

5. Project Alternatives

The proposed alignment for Section 3 (Ararat to Stawell) of the Western Highway Project has been developed through a detailed options assessment process. The proposed alignment meets the Project Objectives and delivers the desired benefits of improved road safety and transport efficiency.

The Project Area was divided into three zones to allow for comparison of options against the existing highway and identification of preferable options having regard to potential social, environmental, cultural heritage and economic impacts.

The first phase of the options assessment involved developing a long list of alignment options. The options considered the features and constraints of the Project area, as well as options considered in previous studies.

A rapid assessment with specialists in the relevant disciplines was undertaken to consider the benefits and disbenefits of each option against the draft evaluation objectives included in the Environment Effects Statement (EES) Scoping Requirements. The outcome was an acceptable shortlist of alignment options for further consideration.

In the second phase, the shortlisted options were assessed in more detail. The objective was to assess the impacts to the identified values of the study area and to select an alignment that balanced impacts to biodiversity, social and cultural heritage values. The preferred options within each zone were connected to provide a proposed alignment option from the start to the end of Section 3.

Whilst risks were broadly considered with the impacts of alignment options, a detailed Environmental Risk Assessment was undertaken for the proposed alignment during the third phase of the assessment. It was undertaken to identify the activities that could lead to pathways which impact on environmental, social or economic values of the Project area. The risk assessment also identified alignment changes required to mitigate potential impacts.

As a result of the three phase assessment, which included consideration of feedback received at community information sessions, VicRoads presents a proposed final alignment for consideration as part of the EES.

Generally, biodiversity and social values are competing in the selection of a preferred alignment for linear infrastructure projects. For Zone 3 of the Western Highway Project,

cultural heritage values were also a key consideration in the selection of the alignment.

In order to balance the impacts on the competing factors, the proposed alignment selected was one which primarily follows the existing highway on both sides of Great Western, and provides a bypass of the town to the north-east.

By following the existing highway, impacts on land severance are minimised, which in turn has lower social and economic impacts. It does however have higher potential impacts on native vegetation in the road reserve. The proposed alignment and service roads were therefore refined in Phase 3 to be located in cleared paddocks with the objective of retaining road-side vegetation.

For the southern end, the proposed alignment is located east of the existing highway and then transitions to the west to minimise impacts on native vegetation within Ararat Regional Park. Prior to the Armstrong Deviation, the alignment transitions to the north east and follows the existing highway to avoid vegetation of high conservation significance and Golden Sun Moth habitat along the railway line. The recommended option would also utilise the existing infrastructure and corridor at the Armstrong Deviation.

The proposed alignment bypasses the town of Great Western to the north-east. This was assessed as having lower potential social and economic impacts of the shortlisted options in this locality through less land severance; provides better connectivity to Great Western with interchanges on either side of the town, and would not restrict the future growth of Great Western. It would also have less impact on confirmed and potential Golden Sun Moth habitat and scattered large and very large old trees.

A bypass to the north-east of Great Western does however have more impact on native vegetation than a bypass to the south-west. The proposed alignment has been located through areas already disturbed (within the old and existing quarries) and the footprint has been narrowed to the extent practicable at this stage of the Project. The amount of vegetation removal is expected to be further reduced during detailed design.

A key consideration for selection of the proposed alignment from Great Western to Stawell was the potential impacts to areas of significant cultural heritage sensitivity. There is a visual connection between Sisters Rocks and the Black Range located to the south-west and outside the Project area, and this view

has high Aboriginal cultural significance. The proposed alignment follows the existing highway which reduces potential impacts on this view. Another consideration for selection of an alignment between Great Western and Stawell was avoiding severance of large rural properties south the existing highway and avoiding impacts on the views from properties in Robson Road.

North of Great Western, a key consideration has also been native vegetation within and adjacent to the road reserve. A wide median has been adopted with carriageways located in cleared paddocks to minimise impact on vegetation adjacent to the existing highway near Churchill Crossing Road. Initially the alignment was proposed to be on the eastern side of the existing highway, however in response to landowner concerns and in consultation with all affected landowners, the alignment was moved to the west.

The carriageways and intersection at London Road are also proposed to be located to the east of the existing highway in cleared farm land. The construction footprint has been restricted to reduce impact on national (Trailing Hop-bush) and state listed (Emerald Lip Greenhood) flora species located in a DSE managed reserve on the western side of the existing highway.

To reduce the impact on significant vegetation in the road reserve and within the bypass of Great Western, the footprint of the proposed alignment was refined throughout the risk and impact assessment. The footprint would be further refined through detailed design and the amount of vegetation removal is expected to be reduced.



Western Highway - looking south towards Armstrong

5.1 Introduction

This chapter describes the Project alignment alternatives that have been considered, and the process followed to select a proposed alignment.

In the development of the Environment Effects Statement (EES), consideration has been given to the 'no project' scenario as well as alternate design options to address Project Objectives.

The objective of the alignment options assessment for the EES was to select alignments that minimise potential adverse environmental, social and economic impacts whilst maximising the benefit to be gained as a result of the Project proceeding.

The assessment of alignment options was undertaken in three phases illustrated in Figure 5-1 and outlined in the Options Assessment Report forming Technical Appendix B of the EES.

Phase 1 involved developing a range of alignment options, followed by a rapid assessment to identify a shortlist through a high level consideration of potential impacts and benefits.

Phase 2 involved the detailed assessment of the options shortlisted in Phase 1 to identify a proposed alignment through a more detailed consideration of potential impacts and benefits.

Phase 3 involved an Environmental Risk Assessment of the proposed alignment and commencement of the specialist impact assessments to identify areas where further micro refinements were required to mitigate potential areas of impact.

VicRoads considers that the proposed alignment is an appropriate outcome compared to the 'no project' scenario.

5.2 Consideration of Relevant Alternatives

The selection of feasible duplicated highway alignment options involved the consideration of the resultant impact of no upgrade to the highway and of implementing design alternatives to address safety and efficiency requirements.

5.2.1 The 'No Project' Scenario

Consideration of the 'no project' scenario is important in order to evaluate the implications of not undertaking the Project.

The chapters for each study discipline describe the existing conditions within their specific study area in order to establish the baseline for impact assessments.

The rationale for the Project is outlined in Chapter 2 (Project Rationale) of this EES. The relevant key objectives of the Project are:

- Improvement of road safety;
- Improvement of transport and freight efficiency;

- Provision of adequate and improved rest areas; and
- Provision of alignments to allow for the possible future bypasses of Beaufort and Ararat.

Without the upgrading of the Western Highway, freight and personal vehicles would continue to utilise an existing road that does not provide sufficient and safe passing areas or a road geometry that meets current highway or freeway standards. Continued use of the highway without any upgrade could result in additional accidents.

With continued population growth within the regions and continued reliance by road freight, there would be increased demand on the Western Highway which could result in a deterioration of road safety and amenity for surrounding landowners. The potential decline in road safety can be mitigated by a revised road layout, as proposed by the Project.

In order to assess the options against the 'no project', the evaluation framework has considered the potential benefits and adverse impacts of each option as follows:

- The alignment options were rated as being either better or worse than the 'no project' scenario; and
- Acknowledging that neither the benefits nor the adverse impacts attributable to the Project, as documented in the EES, would be realised for the 'no project'.

5.2.2 Alternative Solutions

As part of the Project, a number of broad solutions have been considered in order to improve connectivity and efficiency between Ballarat and Stawell. These potential solutions include:

- Use of an alternate route;
- Use of an alternative transport mode;
- Construction of a greater number of overtaking opportunities; or
- Duplication of the Western Highway.

5.2.2.1 Use of an alternate route

In addition to the Western Highway corridor, another possible corridor would be the Sunraysia Highway through the towns of Learmonth, Waubra and Lexton, connecting to the Pyrenees Highway via Elmhurst and then extending to the north of the Ararat Hills Regional Park into Great Western and then along the Western Highway into Stawell. While this corridor could be marginally shorter (depending on the final route chosen), at 106 kilometres (km), compared with 108km for the existing Western Highway corridor, this alternative was not considered for further investigation due to:

- The Sunraysia and Pyrenees Highways are classified as B road routes under the Linking Victoria Strategy and would require significant

upgrades to the vertical and horizontal alignments to meet the M road standard;

- It would require considerable construction of new roads (through hilly and environmentally sensitive landscapes) to be completed between the Sunraysia Highway and the Pyrenees Highway and the Western Highway before such a corridor could be available for interstate traffic. This would have a substantial social impact as there would be a large length of road that would be through "greenfield" sites as there is not an existing road corridor. While the planning and land severance impacts would be far greater for a "greenfield" option, this option would also be far more expensive as it would not make use of the existing Western Highway corridor and infrastructure; and
- The current Western Highway corridor better serves the major towns of Beaufort and Ararat, as well as the major Grampians tourist area and therefore an alternative corridor would not get maximum use. The proposed option provides improved access to popular tourist areas which in turn would create economic opportunities. If an alternative corridor to the north was used, the existing Western Highway would have to be maintained as a high standard parallel route.

The option of using alternative routes is also not considered feasible because alternative roads are not constructed to the standard required for the traffic. The cost of upgrading an alternative route would be far in excess of the option of duplicating the existing highway and it would provide a detrimental impact to existing major towns on the Western Highway through leaving the existing travel time and safety issues on the existing highway unresolved.

5.2.2.2 Use of an alternative transport mode

The upgrade of the existing railway was considered and it was identified that 75% of freight between Melbourne and Adelaide is non-bulk items. The need for these items to be collected from and distributed to many different locations means that there is a reliance on flexibility in the delivery chain that is provided by road solutions. Additionally, the need for flexibility in transport options suggests that intermodal freight centres would be required for a combination of road and rail to provide appropriate freight solutions. The existing capacity in the rail network would also need to be considered.



5.2.2.3 Construction of a greater number of overtaking opportunities

The Western Highway between Ballarat and Stawell has a number of overtaking lanes along the route. It has been determined that constructing more overtaking lanes along the Western Highway between Ballarat and Stawell alone is not adequate for the following reasons:

- Although overtaking lanes provide some relief to congestion, they are not as effective in addressing the road safety issues along the highway. Opposing directions of traffic are not separated so the risk of head on crashes remains high unless a median barrier is introduced. While a median barrier is a hazard in itself and also provides maintenance issues, it is also not considered appropriate in this case due to the high proportion of trucks and the fact that trucks may still penetrate the barriers.
- Overtaking lanes would not allow the speed limit to be raised to 110 kilometres per hour (km/h).
- Overtaking lanes do not cater for overtaking of vehicles that cannot travel at or near the speed limit on shallow gradients.

While this is a potentially cheaper option, this alternative does not fully address the travel time issue as the posted speed would have to remain at 100km/h and there would still be delays behind slow moving vehicles in the sections that did not have overtaking lanes. More significantly, the opposing

directions of traffic are not separated under this option, therefore the current safety issue associated with head on crashes is not treated, leaving this risk within this corridor.

5.2.2.4 Duplication of the Western Highway

This option involves the construction of a second carriageway and increasing the number of lanes on the highway to four.

This option effectively doubles the capacity of the highway and provides for considerably safer overtaking opportunities. The separation of the two directions of traffic would significantly reduce the likelihood of head on crashes and reduce the chances of rear end crashes by allowing vehicles to use the extra lane to move around slow or stationary vehicles on the highway.

The duplication of the Western Highway would allow safer access to and from adjoining local roads and private properties through the construction of wide median treatments at existing intersections and some private properties. The wide median intersections would allow safe turning movements to and from local roads or private entrances.

For the above reasons, it has been determined that the duplication of the Western Highway between Ballarat and Stawell, including Section 3 (between Ararat and Stawell), would be the most appropriate means of addressing safety and efficiency.



Intersection of Western Highway and St Ethel's Road, looking north toward Great Western

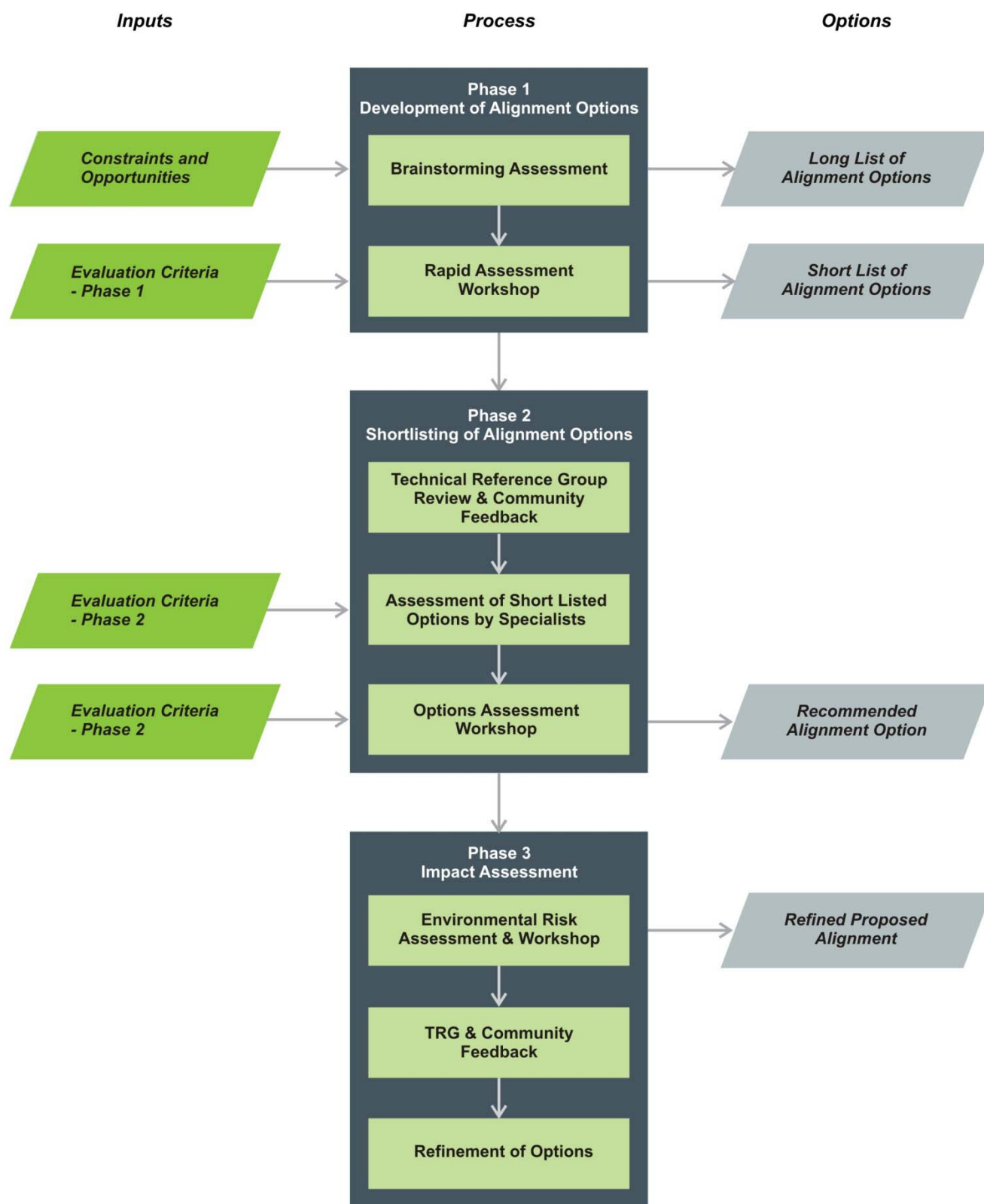


Figure 5-1 Alignment Options Assessment Process

5.3 Phase 1: Development of Alignment Options

Phase 1 involved developing a long list of feasible alignment options, followed by a rapid assessment to refine them into a shortlist for a more thorough consideration in Phase 2.

All potential alignments assumed a freeway (AMP1) standard design in the ultimate upgrade, and a highway (AMP3) in the interim, in order to realise the benefits from improved travel times and safety.

5.3.1 Initial Considerations

Phase 1 sought to restrict potential alignment options to those that meet the Project Objectives and avoid known constraints, and were considered feasible.

A Project area boundary was set to restrict potential option alignments to those that could potentially meet Project objectives and constraints efficiently. This boundary was set at 1500 metres (m) either side (east and west) of the existing highway, except around Great Western where the Project area extended to 1800m to allow for a potential bypass of the town.

A number of factors and features within the Project area influenced the development of the initial 'long-list' Phase 1 alignment alternatives. These included:

- the need for an appropriate connection with the existing highway,
- allowing for the future bypass of Ararat,
- ensuring design and safety standards are achieved,
- optimising use of existing infrastructure, and
- minimising cultural heritage, ecological and social impacts.

The Ararat Regional Park and the Sisters Rocks reserve and adjacent land were considered unacceptable areas to accommodate the Project, due to the presence of high quality, contiguous remnant vegetation and habitat for flora and fauna species, and were therefore excluded. Refer to Figure 5-2 for the Project area.

Preference was for the existing carriageway to be retained and utilised where possible in accordance with the VicRoads Sustainability and Climate Change Policy, to reduce cost and minimise the overall impact.

5.3.2 Developing 'Long List' Options

Prior to the commencement of the EES, VicRoads had established some initial options through preliminary environmental and engineering investigations, and consultation with the community and regulatory agencies. This information was used to generate additional concepts in a brainstorming workshop in April 2011 involving specialist traffic engineers, environmental scientists and town

planners, alongside VicRoads staff. Feasibility, performance, planning and environmental factors were taken into account. The outputs of this process are described in Table 5-1 to Table 5-3.

Section 3 was split into three zones with similar environmental, social and physical conditions to allow for evaluation of options in a localised and relevant context. The recommended option in each zone was combined to make up the proposed alignment. The three zones are shown in Figure 5-3, Figure 5-4 and Figure 5-5.



Western Highway, looking south towards Ararat Regional Park

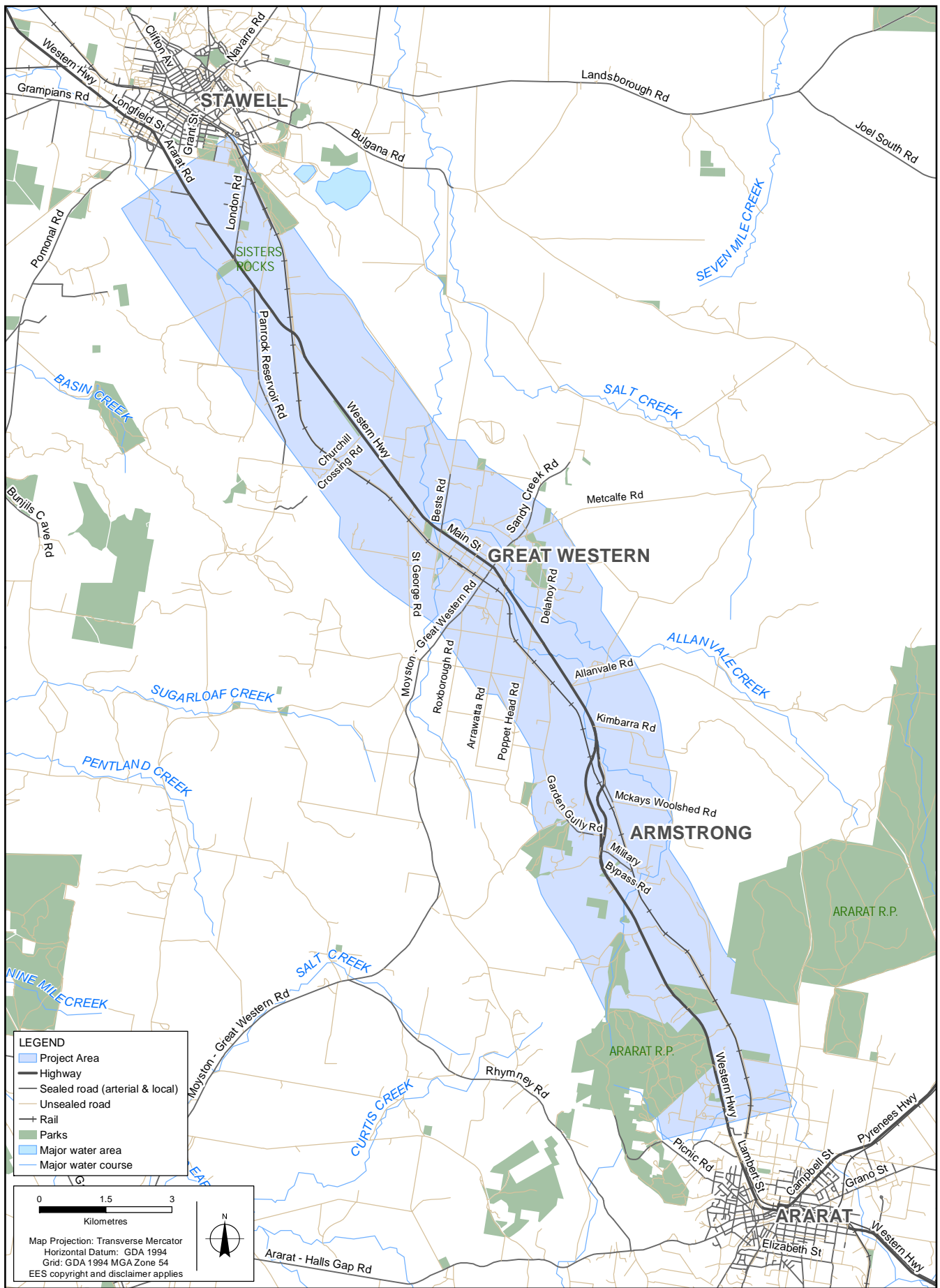


Figure 5-2 Section 3 Project Area

Table 5-1 Zone 1 Long List Options Description

Option	Description (eliminated options shaded grey)	Shortlisted
Zone 1: Pollard Lane to Allanvale Road		
1A	Duplication on north-east side highway for south-bound lanes and use of existing highway for north bound lanes – to near Allanvale Road and joins with option 1C.	✓
1E	Duplication of existing highway (partly east side and partly west side) and joining with Option 2D just before the Armstrong Deviation railway bridge.	✓
1B	Deviation from current highway alignment at Pollard Lane with new dual carriageway highway to head in a northerly direction across paddocks to the railway line near The Majors Road, then heads alongside the south-west of the railway reserve to join Option 2D.	✗
1C	Deviation from current highway alignment at Pollard Lane with new dual carriageway highway to head in a north easterly direction across paddocks to cross the railway line near The Majors Road, then head in a north-westerly direction alongside Railway Loop Road, then in a northerly direction alongside an unused road reserve, and then through agricultural properties to re-join the existing highway near Allanvale Road.	✓
1D	Deviation from current highway alignment at Pollard Lane with a new dual carriageway highway to head in a northerly direction across paddocks to cross the railway line near The Majors Road, then heads alongside the north-east of the railway reserve to re-join the existing highway alignment near Kimbarra Road.	✗

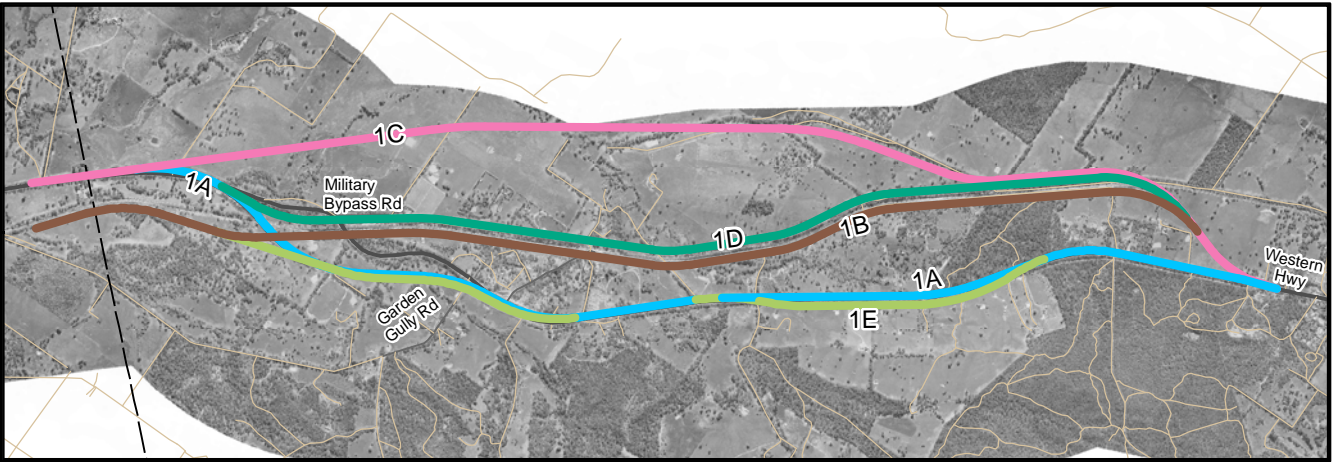


Figure 5-3 Zone 1 Long List Options

Table 5-2 Zone 2 Long List Options Description

Option	Description (eliminated options shaded grey)	Shortlisted
Zone 2: Allanvale Road to Briggs Lane		
2A	Duplication of the existing highway through Great Western.	✗
2B	New dual carriageway highway (with divided south-bound and north-bound lanes) to provide an eastern bypass of Great Western from just north-east of Delahoy Road, running north-west of the bushland reserve and through the quarry north-east of Western View Road, then across Hurleys Lane & Bests Road to re-join the existing highway near Briggs Lane.	✓
2C	New dual carriageway highway (with divided south-bound and north-bound lanes) to provide an eastern bypass of Great Western from just south-east of Delahoy Road, running north-east of the bushland reserve, across Metcalfe Road, around the quarry north-east of Western View Road, then across Hurleys Lane & Bests Road to re-join the existing highway near Briggs Lane.	✓
2D	New dual carriageway highway (with divided south-bound and north-bound lanes) to provide a western bypass of Great Western by leaving the existing highway near Allanvale Road and heading in a westerly direction through farmland and across the railway line and Delahoy, Garden Gully, Roxborough and Moyston-Great Western Roads and then in a northerly direction alongside St George Road and across the railway line to re-join the existing highway near Briggs Lane.	✓

Option	Description (eliminated options shaded grey)	Shortlisted
2E and 2F	<p>New dual carriageway highway to provide a second south-western bypass of Great Western. As for Option 2D, 2E is also a continuation of Option 1E, however it travels further north before diverting to the west. It follows a slightly different alignment up to Moyston-Great Western Road, where it then follows Option 2D alignment. Rather than re-joining the existing highway near St George Road, Option 2E stays on the western side of the railway and joins to Option 3C.</p> <p>Option 2F is a continuation of Option 1A and bypasses Great Western to the west following. Once 2F crosses the railway line it then follows the same alignment as 2D.</p> <p>Options 2E and 2F were initially on the long list however, through the rapid assessment, they were rationalised and only 2D was considered further. Options 2D, 2E and 2F were considered to all be very similar and did not offer any different benefits or impacts to each other.</p>	x

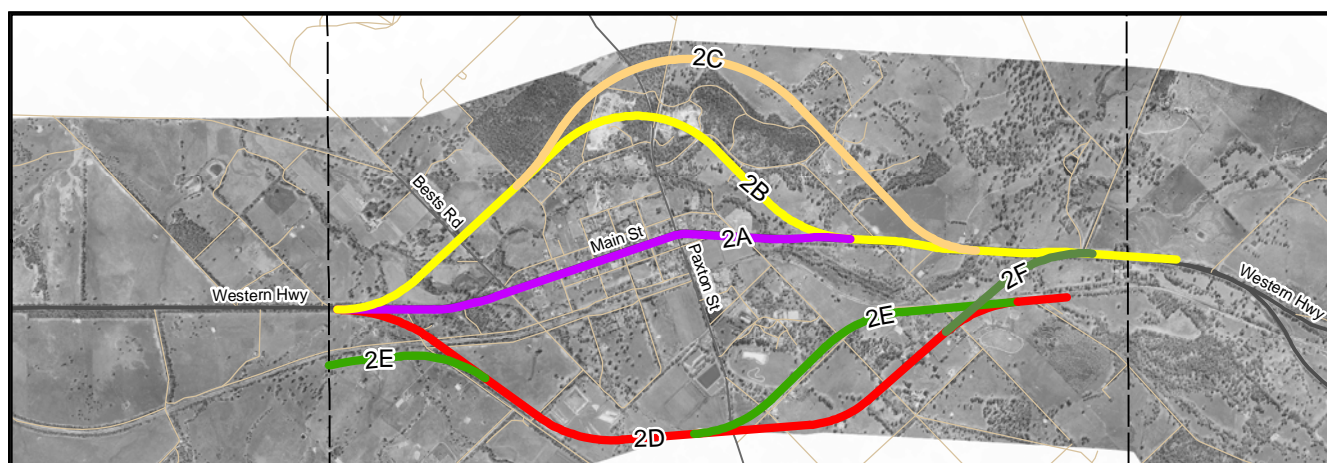


Figure 5-4 Zone 2 Long List Options

Table 5-3 Zone 3 Long List Options Description

Option	Description (*eliminated options shaded grey)	Shortlisted
Zone 3: Briggs Lane to Gilchrist Road		
3A	Duplication on west side of existing highway for north-bound lanes and use of existing highway for south-bound lanes from near Briggs Lane to Stawell.	✓
3B	Duplication on east side existing highway from Briggs Lane to just south of Harvey Lane and the railway line and then as for Option 3A to Stawell.	✓
3C	New dual carriageway highway (with divided east-bound and west-bound lanes) from Option 2D at St George Road along the south-west side of the railway line to re-join the existing highway near Harvey Lane and then as for Option 3A to Stawell.	✓
3DC	New dual carriageway highway (with divided south-bound and north-bound lanes) from Option 2D at Churchill Crossing Road along the south-west side of the railway line and then running north through pasture, across Panrock Reservoir Road and south-west of the golf course to join the existing highway near Gilchrist Road, Stawell.	x

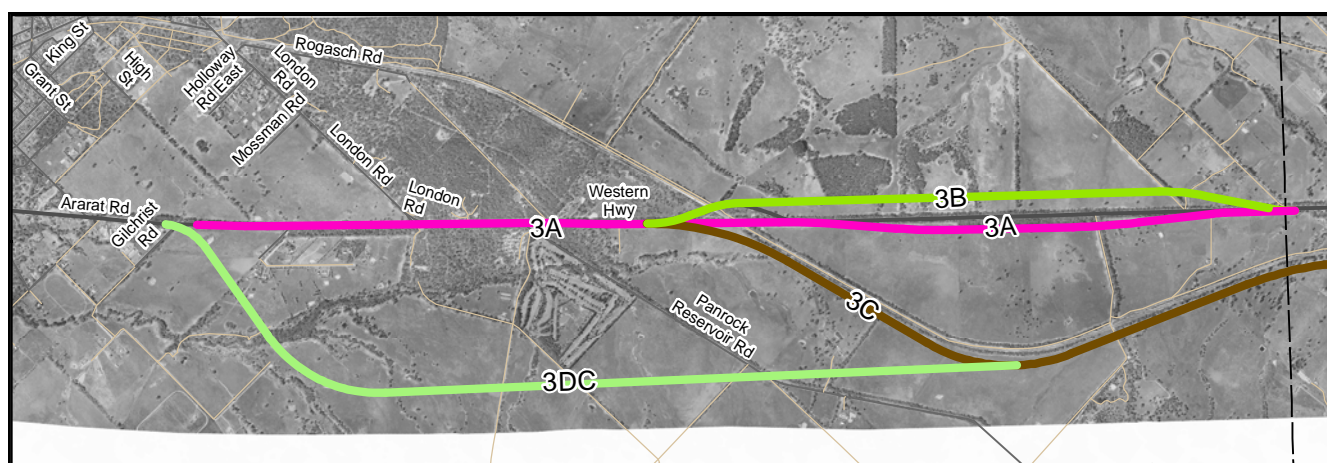


Figure 5-5 Zone 3 Long List Options

5.3.3 Method for Refining the ‘Long List’

A rapid assessment workshop was held in May 2011 to act as a ‘coarse sieve’ to refine the long list into a shorter list of potential and feasible options. Participants included specialist traffic engineers, environmental scientists and town planners, alongside VicRoads Project staff.

The alignment options were rated against a set of objectives, described in Table 5-4. These objectives were derived from the Project Objectives and the draft EES Scoping Requirements issued by the Department of Planning and Community Development for the Project. For each objective, a set of initial evaluation criteria was used to establish the degree that the objective could be met in terms of potential project benefits or disbenefits.

Each alignment option was rated against the objectives according to the definitions provided in the ratings table shown in Table 5-5. This approach is consistent with that previously adopted for large scale road projects by VicRoads and endorsed by Planning Panels Victoria.

Impact ratings of each option took into account:

- The scale and geographic extent of potential effects, or by policy/legislative compliance and implication;
- The environmental, social and/or economic significance of the potential effects; and
- The level of uncertainty surrounding the potential effects, taking account of the precautionary principle.

Within each zone the ratings for each option were aggregated, which allowed their preference to be ranked relative to each other. Options that addressed the Project Objectives and Scoping Requirements were shortlisted for further consideration (as highlighted with the ticks in Table 5-1 to Table 5-3). Options which were clearly less favourable were eliminated and the rationale is described in Table 5-6.

The approach to the Phase 1 assessment is further documented in the Options Assessment Report in Technical Appendix B.

Table 5-4 Selected Objectives and Initial Evaluation Criteria for Rapid Assessment

Objective	Phase 1 Initial Evaluation Criteria
VicRoads' Project Objectives	
Reduce travel time	<ul style="list-style-type: none">▪ Travel time in Project Section 3 overall
Improve safety	<ul style="list-style-type: none">▪ Reduction in number of at-grade intersections▪ Potential for grade-separation of major intersections – including Garden Gully Road and London Road▪ Reduction in number of properties with direct access to highway▪ Potential for adequate rest areas▪ Compliant with standards for future High Productivity Freight Vehicle loads
Complement future bypasses	<ul style="list-style-type: none">▪ Allow for future bypasses of Ararat
Minimisation of construction and acquisition costs and maximisation of use of the existing highway	<ul style="list-style-type: none">▪ Minimise construction cost (including service relocations)▪ Minimise land acquisition cost▪ Avoid difficult geotechnical ground conditions▪ Avoid areas of potential land contamination▪ Maximise length of existing highway able to be utilised
Evaluation Objectives from Draft Scoping Guidelines	
Avoid or minimise effects on species and ecological communities	<ul style="list-style-type: none">▪ Area and quality of native vegetation to be removed▪ Impacts on habitat integrity/ fragmentation
Avoid or minimise disruption and other adverse effects on infrastructure, land use, households and road users	<ul style="list-style-type: none">▪ Number of railway crossings▪ Impact on utility services with high cost for relocation▪ Extent and impact of change to existing and future land use (consistency with applicable planning policies)▪ Approximate number of dwellings affected by full or partial acquisition▪ Approximate number and significance of businesses (including agricultural) affected by full or partial acquisition▪ Approximate area of land to be acquired▪ Approximate area of public open space either directly impacted (required) or indirectly impacted (located nearby).▪ Approximate number and size of linkages irreversibly severed▪ No introduction of significant barrier(s) to movement within communities
Protect Aboriginal and non-Aboriginal cultural heritage	<ul style="list-style-type: none">▪ Number of listed European cultural heritage sites requiring removal or impacted▪ Number of listed Aboriginal cultural heritage sites requiring removal or impacted

Objective	Phase 1 Initial Evaluation Criteria
Avoid or minimise noise, visual and other amenity effects	<ul style="list-style-type: none"> Approximate number of sensitive receptors within 250m of route alignment
Protect catchment values, surface water and groundwater quality, stream flows and floodway capacity	<ul style="list-style-type: none"> Approximate number of waterway crossings Length of road in areas subject to inundation (potential impact on flooding potential) Potential for interception of water table
Provide for long-term management of retained native vegetation and habitat areas within and adjacent to the road	<ul style="list-style-type: none"> Area of native vegetation and habitat protected within road reserve and adjacent land as percentage of total vegetation and habitat currently present

Table 5-5 Impacts Rating Table

Potential Project Benefits	Rating Colour Code		Potential Project Disbenefits
	Phase 1	Phase 2	
Significant benefit to the State Superior benefit to the region Policy consistency with superior positive impact moderate positive impact	VERY WELL 9*		
Moderate benefit to the State Significant benefit to the region Superior benefit to the locality Policy consistency with significant positive impact	WELL 8		
Moderate benefit to the region Significant benefit to the locality Policy consistency with	MODERATELY WELL 7		
Localised minor benefits for some local areas or individuals (Phase 2 assessment)		PARTIAL 6	
Minimal benefit at any level	NEGLIGIBLE 5		Minimal disbenefit at any level
		LOW 4	Localised minor impact for some local areas or individuals (Phase 2 assessment)
	MODERATELY POOR 3		Moderate disbenefit to the region Significant disbenefit to the locality Policy inconsistency with moderate negative impact
	POOR 2		Moderate disbenefit to the State Significant disbenefit to the region Severe disbenefit to the locality Policy inconsistency with significant negative impact
	VERY POOR 1		Significant disbenefit to the State Severe disbenefit to the region Policy inconsistency with severe negative impact

* Rating numbers for Phase 2. Refer to the Options Assessment Report (GHD, 2012k) Technical Appendix B for further details

5.3.4 Result of Phase 1 Assessment

As a result of the Phase 1 Assessment, only a small number of options were eliminated from further consideration in each Zone. Two options were eliminated in Zone 1 whilst Zones 2 and 3 each only had one option eliminated.

Table 5-6 details the rationale for elimination of options from further assessment as part of the Phase 2 assessment.

The outcomes of the Phase 1 assessment are further documented in the Options Assessment Report in Technical Appendix B.

Table 5-6 Rationale for Eliminated Options in Phase 1

Option	Reasons for elimination
Zone 1: Pollard Lane to Allanvale Road	
1B	<p>Two new dual carriageways would follow the railway line on the western side.</p> <p>It was considered this alignment option would have a greater impact than the shortlisted options on infrastructure, land use, households and road users. The land required for the new dual carriageways in combination with the land required for the railway line, would impact on more area of private landowners than duplication of the existing highway (options 1A and 1E) or a new dual carriageway not adjacent to the railway (Option 1C). This was considered to be a greater issue in this location because of the lot sizes in the settlement of Armstrong adjacent to this option.</p> <p>It was also considered that this alignment option would have a greater impact on native vegetation than the shortlisted options. With the close proximity of dwellings in Armstrong to the west and the constraint of the railway line to the east, there would be less opportunity (ie: wide medians or realignments) to avoid significant vegetation in the rail reserve than the shortlisted options.</p> <p>Overall, it was considered this alignment option would have a greater impact on amenity at dwellings than the shortlisted options. It was also considered that the impacts to native vegetation were greater than the shortlisted options as there were limited opportunities to be able to alter the alignment and avoid significant vegetation.</p>
1D	<p>Two new dual carriageways would follow the railway line on the eastern side.</p> <p>This alignment option was considered to have similar impacts to Option 1B, with potential impacts on the settlement of Armstrong and similar impact on land severance by being adjacent to the railway.</p> <p>It was also considered that this alignment option would have a greater impact on vegetation than the shortlisted options due to the vegetation adjacent to the railway line and road reserve of Military Bypass Road. Like Option 1B, this option has the potential to displace residences due to the small allotments and their zoning.</p>
	<p>Note - Option 1C (two new dual carriageways in farmland to the east) also received a low rating overall in Phase 1, however it was included on the shortlist of options for Zone 1 to provide an alternative to Option 1A and 1E which both involve a new carriageway alongside the existing highway between Ararat and Armstrong.</p>
Zone 2: Allanvale Road to Briggs Lane (Great Western)	
2A	<p>Option 2A would involve duplication of the highway through the centre of Great Western township.</p> <p>This option would potentially impact on:</p> <ul style="list-style-type: none">▪ infrastructure, land use, households & road users located within the township of Great Western and adjacent to the existing highway▪ the amenity of more houses within the township compacted to the shortlisted options▪ the access to adjoining properties as the duplication would intersect local roads and significantly limit movements within the town▪ buildings listed on the Victorian Heritage Register located within the township of Great Western▪ travel of High Productivity Freight Vehicles as the speed limit would have to reduce as the road travels through the township of Great Western. <p>Consultation undertaken by VicRoads prior to the EES also indicated that the residents of Great Western would prefer the town be bypassed to remove large freight trucks from the town to reduce the amenity impacts and address safety issues caused by these vehicles.</p> <p>The shortlisted options have more potential impact on vegetation and Aboriginal cultural heritage; however it was considered that on balance, the social and amenity impacts to the township of Great Western were greater, therefore Option 2A was excluded from the shortlist.</p> <p>Note – the elimination of Option 2A results in the township of Great Western being bypassed.</p>
Zone 3: Briggs Lane to Gilchrist Road	
3DC	<p>Two new dual carriageways following the railway and on the western side of the Stawell Park Caravan Park to re-join the existing highway just before Stawell.</p> <p>This option was excluded from the shortlist initially because of the impacts to landowners through land severance as the alignment did not follow property boundaries. It was also considered to have greater impacts compared to the shortlisted options due to noise, visual and other amenity effects as the alignment travelled closer to houses than the existing highway. Also, due to topography, the new alignment would be more visible in the landscape.</p> <p>Whilst the shortlisted options had more potential to impact on vegetation in the road reserve, it was considered that these impacts could be managed through realignment or wide medians between carriageways.</p> <p>However, during Phase 2 and following subsequent discussions with the Technical Reference Group (TRG), Option 3DC was re-added to provide an alternative alignment to following the existing highway past Sisters Rocks and the Stawell Park Caravan Park.</p>
	<p>Note – Option 3C also received a low overall rating in Phase 1, however it was placed on the shortlist of options for Zone 3 to provide an alternative alignment to Option 3A and 3B which both involve a new carriageway alongside the existing highway between Great Western and Stawell.</p>

5.3.5 Bypass of Great Western

Through the Phase 1 assessment, Option 2A was eliminated from further assessment and it was identified that the town of Great Western would be bypassed by the Project. Detailed assessment of the shortlisted options in Phase 2 has determined the proposed location of the bypass.

The bypass of Great Western would:

- Remove large trucks from travelling through the town which would improve safety for local road users;
- Improve the amenity of the town; and
- Allow more efficient transport movements by avoiding speed restrictions in Great Western.

Also, by not duplicating the highway through the township of Great Western it would:

- Avoid potential impacts to historical buildings located within the township;
- Avoid potential impacts to existing infrastructure, land use, and households located within the town and close to the highway; and
- Minimise disruption to local intersections and prevent restriction of road user movements within the township of Great Western.



5.4 Phase 2: Shortlist Assessment

A more detailed assessment of the shortlisted options identified in Phase 1 was undertaken to enable the selection of a proposed alignment in Phase 2.

The Phase 2 assessment adopted the same approach as Phase 1 (described in Section 5.3.3) however with a more detailed impact ratings assessment and evaluation framework, as shown in Table 5-5 (refer to Options Assessment Report in Technical Appendix B for further explanation).

More detailed evaluation criteria were also developed for assessment of alignment options in Phase 2 and these are listed in Table 5-7. The Specific methodologies adopted for assessment against these criteria are detailed in Section 5.4.4 for each technical area.

The Phase 2 assessment was based on the likely maximum construction footprint and assumed that the divided rural highway AMP3 requirements would be accommodated within the freeway AMP1 (maximum construction) footprint.

The options were assessed within the same three zones. Within each zone, the ratings for alignment options were aggregated, which allowed their preference to be ranked relative to each other. To allow for a balanced consideration of the outcomes of each assessment an Options Assessment Matrix was created, which compiled the outcomes of the specialists' assessments and provided a ranking of alignment options in each zone based on the total weighted score. The scores applied to the ratings are as shown in Table 5-5 and the matrix is provided in Technical Appendix B (Options Assessment Report).

The assessments undertaken for each technical discipline and the overall ranking of options in each zone were reviewed in a workshop. Through this review and consultation with the community and the TRG, the recommended alignment options within each zone were identified.

Similar to Phase 1, the impact ratings for Phase 2 generally assumed no mitigation of potential impacts. However some consideration for the ability to mitigate or rectify potential effects was applied for the following specialist disciplines:

- Flora and fauna – where a new carriageway was proposed to be constructed adjacent to the existing highway in land which has been cleared of native vegetation, it was assumed that removal of existing roadside vegetation would be avoided where possible by including it in a wide median or duplicating on the opposite side to significant patches of vegetation.
- Surface Water – piers for new bridges would not be located within the waterway channel or on the banks immediately adjacent.
- Soils and geology – common engineering solutions and environmental management measures have been assumed. More specifically with respect to managing contamination from the old Great Western Landfill.

The outcomes of the Phase 2 assessment and the Options Assessment Matrix are further documented in the Options Assessment Report in Technical Appendix B.

5.4.1 Assumed Design Considerations

For the purpose of undertaking the Phase 2 assessment, the following assumptions were made regarding the design of the short-listed options:

- The duplicated Western Highway would be designed for a 110km/h posted speed limit.
- Where sections of the proposed alignment utilise the existing highway, the existing bi-directional road would be converted to a single direction,

and a new parallel carriageway would be constructed to serve traffic travelling in the other direction.

- Construction corridor was assumed to be approximately 50m wide for a new carriageway where the existing highway would be utilised for one carriageway.
- Where the Project involves construction of two new carriageways, a construction corridor of 80-100m would be required. This width was allocated in order to accommodate a wide median (approximately 30m) to allow for turning of B-Double trucks at intersections under AMP3 highway conditions. It also allowed for service roads, clear zones and services.

Turning movements of vehicles legally able to use the Western Highway were considered in the options assessment. This was considered by VicRoads and resulted in adopting a typical median width of 30m. It was not anticipated that high performance vehicles (over 30m in length) would need to turn off the highway under AMP3 conditions.

Grade separated interchanges under AMP1 conditions would allow for turning movements for high productivity vehicles. Wider widths were allowed for at the following interchange locations:

- Garden Gully Road near Armstrong;
- North and south of Great Western for eastern bypass options, and Moyston-Great Western Road for western bypass options; and
- London Road.

5.4.2 Community Consultation on Short-Listed Options

The assessment of shortlisted options commenced with consulting the community, at public meetings held in Great Western on 14 July, and Ararat on 19 July 2011. The meetings were advertised in an Information Bulletin which was posted to the surrounding area and notices were placed in local newspapers.

Alignment alternatives were presented, by way of a public display, to provide information on the route options and provide the community with the opportunity to ask questions and provide feedback.

Further detail of the community information sessions and feedback received is provided in Chapter 7 (Community and Stakeholder Engagement).

5.4.3 Assessment Criteria

In Phase 2, the evaluation criteria were refined for each of the Project Objectives and Evaluation Objectives, considering relevant legislation, policies and guidelines. The criteria addressed the following disciplines:

- | | |
|----------------------------|------------------------|
| ■ Planning and Land Use | ■ Cultural Heritage |
| ■ Traffic and Transport | ■ Air Quality |
| ■ Soils and Geology | ■ Noise |
| ■ Groundwater | ■ Visual and Landscape |
| ■ Surface water | ■ Social |
| ■ Biodiversity and Habitat | ■ Economic |

Table 5-7 outlines the evaluation criteria. Specific methodologies adopted for assessment of these criteria and any assumptions are detailed in Section 5.4.4.



Intersection of Western Highway and Kimbarra Road – looking south

Table 5-7 Phase 2 Evaluation Objectives and Evaluation Criteria

Evaluation Objective	Phase 2 Evaluation Criteria	Discipline
To avoid or minimise effects on species and ecological communities listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth) and/or the <i>Flora and Fauna Guarantee Act 1988</i> (Vic)	<ul style="list-style-type: none"> Extent of impacts to Matters of National Environmental Significance (MNES). Extent of impacts to species, communities and processes listed under the FFG Act. 	Biodiversity and habitat
To comply with requirements and best meet the objectives of 'Victoria's Native Vegetation Management – A Framework for Action' and to minimise impacts on wildlife corridors.	<ul style="list-style-type: none"> Net gain requirements for removal of native vegetation Extent of impact to native habitat and vegetation which is of very high conservation significance. Extent of impact on wildlife corridors (considering extent, connectivity and known species records). 	Biodiversity and habitat
To protect Aboriginal and non-Aboriginal cultural heritage	<ul style="list-style-type: none"> Extent of impact on registered and potential Victorian Aboriginal Heritage Register (VAHR) places excluding mortuary trees and burnt mounds. Impact on registered and potential Victorian Heritage Inventory (HI) places, local planning schemes Heritage Overlay (HO) places, Victorian Heritage Register (VHR) places and other Historical Heritage Registers. Impact on registered and potential mortuary trees and burnt mounds (VAHR places). 	Cultural Heritage (Aboriginal and Non-Aboriginal)
To avoid or minimise disruption and other adverse effects on infrastructure, land use (including agriculture and residential) and households, as well as road users during construction and/or resulting from the highway alignment.	<ul style="list-style-type: none"> Extent of impact on major utility services. Extent and impact of change to existing land use (consistency with applicable planning policies). Extent and impact of change to future land use (consistency with applicable planning policies). 	Land use Planning
	<ul style="list-style-type: none"> Extent of impact on access, mobility, social severance. Extent of impact of the full or partial acquisition of properties. Impacts from dislocation effects. Extent of impacts from amenity changes. Extent of impacts on community facilities. Community Context: The expressed concerns of local people. 	Social
	<ul style="list-style-type: none"> Number and significance of businesses (including agricultural) affected by full or partial acquisition. Extent of impact on accessibility for industry and tourism opportunities. Extent of impact on rail operations during construction. 	Economic
	<ul style="list-style-type: none"> Extent of impact on road safety. Travel times for road users during construction phase & consideration of impact on rail users. Impact on travel times for road users during operation phase. Degree to which AMP3 design (with provisions for upgrade to AMP1) requirements are met. 	Traffic and Transport
	<ul style="list-style-type: none"> Extent of impact on upon the visual amenity of adjacent residents. Extent of visual impact on upon townships and places of cultural and natural value. Extent of impact on sensitive landscape character types. 	Landscape and Visual
	<ul style="list-style-type: none"> Distances from dwellings and other sensitive receptors (e.g. schools) to road alignment for each option. 	Noise
To minimise noise, landscape, visual and other adverse amenity effects on the environment and local residents during the construction and operation of the proposed duplicated highway to the extent practicable.	<ul style="list-style-type: none"> Extent of impact of construction dust on sensitive receptors within close proximity to the road. Extent of impact of emissions into the atmosphere as a measure of potential contribution to regional load of air pollutants. Predicted impact of vehicle emissions on sensitive receptors within a minimum distance as evaluated by AustRoads using expected, indicative traffic emissions and sectional meteorology. 	Air Quality

Evaluation Objective	Phase 2 Evaluation Criteria	Discipline
To protect catchment values, surface water and groundwater quality, stream flows and floodway capacity, as well as to avoid impacts on protected beneficial uses.	Extent of potential impact to waterway value taking into account the following: <ul style="list-style-type: none"> ▪ Beneficial uses of the waterway. ▪ No. of waterway crossings and effective footprint area of waterway affected. ▪ Status of river health of the catchment system (including downstream receiving waterway). ▪ Status of river health (local scale e.g. bank condition, in-stream features). ▪ Potential to increase flooding risk taking into account the following: <ul style="list-style-type: none"> ▪ No. of waterway crossings. ▪ Effective width of floodplain (measured by 100 year flood extent). ▪ Complexity of floodplain interactions. 	Surface Water
	<ul style="list-style-type: none"> ▪ Extent of impact of gross contamination from historic land use (including historic landfills), and potential cost of works. ▪ Extent of exposure to watercourse embankments and river beds (potential triggers for erosion/instability criteria). ▪ Extent of potential impact of poor soils and / or topographic location on road construction or operation activities (unstable, low strength subgrades, wet or poor draining areas). 	Soils and Geology
	<ul style="list-style-type: none"> ▪ Extent of potential impacts (decline/deterioration) to groundwater quality and implications for beneficial uses. ▪ Extent of disruption of groundwater flow (recharge, discharge) i.e. flow paths, availability (for users, environment). ▪ Potential for alteration of groundwater levels. 	Groundwater

5.4.4 Technical Studies

This Section presents a summary of the assessment approach for each technical impact assessment study undertaken to inform Phase 2 of the options assessment. The outcome of the assessments for each zone is presented in Section 5.5

5.4.4.1 Planning and Land Use

Each alignment option was assessed with regard to land use and planning conditions. This involved consideration of:

- Current and future land uses and development supported by the zoning and overlay controls in the relevant Planning Scheme.
- Aerial photography and infrastructure servicing mapping, considering policy directions contained within the relevant planning scheme at a local and state level, particularly those relating to urban growth and land use change, and coal resources.
- Relevant Planning Schemes (Ararat and Northern Grampians).
- Discussions with Council Planners
- Copies of current Planning Permit Applications lodged with Council.
- Observations from Site inspections.

The impact on utility services was evaluated by considering whether a highway crossing or infrastructure relocation was necessary, or if relocated, could be accommodated within the new road reserve. It was assumed that a linear asset would need relocation if it would otherwise be located within the median, or if the alignment option impacted a length of utility greater than 200m. Extended lengths requiring relocation were

considered to be significant impacts due to land acquisition associated with protecting maintenance access. Crossings where the length of impact measures less than 200m were generally recognised as being minor.

The alignment options were considered in relation to existing and future potential land uses, and the extent and impact of any change was assessed by evaluating consistency with applicable planning policies. The proportion of properties to be acquired, and how the acquisition would affect land use was relevant. The impact significance was influenced by the type of use of the part of the property affected, the proportion of the property to be acquired, any restrictions on the site such as flooding constraints, and whether any significant structures would be affected. Severance and fragmentation issues were considered in the context of potential impact on land productivity.

5.4.4.2 Traffic and Transport

The following factors were considered to assess each alignment option against the evaluation criteria:

- Extent of impact on road safety

Consideration was given to the ability of the alignment options to reduce the risk of casualty crashes occurring, compared to the existing highway. This was done with regard to identified existing road safety concerns established using crash histories. The estimated road geometry and sight distances of the alignment options were relevant.
- Travel times for road users during construction phase and consideration of impact on rail users.

The impact on road user travel times was informed by considering the significance of likely

construction activities on the existing carriageway and the rail line, with any opportunity for staging construction.

- Impact on travel times for road users during operation phase.

The objective of this criterion was to consider the impact to highway travel times during the operation phase, when the highway speed limit is expected to be 110km/h, additional capacity is provided and existing overtaking constraints are removed. The change in travel time was considered cumulatively for all vehicles that are expected to use the upgraded Western Highway.

- Degree to which AMP3 – divided rural highway design (with provisions for upgrade to AMP1 – freeway) requirements are met which considers the type of intersections and vehicle turning movements.

The ability of the alignment options to be consistent with the Performance Objectives, Standards and Principal Characteristics of VicRoads AMP3, while allowing for upgrade to AMP1 in the future, was assessed. Relevant considerations included the level of control over site access points, intersection spacing, crossing movements and vehicle turns such as U-turns controlled by medians and median breaks, and turning lanes separated from through lanes, where warranted.



5.4.4.3 Soils and Geology

A desktop review was undertaken to ascertain the existing soil and geology conditions and potential for contamination within the Project area. The assessment against relevant criteria involved a review of:

- Historical aerial photographs of the area to assist in establishing the physical patterns of development over time. Historic agricultural, commercial, industrial or waste disposal land uses indicate potential land contamination.
- Publically available literature and geotechnical information relevant to the Project area.
- Relevant available borehole, test pit and other geotechnical data.

- Development of a preliminary geological and geotechnical model of the Project area.
- A preliminary acid sulphate soil (ASS) hazard assessment.
- The angle of waterway crossings and the number and size of farm dams intersected.

5.4.4.4 Groundwater

The groundwater assessment of alignment options focused on areas which were below grade and therefore had potential to interact with the groundwater system. Whilst areas above grade (natural surface level) can result in impacts to groundwater, these can generally be mitigated using a number of engineering design and construction techniques and are therefore considered a lower risk. Areas above grade, or shallow cuts (generally less than 4m) were considered to have negligible impacts.

From a regional perspective, the groundwater resources are generally considered to be low yielding and of poor quality (saline), and this has resulted in limited development of groundwater, apart from the occasional stock bore.

5.4.4.5 Surface Water

An assessment of potential impacts on waterway ecological values was made based on existing waterway data, the Department of Sustainability and Environment (DSE) Index of Stream Classification and aerial photography. For the four major waterway crossings, this was supplemented by a site inspection. The following features at each waterway crossing were taken into account:

- Size of footprint
- Bank and channel condition
- In-stream features
- Riparian habitat
- Floodplain condition and features

The potential implications for flood risk were estimated by considering the initial preliminary modelling undertaken by Bonacci Water Ltd (2011).

5.4.4.6 Biodiversity and Habitat

The extent that the options affect matters of national environmental significance was established using the likely presence of flora and fauna species or communities listed under the EPBC Act within the assumed construction corridor for each option. Similarly, species, communities and processes listed under the FFG Act were used to establish the impact on significant matters at the State level.

The impact to native habitat and vegetation of very high conservation significance was assessed using Net Gain calculations and the number of Large Old Trees and scattered trees potentially impacted. Impacts to wildlife corridors were based on the extent impacted, their connectivity and known species records.

The assessment against criteria involved a review of:

- Net Gain requirements
- Extent of impact to native habitat and vegetation which is of very high conservation significance
- Extent of impacts to matters of National Environmental Significance (NES)
- Extent of impacts to species, communities and processes listed under the FFG Act
- Extent and impact on wildlife corridors (considering extent, connectivity and known species records).

Maps showing the results of the flora and fauna surveys across the study area are provided in Chapter 13 (Biodiversity and Habitat).

5.4.4.7 Historical and Cultural Heritage

A risk-based approach was adopted by identifying areas with low, medium or high potential for presence of both Aboriginal and non-Aboriginal values. This considered both known sites based on registered places, and predicted sites and places based on environmental features and cultural values which could have influenced historic Aboriginal occupation.

To model predicted areas of Aboriginal cultural heritage, the Victorian Aboriginal Heritage Register (VAHR) and geological and environmental spatial datasets were combined with findings from a review of archaeological reports and local Aboriginal community consultation. The model was based on the following assumptions:

- All landforms within 200m of waterways may be sensitive for Aboriginal cultural heritage (as specified in s. 23 of the *Aboriginal Heritage Regulations 2007*).
- The potential for historic Aboriginal occupation areas such as camp sites is considerably lower on steeply sloping ground compared to level ground.
- Vegetation structure established through an Ecological Vegetation Class (EVC) dataset reflects potential greater resource availability, and therefore an increased likelihood of Aboriginal occupation.
- Geology is an indicator of resource availability, correlated with the likelihood of encountering quarry sites for the manufacture of stone tools, and for influencing the historic distribution of flora and fauna resources.
- The potential for Aboriginal Mortuary Trees to be present in the Project area. A Mortuary Tree is the location of a secondary 'burial' of human remains. Trees aged greater than 250 years are potential burial sites and therefore preference is for options where these old trees are avoided.

The cultural values as expressed by the Barengi Gadjin and Martang communities were represented spatially. This was instrumental for assessing the pattern of past human occupation across the landscape, and continuing cultural relevance. Traditional cultural knowledge and scientific knowledge were able to be examined concurrently to better inform decisions for the Options Assessment.

The potential impact on registered and potential non-Aboriginal Cultural (Historical) Heritage was established following a ground truthing survey of previously registered historic places within the Project area, undertaken in September 2011. The following registers were consulted prior to the field examination:

- Victorian Heritage Register
- Victorian Heritage Inventory
- Register of the National Estate
- Commonwealth Heritage List
- National Heritage List
- Planning Scheme Heritage Overlays and
- The National Trust List

5.4.4.8 Air Quality

Road projects generate two types of air quality impacts: dust and other minor emissions due to construction activity, and vehicle emissions dispersing away from the running lanes during operation. When comparing a Project option with the 'no project', operational traffic emissions can be considered to be always better with the Project proceeding due to smoother traffic flow and construction emissions would always provide a worsening impact compared to a 'no project'.

The risk and significance of impacts decreases with increasing distance from the source. To evaluate construction dust the number of sensitive receptors (in this case dwellings) within 15m, 80m, 100m and 200m respectively from the construction area was counted for each option, and a weighting factor was applied to rank closer receptors as having higher risk of exposure.

To evaluate operational impacts, Austroads criteria were used to define distances from the road where the objectives in the State Environmental Protection Policy (Air Quality) might not be met.

The contribution to the regional load of air pollutants was assessed as the total amount of pollutants released into the atmosphere over the alignment length. All options would be an improvement on existing conditions due to better traffic flow with dual carriageways.

5.4.4.9 Noise

Background noise levels were measured at existing dwellings located in close proximity to the highway using a combination of unattended noise loggers and attended noise measurements. The noise disturbance criterion was assessed by reviewing each option against the presence and number of sensitive receptors (dwellings) within 15m, 15-50m, 50-120m, and 120-200m. Each of these bands was assigned a magnitude weighting, with the highest being those closest to the highway. The same process was undertaken for the existing highway in order to provide a comparison to the 'no project' scenario.

Whilst construction noise was not specifically modelled it is considered that the indicators (buffer distances) for operational noise are a suitable proxy for construction noise.

5.4.4.10 Landscape and Visual

The assessment was informed by a site inspection from publicly accessible locations, and a review of aerial photography and topographic information. The following was considered to assess each alignment option against the evaluation criteria.

The extent of impact on adjacent residents was estimated by quantifying the number of households within 500m to the option, and those within 150m proximity. The number of houses within each zone was used as an indicator of potential impact.

The extent of visual landscape change from townships, vistas and places of cultural and natural value was assessed based on proximity, level of significance of the place of natural or cultural value, the size of any township, and visual prominence.

Landscape character types were identified, and the capacity of each to absorb the visual change from the Project established based on an estimate of the percentage of the character type altered, and the sensitivity of the character type to visual change. The "Bushland" and "Mountain bushland" landscape character types were considered to have high landscape sensitivity, whereas the "Existing Highway" and "Vegetated Plantations" were considered to have very low landscape sensitivity and therefore, considered to be resilient to change.



5.4.4.11 Social

A qualitative assessment of the potential social impacts of the alignment options was undertaken. A sound understanding of the current conditions and social factors that apply to the existing Western Highway and local roads was established through the following:

- Site visits to the area, including attendance at community information sessions and Council meetings, and to meet with affected landowners and to inspect the options around Great Western;
- Review of the community feedback collected informally at the public information displays and provided later through feedback forms and records of VicRoads contacts with affected landowners, as well as feedback provided through stakeholder interviews;
- Review of the information collected on the location of community services and facilities;
- Review of the social policy data collected during for the existing conditions report; and
- Consideration of the number of properties potentially severed by each option and the number of houses potentially affected, either by acquisition or amenity impacts.

The following was considered to assess each alignment option against the evaluation criteria.

- Extent of impact on access, mobility and severance.

Each option was assessed based on whether it would create barriers to access adjacent properties, whether it would increase travel times for landowners and whether any property severance was severe enough to create a negative social impact. This was based on the basic assumptions made with regard to access and intersections. The locations of median breaks were not identified for shortlisted options so these were not considered.

- Extent of impact of the full or partial acquisition of properties.

Each option was assessed based on the anticipated community impacts of full or partial acquisition of properties.

- Impacts from dislocation effects.

Each option was assessed based on whether it may lead to a dislocation impact for the landowner. This was a qualitative assessment based on the options maps and data on the number of houses within 50m and 100m distances respectively from each option.

■ Extent of impact from amenity changes.

Each option was assessed based on its potential to lead to negative effects on the amenity of adjacent properties. However, this criterion was not rated in the options assessment matrix because the components of amenity impacts are covered in individual ratings for air, noise, landscape and transport criteria.

■ Extent of impacts on community facilities.

Each option was assessed based upon its impact on facilities for the local or broader community.

■ Community context – the expressed concerns of the local people.

Each option was assessed based on the community response from the landowner information sessions and feedback forms. This was a preliminary qualitative assessment which was intended to reflect the community response to each option. Community consultation is described in more detail in Chapter 7 (Community and Stakeholder Engagement).

5.4.4.12 Economics

The economic assessment was informed by existing information, aerial imagery and outcomes from community consultation, discussions with council officers, and some affected landowners.

The following was considered to assess each alignment option against the evaluation criteria.

■ Number and significance of businesses affected by full or partial acquisition.

To assess this criterion the direct land loss, degree of severance, relationship to allotment and tenement boundaries, and effects on infrastructure was considered. Agricultural, tourism and commercial sites were assessed on whether land loss would be a disbenefit or benefit to the viability of the affected businesses.

■ Impact on accessibility for industry and tourism opportunities.

Consideration was given to ownership patterns of allotments within the Project area, planning zones (industrial or business), and the importance of the site, or tourist destination as identified in local economic and tourism development plans and strategies.

Accessibility impacts were established by considering townships within the Project area, particularly those that would be bypassed by an option. Highway visibility was relevant as some businesses rely on highway trade, and a reduction is likely to affect the impetus or impulse of a customer to access a site as well as accessibility itself.

■ Impact on Rail Operations during Construction.

Disruption is likely to occur only where an option involves work in the rail corridor, taking into account any disrupted passenger movements affecting the locality, region or the State. Potential for the greatest impact is work involving new railway crossings.

5.5 Outcome of Phase 2 Options Assessment

This section outlines the outcomes of Phase 2 of the alignment options assessment and recommends options within each zone. The outcomes of Phase 2 are further documented in the Options Assessment Report in Technical Appendix B.

Generally, biodiversity and social values are competing in the selection of a preferred alignment for linear infrastructure projects, and this project is not an exception. For Zone 3 within Section 3 of the Western Highway however, cultural heritage values were also a key consideration in the selection of the alignment.

The objective of Phase 2 was to assess the impacts to the identified values of the Project area and to select an alignment that balanced impacts to biodiversity, social and cultural heritage values.

Following the Phase 1 assessment, Option 2E (as a variation of Option 2D) was added in Zone 2 to provide connection with options in Zone 1 and 3 located on the western side of the existing highway and railway. Additionally, in discussion with the TRG, alignment Option 3DC was added to Zone 3 to provide an alternative to following the existing highway past Sisters Rocks and the Stawell Park Caravan Park. Also, Option 3AD was a new option added to provide connection to a north-eastern bypass of Great Western in Zone 2 and Option 3DC in Zone 3.

5.5.1 Zone 1: Pollard Lane to Allanvale Road

Zone 1 contains three options for assessment (1A, 1C and 1E) and extends from Pollard Lane, north-west of Ararat to Allanvale Road, south-east of Great Western.

The existing highway allows for a single lane of traffic in both directions for traffic travelling between Ararat and Great Western. This section of the highway includes the Armstrong Deviation, which crosses the railway line and is a section of the highway that was upgraded in 2003. The existing highway intersects ten local roads and an access point to tracks in the Ararat Regional Park. The characteristics and key constraints in Zone 1 include:

- At the start of the zone the Ararat Regional Park constrains the Western Highway to the east and west for approximately 3.5km of the highway;

- The Australian Rail Track Corporation's (ARTC) interstate rail line is located to the east of the existing highway and is crossed by the existing highway at the Armstrong Deviation;
- The locality of Armstrong is located within this zone, largely between the existing highway and railway line;
- The area is predominantly privately owned land used for agricultural or rural living purposes with a number of established dwellings in Armstrong;
- Historical ruins are located near the existing highway in the Armstrong area; and
- Crossing of a number of waterway tributaries.

Options 1A and 1E both follow the existing highway using either side of the existing alignment. These options differ at the northern end with 1A following the existing highway and 1E deviating to follow the railway. Option 1C deviates from the existing highway at the start of the zone and travels north-west through predominantly cleared farmland. Option 1C re-joins the existing highway just after the Armstrong Deviation.

Biodiversity and Habitat

The Ararat Regional Park is located on either side of the existing highway north of Ararat. The largest area of the park is located to the north-east of the existing highway and of the railway line (Refer to Figure 5-2).

There is Plains Grassy Woodland, Grassy Woodland, Grass Dry Forest and Creekline Grassy Woodland Ecological Vegetation Classes (EVCs) located in the area adjacent to the railway and existing highway. There is potential Golden Sun Moth habitat, scattered large old trees and patches of native vegetation in the paddocks to the east.

Options 1A and 1E have the potential for similar impacts on vegetation located in the road reserve. At the start of the zone, Option 1A has more impact on remnant native vegetation within Ararat Regional Park whereas Option 1E impacts on potential and confirmed Golden Sun Moth Habitat. At the northern end of the zone, Option 1E follows the railway and has impact on Plains Grassy Woodland and Grassy Woodland of high and very high conservation significance, as well as potential and confirmed Golden Sun Moth habitat.

Option 1C is located in predominantly cleared farmland and impacts a greater number of scattered large and very large old trees than Options 1A and 1E. Option 1C impacts less area of native vegetation, however the vegetation is of a similar type, being Grassy Woodland and Creekline Grassy Woodland. It also impacts on and potential Golden Sun Moth habitat.

Options 1A and 1E bisect the wildlife corridor between areas of the Ararat Regional Park where the existing highway is located. Option 1C however

would have a greater impact through the creation of a new barrier where none currently exists between two large areas of the Ararat Regional Park located to the north-east of the existing highway.

Overall, Option 1C has lower potential impacts on flora and fauna values than 1A and 1E as it impacts less area of native vegetation. Option 1C does however have greater potential impact on wildlife corridors of the Ararat Regional Park than Options 1A and 1E, and scattered large old trees.

Landuse, Socioeconomic and Amenity

All options sever a number of rural properties, however Option 1C has the greatest impact as it does not generally follow property boundaries, particularly at the southern end. Options 1A and 1E follow the existing highway and therefore intersect properties along their boundaries.

Option 1C has the potential to create landholdings of insufficient lot sizes which are inconsistent with the planning controls and policies. It also could impact on an organic vineyard and its water supply.

Options 1A and 1E are closer to the settlement of Armstrong than Option 1C, which is located further away from dwellings. This suggests there could be a benefit to properties in Armstrong through adopting Option 1C by reducing traffic noise and air emissions. Option 1C would introduce traffic noise and emission impacts to a lower number of dwellings, however it would be in areas that are not currently exposed to this.

Options 1A and 1E have less visual impact compared to Option 1C as they involve duplication next to the existing highway rather than being located in an area that doesn't currently have a highway or major roads.

The roadside vegetation provides some visual screening of the existing highway. It was considered that much of the roadside vegetation could be retained through realignment of carriageways into adjacent cleared farmland and this could reduce visual impacts in some locations.

Traffic and Transport

Options 1A and 1E would utilise the existing highway as one of the carriageways. Option 1C however introduces a new dual carriage highway into an area with small local unsealed roads.

Option 1A would require duplication of the existing railway crossing at the Armstrong Deviation and would utilise the existing railway crossing. Option 1C would require a new railway crossing. Option 1E does not require additional railway crossings.

All options appropriately address the traffic and transport evaluation criteria and would improve traffic flows and safety. Overall, Options 1A and 1E are considered more favourable as they utilise the existing highway and do not require new railway crossings.

Cultural Heritage

All options have the potential to impact on areas of historical cultural heritage sensitivity at waterway crossings and registered sites. Option 1C was considered to have a higher potential to impact on Aboriginal cultural heritage values because it intersects more large old trees (potential for mortuary trees) than Option 1A and 1E. However, in contrast, Option 1C was considered to have lower potential impact on Historical Heritage values as it avoids previously registered sites at Armstrong.

Catchment Values

Option 1C was considered less favourable as it had a higher potential to encounter areas of land instability than Options 1A and 1E because it crosses a number of farm dams and drainage lines.

All Options cross Concongella Creek three times however options 1A and 1E were equally preferred as Option 1C had a crossing at an acute angle at the confluence of three minor waterways.

All options have small areas of cut with the potential to interact with groundwater and could not be differentiated.

Zone 1 Conclusion

A combination of Options 1A and 1E has been recommended as it would have lower potential impacts on land use, social, economic and amenity values. Option 1C was considered to have more impact as it involves greater land severance and

visual impact through being located in farmland and it does not follow the existing highway or property boundaries. Option 1C would introduce traffic noise and emissions in areas that are not currently exposed.

Overall, Option 1C has lower potential impacts on flora and fauna values than 1A and 1E, however 1C has greater potential impact on wildlife corridors by creating a new barrier between two large areas of the Ararat Regional Park. Option 1C would also impact a greater number of scattered large and very large old trees than Option 1A and 1E.

A combination of 1A and 1E reduces the potential impacts on flora and fauna values compared to either option on their own. The recommended option adopts the start of Option 1E (to minimise impacts on native vegetation within Ararat Regional Park) and transitions to Option 1A just before the Armstrong Deviation (to avoid vegetation of high conservation significance and Golden Sun Moth habitat along the railway line).

The recommended option would also utilise the existing infrastructure and corridor at the Armstrong Deviation.

On balance, a combination of Option 1A and 1E has been assessed as having the lowest overall negative impacts of the three shortlisted options which were assessed for Zone 1.

The shortlisted and recommended option in Zone 1 is shown in Figure 5-6.

Table 5-8 Summary of Potential Impacts for Zone 1

		Option 1A	Option 1C	Option 1E	Option 1A/1E
Approximate Land Acquisition (ha)		45	96	60	36
Directly Impacted Buildings		NA	NA	NA	NA
Distance to and number of residential dwellings		8 within 150 m	3 within 150 m	8 within 150 m	8 within 150m
Native Vegetation		Area (ha)			
High Conservation Significance		4.8	9.6	1.1	4.7
Very High Conservation Significance		48.8	18.5	51.6	41.6
EVC (bioregion)	Conservation Status	Area Impacted (ha)			
CGW (Goldfields)	Endangered	5.8	8.2	4.2	4.0
GDF (Goldfields)	Depleted	3.8	3.1	3.9	3.8
GW (Goldfields)	Endangered	41.1	14.0	45.2	35.7
PGW (Goldfields)	Endangered	3.2	3.3	0.0	3.2
Total Potential Native Vegetation Loss (ha)		54.1	28.6	53.3	46.8
Large old (LOT) and Very Large Trees (VLOT)		LOT: 8 VLOT: 6	LOT: 22 VLOT: 15	LOT: 10 VLOT: 9	LOT: 3 VLOT: 7
Heritage Values		Known heritage sites at Armstrong although not registered*	Heritage Overlay – Fountain Head Brewery HO112	Known heritage sites at Armstrong although not registered*	Known heritage sites at Armstrong although not registered*

	Option 1A	Option 1C	Option 1E	Option 1A/1E
Number of Waterway Crossings	3 significant waterway crossings 29 minor drainage line crossings	3 significant waterway crossings 26 minor drainage line crossings	2 significant waterway crossings 33 minor drainage line crossings	3 significant waterway crossings 27 minor drainage line crossings

* At the time of the Options Assessment sites were not registered, however they have been registered through the impact assessment

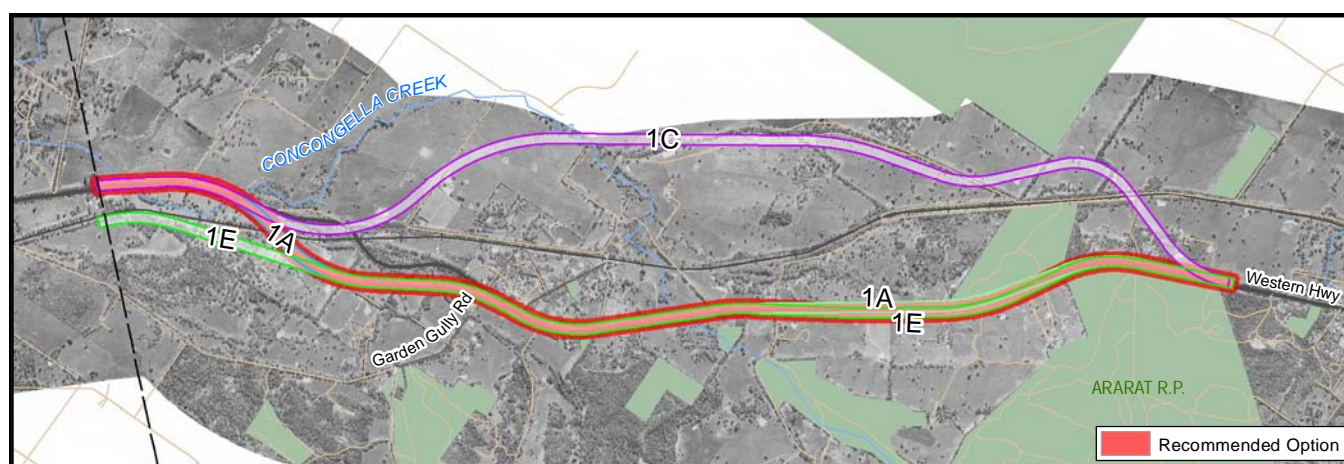


Figure 5-6 Zone 1 Shortlist and Proposed Option

5.5.2 Zone 2: Allanvale Road to Briggs Lane

Zone 2 contains four options for assessment (2B, 2C, 2D and 2E) that bypass Great Western. The zone extends between Allanvale Road on the southern side of Great Western and Briggs Lane on the northern side of Great Western.

The existing highway provides a single traffic lane in each direction which pass through the centre of the Great Western township and intersect a number of local roads. The existing highway also intersects Great Western - Moyston Road, which provides access to the Grampians National Park.

Following discussion with TRG it was recognised that an additional alignment option was required in Zone 2 to provide connection with options in Zone 1 and Zone 3 that were located west of the existing highway and railway line.

Option 2E was added to provide connection with Option 3C and Option 3DC. Option 2E, re-introduced in Phase 2, was slightly modified from that considered as part of the long list in Phase 1. For Phase 2 the Option 2E was similar to Option 2D, however it does not cross the railway on the northern side of Great Western and connects with Options 3C and 3DC.

The characteristics and key constraints in Zone 2 include:

- A former vineyard and historic homestead on the south eastern side of Great Western adjacent to the existing highway (near Congongella Creek);

- An existing quarry and former landfill to the north east of Great Western off Sandy Creek Road;
- A bushland reserve north east of Great Western;
- Best's Winery, located north of Great Western off Bests Road, which is listed on the Heritage Register;
- The Australian Rail Track Corporation (ARTC) interstate railway line is located to the south west of the existing highway;
- The confluence of Congongella Creek, Robinsons Creek and Donalds Creek on the north west side of Great Western;
- The confluence of Congongella Creek and Allanvale Creek to the south of Great Western;
- Rural Living Zone in areas to the south west of Great Western;
- Primarily Farming Zone in the area to the east of Great Western; and
- Historical heritage relating to former mining activities around Great Western.

The four shortlisted alignment options all bypass the Great Western township. Options 2B and 2C bypass Great Western to the east and Options 2D and 2E to the west. The topography to the east is elevated and the alignment options would require areas of cut through the hill to achieve the required gradeline. In contrast, the topography to the west of Great Western is relatively flat and the alignment options

would have to be raised to achieve the required gradeline and clearance above flood levels.

Biodiversity and Habitat

Great Western is located in the centre of Zone 2. The area surrounding the township is primarily used for agriculture and contains areas of remnant vegetation and large old trees. There is also an operating quarry and former landfill located to the east.

The largest area of remnant vegetation is to the north-east and east of the town. To the west of the town are patches of remnant vegetation and scattered large and very large old trees. The native vegetation is of very high and high conservation significance on both sides of Great Western.

Options 2B and 2C travel through marginal agricultural land and remnant native vegetation to the east and north-east of Great Western. The remnant vegetation is predominantly Heathy Woodland with patches of Plains Grassy Woodland EVC which are of high and very high conservation significance respectively. Option 2B would result in removal of less native vegetation than Option 2C.

Option 2B intersects a former quarry and an operating quarry north-east of Great Western. Option 2C is located further east and travels through part of the vegetation that has been secured as native vegetation offsets for the quarry. Part of Option 2B however is located in the area proposed for the quarry expansion.

There were no national or state listed flora species or nationally listed fauna species identified during targeted surveys along the Option 2B and 2C alignments.

The Brown Toadlet, which is state listed, was recorded north-east and north-west of Great Western during targeted surveys. The Brown Toadlet was also found to be widespread through the study area.

Options 2D and 2E traverse the area to the west of Great Western which is productive agriculture land with patches of native vegetation, roadside vegetation and scattered large and very large old trees. The vegetation patches are Plains Grassy Woodland and the road side vegetation is Grassy Woodland.

Options 2D and 2E are also more likely to contain habitat for Golden Sun Moth than Options 2B and 2C. Golden Sun Moth were recorded at the southern end of Options 2D and 2E adjacent to the railway.

Overall, Options 2D and 2E would impact on less area of native vegetation than Option 2B, and particularly 2C. However Options 2D and 2E would have more potential impact on Golden Sun Moth habitat and scattered large and very large old trees.

Whilst Option 2B has more impact on significant native vegetation than Options 2D or 2E, the area of

impact would be further reduced during detailed design through adopting minimum medium widths between carriageways. A conservative footprint was adopted for the alignment options assessment.

Land use, Socioeconomic and Amenity

Option 2D and 2E result in the severance of a larger number of rural properties than Option 2B and 2C. They also impact on productive agricultural land to the west of Great Western.

Due to the topography of the land to the east and north-east of Great Western, if growth occurred in the town it would likely be to the west. The Northern Grampians Municipal Strategic Statement, which is part of the planning scheme, acknowledges that Great Western's growth is restricted by its physical features and growth potential connected to the existing township could be mostly towards the west. Options 2D and 2E could therefore restrict future growth of Great Western.

Option 2B is considered to have the least impact, as the alignment extends closer to property boundaries and does not sever large agricultural properties compared to the other options.

While parts of Option 2B may be more visible than 2C, 2D and 2E from the township, community consultation with local businesses suggested this could be beneficial by being able to see the town from the bypass and increasing the likelihood of passing traffic stopping to support the town businesses. Community consultation revealed more support for an eastern bypass of Great Western.

All alignment options require new dual carriageways in areas where there is currently no major road. Option 2B is closer to more dwellings than the other options, however some of the alignment length is proposed to be located within a large section of cut which provides some mitigation for noise and visual amenity impacts. Also, all options move the highway away from more dwellings than moving the highway closer, providing some noise benefits.

Overall, Options 2B and 2C have been considered to have less potential land use, social and economic impacts than 2D and 2E. Options 2B and 2C were also considered to have less noise and visual amenity impacts.



Existing Quarry, north-east of Great Western

Traffic and Transport

Options 2B and 2C would require two half diamond interchanges, one on either side of Great Western. Options 2D and 2E would have one interchange, on the western side of the township at Great Western - Moyston Road.

The interchanges associated with Options 2B and 2C were considered to be more conducive to traffic flow through the town. This is because vehicles could exit the highway from one side of the town and then continue in the overall direction of travel to re-enter the highway. Whereas a single interchange, as proposed for Option 2D and 2E, would require travel into and out of Great Western by the same road, which would not flow with the overall direction of travel. The interchange for Options 2D and 2E would, however allow direct connection to Great Western – Moyston Road which provides access to the Grampians.

Option 2B utilises more of the existing highway than the other options. Options 2D and 2E have limited use of the existing highway.

All options appropriately address traffic and transport evaluation criteria, however the key differentiation is that Option 2D would require a new crossing of the railway at the northern end of the zone.

Options 2B and 2C were considered to be more favourable as they are likely to enable better traffic flow through Great Western. Option 2B was preferred over 2C as it utilises more of the existing highway.

Cultural Heritage

All options were considered to have a low potential impact on historical heritage values. However Options 2B and 2C were considered to have lower potential to impact on Aboriginal heritage values than Options 2D and 2E. This is because Options 2D and 2E contain many scattered large old trees which were considered to have the potential of being mortuary trees.

Additionally, Options 2D and 2E were considered to transverse an area of Aboriginal cultural heritage sensitivity, as indicated by the predictive modelling and confirmed through consultation with the local Aboriginal community.

Catchment Values

Options 2D and 2E could not be differentiated in terms of impacts to catchment values. Option 2C was marginally preferred over Option 2B because 2B intersects part of the former Great Western Landfill site adjacent to Metcalfe Road.

Option 2B would require the excavation and relocation of waste material currently held in the former landfill site. The landfill is located in a disused quarry and is approximately 6m below surface level. The adjacent quarry is also excavated to a similar depth. The quarry operator has indicated

there is groundwater intrusion into the quarry is not an issue. Traversing through the landfill could have potential contamination impacts to groundwater and soil. However it would also result in an overall improvement in the containment and management of the waste material through upgraded storage conditions that meet EPA regulations. The current landfill is not lined and was established before the current regulations were put in place.

Great Western is known to have flooding issues and the existing highway is also flood affected. Alignment options that utilise the existing highway provide an opportunity to address flooding issues for the highway which may provide benefits for Great Western. On this basis, Options 2B was preferred and then Option 2C.

Options 2B and 2C cross relatively long sections of flood extent, including substantial areas where interchanges are proposed. Options 2D and 2E cross less floodplain but were considered during the options assessment more likely to potentially exacerbate local flooding at the northern end of the zone near the confluence of Robinsons and Cobey's Creek.

Great Western is known to have flooding issues and the existing highway is also flood affected. Alignment options that utilise the existing highway provide an opportunity to address flooding issues for the highway which may provide benefits for Great Western. On this basis, Options 2B was preferred and then Option 2C.

Zone 2 Conclusion

A bypass of Great Western to the north-east has been recommended because it:

- Results in lower potential social and economic impacts through less land severance of productive agricultural land;
- Has less potential impact to areas of Aboriginal cultural sensitivity as indicated by the predictive modelling and confirmed through consultation with the local Aboriginal community;
- Provides better connectivity to Great Western with interchanges on either side of the town that would be more conducive to flow through traffic than a single interchange to the west of the town;
- Would not restrict the future growth of Great Western, or place additional pressure upon services proposed by Council due to land severance; and
- Has less potential impact to confirmed and potential Golden Sun Moth habitat, and large and very large old trees.

A bypass to the north-east would also enable the existing area of cut created by the operating quarry to be utilised. The proposed alignment is also located in an area identified for potential expansion of the quarry.

Whilst a bypass to the east of Great Western has more impact on significant native vegetation, the area of impact would be further reduced during detailed design through adopting minimum medium widths between carriageways. A conservative footprint was adopted for the alignment options assessment.

A bypass to the west of Great Western would have more impact on scattered large and very large old trees and potential and confirmed Golden Sun Moth habitat.

It was considered that the land severance, the future growth of Great Western and social impacts

arising from Options 2D and 2E were more substantial than the impacts to significant native vegetation from Option 2B. Option 2B would also require removal of less native vegetation and result in less land severance than Option 2C.

Overall, thorough a balanced consideration of the impacts to different values, Option 2B has been recommended.

The shortlisted and recommended options in Zone 2 are shown in Figure 5-7.

Table 5-9 Summary of Potential Impacts for Zone 2

		Option 2B	Option 2C	Option 2D	Option 2E
Approximate Land Acquisition (ha)		113	128	94	100
Directly Impacted Buildings		1 house, 1 shed	2 houses	1 house	1 house
Distance to and number of residential dwellings		Total 25 dwellings. 5 within 150m proximity. 20 within 150-500m.	Total 14 dwellings. 2 households within 150m. 12 within 150-500m	Total 16 dwellings. 10 households within 150m proximity. 6 within 150-500m.	Total 18 dwellings. 11 within 150m, 7 within 150-500m.
Native Vegetation		Area (ha)			
High Conservation Significance		11.5	7.5	10.8	10.8
Very High Conservation Significance		33.0	34.3	13.1	4.7
EVC (Bioregion)	Conservation Status	Area Impacted (ha)			
CGW (Central Victorian Uplands)	Endangered	4.6	3.8	2.5	0.8
CGW (Goldfields)	Endangered	0.7	0.7	0.5	0.5
GW (Goldfields)	Endangered	1.2	1.2	0.3	1.9
GW (Central Victorian Uplands)	Endangered	-	-	3.9	1.9
HW (Central Victorian Uplands)	Depleted	13.6	15.6	-	-
PGW (Central Victorian Uplands)	Endangered	16.4	14.5	9.7	5.0
PGW (Goldfields)	Endangered	8.0	5.8	6.9	6.9
Total Potential Native Vegetation Loss (ha)		44.5	41.7	23.9	15.4
Large old (LOT) and Very Large Trees (VLOT)		LOT: 6 VLOT: 1	LOT: 4 VLOT: 0	LOT: 6 VLOT: 4	LOT: 7 VLOT: 6
Heritage Values		DSE registry - Great Western Lead	DSE registry - Great Western Lead	Potential Mortuary Trees and area of Aboriginal value	Potential Mortuary Trees and area of Aboriginal value
Number of Waterway Crossings		8 significant waterway crossings 1 minor drainage line crossings	7 significant waterway crossings 5 minor drainage line crossings	8 significant waterway crossings 13 minor drainage line crossings	6 significant waterway crossings 14 minor drainage line crossings

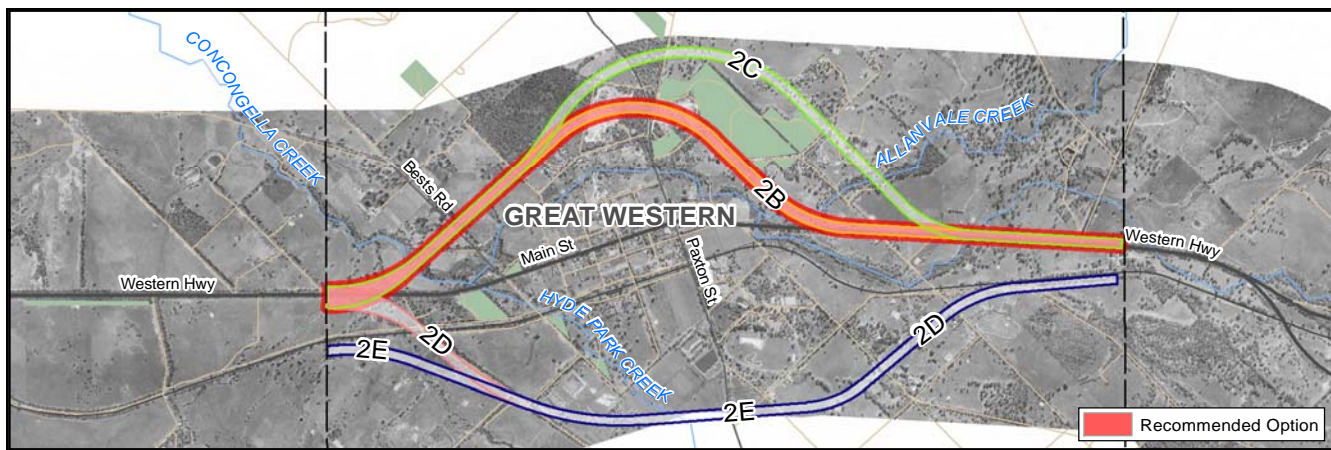


Figure 5-7 Zone 2 Shortlist and Proposed Option

5.5.3 Zone 3: Briggs Lane to Gilchrist Road

Zone 3 includes five alignment options (3A, 3B, 3C, 3AD, and 3DC) that extend from Briggs Lane north of Great Western to Gilchrist Road, south east of Stawell. The existing highway provides a single traffic lane in each direction, and a crossing of the railway at Harvey Lane (known as Oddfellows Bridge). It intersects with four local roads including the London Road intersection, which is the busiest intersection in both Section 2 and 3.

Following discussions with the TRG, alignment option 3DC was re-added to the shortlist assessed for Zone 3. Option 3DC would provide an alternative to following the existing highway past Sisters Rocks and the Stawell Park Caravan Park. A new option, 3AD, was also included to provide connection between Options 3A and 3B and Option 3DC.

The characteristics and key constraints in Zone 3 include:

- Substantial roadside vegetation including a significant habitat patch near the intersection of Churchill Crossing Road, a flora and fauna reserve alongside the existing highway near Robson Road and the Sisters Rocks Bushland Reserve;
- Sisters Rocks heritage site (listed on the DSE heritage list) is located within the bushland reserve less than 100m from the existing highway, and includes a council open space reserve;
- Stawell Park Caravan Park is located south west of the Western Highway alongside Monaghan Road on the outskirts of Stawell, and has a high proportion of permanent residents;
- The 18-hole Grange Golf Club is located next to the caravan park;
- Crossing of the ARTC railway line at Harvey Lane;
- Crossing of a number of waterway tributaries; and

- The area is predominantly agricultural land with a number of established dwellings located either side of the existing highway.

Of the five shortlisted options in this zone, Options 3A and 3B follow either side of the existing highway. Option 3C deviates from the existing highway and follows the railway line to then join back with the existing highway before Panrock Reservoir Road. Option 3DC is a continuation of 3C but does not rejoin the existing highway until almost at Gilchrist Road. Option 3AD utilises the start of 3A, then deviates west to cross the railway line and following the alignment of 3DC. The options are shown in Figure 5-8.

At this stage of the options assessment it was assumed that the AMP1 duplication would end just after Harvey Lane (Oddfellows Bridge). This would allow a wide median treatment to be adopted for London Road. It was also assumed that a realignment of Panrock Reservoir Road would be required. However, following the options assessment, the concept was revised so that the AMP1 duplication would continue to Gilchrist Road, Stawell.

Biodiversity and Habitat

In Zone 3 there is remnant native vegetation within the Western Highway road reserve, along the railway line located to the west, and a large area near London Road in the vicinity of Sisters Rocks.

Adjacent to the railway is Heathy Woodland, Grassy Woodland and Golden Sun Moth habitat. At the western end of the alignment, Trailing Hop-Bush (listed as Vulnerable under the EPBC Act) and Emerald-lip Greenhood (listed as vulnerable under the FFG Act) have been identified within and adjacent to the road reserve (managed by DSE). From the outset of the options assessment, the alignments between Great Western and Stawell that followed the existing highway were assumed to avoid the significant roadside vegetation near Churchill Crossing Road and in the Crown land reserve near London Road.

Pleasant Creek runs to the west of the existing highway (not crossed by the highway) which has riparian vegetation consisting of Grassy Woodland and Creekline Grassy Woodland. The remaining area is predominantly cleared farmland with scattered indigenous trees and native vegetation in road reserves. The road reserves contain Heathy Woodland with patches of Plains Grassy Woodland and Grassy Woodland.

Options 3A and 3B both utilise the existing highway and propose a new carriageway respectively on either side. Option 3A extends along the western side of the existing highway and has the potential to impact a large patch of Heathy Woodland located near Churchill Crossing Road. Option 3B is located on the eastern side of the existing highway predominantly in cleared farmland until it reaches the railway line.

North of where the existing highway crosses the railway, Options 3A, 3B and 3C follow the existing highway. It was assumed that the footprint would be constrained through this area with a narrow median to reduce impacts to the vegetation on either side of the alignment.

At the southern end of the zone, Options 3C and 3DC both follow along the western side of the railway line. This has potential impacts on Heathy Woodland, Grassy Woodland and Creekline Grassy Woodland. Option 3C re-joins the highway at Harvey Lane and therefore has similar potential impacts to Options 3A and 3B at the northern end of the zone.

Option 3DC however continues towards Stawell through farmland to re-join the highway near Gilchrist Road at the north-western end of the zone. Option 3DC requires a new crossing of Pleasant Creek through an area of Grassy Woodland and Creekline Grassy Woodland.

Option 3AD follows 3A at the beginning of the zone and then crosses farmland and the railway to join Option 3DC. Option 3AD has the potential to impact on significant vegetation in the road and rail reserves. It would also require a new crossing of Pleasant Creek.

The large area of native vegetation either side of the existing highway between London Road and Harvey Lane forms part of a significant wildlife corridor which continues to the south and west through vegetated areas along Panrock Reservoir Road and Pleasant Creek. This wildlife corridor is potentially impacted to varying degrees by all alignment options in Zone 3.

Overall, all the options have impacts to flora and fauna values as they are located either in or adjacent to the road or railway reserves, or involve a new waterway crossing.

Options 3A, 3B and 3C have higher potential impacts to the nationally listed Trailing Hop-bush, whereas Options 3AD and 3DC would have more impact to

scattered Large and Very Large Old Trees and require a new crossing of Pleasant Creek.

It was considered that through further alignment refinements in detailed design the impacts to flora and fauna values could be further reduced. Also, a translocation plan could be implemented to further minimise the impact on Trailing Hop-bush.

Land use, Socioeconomic and Amenity

The options that extend along the existing highway (3A, 3B, and 3C) were considered to have less impact on existing farming land use, land access and property severance because 3A and 3B use the existing road reserve and 3C follows the railway line and then the road reserve. Option 3C however, would require more acquisition of private land for two new carriageways, whereas Options 3A and 3B utilise the existing highway.

Options 3AD and 3DC extend through agricultural properties over a distance of approximately 6km and would result in inappropriate subdivision in this rural area. This could potentially result in land ownership changes and transition from rural land uses due to the reduced lot sizes. Options 3C, 3AD and 3DC also have higher visual impacts due to imposing a new highway through a landscape that currently has no major road. Option 3AD and 3DC would have major visual impact on properties located in Robson Road.

Options 3A, 3B and 3C were also considered to have lower economic impacts by impacting less agricultural land.

Traffic and Transport

All alignment options perform equally well in terms of road safety. New railway crossings would be required for Options 3A, 3B and 3DC. Options 3AD, 3DC and 3C create new intersections between local roads and the highway. Overall, Option 3C was considered to have marginally less impact than Options 3A and 3B.

Cultural Heritage

A key consideration in the selection of a proposed alignment was cultural heritage values.

Sisters Rocks is a ceremonial Aboriginal heritage site (although not listed on the Aboriginal Heritage Register) located adjacent to the intersection of the existing highway and London Road. Sisters Rocks also have historical cultural significance and it is listed on the DSE heritage register.

There is a visual connection between Sisters Rocks and the Black Range located to the south-west and outside the Project area. This view has high Aboriginal cultural significance.

Pleasant Creek also has significant Aboriginal cultural value and there is potential for other significant sites, such as mortuary trees and burnt mounds, to be located in the area west and south-west of the alignment.

Options 3C, 3AD and 3DC were rated as having the highest potential impact of the options on Aboriginal cultural heritage values due to the creation of a major new road through the landscape. This would impact on the visual connection between Sisters Rocks and Black Range.

Options 3C, 3AD and 3DC were also considered to have a higher potential to intersect more large old hollow bearing trees and therefore have a higher potential risk of encountering Aboriginal mortuary trees. Options 3AD and 3DC require a new crossing of Pleasant Creek which would also impact on Aboriginal cultural heritage values.

Options 3A and 3B are immediately adjacent to Sisters Rocks. However it was assumed that the footprint would be constrained through this area with a narrow median to reduce impacts to the vegetation on either side of the alignment which would also reduce the potential impact on Sisters Rocks.

Overall, whilst Options 3A and 3B are located close to Sisters Rocks they are considered to have lower potential negative impacts on Aboriginal Cultural Heritage by following the existing Western Highway alignment.

Catchment Values

Options 3C, 3AD and 3DC were considered to have higher impacts on soils and geology due to the need for new crossings of Pleasant Creek and several of its tributaries. Options 3A, 3B and 3DC do not cross Pleasant Creek as it runs to the west of the existing highway.

All options have minor potential impacts on waterway health by crossing watercourses with low habitat quality. Option 3C was also considered to potentially exacerbate flooding and is least preferred. The other options could not be differentiated in relation to potential impacts on surface water.

Overall, Options 3A, 3B and 3C were considered to have the lowest impact on catchment value as they do not require a new crossing of Pleasant Creek.

Zone 3 Conclusion

Option 3B was recommended as it was considered to have lower potential impacts on cultural heritage, social, visual and land use values than Options 3C, 3AD and 3DC. Option 3A however, was considered to have only marginally higher impacts overall than 3B due to potential impacts on vegetation near Churchill Crossing Road.

A key consideration of the options assessment for Zone 3 was the potential impacts to areas of significant Aboriginal cultural heritage value. Options 3A and 3B had the lowest potential impacts on Aboriginal cultural heritage values by following the existing highway, which reduces potential impacts on the visual connection between Sisters Rock and Black Range. The construction footprint was constrained from the outset of considering alignment options to avoid direct impact to Sisters Rocks.

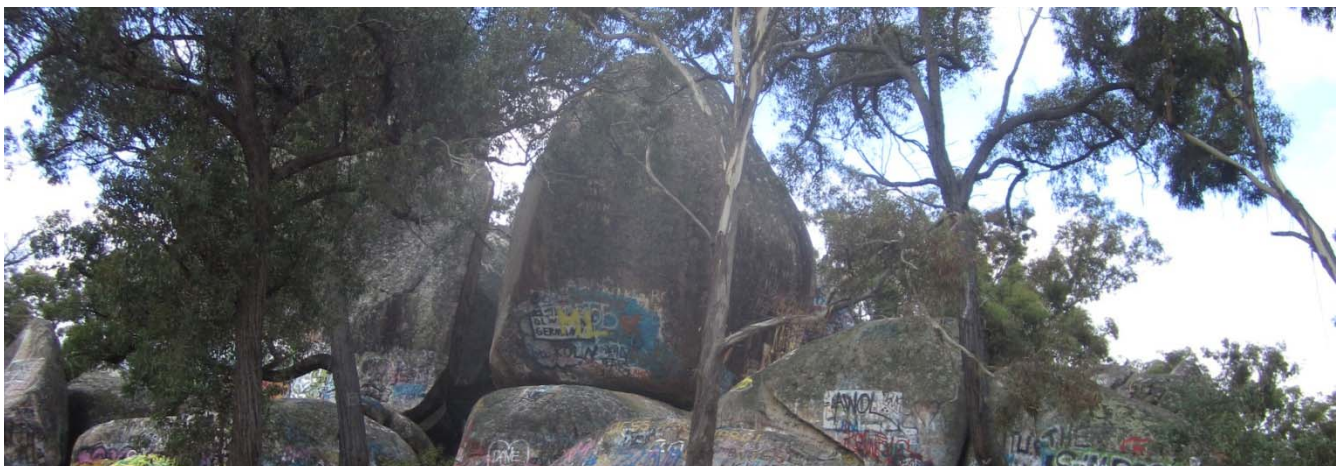
Overall, the options all have impacts to flora and fauna values as they are located either in or adjacent to the road or railway reserves, or involve a new waterway crossing.

Options 3A, 3B and 3C have higher potential impacts to the nationally listed Trailing Hop-bush, whereas Options 3AD and 3DC would have more impact to scattered Large and Very Large Old Trees and require a new crossing of Pleasant Creek.

It was considered that through further alignment refinements in detailed design the impacts to flora and fauna values could be reduced. Also, a translocation plan could be implemented to further minimise the impact on Trailing Hop-bush.

Options 3A and 3B were considered to have lower social and economic impacts than the other options by impacting less agricultural land and resulting in less land severance.

The shortlisted and recommended options in Zone 3 are shown in Figure 5-8.



Sisters Rocks

Table 5-10 Summary of Potential Impacts for Zone 3

		Option 3A	Option 3AD	Option 3B	Option 3C	Option 3DC
Approximate Land Acquisition (ha)		68.7	171.7	57.2	76.9	109
Directly Impacted Buildings		NA	1 house	NA	NA	1 house
Distance to and number of residential dwellings		5 within 150m	3 within 150m	7 within 150m	5 within a 150 - 500m	2 within 150m
Native Vegetation		Area (ha)				
High Conservation Significance		0.1	4.7	0.1	0.2	4.2
Very High Conservation Significance		45.2	40.8	39.9	37.3	15.6
EVC (Bioregion)	Conservation Status	Area Impacted (ha)				
CGW (Central Victorian Uplands)	Endangered	1.2	2.8	0.4	2.8	2.8
CGW (Wimmera)	Endangered		0.4			0.4
GW (Central Victorian Uplands)	Endangered		4.1		7.7	3.6
GW (Wimmera)	Endangered		5.0		0.2	4.2
HW (Central Victorian Uplands)	Depleted	32.1	25.5	30.8	21.9	4.5
HW (Wimmera)	Depleted		0.4			
PGW (Central Victorian Uplands)	Endangered	10.3	4.0	7.6	3.3	0.9
PGW (Wimmera)	Endangered	1.6	3.3	1.6	1.6	3.3
RS (Central Victorian Uplands)	Endangered		0.2			0.2
Total Potential Native Vegetation Loss (ha)		45.5	45.7	40.5	37.5	20.0
Large old (LOT) and Very Large Trees (VLOT)		LOT: 5 VLOT: 8	LOT: 11 VLOT: 11	LOT: 11 VLOT: 11	LOT: 11 VLOT: 4	LOT: 6 VLOT: 3
Heritage Values		Sisters Rocks – Historical and Aboriginal significance	View between Sisters Rocks and Black Range has high Aboriginal cultural heritage significance	Sisters Rocks – Historical and Aboriginal significance	Sisters Rocks – Historical and Aboriginal significance	View between Sisters Rocks and Black Range has high Aboriginal cultural heritage significance
Number of Waterway Crossings		7 significant waterway crossings 6 minor crossings	5 significant waterway crossing 29 minor crossings	5 significant waterway crossings 7 minor crossings	4 significant waterway crossings 15 minor crossings	4 significant waterway crossings 19 minor crossings

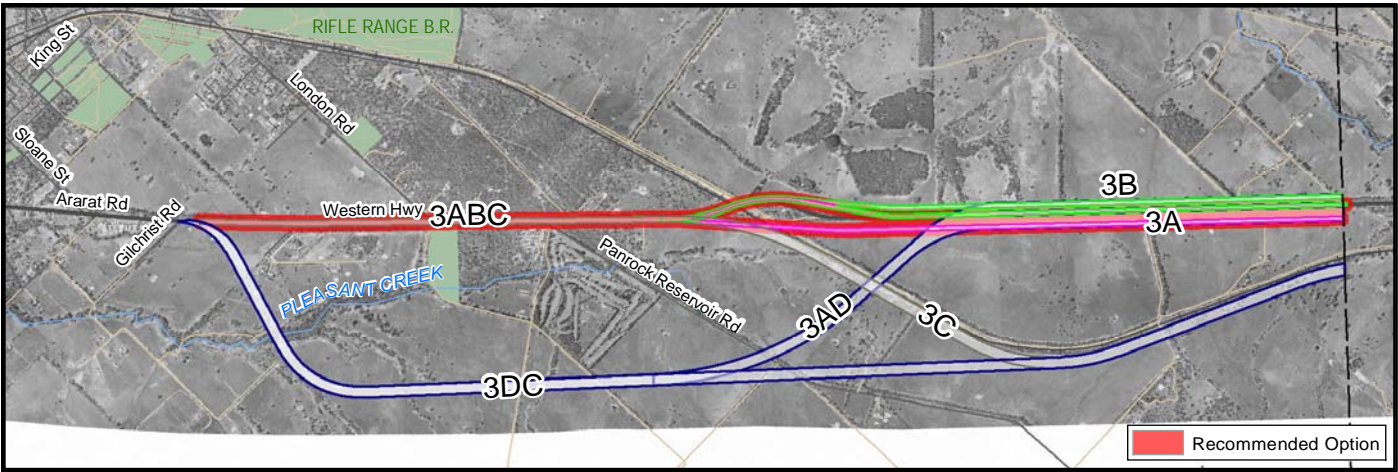


Figure 5-8 Zone 3 Shortlist and Proposed Option

5.5.4 Final Alignment Option

The objective of the Phase 2 assessment was to identify a recommended option in each zone that balanced the impacts to biodiversity, social and cultural heritage values.

The recommended options within each zone were connected to provide one complete alignment option (the proposed alignment) that extended from the start to end of the Project area.

In order to balance the impact on the competing factors, the alignment selected was one which primarily follows the existing highway on either side of Great Western and includes a bypass of the town to the north-east.

The proposed option for Section 3 was a combination of Option 1A and 1E for Zone 1, Option 2B (providing an eastern bypass of Great Western for Zone 2) and Option 3B for Zone 3.

This proposed alignment was further assessed in Phase 3 and alignment refinements identified to reduce potential impacts. This resulted in changes to the final proposed alignment, particularly in Zone 3 where an altered version of 3A was adopted which avoided impact on roadside vegetation. The alignment changes are described in Section 5.7.

The preferred alignment is shown in Figure 5-9 and is described in detail in Chapter 6 (Project Description).

5.6 Phase 3: Environmental Risk Assessment

In January 2012, a detailed Environmental Risk Assessment Workshop was held with specialists to identify potential risks associated with the proposed alignment identified in Phase 2.

Whilst risks were broadly considered with the impacts of alignment options, a detailed risk assessment was undertaken for the proposed alignment in Phase 3.

A detailed risk assessment was undertaken to identify the activities that could lead to pathways which impact on environmental, social or economic values of the Project area. The risk assessment was used as a tool to identify potentially significant risk events for more detailed assessment of impact and mitigation measures. The process enabled activities and events with relatively high levels of risk to be prioritised from those with a lower level of risk or which were easily managed.

The impact assessment then verifies the impact pathway, considers and evaluates the measures available to mitigate the effect, reviews the probability of the effect materialising through the pathway, and determines the net impact from the pathway. The purpose of the impact assessment is to draw conclusions, on balance, as to the likely

impacts of the Project in the context of existing conditions and identified measures available to mitigate likely impacts.

As many environmental risks are difficult to quantify, a semi-quantitative risk assessment was undertaken. This means that risks have been quantified where possible, however if that was not possible without significant assumptions, then a qualitative assessment has been made by relevant technical specialists.

The scope of the risk assessment included construction and operational risks of the Project in relation to social, environmental and economic values on both a local and regional scale. The risk assessment did not consider risks of project delays or reputational, financial or organisational effectiveness risks posed to VicRoads or the contractor(s) managing or undertaking the Project.

An initial risk assessment was undertaken for each impact pathway as identified by specialists for the proposed alignment for Section 3. This initial rating assumed implementation of the standard VicRoads environmental management procedures and design measures. After each risk was assigned a rating, proportional management and mitigation measures were developed. The risk rating was then re-evaluated, taking into account the additional management and mitigation measures, to identify the residual risk from the Project.

Once a preliminary risk register was completed by each technical specialist, a risk workshop was held to discuss the key risks. This workshop allowed technical specialists from each discipline to collectively discuss risks which were interrelated.

As a result of the outcomes from the Environmental Risk Workshop, alignment refinements were made to the proposed alignment in order to reduce potential impacts.

The risk assessment is presented in a report appended to the EES (refer Technical Appendix Q).

5.7 Refinement of Alignment Post Risk Assessment Workshop

During the Phase 3 assessment and ongoing landowner discussions, it became evident that the potential impact on areas of vegetation and landowner assets could be minimised by refinement of the proposed alignment.

The alignment refinements adopted following the Phase 3 risk assessment and landowner consultation include:

- A key change was made to the proposed alignment north of Great Western in Zone 3. The alignment was altered to adopt Option 3A with a wide median to protect the significant vegetation adjacent to the existing highway and Churchill

Crossing Road. The existing highway would become a southbound carriageway and a new carriageway constructed in cleared farmland to the west. This change was made in consultation with landowners and DSE.

- The alignment crossing the railway north of Great Western was changed to include two new bridges crossing the railway south of Oddfellows Bridge. The existing highway then reverts to a service road and south bound onramp, providing connection to Harvey Lane.
- Narrowing of the construction footprint to:
 - Minimise impacts on existing dams adjacent to the existing highway near Armstrong and Delahoy Road;
 - Minimise potential impacts on vineyards south of Petticoat Gully Road, and south of St Ethels Road;
 - Minimise the impact on an historic homestead south of Delahoy Road;
 - Minimise impacts to vegetation near Sisters Rocks;
 - Minimise impact on significant remnant native vegetation to the north-east and east of Great Western; and
 - Minimise impacts on the Stawell Park Caravan Park and Grange Golf Club.
- The alignment for the bypass of Great Western to the north-east was refined to avoid the old landfill as much as possible whilst also being aligned through areas of the old and existing quarry where native vegetation has already been removed.
- To reduce the width of the cut for the bypass of Great Western, 2:1 batter slopes have been proposed.
- Protection of roadside vegetation (DSE reserve) north of Churchill Crossing Road and London Road by realigning the highway alignment into cleared farmland and excluding the vegetation from the construction footprint.
- Provision of access under the ultimate upgrade (freeway) by designing a new service road between Bests Road and Humphrey Lane to allow for access to Great Western for impacted landowners.
- Changing the design standard from AMP3 to AMP1 for the last length of Section 3 from Harvey Lane to Gilchrist Road.
- Development of an interchange at London Road to provide improved access and meet AMP1 design standards. The interchange was located in cleared farmland to minimise potential impacts on significant vegetation on the western side of the existing highway.

The risk assessment considered a corridor for the alignment options and was therefore conservative in the estimate of vegetation removal. Following the risk assessment the proposed carriageways and service road alignments were determined with the objective to avoid vegetation to the extent practicable through adopting wide medians and service roads set back from the main carriageways.

During the impact assessment the construction footprint and alignment was refined, and the amount of native vegetation proposed to be removed reduced by over 10 ha. However, the amount of vegetation removal proposed for the Project is expected to be further reduced during detailed design because the assessed footprint is still considered conservative.

Refer to Figure 6-1 in Chapter 6 (Project Description) and Technical Appendix A for the proposed alignment that incorporates these refinements.

5.8 Conclusion

As a result of the three phase assessment process and taking into consideration feedback received at community information sessions, VicRoads presents a proposed final alignment for consideration as part of the EES.

The proposed alignment meets Project Objectives and delivers the desired benefits of improved road safety and transport efficiency.

Through the options assessment process, it became evident that the lowest impact option was one which followed the existing road reserve and avoided roadside vegetation where possible.

The proposed alignment utilises the existing highway corridor on either side of Great Western in part to reduce the potential impacts on landowners, Aboriginal cultural heritage values and the environment. The proposed alignment was refined following Phase 3 in order to avoid native vegetation where possible.

A bypass of Great Western is proposed to the north-east. The alignment impacts on a large area of native vegetation of high and very conservation significance. A bypass to the south-west would have less impact on native vegetation, however, have more impact on confirmed and potential Golden Sun Moth habitat and scattered large and very large old trees.

The proposed bypass to the north-east was also assessed as having lower potential social and economic impacts through less land severance; provides better connectivity to Great Western with interchanges on either side of the town, and would not restrict the future growth of Great Western, or place additional pressure upon services proposed by Council due to land severance.

Overall, it was considered that the potential impacts associated with a bypass to the south-west were, on balance, more substantial than the impacts to significant native vegetation from a north-east bypass of Great Western.

A key consideration for selection of the proposed alignment between Great Western and Stawell was the potential impacts to cultural heritage values. Sisters Rocks is a ceremonial Aboriginal heritage site (although not listed on the Aboriginal Heritage Register) that is located adjacent to the intersection of the existing highway and London Road. There is a visual connection between Sisters Rocks and the Black Range, located to the south-west and outside the Project area, which has high Aboriginal cultural significance. Sisters Rocks also have historical cultural significance and is listed on the DSE heritage register.

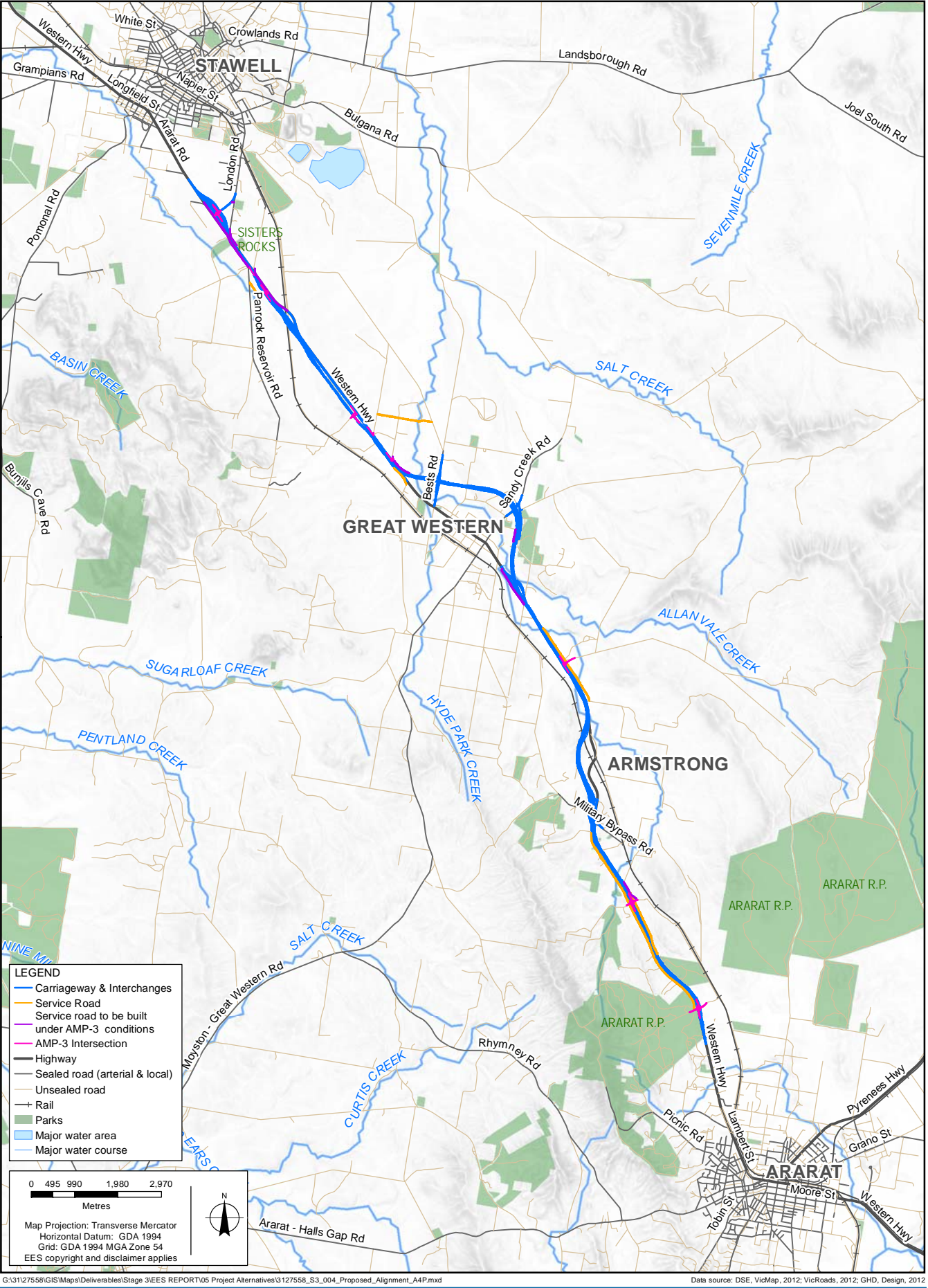
The proposed alignment has lower potential impact on Aboriginal cultural heritage values than the other options as it would minimise the impact on the visual connection between Sisters Rocks and Black Range.

The proposed alignment impacts on areas of native vegetation, however this could be reduced through such measures as adopting minimum median widths between carriageways and restricting the construction footprint in sensitive areas. A conservative footprint was adopted for the alignment options assessment which has been refined through the impact assessment and would be further refined during detailed design.

The proposed alignment is shown in Figure 5-9 and is included in the mapbook contained in Technical Appendix A to the EES.



Western Highway, Armstrong Deviation - looking north



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Data source: DSE, VicMap, 2012; VicRoads, 2012; GHD, Design, 2012

Figure 5-9 Proposed Alignment