design.

Refer to Technical Appendix A to view the locations of these buffers. Areas that include a 0m construction buffer are situated adjacent to areas of sensitivity, such as the northern side of the eastbound carriageway for Option 1 near Buangor-Ben Nevis Road, along the northern side of the eastbound carriageway that utilises the existing highway west of Buangor, the southern side of the westbound carriageway near Hillside Road and northern side of the carriageways (for both options) between Warrayatkin Road and the western end of service centre near Ararat. Also, in some locations the median has been excluded from the construction

area to protect significant vegetation. This is shown in the map books in Technical Appendix A.

At the current stage of the design it is not possible to accurately define the construction buffers and so those shown for the purposes of the EES are

somewhat conservative (see Technical Appendix A). The extent of the construction buffers would be refined through the detailed design and would likely lead to reduced vegetation loss or impacts on landowners.



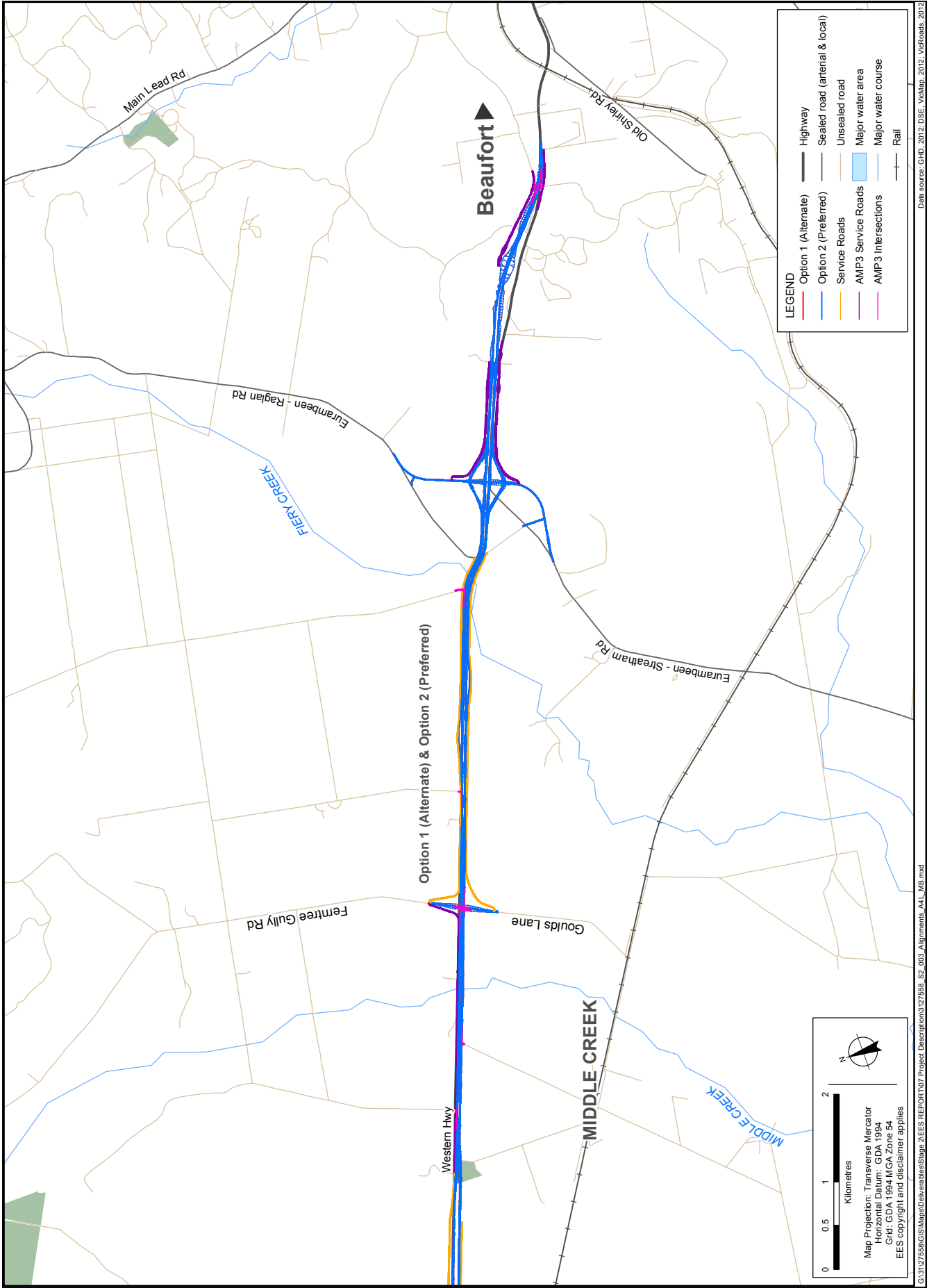


Figure 6-1 Preferred and Alternate Alignment Options

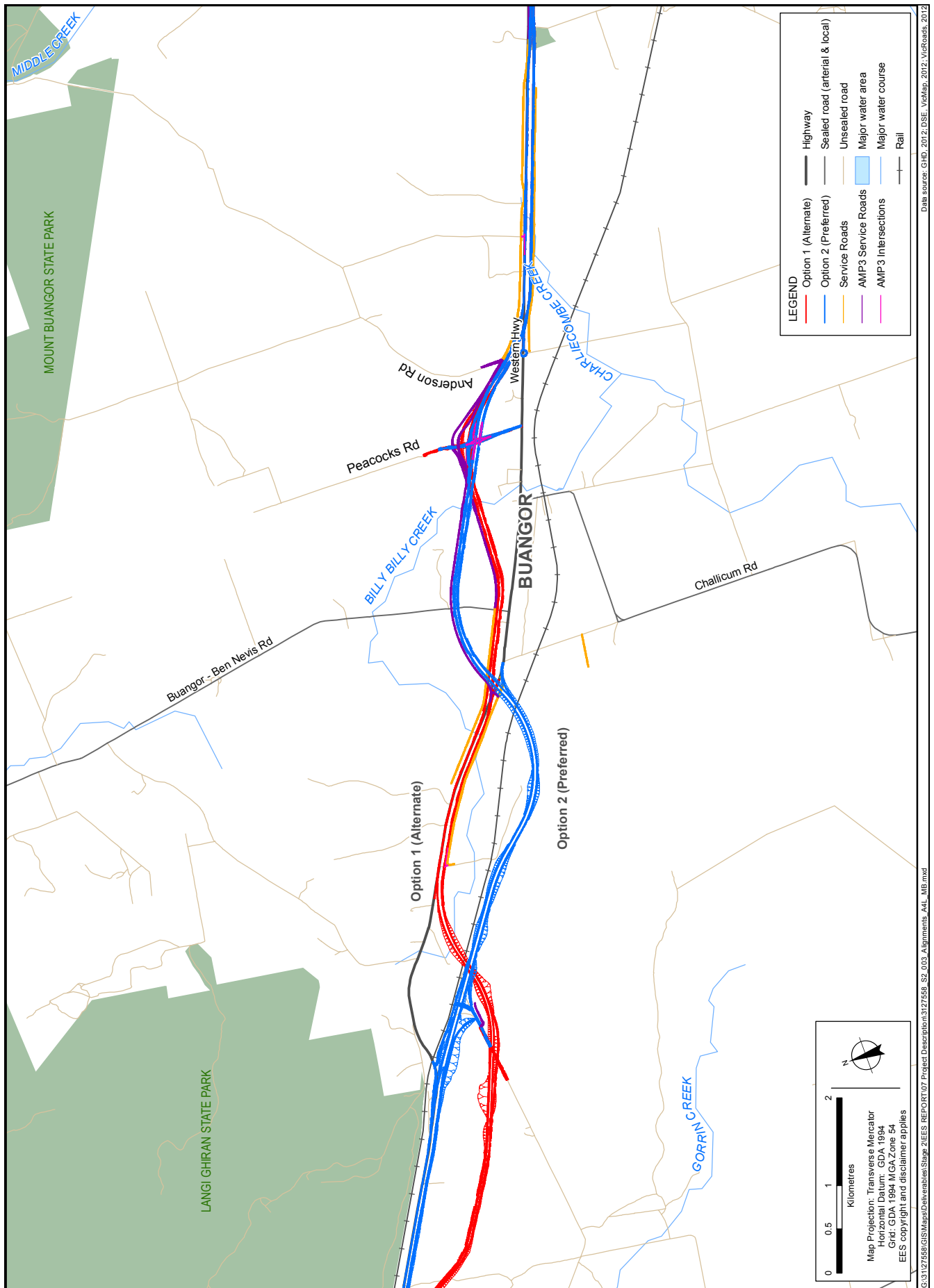


Figure 6-2 Preferred and Alternate Alignment Options

6.8 Typical Cross Sections

Typical cross sections of the Project are discussed below to illustrate different situations along the alignment options. Though these cross sections apply to both the interim and ultimate upgrades, it should be noted that most service roads would only be constructed in the ultimate upgrade.

1. Cross Section 1 – typical (30m median)
2. Cross Section 2 – wide medians (greater than 30m)
3. Cross Section 3 – narrow median.

All cross sections include:

- Main carriageway traffic lanes are proposed to be 3.5m wide, with two traffic lanes in each direction. The cross section includes a 3m wide outer shoulder with a 1.5m verge, and a 1m wide median shoulder.
- Service road lanes are proposed to be 3.1m wide lanes and service roads would have one lane in each direction together with a 2m shoulder and 1m verge.
- Separation of the main carriageway and service roads of 15m without a barrier, however if the separation is reduced then a barrier would be required.

The width of the proposed road reserve may vary in some locations in order to protect areas of environmental sensitivity. This would be confirmed during the detailed design phase. Table 6-1 and Table 6-3 outline the proposed median treatments for each intersection within Section 2.

6.8.1 Cross Section 1 – Typical Median

Cross section 1, as shown in Figure 6-4, is typical of new dual carriageways and duplication of sections of the existing Western Highway.

The median width shown for this typical cross section is 30m between the two carriageways or 32m wide separating the traffic lanes if the shoulders are included.

The typical median treatment gives preference for through traffic whilst providing safe turning facilities. The typical median width is designed to allow for vehicles as large as a standard 25m B-Double truck to store safely in the median during a turning manoeuvre.

6.8.2 Cross Section 2 – Wide Median

Cross section 2, as shown in Figure 6-5, applies to some locations where there are environmental constraints that can be avoided by locating them in the median.

This is the same as the typical cross section with the exception of the median, which is greater than 30m width.

6.8.3 Cross Section 3- Narrow Median

Cross section 3, as shown in Figure 6-6, is the same as the typical cross section with the exception of the median, which is narrower (6m wide between the two carriageways or 8m separating the traffic lanes if the shoulders are included).

A wire rope safety barrier would be installed in the median to meet VicRoads safety standards. This type of median is required where values such as significant native vegetation exist on either side of the road corridor.

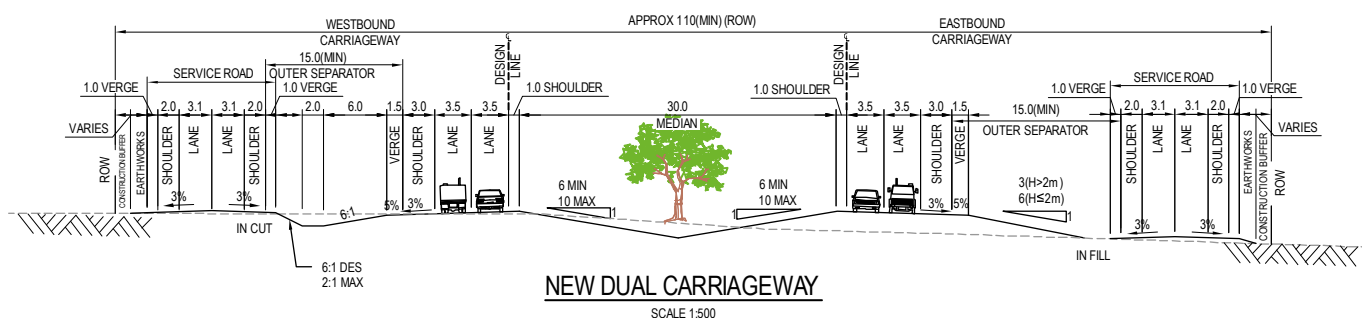


Figure 6-4 Cross Section 1 – Typical median

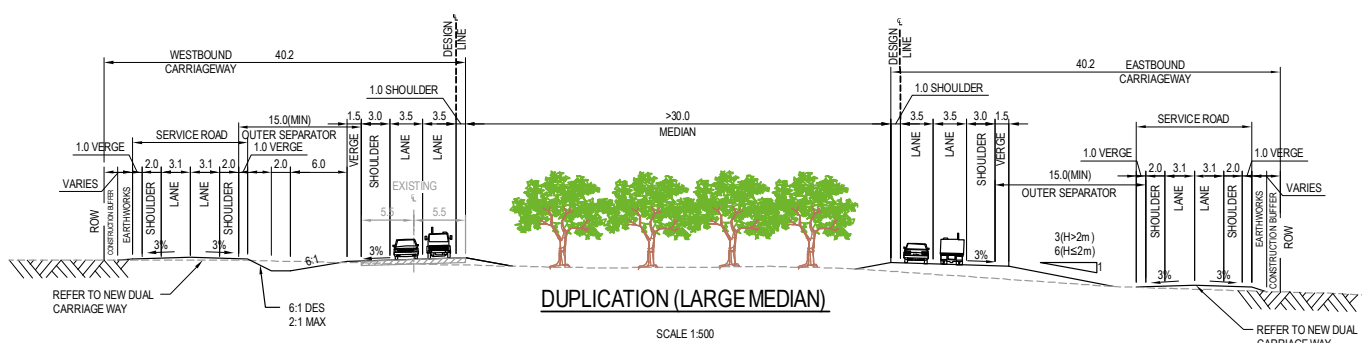


Figure 6-5 Cross Section 2 – Wide median

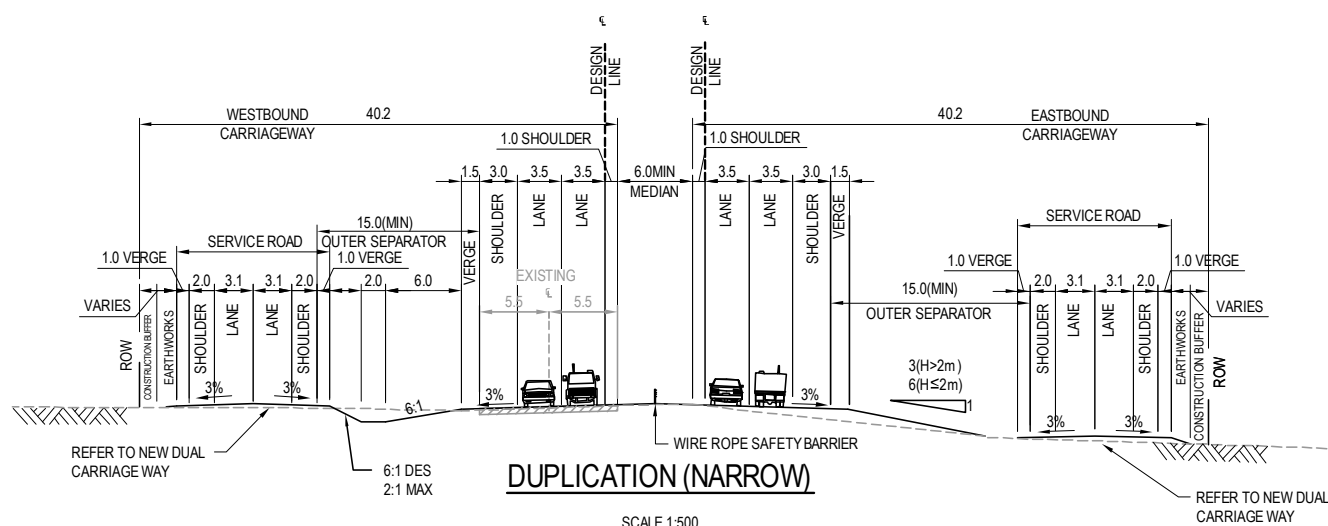


Figure 6-6 Cross Section 3 – Narrow median

6.9 Intersections and Access Control

The Western Highway between Beaufort and Ararat has a number of intersecting local roads and direct property access. In developing the Project, VicRoads has sought to balance the road safety and traffic efficiency of the road with the needs of owners and occupiers of adjoining properties. This has been done by seeking to achieve the following key project objectives:

- Provide safer conditions for all road users by:
 - Reducing the incidence of head-on crashes and run-off-road;
 - Improving safety at intersections; and
 - Improving safety of access to adjoining properties.
- Improve efficiency of freight by designing for High Productivity Freight Vehicles.

The VicRoads Access Management Policies have been developed to provide a framework for decision making in relation to access.

Both AMP3 and AMP1 standards are to be utilised (interim and ultimate) for the construction of the Western Highway Project. The transportation function, that is the safe and efficient movement of through traffic, is predominant for both schedules, however the access needs of adjacent land are also

important. Based on this policy, VicRoads adopted the following for the Project:

- Grade-separated freeway interchanges and entry and exit ramps are to be provided under the AMP1 freeway standard.
- Wide median intersection treatments are to be provided at key locations along the alignment to facilitate connectivity with major local roads under the AMP3 duplicated highway standard. These are designed to give preference for through traffic whilst accommodating safe turning movements and storage of vehicles accessing the highway. The wide median treatments are designed to allow standard B-Double trucks to store safely within the median during a turning manoeuvre.
- Highway access typically designed to be left in, left out only, under the AMP3 duplicated highway standard.
- Service roads are to be provided wherever alternative access to an existing property is not available, and may be required under both the interim and ultimate proposals.

The intersection arrangements for the preferred and alternative alignments are outlined in Table 6-1.

A wide median treatment is shown in Figure 6-7 and a grade separated interchange in Figure 6-8.

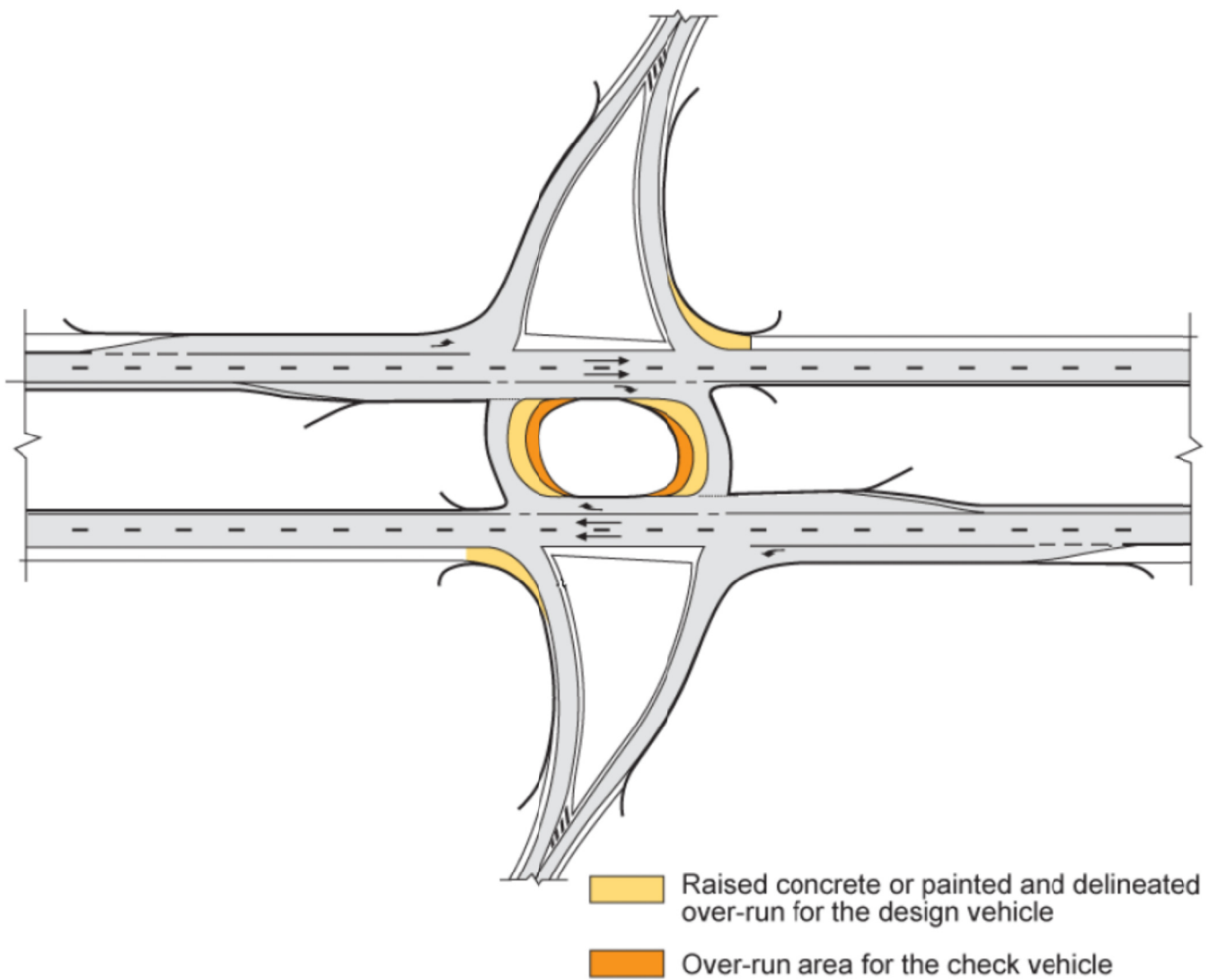


Figure 6-7 Wide Median Treatment (AustRoads 2009, Part 4A, Figure 4.21)

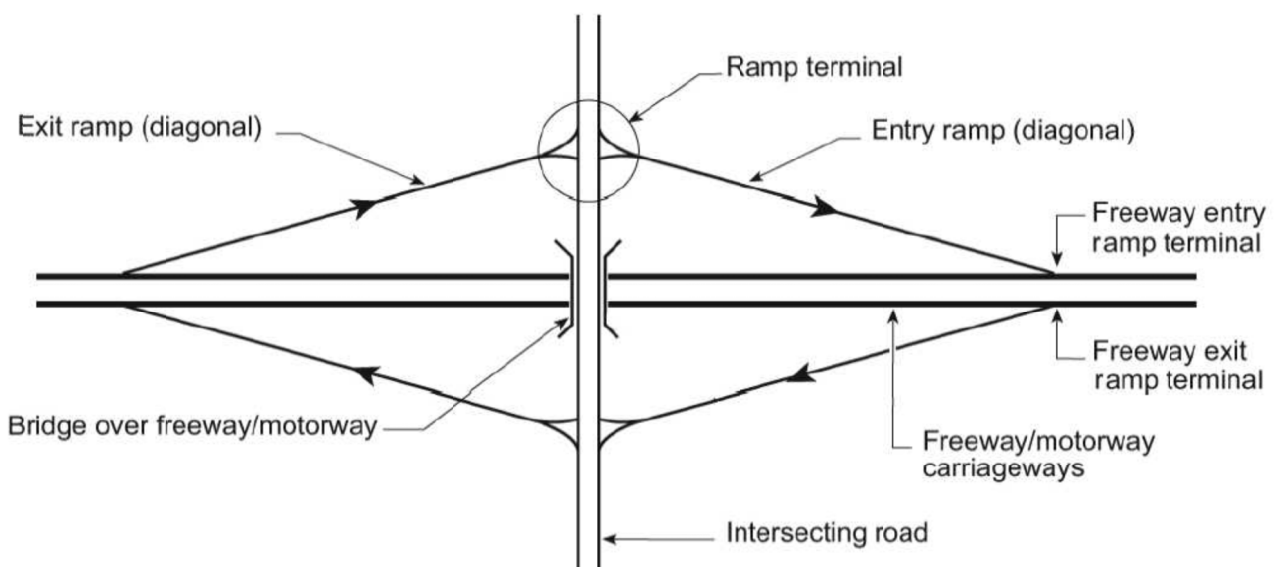


Figure 6-8 Illustration of a Grade separated interchange (AustRoads 2009, Part 4C, Figure 3.3)

Table 6-1 Intersection and access control for both options (unless otherwise stated)

| Road | AMP1 – Freeway Standard | | | | | | AMP3 – Divided Highway Standard | | |
|--|---|-----------------|---------------------|---|---|-----------------------------|---|-----------------------|----------------------------|
| | Diamond Interchange | | | Grade Separation / Service Road | Entry Ramp | Exit Ramp | Wide median treatment | Left-in/Left-out only | Left/right turn in and out |
| | 1/2 | 3/4 | Full | | | | | | |
| Martins Lane / Existing Highway Box's Cutting | | | | | | ✓ westbound | ✓ | | |
| McKinnon Lane | | | | | | | Truncated with service road | | |
| Grampians View Road / Centre Road | | | | | | | Existing Highway becomes service Road | | |
| Eurambeen-Raglan Rd / Eurambeen-Streatham Road | | | ✓ (Local road over) | | | | ✓ | | |
| Star Road, Aherns Road, Middle Creek Road, Waldrons Road, and Mile Post Lane | | | | ✓ (service Road) | | | | ✓ | |
| Ferntree Gully Road / Goulds Lane | | | | ✓ (Local road over) | | | ✓ | | |
| Anderson Road | | | | | | ✓ (Westbound) | Truncated with service road & Westbound exit ramp | | |
| Peacocks Road | ✓ (Local road over freeway) | | | | | | ✓ | | |
| Buangor-Ben Nevis Road | | | | | | | Truncated with service road | | |
| Existing Western Highway west of Buangor | | | | | ✓ (Westbound for both) ✓ (Option 1 – Eastbound) ✓ (Option 2 – Eastbound truncated with service road) | | Both Options - Westbound entry ramp Option 1 - East bound entry ramp Option 2 - Eastbound truncated with service road | | |
| Pope Road | | | | ✓ (Option 1 - Service Road) ✓ (Option 2 service Road via existing highway) | | | | ✓ (option 1) | |
| Hillside Road | ✓ (Option 1 - Freeway over local road) | ✓ (Option 2) | | | ✓ (Option 1 – westbound) (Option 2 – East & Westbound) | ✓ (Option 1 - Westbound) | ✓ | | |

| Road | AMP1 – Freeway Standard | | | | | | AMP3 – Divided Highway Standard | | |
|---|-------------------------|-----|------------------------|---------------------------------|------------|------------------|---------------------------------|-----------------------|----------------------------|
| | Diamond Interchange | | | Grade Separation / Service Road | Entry Ramp | Exit Ramp | Wide median treatment | Left-in/Left-out only | Left/right turn in and out |
| | 1/2 | 3/4 | Full | | | | | | |
| Existing Western Highway (Langi Ghiran) | | | | | | ✓ (Eastbound) | ✓ | | |
| Langi Ghiran Picnic Ground Road | | | ✓ (Local road over) | | | | ✓ | | |
| Brady Road / Hillside Road | | | | ✓ (service Road) | | | ✓ | | |
| Dobie Road | | | | ✓ (service Road) | | | | ✓ | |
| Warrayatkin Road | Not upgraded for AMP1 | | | | | | ✓ | | |
| Airport Access Road | Not upgraded for AMP1 | | | | | | | | ✓ |
| Geelong Road/Green Hill Lake Road | Not upgraded for AMP1 | | | | | | | ✓ | |

6.10 Waterways and Drainage

As shown in Table 6-2, there are six major waterways and 21 minor waterways that would be intersected by the proposed options. A major waterway is defined as a designated river or stream, and a minor waterway is an unnamed tributary stream or drainage line.

It is proposed that the type of waterway crossing treatments for the Project would typically match those of the existing highway. This means that where there is an existing culvert, a culvert is proposed for the duplicated highway, and where there is an existing bridge, a bridge is proposed for the duplicated highway.

The piers of the bridges would be constructed outside of the low flow channel extents. In order to prevent exacerbation of flooding it is likely that some existing bridges would require upgrades to accommodate the duplicated crossing. Detailed flood modelling has been completed for key crossings and has informed the EES.

In one location where the proposed alignment crosses Charliecombe Creek (Ch. 14200 – Ch. 15300) the carriageway would overlie 250m of the present creek channel. To mitigate potential flooding impacts, the creek would need to be realigned through an adjacent farm property. The potential impacts and management are further discussed in Chapter 12 (Surface Water) and Technical Appendix G.

In order to sustainably manage surface water runoff and protect water quality, the duplicated highway

would be constructed and operated in accordance with the VicRoads Integrated Water Management Guidelines (VicRoads 2011) and Water Sensitive Road Design Guidelines (VicRoads, 2007). The Project would also be designed to meet the objectives for water quality that are described in the Best Practice Environmental Management Guidelines (CSIRO, 1999). Specifically VicRoads proposes to:

- Use sedimentation basins and other best-practice environmental management techniques to prevent sediment laden run-off from leaving construction sites.
- Utilise non-potable (non-drinking water quality) water for construction activities wherever practicable.



Table 6-2 Waterway Crossings that apply to Both Options

| Type of Waterway | Waterway | Waterway Crossing Treatment |
|------------------------|---|---|
| Major waterways | Fiery Creek | Bridge |
| | Middle Creek | Culvert |
| | Charliecombe Creek | 3 crossings – 2 culverts and a Bridge Minor realignment where the proposed carriageway overlays the stream channel |
| | Billy Billy Creek | 2 existing crossings Bridge - New crossing north of Buangor Township |
| | Hopkins River | Bridge |
| | Green Hill Creek | Culvert |
| Minor waterways | Drainage lines and tributaries of Yam Holes Creek | Culverts |

6.11 Bicycle and Pedestrian Use

Based on VicRoads Access Management Policies and road rules, it is anticipated that cyclists would be able to continue using the Western Highway between Beaufort and Ararat for both the interim and ultimate upgrades, provided road access signs do not prohibit cyclists. The 3m sealed shoulder is sufficient width to allow for cyclists.

No specific provisions have been included within the design for pedestrians. Pedestrians are not permitted to use the Western Highway under the road rules and would be required to use alternative roads.

6.12 Railway Crossings

One new crossing of the Ballarat – Ararat railway line is proposed on the western side of Buangor between Beaufort and Ararat for both alignment options.

Access arrangements regarding construction work over and in the vicinity of the railway line would be agreed between VicRoads and VicTrack. This agreement would identify when construction activities can occur, which would predominantly be between train movements (which are not frequent) or after hours. Although unlikely, it is possible that operation of passenger trains could be suspended for a short period to allow construction work to occur. In this case, a bus service could temporarily replace passenger train services for the construction period.

6.13 Noise Attenuation

As described in Chapter 16 (Noise and Vibration), in accordance with the provisions of the Traffic Noise Reduction Policy (VicRoads, 2005) noise attenuation measures may be required in certain circumstances.

6.14 Lighting and Traffic Signals

Street lighting would be provided in accordance with Chapter 6 of VicRoads Traffic Engineering Manual

Volume 1 – Traffic Management which states a specified level of lighting at intersections. Street lighting would be provided at all interchange and wide median treatment intersections. Additional lighting may also be required along the freeway section and at the following locations:

- Railway crossings
- Rest areas
- Changes in carriageway width (merge areas)
- Ramps and round-a-bouts

No traffic signals are proposed for the Project.

6.15 Landscaping

Some vegetation in the road reserve which currently screens views to and from the highway would be removed for the Project. Landscaping for the Project would be undertaken in accordance with VicRoads Roadside Planting Guidelines (VicRoads 2010). The design and species selection for landscaping would be sympathetic to the existing landscape.

6.16 Rest Areas and Truck Stops

The existing Red Kangaroo Roadhouse located west of Beaufort township and Caltex Service Centre located to the east of Ararat would be retained as rest areas for all traffic.

New eastbound and westbound truck parking bays would be also created along the proposed alignment. These are proposed between Stars Road and Aherns Road.

6.17 Refinement of the Preferred and Alternate Alignments

Following selection of the preferred and alternate options, the alignments have been refined through the EES assessment process. The refinement of both alignments has been iterative following the risk assessment and impact assessment stages as these

have progressively provided further information on environmental values and risks.

The key changes and basis for the final proposed alignments presented in this EES are outlined in Table 6-3. Further description of the alignment changes to avoid impacts on native vegetation is provided in Chapter 13 (Biodiversity and Habitat).

The location of each item described in Table 6-3 is shown in the map books in Technical Appendix A with the corresponding item number.

Table 6-3 Key Changes and Basis for Alignment Options Assessed

| Option | Item No. and Chainage | Description |
|----------|-------------------------|--|
| Both | 1 Ch. 0 to 840 | <ul style="list-style-type: none"> Construction footprint move west to accommodate potential tie-in points of future bypass of Beaufort. Access maintained to the Red Kangaroo Service Station. Reduces impact on landowners on the south side of the existing highway from the railway crossing to McKinnon Lane. |
| Both | 2 Ch. 840 to 3200 | <p>Realignment of Box's Cutting to:</p> <ul style="list-style-type: none"> address gradeline issues with the existing cutting that currently prevent safe sight distances being achieved existing highway reverts to a local road to maintain access for properties and local roads to the south Reduce impact on vegetation on the south of the existing highway Minimise impacts on landowners |
| Both | 3 Ch. 4800 – 5200 | <ul style="list-style-type: none"> Realignment of Eurambeen-Raglan / Streatham Road to improved safety at intersection. Alignment of Eurambeen-Raglan Road addressed landowner comments to minimise impact on property severance and infrastructure Alignment of main carriageway and services roads, and construction area restricted to minimise impact on EPBC grasslands (Natural Temperate Grassland of the Victorian Volcanic Plain) on the corner between Crockers Lane and the existing alignment of Eurambeen - Streatham Road. Realignment of crossing of Fiery Creek to improve site distances and road geometry. |
| Both | 4 Ch. 8200 to 12000 | <p>Rest stops located on both sides of the highway to provide safe travel in accordance with VicRoads Rest Area Policy</p> <p>Duplication to the south side of the existing highway to reduce impact on:</p> <ul style="list-style-type: none"> landowners avoid impact on the historic Woodnaggerak homestead at Ch. 10800. Avoid impacts on historic hedge at Ch. 8700 <p>Narrow median to avoid adjacent large old trees between Ch. 9800 and 12800</p> <p>Maintaining north-south access for Ferntree Gully Road / Goulds Lane</p> |
| Both | 5 Ch. 12600 to 16400 | <ul style="list-style-type: none"> Alignment on the south side through Woodnaggerak Reserve following cleared area for existing services and construction area minimised. From Ch. 12600 a wide median is proposed to protect existing roadside vegetation. Service road on the north side is proposed to be set back from the alignment and into private property to protect vegetation. However at Ch. 14400 the service road has been brought closer to the proposed highway to minimise impacts on landowner property. Westbound off-ramp at Ch. 16400 to maintain access to Buangor Township |
| Option 1 | 6 Ch. 17600 to 20600 | <p>Proposed bypass of Buangor to the north to:</p> <ul style="list-style-type: none"> Remove large trucks from travelling through the town Avoid impacts on heritage listed site and avenue of honour in the township Avoids impact on telecommunication tower Avoid impact on large old trees to the south of the existing highway Avoid severance of the township areas on the south of the existing highway Avoid impacts on significant vegetation between Ch. 19000 and 19400 <p>Full diamond interchange at Peacocks Road to provide a central point of access to Buangor Township</p> <p>One dwelling is proposed to be acquired however this was the preference of the landowner in order to retain viable farming land.</p> <p>Avoiding substation at Ch. 20100 on the south side of the existing highway.</p> <p>Westbound on-ramp at Ch. 20600 to provide access from Buangor Township.</p> |

| Option | Item No. and Chainage | Description |
|----------|-------------------------|---|
| Option 1 | 7 Ch. 20600 to 22600 | Wide median treatment to minimise impacts on roadside vegetation. Proposed duplication follows existing highway to minimise impacts on landowners. |
| Option 1 | 8 Ch. 22600 to 28200 | Proposed duplication diverts south west away from the existing highway because: <ul style="list-style-type: none"> ▪ The existing highway has substandard geometry and sight distance for a freeway, and a dangerous crossing of the railway crossing. ▪ To avoid impacts on flora and fauna values in the existing road reserve. ▪ To avoid impacts on identified heritage sites ▪ To avoid impact on the property at the intersection of Hillside Road and the railway line Access provided to Hillside Road. Narrow median and construction foot print to reduce impact on the EPBC listed Golden Sun Moth. |
| Option 2 | 6 Ch. 17600 to 20600 | Proposed bypass of Buangor to the north to: <ul style="list-style-type: none"> ▪ Remove large trucks from travelling through the town ▪ Avoid impacts on heritage listed site and avenue of honour in the township ▪ Avoid impact on telecommunications tower ▪ Avoid impacts on large old trees to the south of the existing highway ▪ Avoid severance of the township areas to the south of the existing highway ▪ Avoids impacts on significant vegetation between Ch. 19000 and 19400 Full diamond interchange at Peacocks Road to provide a central point of access to Buangor Township Impact on one dwelling at the crossing of Buangor-Ben Nevis Road. Westbound onramp at Ch. 20600 to provide access from Buangor Township. |
| Option 2 | 7 Ch. 20600 to 24800 | Proposed duplication diverts south west away from the existing highway because: <ul style="list-style-type: none"> ▪ The existing highway has substandard geometry and sight distance for a freeway, and a dangerous crossing of the railway crossing. ▪ To avoid impacts on flora and fauna values in the existing road reserve. ▪ To avoid impacts on identified heritage sites Impacts on the property at the intersection of Hillside Road and the railway line Provides access to Hillside Road. Proposed alignment to be parallel to the railway to minimise impacts of land severance however it may require relocation of services. Access road proposed from Gravel Route Road to maintain landowner access. |
| Option 2 | 8 Ch. 24800 to 28200 | <ul style="list-style-type: none"> ▪ Proposed duplication follows the existing highway to minimise impact on land owners. ▪ Wide median and reduced construction footprint to minimise impacts on significant vegetation. |
| Both | 9 Ch. 28200 to 39600 | <ul style="list-style-type: none"> ▪ Proposed duplication follows the existing highway to minimise impact on land owners. ▪ Full diamond interchange at Langi Ghiran Picnic Ground Road to provide access to the State Park. ▪ Eastbound exit ramp to provide access to existing highway. ▪ Construction area reduced on the south side to minimise impacts on Golden Sun Moth. ▪ Access road propped from Hillside Road to maintain landowner access. ▪ Construction area reduced at Ch. 32200 to avoid impact on registered aboriginal heritage place (Burnt Mounds). ▪ Duplication to the south of existing highway and construction are reduced to avoid impacts on EPBC listed grasslands (Natural Temperate Grassland of the Victorian Volcanic Plain) between the highway and railway line. ▪ Access maintained to the Caltex Service Station. |

6.18 Construction Method

This sub-section outlines an indicative construction method which is based on VicRoads experience in constructing projects of a similar scale.

To match project funding and delivery of the works, it is likely to be divided into a number of sections or stages.

6.18.1 Workforce and Working Hours

It is likely that a considerable number of construction and site management personnel would be required; however this would be dependent on the structure and size of the contract packages. Construction is expected to be undertaken over a period of up to three years subject to future funding.

Construction work for the Project would be undertaken during the standard hours for construction work as set out in VicRoads specifications, which are:

- Monday to Saturday: between 7 am or sunrise (whichever is the later) and 6 pm or sunset (whichever is the earlier).
- Saturday: 8 am to 2 pm typically.

Construction outside of the standard hours is likely to be minimal and would be subject to approval by VicRoads and notification of affected members of the community. It is possible, though unlikely, that night works may be required to minimise impact on traffic in some locations.

6.18.2 Construction Activities

Construction activities would be guided by the Contractor(s) Environmental Management System (EMS) and associated Construction Environmental Management Plans (CEMPs) which would incorporate all measures as described in Chapter 21 (Environment Management Framework) of this EES, and any other measures identified in the conditions of subsequent statutory approvals for the Project.

Site Preparation, Pavement and Road Construction

- Project boundaries would be delineated with suitable fencing and signage. Traffic management measures would be installed as required.
- Contractor's site office and compound would be established, along with stockpile sites as required.
- Erosion and sedimentation controls would progressively be installed for all activities. Other additional environmental management measures would be installed as required. This would include fencing off and signage for the protection of sensitive areas.
- Vegetation and tree stumps in the construction area outside specified fenced protected areas would be removed and topsoil stripped. Topsoil would be stored on site, for later reuse, as well as

protected with silt fencing around each stockpile and seeded to minimise erosion.

- Utilities would be relocated or protected, as and when required. Refer to Section 6.18.9 for more information.
- Stormwater drainage works would be completed, including the construction of water sensitive road design measures. These may be consolidated with temporary sediment basins.
- Earthworks and pavement preparation would be carried out by graders, dozers, scrapers and other equipment, including compaction of the resultant surface using compaction equipment such as various types of rollers (vibrating, pad-foot, smooth-drum) and compactors.
- Cut material would be excavated to the necessary level, as and where required. Suitable excavated material would be recycled and incorporated in earthworks wherever possible. Unsuitable cut material would be transported and disposed of (on-site where possible).
- Additional fill material would be imported as required for the permanent works to each subgrade level. Material would be compacted and tested, and confirmed that it meets the specified requirements.
- Verges would be constructed, batters completed, and roadside drainage elements constructed, as required. Kerbs and channels (where required) would be constructed throughout. Granular pavement materials would be imported, placed and compacted.
- Flexible asphalt pavement would be applied by pavers and rollers, or sprayed seal treatments as applicable.
- Lighting, line markings, signs, and other road furniture (e.g. safety barriers and guide posts) would be installed where required.
- The construction site would be landscaped and re-vegetated, including reinstating and topping up of topsoil, seeding, planting trees and shrubs, installing weed mats, mulch and the like. Any design elements such as artwork would be installed as required.

Structural Works

Activities associated with construction of structures such as bridges, culverts and retaining walls may include:

- Bored or driven piles are proposed to be installed for structural elements, as and when required. Some structures may also incorporate spread or pad footings.
- All footings works for the various structures would be completed including casting pile caps for major structures, pad footings for

miscellaneous structures, or in the case of major culvert structures, foundation slabs etc.

- Piers and abutments in-situ (although precast options may be viable) would be constructed up to underside of the deck or other superstructure elements. Structural fill and abutment works would be completed, including construction of approach slabs and the like, while also pre-casting all bridge beams and crown units required, off site.
- Bridge headstocks would be cast, precast beams placed, and deck constructed. Precast parapets and rails would be installed and kerb infill/deck connection constructed. Thin asphalt wearing course would be placed on completed bridge deck/superstructure, and line marking and associated infrastructure would be installed.
- For retaining walls, typically once a strip footing (or similar is in place), wall units would be placed and structural fill in layers built up so as to tie all elements together. Once at the required level, handrails and other protective mechanisms would be installed.
- Any gantries, cantilevers or other major sign supports or crown units (which have previously been manufactured off site) would be installed and connected together so that they are integral with the completed works.
- Any off-structure bridge barriers required would be constructed, including footing details and precast barrier units. This would require materials to be brought on site and connected to each other, as well as any other wire rope safety barrier or guard fence to protect end terminals.
- The site would be cleaned up and all surplus waste materials disposed.

6.18.3 Plant and Equipment

Plant and equipment for the construction of the Project would be determined by the Contractor(s) during the construction planning phase. An indicative list of plant and equipment likely to be used on site for the Project would include:

- Scrapers, dozers, excavators, backhoes, graders, paving and other earth moving equipment.
- Kerbing machine, profiler, trenching machine, line marking machine and concrete trucks and pumps.
- Compaction equipment such as rollers, vibrating rollers and compactors.
- Piling rig, cranes, crane trucks (truck with a mounted crane on the rear), and associated equipment.
- Trucks and trailers, water carts, dump trucks and associated equipment.
- Light vehicles, pneumatic hand or power tools, and general tradesmen equipment.
- Pavement profiler and pavers for asphalt and/or crushed rock pavements.
- Traffic management gear such as safety barriers and variable message boards.
- Bitumen sprayers, rollers and aggregate loaders for spray seal surfacing works.

6.18.4 Earthworks

Earthworks construction for the Project is expected to be dominated by the need for cutting into some hillsides to achieve adequate grades and for fill above the natural surface in other areas. Much of the new carriageway(s) would be built on low level fills to achieve drainage and protect the road pavement.

The cut and fill volumes differ between the preferred and alternative alignments. For the preferred alignment, preliminary estimates forecast that approximately 2.8 million cubic metres of spoil from excavations would be reused or disposed with potentially up to around 3.3 million cubic metres of fill material required to build up the road in other areas. For the alternative alignment, preliminary estimates forecast that approximately 1.7 million cubic metres of spoil would be reused or disposed of with potentially up to around 3.4 million cubic metres of fill material required to construct the works.

Spoil would be used during construction for batter flattening or land forming where this is possible. Spoil considered unsuitable for this purpose would be disposed of onsite where possible. Disposal of spoil onsite would be within the identified construction area or outside of environmentally sensitive 'no go' areas. Spoil may be disposed of offsite on adjacent properties (in non-environmentally sensitive areas) as agreed with landowners and subject to necessary statutory approvals.

6.18.5 Source and Quantity of Materials

Fill material would be sourced from cut areas from the site wherever possible, however considering the likely significant short-fall, additional sources would need to be identified. These would potentially be from a combination of sources, including local quarries and borrow pits in the vicinity of the works.

It is possible that the Contractors could come to an arrangement with local farmers for the construction of dams and reshaping of adjacent land to source the necessary material. It has not been feasible to identify sites for gaining fill material during this EES because:

- the precise quantities of fill required cannot be determined until the detailed design phase;
- the precise nature and quantity of materials on nearby sites is currently not available; and
- the sourcing of fill is to be the responsibility of the construction contractor(s).

The road pavement material would be sourced from appropriately licensed facilities which meet the quality requirements of the required material. Exact material quantities are unknown at this stage but materials may include concrete, steel, crushed rock, aggregate, sand and other quarry materials. These materials would be sourced from local quarries and commercial suppliers wherever possible.

Surplus material that cannot be used on site would be re-used or disposed of at accredited materials recycling or waste disposal facilities.

Quantities of water required during construction are unknown at this stage and would depend on material sources and methodologies applied by the contractor(s). Water would be required for earthworks and pavement construction as well as part of dust suppression measures.

As the majority of water is likely to be required for earthworks construction and dust suppression, this could be sourced locally through re-use of water captured on site or other non-potable supplies. In accordance with VicRoads Water Use Policy, in this area, recycling of waste water would also be considered where possible.

6.18.6 Construction Site Drainage

During construction, provision of sedimentation basins and other similar treatments and measures may be required to capture and treat any runoff from the site to prevent the discharge of sediment laden water into nearby waterways. In accordance with VicRoads requirements the sedimentation basins would be required to have a capacity to capture/store water generated up to a two year Average Recurrence Interval (ARI) storm event. The sizing of sedimentation basins would also need to be determined in accordance with the VicRoads Temporary Sedimentation Basin Design Tool.

The quality of water in receiving waterways would be monitored to ensure there was no detrimental impact from site runoff.

6.18.7 Traffic Management and Access

There would be movements of heavy vehicles resulting from the construction works, primarily associated with transport of construction machinery and equipment to and from the site, and import and disposal of materials (fill, pavements, etc.) using trucks. The Project would likely be constructed on a 6 day working week basis.

In accordance with VicRoads policy, construction vehicles and machinery would be restricted to the highway and arterial roads wherever possible. Construction vehicles would not typically use local roads and would likely access the site via the highway and possibly purpose built access tracks along the alignment. These access tracks would be restricted to avoid environmentally sensitive areas (which would in turn be fenced off to prevent construction access) and are identified within the construction footprint.

The volume of construction traffic would ultimately depend on the program and staging of construction sections, where an increased rate of construction would result in higher traffic volumes on the network each day but over a shorter overall period. The sequencing of construction phases would depend on contractor's works program, construction methodology adopted, the time of year and the part of the Project.

The construction of the Project is estimated to generate traffic related to the following broad construction activities:

- Set out and preparation of the construction corridor.
- Relocate or protect utilities and other services, where required.
- Complete drainage works.
- Undertake surface preparation, compaction and associated earthworks.
- Construct pavement, including verges, batters, kerb and channel, where required.
- Construction of bridge and culvert structures.
- Apply flexible asphalt pavement and/or spray seal treatment.
- Apply line markings, re-vegetate and install other road furniture.

An accurate estimate of construction traffic generation cannot be made until a program and staging of construction has been developed. However, the construction of similar projects typically generates the greatest traffic volumes during the earthworks and pavement construction phases, and generally less traffic volumes at other times. These two phases could be expected to generate in the order of 100 – 150 truck trips per day across the workday. Less than 100 light vehicle trips would be expected to be generated by worksite contractors accessing the site, typically expected to occur during early morning and late-afternoon periods.

Based on the above, at its peak, the construction of the Project would be typically expected to generate in the order of 250 vehicle trip ends per day, including 150 heavy vehicles.

It is not anticipated that night work would be required, although this would be considered where it may reduce the impact on the public and local community.

It is conservatively assumed that 30% of light vehicle construction traffic occurs during the peak hours, associated with worksite employees arriving and departing the site. Similarly, it is conservatively assumed that 15% of heavy vehicle traffic occurs in the peak hours, associated with an even distribution of truck movements across the workday. It is also conservatively assumed that the construction peak

hours would coincide with the peak hours of Western Highway. It is therefore estimated that the construction activities may generate up to 43 vehicle trip ends in peak hours, including 13 heavy vehicles.

Given the existing observed peak period traffic volumes and relatively high percentage of heavy vehicles on Western Highway in the project area, the additional construction traffic is not anticipated to have an unmanageable impact on the operation of the highway. More significant impacts are likely to result from temporary changes to road environments and localised speed reductions, and these would be addressed in the Traffic Management Plan.

6.18.7.1 Traffic Management Plan

Traffic management would be undertaken in accordance with established VicRoads practices, the Worksite Safety Traffic Management Code of Practice and the *Road Management Act 2004*. Typically, this would include installation of traffic barriers along the alignment to separate the construction work area from passing traffic as appropriate, a reduction in speed (nominally to 60km/h or 80km/h, or lower if justified at a locality) and other routine traffic management measures.

Traffic Management Plans would be prepared to provide details of the traffic management to be implemented during construction to minimise highway impacts and maintain traffic flow on the surrounding road network. This would include details of all traffic management measures and any specific routes that construction traffic and local traffic would follow, if required, to minimise the overall impact on the public and local community. Details of the staging of the works have not yet been finalised, and would be dependent on a number of factors including the final design adopted, the staging and breakdown of construction contracts/packages, and the actual works ultimately required.

6.18.8 Site Compounds

Site compounds would be used to stockpile materials, store plant and equipment and to provide site offices, parking and amenities for construction staff. Chemicals and fuels for construction would be stored in appropriate storage areas within the compound site.

Site compounds and construction laydown areas are likely to be located in close proximity to the section of highway under construction, but the exact number, area and locations cannot be identified at this time.

The construction area identified for the EES does not include location of site compounds, however there may be some areas that could accommodate them.

VicRoads would require that the contractor(s) identify suitable locations, preferably within both the project area and Activity Area (area referring to that assessed for cultural heritage), and obtain approval for these. If the contractor identified a suitable location outside the Project and Activity Areas, it would need to ensure it met performance standards

that resulted in no impacts to the environmental and social values assessed in this EES and undertake appropriate consultation.

The contractor(s) CEMP would be required to contain provisions excluding the locations of site compounds and laydown areas from sites that:

- Contain Ecological Vegetation Classes or known habitats for endangered species;
- Contain Aboriginal or non-Aboriginal cultural heritage sites;
- Within 30m of waterways; and
- Within 100m of dwellings.

6.18.9 Utility Services

Service relocation and protection activities would be required from utility asset owners impacted by the proposed alignment. Relocation and/or protection of utility assets would be developed in consultation with utility asset owners prior to and during detailed design.

Actions would be put in place to ensure no damage occurs to existing services, and the road design incorporates the requirements of the utility asset owners. These actions would potentially include:

- Additional potholing and proving of services (locations, depths, etc.).
- Obtaining specific approvals from utility asset owners and agreeing on proposed measures to protect, relocate or maintain those services.
- Protection of impacted assets (e.g. using measures such as concrete covers of the affected services) and/or relocation of the affected service, as appropriate.
- Adjustment of the road design where required.

Dial-Before-You-Dig searches were undertaken by VicRoads during the concept development stage, and site surveys ascertained the position of existing services within and immediately adjacent to the road reservation. A summary of the services understood to be located in close proximity to the works include:

- Telecommunications (Telstra and Optus); and
- Electricity (Powercor).

6.19 Rehabilitation

Upon completion of the works, the construction site would be landscaped and re-vegetated, including reinstating topsoil, seeding, planting trees and shrubs, installing weed mats and mulch, and installing any design elements, as required.

6.20 Operation and Maintenance

Key operational activities would be the on-going road maintenance consistent with current practices and standards. Assets to be maintained would include landscaping, stormwater drains, bridges, road pavement, signage, barriers and line marking.

6.20.1 Roadside Management

VicRoads has a number of tools with which it manages its assets, including roadsides.

VicRoads' 'Roadside Management Strategy 2011, Roadside Management – A Balanced Approach' is a strategy which aims to provide clear and consistent objectives to manage roadside areas. It provides a balanced approach to management, including sometimes complex and conflicting issues, in consultation with the local community to achieve the best balance between all factors, whilst ensuring efficient performance of the road network. It sets the primary direction for holistic and integrated roadside management.

The strategy provides a framework for the balanced consideration of the four key objectives of roadside management:

- Enhance transport safety, efficiency and access.
- Protect environmental and cultural heritage values.
- Manage fire risk.
- Preserve and enhance roadside amenity.

It uses an asset management approach to balance the key objectives of roadside management and identify the most appropriate treatments to preserve roadside functions.

Fire management is a cooperative approach between government agencies to ensure that fire management is strategic, effective and targeted. Particular actions associated with the strategy are to assess all arterial roads for fire risk and identify a treatment program based on risk assessment. Road reserve fire hazards that have been identified by landowners through consultation for the Project, would be assessed as part of the above Roadside Management Strategy for all roads VicRoads has the responsibility to maintain.



Western Highway – looking west from Beaufort