Beaufort Bypass Options Assessment Report - July 2019

Contents

Abbreviations/Acronyms

- BoM – Bureau of Meteorology
- CFA – Country Fire Authority
- CSIRO – Commonwealth Scientific and Industrial Research Organisation
- DEDJTR – Department of Economic Development, Jobs, Transport and Resources
- DELWP – Department of Environment, Land, Water and Planning
- EES – Environment Effects Statement
- EPA – Environment Protection Authority
- EPBC Act – Environment Protection Biodiversity Conservation Act 1999
- EVC – Ecological Vegetation Class
- FFG Act – Flora and Fauna Guarantee Act 1988
- OBEM – Objective Based Evaluation Matrix
- PAO – Public Acquisition Overlay
- PRC – Project Review Committee
- RRV – Regional Roads Victoria/ VicRoads
- TRG – Technical Reference Group
- VBA – Victorian Biodiversity Atlas

1. Executive Summary

Purpose of the Report

1. The purpose of this report is to provide an outline of the approach, methodology, investigations and assessment undertaken by VicRoads/Regional Roads Victoria (from here onwards will be referred to as RRV throughout the report) in the selection and determination of its' preferred alignment as a part of the exhibition of Beaufort Bypass EES.

The Project

2. The project study area is located within the Pyrenees Shire Council and to the north of the current Beaufort township. The project study area extends across the north of Beaufort for approximately 11 km from the eastern end to the western end of the Beaufort township.

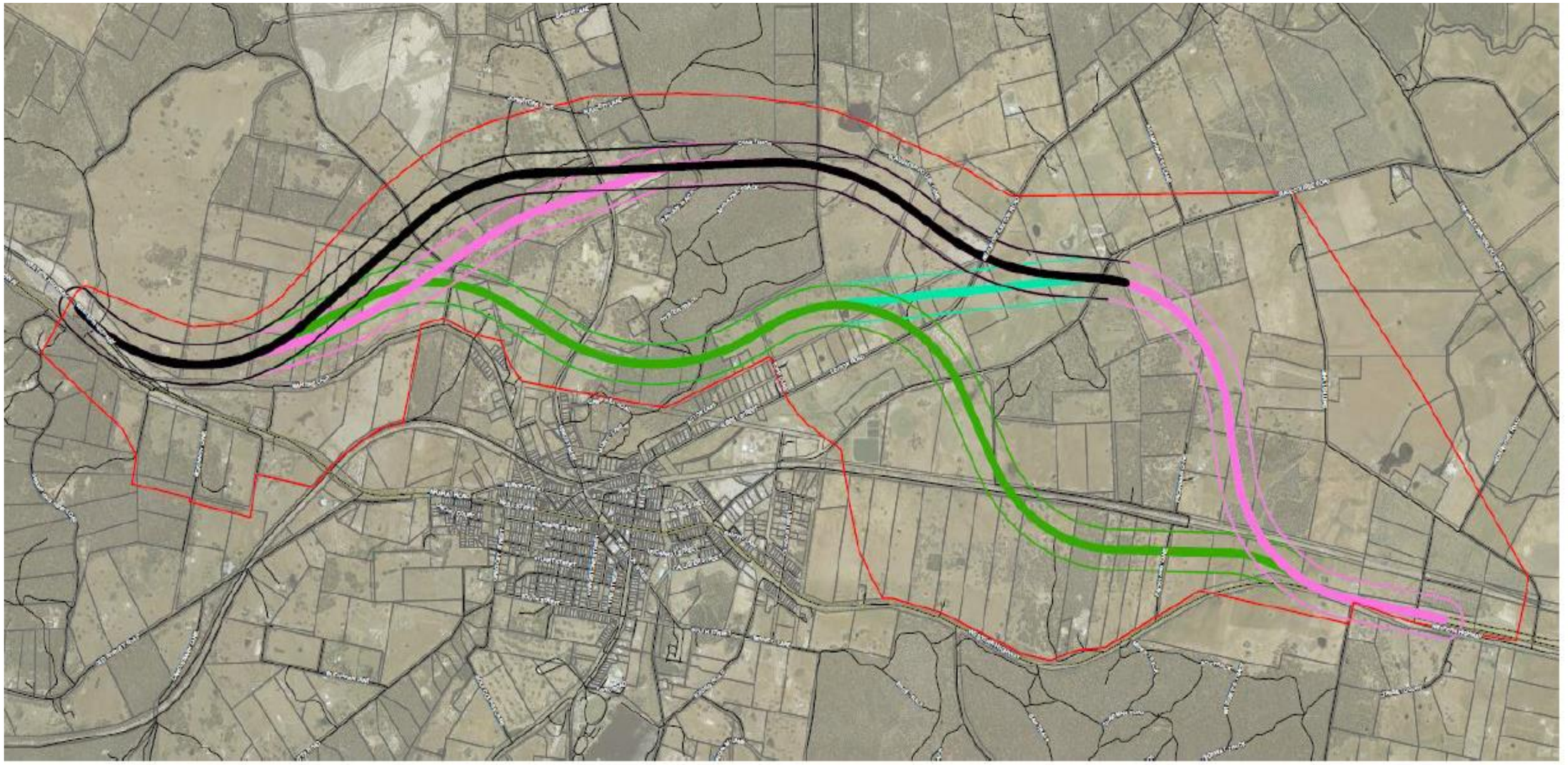
3. RRV's objective for this project and EES is to seek approval of one of four corridor alignments within the study area (the project), each corridor is comprised of a 250 m wide alignment to contain a freeway standard bypass, connecting the two recently duplicated sections of the Western Highway that terminate to the east and west of Beaufort.

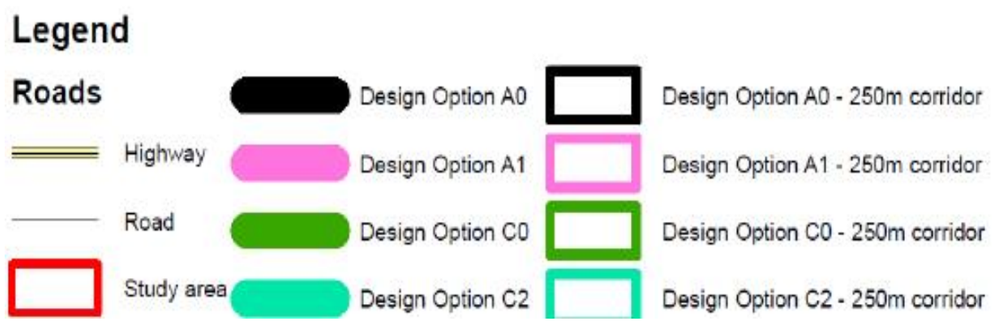
4. These four alignment options being A0, A1, C0 & C2 have been developed for assessment in the EES. The ultimately approved alignment would be constructed under a Design and Construction or Construction contract administered by a superintendent at RRV, following a competitive tender process.

5. The approved corridor would provide for the construction of a new duplicated section of the Western Highway (dual carriageway, interchanges to connect the Beaufort township to the Western Highway, several waterway crossings, an overpass of the Melbourne – Ararat rail line and intersection treatments of local roads) to bypass the town of Beaufort, linking the completed sections of the Western Highway duplication project to the east and west of Beaufort. Further details on the descriptions and key features of the 4 alignment options are provided in Section 2.3.

6. The map below provides an outline of the project area and the locations of the 4 alignment options.

map 1 Beaufort Bypass Project Area and Alignment Locations





How were the Assessment Criteria Selected?

7. To identify criterion to be used in the assessment and selection of the preferred alignment for the Beaufort Bypass a two-step approach was undertaken to select the key criteria for inclusion in the Revised Options Assessment Matrix.

Revised Options Assessment Matrix

8. Step one involved a detailed review of the primary project objectives and the EES scoping requirement and how these objectives assist or do not assist RRV in the selection of the preferred alignment.

9. Based on the review it was concluded that the RRV project objectives associated with "*Improve freight movement and efficiency", "Improve road safety within the township and arterial road network"* and *"Improve access to markets and the competitiveness of local industries"* did not assist in the selection of a preferred alignment due to the impacts/benefits of these 3 objectives being the same or similar across the 4 alignments.

10. The "Improve amenity within the township" objective, however, was considered to assist with the selection of the preferred alignment, particularly the components associated with the potential transferred of impacts to properties, landowners and other sensitive receptors near the 4 alignment options that previously were not impacted by the existing Western Highway.

11. The following EES scoping objectives were considered to fully or partially assist RRV in the selection of the preferred alignment:
    - Biodiversity;
    - Catchment Values and Hydrology;
    - Cultural Heritage (Aboriginal and Historic);
    - Social and community;
    - Amenity; and
    - Landscape and Visual.

12. The following EES scoping objectives were considered not to assist RRV in the selection of the preferred alignment:
    - Road Efficiency, Capacity and Safety;
    - Land Use and Planning;
    - Environmental Management Framework; and
    - Sustainable Development.

13. For further details please refer to Section 5.3 and Table 6 – RRV Project Objectives and EES scoping Requirement Assessment.

14. Step two involved the identification, justification and selection of assessment criterion that aligned with the project and EES objectives identified in step 1. Based on this assessment, the following key assessment criterion were selected:

    Environmental

    - Extent of native vegetation to be cleared (all classes) per alignment;
    - Threatened vegetation communities within alignment corridor;
    - Wild life corridor/connectivity impact;
    - Strategic Biodiversity Value Score per alignment by EVC conservation Status;
    - Condition score of native vegetation to be removed per alignment by EVC Conservation Status;
    - Construction within floodplains.

Social

- Impact on number of known or registered sites by proposed alignment;
- Acquisition and property impacts;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass;
- Air quality impacts;
- Visual Impact – Number of dwellings within 500 m of proposed alignment.

Economic

- Construction cost per alignment.

15. For further details please refer to Section 5.4 and Table 7 – Assessment Criteria Justification.

The Impact Evaluation and Scoring Framework.

16. A comprehensive impact evaluation and scoring framework was developed as part of RRV's selection of the preferred alignment. The developed evaluation and scoring framework reflect the complex and multi-facet nature of the assessment involved in the selection of the preferred alignment. The inclusion of multiple scoring scenarios and scoring sensitivity scenarios are critical and ensure that appropriate levels of rigour and robustness are considered as part of the assessment. The scoring framework that has been developed will further ensure that a wholistic decision-making process has been undertaken and that no one scoring, or sensitivity scenario will be the primary determining factor in the identification and selection of the preferred alignment.

17. Six scoring scenarios and 3 scoring sensitivity scenarios were developed specifically for the project. An overview of the 6 scoring and 3 sensitivity scenarios are outlined below:

- Scoring scenario 1 – Apply a score of 1 to 4 from least to highest impact;
- Scoring Scenario 2 – Alignment with the highest number of least impact score;
- Scoring Scenario 3 – Apply a scoring of 1 to the highest impact and then subtract the % difference between the remaining alignments;
- Scoring Scenario 4 – Apply a scoring of 1 to the least impact and then add the % difference between the remaining alignments;
- Scoring Scenario 5 – Same scoring system as Scenario 3 but minus criterions that can be mitigated and biodiversity impacts that are not vulnerable or endangered;
- Scoring Scenario 6 – Same scoring system as Scenario 4 but minus criterions that can be mitigated and biodiversity impacts that are not vulnerable or endangered;
- Scoring Sensitivity Scenario 1;
- Scoring Sensitivity Scenario 2;
- Scoring Sensitivity Scenario 3.

18. For further details please refer to Section 5.5.

The Assessment and Selection of the Preferred Alignment for the Beaufort Bypass

19. The 4 alignment options (A0, A1, C0 and C2) has been assessed against the 6 scoring scenarios and 3 scoring sensitivity scenarios. For further details please refer to Section 6.

20. The outcomes of the 6 scoring scenarios and 3 scoring sensitivity analysis has identified C2 as the alignment option that would result in the least impact overall from an Environmental, Social and Economic perspective. The was due to the C2 alignment having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area;

- The least amount of impact on native vegetation with high conditions to be removed by EVC Conservation Status;
- The least potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

21. Based on the above assessment, RRV concludes that overall the preferred alignment for the Beaufort Bypass project is Alignment option C2.

Overall Scoring Summary

	Scoring Scenario 1	Scoring Scenario 2	Scoring Scenario 3	Scoring Scenario 4	Scoring Scenario 5	Scoring Scenario 6	Scoring Sensitivity Scenario 1	Scoring Sensitivity Scenario 2	Scoring Sensitivity Scenario 3
1	C2: 111	C2: 27	C2: 43.95	C2: 74.12	C2: 19.44	C2: 35.49	C2: 9	C2: 11	C2: 5
2	A1: 123	A1: 22	A1: 44.89	A1: 77.59	A1: 22.70	A1: 42.69	A1: -3	A1: 2	A1: -6
3	C0: 126	C0: 20	A0: 45.85	A0: 81.03	A0: 24.16	A0: 47.74	C0: -5	A0: -3	C0: -9
4	A0: 128	A0: 18	C0: 50.01	C0: 93.98	C0: 27.03	C0: 56.16	A0: -6	C0: -4	A0: -11

	1st Overall
	2nd Overall
	3rd Overall
	4th Overall

2. Introduction

2.1 Purpose of the Options Assessment Report

The purpose of this report is to provide an outline of the approach, methodology, investigations and assessment undertaken by RRV in the selection and determination of its' preferred alignment to take into the exhibition of Beaufort Bypass EES.

2.2 Project Context

As the principal road link between Melbourne and Adelaide, the Western Highway (A8) serves interstate trade between Victoria and South Australia. It is the main road transport corridor through Victoria's western district, supporting farming, grain production, regional tourism and a range of manufacturing and service activities. Over 6,500 vehicles currently utilise the Western Highway, west of Ballarat each day. Of these 6,500+ vehicles, 1,500 are classed as commercial heavy vehicles. These traffic volumes are expected to increase to approximately 7,500 by 2025 and 9,500 by 2040.

RRV have identified the need to upgrade the Western Highway from Ballarat to Stawell to:

- Improve road safety at intersections;
- Improve safety of access to adjoining properties;
- Enhance road freight efficiency;
- Reduce travel time;
- Provide better access to local facilities; and
- Improve roadside facilities.

The Western Highway currently passes through the centre of Beaufort, through the township environment with its corresponding speed restrictions, junctions and road user/ pedestrian interactions. As a result, the overall functionality of the Western Highway is impeded by the obstruction of the Beaufort Township. The overall context of Beaufort as a country town of some 1,100 people represents an important factor in considering the effects of a major transport route making its way through the centre of the settlement area.

Since 2011, RRV has undertaken a number of preliminary investigations for potential bypass alignments around Beaufort to determine the most appropriate start and end points for the Western Highway Duplication project from Ballarat to Stawell. These investigations have identified and documented the Western Highway's approach and exit points that could cater for a future bypass of Beaufort.

These preliminary investigations have considered the possibilities of both the northern and southern bypass alignment including detailed discussions with the Pyrenees Shire Council. Based on these investigations (which are further discussed in detail in Section 2 of the report) it was determined that the area to the north of the Beaufort Township become the focus for further investigations into the bypass of the town.

Overall, it was considered that a bypass to the north of Beaufort was more favourable when compared to the southern bypass for the follow reasons:

- Better alignment with the Pyrenees Planning Scheme;
    - A southern bypass would significantly affect land in the Rural Living Zone south of the township;
    - Impact on the future short-term growth of the township to the south (Clause 21.06-1, Objective 1, Strategy 1.2); and
    - Better land use opportunities for future industry development to the north of the township.
- Shorter travel distance and travel time;
- Lower land severance (including land acquisition); and
- Lower construction cost.

A referral under the Environment Effects Act 1978 for the Beaufort Bypass (with a defined study area north of the township – see below) was submitted to the Minister for Planning in May 2015.

map 2 Beaufort Bypass Study Area

In July 2015, the Minister determined that an EES was required for the Beaufort Bypass as the project has "the potential to result in significant adverse effects on biodiversity, land uses and cultural heritage values".

In January 2017, the Minister for Planning issued the final scoping requirement for the Beaufort Bypass EES. The final scoping requirements defined the following specific matters to be investigated:

- Road efficiency, capacity and safety;
- Biodiversity;
- Catchment values and hydrology;
- Cultural heritage;
- Social and community matters;
- Land use and economic;
- Amenity;
- Landscape and visual;
- Environmental management framework; and
- Sustainable development.

As part of the EES process, a Technical Reference Group (TRG) has been formed and convened by the Department of Environmental, Land, Water and Planning (DELWP) for the project. The membership of the TRG contains the following Local Government and State Government Department/Agencies:

- DELWP – Impact Assessment, Regional Planning and Approvals, Forest, Fire and Region Aboriginal Victoria;
- Heritage Victoria;
- Pyrenees Shire Council;
- Glenelg Hopkins Catchment Management Authority;
- Southern Rural Water;
- Department of Economic Development, Jobs, Transport and Resources (DEDJTR);
- Country Fire Authority (CFA); and
- Parks Victoria.

2.3 The project

The project study area is located within the Pyrenees Shire Council and to the north of the current Beaufort township. The study area extends for approximately 9km from the eastern end to the western end of the Beaufort township.

The project will ultimately involve the construction of a new duplicated section of the Western Highway (dual carriageway, interchanges to connect the Beaufort township to the Western Highway, several waterway crossings, an overpass of the Melbourne – Ararat rail line and intersection treatments of local roads) to bypass the town of Beaufort, linking the completed sections of the Western Highway duplication project to the east and west of Beaufort.

The key RRV objectives for the project are to:

- Improve road safety and maintain the functionality of the town's road network;
- Improve freight movement and efficiency across the road network;
- Improve amenity of the township by removing heavy vehicles; and
- Improve access to markets and the competitiveness of local industries.

The project will ultimately connect the duplicated sections of the Western Highway to the east and west of Beaufort, via a route option to the north of Beaufort that avoids Snowgums Bushland Reserve and cuts through Camp Hill The bypass would include the following key components:

- Designed as a freeway standard bypass;
- Between approximately 10 and 11 km long;
- Designed to 120 km/hr and sign posted to 110 km/hr for its entirety;
- Two tie-in interchanges;
- One road over rail bridge;
- Waterway crossings;
- Diamond interchange to connect with the local road network; and
- Two to three overpass bridge structures over the local road network (depending on the chosen alignment).

In more detail the project proposes:

- Tie-in points to existing Western Highway at the eastern and western ends of the bypass;
- Diamond interchange at existing local road network connection (Beaufort-Lexton Road).

The route option have bridge structures at the following locations:

- Road over rail bridge structure for the Melbourne to Ararat rail line;
- waterway bridge structure over Yam Holes Creek.

Overpass bridge structures for the existing local road network;

- Main Lead Road;
- Beaufort-Lexton Road (diamond interchange);
- Racecourse Road;
- Back Raglan Road (this overpass bridge structure may be removed from the C0 and C2 alignments).

Ancillary components for the project potentially include the planning for:

- utility service relocations
- service roads to provide access to properties and for emergency services
- intersection treatments with local roads (i.e. where entry and exit ramps join with the local roads) – this can include either a standard intersection, roundabout or traffic signals.

Utility services may need to be relocated depending on the alignment route ultimately approved for construction. For any services that require relocation, it would be RRV's preference to locate them within the proposed ROW. Where this is not possible or preferable (for reasons other than RRV's preference) any impacts would be accounted for in the relevant assessments prior to construction and in line with the approval processes of the infrastructure agencies.

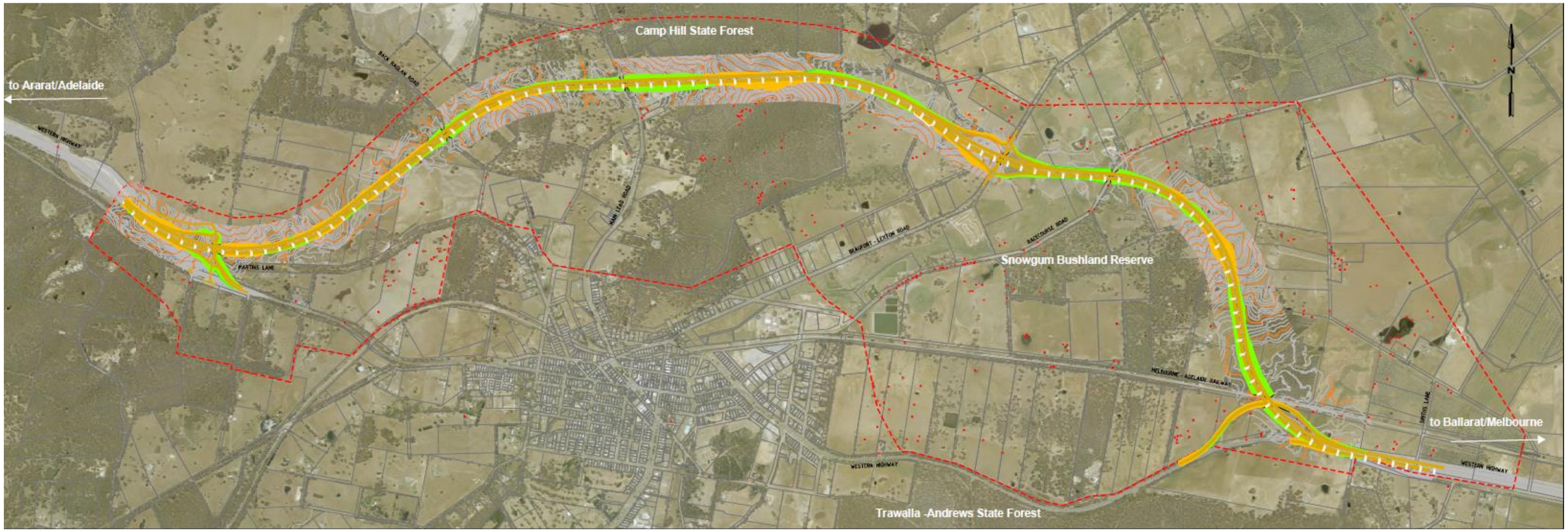
An Access Strategy would be developed and implemented to ensure that access to properties and local roads is retained through the use of service roads, where necessary. Intersection treatments with local roads would be designed appropriate to the traffic volumes. At this stage of planning, the nature and requirement for utility service relocations, service roads or the modification of intersections with local roads has not been determined.

Four alignment options have been developed for the project. The 4 alignments are described below:

Alignment Option A0

The A0 alignment option is 11.2km in length and is the northern most bypass option. From the western tie-in point, approximately 3km from the Beaufort Township, this alignment curves north-northeast. The alignment passes over Main Lead Road then climbs through the State Forrest north of Camp Hill. From here it descends to Beaufort-Lexton Road, before re-joining the Western Highway at its eastern extent, approximately 4.5km from Beaufort. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Melbourne-Ararat train line.

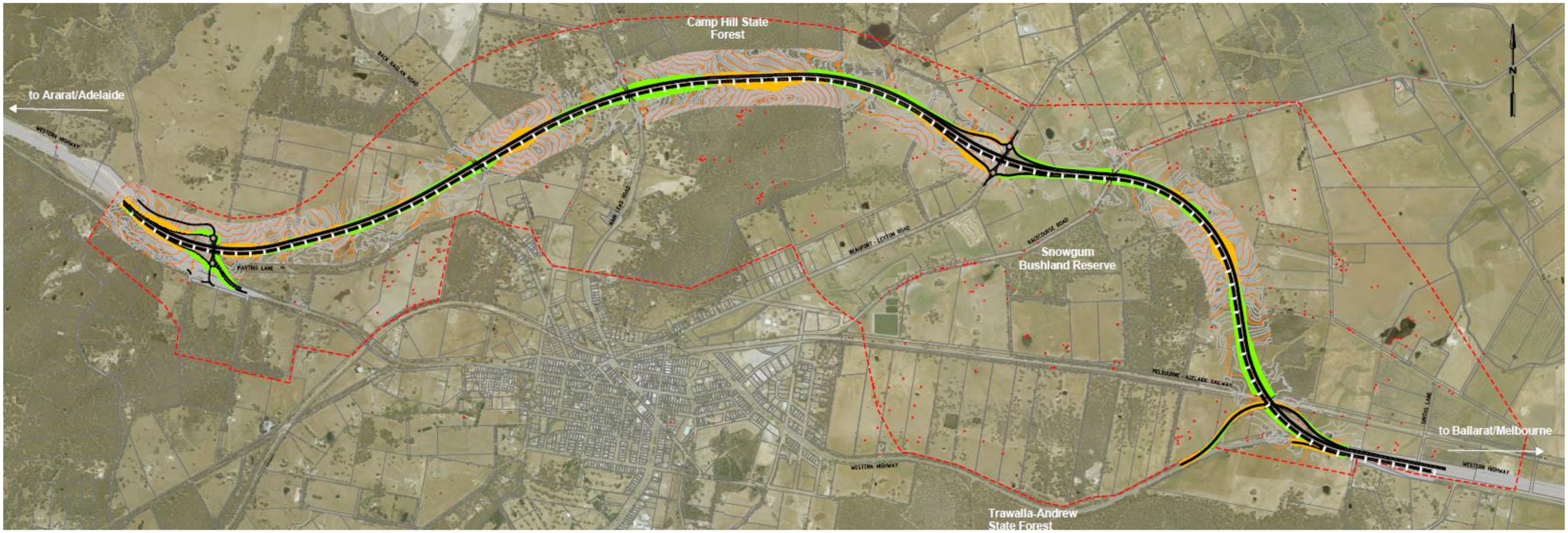
map 3 Alignment Option A0



Alignment Option A1

The A1 alignment option is 11.1km in length. Approximately 3km from the Beaufort Township, this alignment deviates northeast from the Western Highway, staying slightly south of alignment A0 until a point east of Main Lead Road, where it re-joins the A0 alignment. The A1 alignment will re-join the Western Highway approximately 4.5km to the east of the township. Bridges will pass over main Lead and Racecourse Roads, as well as over the Melbourne-Ararat train line.

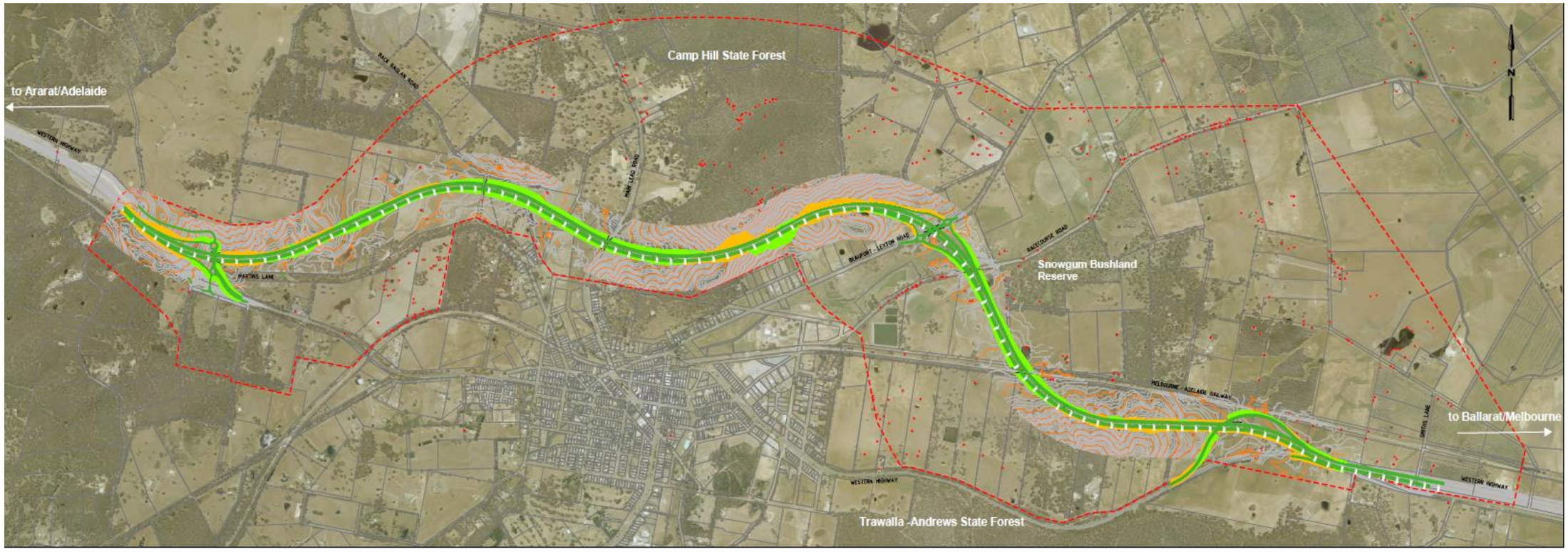
map 4 Alignment Option A1



Alignment Option C0

The southernmost alignment option, C0 is approximately 10.6km in length. The C0 option follows the A0 option from the western tie-in point, approximately 3km from the Beaufort township, before deviating at Back raglan Road in a more easterly direction almost parallel to the existing Western Highway. This option passes close to the north of Camp Hill, before curving south-east to Beaufort-Lexton Road. The C0 alignment will re-join the existing Western Highway approximately 4.5km to the east of the township. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Melbourne-Ararat train line.

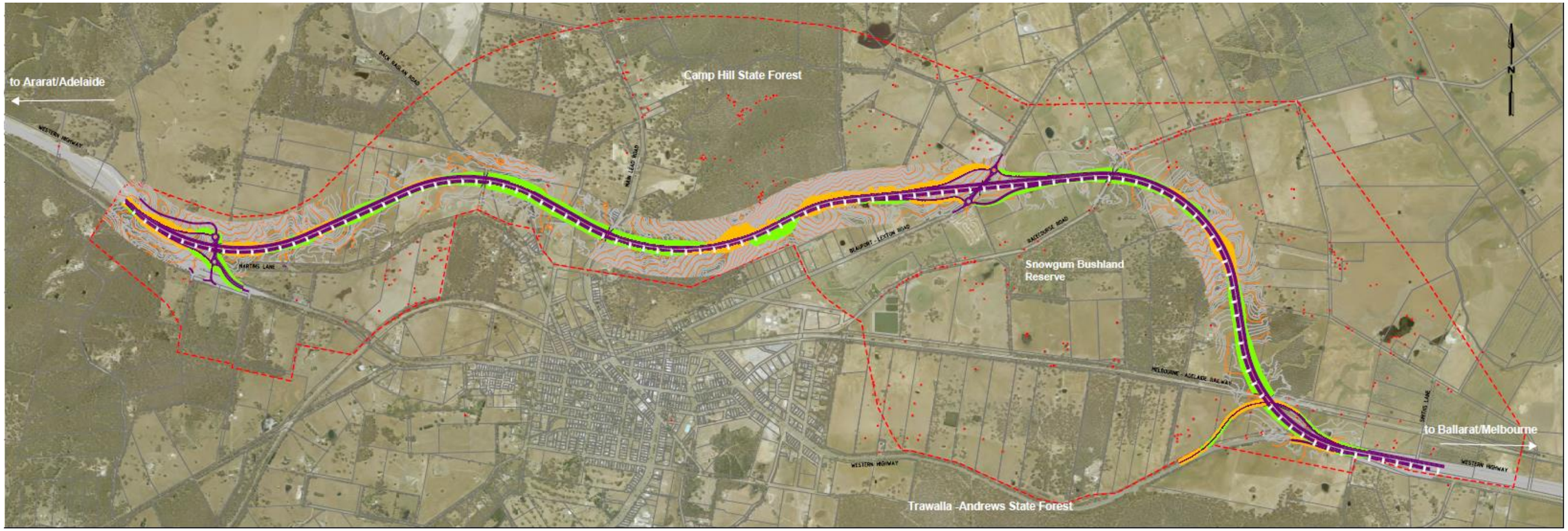
map 5 Alignment Option C0



Alignment Option C2

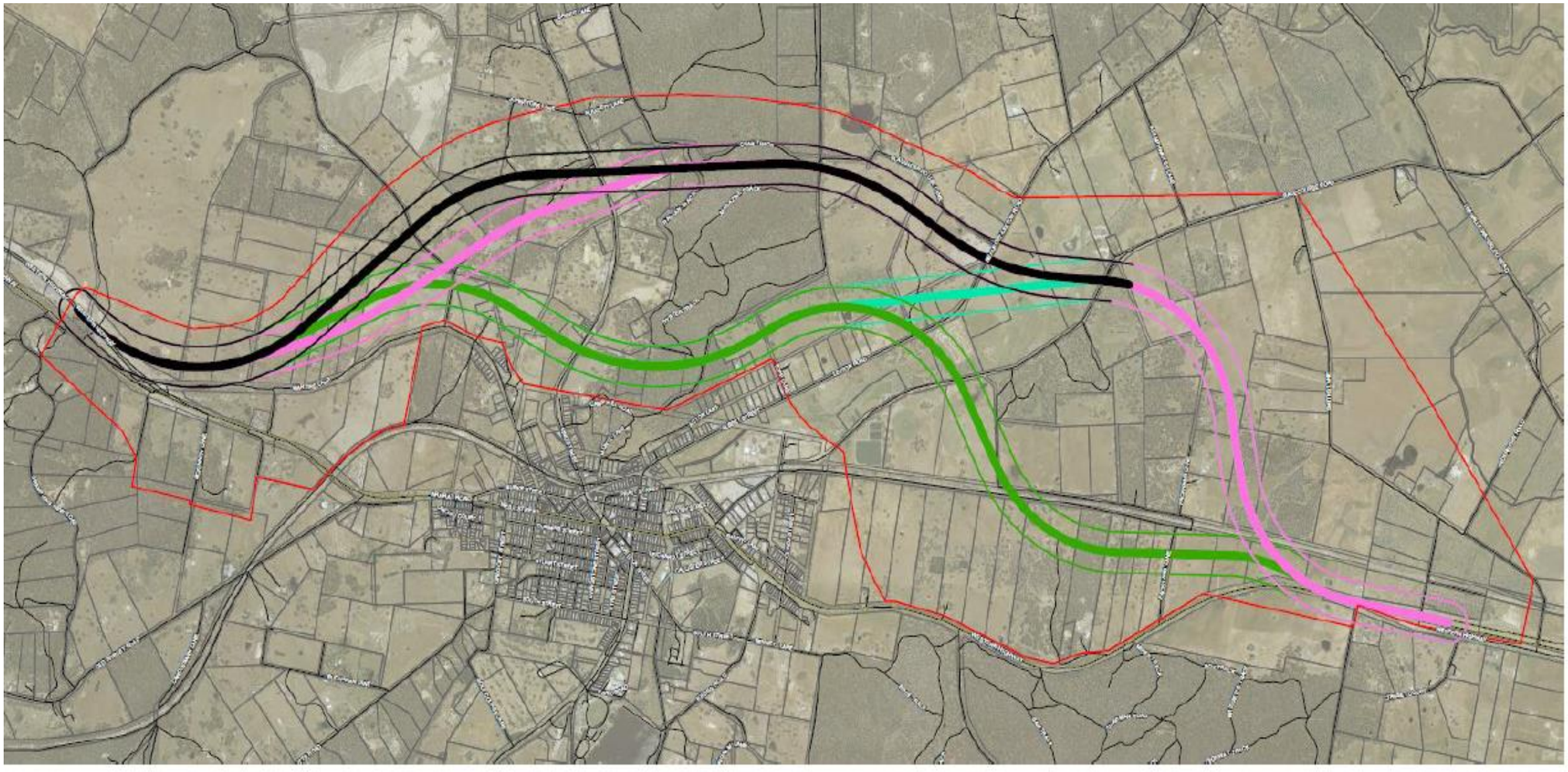
Alignment option C2 is 11km in length and follows the C0 option from the western tie-in point (approximately 3km from the Beaufort township) until Beaufort-Lexton Road, where it continues in an easterly direction and joins the A0 alignment near Racecourse Road. The C2 alignment will re-join the existing Western Highway at the eastern tie-in point, approximately 4.5km from the township. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Melbourne-Ararat train line.

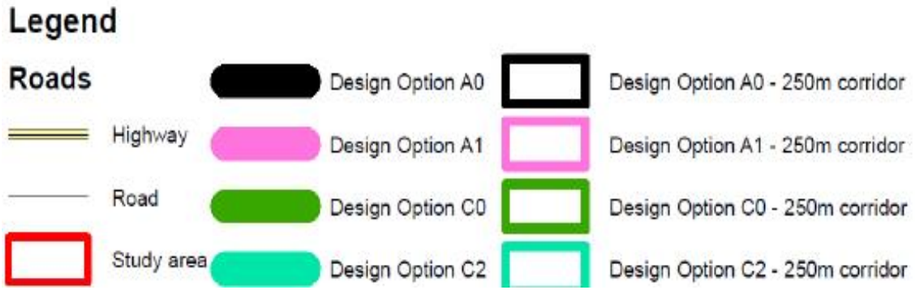
map 6 Alignment Option C2



A map outlining the combined locations of the 4-bypass alignment is also provided below.

map 7 Beaufort Bypass Project Area and Alignment Locations





3. Previous Options Assessment

This section of the report provides an outline of previous bypass options and alternative solutions for Beaufort that have been investigated and considered by both Pyrenees Shire Council and RRV since 2009.

3.1 TTM Consulting 2009

In 2009, TTM Consulting was engaged by the Pyrenees Shire Council to consider the merits of a bypass around Beaufort. The report identified a likely alignment to the north of Beaufort and was informed by consultation, planning, geography, topography and engineering considerations (TTM Consulting, 2009).

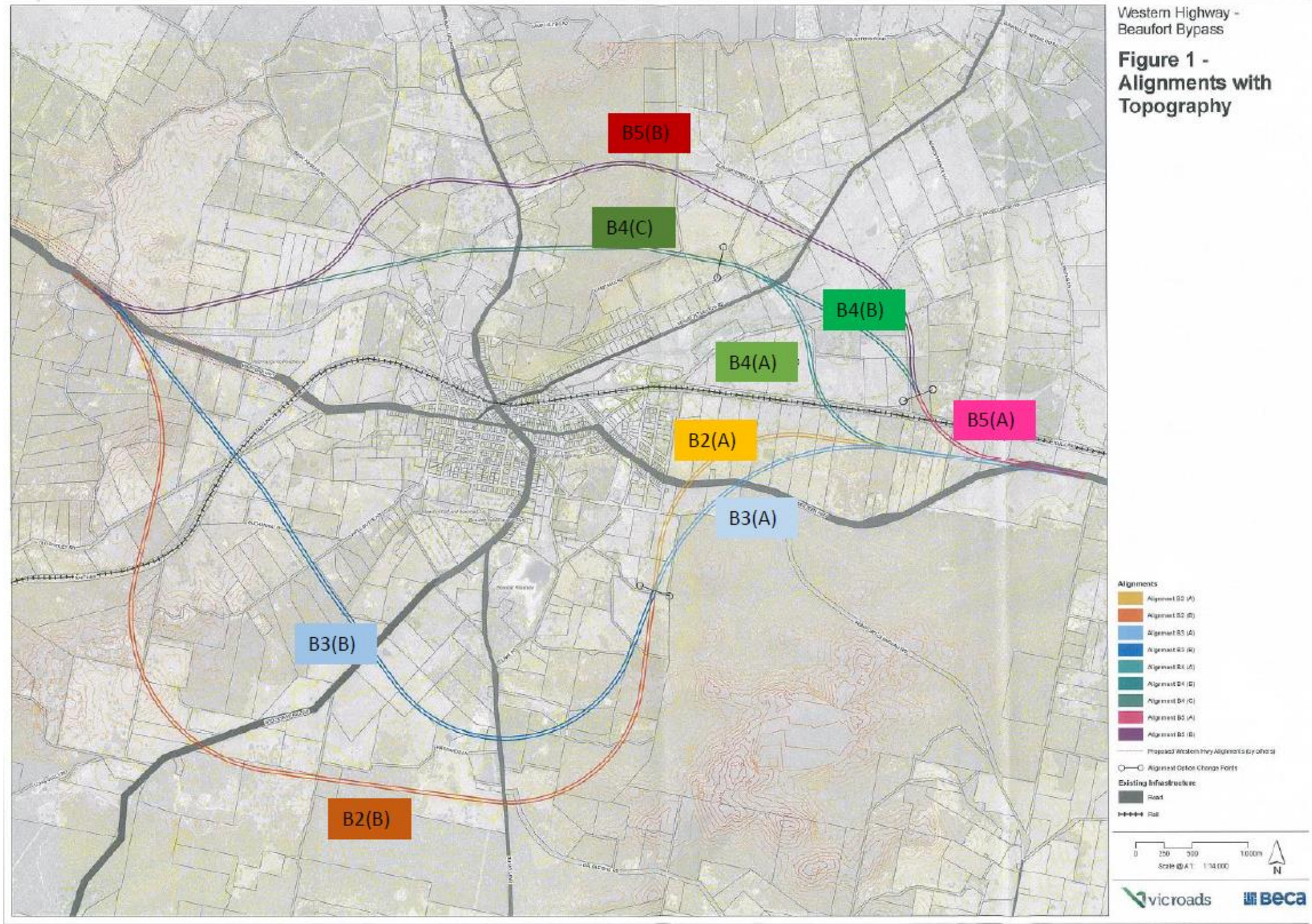
3.2 Beca 2012

In 2012, Beca developed an alignment options report for RRV for the bypass of Beaufort. This report looked at a number of alignments around Beaufort to the north and south, with a tie-in to the existing Western Highway (Beca 2012, p.1) to the east of Beaufort at a location west of Smith's Lane, and to the west of Beaufort at a location east of Grampians View Road.

The report assessed variations on seven alignment options against environment and ecology, community and social, engineering and economic criteria to identify the best performing options. The Beca (2012) report did not recommend a preferred alignment.

The options assessed by Beca (2012) are further discussed below in Table 1 and displayed at Map 8 both of which are extracted from the Beca report.

map 8 Bypass Options considered by Beca



Source: Adapted from Beca, 2012

Table 1 Description of alignment options previously assessed by Beca 2012

OPTION NAME	LOCATION	DESCRIPTION OF OPTION	EXTRACTED COMMENTS FROM BECA (2012) REPORT
B1	Southern option	This option leaves the western highway to the east of Trawalla and travels south of the Camp Hill State Forest, continuing south of the town centre before tying into the western highway east of Eurambeen Streatham Road. The total length of this option is 20 km.	**Eliminated** from further consideration as it was deemed to be excessively long, with higher construction costs and limited connectivity between passing traffic and Beaufort.
B2-A	Southern option	This option leaves the western highway, travels parallel to the Melbourne-Ararat rail line before travelling south and across the western highway. It then runs to the west of the state forest to a point east of the Beaufort Reservoir. The total length of this option is 4.7 km.	Included for assessment.
B2-B	Southern option	This option travels south from a point east of Beaufort Reservoir before turning westward to the south of the town, crossing the Melbourne-Ararat rail line and tying into the western highway at a point west of the Red Kangaroo Roadhouse. The total length of this option is 10.0 km.	Included for assessment.
B3-A	Southern option	This option follows a similar path to that of Option B2-A but travels more westerly than that option before ending at a point east of the Beaufort Reservoir. The total length of this option is 4.4 km.	Included for assessment.
B3-B	Southern option	This option travels south from a point east of Beaufort Reservoir before turning westward to the immediate south of the town, crossing the Melbourne-Ararat rail line and tying into the western highway at a point west of the Red Kangaroo Roadhouse. The total length of this option is 7.6 km.	Included for assessment.
B4-A	Northern option	This option leaves the western highway, travels parallel to the Melbourne-Ararat rail line before travelling north and across the rail line. It then travels immediately east of the sewage treatment plant to a point north of the Beaufort-Lexton Road. The total length of this option is 3.9 km.	Included for assessment.
B4-B	Northern option	This option is a direct alternative to that of option B4-A. It leaves the western highway, travels parallel to the Melbourne-Ararat rail line before travelling north and across the rail line at a point more easterly than that of B4-A. It then travels east of the sewage treatment plant to a point north of the Beaufort-Lexton Road. The total length of this option is 3.7 km.	Included for assessment.
B4-C	Northern option	This option travels from a point north of the Beaufort-Lexton Road and continues to the north of the town before tying into the western highway at a point west of the Red Kangaroo Roadhouse. The total length of this option is 5.9 km.	Included for assessment.
B5-A	Northern option	This option leaves the western highway, travels parallel to the Melbourne-Ararat rail line before travelling north and across the rail line to a point immediately north of the rail line. The total length of this option is 1.75 km.	Included for assessment.

OPTION NAME	LOCATION	DESCRIPTION OF OPTION	EXTRACTED COMMENTS FROM BECA (2012) REPORT
B5-B	Northern option	This option travels from immediately north of the Melbourne-Ararat rail line and continues to the north of the town, more northerly than that of option B4-C before tying into the western highway at the same location as B4-C. The total length of this option is 8.8 km.	Included for assessment.
B6	Southern option	This option followed a similar path to that of Option B3-A and B3-B except that it tied into the western highway between the existing rail bridge crossing and the Old Shirley Road. The total length of this option is 7.3 km.	**Eliminated** from further consideration as it greatly impacted the future short-term growth of the town to the south west.
B7	Through town centre	This option travelled through the centre of the town and utilised the existing western highway road reserve. The existing reserve went someway to accommodate the wider cross section of the Type M alignment however, the existing horizontal geometry was insufficient to accommodate the larger horizontal radii required of a freeway standard alignment. The total length of this option is 5.8 km.	**Eliminated** from further consideration as it would have resulted in significant property acquisition and would have created significant community severance.

3.3 Aurecon 2015

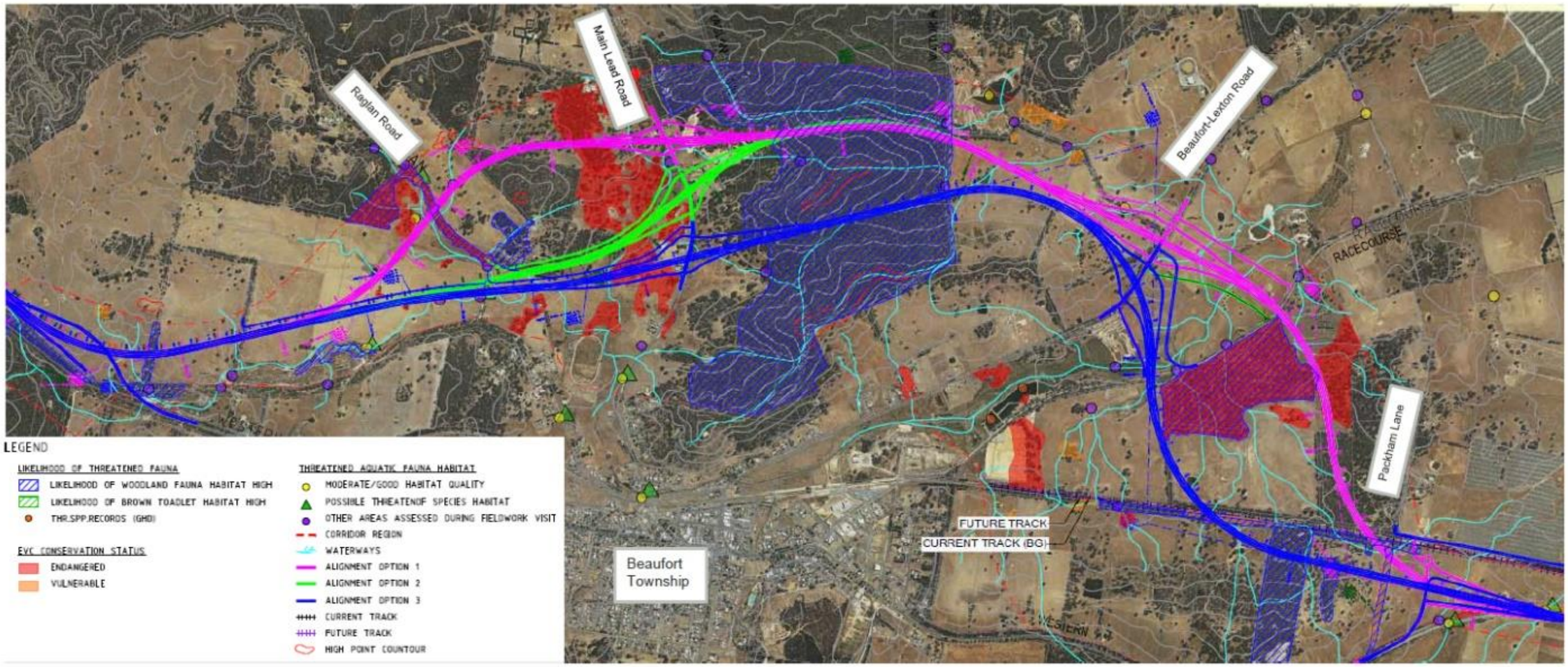
Aurecon undertook an objectives-based evaluation on 3 northern bypass alignment options, further expanding on the options assessment undertaken by Beca in 2012. Aurecon applied the following objectives to Beca's assessment:

- **Principal Objectives**, such as improved freight movement and efficiency, and maintaining road network functionality;
- **Engineering Objectives**, such as maximising safety and efficiency, and minimising earthworks; and
- **Additional Objectives**, such as minimising impacts and cost.

The 3 alignment options considered by Aurecon are outlined below and in Map 9:

- Option 1 (10.5km in length and coloured pink);
- Option 2 (10.3km in length and coloured green);
- Option 3 (10.2km in length and coloured blue).

map 9 Bypass Options Considered by Aurecon

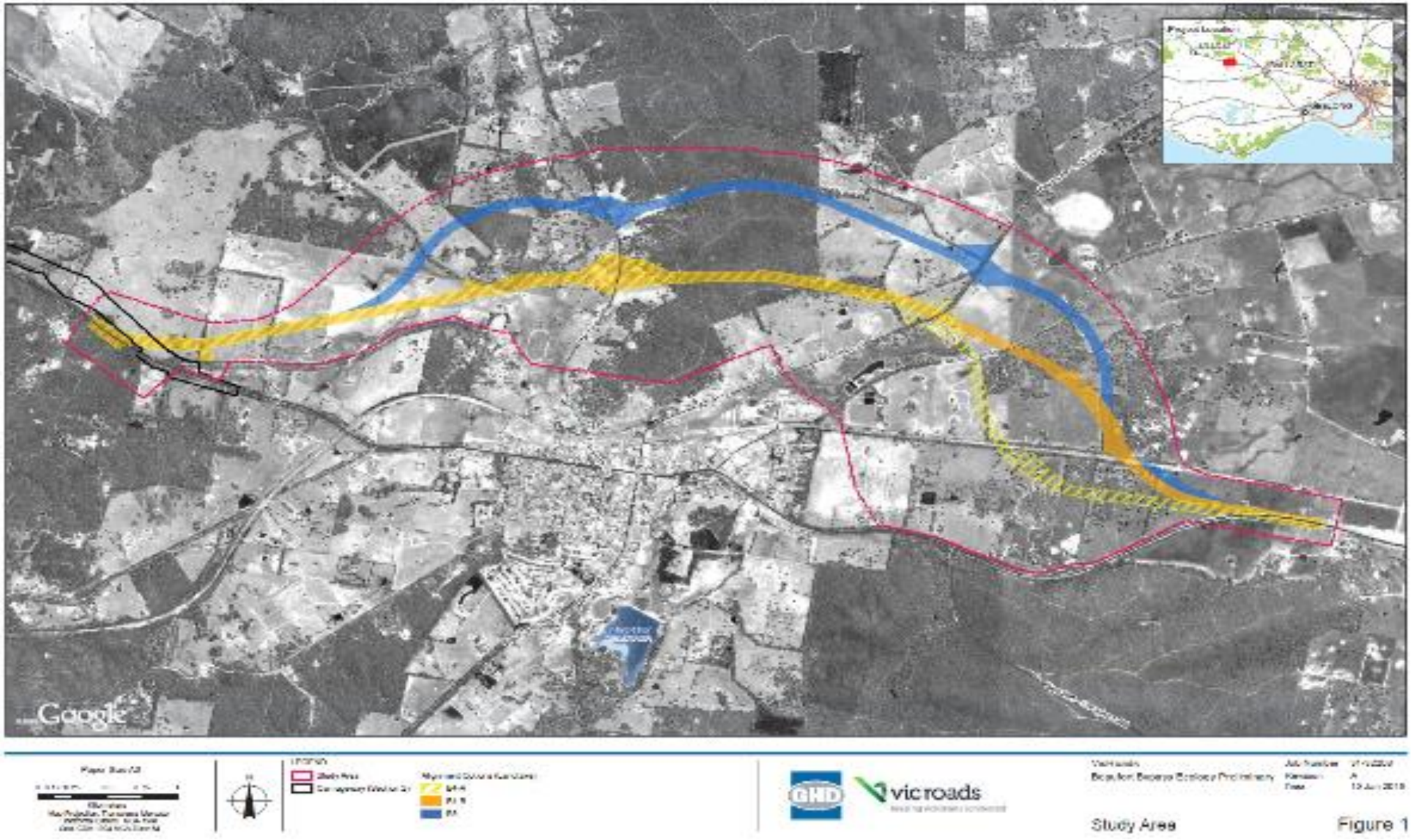


Based on this assessment, Aurecon determined that, whilst all options performed well, Option 2 performed the best overall because of its low ecological impact and high engineering geometry values.

3.4 GHD 2015

GHD in 2015 undertook a flora, fauna and aquatic habitat report to identify the main ecological values present within the study area for the proposed Beaufort Bypass. Three northern alignment options being B4-A (9.8km in length), B4-B (9.6km) and B5 (10.5km) were then assessed against ecological criteria for native vegetation loss, area of habitat for Flora and Fauna Guarantee Act and EPBC Act listed flora and fauna species, and waterway habitat and fragmentation. Each criterion was ranked on a five-level scale ranging from ‘very poor’ to ‘very well’. The assessment indicated that each alignment performed very differently against each of the assessment criterion. All assessment criteria however were not considered to be equal and the report recommended that further work be undertaken require that individual criterion be weighted to determine the greatest impacts on ecological values of each alignment. The assessment further recommended that the information provided within the report be used in a risk assessment to determine the preferred alignment considering ecological and other values within the study area.

map 10 Bypass Options Considered by GHD



3.5 Alternative Project Solutions to a Bypass of Beaufort

In addition to the above studies RRV also investigated alternative transport scenarios and solutions that could potentially be implemented to meet the project objectives for this section of the Western Highway.

The rationale for constructing a bypass of Beaufort necessarily starts with an assessment of the 'no project' option, as well as a consideration of other ways in which the project objectives might be achieved. Below is an overview of the alternative solutions that have been investigated by RRV.

3.5.1. The 'No project' scenario

Section 3.2 of the Scoping Requirements states that the 'no project' scenario should be considered in order to understand the implications of not completing the project, and to provide a baseline for evaluating the relative impacts and benefits for each bypass option.

As outlined in section 1.3 above, the rationale/objectives for the project is to improve:

- Freight movement and efficiency;
- Road safety within the township and arterial road network;
- Access to markets and the competitiveness of local industries; and
- Amenity within the township.

It was concluded that the 'no project' scenario failed to meet any of the above project objectives and that it would permit an existing traffic issue (which was driving the need for the bypass project) to continue. Through traffic, including freight and personal vehicles, would continue to utilise the existing road network in Beaufort as there are no other viable routes. The current route through the centre of Beaufort does not provide sufficient capacity and connectivity and it has the potential to contribute to:

- Accidents between vehicles;
- Pedestrians and vehicles;
- Inefficient freight movement; and
- Loss of town amenity and town centre function.

3.5.2. Alternative solutions

A wide range of alternative strategic solutions to achieve the objectives which underpin the project have been consider by RRV. These alternative solutions are further discussed below.

Alternative transport mode

An alternative transport mode was considered not feasible during the EES assessment for the Western Highway Duplication Project Section 2 - Beaufort to Ararat EES. This was due to 75% of the freight movement between Melbourne and Adelaide being the movement of non-bulk items. There is a need for these items to be collected from, and distributed to different locations, means that there is a need for flexibility to be maintained in the delivery chain which road solutions provide (GHD, 2012). As such this option has not been reconsidered as part of this EES.

Alternative Bypass routes

The EES referral identifies eight potential alignment options. Three preliminary alignment options (B4-A, B4-B and B5) were presented in the referral to be investigated further within the study area. These three options have been refined based on technical specialist input and community feedback. Four options have now been shortlisted for assessment and selection of the preferred alignment which forms part of this options assessment report.

<u>Southern Corridor (2016)</u>

In 2016, WSP undertook a high-level qualitative review and compilation of existing planning, environment and engineering information for the southern alignment options for the Beaufort Bypass. This report found that, although the previous bypass options assessment report, undertaken by Beca (2012), draws on available government environmental data and previous reports, that a separate planning and environment assessment specifically for the area to the south of Beaufort was required.

A Preliminary Environmental and Planning Assessment and pre-qualitative risk assessment were undertaken to investigate the southern bypass alignment options to determine existing environmental and planning values and risks of the bypass to the south of the township. Previous technical investigations for the Beaufort Bypass Project and Western Highway Duplication, were reviewed as part of the assessment. These documents include:

- Western Highway Duplication Project Possible Bypass of Beaufort: Assessment of Potential Impacts and Solutions for Beaufort (TTM Consulting – 2009);
- Beaufort Bypass Geotechnical Desk Study (Halcrow – 2011);
- Alignment Options Report – Beaufort Bypass Western Highway (Beca – 2012);
- Project Review Committee report: Beaufort Bypass – Approval of Investigation Corridor, Objectives and Concept Alignments (VicRoads - 2015); and
- Beaufort Framework Context Report (Hansen Partnership - 2017).

The following publicly available data was also analysed by WSP as part of the Southern Corridor assessment:

- Planning Scheme zones and overlays;
- Relevant legislation, government policy and strategies;
- Environment Protection Authority (EPA) Victoria Priority Sites Register;
- Aerial imagery via Google Earth;
- Australian Soil Resource Information System (ASRIS) (CSIRO);
- Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Search Tool – 10km radius of the study area (Department of the Environment and Energy 2017);
- Department of Environment, Land, Water and Planning (DELWP) NatureKit (previously Biodiversity Interactive Map online database);
- Victorian Biodiversity Atlas (VBA) (DELWP);
- WSP's draft Flora and Fauna Assessment: Existing Conditions report for the Beaufort Bypass;
- publicly available reports;
- Victorian Heritage Database;
- Visualising Victoria's Groundwater (VVG) website;
- Bureau of Meteorology (BoM) climate data;
- Land and Survey Spatial Information (LASSI) – DELWP;
- Australian Bureau of Statistics 2016 census data;
- Victorian Resources Online (VRO) website (Department of Economic Development, Jobs, Transport and Resources (DEDJTR));
- Directory of Important Wetlands (Department of the Environment and Energy);
- Aboriginal Cultural Heritage Register and Information System (ACHRIS) database;
- Native Title Tribunal, search of Native Title Claims and Register.

Specifically, the two alignments considered in the WSP's southern corridor assessment are outlined below. It should be noted that these two alignments are a refinement and update of the B2 and B3 alignments considered in the Beca (2012) assessment.

<u>Alignment D0</u>

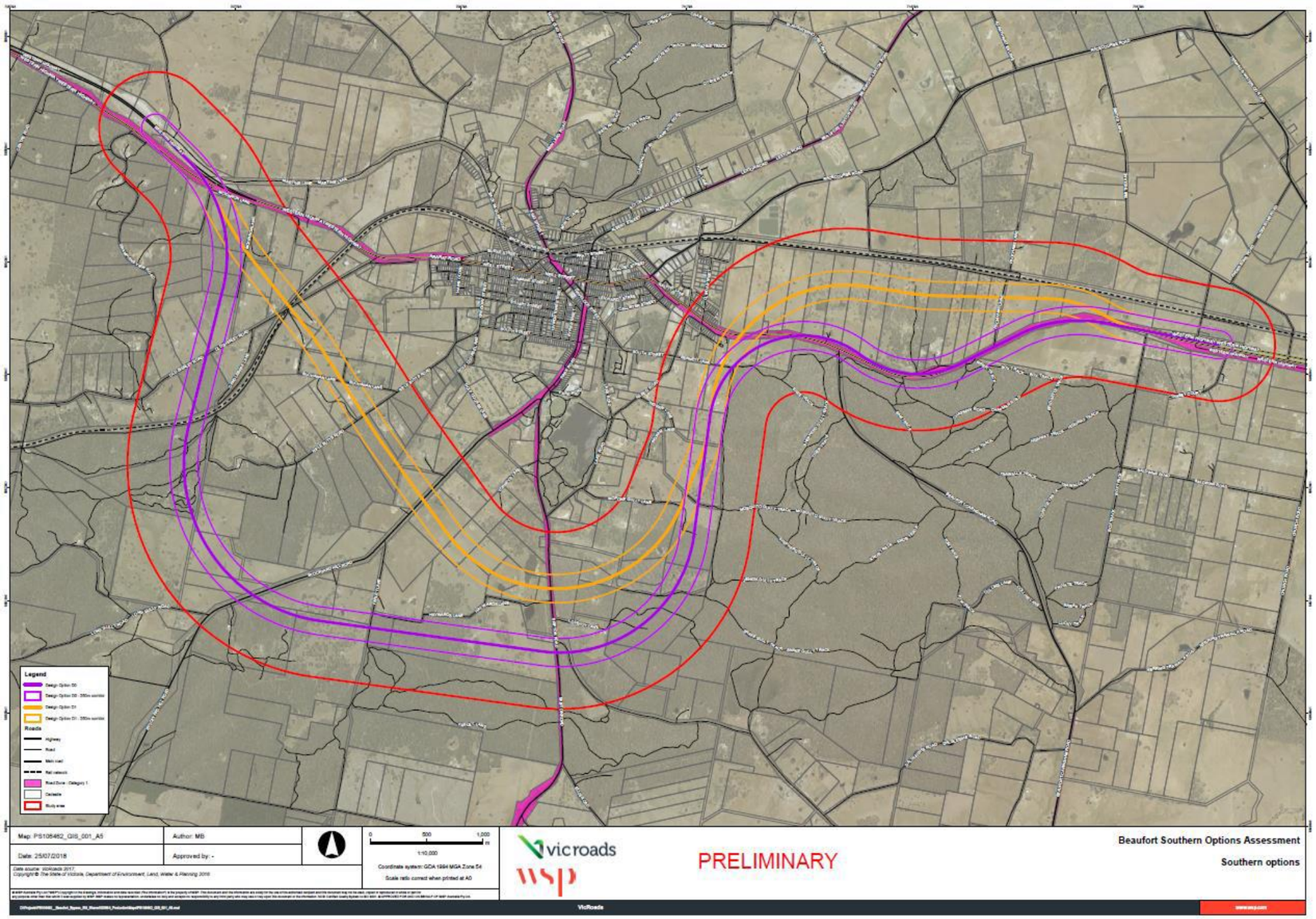
This alignment leaves the existing Western Highway near Martins Lane, approximately 2.5 km to the west of the Beaufort township, and turns south until reaching the Melbourne-Ararat rail line, where it begins to turn in a more south-easterly direction. After Stockyard Hill Road, the D0 alignment heads in an easterly direction, before gradually turning north and running almost parallel to the Trawalla State Forest. This alignment re-joins the existing Western Highway at a point near Beaufort-Carngham Road, approximately 2 km east of the township. The D0 alignment is approximately 15.2 km in length.

Alignment D1

The D1 alignment leaves the existing Western Highway at the same point as the D0 alignment, however, this alignment heads in a south-easterly direction until Skipton Road, where it gradually turns north and runs almost parallel to the Trawalla State Forest. This alignment passes over the existing Western Highway and runs in an easterly direction, before re-joining the Western Highway near Box Track, approximately 4.5 km east of the township. The D1 alignment is approximately 13 km in length.

Map 11 below provides an outline of the locations of alignment D0 & D1.

map 11 Southern Bypass Alignment D0 & D1



The WSP assessment identified several high risks that would impact the feasibility of the D0 & D1 alignment options proceeding. These high risks were associated with the high amount of property acquisition that would be required along both alignments and the high amount of vulnerable and endangered native vegetation that would be removed. Other high risks associated with alignment D0 & D1 includes the impacts on areas identified for future low density residential development and its proximity to a comparatively high number of sensitive receptors (houses).

Specifically, the D0 alignment corridor, due its overall length of 15.2 km, is unable to provide any time savings and therefore does not meet the project objectives of improving freight efficiency, road safety, market access and amenity within the Beaufort township. The D1 alignment corridor, with an overall length of 13 km, will achieve minor travel time savings of 59 seconds for light vehicles and 20 seconds for heavy vehicles. However, these travel time savings are significantly less than the time savings for the A0 alignment (the longest northern corridor alignment option at 11.2 km in length), with savings of 1 min 57 sec for light vehicles and 1 min 25 sec for heavy vehicles.

Additionally, the WSP assessment also found that the D1 alignment would:

- Impact on a significantly larger area of groundwater dependant ecosystems, when compared to the northern options;
- Potentially removes 67.43 ha of endangered and 9.28 ha of vulnerable EVCs. While this is comparable to the northern corridor options, the D1 alignment corridor has the potential to remove a total of 212.13 ha of EVCs. In contrast, the northern corridor options have the potential to remove between 116.52 to 147.23 ha in total of EVCs;
- Potentially affects 197.46 ha of rural living zone and limits the future growth of the town by impacting the ‘amphitheatre’ feel south of Beaufort;
- Is not consistent with the strategic planning policy and is not supported by the local council; and
- Is within 850 m of, and has the potential to impact on, ten (10) significant community facilities. These sensitive receptors include the Caravan Park, Primary and Secondary School, Beaufort Lake, Kindergarten and Early Childhood Centre, Recreation Reserve, Cemetery, Swimming Pool and Community Church.

Based on the above assessment, the two southern bypass alignment options of Beaufort were not considered feasible to be considered as part of this EES.

4. Current Options Assessment Process

In addition to the previous investigative work outlined in Section 3 of the report, RRV has been undertaking further investigations into road corridor options (250m wide) within the study area to the north of the Beaufort township since October 2016. The purpose of these further investigation is to focus on specific alignments (or a single specific alignment) to progress through to public engagement/consultation and the EES assessment and the application of a Public Acquisition Overlay (PAO). This approach allows for detailed studies to be focused on the feasibility and constructability of the preferred alignment or alignments instead of looking at the entire area of interest.

This section of the report provides an outline of the 3-phase process that has been undertaken by RRV in the development of alignment options for the Beaufort bypass, its refinements and the identifications, assessment and selection of the preferred alignment. The 3-phases include:

- Phase 1 – Concept Alignment Development;
- Phase 2 – Option Development and Assessment;
- Phase 3 – Identification of Preferred Alignment.

The terms of the EES Scoping Requirements prescribe an integrated assessment of environmental effects to be undertaken by RRV, with appropriate consideration provided to the assessment of alternative alignments. The development and assessment of alignment options for the Beaufort Bypass is being undertaken in three phases, as illustrated in Diagram 1 below. This integrated approach enabled RRV to ascertain which alignment option achieves the most appropriate balance between positive and negative impacts

Diagram 1 below provides a conceptual overview of this 3-phase process.

Diagram 1 Options Selection Process

Phase 1 - Concept Alignment Development
Concept Alignment Development – Trimble (220 + design options) Bypass Corridor Seed Options and Micro-Siting and Refinement (identification of 3 distinct bypass Corridors) Road Bypass Route Options for Community Engagement (3 bypass route)

Phase 2 - Option Development and Assessment
Community consultation (Options A, B, C)
Three to Eight Alignment Options (A0, A1, B0, B1, B2, C0, C1 & C2)
Concept Design & Feasibility Workshop to test 8 Bypass Options
Eight to Four Alignment Options (A0, A2, C0 & C2)
Community Engagement (4 bypass options)

Phase 3 - Identification of Preferred Alignment
Risk Assessment Workshop
Objective Based Evaluation Matrix Assessment (A0, A1, C0 & C2)
Undertake Revised Options Assessment Matrix
Presentation of Revised Options Assessment Matrix to Technical Reference Group
Undertake Revised Options Assessment Matrix Workshop with Internal Specialist
Legal Review of Revised Options Assessment Matrix
Selection of preferred Alignment

4.1 Phase 1 - Road Alignment Investigations / Options

4.1.1. Road Alignment Corridor Development

Phase 1 of the options assessment process involved the following steps:

1. Concept Alignment Development;
2. Bypass Corridor Seed Options; and
3. Road Bypass Route Options.

The 3 steps are further explained below.

4.1.2. Concept Alignment Development

This step involved the utilisation of Trimble, an autonomous road design software, which allows the automated design of a large number of design options based on user selected input data. Input data used for the Beaufort Bypass investigations are summarised below:

Base Information:

- Light Detection and Ranging (LIDAR) survey data;
- Avoidance Zones (previous contaminating land uses, natural environmental features, waste water treatment plant, etc);
- "Area of Interest" EES boundary constraint;
- Desktop data (flora and fauna, cultural heritage, contaminated land, flood models and geological / topographical features);
- Preliminary flora and fauna surveyed data; and
- Fixed tie in points to Western Highway. (To minimise wastage of the recently duplicated Western Highway).

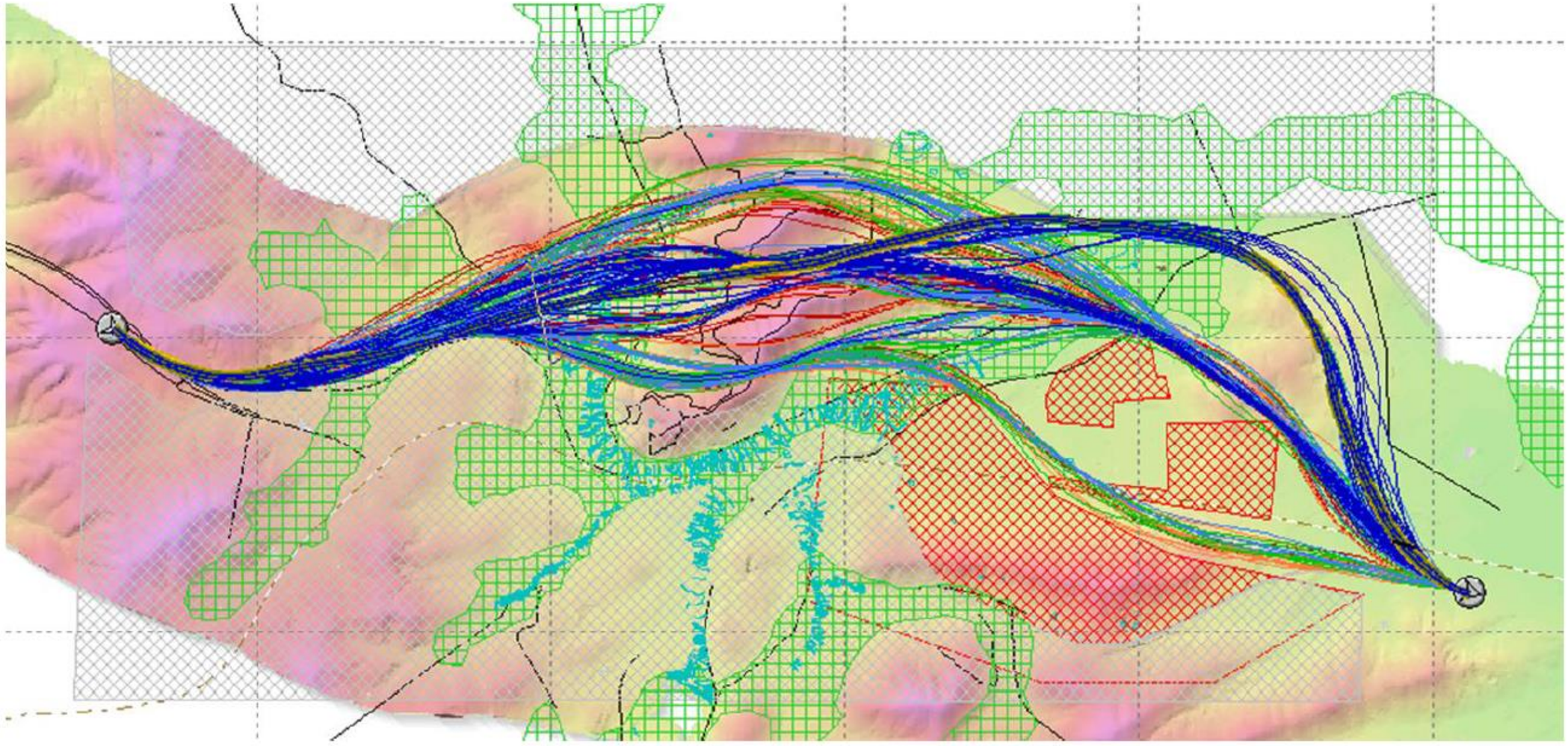
Design Input Data:

Desirable criteria which has been adopted for the Beaufort Bypass is consistent with other sections of the recently upgraded Western Highway Duplication including the following:

- Relevant Austroads Guides and VicRoads Supplements;
- Relevant VicRoads Standards, Design Notes.

The outputs of the Trimble analysis produced approximately 200 design alternatives for consideration as shown below in Map 12.

map 12 Trimble Design Output



The Trimble outputs represent a desirable road alignment outcome based on the input data catered around truck efficiency and construction cost, however, the data alone *does not represent all key issues and solutions which may need to be considered when developing a road alignment or that required by the EES process itself.* The Trimble outputs (200+ design alternatives) provides a *starting point* to inform the identification of the final alignment(s) to be adopted in the EES.

4.1.3. Bypass Corridor Seed Options

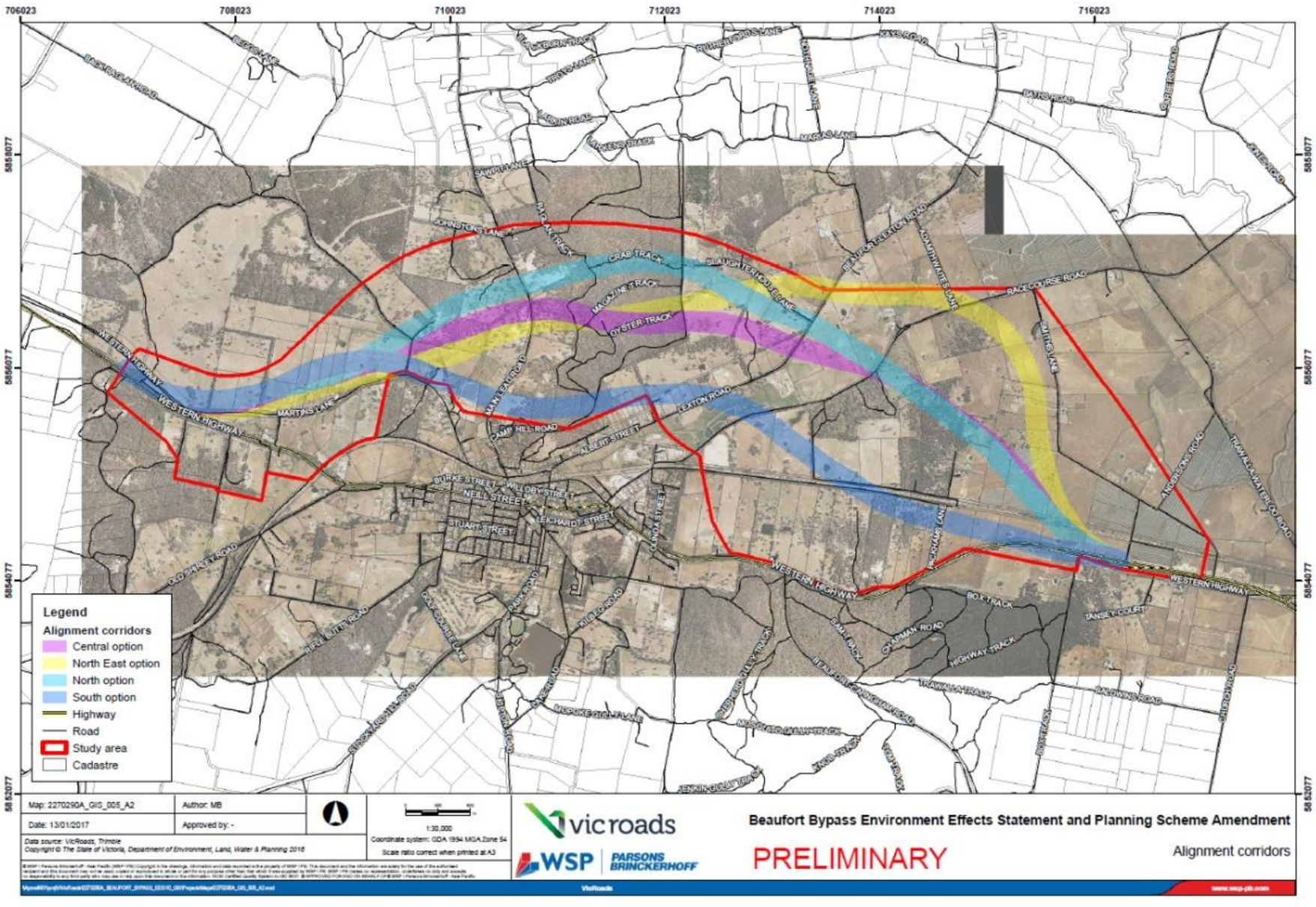
Following on from the Trimble outputs and to progress the development of road alignment options, the Trimble outputs were further refined into three (3) distinct corridors (based on commonalities identified in the outputs) with an approximate width of 250m for further investigations which can be categorised into the following:

- An option closest to the Beaufort township;

- An option furthest from Beaufort township (includes two alignment variations); and
- A central option.

The bypass corridor seed options are shown in Map 13 below.

map 13 Bypass Corridor Seed Options



Following the identification of the corridor seed options, two workshops (including site visits of the identified options) were held between RRV and WSP to further analyse the options from a road design and project constraints perspective.

The workshop involved undertaking a “micro-siting” exercise of the corridor seed options to further avoid and minimise impacts on identified key constraints.

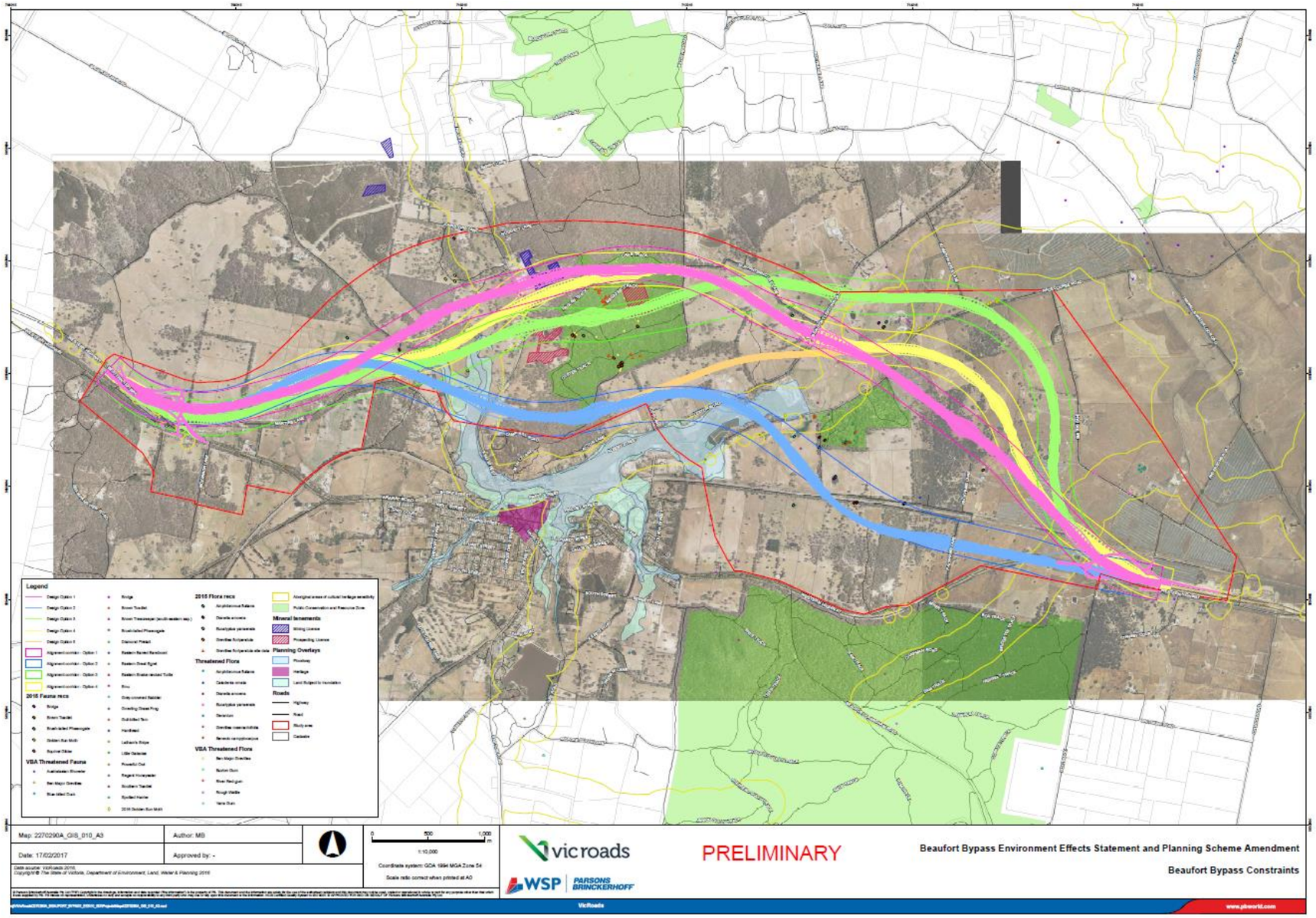
These key constraints include:

- Biodiversity (Federal and State listed species and communities);
- Large trees;
- Mining tenements and leases;
- Significant local infrastructure (Optus Exchange); and
- Dwellings (avoiding where possible).

In addition to the above constraints, practical adjustments/improvements to road design such as ensuring geometric fit, following sensible contours, etc were also made.

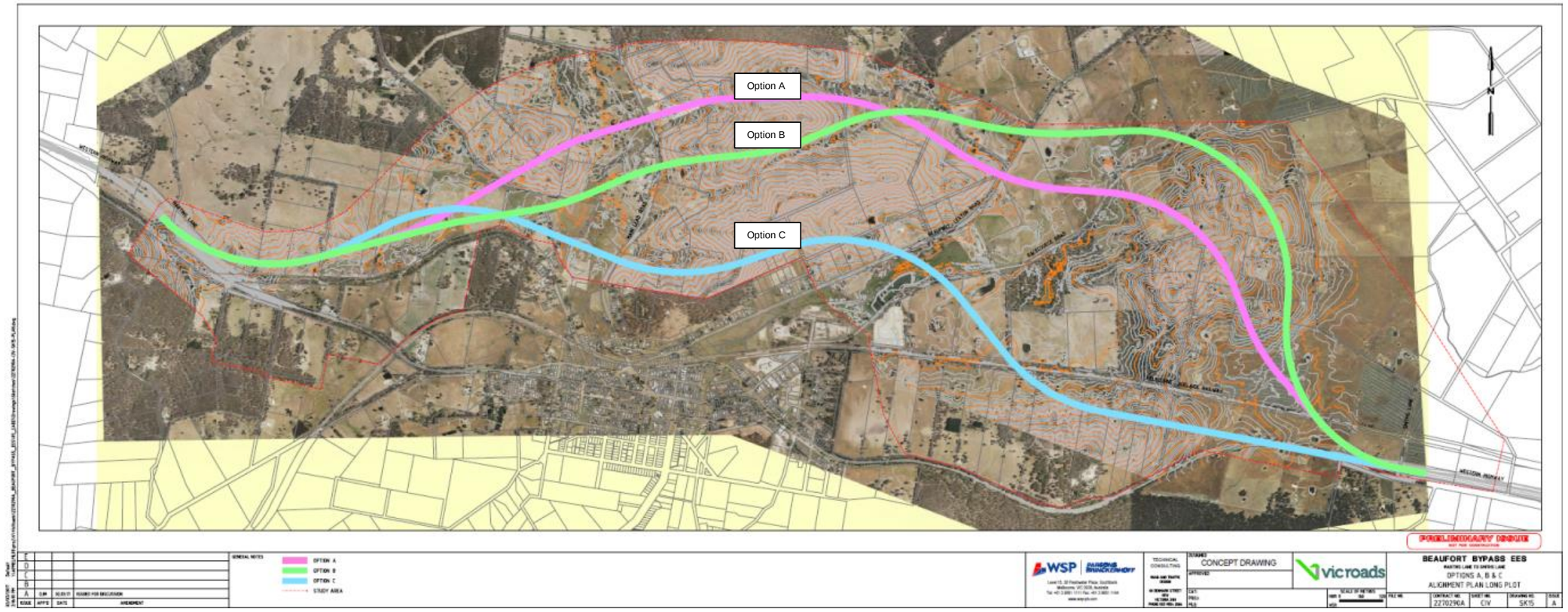
Based on the “micro-siting” exercise, alignment corridor options were further refined as shown in Map 14 below.

map 14 Corridor Seed Option Micro-Siting and Refinement



4.1.4. Road Bypass Route Options for Community Engagement

Step 3 of Phase 1 involved the further refinement of the corridor seed options from the micro-siting exercise into 3 bypass route alignment for community engagement and feedback. The 3-bypass route alignment identified for community engagement are shown below in Map 15. The 3 bypass route options have been chosen as it was considered to best represent the most feasible options based on outputs of the Trimble assessment and corridor seed options micro-siting exercise.



map 15 Bypass Route Options for Community Engagement

A summary of the 3 road bypass route options for community engagement is detailed in the Table 2 below.

Table 2 Summary of Road Bypass Route Options for Community Engagement

Options	Length (Approximate)	Summary of Key Road Features (Concept)
A	10.9 Km	Proposed full diamond interchanges at Main Lead Road and Beaufort-Lexton Road, and half diamond interchanges at Martins Lane and Smiths Lane. Bridges will be required at these interchanges as well as at the Melbourne-Adelaide rail crossing, Camp Hill Road, Back Raglan Road, and three crossings of Yam Holes Creek and its tributaries. **A total of 20 structures will be required.**
B	11.3 Km	Proposed full diamond interchanges at Main Lead Road and Beaufort-Lexton Road, and half diamond interchanges at Martins Lane and Smiths Lane. Bridges will be required at these interchanges as well as at the Melbourne-Adelaide rail crossing, Slaughterhouse Lane, Camp Hill Road, Back Raglan Road, and three crossings of Yam Holes Creek and its tributaries. **A total of 22 structures will be required.**
C	10.2 Km	Proposed full diamond interchanges at Main Lead Road and Beaufort-Lexton Road, and half diamond interchanges at Martins Lane and Smiths Lane. Bridges will be required at these interchanges as well as at the Melbourne-Adelaide rail crossing, Camp Hill Road, Back Raglan Road and three crossings of Yam Holes Creek and its tributaries. **A total of 18 structures will be required.**
Do Nothing	10 Km	

4.2 Phase 2 – Option Development and Assessment

4.2.1. Three to Eight Alignment Options

Community Consultation 2017

The 3 bypass alignment options as outlined in Map 14 above were presented to the community over 2 Community Information Sessions (CIS) held in Beaufort on 28 April and 1 May 2017. The sessions were attended by a total of 150 people with representatives of RRV, Pyrenees Shire Council, Western Duplication Project team, RRV's Property Services and WSP in attendance.

Through the CIS, the community identified the following key issues associated with the 3 bypass alignment options that required further consideration by RRV. The key issues were:

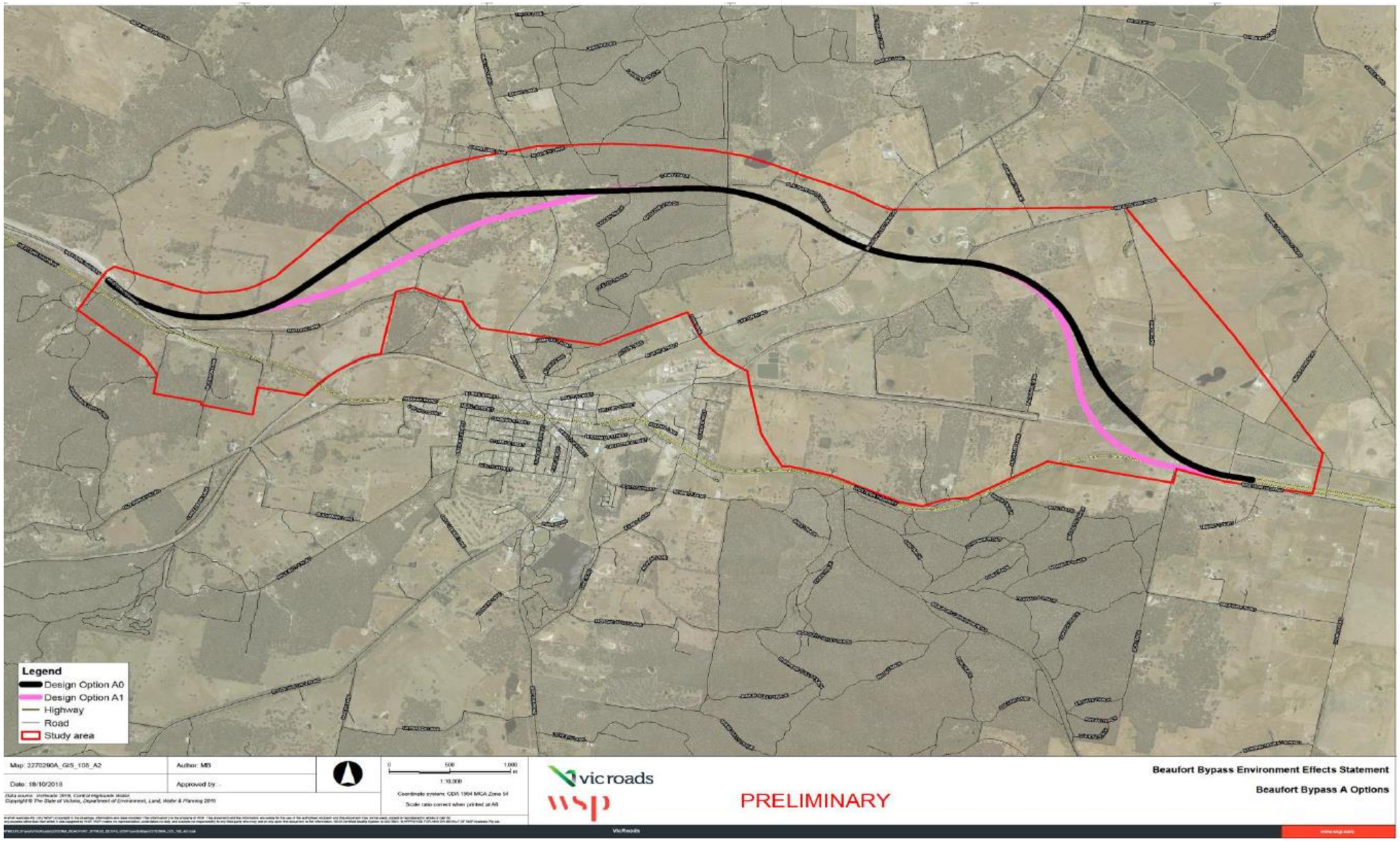
- Acquisition of properties;
- How the proposed route options would affect local access (e.g. maintaining access to the north-south roads for local and regional residents and businesses);
- The amenity impacts of traffic noise and light on the community (e.g. a bypass further from town would have a lower impact on amenity, the importance of maintaining Beaufort's rural landscape and character);
- The importance of minimising environmental impacts (e.g. protecting wildlife corridors, avoiding the loss of large old trees); and
- The negative local economic impacts, such as the loss of passing trade for local businesses (e.g. a bypass closer to town may mean vehicles do not have to detour as far to come into Beaufort).

4.2.2. Refining Options A, B and C

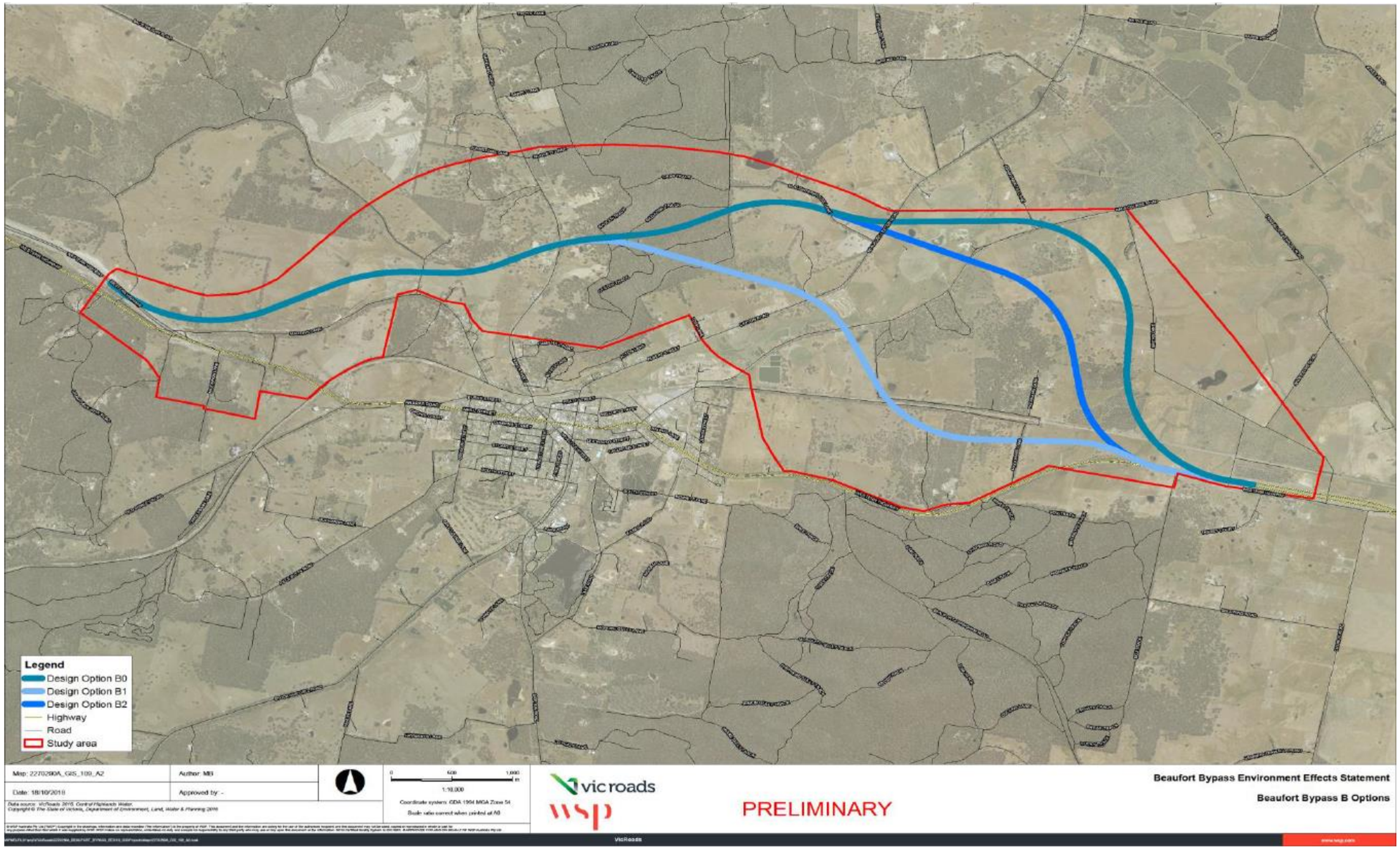
Based on community feedback as outlined in 3.2.1 above, further modifications and variations were made to alignment Options A, B and C to further investigate the key issues identified by the community and the potential implications on further alignment options development.

As a result, eight alignment options (as shown below in Maps 16-18 below) were generated for further assessment. Variations to Option A were named A0 and A1, Option B variations were named B0, B1 and B2, Option C variations were named C0, C1 and C2.

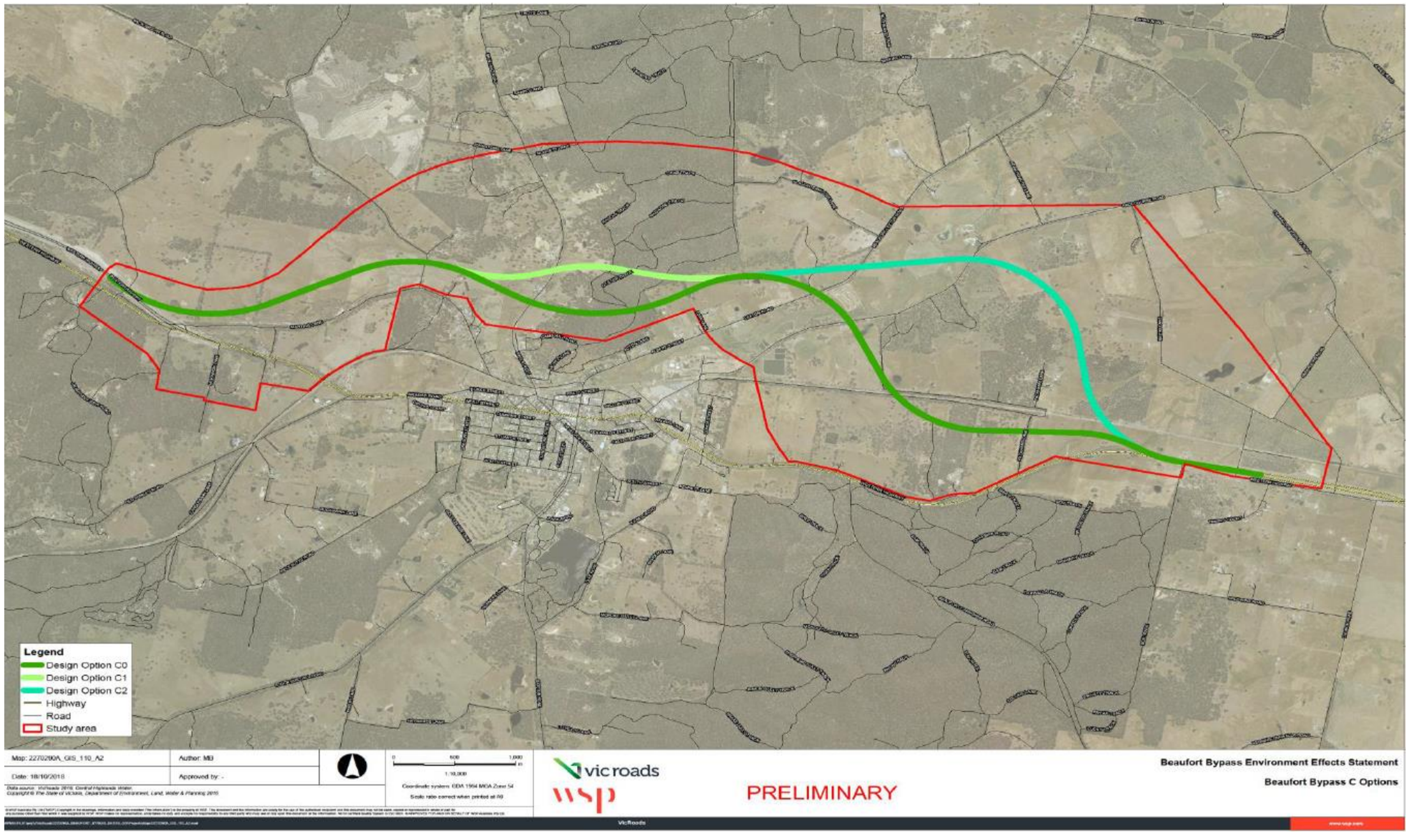
map 16 Alignment Option A Variation – A0 & A1



map 17 Alignment Option B Variation – B0, B1 & B2



map 18 Option C Variation – C0, C1 & C2



A summary of the 8 bypass alignment options are detailed Table 3 below.

Table 3 Alignment A0, A1, B0, B1, B2, C0, C1 & C2 Description

OPTIONS	LENGTH (APPROX.)	SUMMARY OF KEY ROAD FEATURES (CONCEPT)
A0	11.2 km	From the western tie-in point, approximately 3km from the Beaufort township, this alignment curves north-north east. The alignment passes over Main Lead Road then climbs through the State Forest north of Camp Hill. From here it descends to Beaufort-Lexton Road, before re-joining the existing Western Highway at its eastern extent, approximately 4.5km from Beaufort. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Ballarat-Ararat train line.
A1	11.1 km	Approximately 3km from the Beaufort township, this alignment deviates north-east from the Western Highway, staying slightly south of option A0 until a point east of Main Lead Road, where it re-joins the A0 alignment. The A1 alignment will re-join the existing Western Highway approximately 4.5km to the east of the township. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Ballarat-Ararat train line.
B0	11.4 km	From the western tie-in point, approximately 3km from the Beaufort township, the B0 alignment option follows the A0 alignment for approximately 1.5km, where it heads in a more easterly direction and crosses Back Raglan Road. From this point, the alignment curves north-east, crossing Main Lead Road and passing through the State Forest north of Camp Hill. From here it heads east, crossing Beaufort-Lexton Road and Racecourse Road, before turning south and re-joining the existing Western Highway at its eastern extent, approximately 5km from Beaufort. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Ballarat-Ararat train line.

OPTIONS	LENGTH (APPROX.)	SUMMARY OF KEY ROAD FEATURES (CONCEPT)
B1	10.5 km	From the western tie-in point, approximately 3km from the Beaufort township, the B1 alignment option follows the same path as the B0 alignment until Main Lead Road, where it heads in a more south-easterly direction and passes through the State Forest north of Camp Hill. At Beaufort-Lexton Road, this alignment turns more towards the south, crossing Racecourse Road and the Ballarat-Ararat train before heading east and re-joining the existing Western Highway approximately 4.5km to the east of the township. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Ballarat-Ararat train line.
B2	11 km	The B2 alignment follows the B0 alignment from the western tie-in point, approximately 3km from the Beaufort township, passing through the State Forest north of Camp Hill before deviating at a point west of Beaufort-Lexton Road and heading in a more south-easterly direction. At Racecourse Road, this option joins the A0 alignment, which re-joins the existing Western Highway approximately 4.5km to the east of the township. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Ballarat-Ararat train line.
C0	10.6 km	The C0 option follows the A0 option from the western tie-in point, approximately 3km from the Beaufort township, before deviating at Back Raglan Road in a more easterly direction almost parallel to the existing Western Highway. This option passes close to the north of Camp Hill, before curving south-east to Beaufort-Lexton Road. The C0 alignment will re-join the existing Western Highway approximately 4.5km to the east of the township. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Ballarat-Ararat train line.
C1	10.4 km	The C1 option follows the C0 option from the western tie-in point (approximately 3km from the Beaufort township) until a point approximately 850m west of Main Lead Road. From here it heads east, passing close to the north of Camp Hill, before re-joining the C0 alignment after approximately 2.4km. As per the C0 alignment, this option will re-join the existing Western Highway approximately 4.5km to the east of the township. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Ballarat-Ararat train line.

OPTIONS	LENGTH (APPROX.)	SUMMARY OF KEY ROAD FEATURES (CONCEPT)
C2	11 km	The C2 alignment follows the C0 option from the western tie-in point (approximately 3km from the Beaufort township) until Beaufort-Lexton Road, where it continues in an easterly direction and joins the A0 alignment near Racecourse Road. The C2 alignment will re-join the existing Western Highway at the eastern tie-it point, approximately 4.5km from the township. Again, bridges will pass over Main Lead and Racecourse Roads, as well as over the Ballarat-Ararat train line.

4.3Eight to Four Alignment Options

4.3.1 Technical Assessments

To assess and evaluate the impact of the 8 alignments in accordance with the terms of the EES Scoping Requirements, technical studies were conducted between May – October 2017 by subject matter experts.

The constraints identified by this process include:

- Feasible crossing locations for water courses including Yam Holes Creek and natural and man-made water bodies;
- Low lying land and areas subject to flooding;
- The location of existing utilities and infrastructure including water, sewerage, power, telecommunications, gas and council assets;
- Flora and fauna habitats including protected species, large old trees and revegetated areas;
- The Camp Hill Reserve;
- Current and historic mining licences and tenements;
- Identified sites of European and Aboriginal cultural heritage;
- Geology and soil make up; and
- Planning controls, council strategic planning, easements, crown land and dwellings.

4.3.2 Concept Design & Feasibility Workshop

To gain a better understanding of the impacts, preliminary concept designs were developed for the eight alignment options. On 4 October 2017 an internal RRV workshop was held to assess the feasibility of the eight alignment options. The workshop was attended by a range of RRV internal subject matter experts including road engineers, environmental scientists, planners and stakeholder engagement specialists. External subject matter experts included relevant consultants such as a senior planner, road design engineer, senior environmental scientist and lead ecologist also attended the workshop.

During the workshop, each route option was assessed in detail using information from the existing conditions assessments, aerial imagery and spatial data, landholder and community feedback, and the project knowledge of those present to identify the key social, cultural heritage, planning and environmental values and engineering considerations for each alignment options.

Interchange Design

When developing the preliminary concept design, interchange locations for the Beaufort Bypass were also considered. The interchange configurations sought to provide better access to the bypass for local road users, where possible further reduce traffic movement in the town, and improve road safety through adoption of safe systems(1*) design solutions for major road intersections on rural highways. Taking this into consideration, the following interchanges were considered.

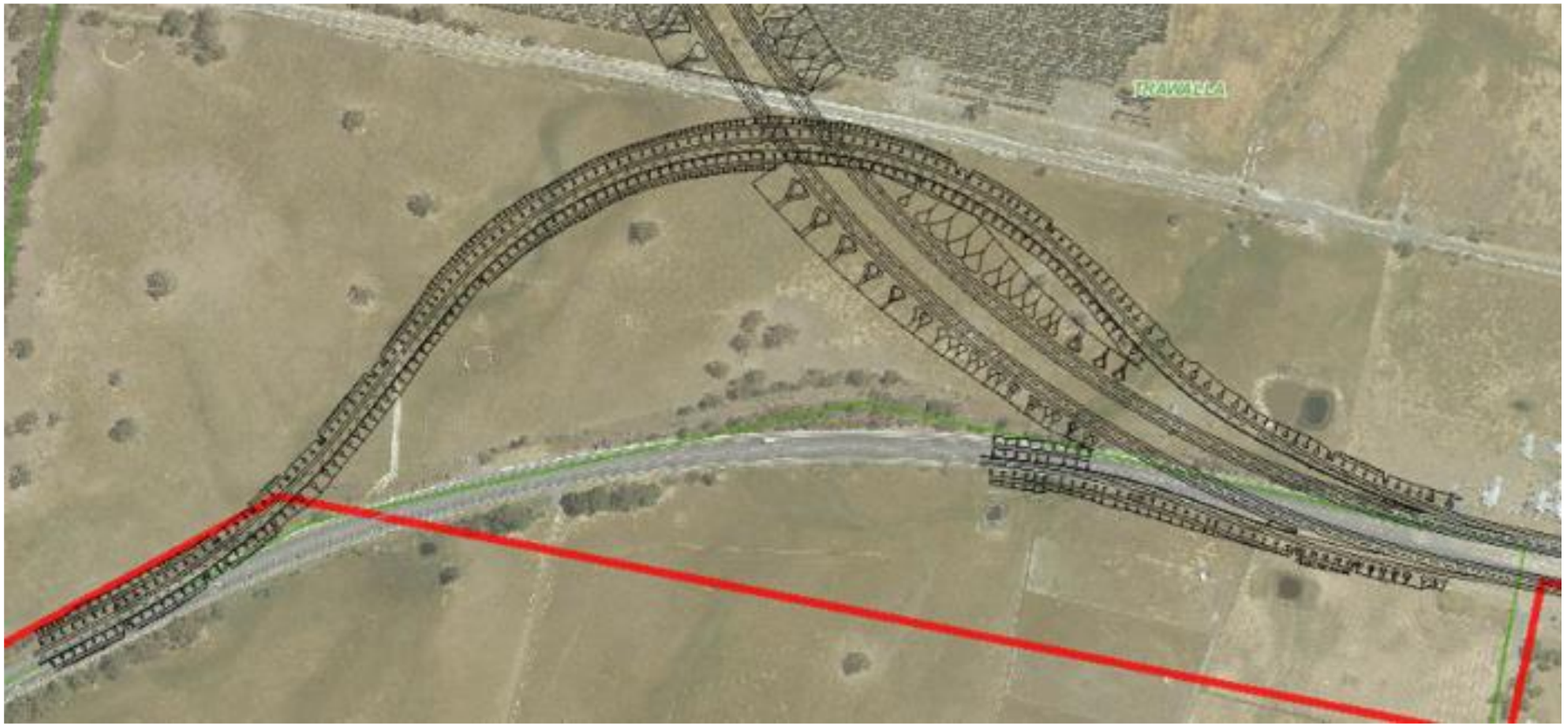
1* - The Safe System is a targeted approach that aims to eliminate fatal and serious injury on the road, with the guiding principle that everyone shares responsibility for creating a safe road system. It recognises that road users make mistakes and some crashes are inevitable. The Safe System approach aims to support development of a forgiving transport system that is better able to accommodate human error and road user vulnerability. Both the Australian and New Zealand National Road Safety Strategies are built on the Safe System approach. Although safety is recognised as a desired outcome of land-use planning, Safe System principles are not widely employed by planners. Considering and implementing Safe System principles early in the planning process achieves the best possible balance between the multiple objectives, resulting in the best possible outcome for the community. (Austroads AP-R488-15)

The Safe System is a targeted approach that ultimately aims to eliminate fatal and serious injury on the road. It recognises that road users inevitably make errors in judgment that may lead to a crash and that there are limits to the force that the human body can withstand (without causing death or serious injury) in a crash. These limitations are directly linked to the type of crash and the speed of the impact. The Safe System approach aims to support a transport system that is better able to accommodate human error and road user vulnerability. This can be achieved through better management of crash energy, so that individual road users are not exposed to crash forces likely to result in death or serious injury.

Eastern Tie In

The eastern gateway to the township of Beaufort has a half diamond configuration, facilitating eastbound entry and westbound exit only. The location of the interchange and distance from the township does not make a full diamond interchange feasible.

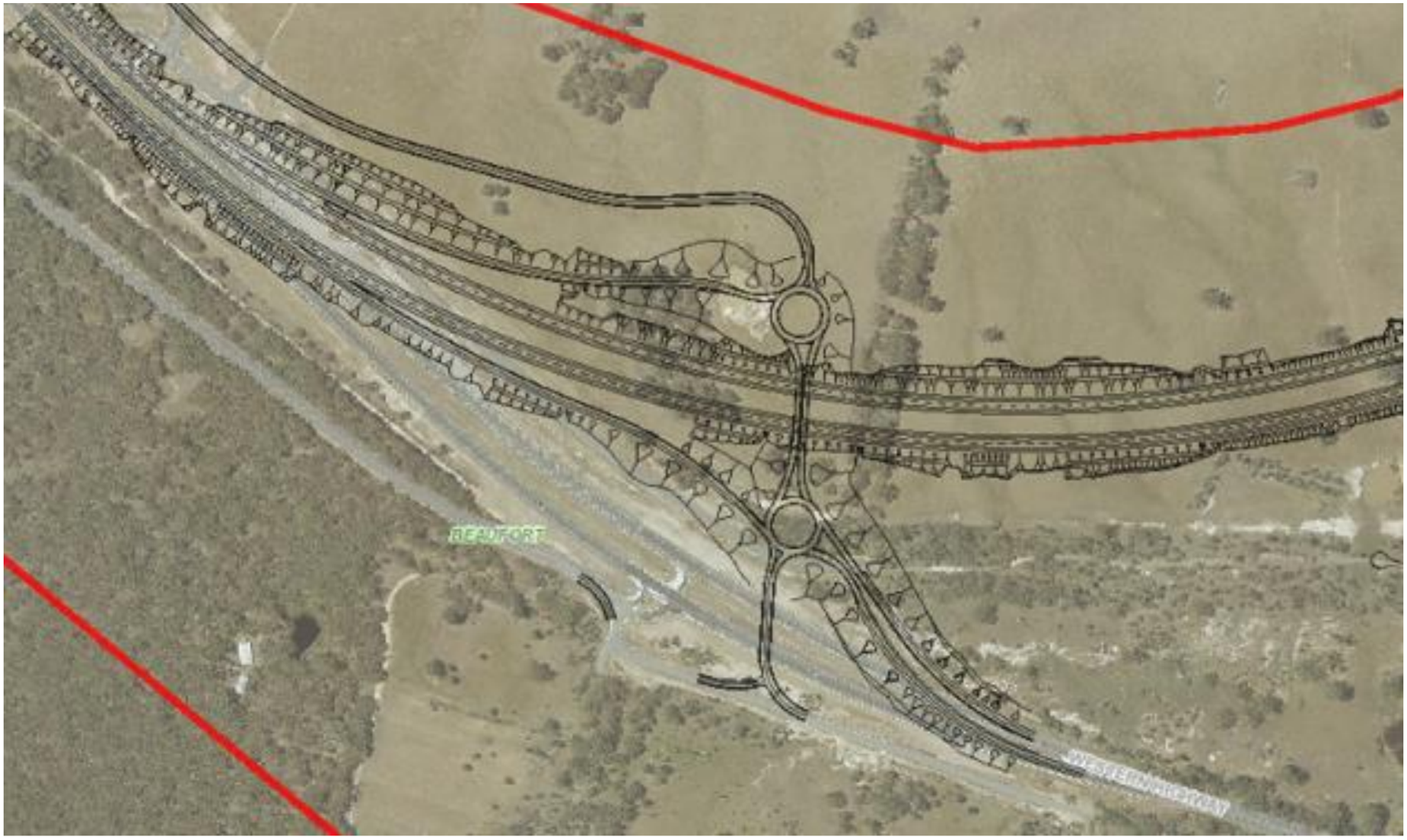
map 19 Eastern Tie-in Interchange Design



Western Tie-In

The western gateway to the township of Beaufort has a half diamond configuration, facilitating westbound entry and eastbound exit only. Again, the location of the interchange and distance from the township does not make a full diamond interchange feasible.

map 20 Western Tie Interchange Design



Beaufort-Lexton Road

Beaufort-Lexton Road (C172) is the principal link between Beaufort and the townships of Waterloo and Lexton. It has been identified by the grain industry as an important transportation link, which is reflected in the traffic data set out below:

- Two Way AADT: 530
- Heavy Vehicles Percentage: 0.24 (24%)
- Growth Rate: 3.4%

Design for this interchange proposes a full diamond configuration to facilitate all traffic movements.

map 21 Beaufort-Lexton Road Tie-In Interchange Design (Option A1)

map 22 Beaufort-Lexton Road Tie-In Interchange Design (Option C2)

Main Lead Road

Main Lead Road serves as the principal link between Beaufort and the townships of Raglan and Elmhurst. Main Lead Road has the following traffic data:

- Two Way AADT: 788
- Heavy Vehicles Percentage: 0.12 (12%)
- Growth Rate: Unknown

A full diamond interchange at Main Lead Road was initially considered as part of the design options but was not developed further due to the impact on vegetation, flood plains, seasonal wetlands and local amenity. Vehicles using Main Lead Road can enter and exit the bypass, without passing through the town, via the Beaufort Lexton Road Interchange.

Due to the additional vehicle usage, a section of Beaufort Lexton Road (C172) between the township and the proposed interchange will need to undergo improvement works during the construction of the Beaufort Bypass.

A safe system assessment was undertaken on the various bypass alignments and the close proximity of interchanges and vehicle weaving was raised as a potential safety issue. The removal of the Main Lead Road interchange helped to eliminate this safety risk.

4.3.3. Four Alignment Options

The internal concept and design feasibility workshop produced a shortlist of 4 alignment options from the 8 options outlined in Maps 16-18.

The 3 Option B variations (B0, B1 and B2) and Option C1 were de-listed from further investigation due to the:

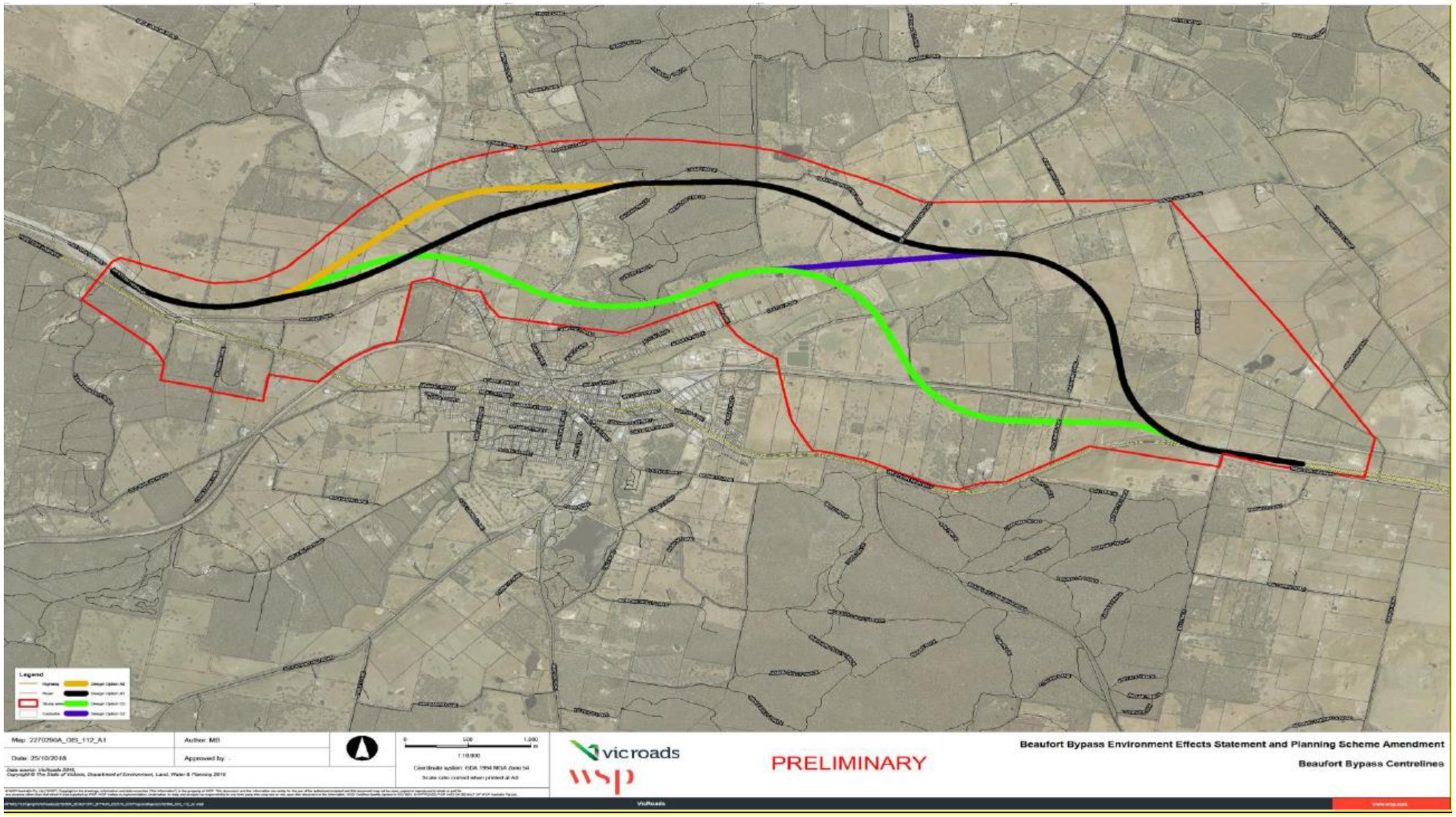
- Severance and impact on Camp Hill, a public reserve used for bushwalking, horse riding and other recreation activities;
- Significant impacts on biodiversity and native vegetation, including direct impact on the Ben Major Grevillea, which is listed as 'vulnerable' under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and 'threatened' under the Victorian Flora and Fauna Guarantee Act 1988.

B0 also had a significant impact on existing dwellings and land severance along Smiths Road. Also, the eastern end of Option A0 was delisted to avoid a dwelling at the eastern tie-in point.

The 4 shortlisted alignment options are shown on Map 23 below. As the four refined route options consist of two of the three original route options and two minor variations, the decision was made to continue to progress with these refined route alignment options through the EES process.

These 4 alignments are further discussed in Phase 3 as part of the selection of the preferred alignment for the Beaufort Bypass.

map 23 Bypass Alignment Options A0, A1, C0 & C2



4.3.4 Community Consultation – 2018

The 4 refined alignment options were presented to the community in 28th February and 1st & 3rd March 2018 via an extensive communication strategy that included media release, web page updates, mail outs, one-on-one meetings with directly affected property owners and three community information sessions.

Key issues raised at the community consultation sessions were:

- Reduction in property value, particularly for properties in close proximity of the bypass but not directly affected;
- The time that the EES process has taken and the impact it is having on the community;
- Impact on directly affected properties;
- The amenity impacts of traffic noise and light on the community (e.g. a bypass further from town would have a lower impact on amenity, the importance of maintaining Beaufort's rural landscape and character);
- The importance of minimising environmental impacts (e.g. protecting wildlife corridors, avoiding the loss of large old trees); and
- The negative local economic impacts, such as the loss of passing trade for local businesses (e.g. a bypass closer to town may mean vehicles do not have to detour as far to come into Beaufort).

These key issues are further considered as part of the Revised Options Assessment Matrix used to select the preferred Bypass Alignment and discussed in Section 5 of the report.

4.4 Phase 3 – Identification of Preferred Alignment

4.4.1 Four to one Alignment Option

Objective Based Evaluation Matrix (presented to PRC)

An assessment utilising the Objective Based Evaluation Matrix (OBEM) was undertaken in October 2018 to determine the preferred alignment. To assess and evaluate the impacts of the four alignment options, impact assessment reports were developed in the following key areas in line with the EES scoping requirement for the project:

- Traffic and Transport;
- Aboriginal Cultural Heritage;
- Historical Heritage;
- Surface Water;
- Ground Water;
- Soils & Geology;
- Biodiversity;
- Social;
- Regional Economy;
- Air Quality;
- Land Use & Planning;
- Landscape & Visual.

The findings of the various impact assessments were then utilised in the OBEM assessment for the 4 alignment options. The findings of the OBEM assessment concluded that the C2 and A1 options were the two best performing options with a score of 3 and 0 respectively. The OBEM assessment findings were presented to RRV 's Project Review Committee (PRC) for consideration with a recommendation to continue to advance the EES process with C2 and A1 options but nominating the C2 option as the preferred alignment.

PRC have endorsed this recommendation subject to further work being undertaken to ensure the robustness of the OBEM assessment in the selection of the preferred alignment.

Revised Options Assessment Matrix
A number of matters for further investigation of the OBEM methodology were identified. These matters included of the degree of transparency and consistency of its applications and scoring. In recognition of the complexity and to ensure the robustness of the evaluative process, it was determined that a Revised Options Assessment Matrix be developed to reassess the preferred bypass alignment options.

The Revised Options Assessment Matrix are further discussed in Section 5 of the report.

Presentation of Revised Options Assessment Matrix to Technical Reference Group (TRG) Members

The Revised Options Assessment Matrix was presented to TRG members on 14 March 2019. The TRG were generally supportive of the Revised Options Assessment Matrix. Specifically, key comments provided by TRG members concerned scoring methodology, assessment criterion utilised, consideration of weighting the assessment criterion, refinement of the wordings of assessment criterion and general points of clarifications.

The Revised Options Assessment Matrix has been reviewed having regard to the TRG comments and appropriate changes effected.

Revised Options Assessment Matrix Workshop with Internal Specialist

The Revised Options Assessment Matrix was also presented to RRV internal specialist at a workshop on 16 April 2019. RRV internal specialist supported the Revised Options Assessment Matrix and determined subject to legal review, that the Revised Options Assessment be utilised to assess and determine the preferred alignment for Beaufort Bypass.

Legal Review of Revised Options Assessment Matrix

The Revised Options Assessment has been reviewed in accordance with the RRV recommendations. The resulting Revised Options Assessment Matrix is considered by RRV to represent a more logical and transparent assessment matrix then the current OBEM and it is considered it should be implemented having regard to all feedback received during its inception.

RRV has determined that it will prepare an options assessment report that includes:

1. An explanation on the selection of the assessment criteria, why it is an appropriate measure to compare potential impacts of the 4 bypass alignments and how it appropriately captures/meets the intent of the EES scoping requirement. Further detailed discussions are contained in Section 5 of the report.
2. The utilisation of a range of scoring scenarios and sensitivity analysis in the assessment and determination of the preferred bypass alignment including commentary/discussions/analysis associated with the scoring.

These additional works have been incorporated into the Revised Options Assessment Matrix and are further discussed in Section 5 & 6 of the report

Selection of preferred Alignment
A preferred alignment for the Beaufort Bypass has been selected utilised the Revised Options Assessment Matrix. A detail assessment of the preferred alignment is discussed in Section 6 of the report.

5 Revised Options Assessment Matrix

5.1 The Current OBEM

RRV projects are currently assessed using the Objective Based Evaluation Matrix (OBEM). Tables 4 below outlines the rating categories and defined values and score rating that are applied as part of the OBEM. Scoring ratings are applied to projects based on the potential benefits and disbenefits as outline in Table 5 below. A rating of Very well would receive a score of +3 and a score of very poor would receive a score of -3. RRV have used the OBEM to assist with its assessment and determination of preferred alignments on numerous major road projects. As outlined in Section 3.4.1, the OBEM has also been used in an assessment and determination of the preferred alignment for the Beaufort Bypass project. The OBEM assessment identified the C2 option as the best performing alignment.

Table 4 OBEM Rating Categories

RATING	DEFINED VALUES	COLOUR
Very Well	Best practice, strong level of compliance, major positive impact	Green
Well	Improved practice, good policy compliance, positive impact	Light Green
Moderately Well	Partial policy compliance, no distinctive positive or negative impact	Yellow
Poor	Policy non-compliance, no distinctive positive or negative impact	Orange
Very Poor	Major policy non-compliance / and or negative impact	Red

Table 5 OBEM scoring Ratings

POTENTIAL PROJECT BENEFITS	RATING COLOUR CODE	POTENTIAL PROJECT DISBENEFITS
Significant benefit to the state Superior benefit to the region Policy consistency with superior positive impact Best practice	VERY WELL +3	
Moderate benefit to the State Significant benefit to the region Superior benefit to the locality Policy consistency with significant positive impact Improved practice	WELL +2	
Moderate benefit to the region Significant benefit to the locality Policy consistency with moderate positive impact	MODERATELY WELL +1	
Minimal benefit at any level Partial policy compliance, no distinct positive or negative impact	NEGLIGIBLE 0	Minimal disbenefit at any level Partial policy compliance, no distinct positive or negative impact
	MODERATELY POOR -1	Moderate disbenefit to the region Significant disbenefit to the locality Policy inconsistency with moderate negative impact
	POOR -2	Significant disbenefit to the region Severe disbenefit to the locality Policy inconsistency with significant negative impact
	VERY POOR -3	Significant disbenefit to the State Severe disbenefit to the region Policy inconsistency with severe negative impact.

5.2 Why a Revised Options Assessment Matrix was developed for the project?

In recognition of the complexity and multi-facet nature of the Beaufort Bypass project, RRV has develop a comprehensive Revised Options Assessment Matrix to ensure that appropriate level of rigour and robustness are fully incorporated into the assessment and selection of the preferred alignment.

5.2.1 What are the gaps with the current OBEM?

While, the current OBEM provide a framework to assess and select the preferred alignment for the Beaufort Bypass, there are, however, deficiencies that exist with respect to the assessment framework and how it is applied.

Specifically, these deficiencies are:

- The OBEM does not state or outline which assessment criteria are key considerations to the selection of the preferred Bypass alignment.
- There is no explanation of how the rating/scoring is to be measured and applied. Impacts and benefits haven't been set or clearly articulated and as such is difficult to quantify and/or qualify. For example, what constitutes a significant benefit to the State – Is it $80 million dollars or does a 21 seconds reduction in travel time constitute a state significant benefit/impact? There is no clarity regarding the benchmarks to measure the benefits or impacts against.
- The OBEM rely on a qualitative assessment being undertaken and lacks quantifiable data to support qualitative statements or conclusions reached. For example, does an expert in one discipline determine the difference between 'well' and 'very well' compared with an expert in a different discipline?
- The OBEM attempts to rate both impacts and benefits which can be overly complicated and can distort the rating/scoring of an impact (either overstating or understating benefits/impacts). Additionally, the OBEM appears to be premised upon an assumption that there is a benefit associated with actions such as native vegetation removal or property acquisition to the State or community.
- Impacts may appear to be rated based on the implementation of mitigation, which subsequently has resulted in impacts across all 4 alignments being rated the same for a number of categories.
- The OBEM's rating and scoring matrix does not provide a clear differentiation to compare impacts across the 4 alignments.
- Difficult to apply consistently across a range of technical considerations.

Based on these identified gaps, it was concluded that a Revised Options Assessment Matrix that can quantity, compare and differentiate the potential impacts of the 4 alignments be further developed to assist RRV with the assessment and selection of the preferred alignment for the Beaufort Bypass project.

5.2.2 How was the Revised Options Assessment Matrix Developed?

- Step 1 – Review all objectives and sub-objectives identified for the project by RRV and from the EES scoping requirement as identified by the Minister for Planning.
- Step 2 – Decide whether this is an impact or benefit-based matrix assessment.
- Step 3 – Determine that it is an impact-based matrix assessment.

  Why an impact assessment
  For the purposes of identifying the preferred alignment, RRV considered that an impact assessment was the most appropriate framework given that the intent of the EES process is to identify and understand the potential impact of the project from an environmental, social and economic perspective. The impact assessment enables RRV to assess and compare the impacts of each alignment against one another.

- Step 4 – Select objectives based on a triple bottom line approach – Environmental, Social and Economics and initial assessment/comments made by RRV against the objectives and sub-objectives identified for the project and in the EES scoping requirements.

- Step 5 – Select objectives where quantifiable impacts are clearly stated within the technical reports or where information is readily available or where the impacts can be used to compare and differentiate for each alignment to select the preferred alignment.
- Step 6 – Objectives with no quantifiable impacts or are likely to have the same or minimal impact differences between the 4 alignment options or the impacts are temporary such as impact on access during construction will not be included in the assessment matrix scoring but will still form part of the overall qualitative assessment of the preferred alignment. For further details please refer to Section 6.12 Qualitative Assessment.
- Step 7 – Key objectives identified for assessment criteria were related to Environmental (Impacts on biodiversity and floodplains), Social (Cultural and European heritage, Acquisition and property impacts, Noise impacts, air quality impacts and visual impacts) and Economic (Construction cost of each alignment).

- Step 8 – Undertake a preliminary assessment to test the usability and functionality of the Revised Options Assessment Matrix.
- Step 9 – Present Revised Options Assessment Matrix to TRG members for comments and Feedback.
- Step 10 – Make further modifications and amendments to the Revised Options Assessment Matrix based on comments and feedback received from TRG members.
- Step 11 – Present and workshop with RRV internal specialist.
- Step 12 – Obtain legal advice on the usability and functionality of the Revised Options Assessment Matrix.
- Step 13 - Make further modifications and amendments to the Revised Options Assessment Matrix based on advice.
- Step 14 - Undertake a final assessment to rate and identify the preferred alignment for the Beaufort Bypass project.

5.2.3 What Are the Key Differences Between the OBEM and the Revised Options Assessment Matrix

The key difference between the current OBEM and Revised Options Assessment Matrix are:

- It is primarily an impact assessment and not a benefits assessment.
- It can compare the impacts of alignment to alignment.
- It is a quantitative assessment and not solely a qualitative assessment.
- A range of scoring/rating and sensitivity analysis are applied to the assessment.
- Only assessment criteria that help to differentiate the alignments are included in the assessment and scoring.
- Criteria are selected using a triple bottom line approach.
- There is no weighting to the scoring – all criteria are weighted the same
- Transparent and easy to explain the assessment and scoring.
- Fit for purpose – criteria can be added or removed based on the project and/or the context.

In respect to the non-application of weighting to the scoring, while this is considered to be addressed through the identification of objective measures (Section 5.3 and 5.4) and the use of multiple scoring scenarios and scoring sensitivity scenarios (Section 5.5), RRV does acknowledge that due to a greater number of environmental assessment criterion, there is a potential that the assessment outcomes could be skewed in favour of those alignments that perform stronger against these environmental criterions. However, there are several reasons for the greater number of environmental assessment criterion, these are:

- The Minister for Planning's reason for decision on the requirement for an EES, specifically focuses on potential significant adverse effects on biodiversity and that alignment selection be determine via an integrated assessment of environmental effects;
- The primarily focus of the EES scoping requirements and TRG has been on environmental factors and the selection of assessment criterion reflect and align with this focus;
- The Beaufort surrounds being a location that contains high quality and valued environmental features;
- A risk assessment for the project identified Flora/Fauna values as having the highest residual risk profiles and therefore should be considered key in the selection of the preferred alignment;
- While a relevant factor in the assessment, the number of social and economic impact criterion identified are reflective of its local importance when compared to environmental impact considerations. Environmental impacts were considered to potentially have a significance impact from a State and Commonwealth policy perspective, while, social and economic impacts were considered significant at a local level. While this does not mean that the social and economic impacts at this local level are not significant, the potential effects were limited in scale and geography when compared to the potential environmental impacts.
- A range of economic impact criterion between the four alignments were the same or very minor which did not assist with the selection of the preferred alignment. Economic impacts on businesses were considered the same across all 4 alignments and travel time cost saving were minor given that there was only 21 seconds difference in travel time between the 4 alignments and as such was not considered for inclusion. The single economic criterion addressing construction costs are based on preliminary concept designs and not detailed designs. The costing also does not consider the potential cost of providing offsets for native vegetation removal under both State and Federal legislations Additionally, construction cost is not a primary consideration used by RRV in the selection of a preferred alignment. Therefore, it was considered that economic factors are not a key determining factor in the selection of the preferred alignment.

In conclusion, RRV has considered the potential skewing of the assessment criteria and consider it to be appropriately addressed based on the above discussions.

5.3 How were the assessment criteria selected?

To identify criterion to be used in the assessment and selection of the preferred alignment for the Beaufort Bypass a 2-step approach was undertaken to select the key criteria for inclusion in the Revised Options Assessment Matrix.

Step 1 involved a detailed review of the RRV primary project objectives and the EES scoping requirement and how these objectives assist or do not assist RRV in the selection of the preferred alignment. Step 2 involved the identification, justification and selection of assessment criterion that aligned with the project and EES objectives identified in step 1.

Section 5.3.1 (Table 6 – RRV Project Objectives and EES scoping Requirement Assessment) and 5.3.2 (Table 7 – Assessment Criteria Justification) below provide further detailed discussions on the 2 step approach undertaken by RRV.

5.3.1 Project Objective and EES Scoping Requirements Review (Step 1)

This step involved the review and assessment of the primary project objectives and the EES scoping requirement for the project and whether they assist or do not assist with the selection of the preferred alignment.

Table 6 below provides the detailed assessment and justification on the reasoning for inclusion/exclusion from the key assessment criteria.

Table 6 RRV Project Objectives and EES Scoping Requirements Assessment

RRV's Primary Project Objectives	Key Issues to consider	Does the Objectives assist RRV to select a preferred alignment (Y/N)	Reasoning for inclusion/exclusion from preferred alignment key assessment criteria
1. Improve freight movement and efficiency	• Freight vehicle travel time improvements compared to "do nothing" alternative. • Design maximum freight vehicle count compared to "do nothing" alternative. • All vehicles travel time improvements compared to "do nothing" alternative.	**No**	• There will only be a travel time difference of 21 seconds between the 4 alignment options. While it is acknowledged that overall any of the 4 alignment options will significantly improve travel time when compared to the current Western Highway alignment through the Beaufort township, the comparative travel time saving is considered minimal. • The reduction in heavy vehicles travelling through the Beaufort township will be the same across all 4 alignments.
2. Improve road safety within the township and arterial road network	• Predicted effect on road safety in Beaufort during construction. • Predicted effect on road safety in Beaufort during operation.	**No**	• All 4 alignment options would require a significant amount of imported fill and pavement materials to be transported to the construction zone (the exact amount will be determined based on the preferred alignment and as part of the detail design stage). Importation of fill and pavement materials will add a significant number of additional heavy vehicle trucks and trailers onto the road network and through the Beaufort township during the construction phase regardless of which alignment is selected. Therefore, it is considered that the impact of the 4 alignment options on Beaufort and the road network during construction would be the same. • All 4 alignment options once operational would improve road safety within Beaufort when compared to the current Western Highway alignment through the township. Overall, improved road safety is considered the same across the 4 alignments.
3. Improve access to markets and the competitiveness of local industries	• Predicted effect on travel time for businesses located west of Beaufort to Ballarat and Melbourne business centres. • Predicted effect on travel time for people visiting towns west of Beaufort from Ballarat and Melbourne (e.g. Stawell). • Predicted effect on travel time for metropolitan visitors to tourism destinations west of Beaufort, e.g. Grampians National Park, Ararat Hills Regional Park, etc.	**No**	• It is considered that the bypass of the Beaufort township would significantly reduce travel time for businesses west of Beaufort to the key centres of Ballarat and Melbourne and conversely for those visitors travelling to townships west of Beaufort and major tourism destinations such as the Grampians National Park, Ararat Hills Regional Park, Great Western and Pyrenees wine region. • As outlined above, there will only be a travel time difference of 21 seconds between the 4 alignment options, the travel time saving is considered minimal. • It is acknowledged, however, that there is one minor difference in the interchange arrangements between the 4 alignment options. The C0 alignment interchange at Beaufort-Lexton Road is 500 metres closer to the Beaufort Township in comparison to the A0, A1 & C2 alignments. As a result, the C0 alignment could be considered slightly better from this perspective. However, any benefit gained would be very marginal and not a major factor in determining a preferred alignment. • This factor may be a qualitative factor in the assessment process.

4. Improve amenity within the township	• Predicted noise and amenity impact of bypass on township. • Predicted reduction in traffic volumes within township	**Yes – In part**	• Overall, it is considered that the Beaufort bypass would significantly reduce vehicle noise within the Beaufort township when compared to the current Western Highway alignment through the township. However, it is considered that the reduction in vehicle noise within the Beaufort township will be the same across all 4 alignments. • Overall, the reduction in traffic volumes travelling through the Beaufort township will be the same across all 4 alignments. • While, it is predicted that there will be a significant reduction in noise, amenity and traffic volumes on the Beaufort township as result of the bypass, these noise, amenity and traffic volume impacts could potentially be transferred to properties, landowners and other sensitive receptors near the 4 alignment options, although mitigation measures can be implemented through the installation of noise walls, off reservation treatment and landscaping. • The impact of noise, amenity and visual perspective on properties and sensitive receptors along the route of the proposed 4 alignments can be used to identify a preferred alignment. • Therefore, the noise and visual impact components are included within the social criteria of the revised preferred alignment assessment matrix.

EES Project Objectives	Key Issues to consider	Does the Objectives assist RRV to select a preferred alignment (Y/N)	Reasoning for inclusion/exclusion from preferred alignment key criteria
1. Road efficiency, capacity and safety To provide for an effective Western Highway bypass of Beaufort, to improve travel efficiency, road safety, and capacity, as well as improve amenity and local transport network in Beaufort.	• Impacts from through traffic (including heavy vehicles) in Beaufort. • Effective integration of the project with local transport networks including public transport; particularly the existing rail line in Beaufort. • Identify and compare expected or modelled transport performance of identified alignment options, in terms of travel times, capacity, traffic volumes, road safety and accessibility.	**No**	• The reduction in traffic volumes (including heavy vehicles) travelling through the Beaufort township will be the same across all 4 alignments. • That there will only be a travel time difference of 21 seconds between the 4 alignment options. While it is acknowledged that overall any of the 4 alignment options will significantly improve travel time when compared to the current Western Highway alignment through the Beaufort township, the travel time saving is considered minimal. • All 4 alignment options would require a significant amount of imported fill and pavement materials to be transported to the construction zone. Importation of fill and pavement materials will add a significant number of additional heavy vehicle trucks and trailers onto the road network and through the Beaufort township during the construction phase regardless of which alignment is selected. It is considered that the impact of the 4 alignment options on Beaufort and the road network during construction would be the same. • All 4 alignment options once operational would improve road safety within Beaufort when compared to the current Western Highway alignment through the township. Overall, improved road safety is considered the same across the 4 alignments. • Potential delays during the construction phase due to increase in construction vehicle movements on the Beaufort and the road network (including rail movements) will be the same across all 4 alignments.
2. Biodiversity To avoid and minimise adverse effects on native vegetation, as well as habitat for threatened flora and fauna species and ecological communities, including those listed under the FFG Act, and address offset requirements	• Loss or degradation of native vegetation and habitat for threatened species and communities, including those listed under Flora & Fauna Guarantee Act and DELWP Advisory List.	**Yes**	• Potential impacts on biodiversity are distinct between the 4 alignment routes, including proposed native vegetation removal, impacts on threaten flora and communities, existing wildlife corridor/connectivity and EVC conservation status vegetation for example.

for predicted losses consistent with relevant policy.	• Degradation to local and downstream ecology of aquatic environments. • The impact of the road bypass on wildlife movement within continuous vegetation linkages.		
3. Catchment values and Hydrology To protect catchment values, surface water and ground water quality, stream flows and floodway capacity, and avoid impacts on protected beneficial uses.	• Potential changes to the extent and severity of floodwaters in the area, that could have an effects on Beaufort or other significant locations. • Potential adverse effects on the functions and values of existing waterways during construction and operation. • Potential for unsuitable soil conditions to support the proposed bypass, including the potential for unearthing acid sulphate and contaminated soils. • Potential for effects on surface water quality, stream flows and groundwater, in particular on protected beneficial uses. • Potential for increased salinity, and related impacts on vegetation, soil and habitat values.	**Yes – In part**	The impact on groundwater is not considered a key assessment criterion to assist RRV in determining the preferred alignment. This is based on the following assessment: • That impact on groundwater will be the same across all 4 alignments. The potential impacts on waterways and floodplains is considered a key assessment criterion to assist RRV in determining the preferred alignment. This is based on the following assessment: • Potential impacts on waterways and floodplains are distinct between the 4 alignment routes, including number and locations of significant waterway crossings, total watercourse crossing length allowing 100 mm or less flood level increase, the extent of ground disturbing works within 50 m of the watercourse and total length of alignment within the 1% AEP base case floodplain for example.
4. Cultural Heritage (Aboriginal and Historic) To avoid and minimise adverse effects on Aboriginal and historic cultural heritage values, and to identify best practice mitigation measures.	• The potential for adverse effects on Aboriginal cultural heritage. • The potential for adverse effects on significant non-Aboriginal cultural heritage values.	**Yes**	• Potential impacts on cultural heritage are distinct between the 4 alignment routes, including impacts on registered Aboriginal sites, percentage of areas of sensitivity and registered European heritage sites.
5. Social and Community To minimise and manage adverse effects on the well-being of the local community, including potential impacts on cohesion and severance of community access to services, facilities and infrastructure.	• Potential Social impacts from displacement of residences, existing land uses and impacts on businesses. • Variable (positive or adverse) effects from relevant alignment alternatives on community access to and within Beaufort, including severance/access to community facilities, services and infrastructure. • Impacts of relevant alignment alternatives on opportunities for the future growth and development of Beaufort.	**Yes – In parts**	The potential impact on businesses, access to community facilities/services, future growth and development of Beaufort and strategic policies/plans is not considered a key assessment criterion to assist RRV in determining the preferred alignment. This is based on the following assessment: • The impact on businesses within the Beaufort township is considered the same across all 4 alignments. Existing highway reliant businesses within the township will be impacted regardless as all 4 alignments will divert traffic that would otherwise travel through the current Western Highway alignment without the bypass. • The impacts on access to community facilities and services are the same across all 4 alignments. • The 4 bypass alignments will not impact the future growth and development of Beaufort. Clause 21.06-1 (Beaufort) of the Pyrenees Planning Scheme identifies the areas to the south

	• Potential for inconsistency with existing strategic land use planning objectives, policies or plans.		of the current township for future residential growth. The 4 alignments are to the north of the current township. • The Pyrenees Planning Scheme currently recognises Beaufort as a highway town and it could be argued that with its bypass it is no longer a highway town and as such does not accord with this policy direction for Beaufort. From this perspective all 4 alignments will have the same impact on this policy direction. The potential impacts on property severance, acquisition and landowners is considered a key assessment criterion to assist RRV in determining the preferred alignment. This is based on the following assessment: • it is considered that the potential impacts on properties and landowners along the route of the proposed 4 alignments can be used to assess which alignment and how many properties/landowners are likely to be impacted from this perspective. • Therefore, the impacts on acquisition and property components are included within the social criteria of the revised preferred alignment assessment matrix.
6. Land use and Planning To minimise and manage adverse effects on local business (including agriculture) and existing or planned land uses.	• Potential economic impacts of land severance/changes to existing land uses and local business or planned land uses. • Economic performance of project alternatives in terms of relative benefits and costs. • Potential impacts on land managers located adjacent to the proposed bypass and township entry point. • Economic impacts of relevant alignment alternatives on future growth and development of Beaufort.	**No**	• The economic impacts of the 4 alignments on the Beaufort township is the same. Any bypass of the existing township will have an impact on those existing businesses that are reliant on passing traffic along the existing Western Highway. While there were some suggestions that a bypass alignment closer to the existing township would have a smaller impact in comparison to an alignment further from the township, there exists no economic evidence to suggest that this was the case. • As indicated above, the future residential growth and development of Beaufort is identified to the south of the existing township and the 4 bypass alignments will not impact on this. • The impact on existing land uses is considered comparable across the 4 alignments. While some land uses and current operations maybe impacted through potential severance or limited access during construction this will be temporary. In addition, the bypass alignments will not change the current planning controls with the study corridor (other than applying a Public Acquisition Overlay (PAO) to land required for the preferred bypass) and as such is unlikely to change the land use requirements under the current zoning and overlays controls and therefore should not inhibit these existing land uses (for expansion etc) or any other new/planned land uses to be considered by the relevant planning authority in the future.
7. Amenity To minimise adverse air quality, noise or vibration effects on the amenity of residents and local communities, as far as practicable during construction and operation.	• Increased noise levels from the project's construction and operation could affect amenity in areas in close proximity to the road alignment alternatives.	**Yes**	• While, it is predicted that there will be a significant reduction in noise, amenity and traffic volumes on the Beaufort township as result of the bypass, these noise, amenity and traffic volume impacts could potentially be transferred to properties, landowners and other sensitive receptors near the 4 alignment options, although mitigation measures can be implemented through the installation of noise walls, off reservation treatment and landscaping. The impact of noise, amenity and visual perspective on properties and sensitive receptors along the route of the proposed 4 alignments can be used to identify a preferred alignment.
8. Landscape and Visual To minimise adverse effects on visual and landscape values as far as practicable, during construction and operation.	• The potential for adverse effects on landscape and visual values, particularly the sensitive landscape areas of local or regional significance including; Camp Hill State Forest, Snowgums Bushland Reserve, Beaufort	**Yes – In parts**	The potential impact on sensitive landscape areas of local and regional significance is not considered a key assessment criterion to assist RRV in determining the preferred alignment. This is based on the following assessment: • Whilst Option A alignments impact on fewer local areas - they have a greater impact on Camp Hill State Forest than the Option C alignments. The Option C0 alignment currently

	trotting track, Beaufort main Lead Common and Beaufort Motorcycle Track, and water crossing including culturally significant watercourses in the landscape. • Consider the adverse effects on landscape and visual values associated with potential impacts to treed roadsides and, in general, the impacts associated with loss of trees and other vegetation. • Consideration of the interaction of the proposed alignment alternatives with view sheds to the wider landscape and significant landscapes in the area.		impacts the motorcycle track and the snow gum reserve but this could be minimised or completely avoided by refining the design. RRV considers that this component is very subjective and difficult to define/quantify the impact of one alignment over another. • In relation to the potential impact on landscape and its visual value from vegetation removal, RRV considers that this component will be sufficiently covered through the environment criteria of the revised preferred alignment assessment matrix. The visual impacts on dwellings and property owners along the 4 alignment routes is considered a key assessment criterion to assist RRV in determining the preferred alignment. This is based on the following assessment: • It is considered that the location of the proposed bypass alignments could potentially have visual impact on properties and landowners that previously were not impacted by the existing Western Highway. • While, mitigation measures can be implemented through landscaping and other measures, it is considered that the potential impacts on properties within 500m of the route of the proposed 4 alignments can be used to assess which alignment and how many properties it is likely to impact on from a no visual perspective. • Therefore, the visual impact components are included within the social criteria of the revised preferred alignment assessment matrix.
9. Environmental Management Framework To provide a transparent framework with clear accountabilities for managing environmental effects and hazards associated with construction and operation phases of the proposed project, in order to achieve acceptable environmental outcomes.	• Weak management of environment effects during project construction and operation could result in failure to meet statutory requirements and sustain stakeholder confidence.	**No**	Environmental management framework plan(s) will be developed to meet RRV standards and required legislations for the construction and operational phases of the bypass irrespective of the alignment route selected.
10. Sustainable Development Overall, to identify an alignment and conceptual design for the Western Highway bypass of Beaufort that would achieve a sustainable balance of environmental, economic and social outcomes and provide a net community benefit.	• The choice of the preferred alignment alternative for the project needs to provide an optimal balance of environmental, economic and social outcomes.	**No**	While RRV has not included this objective within the key assessment criteria in determining the preferred alignment, it does, however, acknowledge that the preferred alignment selected needs to demonstrate that on balance it achieves optimal environmental, social and economic outcomes. On this basis, RRV has a developed the revised preferred alignment assessment matrix based on a triple bottom line approach to clearly demonstrate in a quantifiable and transparent manner that the preferred alignment selected achieves a balance outcome from an environmental, social and economic perspective.

Based on the above assessment it was concluded that the RRV project objectives associated with "*Improve freight movement and efficiency", "Improve road safety within the township and arterial road network"* and *"Improve access to markets and the competitiveness of local industries"* did not assist in the selection of a preferred alignment due to the impacts/benefits of these 3 objectives being the same or similar across the 4 alignments.

The "*Improve amenity within the township*" objective, however, was considered to assist with the selection of the preferred alignment, in particular the components associated with the potential transferred of impacts to properties, landowners and other sensitive receptors near the 4 alignment options that previously were not impacted by the existing Western Highway.

The following EES scoping objectives were considered to fully or partially assist RRV in the selection of the preferred alignment.

- Biodiversity;
- Catchment Values and Hydrology;
- Cultural Heritage (Aboriginal and Historic);
- Social and community;
- Amenity; and
- Landscape and Visual.

The following EES scoping objectives were considered not to assist RRV in the selection of the preferred alignment:

- Road Efficiency, Capacity and Safety;
- Land Use and Planning;
- Environmental Management Framework; and
- Sustainable Development.

5.4 How has the assessment criteria been selected, and does it meet the intent/purpose of the EES scoping requirements?

5.4.1 Assessment Criteria Selection (Step 2)

This step involved the selection of assessment criterion that aligns with the project and EES objectives identified above in section 5.3.1 as assisting RRV with the selection of the preferred alignment.

The following key assessment criterion were selected:

<u>Environmental</u>

- Extent of native vegetation to be cleared (all classes) per alignment;
- Threatened vegetation communities within alignment corridor;
- Wild life corridor/connectivity impact;
- Strategic Biodiversity Value Score per alignment by EVC conservation Status;
- Condition score of native vegetation to be removed per alignment by EVC Conservation Status;
- Construction within floodplains.

<u>Social</u>

- Impact on number of known or registered sites by proposed alignment;
- Acquisition and property impacts;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass;
- Air quality impacts;
- Visual Impact – Number of dwellings within 500 m of proposed alignment.

<u>Economic</u>

- Construction cost per alignment.

Table 7 below provides a detailed discussion and justification on each assessment criteria that has been selected for the Revised Options Assessment and how it captures/meets the intent of the EES scoping requirement and why these criterions are good measures to use in the selection of the preferred alignment.

Table 7 Assessment Criteria Justification

Assessment Criteria	Justification as to why these criterions are good measures for selecting a preferred alignment
Environmental	
Extent of native vegetation to be cleared (all classes) per alignment: • Scattered trees • Large trees in patches • Number of large trees to removed • Impact on Endangered EVC habitat • Native vegetation offset requirement	The number, size and extent of native vegetation proposed to be removed per alignment is an appropriate measure to assess the potential impact of the bypass on vegetation within the Beaufort location, which is a key environmental feature. This assessment criteria provides clarity on the types and size of trees to be removed, including the ecological vegetation class with endangered status and the extent of vegetation required to offset those proposed to be removed. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses each alignment and the extent that each alignment will avoid and minimise adverse impacts on native vegetation including offsets required to address the predicted losses in accordance with relevant native vegetation removal guidelines. Therefore, this assessment criterion is considered appropriate to measure and compare the potential impacts of each bypass alignment on vegetation. Quantifiable measures for this criterion were taken from the following sections of the Flora and Fauna impact assessment report: • Table 6.1 Breakdown of impacts on EVCs in each alignment (in hectares), P142-143. • Table 6.2 Summary of EVCs proposed for removal by conservation status (not including tree losses), P143. • Table 6.4 Summary of preliminary proposed tree losses (large trees and small scattered trees only) within construction footprint per alignment option, P145 • Table 9.1 Summary of Biodiversity impacts and offset requirements (10m buffer on construction footprint), P244-245.
Threatened vegetation communities within alignment corridor: • Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act) • White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act) • Victorian Woodland Bird community (Threatened under FFG Act)	As all 4 bypass alignments intersect with vegetation communities identified as critically endangered or threatened under both the Environment Protection and Biodiversity Conservation Act and Flora and Fauna Guarantee Act, understanding how each alignment will impact on these important vegetation communities is considered critical from a biodiversity perspective. Three threatened vegetation communities were identified in the Flora and Fauna assessment report as being located within the Beaufort Bypass project area and outlined in the column opposite. These provide important habitat for a variety of fauna species, as such minimising the impacts of the bypass is an important consideration in the selection of the preferred bypass alignment. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses each alignment and the extent that each alignment will potentially impact on habitat for threatened flora and fauna species and ecological communities, including those listed under the EPBC and FFG Act.

	Therefore, this assessment criterion is considered appropriate and provides a clear measure to compare how each alignment will impact on critically endangered vegetation communities within the Beaufort Bypass project area. Quantifiable measures for this criterion were taken from the following sections of the Flora and Fauna impact assessment report: • Table ES.1 - Potential direct impacts of the alignment options on significant ecological values without mitigation measures, Pxx • Table 6.3 Breakdown of Threatened Vegetation Communities, p144.
Wild life corridor/connectivity impact: • Core • Node • Stepping stones • Terrestrial corridors • Wetlands	All 4 bypass alignments will impact and fragment existing wildlife corridors within the Beaufort Bypass project area, which could restrict access or create barriers or lead to the loss of habitat for a number fauna species. Further impacts could also increase the rate of wildlife mortality due to fauna crossing the bypass alignment trying to access key habitat areas. Therefore, minimising the impacts of the bypass alignments on the movement and connectivity of wildlife within the Beaufort Bypass project area is considered critical from a biodiversity perspective. This assessment criteria provides clear measures on how each bypass alignment will impact on the different structural wildlife corridors types (by size and importance) that are currently existing or are likely to be used by wildlife in the Beaufort Bypass project area. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses each alignment and the extent that each alignment will potentially impact on wildlife movement within continuous vegetation linkages in the project area. Therefore, this assessment criterion is considered appropriate to measure and compare each bypass alignment's impact on wildlife corridor and connectivity. Quantifiable measures for this criterion were taken from the following sections of the Flora and Fauna impact assessment report: • Table ES.1 - Potential direct impacts of the alignment options on significant ecological values without mitigation measures (Structural Connectivity), Pxxi
Strategic Biodiversity Value Score per alignment by EVC conservation Status: • Low (0.0 -0.3) • Medium (0.31 – 0.79) • High (0.8+)	The value of native vegetation (in particular those that have endangered EVC conservation status) to be removed is important when assessing and implementing the "*avoid and minimise*" requirement of the current DELWP Guidelines For Native Vegetation Removal (2017) and for the responsible authority when deciding if the proposed native vegetation removal should be approved. How the respective alignments impact on native vegetation that are of high strategic value to the Beaufort location and the bio-region is critical in the selection of the preferred alignment. Knowing the strategic biodiversity value of the vegetation within each alignment enables a comparative assessment of whether the native vegetation to be removed is of a high or low biodiversity value including which alignment is likely to have the least or most impact from this perspective. Combined with the impacts on the extent of native vegetation removal, threatened vegetation communities and on wildlife corridor and connectivity - the impacts on Strategic Biodiversity Value of native vegetation will

	further add and provide a significantly greater understanding of the overall impacts of each alignment on the environmental and biodiversity features of the Beaufort location and the bio-region. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses each alignment and the extent that each alignment will avoid and minimise adverse impacts on native vegetation that are either endangered or have a high Strategic Biodiversity Value score. Therefore, this assessment criterion is considered appropriate and provides a clear measure to compare how each alignment will impact on not just the loss of native vegetation overall but also the Strategic Biodiversity Value and potentially the Beaufort location and the bio-region. Quantifiable measures for this criterion were taken from the following sections of the Flora and Fauna impact assessment report: • Appendix F – ENSYM Reports.
Condition score of native vegetation to be removed by EVC conservation Status: • Low (less than 0.3) • Medium (between 0.31 – 0.59) • High (above 0.6)	The condition of native vegetation (in particular those that have endangered EVC conservation status) to be removed is important when assessing and implementing the avoid and minimise requirement of the current guidelines for native vegetation removal and for the responsible authority when deciding if the proposed native vegetation removal should be approved. How the respective alignments impact on native vegetation with high condition scores and value to the Beaufort location and the bio-region is critical in the selection of the preferred alignment. Knowing the condition scores of the vegetation within each alignment enables a comparative assessment of whether the native vegetation to be removed is of a high or low condition including which alignment is likely to have the least or most impact from this perspective. Combined with the impacts on the extent of native vegetation removal, threatened vegetation communities, wildlife corridor and connectivity and Strategic Biodiversity Value - the impacts on native vegetation with high or low condition scores will further add and provide a significantly greater understanding of the overall impacts of each alignment on the environmental and biodiversity features of the Beaufort location and the bio-region. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses each alignment and the extent that each alignment will avoid and minimise adverse impacts on native vegetation that are either endangered or have a high condition score. Therefore, this assessment criterion is considered appropriate and provides a clear measure to compare how each alignment will impact on not just the loss of native vegetation overall but also the condition of the native vegetation to be removed and potential implication to the Beaufort location and the bio-region. Quantifiable measures for this criterion were taken from the following sections of the Flora and Fauna impact assessment report: • Appendix F – ENSYM Reports.
Construction within floodplains: • Total number of waterway crossings • Total number of designated waterway crossings • Greatest 1% AEP flood depth intersecting bypass alignment option • Max flooding width at Yam Holes Creek crossing (1% AEP base case) • Total length of alignment within the 1% AEP base case floodplain	It is acknowledged that impacts on waterways and floodplains of all 4 alignments can be mitigated through design and standard engineering solutions to the satisfaction of the Glenelg Hopkins Catchment Management Authority and, as such, the criteria could be excluded from the Options Assessment Matrix. However from a potential risk and transparency perspective it was considered that there was a need to be very clear to separate the issues of potential impact that certain alignments will create from the mitigation required or standard engineering solutions to deal with the potential impact of these alignment as part of the EES.

• Total watercourse crossing length allowing 10 mm or greater (up to 100 mm) flood level increase • Yam Hole Creek crossing length allowing 10 mm or greater (up to 100 mm) flood level increase • Yam Hole Creek crossing average 1% AEP depth allowing 10 mm or greater (up to 100 mm) flood level increase • The extent of ground disturbance works within 50 m of watercourse	All 4 bypass alignments intersect a significant area of designated waterways and floodplains within the Beaufort Bypass project area. Knowing the potential impact/risk each alignment poses to designated waterways and floodplains enables a comparative assessment of alignment impacts on potential changes to the extant and severity of floodwaters in the area, which could have an effect on Beaufort or other significant locations prior to the consideration of mitigation measures. All mitigations measures for the 4 alignments are included in the preliminary costings for the project. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses each alignment and the extent that each alignment could potentially change the severity of floodwaters in the Beaufort area because of the project. Therefore, this assessment criterion is considered appropriate and provides a clear measure to compare how each alignment will impact on designated waterways and floodplains within the Beaufort Bypass project area. Quantifiable measures for this criterion were taken from the following sections of the Surface water impact assessment report: • Table 8.7 Summary of assessment Surface Water Impact Assessment, p78-79.
Social	
Impact on number of known or registered sites by proposed alignment. • Aboriginal • % of alignment within an area of Aboriginal sensitivity • European	Understanding impacts on known and potential places/locations of cultural and historic significance is important in minimising impacts on the key social and cultural fabric that is valued by the Beaufort community. From a cultural heritage perspective, all 4 bypass alignments intersect with known/registered aboriginal sites and areas identified as having aboriginal sensitivity and/or could potentially contain artefacts or evidence of the locations previously being occupied/used by local indigenous groups. While it is acknowledged that additional sites could potentially be unearthed or found during the complex assessment and/or construction phase, knowing how each alignment potentially impacts on Beaufort's cultural heritage is considered critical in the selection of the preferred alignment and understanding which alignment is likely to have the least or most impact from this perspective. From a historic heritage perspective, all 4 bypass alignments intersect with known and registered European heritage sites generally associated with the gold rush period in Beaufort. While it is acknowledged that additional sites could potentially be unearthed or found during the construction phase, knowing how each alignment potentially impacts on Beaufort's historic heritage is considered critical in the selection of the preferred alignment and understanding which alignment is likely to have the least or most impact from this perspective. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses each alignment and the extent that each alignment could potentially have adverse effects on significant Aboriginal and non-Aboriginal cultural heritage in the Beaufort area because of the project. Therefore, this assessment criterion is considered appropriate and provides a clear measure to compare how each alignment will impact on both Beaufort's cultural and historic heritage. Quantifiable measures for this criterion were taken from the following sections of the Beaufort Bypass Aboriginal Cultural Heritage Impact Assessment and Beaufort Bypass Historic Cultural Heritage Impact Assessment Reports:

	• Section 8.3 Design Options Impact Assessment – Aboriginal Cultural Heritage Impact Assessment, p77-80. • Table 8 Historic Archaeological Sites within the Project Area - Historical Cultural Heritage Impact Assessment, p35. • Section 7 Impact Assessment - Historical Cultural Heritage Impact Assessment, p56-58.
Acquisition and property impacts • Total areas to be acquired • Number of lots directly impacted by alignment corridor • Number of landowners directly impacted by alignment corridor • Number of dwellings directly impacted by alignment corridor	Major road infrastructure projects will generally impact individual land owners and property holdings and potentially create land severance and displacement issues for residence and occupants. The acquisition and property impact of each alignment is considered critical in the selection of the preferred alignment. The extent of land to be acquired including the number landowners, landholdings and dwellings that will be directly impacted by the Bypass alignments provides a clear measure to compare which alignment is likely to have the least or most impact. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses each alignment and the extent that each alignment's potential social impacts from a residential displacement and land severance perspective because of the project. Potential social impacts from displacement of residences, existing land uses and impacts on businesses, properties and landowners along the route of the proposed 4 alignments can be used to assess which alignment and how many properties/landowners are likely to be impacted from this perspective Therefore, this assessment criterion is considered an appropriate measure to use in the selection of the preferred alignment from the impacts on landowners and properties perspective. Quantifiable measures for this criterion were taken from the following sections of the Planning and Land use Assessment report: • Table 6.3 Land and Dwelling impacts for alignment options p67. • Table 6.4 Lots Impacted p67.
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	The extend of impact of the Bypass alignments on surrounding properties and sensitive receptors if mitigation measures were not provided is considered critical in understanding the likely noise and amenity impacts that would now be transferred from the existing Beaufort township to the properties and sensitive receptors north of the township. While it is acknowledged that mitigation measures will be implemented through the installation of noise walls, off reservation treatment and landscaping, it is important to understand the potential extent of impact on properties and landowners that previously were not impacted by the existing Western Highway in the selection of the preferred alignment and understanding which alignment is likely to have the least or most impact. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses the potential noise impact of each alignment during the construction and operation phase that could affect the amenity of nearby sensitive receptors such as dwellings. Therefore, this assessment criterion is considered an appropriate measure to use in the selection of the preferred alignment from a noise and amenity impact perspective. Quantifiable measures for this criterion were taken from the following sections of the Noise and Acoustic impact assessment report:

	• Table 1.1 & Table 8.1 – Predicted Unmitigated Road Traffic Noise Level from Beaufort Bypass, pviii & p37.
Air quality impacts • Sensitive receptors within 100 m of alignment • Sensitive receptors within 200 m of alignment • Sensitive receptors within 300 m of alignment	Overall it is considered likely that air quality impacts on the Beaufort township will significantly improve as a result of the Bypass project. Like noise and amenity, the impact of the Bypass alignments on surrounding properties and sensitive receptors is considered critical in understanding the likely air quality impacts that would now be transferred from the existing Beaufort township to the properties and sensitive receptors to north of the township. This is important to understand the potential extent of impact on properties and landowners that previously were not impacted by the existing Western Highway in the selection of the preferred alignment and understanding which alignment is likely to have the least or most impact. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses the potential air quality impacts of each alignment during the construction and operation phase that could affect nearby sensitive receptors such as dwellings. Therefore, this assessment criterion is considered an appropriate measure to use in the selection of the preferred alignment from an air quality impact perspective. Quantifiable measures for this criterion were taken from the following sections of the Air Quality impact assessment report: • Table 2-1 Number of Sensitive Receptors at Various Distances from Routes p10.
Visual Impact - Number of dwellings within 500 m of proposed alignment	Like noise and amenity and air quality impacts, the of impact of the Bypass alignments on surrounding properties and sensitive receptors is considered critical in understanding the likely visual impacts that would now be transferred from the existing Beaufort township to the properties and sensitive receptors to north of the township. This is important to understand the potential extent of visual impact on properties and landowners that previously were not impacted by the existing Western Highway in the selection of the preferred alignment and understanding which alignment is likely to have the least or most impact. While, it is acknowledged that mitigation measures can be implemented through landscaping and other design measures, the potential impacts on properties within 500m of the route of the proposed 4 alignments can be used to assess which alignment is likely to have the least or most visual impact on surrounding properties. The potential impact on landscape and its visual value from vegetation removal is sufficiently covered through the environment assessment criteria. This assessment criteria meets the intent of the EES scoping requirements as it considers and assesses the potential visual impacts of each alignment on properties and landowners that could now be impacted on by the project. Therefore, this assessment criterion is considered an appropriate measure to use in the selection of the preferred alignment from a visual impact perspective. Quantifiable measures for this criterion were taken from the following sections of the Landscape and Visual impact assessment report: • Table “titled” – Residential Dwellings Within 500 M of the Bypass, p189.
Economics	
Construction cost per alignment	VicRoads/RRV has not previously used construction cost solely in its decision making for selecting a preferred alignment but rather used this to compare and understand the likely cost implications of one alignment over

	another. However, it has in the past used the cost of construction to assist with the selection preferred alignment. For the Princes Highway Duplication, Traralgon East to Kilmany EES, where impacts were considered acceptable and /or where options appeared to be similar for all assessment criteria, the cost of options was then considered and used in the selection of the preferred alignment. From this perspective, this assessment criterion is considered an appropriate measure to use in the selection of the preferred alignment if impacts are similar for all options. Quantifiable measures for this criterion were taken from the costing prepared by Aquenta and from the following sections of the Regional Economy Existing Conditions and Impact assessment report: • Section 6.3.4 Considerations of Options, p62-65.

5.5 The Impact Evaluation and Scoring Framework.

A comprehensive impact evaluation and scoring framework was developed as part of RRV's selection of the preferred alignment. The developed evaluation and scoring framework reflect the complex and multi-facet nature of the assessment involved in the selection of the preferred alignment. The inclusion of multiple scoring scenarios and scoring sensitivity scenarios are critical and ensure that appropriate levels of rigour and robustness are considered as part of the assessment. The scoring framework that has been developed will further ensure that a wholistic decision-making process has been undertaken and that no one scenario will be the primary determining factor in the identification and selection of the preferred alignment.

The impact evaluation and scoring framework associated with the Revised Options Assessment Matrix includes undertaking 6 scoring scenarios and 3 scoring sensitivity scenarios in the evaluation and determination of the preferred alignment for the project.

The scoring scenarios and scoring sensitivity scenarios are explained below.

5.5.1 Scoring scenario 1 – Apply a score of 1 to 4 from least to highest impact

Under this scenario a score rating of 1 to 4 is applied to the impact assessment. This score rating approach ranks the 4 alignment options considered.

A score of 1 indicates the alignment option with the least impact based on the raw data for that specific assessment criteria and a score of 4 indicates the alignment option with the largest impact when compared against all 4 alignment options for that specific assessment criteria. A score of 2 and 3 will be allocated to the alignment options that is considered to have the second and third rated impacts. Where quantifiable impacts of the proposed alignments are the same, those alignments will receive the same score.

The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

5.5.2 Scoring Scenario 2 – Alignment with the highest number of least impact score

Under this scenario the number of least impact scores (a score of 1) is totalled to identify alignment option with the highest number of least impact scores. Other scores of 2, 3 & 4 are not included in the assessment under this scenario.

The alignment option with the highest total score of 1 across all assessment criteria is considered to have the least impact.

5.5.3 Scoring Scenario 3 – Apply a scoring of 1 to the highest impact and then subtract the % difference between the remaining alignments

Under this scenario a score rating of 1 is applied to the alignment with the highest impact based on the quantifiable data for that specific assessment criteria. The percentage difference between the alignment with the highest quantifiable data is then calculated between the quantifiable data figures for the remaining 3 alignments. A score is then apportioned to the remaining 3 alignments by subtracting the percentage difference with the alignment with the score of 1. Where quantifiable impact data of the proposed alignments are the same, those alignments will receive the same score.

An example of how the scoring under this scenario works is provided in Table 8 below.

Table 8 Scoring Scenario 3 Example

	Alignment A0	Alignment A1	Alignment C0	Alignment C2
Extent of native vegetation to be cleared (all classes) per alignment	**62.61ha**	**62.55ha**	**62.3ha**	**50.7ha**
% differentiation between alignment with the highest impact	**Highest impact**	**0.001% lower**	**0.005% lower**	**0.19% lower**
Scores	**1**	**0.999**	**0.995**	**0.81**

Based on the above example, under this scoring scenario, Alignment A0 has the highest impact with a score of 1 for total extent of native vegetation removal. Alignment C2 with a score of 0.81 has the least impact followed by Alignment C0 and A1 with a score of 0.995 and 0.999 respectively.

This scoring scenario was developed to ensure that scores are reflective of either the small or big margin differences between the 4 alignments based on the quantifiable data and as a contrast to scoring scenario 1. The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

5.5.4 Scoring Scenario 4 – Apply a scoring of 1 to the least impact and then add the % difference between the remaining alignments

Under this scenario a score rating of 1 is applied to the alignment with the least impact based on the quantifiable data for that specific assessment criteria. The percentage difference between the alignment with the lowest quantifiable data is then calculated between the quantifiable data figures for the remaining 3 alignments. A score is then apportioned to the remaining 3 alignments by adding the percentage difference with the alignment with the score of 1. Where quantifiable impact data of the proposed alignments are the same, those alignments will receive the same score. Under this scoring scenario the highest impact alignment can only be allocated a maximum score of 4 even if the percentage difference between the least impact and the highest impact alignment would result in a score allocation of greater than 4.

An example of how the scoring under this scenario works is provided in Table 9 below.

Table 9 Scoring Scenario 4 Example

	Alignment A0	Alignment A1	Alignment C0	Alignment C2
Extent of native vegetation to be cleared (all classes) per alignment	**62.61ha**	**62.55ha**	**62.3ha**	**50.7ha**
% differentiation between alignment with the least impact	**23.5% higher**	**23.4% higher**	**22.9% higher**	**Least impact**
Scores	**1.235**	**1.234**	**1.229**	**1**

Based on the above example, under this scoring scenario, Alignment C2 has the least impact with a score of 1 for total extent of native vegetation removal followed by Alignment C0 and A1 with a score of 1.229 and 1.234 respectively. Alignment A0 with a score of 1.235 has the highest impact.

This scoring scenario was developed to ensure that scores are reflective of either the small or big margin differences between the 4 alignments based on the quantifiable data and as a contrast to scoring scenario 1 and 3.

The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

5.5.5 Scoring Scenario 5 – Same scoring system as scenario 3 but minus criterions that can be mitigated and biodiversity impacts that are not vulnerable or endangered

Under this scenario, the same scoring system as scenario 3 is applied to the impact assessment. The key difference being criterions that can be mitigated, biodiversity impacts that that were not impacting on vulnerable or endangered EVCs and construction costs were removed. The following criterion were removed:

- Node, stepping stones, terrestrial corridor and wetlands were removed from the Wildlife corridor/connectivity criterion;
- Least concern, depleted EVCs were removed from Strategic Biodiversity Value Score Per Alignment criterion;
- Least concern, depleted EVCs were removed from the condition score of native vegetation to be removed criterion;
- Construction within floodplains criterion;
- Impact on number of known or registered sites by proposed alignment (Aboriginal and historic) criterion;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass criterion;
- Construction cost criterion.

The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

5.5.6 Scoring Scenario 6 – Same scoring system as scenario 4 but minus criterions that can be mitigated and biodiversity impacts that are not vulnerable or endangered

Under this scenario, the same scoring system as scenario 4 is applied to the impact assessment. The key difference being criterions that can be mitigated, biodiversity impacts that that were not impacting on vulnerable or endangered EVCs and construction costs were removed. The following criterion were removed:

- Node, stepping stones, terrestrial corridor and wetlands were removed from the Wildlife corridor/connectivity criterion;
- Least concern, depleted EVCs were removed from Strategic Biodiversity Value Score Per Alignment criterion;
- Least concern, depleted EVCs were removed from the condition score of native vegetation to be removed criterion;
- Construction within floodplains criterion;
- Impact on number of known or registered sites by proposed alignment (Aboriginal and historic) criterion;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass criterion;
- Construction cost criterion.

The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

In addition to the above 6 scoring scenarios, 3 additional scoring sensitivity scenarios were also developed to further test the robustness to the Revised Options Assessment Matrix. An overview of the sensitivity scenarios is provided below.

5.5.7 Scoring Sensitivity Scenario 1

Under this sensitivity scenario, the following scoring system was applied:

- Alignment Options with the least impact and other options within 5% of the least impact are apportioned a score of 1 point and a Green light.
- Alignment Options within 5 - 20% of the least impact option are apportioned a score of 0 point and an Amber light.
- Alignment Options with an impact of 20% or greater than the least impact option is apportioned a score of -1 and a Red light.

This scenario was prepared against all criteria rather than the reduced criteria reflected in Scoring Scenarios 5 and 6.

The alignment option with the highest positive total score across all assessment criteria is considered to have the least impact and best performing alignment.

5.5.8 Scoring Sensitivity Scenario 2

Under this sensitivity scenario, the following scoring system was applied:

- Alignment Options with the least impact and other options within 5% of the least impact are apportioned a score of 1 point and a Green light.
- Alignment Options within 5 - 25% of the least impact option are apportioned a score of 0 point and an Amber light.
- Alignment Options with an impact of 25% or greater than the least impact option is apportioned a score of -1 and a Red light.

This scenario was prepared against all criteria rather than the reduced criteria reflected in Scoring Scenarios 5 and 6.

The alignment option with the highest positive total score across all assessment criteria is considered to have the least impact and best performing alignment.

5.5.9 Scoring Sensitivity Scenario 3

Under this sensitivity scenario, the following scoring system was applied:

- Alignment Options with the least impact and other options within 5% of the least impact are apportioned a score of 1 point and a Green light.
- Alignment Options within 5 - 15% of the least impact option are apportioned a score of 0 point and an Amber light.
- Alignment Options with an impact of 15% or greater than the least impact option is apportioned a score of -1 and a Red light.

This scenario was prepared against all criteria rather than the reduced criteria reflected in Scoring Scenarios 5 and 6.

The alignment option with the highest positive total score across all assessment criteria is considered to have the least impact and best performing alignment.

6 The Preferred Alignment Options Assessment

Utilising the impact evaluation and scoring framework outlined in Section 5.5, RRV has undertaken an assessment of the 4 alignment options (A0, A1, C0 and C2) under consideration for the Beaufort Bypass ESS. The following section of the report outlines the results of the Revised Options Assessment Matrix including the key findings and the identification of the preferred alignment under the 6 scoring scenarios and the 3 scoring sensitivity scenarios.

6.1 Preferred Alignment Assessment Criteria and Quantifiable Data Input

Table 10 below provides a consolidated outline of the assessment criteria and the quantifiable data input that was used by RRV to evaluate the 4 alignment alignments against the 6 scoring scenarios and 3 score sensitivity scenarios to determine the preferred alignment for the Beaufort Bypass.

Table 10 Alignment Assessment Criteria and Quantifiable Data input

Assessment Criteria	**Alignment A0**	**Alignment A1**	**Alignment C0**	**Alignment C2**
Extent of native vegetation to be cleared (all classes) per alignment	**62.61ha**	**62.55ha**	**62.3ha**	**50.7ha**
Scattered trees	2.70ha	2.92ha	2.23ha	2.48ha
Large trees in patches	3.8ha	3.94ha	2.67ha	2.67ha
Number of large trees to removed	396	374	322	317
Impact on Endangered EVC habitat	16.89ha	14.78ha	9.53	9.03
Native vegetation offset requirement	143.712 Specific Unit	147.134 Specific Units	188.161 Specific Units	80.413 Specific Units
Threatened vegetation communities within alignment corridor	41.13 ha	38.8 ha	44.14 ha	31.62ah
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06 ha	0.06 ha	2.58 ha	0.06 ha
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act)	2.64 ha	0.65 ha	3.97 ha	0 ha
Victorian Woodland Bird community (Threatened under FFG Act)	38.43 ha	38.09 ha	37.59 ha	31.56 ha
Wild life corridor/connectivity impact	**38.852ha**	**38.739ha**	**37.683ha**	**32.52ha**
Core	24.181ha	25.389ha	16.03ha	10.81ha
Node	0.169ha	0.169ha	0 ha	0.169ha
Stepping Stones	5.453ha	5.556ha	10.788ha	14.462ha
Terrestrial Corridors	6.3ha	6.351ha	6.044ha	5.474ha
Wetlands	2.749ha	1.274ha	4.821ha	1.605ha
Strategic Biodiversity Value Score per alignment by EVC Conservation Status				

Low Score (0.0 - 0.3)				
Endangered	8	8	3	8
Medium Score (0.31 - 0.79)				
Least Concern	22	23	20	23
Depleted	33	44	36	38
Vulnerable	6	6	21	6
Endangered	98	97	64	71
High Score (0.8 +)				
Least Concern			3	2
Depleted	6	6	11	11
Vulnerable	1	1	2	1
Endangered	6	4	11	5
Condition score of native vegetation to be removed by EVC Conservation Status				
Low Score - Less than 0.3				
Least Concern	**13**	**14**	**11**	**13**
Depleted	**3**	**8**	**2**	**3**
Vulnerable	**4**	**4**	**10**	**4**
Endangered	**39**	**39**	**30**	**36**
Medium Score - between 0.31 - 0.59				
Least Concern	**8**	**8**	**11**	**11**
Depleted	**12**	**15**	**25**	**34**
Vulnerable	**2**	**2**	**9**	**1**
Endangered	**65**	**63**	**41**	**46**
High Score - above 0.6				
Least Concern	**1**	**1**	**1**	**1**
Depleted	**24**	**27**	**20**	**12**
Vulnerable	**1**	**1**	**4**	**2**
Endangered	**7**	**7**	**7**	**2**
Construction within floodplains				
Total number of waterway crossings	16	16	14	16
Total number of designated waterway crossings	3	3	3	3
Greatest 1% AEP flood depth intersecting bypass alignment option	1.34m	1.34m	1.5m	1.34m
Max Flooding width at Yam Holes Creek crossing (1% AEP base case)	750m	750m	300m	810m
Total length of alignment within the 1% AEP base case floodplain	1307m	1175m	1550m	2090m
Total watercourse crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	990m	835m	1380m	1475m

Yam Hole Creek crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	610m	610m	495m	570m
Yam Hole Creek crossing average 1% AEP depth allowing 10 mm or greater (up to 100 mm) flood level increase	600mm	600mm	400mm	600mm
The extent of ground disturbance works within 50 m of watercourse	11.6ha	12.45ha	19.5ha	24.5ha
Impact on number of known or registered sites by proposed alignment.				
Aboriginal	2	2	2	2
% of alignment within an area of Aboriginal sensitivity	14%	14.3%	14.8%	10.5%
European	4	3	4	2
Acquisition and property impacts				
Total areas to be acquired	278.47ha	278.88ha	256.12ha	262.59ha
Number of lots directly impacted by alignment corridor	65	62	72	73
Number of landowners directly impacted by alignment corridor	26	23	23	25
Number of dwellings directly impacted by alignment corridor	2	3	5	4
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	**23**	**23**	**27**	**27**
Air quality impacts				
Sensitive receptors within 100 m of alignment	4	2	2	2
Sensitive receptors within 200 m of alignment	5	5	6	4
Sensitive receptors within 500 m of alignment	12	10	12	9
Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**37**	**61**	**66**
Construction cost per alignment	**Estimate: $405.6 Million**	**Estimate: $391.3 Million**	**Estimate: $424.5 Million**	**Estimate: $482.5 Million**

6.2 Scoring and sensitivity scenario assessment Results

The following sections provides the outcomes of the evaluation of the 4 bypass alignment options against each scoring scenarios and scoring sensitivity scenarios identified in Section 4.10 of the report.

6.3 Scoring scenario 1 – Apply a score of 1 to 4 from least to highest impact.

A score rating of 1 to 4 is applied under this scenario.

A score of 1 indicates the alignment option with the least impact based on the quantifiable data for that specific assessment criteria and a score of 4 indicates the alignment option with the largest impact when compared against the other alignment options. A score of 2 and 3 will be allocated to the alignment options that is considered to have the second and third rated impacts. Where quantifiable impacts of the proposed alignments are the same, those alignments will receive the same score.

The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

Table 11 below outlines the assessment outcomes under scoring scenario 1.

Table 11 Scoring Scenario 1 Evaluation Outcomes

Assessment Criteria	Alignment A0	A0 Scores	Alignment A1	A1 Scores	Alignment C0	C0 Scores	Alignment C2	C2 Scores	Assessment Discussion
Extent of native vegetation to be cleared (all classes) per alignment	**62.61ha**	**4**	**62.55ha**	**3**	**62.3ha**	**2**	**50.7ha**	**1**	**The extent of native vegetation to be removed associated with alignment C2 is significantly lower (approximately 11 hectares lower) when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is considered to have the least impact and as such is allocated a score of 1. The difference in total areas of native vegetation to be removed between Alignments A0, A1 and C0 are minimal and it is considered that the potential impacts between these alignments would also be minimal. It is acknowledged that under this scoring scenario the scoring between alignments C0, A1 & A0 is not representative of the differences between potential impacts between the alignments. Under this scoring scenario Alignment C0 is the next least impact alignment with a score of 2 followed by alignments A1 & A0.**
Scattered trees	2.70ha	3	2.92ha	4	2.23ha	1	2.48ha	2	**The extent of native scattered trees to be removed associated with alignment C0 is slightly lower (approximately 0.7 hectares lower) when compared with Alignments A0, A1 & C2. For this criteria Alignment C0 is considered to have the least impact (marginally) and as such is allocated a score of 1. The differences in total areas and the potential impact associated with the removal of native scattered trees between all 4 alignments are minimal. It is acknowledged that under this scoring scenario the scoring between alignments C0, C2, A1 & A0 is not representative of significant differences between potential impacts between the 4 alignments. Under this scoring scenario Alignment C2 is the next least impact alignment with a score of 2 followed by alignments A0 & A1.**

Large trees in patches	3.8ha	2	3.94ha	3	2.67ha	1	2.67ha	1	**The extent of large trees in patches to be removed associated with alignment C0 and C2 are lower (approximately 1.3 hectares lower) when compared with Alignments A0 & A1. For this criteria Alignment C0 and C2 are considered to have the least impact and as such are both allocated a score of 1. The difference in total areas of large trees in patches to be removed between Alignments C0, C2, A0 and A1 are minimal and it is considered that the potential impacts between these alignments would also be minimal. The scoring between alignments C0 & C2 and A1 & A0 is not representative of the differences between potential impacts between the 4 alignments. Under this scoring scenario Alignment A0 is the next least impact alignment with a score of 2 followed by alignment A1.**
Number of large trees to removed	396	4	374	3	322	2	317	1	**The number of large trees to be removed associated with alignment C2 is lower (approximately 5 tree) when compared with Alignment C0 and approximately between 50-70 trees when compared to Alignments A0 & A1. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 1. The scoring between C2 and C0 is not representative of significant differences between potential impacts between these two alignments.** **Under this scoring scenario Alignment C0 is the next least impact alignment with a score of 2 followed by alignments A1 & A0.** **It is considered that the scoring differences between the C alignments and the A alignments for this criterion are representative of the significant differences in the number of large trees to be removed.**
Impact on Endangered EVC habitat	16.89ha	4	14.78ha	3	9.53	2	9.03	1	**The extent of impact on endangered EVC habitat associated with alignment C2 is lower (approximately 0.5 hectares) when compared with Alignment C0 and approximately between 5-7 hectares when compared to Alignments A1 & A0. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 1. The scoring between C2 and C0 is not representative of the differences between potential impacts between the alignments.** **Under this scoring scenario Alignment C0 is the next least impact alignment with a score of 2 followed by alignments A1 & A0.** **It is considered that the scoring differences between the C alignments and the A alignments for this criterion are representative of the significant differences in the impact on Endangered EVC habitat.**

Native vegetation offset requirement	143.712 Specific Unit	2	147.134 Specific Units	3	188.161 Specific Units	4	80.413 Specific Units	1	**The extent of native vegetation offset required to replace those proposed to be removed is lower for Alignment C2 when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is allocated a score of 1, while A0, A1 & C0 were allocated a score of 2, 3 and 4 respectively.** **It is considered that the scoring differences between the alignments are representative of the amount of vegetation proposed to be removed per alignment.**
Threatened vegetation communities within alignment corridor	**41.13**	**3**	**38.8**	**2**	**44.14**	**4**	**31.62**	**1**	**There is a total of 31.62 hectares of threatened vegetation communities within C2, 38.8 hectares for A1 and 41.13 hectares for A0 and 44.14 hectares for C0. For this criteria Alignment C2 is allocated a score of 1, 2 for A1, 3 for A0 and a score of 4 for C0 respectively.**
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06 ha	1	0.06 ha	1	2.58 ha	2	0.06 ha	1	**Alignments A0, A1 and C2 have the same impacts (0.06 hectares) on seasonal herbaceous wetlands and as such are allocated a score of 1.** **Alignment C0 with an impact area of 2.58 hectares has a slightly larger impact on seasonal herbaceous wetlands with compared to the other 3 alignments and as such is allocated a score of 2.** **It is considered that the scoring differences between the alignments A0, A1 & C2 and alignment C0 is representative of the differences in impact area.**
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act)	2.64 ha	3	0.65 ha	2	3.97 ha	4	0 ha	1	**Alignment C2 does not impact on this EPBC critically endangered woodland and as such is allocated a score of 1.** **Alignment A1 has an impact area of 0.65 hectares on this critically endangered woodland, which is marginally higher then C2 and as such is allocated a score of 2.** **A0 and C0 have a higher impact area (2-3 hectares higher) when compared to C2 and A1 and as such are allocated a score 3 and 4 respectively.**
Victorian Woodland Bird community (Threatened under FFG Act)	38.43 ha	4	38.09 ha	3	37.59 ha	2	31.56 ha	1	**C2 has an impact area of 31.56 hectares on this FFG threatened vegetation community, which is approximately 6-7 hectares lower then C0, A1 & A0, therefore, a score of 1 is allocated.** **A score of 2 is allocated to C0 with an impact area of 37.59, following by A1 and A0.** **The scoring for C0, A1 & A0 is not representative of the differences between the impact areas between the alignments.**
Wildlife corridor/connectivity impact	**38.852ha**	**4**	**38.739ha**	**3**	**37.683ha**	**2**	**32.52ha**	**1**	**C2 has an impact area of 32.52 hectares on wildlife corridor/connectivity, which is approximately 5-6 hectares lower then C0, A1 & A0, therefore, a score of 1 is allocated.**

									A score of 2 is allocated to C0 with an impact area of 37.68, following by A1 and A0. **The scoring for C0, A1 & A0 is not representative of the differences between the impact areas between the alignments.**
Core	24.181ha	3	25.389ha	4	16.03ha	2	10.81ha	1	**C2 has an impact area of 10.81 hectares on core wildlife corridor/connectivity, which is approximately 6-15 hectares lower then C0, A0 & A1, therefore, a score of 1 is allocated.** **A score of 2 is allocated to C0 with an impact area of 16.03 hectares, following by A0 and A1.** **The scoring for A0 & A1 is not representative of the differences between the impact areas on core habitat between the alignments.**
Node	0.169ha	2	0.169ha	2	0 ha	1	0.169ha	2	**C0 does not impact on node wildlife corridor and as such is allocated a score of 1.** **A score of 2 is allocated to A0, A1 and C2 which has the same impact area of 0.169 hectares.**
Stepping Stones	5.453ha	1	5.556ha	2	10.788ha	3	14.462ha	4	**A0 has an impact area of 5.453 hectares on stepping stone habitat corridor, which is marginally lower then A1 with an impact area of 5.556 hectares. A score of 1 is allocated to A0 and a score of two is allocated to A1.** **The scoring for A0 & A1 is not representative of the differences between the impact areas on stepping stone habitat between the alignments.** **A score of 3 is allocated to C0 with an impact area of 10.788 hectares, while a score of 4 is allocated to C2 with an impact area of 14.462 hectares.**
Terrestrial Corridors	6.3ha	3	6.351ha	4	6.044ha	2	5.474ha	1	**C2 has an impact area of 5.47 hectares on terrestrial corridor, which is marginally lower then C0, A1 & A0, therefore, a score of 1 is allocated.** **A score of 2 is allocated to C0 with an impact area of 6.044 hectares, followed by A0 and A1.** **The scoring for C2, C0, A0 & A1 is not representative of the differences between the impact areas between the alignments.**
Wetlands	2.749ha	3	1.274ha	1	4.821ha	4	1.605ha	2	**A1 has an impact area of 1.274 hectares on wetlands, which is marginally lower then C2 with an area of 1.605 hectares, therefore, a score of 1 is allocated. A score 2 is allocated to C2.**

									The scoring for A1 and C2, is not representative of the differences between the impact areas between the alignments. **A score of 3 is allocated to A0 with an impact area of 2.749 hectares, while a score of 4 is allocated to C0 with an impact area of 4.821 hectares.**
Strategic Biodiversity Value Score per alignment by EVC Conservation Status									
Low Score (0.0 - 0.3)									
Endangered	8	2	8	2	3	1	8	2	**C0 impacts on 3 zones of endangered EVC status vegetation with a low strategic biodiversity value score, which is lower in comparison to A0, A1 and C2 which impacts on 8 zones of endangered EVC status vegetation with a low strategic biodiversity value score. Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to A0, A1 and C2.**
Medium Score (0.31 - 0.79)									
Least Concern	22	2	23	3	20	1	23	3	**C0 impacts on 3 zones of endangered EVC status vegetation with a low strategic biodiversity value score, which is lower in comparison to A0, A1 and C2 which impacts on 8 zones of endangered EVC status vegetation with a low strategic biodiversity value score. Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to A0, A1 and C2.**
Depleted	33	1	44	4	36	2	38	3	**A0 impacts on 33 zones of depleted EVC status vegetation with medium strategic biodiversity value score, which is approximately between 3 to 11 zones lower in comparison to CO, C2 and A1 which impacts on 36, 38 and 44 zones of depleted EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 1 is allocated to A0, while a score of 2 is allocated to C0, 3 to C2 and 4 to A1.**
Vulnerable	6	1	6	1	21	2	6	1	**A0, A1 and C2 impacts on 6 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score, which is significantly lower in comparison to C0 which impacts on 21 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 2 is allocated to C0.** **The scoring for A0, A1, C2 compared with C0 is not representative of the differences between the amount vulnerable EVC status vegetation zones being impacted by CO.**
Endangered	98	4	97	3	64	1	71	2	**C0 impacts on 64 zones of endangered EVC status vegetation with a medium strategic biodiversity value score, which is**

									approximately between 7 to 34 zones lower in comparison to C2, A1 and A0, which impacts on 71, 97 and 98 zones of endangered EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to C2, 3 to A1 and 4 to A0. **The scoring for A1 and A0 is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**
<u>High Score (0.8 +)</u>									
Least Concern	0	1	0	1	3	3	2	2	**A0 and A1 does not impact of any least concern EVC status vegetation with a high strategic biodiversity value score, while C2 and C0 impacts on 2 and 3 zones of least concern EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 1 is allocated to both A0 and A1, while a score of 2 is allocated to C2, 3 to C0.** **The scoring for C2 and C0 is not representative of the very minor differences between the amount of EVC status vegetation zones being impacted.**
Depleted	6	1	6	1	11	2	11	2	**A0 and A1 impacts on 6 zones of depleted EVC status vegetation with a high strategic biodiversity value score, while both C2 and C0 impacts on 11 zones of depleted EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 1 is allocated to both A0 and A1, while a score of 2 is allocated to both C2 and C0.**
Vulnerable	1	1	1	1	2	2	1	1	**A0, A1 and C2 impacts on 1 zone of vulnerable EVC status vegetation with a high strategic biodiversity value score, while C0 only impacts on 2 zones of vulnerable EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 2 is allocated to C0.** **The scoring for A0, A1, C2 compared with C0 is not representative of the very minor differences between the amount of EVC status vegetation zones being impacted.**
Endangered	6	3	4	1	11	4	5	2	**A1 impacts on 4 zones of endangered EVC status vegetation with a high strategic biodiversity value score, which is between 1 to 7 zones lower in comparison to C2, A0 and C0, which impacts on 5, 6 and 11 zones of endangered EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 1 is allocated to A1, while a score of 2 is allocated to C2, 3 to A0 and 4 to C0.** **The scoring for A1, C2 and A0 is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**

Condition score of native vegetation to be removed by EVC Conservation Status									
Low Score - Less than 0.3									
Least Concern	13	2	14	3	11	1	13	2	**C0 impacts on 11 zones of least concern EVC status vegetation with a low condition score, which is between 2 to 3 zones lower in comparison to C2, A0 and A1, which impacts on 13, 13 and 14 zones of least concern EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to both C2 and A0 and 3 to A1.** **The scoring between the 4 alignments is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**
Depleted	3	2	8	3	2	1	3	2	**C0 impacts on 2 zones of depleted EVC status vegetation with a low condition score, which is between 1 to 6 zones lower in comparison to C2, A0 and A1, which impacts on 3, 3 and 8 zones of depleted EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to both C2 and A0 and 3 to A1.** **The scoring between C0 and C2 and A0 is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**
Vulnerable	4	1	4	1	10	2	4	1	**A0, A1 and C2 impacts on 2 zones of vulnerable EVC status vegetation with a low condition score, while C0 impacts on 8 zones of vulnerable EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 2 is allocated to C0.**
Endangered	39	3	39	3	30	1	36	2	**C0 impacts on 30 zones of endangered EVC status vegetation with a low condition score, which is between 6 to 9 zones lower in comparison to C2, A0 and A1, which impacts on 36 and 39 zones of endangered EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to C2 and 3 to both A0 to A1.** **The scoring between C2, A0 and A1 is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**
Medium Score - between 0.31 - 0.59									
Least Concern	8	1	8	1	11	2	11	2	**A0 and A1 impacts on 8 zones of least concern EVC status vegetation with a medium condition score, while C0 and C2 impacts 11 zones of least concern EVC status vegetation with a**

									medium condition score. Therefore, a score of 1 is allocated to both A0 and A1, while a score of 2 is allocated to both C0 and C2. **The scoring between A and C alignments is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**
Depleted	12	1	15	2	25	3	34	4	**A0 impacts on 12 zones of depleted EVC status vegetation with a medium condition score, which is between 3 to 22 zones lower in comparison to A1, C0 and C2, which impacts on 15, 25 and 34 zones of depleted EVC status vegetation with a medium condition score. Therefore, a score of 1 is allocated to A0, while a score of 2 is allocated to A1, 3 to C0 and 4 to C2.** **The scoring between A0 and A1 is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**
Vulnerable	2	2	2	2	9	3	1	1	**C2 impacts on 1 zone of vulnerable EVC status vegetation with a medium condition score, which is between 1 to 8 zones lower in comparison to A0, A1 an C0, which impacts on 2 and 9 zones of vulnerable EVC status vegetation with a medium condition score. Therefore, a score of 1 is allocated to C2, while a score of 2 is allocated to both A0 and A1 and 3 to C0.** **The scoring between A0 and A1 is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**
Endangered	65	4	63	3	41	1	46	2	**C0 impacts on 41 zones of endangered EVC status vegetation with a medium condition score, which is between 5 to 24 zones lower in comparison to C2, A1 and A0, which impacts on 46, 63 and 65 zones of endangered EVC status vegetation with a medium condition score. Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to C2, 3 to A1 and 4 to A0.** **The scoring between C0 and C2 is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.** **Also, the scoring between A0 and A1 is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**
High Score - above 0.6									
Least Concern	1	1	1	1	1	1	1	1	**All 4 alignments impact on 1 zone of least concern EVC status vegetation with a high condition score and as such are allocated a score of 1.**
Depleted	24	3	27	4	20	2	12	1	**C2 impacts on 12 zones of depleted EVC status vegetation with a high condition score, which is between 8 to 15 zones lower in comparison to C0, A1 and A0, which impacts on 20, 24 and 27**

									zones of depleted EVC status vegetation with a high condition score. Therefore, a score of 1 is allocated to C2, while a score of 2 is allocated to C0, 3 to A0 and 4 to A1.
Vulnerable	1	1	1	1	4	3	2	2	**A0 and A1 impacts on 1 zone of vulnerable EVC status vegetation with a high condition score, which is only 1 and 3 zones lower in comparison to C2 and C0, which impacts on 2 and 4 zones of vulnerable EVC status vegetation with a high condition score. Therefore, a score of 1 is allocated to both A0 and A1, while a score of 2 is allocated to C2 and 3 to C0.** **The scoring between the 4 alignments is not representative of the very minor differences between the amount EVC status vegetation zones being impacted.**
Endangered	7	2	7	2	7	2	2	1	**C2 impacts on 2 zones of endangered EVC status vegetation with a high condition score, which is 5 zones lower in comparison to A0, A1 and C0, which impacts on 7 zones of endangered EVC status vegetation with a high condition score. Therefore, a score of 1 is allocated to C2, while a score of 2 is allocated to A0, A1 and C0.**
Construction within floodplains									
Total number of waterway crossings	16	2	16	2	14	1	16	2	**C0 includes a total of 12 waterway crossings, which is 2 waterway crossings less then A0, A1 and C2. Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to A0, A1 and C2.**
Total number of designated waterway crossings	3	1	3	1	3	1	3	1	**All 4 alignments cross 3 designated waterways and as such are allocated a score of 1.**
Greatest 1% AEP flood depth intersecting bypass alignment option	1.34m	1	1.34m	1	1.5m	2	1.34m	1	**A0, A1 and C2 intersect modelled flood depth at its greatest point at 1.34 m, while C0 intersect flood depth at its greatest point at 1.5m. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 2 is allocated to C0.**
Max Flooding width at Yam Holes Creek crossing (1% AEP base case)	750m	2	750m	2	300m	1	810m	3	**C0 has a maximum modelled flood width of 300 m at the Yam Holes Creek crossing, while A0, A1 and C2 has a maximum modelled flood width of 750 m and 810 mat the Yam Holes Creek crossing respectively.** **Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to both A0 and A1 and a score of 3 to C2.**
Total length of alignment within the 1% AEP base case floodplain	1307m	2	1175m	1	1550m	3	2090m	4	**A1 has a total length of 1175 m within the modelled 1% AEP base case floodplain, while A0 and C0 has a total length of 1307 m and 1550 m respectively within the modelled 1% AEP base case floodplain. C2's total length is nearly doubled that of A1 at 2090 m.** **Therefore, a score of 1 is allocated to A1, while a score of 2 is allocated to A0, 3 to C0 and a score of 4 to C2.**

Total watercourse crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	990m	2	835m	1	1380m	3	1475m	4	**A1 has a total watercourse crossing length of 835 m modelled that could allow an increase of 10 mm or greater in flood levels, while A0, C0 and C2 has a total watercourse crossing length of 990 m, 1380 m and 1475 m respectively modelled that could allow an increase of 10 mm or greater in flood levels.** **Therefore, a score of 1 is allocated to A1, while a score of 2 is allocated to A0, 3 to A1 and a score of 4 to C2.**
Yam Hole Creek crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	610m	3	610m	3	495m	1	570m	2	**C0 has a total crossing length of 495 m modelled at the Yam Holes Creek that could allow an increase of 10 mm or greater in flood levels, while C2, A0 and A1 has a total crossing length of 570 m and 610 m respectively modelled at the Yam Holes Creek that could allow an increase of 10 mm or greater in flood levels.** **Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to C2 and a score of 3 to both A0 and A1.**
Yam Hole Creek crossing average 1% AEP depth allowing 10 mm or greater (up to 100 mm) flood level increase	600mm	2	600mm	2	400mm	1	600mm	2	**C0 has a modelled average depth of 400 mm at Yam Holes Creek crossing allowing an increase of 10 mm or greater in flood levels, while A0, A1 and C2 has a modelled average depth of 600 mm.** **Therefore, a score of 1 is allocated to C0, while a score of 2 is allocated to A0, A1 and C2.**
The extent of ground disturbance works within 50 m of watercourse	11.6ha	1	12.45ha	2	19.5ha	3	24.5ha	4	**A0 has a total of 11.6 hectares of ground disturbance work within 50 m of watercourse, which is lower in comparison with A1 which has a total of 12.45 hectares of ground disturbance work within 50 m of watercourse. The extend of ground disturbance works with 50 m of watercourses is significantly higher for C0 and C2, which has a total area of 19.5 hectares and 24.5 hectares respectively.** **Therefore, a score of 1 is allocated to A0, while a score of 2 is allocated to A1, 3 to C0 and a score of 4 to C2.**
Impact on number of known or registered sites by proposed alignment.									
Aboriginal	2	1	2	1	2	1	2	1	**All 4 alignments impact on 2 registered aboriginal sites and as such are allocated a score of 1.**
% of alignment within an area of Aboriginal sensitivity	14%	2	14%	3	15%	4	11%	1	**C2 has the least amount of its alignment corridor within an area of aboriginal sensitivity with 11%, which is only 3% and 4% lower in comparison to A0, A1 and C0, which has 14% and 15% of its alignment corridor within an area of aboriginal sensitivity. Therefore, a score of 1 is allocated to C2, 2 to both A0 and A1 and 3 to C0.**

									The scoring between the 4 alignments is not representative of the very minor differences between the amount of alignment corridor being within an area of aboriginal sensitivity.
European	4	3	3	2	4	3	2	1	**C2 impacts on 2 registered historic sites, which between 1 and 2 registered sites lower in comparison to A1, A0 and C0, which impact on 3 and 4 registered historic sites. Therefore, a score of 1 is allocated to C2, 2 to A1 and 3 to both A0 and C0.** **The scoring between the 4 alignments is not representative of the very minor differences between the amount of registered historic sites being impacted.**
Acquisition and property impacts									
Total areas to be acquired	278.47ha	3	278.88ha	4	256.12ha	1	262.59ha	2	**C0 will result in the total acquisition of approximately 256.12 hectares of land, which is between 6 to 22 hectares lower in comparison to C2, A0 and A1, which will result in the total acquisition of approximately 262.59, 278.47 and 278.88 hectares respectively. Therefore, a score of 1 is allocated to C0, 2 to C2, 3 to A0 and 4 to A1.** **The scoring between A0 and A1 is not representative of the very minor differences between the total amount of land to be acquired.**
Number of lots directly impacted by alignment corridor	65	2	62	1	72	3	73	4	**A1 will directly impact on 62 lots, which is between 3 to 11 lots lower in comparison to A0, C0 and C2, which will directly impact on 65, 72 and 73 lots respectively. Therefore, a score of 1 is allocated to A1, 2 to A0, 3 to C0 and 4 toC2.** **The scoring between A0 and A1 is not representative of the very minor differences between the total amount of lots to be impacted.** **The scoring between C0 and C2 is also not representative of the very minor differences between the total amount of lots to be impacted.**
Number of landowners directly impacted by alignment corridor	26	3	23	1	23	1	25	2	**A1 and C0 will directly impact on 23 landowners, which is 2 to 3 lower in comparison to C2 and A0, which will directly impact on 25 and 26 landowners respectively. Therefore, a score of 1 is allocated to both A1 and C0, 2 to C2 and 3 to A0.** **The scoring between the 4 alignments is not representative of the very minor differences between the number of landowners that will be directly impacted.**
Number of dwellings directly impacted by alignment corridor	2	1	3	2	5	4	4	3	**A0 and A1 will directly impact on 2 & 3 dwellings respectively, which is marginally lower than C0 and C2 will directly impacts on 5 and 4 dwellings. Therefore, a score of 1 is allocated to A0, 2 to A1, 3 to C2 and 4 to C0.**

									The scoring between the 4 alignments is not representative of the very minor differences between the number of dwellings that will be directly impacted.
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	**23**	**1**	**23**	**1**	**27**	**2**	**27**	**2**	**Without implementing noise mitigation, A0 and A1 will directly impact on 23 residential properties post construction, which is slightly lower than C0 and C2 which will directly impact on 27 residential properties. Therefore, a score of 1 is allocated to both A0 and A1 and a score of 2 to both C0 and C2.** **The scoring between the 4 alignments is not representative of the very minor differences between the number of residential properties that would be impacted by noise (without mitigation) post construction of the bypass.**
Air quality impacts									
Sensitive receptors within 100 m of alignment	4	2	2	1	2	1	2	1	**There will be 2 sensitive receptors (dwellings) within 100 m of A1, C0 and C2, which is marginally lower than A0 will have 4 sensitive receptors within the same distance. Therefore, a score of 1 is allocated to A1, C0 and C2 while a score of 2 is allocated to A0.** **The scoring between the 4 alignments is not representative of the very minor differences between the number of sensitive receptors within 100 m.**
Sensitive receptors within 200 m of alignment	5	2	5	2	6	3	4	1	**There will be 4 sensitive receptors (dwellings) within 200 m of C2, which is marginally lower than A1, A0 and C0 which has 5 and 6 sensitive receptors within the same distance. Therefore, a score of 1 is allocated to C2, 2 to A0 and A1 and 3 to C0.** **The scoring between the 4 alignments is not representative of the very minor differences between the number of sensitive receptors within 200 m.**
Sensitive receptors within 300 m of alignment	12	3	10	2	12	3	9	1	**There will be 9 sensitive receptors (dwellings) within 300 m of C2, which is lower than A1, A0 and C0 which has 10 and 12 sensitive receptors within the same distance. Therefore, a score of 1 is allocated to C2, 2 to A1, 3 to both A0 and C0.** **The scoring between the 4 alignments is not representative of the very minor differences between the number of sensitive receptors within 300 m.**
Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**2**	**37**	**1**	**61**	**3**	**66**	**4**	**A1 has a total number of 37 dwellings within 500 m of its alignment corridor, which is marginally lower than A0 and significantly lower than C0 and C2 which has total number of 40, 61 and 66 dwellings within the same distance. Therefore, a score of 1 is allocated to A1, 2 to A0, 3 to C0 and 4 to C2.**

									The scoring between A1 and A0 is not representative of the very minor differences between the number of dwellings within 500 m of its alignment corridor.
Construction cost per alignment	**Estimate: $405.6 Million**	**2**	**Estimate: $391.3 Million**	**1**	**Estimate: $424.5 Million**	**3**	**Estimate: $482.5 Million**	**4**	**A1 is estimated to have the lowest construction cost at $391.3 million which is lower than A0, C0 and C2 which is estimated to have a construction cost of $405.6 million, $424.5 million and $482.5 million.** **Therefore, a score of 1 is allocated to A1, 2 to A0, 3 to C0 and 4 to C2.** **However, it should be noted that RRV has not previously used construction cost solely in its decision making for selecting a preferred alignment but rather it has been used to compare and understand the likely cost implications of one alignment over another and to use in the selection of the preferred alignment if impacts are similar for all options.**
Total		**128**		**123**		**126**		**111**	**Under this scoring scenario, C2 has the lowest total score of 111 across all assessment criteria followed by A1 with 123, C0 with 126, and A0 with 128. Therefore, C2 is the alignment with the least impact under scoring scenario 1.**

6.3.1 Impact Scores by Key Assessment Criteria

Table 12 below provides a breakdown of the impact scoring by each key assessment criteria per alignment.

Table 12 Impact Scoring Breakdown by Key Assessment Criteria per Alignment

Assessment Criteria	Alignment A0	Alignment A1	Alignment C0	Alignment C2
Total Environment Criteria Scores	**101**	**101**	**94**	**84**
Extent of native vegetation to be cleared (all classes) per alignment	19	19	12	7
Threatened vegetation communities within alignment corridor	11	8	12	4
Wild life corridor/connectivity impact	16	16	14	11
Strategic Biodiversity Value Score per alignment by EVC Conservation Status	16	17	18	18
Condition score of native vegetation to be removed by EVC Conservation Status	23	26	22	21
Construction within floodplains	16	15	16	23
Total Social Criteria Scores	**25**	**21**	**29**	**23**
Impact on number of known or registered sites by proposed alignment.	6	6	8	3
Acquisition and property impacts	9	8	9	11
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	1	1	2	2
Air quality impacts	7	5	7	3
Visual Impact - Number of dwellings within 500 m of proposed alignment	2	1	3	4
Total Economic Criteria Scores	**2**	**1**	**3**	**4**
Construction cost per alignment	2	1	3	4
Total Overall Combined Scores	**128**	**123**	**126**	**111**

6.3.2 Scoring Scenario 1 Conclusions

Utilising the assessment and evaluation framework outlined under scoring scenario 1, C2 is identified as the alignment with the least overall impact with a score of 111 points, followed by A1 with a score of 123, C0 with a score of 126 points and A0 with the highest impact score of 128 points. The key difference in the scoring between C2 and the A1, C0 and A0 alignments relates to its superior performance against the Environment Criteria. Overall, C2 scored between 10 points and 17 points respectively lower then C0 and A1 & A0. Specifically, this was due to C2 having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area; and
- The least amount of impact on native vegetation with high conditions to be removed by EVC Conservation Status.

Conversely, C2 had the biggest potential construction within floodplains within the project area compared to the other 3 alignments based on modelling working undertaken to date. For this assessment Criteria, A1 has the least impact with an overall score of 15. Also, C2 performed marginally worst then the other 3 alignments against the impact on Strategic Biodiversity Value Score criterion. This was due to the C2 alignment

resulting in a higher removal of EVC conservation status that were classified as least concern and depleted in comparison to the other 3 alignment. However, C2 would result in a significantly lower amount of native vegetation with vulnerable and Endangered EVC status to be removed when compared to the 3 alignments. This is further demonstrated under scoring scenario 5 & 6 where the impacts on vulnerable and Endangered EVC status are only considered in the impact assessment.

A1 is considered to have the least impact from a social impact perspective with a score of 21, marginally lower then C2 with score of 23, followed by A0 with a score of 25 and C0 with a score of 29. Specifically, A1 performed better than C2 on:

- Acquisition and property impacts. While A1 would result in a higher amount of land to be acquired when compared to C2, it however, impacts on a smaller number of properties, landowners and dwellings that would directly be impacted by the alignment corridor. This is due to the location being more rural when compared to the "C" alignments being semi-rural and closer to the Beaufort Township.
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass; and
- Visual Impact in that there will be a lower number of dwellings within 500 m of the alignment corridor. This is due to the location being more rural when compared to the "C" alignments being semi-rural and closer to the Beaufort Township.

Specifically, C2 performed better than A1 on:
- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

A1 is the best performing alignment for the economic criteria due to it being the alignment with lowest construction cost, followed by A0, C0 and C2. It should be noted that the costings for C2 is higher due to its impact on the floodplains and reflective of the potential number of culverts and bridge structures required. However, as indicated previously in the report, RRV has not previously used construction cost solely in its decision making for selecting a preferred alignment but rather it has been used to compare and understand the likely cost implications of one alignment over another and to use in the selection of the preferred alignment if other impacts are similar for all options.

Based on the above discussions, RRV considers alignment option C2 to be the preferred alignment under scoring scenario 1.

RRV notes that under this scoring scenario, some of the scoring for specific criterions are not representative of the differences in the quantifiable data outlining potential impacts between the 4 alignments. It is considered that scoring scenarios 3 & 4 more appropriately captures the differences in the quantifiable data outlining potential impacts between the 4 alignments in its scoring allocation. However, the results under this scoring scenario is still considered appropriate and provides a solid baseline/platform assessment in the overall identification of the preferred alignment for the Beaufort Bypass.

6.4 Scoring Scenario 2 – Alignment with the highest number of least impact score

Under this scenario the number of least impact scores (a score of 1) is totalled to identify the alignment option with the highest number of least impact scores. Other scores of 2, 3 & 4 are not included in the assessment under this scenario.

The alignment option with the highest total score of 1 across all assessment criteria is considered to have the least impact.

Table 13 below outlines the assessment outcomes under scoring scenario 2.

Table 13 Scoring Scenario 2 Evaluation Outcomes

Assessment Criteria	Alignment A0	A0 Scores	Alignment A1	A1 Scores	Alignment C0	C0 Scores	Alignment C2	C2 Scores	Assessment Discussion
Extent of native vegetation to be cleared (all classes) per alignment	**62.61ha**	**4**	**62.55ha**	**3**	**62.3ha**	**2**	**50.7ha**	**1**	**C2 is the least impact alignment under this assessment criteria.**
Scattered trees	2.70ha	3	2.92ha	4	2.23ha	1	2.48ha	2	**C0 is the least impact alignment under this assessment criteria.**
Large trees in patches	3.8ha	2	3.94ha	3	2.67ha	1	2.67ha	1	**C0 & C2 are the least impact alignments under this assessment criteria.**
Number of large trees to removed	396	4	374	3	322	2	317	1	**C2 is the least impact alignment under this assessment criteria.**
Impact on Endangered EVC habitat	16.89ha	4	14.78ha	3	9.53	2	9.03	1	**C2 is the least impact alignment under this assessment criteria.**
Native vegetation offset requirement	143.712 Specific Unit	2	147.134 Specific Units	3	188.161 Specific Units	4	80.413 Specific Units	1	**C2 is the least impact alignment under this assessment criteria.**
Threatened vegetation communities within alignment corridor	**41.13**	**3**	**38.8**	**2**	**44.14**	**4**	**31.62**	**1**	**C2 is the least impact alignment under this assessment criteria.**
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06 ha	1	0.06 ha	1	2.58 ha	2	0.06 ha	1	**A0, A1 & C2 are the least impact alignments under this assessment criteria.**
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically	2.64 ha	3	0.65 ha	2	3.97 ha	4	0 ha	1	**C2 is the least impact alignment under this assessment criteria.**

Endangered under EPBC Act)									
Victorian Woodland Bird community (Threatened under FFG Act)	38.43 ha	4	38.09 ha	3	37.59 ha	2	31.56 ha	1	**C2 is the least impact alignment under this assessment criteria.**
Wild life corridor/connectivity impact	**38.852ha**	**4**	**38.739ha**	**3**	**37.683ha**	**2**	**32.52ha**	**1**	**C2 is the least impact alignment under this assessment criteria.**
Core	24.181ha	3	25.389ha	4	16.03ha	2	10.81ha	1	**C2 is the least impact alignment under this assessment criteria.**
Node	0.169ha	2	0.169ha	2	0 ha	1	0.169ha	2	**C0 is the least impact alignment under this assessment criteria.**
Stepping Stones	5.453ha	1	5.556ha	2	10.788ha	3	14.462ha	4	**A0 is the least impact alignment under this assessment criteria.**
Terrestrial Corridors	6.3ha	3	6.351ha	4	6.044ha	2	5.474ha	1	**C2 is the least impact alignment under this assessment criteria.**
Wetlands	2.749ha	3	1.274ha	1	4.821ha	4	1.605ha	2	**A1 is the least impact alignment under this assessment criteria.**
Strategic Biodiversity Value Score per alignment by EVC Conservation Status									
Low Score (0.0 - 0.3)									
Endangered	8	2	8	2	3	1	8	2	**C0 is the least impact alignment under this assessment criteria.**
Medium Score (0.31 - 0.79)									
Least Concern	22	2	23	3	20	1	23	3	**C0 is the least impact alignment under this assessment criteria.**
Depleted	33	1	44	4	36	2	38	3	**A0 is the least impact alignment under this assessment criteria.**
Vulnerable	6	1	6	1	21	2	6	1	**A0, A1 & C2 is the least impact alignments under this assessment criteria.**
Endangered	98	4	97	3	64	1	71	2	**C0 is the least impact alignment under this assessment criteria.**
High Score (0.8 +)									
Least Concern	0	1	0	1	3	3	2	2	**A0 & A1 are the least impact alignments under this assessment criteria.**
Depleted	6	1	6	1	11	2	11	2	**A0 & A1 are the least impact alignments under this assessment criteria.**
Vulnerable	1	1	1	1	2	2	1	1	**A0, A1 & C2 is the least impact alignments under this assessment criteria.**

Endangered	6	3	4	1	11	4	5	2	**A1 is the least impact alignment under this assessment criteria.**
Condition score of native vegetation to be removed by EVC Conservation Status									
Low Score - Less than 0.3									
Least Concern	13	2	14	3	11	1	13	2	**C0 is the least impact alignment under this assessment criteria.**
Depleted	3	2	8	3	2	1	3	2	**C0 is the least impact alignment under this assessment criteria.**
Vulnerable	4	1	4	1	10	2	4	1	**A0, A1 & C2 is the least impact alignments under this assessment criteria.**
Endangered	39	3	39	3	30	1	36	2	**C0 is the least impact alignment under this assessment criteria.**
Medium Score - between 0.31 - 0.59									
Least Concern	8	1	8	1	11	2	11	2	**A0 & A1 are the least impact alignments under this assessment criteria.**
Depleted	12	1	15	2	25	3	34	4	**A0 is the least impact alignment under this assessment criteria.**
Vulnerable	2	2	2	2	9	3	1	1	**C2 is the least impact alignment under this assessment criteria.**
Endangered	65	4	63	3	41	1	46	2	**C0 is the least impact alignment under this assessment criteria.**
High Score - above 0.6									
Least Concern	1	1	1	1	1	1	1	1	**All 4 alignments are rated the same under this assessment criteria.**
Depleted	24	3	27	4	20	2	12	1	**C2 is the least impact alignment under this assessment criteria.**
Vulnerable	1	1	1	1	4	3	2	2	**A0 & A1 are the least impact alignments under this assessment criteria.**
Endangered	7	2	7	2	7	2	2	1	**C2 is the least impact alignment under this assessment criteria.**
Construction within floodplains									
Total number of waterway crossings	16	2	16	2	14	1	16	2	**C0 is the least impact alignment under this assessment criteria.**
Total number of designated waterway crossings	3	1	3	1	3	1	3	1	**All 4 alignments are rated the same under this assessment criteria.**
Greatest 1% AEP flood depth intersecting bypass alignment option	1.34m	1	1.34m	1	1.5m	2	1.34m	1	**A0, A1 & C2 are the least impact alignments under this assessment criteria.**

Max Flooding width at Yam Holes Creek crossing (1% AEP base case)	750m	2	750m	2	300m	1	810m	3	**C0 is the least impact alignment under this assessment criteria.**
Total length of alignment within the 1% AEP base case floodplain	1307m	2	1175m	1	1550m	3	2090m	4	**A1 is the least impact alignment under this assessment criteria.**
Total watercourse crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	990m	2	835m	1	1380m	3	1475m	4	**A1 is the least impact alignment under this assessment criteria.**
Yam Hole Creek crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	610m	3	610m	3	495m	1	570m	2	**C0 is the least impact alignment under this assessment criteria.**
Yam Hole Creek crossing average 1% AEP depth allowing 10 mm or greater (up to 100 mm) flood level increase	600mm	2	600mm	2	400mm	1	600mm	2	**C0 is the least impact alignment under this assessment criteria.**
The extent of ground disturbance works within 50 m of watercourse	11.6ha	1	12.45ha	2	19.5ha	3	24.5ha	4	**A0 is the least impact alignment under this assessment criteria.**
Impact on number of known or registered sites by proposed alignment.									
Aboriginal	2	1	2	1	2	1	2	1	**All 4 alignments are rated the same under this assessment criteria.**
% of alignment within an area of Aboriginal sensitivity	14%	2	14%	3	15%	4	11%	1	**C2 is the least impact alignment under this assessment criteria.**
European	4	3	3	2	4	3	2	1	**C2 is the least impact alignment under this assessment criteria.**
Acquisition and property impacts									
Total areas to be acquired	278.47ha	3	278.88ha	4	256.12ha	1	262.59ha	2	**C0 is the least impact alignment under this assessment criteria.**

Number of lots directly impacted by alignment corridor	65	2	62	1	72	3	73	4	**A1 is the least impact alignment under this assessment criteria.**
Number of landowners directly impacted by alignment corridor	26	3	23	1	23	1	25	2	**A1 & C0 are the least impact alignment under this assessment criteria.**
Number of dwellings directly impacted by alignment corridor	2	1	3	2	5	4	4	3	**A0 & A1 are the least impact alignments under this assessment criteria.**
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	**23**	**1**	**23**	**1**	**27**	**2**	**27**	**2**	**A0 & A1 are the least impact alignments under this assessment criteria.**
Air quality impacts									
Sensitive receptors within 100 m of alignment	4	2	2	1	2	1	2	1	**A1, C0 & C2 are the least impact alignments under this assessment criteria.**
Sensitive receptors within 200 m of alignment	5	2	5	2	6	3	4	1	**C2 is the least impact alignment under this assessment criteria.**
Sensitive receptors within 300 m of alignment	12	3	10	2	12	3	9	1	**C2 is the least impact alignment under this assessment criteria.**
Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**2**	**37**	**1**	**61**	**3**	**66**	**4**	**A1 is the least impact alignment under this assessment criteria.**
Construction cost per alignment	**Estimate: $405.6 Million**	**2**	**Estimate: $391.3 Million**	**1**	**Estimate: $424.5 Million**	**3**	**Estimate: $482.5 Million**	**4**	**A1 is the least impact alignment under this assessment criteria.**
Total		**18**		**22**		**20**		**27**	**Under this scoring scenario C2 has the highest total least impact score of 1 across all assessment criteria with a total of 27, followed by A1 with 22, C0 with 20 and A0 with 18. Therefore, C2 is the alignment with the least impact under scoring scenario 2.**

6.4.1 Impact Scores by Key Assessment Criteria

Table 14 below provides a breakdown of the impact scoring by each key assessment criteria per alignment.

Table 14 Impact Scoring Breakdown by Key Assessment Criteria per Alignment

Key Assessment Criteria	Alignment A0	Alignment A1	Alignment C0	Alignment C2
Total Environment Criteria Scores	**15**	**15**	**16**	**21**
Extent of native vegetation to be cleared (all classes) per alignment	**0**	**0**	**2**	**5**
Threatened vegetation communities within alignment corridor	1	1	0	4
Wild life corridor/connectivity impact	1	1	1	3
Strategic Biodiversity Value Score per alignment by EVC Conservation Status	5	5	3	2
Condition score of native vegetation to be removed by EVC Conservation Status	5	4	5	5
Construction within floodplains	3	4	5	2
Total Social Criteria Scores	**3**	**6**	**4**	**6**
Impact on number of known or registered sites by proposed alignment.	1	1	1	3
Acquisition and property impacts	1	2	2	0
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	1	1	0	0
Air quality impacts	0	1	1	3
Visual Impact - Number of dwellings within 500 m of proposed alignment	0	1	0	0
Total Economic Criteria Scores	**0**	**1**	**0**	**0**
Construction cost per alignment	0	1	0	0
Total Overall Combined Scores	**18**	**22**	**20**	**27**

6.4.2 Scoring Scenario 2 Conclusions

Utilising the assessment and evaluation framework outlined under scoring scenario 2, C2 is identified as the alignment with the highest overall number of least impact scores (scores of 1) with 27, followed by A1 with 22, C0 with 20 and A0 with 18. The key difference in the scoring between C2 and the A1, C0 and A0 alignments relates to its superior performance against the Environment Criteria. Overall, C2 scored 21 of its 27 scores of 1 in the Environment Criteria. This was 5 higher than the next best, which was C0 with 16. Specifically, this was due to C2 having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area; and
- The least amount of impact on native vegetation with high conditions to be removed by EVC Conservation Status.

Conversely, C2 had the biggest potential construction within floodplains within the project area compared to the other 3 alignments based on modelling working undertaken to date. While A1 has the least impact score under scoring scenario 1 for impacts on floodplain, under scoring scenario 2, C0 had a slightly higher number of least impact score with 5 compared to A1 which had 4. Also, C2 with the lowest number of least impact score performed marginally worst then the other 3 alignments against the impact on Strategic Biodiversity Value Score criterion. As outlined in the scoring scenario 1 conclusion, was due to the C2 alignment removing a higher amount of EVC conservation status that were classified as least concern and depleted in comparison to the other 3 alignment. However, C2 would result in a significantly lower amount of native vegetation with vulnerable and Endangered EVC status to be removed when compared to the 3 alignments. This is further demonstrated under scoring scenario 5 & 6 where the impacts on vulnerable and Endangered EVC status are only considered in the impact assessment.

A1 is the alignment with the highest overall number of least impact scores (scores of 1) under the social criteria with a score of 7, marginally higher then C2 with 6, followed by C0 with 4 and A0 with 3. Specifically, A1 performed better than C2 on:

- Acquisition and property impacts. While A1 would result in a higher amount of land to be acquired when compared to C2, it however impacts on a smaller number of properties, landowners and dwellings that would directly be impacted by the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass; and
- Visual Impact in that there will be a lower number of dwellings within 500 m of the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.

Specifically, C2 performed better than A1 on:

- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

A1 is the best performing alignment for the economic criteria due to it being the alignment with lowest construction cost and thus was the only alignment to a received a score of 1 for this criterion.

Based on the above discussions and like the outcomes of scoring scenario 1, RRV considers alignment option C2 to be the preferred alignment under scoring scenario 2.

RRV notes that while under this scoring scenario only the least impact score of 1 is counted, however, the results under this scoring scenario is still considered appropriate and provides a simplify identification of least impact alignment in the overall identification of the preferred alignment for the Beaufort Bypass.

6.5 Scoring Scenario 3 – Apply a scoring of 1 to the highest impact and then subtract the % difference between the remaining alignments.

A score rating of 1 is applied to the alignment with the highest impact based on the quantifiable data for that specific assessment criteria. The percentage difference between the alignment with the highest quantifiable data is then calculated between the quantifiable data figures for the remaining 3 alignments. A score is then apportioned to the remaining 3 alignments by subtracting the percentage difference with the alignment with the score of 1. Where quantifiable impact data of the proposed alignments are the same, those alignments will receive the same score.

This scoring scenario was developed to ensure that scores are reflective of either the small or big margin differences between the 4 alignments based on the quantifiable data and as a contrast to scoring scenario 1.

The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

Table 15 below outlines the assessment outcomes under scoring scenario 3.

Table 15 Scoring Scenario 3 Evaluation Outcomes

Assessment Criteria	Alignment A0	A0 Scores	Alignment A1	A1 Scores	Alignment C0	C0 Scores	Alignment C2	C2 Scores	Assessment Discussion
Extent of native vegetation to be cleared (all classes) per alignment	**62.61ha**	**1.000**	**62.55ha**	**0.999**	**62.3ha**	**0.995**	**50.7ha**	**0.810**	**The extent of native vegetation to be removed associated with C2 is significantly lower (approximately 11 hectares lower) when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is considered to have the least impact and as such is allocated a score of 0.810. The difference in total areas of native vegetation to be removed between Alignments A0, A1 and C0 are minimal and it is considered that this is reflected in the scoring. A score of 0.995 is allocated to C0 as the next least impact after C2 while a score of 0.999 and 1 is allocated to A1 and A0 respectively.**
Scattered trees	2.70ha	0.925	2.92ha	1.000	2.23ha	0.764	2.48ha	0.849	**The extent of native scattered trees to be removed associated with C0 is slightly lower (approximately 0.7 hectares lower) when compared with C2, A0 and A1 & C2. For this criteria Alignment C0 is considered to have the least impact (marginally) and as such is allocated a score of 0.764.** **A score of 0.849 is allocated to C2 as the next least impact after C0 while a score of 0.925 and 1 is allocated to A0 and A1 respectively.**
Large trees in patches	3.8ha	0.964	3.94ha	1.000	2.67ha	0.678	2.67ha	0.678	**The extent of large trees in patches to be removed associated with alignment C0 and C2 are lower (approximately 1.3 hectares lower) when compared with Alignments A0 & A1. For this criteria Alignment C0 and C2 are considered to have the least impact and as such are both allocated a score of 0.678.** **A score of 0.964 is allocated to A0 as the next least impact after C0 and C2 while a score of 1 is allocated to A1.**

Number of large trees to removed	396	1.000	374	0.944	322	0.813	317	0.801	**The number of large trees to be removed associated with alignment C2 is lower (approximately 5 tree) when compared with Alignment C0 and approximately between 50-70 trees when compared to Alignments A0 & A1. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 0.801, while a score of 0.813 is allocated to C0.** **A score of 0.944 is allocated to A1 as the next least impact after C2 and C0 while a score of 1 is allocated to A0.**
Impact on Endangered EVC habitat	16.89ha	1.000	14.78ha	0.875	9.53	0.564	9.03	0.535	**The extent of impact on endangered EVC habitat associated with alignment C2 is lower (approximately 0.5 hectares) when compared with Alignment C0 and approximately between 5-7 hectares when compared to Alignments A1 & A0. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 0.535, while a score of 0.564 is allocated to C0.** **A score of 0.875 is allocated to A1 as the next least impact after C2 and C0 while a score of 1 is allocated to A0.**
Native vegetation offset requirement	143.712 Specific Unit	0.763	147.134 Specific Units	0.781	188.161 Specific Units	1.000	80.413 Specific Units	0.427	**The extent of native vegetation offset required to replace those proposed to be removed is lower for Alignment C2 when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is allocated a score of 0.427, while A0, A1 & C0 were allocated a score of 0.763, 0.781 and 1respectively.**
Threatened vegetation communities within alignment corridor	**41.13 ha**	**0.931**	**38.8 ha**	**0.879**	**44.14 ha**	**1**	**31.62 ha**	**0.716**	**There is a total of 31.62 hectares of threatened vegetation communities within C2, 38.8 hectares for A1 and 41.13 hectares for A0 and 44.14 hectares for C0. For this criteria Alignment C2 is allocated a score of 0.716, 0.879 for A1, 0.931 for A0 and a score of 1 for C0 respectively.**
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06 ha	0.023	0.06 ha	0.023	2.58 ha	1.000	0.06 ha	0.023	**Alignments A0, A1 and C2 have the same impacts (0.06 hectares) on seasonal herbaceous wetlands and as such are allocated a score of 0.023.** **Alignment C0 with an impact area of 2.58 hectares has a slightly larger impact on seasonal herbaceous wetlands with compared to the other 3 alignments and as such is allocated a score of 1.**
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act)	2.64 ha	0.665	0.65 ha	0.164	3.97 ha	1.000	0 ha	0.000	**Alignment C2 does not impact on this EPBC critically endangered woodland and as such is allocated a score of 0.** **Alignment A1 has an impact area of 0.65 hectares on this critically endangered woodland, which is marginally higher then C2 and as such is allocated a score of 0.164.** **A0 and C0 have a higher impact area (2-3 hectares higher) when compared to C2 and A1 and as such are allocated a score of 0.665 and 1 respectively.**

Victorian Woodland Bird community (Threatened under FFG Act)	38.43 ha	1.000	38.09 ha	0.991	37.59 ha	0.978	31.56 ha	0.821	**C2 has an impact area of 31.56 hectares on this FFG threatened vegetation community, which is approximately 6-7 hectares lower then C0, A1 & A0, therefore, a score of 0.821 is allocated.** **A score of 0.978 is allocated to C0 with an impact area of 37.59, while a score of 0.991 and 1 are allocated to A1 and A0 respectively.**
Wild life corridor/connectivity impact	**38.852ha**	**1.000**	**38.739ha**	**0.997**	**37.683ha**	**0.970**	**32.52ha**	**0.837**	**C2 has an impact area of 32.52 hectares on wildlife corridor/connectivity, which is approximately 5-6 hectares lower then C0, A1 & A0, therefore, a score of 0.837 is allocated.** **A score of 0.970 is allocated to C0 with an impact area of 37.68, while a score of 0.997 and 1 are allocated to A1 and A0 respectively.**
Core	24.181ha	0.952	25.389ha	1.000	16.03ha	0.631	10.81ha	0.426	**C2 has an impact area of 10.81 hectares on core wildlife corridor/connectivity, which is approximately 6-15 hectares lower then C0, A0 & A1, therefore, a score of 0.426 is allocated.** **A score of 0.631 is allocated to C0 with an impact area of 16.03 hectares, f while a score of 0.952 and 1 are allocated to A0 and A1 respectively.**
Node	0.169ha	1.000	0.169ha	1.000	0 ha	0.000	0.169ha	1.000	**C0 does not impact on node wildlife corridor and as such is allocated a score of 0.** **A score of 1 is allocated to A0, A1 and C2 which has the same impact area of 0.169 hectares.**
Stepping Stones	5.453ha	0.377	5.556ha	0.384	10.788ha	0.746	14.462ha	1.000	**A0 has an impact area of 5.453 hectares on stepping stone habitat corridor, which is marginally lower then A1 with an impact area of 5.556 hectares. A score of 0.377 is allocated to A0 and a score of 0.384 is allocated to A1.** **A score of 0.746 is allocated to C0 with an impact area of 10.788 hectares, while a score of 1 is allocated to C2 with an impact area of 14.462 hectares.**
Terrestrial Corridors	6.3ha	0.992	6.351ha	1.000	6.044ha	0.952	5.474ha	0.862	**C2 has an impact area of 5.47 hectares on terrestrial corridor, which is marginally lower then C0, A1 & A0, therefore, a score of 0.862 is allocated.** **A score of 0.952 is allocated to C0 with an impact area of 6.044 hectares, while a score of 0.992 and 1 are allocated to A0 and 1 respectively.**
Wetlands	2.749ha	0.570	1.274ha	0.264	4.821ha	1.000	1.605ha	0.333	**A1 has an impact area of 1.274 hectares on wetlands, which is marginally lower then C2 with an area of 1.605 hectares, therefore, a score of 0.264 is allocated to A1. A score 0.333 is allocated to C2.**

									A score of 0.570 is allocated to A0 with an impact area of 2.749 hectares, while a score of 1 is allocated to C0 with an impact area of 4.821 hectares.
Strategic Biodiversity Value Score per alignment by EVC Conservation Status									
Low Score (0.0 - 0.3)		1.000		1.000		0.375		1.000	
Endangered	8		8		3		8		**C0 impacts on 3 zones of endangered EVC status vegetation with a low strategic biodiversity value score, which is lower in comparison to A0, A1 and C2 which impacts on 8 zones of endangered EVC status vegetation with a low strategic biodiversity value score. Therefore, a score of 0.375 is allocated to C0, while a score of 1 is allocated to A0, A1 and C2.**
Medium Score (0.31 - 0.79)									
Least Concern	22	0.957	23	1.000	20	0.870	23	1.000	**C0 impacts on 3 zones of endangered EVC status vegetation with a low strategic biodiversity value score, which is lower in comparison to A0, A1 and C2 which impacts on 8 zones of endangered EVC status vegetation with a low strategic biodiversity value score. Therefore, a score of 0.870 is allocated to C0, while a score of 1 is allocated to A0, A1 and C2.**
Depleted	33	0.750	44	1.000	36	0.818	38	0.864	**A0 impacts on 33 zones of depleted EVC status vegetation with medium strategic biodiversity value score, which is approximately between 3 to 11 zones lower in comparison to CO, C2 and A1 which impacts on 36, 38 and 44 zones of depleted EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 0.750 is allocated to A0, while a score of 0.818 is allocated to C0, 0.864 to C2 and 1 to A1.**
Vulnerable	6	0.286	6	0.286	21	1.000	6	0.286	**A0, A1 and C2 impacts on 6 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score, which is significantly lower in comparison to C0 which impacts on 21 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 0.286 is allocated to A0, A1 and C2, while a score of 1 is allocated to C0.**
Endangered	98	1.000	97	0.990	64	0.653	71	0.724	**C0 impacts on 64 zones of endangered EVC status vegetation with a medium strategic biodiversity value score, which is approximately between 7 to 34 zones lower in comparison to C2, A1 and A0, which impacts on 71, 97 and 98 zones of endangered EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 0.653 is allocated to C0, while a score of 0.724 is allocated to C2, 0.990 to A1 and 1 to A0.**
High Score (0.8 +)									

Least Concern		0.000		0.000	3	1.000	2	0.667	**A0 and A1 does not impact of any least concern EVC status vegetation with a high strategic biodiversity value score, while C2 and C0 impacts on 2 and 3 zones of least concern EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 0 is allocated to both A0 and A1, while a score of 0.667 is allocated to C2 and 1 to C0.**
Depleted	6	0.545	6	0.545	11	1.000	11	1.000	**A0 and A1 impacts on 6 zones of depleted EVC status vegetation with a high strategic biodiversity value score, while both C2 and C0 impacts on 11 zones of depleted EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 0.545 is allocated to both A0 and A1, while a score of 1 is allocated to both C2 and C0.**
Vulnerable	1	0.500	1	0.500	2	1.000	1	0.500	**A0, A1 and C2 impacts on 1 zone of vulnerable EVC status vegetation with a high strategic biodiversity value score, while C0 only impacts on 2 zones of vulnerable EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 0.5 is allocated to A0, A1 and C2, while a score of 1 is allocated to C0.**
Endangered	6	0.545	4	0.364	11	1.000	5	0.455	**A1 impacts on 4 zones of endangered EVC status vegetation with a high strategic biodiversity value score, which is between 1 to 7 zones lower in comparison to C2, A0 and C0, which impacts on 5, 6 and 11 zones of endangered EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 0.364 is allocated to A1, while a score of 0.455 is allocated to C2, 0.545 to A0 and 1 to C0.**
Condition score of native vegetation to be removed by EVC Conservation Status									
Low Score - Less than 0.3									
Least Concern	13	0.929	14	1.000	11	0.786	13	0.929	**C0 impacts on 11 zones of least concern EVC status vegetation with a low condition score, which is between 2 to 3 zones lower in comparison to C2, A0 and A1, which impacts on 13, 13 and 14 zones of least concern EVC status vegetation with a low condition score. Therefore, a score of 0.786 is allocated to C0, while a score of 0.929 is allocated to both C2 and A0 and a score of 1 to A1.**
Depleted	3	0.375	8	1.000	2	0.250	3	0.375	**C0 impacts on 2 zones of depleted EVC status vegetation with a low condition score, which is between 1 to 6 zones lower in comparison to C2, A0 and A1, which impacts on 3, 3 and 8 zones of depleted EVC status vegetation with a low condition score. Therefore, a score of 0.250 is allocated to C0, while a score of 0.375 is allocated to both C2 and A0 and a score of 1 to A1.**
Vulnerable	4	0.400	4	0.400	10	1.000	4	0.400	**A0, A1 and C2 impacts on 2 zones of vulnerable EVC status vegetation with a low condition score, while C0 impacts on 8 zones of vulnerable EVC status vegetation with a low condition score. Therefore, a score of 0.4 is allocated to A0, A1 and C2, while a score of 1 is allocated to C0.**

Endangered	39	1.000	39	1.000	30	0.769	36	0.923	**C0 impacts on 30 zones of endangered EVC status vegetation with a low condition score, which is between 6 to 9 zones lower in comparison to C2, A0 and A1, which impacts on 36 and 39 zones of endangered EVC status vegetation with a low condition score. Therefore, a score of 0.769 is allocated to C0, while a score of 0.923 is allocated to C2 and a score of 1 to both A0 to A1.**
Medium Score - between 0.31 - 0.59									
Least Concern	8	0.727	8	0.727	11	1.000	11	1.000	**A0 and A1 impacts on 8 zones of least concern EVC status vegetation with a medium condition score, while C0 and C2 impacts 11 zones of least concern EVC status vegetation with a medium condition score. Therefore, a score of 0.727 is allocated to both A0 and A1, while a score of 1 is allocated to both C0 and C2.**
Depleted	12	0.353	15	0.441	25	0.735	34	1.000	**A0 impacts on 12 zones of depleted EVC status vegetation with a medium condition score, which is between 3 to 22 zones lower in comparison to A1, C0 and C2, which impacts on 15, 25 and 34 zones of depleted EVC status vegetation with a medium condition score. Therefore, a score of 0.353 is allocated to A0, while a score of 0.441 is allocated to A1, 0.735 to C0 and 1 to C2.**
Vulnerable	2	0.222	2	0.222	9	1.000	1	0.111	**C2 impacts on 1 zone of vulnerable EVC status vegetation with a medium condition score, which is between 1 to 8 zones lower in comparison to A0, A1 an C0, which impacts on 2 and 9 zones of vulnerable EVC status vegetation with a medium condition score. Therefore, a score of 0.111 is allocated to C2, while a score of 0.222 is allocated to both A0 and A1 and a score of 1is allocated to C0.**
Endangered	65	1.000	63	0.969	41	0.631	46	0.708	**C0 impacts on 41 zones of endangered EVC status vegetation with a medium condition score, which is between 5 to 24 zones lower in comparison to C2, A1 and A0, which impacts on 46, 63 and 65 zones of endangered EVC status vegetation with a medium condition score. Therefore, a score of 0.631 is allocated to C0, while a score of 0.708 is allocated to C2, 0.969 to A1 and 1 to A0.**
High Score - above 0.6									
Least Concern	1	1.000	1	1.000	1	1.000	1	1.000	**All 4 alignments impact on 1 zone of least concern EVC status vegetation with a high condition score and as such are allocated a score of 1.**
Depleted	24	0.889	27	1.000	20	0.741	12	0.444	**C2 impacts on 12 zones of depleted EVC status vegetation with a high condition score, which is between 8 to 15 zones lower in comparison to C0, A1 and A0, which impacts on 20, 24 and 27 zones of depleted EVC status vegetation with a high condition score. Therefore, a score of 0.444 is allocated to C2, while a score of 0.741 is allocated to C0, 0.889 to A0 and 1 to A1.**
Vulnerable	1	0.250	1	0.250	4	1.000	2	0.500	**A0 and A1 impacts on 1 zone of vulnerable EVC status vegetation with a high condition score, which is only 1 and 3 zones lower in comparison to C2 and C0, which impacts on 2 and 4 zones of**

									vulnerable EVC status vegetation with a high condition score. Therefore, a score of 0.250 is allocated to both A0 and A1, while a score of 0.500 is allocated to C2 and a score of 1 is allocated to C0.
Endangered	7	1.000	7	1.000	7	1.000	2	0.286	**C2 impacts on 2 zones of endangered EVC status vegetation with a high condition score, which is 5 zones lower in comparison to A0, A1 and C0, which impacts on 7 zones of endangered EVC status vegetation with a high condition score. Therefore, a score of 0.286 is allocated to C2, while a score of 1 is allocated to A0, A1 and C0.**
Construction within floodplains									
Total number of waterway crossings	16	1.000	16	1.000	14	0.875	16	1.000	**C0 includes a total of 12 waterway crossings, which is 2 waterway crossings less then A0, A1 and C2. Therefore, a score of 0.875 is allocated to C0, while a score of 1 is allocated to A0, A1 and C2.**
Total number of designated waterway crossings	3	1.000	3	1.000	3	1.000	3	1.000	**All 4 alignments cross 3 designated waterways and as such are allocated a score of 1.**
Greatest 1% AEP flood depth intersecting bypass alignment option	1.34m	0.893	1.34m	0.893	1.5m	1.000	1.34m	0.893	**A0, A1 and C2 intersect modelled flood depth at its greatest point at 1.34 m, while C0 intersect flood depth at its greatest point at 1.5m. Therefore, a score of 0.893 is allocated to A0, A1 and C2, while a score of 1 is allocated to C0.**
Max Flooding width at Yam Holes Creek crossing (1% AEP base case)	750m	0.926	750m	0.926	300m	0.370	810m	1.000	**C0 has a maximum modelled flood width of 300 m at the Yam Holes Creek crossing, while A0, A1 and C2 has a maximum modelled flood width of 750 m and 810 mat the Yam Holes Creek crossing respectively.** **Therefore, a score of 0.370 is allocated to C0, while a score of 0.926 is allocated to both A0 and A1 and a score of 1 to C2.**
Total length of alignment within the 1% AEP base case floodplain	1307m	0.625	1175m	0.562	1550m	0.742	2090m	1.000	**A1 has a total length of 1175 m within the modelled 1% AEP base case floodplain, while A0 and C0 has a total length of 1307 m and 1550 m respectively within the modelled 1% AEP base case floodplain. C2's total length is nearly doubled that of A1 at 2090 m.** **Therefore, a score of 0.562 is allocated to A1, while a score of 0.625 is allocated to A0, 0.742 to C0 and a score of 1 to C2.**
Total watercourse crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	990m	0.671	835m	0.566	1380m	0.936	1475m	1.000	**A1 has a total watercourse crossing length of 835 m modelled that could allow an increase of 10 mm or greater in flood levels, while A0, C0 and C2 has a total watercourse crossing length of 990 m, 1380 m and 1475 m respectively modelled that could allow an increase of 10 mm or greater in flood levels.** **Therefore, a score of 0.566 is allocated to A1, while a score of 0.671 is allocated to A0, 30.936 to A1 and a score of 1 to C2.**

Yam Hole Creek crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	610m	1.000	610m	1.000	495m	0.811	570m	0.934	**C0 has a total crossing length of 495 m modelled at the Yam Holes Creek that could allow an increase of 10 mm or greater in flood levels, while C2, A0 and A1 has a total crossing length of 570 m and 610 m respectively modelled at the Yam Holes Creek that could allow an increase of 10 mm or greater in flood levels.** **Therefore, a score of 0.811 is allocated to C0, while a score of 0.934 is allocated to C2 and a score of 1 to both A0 and A1.**
Yam Hole Creek crossing average 1% AEP depth allowing 10 mm or greater (up to 100 mm) flood level increase	600mm	1.000	600mm	1.000	400mm	0.667	600mm	1.000	**C0 has a modelled average depth of 400 mm at Yam Holes Creek crossing allowing an increase of 10 mm or greater in flood levels, while A0, A1 and C2 has a modelled average depth of 600 mm.** **Therefore, a score of 0.667 is allocated to C0, while a score of 1 is allocated to A0, A1 and C2.**
The extent of ground disturbance works within 50 m of watercourse	11.6ha	0.473	12.45ha	0.508	19.5ha	0.796	24.5ha	1.000	**A0 has a total of 11.6 hectares of ground disturbance work within 50 m of watercourse, which is lower in comparison with A1 which has a total of 12.45 hectares of ground disturbance work within 50 m of watercourse. The extend of ground disturbance works with 50 m of watercourses is significantly higher for C0 and C2, which has a total area of 19.5 hectares and 24.5 hectares respectively.** **Therefore, a score of 0.473 is allocated to A0, while a score of 0.508 is allocated to A1, 0.796 to C0 and a score of 1 to C2.**
Impact on number of known or registered sites by proposed alignment.									
Aboriginal	2	1.000	2	1.000	2	1.000	2	1.000	**All 4 alignments impact on 2 registered aboriginal sites and as such are allocated a score of 1.**
% of alignment within an area of Aboriginal sensitivity	14%	0.946	14%	0.946	15%	1.000	11%	0.709	**C2 has the least amount of its alignment corridor within an area of aboriginal sensitivity with 11%, which is only 3% and 4% lower in comparison to A0, A1 and C0, which has 14% and 15% of its alignment corridor within an area of aboriginal sensitivity. Therefore, a score of 0.709 is allocated to C2, 0.946 to both A0 and A1 and a score of 1 to C0.**
European	4	1.000	3	0.750	4	1.000	2	0.500	**C2 impacts on 2 registered historic sites, which between 1 and 2 registered sites lower in comparison to A1, A0 and C0, which impact on 3 and 4 registered historic sites. Therefore, a score of 0.500 is allocated to C2, 0.750 to A1 and a score of 1 to both A0 and C0.**
Acquisition and property impacts									
Total areas to be acquired	278.47ha	0.999	278.88ha	1.000	256.12ha	0.918	262.59ha	0.942	**C0 will result in the total acquisition of approximately 256.12 hectares of land, which is between 6 to 22 hectares lower in comparison to C2, A0 and A1, which will result in the total acquisition of approximately 262.59, 278.47 and 278.88 hectares**

									respectively. Therefore, a score of 0.918 is allocated to C0, 0.942 to C2, 0.999 to A0 and a score of 1 allocated to A1.
Number of lots directly impacted by alignment corridor	65	0.890	62	0.849	72	0.986	73	1.000	**A1 will directly impact on 62 lots, which is between 3 to 11 lots lower in comparison to A0, C0 and C2, which will directly impact on 65, 72 and 73 lots respectively. Therefore, a score of 0.849 is allocated to A1, 0.890 to A0, 0.986 to C0 and 1 toC2.**
Number of landowners directly impacted by alignment corridor	26	1.000	23	0.885	23	0.885	25	0.962	**A1 and C0 will directly impact on 23 landowners, which is 2 to 3 lower in comparison to C2 and A0, which will directly impact on 25 and 26 landowners respectively. Therefore, a score of 0.885 is allocated to both A1 and C0, 0.962 to C2 and 1 to A0.**
Number of dwellings directly impacted by alignment corridor	2	0.400	3	0.600	5	1.000	4	0.800	**A0 and A1 will directly impact on 2 & 3 dwellings respectively, which is marginally lower than C0 and C2, which, will directly impacts on 5 and 4 dwellings respectively. Therefore, a score of 0.400 is allocated to A0, a score of 0.600 to A1, a score of 0.800 to C2 and a score of 1 to C0.**
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	**23**	**0.852**	**23**	**0.852**	**27**	**1.000**	**27**	**1.000**	**Without implementing noise mitigation, A0 and A1 will directly impact on 23 residential properties post construction, which is slightly lower than C0 and C2 which will directly impact on 27 residential properties. Therefore, a score of 0.852 is allocated to both A0 and A1 and a score of 1 to both C0 and C2.**
Air quality impacts									
Sensitive receptors within 100 m of alignment	4	1.000	2	0.500	2	0.500	2	0.500	**There will be 2 sensitive receptors (dwellings) within 100 m of A1, C0 and C2, which is marginally lower than A0 will have 4 sensitive receptors within the same distance. Therefore, a score of 0.500 is allocated to A1, C0 and C2 while a score of 1 is allocated to A0.**
Sensitive receptors within 200 m of alignment	5	0.833	5	0.833	6	1.000	4	0.667	**There will be 4 sensitive receptors (dwellings) within 200 m of C2, which is marginally lower than A1, A0 and C0 which has 5 and 6 sensitive receptors within the same distance. Therefore, a score of 0.667 is allocated to C2, 0.833 to A0 and A1 and a score of 1 to C0.**
Sensitive receptors within 300 m of alignment	12	1.000	10	0.833	12	1.000	9	0.750	**There will be 9 sensitive receptors (dwellings) within 300 m of C2, which is lower than A1, A0 and C0 which has 10 and 12 sensitive receptors within the same distance. Therefore, a score of 0.750 is allocated to C2, 0.833 to A1 and a score of 1 to both A0 and C0.**
Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**0.606**	**37**	**0.560**	**61**	**0.924**	**66**	**1.000**	**A1 has a total number of 37 dwellings within 500 m of its alignment corridor, which is marginally lower than A0 and significantly lower than C0 and C2 which has total number of 40, 61 and 66 dwellings within the same distance. Therefore, a score of 0.560 is allocated to A1, 0.606 to A0, 0.924 to C0 and a score of 1 to C2.**
Construction cost per alignment	**Estimate: $405.6 Million**	**0.840**	**Estimate: $391.3 Million**	**0.811**	**Estimate: $424.5 Million**	**0.879**	**Estimate: $482.5 Million**	**1.000**	**A1 is estimated to have the lowest construction cost at $391.3 million which is lower than A1, C0 and C2 which is estimated to have a construction cost of $405.6 million, $424.5 million and $482.5 million.**

									Therefore, a score of 0.811 is allocated to A1, 0.840 to A0 and 0.879 to C0 and 1 to C2.
Total		**45.85**		**44.89**		**50.01**		**43.95**	**Under this scoring scenario, C2 has the lowest total score of 43.945 across all assessment criteria followed by A1 with 45.044, A0 with 45.948 and C0 with 50.008. Therefore, C2 is the alignment with the least impact under scoring scenario 3.**

6.5.1 Impacts scores by Key assessment Criteria

Table 16 below provides a breakdown of the impact scoring by each key assessment criteria per alignment.

Table 16 Impact Scoring Breakdown by Key Assessment Criteria per Alignment

Key Assessment Criteria	Alignment A0	Alignment A1	Alignment C0	Alignment C2
Total Environment Criteria Scores	**34.48**	**34.45**	**37.92**	**33.12**
Extent of native vegetation to be cleared (all classes) per alignment	5.65	5.60	4.81	4.10
Threatened vegetation communities within alignment corridor	2.62	2.06	3.98	1.56
Wild life corridor/connectivity impact	4.89	4.65	4.30	4.46
Strategic Biodiversity Value Score per alignment by EVC Conservation Status	5.58	5.68	7.72	6.50
Condition score of native vegetation to be removed by EVC Conservation Status	8.14	9.01	9.91	7.68
Construction within floodplains	7.58	7.46	7.20	8.53
Total Social Criteria Scores	**10.53**	**9.63**	**11.21**	**9.83**
Impact on number of known or registered sites by proposed alignment.	2.95	2.72	3	2.21
Acquisition and property impacts	3.29	3.33	3.79	3.70
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	0.85	0.85	1	1
Air quality impacts	2.83	2.17	2.5	1.92
Visual Impact - Number of dwellings within 500 m of proposed alignment	0.61	0.56	0.92	1
Total Economic Criteria Scores	**0.84**	**0.81**	**0.88**	**1**
Construction cost per alignment	0.84	0.81	0.88	1
Total Overall Combined scores	**45.85**	**44.89**	**50.01**	**43.95**

6.5.2 Scoring Scenario 3 Conclusions

Utilising the assessment and evaluation framework outlined under scoring scenario 3, C2 is identified as the alignment with the least overall impact with a score of 43.95 points, followed by A1 with a score of 44.89, A0 with a score of 45.85 points and C0 with the highest impact score of 50.01 points. Similar to the results of scoring scenario 1 and 2, the key difference in the scoring between C2 and the A1, C0 and A0 alignments relates to its better performance against the Environment Criteria. Overall, C2 was a minimum of 1 point lower then A1, A0 & C0, which is large given the scoring methodology adopted. Specifically, this was due to C2 having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area; and
- The least amount of impact on native vegetation with high conditions to be removed by EVC Conservation Status.

Similar to the results of scoring scenario 1 and 2, C2 had the highest impact score for potential construction within floodplains criterion when compared to the other 3 alignments. For this assessment Criteria, C0 has the least impact with an overall score of 7.20. Also, C2 performed marginally worst then the A0 & A1 alignments against the impact on Strategic Biodiversity Value Score criterion. This was due to the C2 alignment resulting in a higher removal of EVC conservation status that were classified as least concern and depleted in comparison to the these 2 “A” alignments. However, C2 would result in a significantly lower amount of native vegetation with vulnerable and Endangered EVC status to be removed when compared to all 3 alignments. This is further demonstrated under scoring scenario 5 & 6 where the impacts on vulnerable and Endangered EVC status are only considered in the impact assessment.

A1 is considered to have the impact from a social impact perspective with a score of 9.63, marginally lower then C2 with score of 9.83, followed by A0 with a score of 10.53 and C0 with a score of 11.21. Specifically, A1 performed better than C2 on:

- Acquisition and property impacts. While A1 would result in a higher amount of land to be acquired when compared to C2, its however impact on a smaller number of properties, landowners and dwellings that would directly be impacted by the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass; and
- Visual Impact in that there will be a lower number of dwellings within 500 m of the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.

Specifically, C2 performed better than A1 on:

- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

A1 is the best performing alignment for the economic criteria due to it being the alignment with lowest construction cost, followed by A1, C0 and C2.

Based on the above discussions and like the outcomes of scoring scenario 1 and 2, RRV considers alignment option C2 to be the preferred alignment under scoring scenario 3.

RRV considers the methodology and framework adopted for scoring scenario 3 to be appropriate and considers that scoring scenarios 3 appropriately captures the differences in the quantifiable data outlining potential impacts between the 4 alignments in its scoring allocation to select and identify the preferred alignment for the Beaufort Bypass.

6.6 Scoring Scenario 4 – Apply a scoring of 1 to the least impact and then add the % difference between the remaining alignments.

A score rating of 1 is applied to the alignment with the least impact based on the quantifiable data for that specific assessment criteria. The percentage difference between the alignment with the lowest quantifiable data is then calculated between the quantifiable data figures for the remaining 3 alignments. A score is then apportioned to the remaining 3 alignments by adding the percentage difference with the alignment with the score of 1. Where quantifiable impact data of the proposed alignments are the same, those alignments will receive the same score. Under this scoring scenario the highest impact alignment can only be allocated a maximum score of 4 even if the percentage difference between the least impact and the highest impact alignment would result in a score allocation of greater than 4.

This scoring scenario was developed to ensure that scores are reflective of either the small or big margin differences between the 4 alignments based on the quantifiable data and as a contrast to scoring scenario 1 and 3.

The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

Table 17 below outlines the assessment outcomes under scoring scenario 4.

Table 17 Scoring Scenario 4 Evaluation Outcomes

Assessment Criteria	Alignment A0	A0 Scores	Alignment A1	A1 Scores	Alignment C0	C0 Scores	Alignment C2	C2 Scores	Assessment Discussion
Extent of native vegetation to be cleared (all classes) per alignment	**62.61ha**	**1.235**	**62.55ha**	**1.234**	**62.3ha**	**1.229**	**50.7ha**	**1.000**	**The extent of native vegetation to be removed associated with C2 is significantly lower (approximately 11 hectares lower) when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is considered to have the least impact and as such is allocated a score of 1. The difference in total areas of native vegetation to be removed between Alignments A0, A1 and C0 are minimal and it is considered that this is reflected in the scoring. A score of 1.229 is allocated to C0 as the next least impact after C2 while a score of 1.234 and 1.235 is allocated to A1 and A0 respectively.**
Scattered trees	2.70ha	1.210	2.92ha	1.309	2.23ha	1.000	2.48ha	1.112	**The extent of native scattered trees to be removed associated with C0 is slightly lower (approximately 0.7 hectares lower) when compared with C2, A0 and A1 & C2. For this criteria Alignment C0 is considered to have the least impact (marginally) and as such is allocated a score of 1.** **A score of 1.112 is allocated to C2 as the next least impact after C0 while a score of 1.210 and 1.309 is allocated to A0 and A1 respectively.**
Large trees in patches	3.8ha	1.420	3.94ha	1.476	2.67ha	1.000	2.67ha	1.000	**The extent of large trees in patches to be removed associated with alignment C0 and C2 are lower (approximately 1.3 hectares lower) when compared with Alignments A0 & A1. For this criteria Alignment C0 and C2 are considered to have the least impact and as such are both allocated a score of 1.** **A score of 1.420 is allocated to A0 as the next least impact after C0 and C2 while a score of 1.476 is allocated to A1.**
Number of large trees to removed	396	1.249	374	1.180	322	1.015	317	1.000	**The number of large trees to be removed associated with alignment C2 is lower (approximately 5 tree) when compared**

									with Alignment C0 and approximately between 50-70 trees when compared to Alignments A0 & A1. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 1, while a score of 1.015 is allocated to C0. **A score of 1.180 is allocated to A1 as the next least impact after C2 and C0 while a score of 1.249 is allocated to A0.**
Impact on Endangered EVC habitat	16.89ha	1.870	14.78ha	1.637	9.53	1.006	9.03	1.000	**The extent of impact on endangered EVC habitat associated with alignment C2 is lower (approximately 0.5 hectares) when compared with Alignment C0 and approximately between 5-7 hectares when compared to Alignments A1 & A0. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 1, while a score of 1.006 is allocated to C0.** **A score of 1.637 is allocated to A1 as the next least impact after C2 and C0 while a score of 1.870 is allocated to A0.**
Native vegetation offset requirement	143.712 Specific Unit	1.786	147.134 Specific Units	1.829	188.161 Specific Units	2.340	80.413 Specific Units	1.000	**The extent of native vegetation offset required to replace those proposed to be removed is lower for Alignment C2 when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is allocated a score of 1, while A0, A1 & C0 were allocated a score of 1.786, 1.829 and 2.340 respectively.**
Threatened vegetation communities within alignment corridor	**41.13**	**1.300**	**38.8**	**1.230**	**44.14**	**1.400**	**31.62**	**1.000**	**There is a total of 31.62 hectares of threatened vegetation communities within C2, 38.8 hectares for A1 and 41.13 hectares for A0 and 44.14 hectares for C0. For this criteria Alignment C2 is allocated a score of 1, 1.230 for A1, 1.3 for A0 and a score of 1.4 for C0 respectively.**
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06 ha	1.000	0.06 ha	1.000	2.58 ha	2.000	0.06 ha	1.000	**Alignments A0, A1 and C2 have the same impacts (0.06 hectares) on seasonal herbaceous wetlands and as such are allocated a score of 1.** **Alignment C0 with an impact area of 2.58 hectares has a slightly larger impact on seasonal herbaceous wetlands with compared to the other 3 alignments and as such is allocated a score of 2.**
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act)	2.64 ha	4.000	0.65 ha	1.000	3.97 ha	4.000	0 ha	0.000	**Alignment C2 does not impact on this EPBC critically endangered woodland and as such is allocated a score of 0.** **Alignment A1 has an impact area of 0.65 hectares on this critically endangered woodland, which is marginally higher then C2 and as such is allocated a score of 1.** **A0 and C0 have a higher impact area (2-3 hectares higher) when compared to C2 and A1 and as such are allocated a score of 4 respectively.**

Victorian Woodland Bird community (Threatened under FFG Act)	38.43 ha	1.220	38.09 ha	1.210	37.59 ha	1.190	31.56 ha	1.000	**C2 has an impact area of 31.56 hectares on this FFG threatened vegetation community, which is approximately 6-7 hectares lower then C0, A1 & A0, therefore, a score of 1 is allocated.** **A score of 1.190 is allocated to C0 with an impact area of 37.59, while a score of 1.210 and 1.220 are allocated to A1 and A0 respectively.**
Wild life corridor/connectivity impact	**38.852ha**	**1.194**	**38.739ha**	**1.191**	**37.683ha**	**1.158**	**32.52ha**	**1.000**	**C2 has an impact area of 32.52 hectares on wildlife corridor/connectivity, which is approximately 5-6 hectares lower then C0, A1 & A0, therefore, a score of 1 is allocated.** **A score of 1.158 is allocated to C0 with an impact area of 37.68, while a score of 1.191 and 1.194 are allocated to A1 and A0 respectively.**
Core	24.181ha	2.230	25.389ha	2.340	16.03ha	1.480	10.81ha	1.000	**C2 has an impact area of 10.81 hectares on core wildlife corridor/connectivity, which is approximately 6-15 hectares lower then C0, A0 & A1, therefore, a score of 1 is allocated.** **A score of 1.480 is allocated to C0 with an impact area of 16.03 hectares, while a score of 2.230 and 2.340 are allocated to A0 and A1 respectively.**
Node	0.169ha	0.169	0.169ha	0.169	0 ha	0	0.169ha	0.169	**C0 does not impact on node wildlife corridor and as such is allocated a score of 0.** **A score of 0.169 is allocated to A0, A1 and C2 which has the same impact area of 0.169 hectares.**
Stepping Stones	5.453ha	1.000	5.556ha	1.018	10.788ha	1.978	14.462ha	2.652	**A0 has an impact area of 5.453 hectares on stepping stone habitat corridor, which is marginally lower then A1 with an impact area of 5.556 hectares. A score of 1 is allocated to A0 and a score of 1.018 is allocated to A1.** **A score of 1.978 is allocated to C0 with an impact area of 10.788 hectares, while a score of 2.652 is allocated to C2 with an impact area of 14.462 hectares.**
Terrestrial Corridors	6.3ha	1.150	6.351ha	1.160	6.044ha	1.100	5.474ha	1.000	**C2 has an impact area of 5.47 hectares on terrestrial corridor, which is marginally lower then C0, A1 & A0, therefore, a score of 1 is allocated.** **A score of 1.1 is allocated to C0 with an impact area of 6.044 hectares, while a score of 1.150 and 1.160 are allocated to A0 and A1 respectively.**
Wetlands	2.749ha	2.150	1.274ha	1.000	4.821ha	3.780	1.605ha	1.250	**A1 has an impact area of 1.274 hectares on wetlands, which is marginally lower then C2 with an area of 1.605 hectares, therefore, a score of 1 is allocated to A1. A score 1.250 is allocated to C2.**

									A score of 2.150 is allocated to A0 with an impact area of 2.749 hectares, while a score of 3.780 is allocated to C0 with an impact area of 4.821 hectares.
Strategic Biodiversity Value Score per alignment by EVC Conservation Status									
Low Score (0.0 - 0.3)									
Endangered	8	2.700	8	2.700	3	1.000	8	2.700	**C0 impacts on 3 zones of endangered EVC status vegetation with a low strategic biodiversity value score, which is lower in comparison to A0, A1 and C2 which impacts on 8 zones of endangered EVC status vegetation with a low strategic biodiversity value score. Therefore, a score of 1 is allocated to C0, while a score of 2.7 is allocated to A0, A1 and C2.**
Medium Score (0.31 - 0.79)									
Least Concern	22	1.100	23	1.150	20	1.000	23	1.150	**C0 impacts on 3 zones of endangered EVC status vegetation with a low strategic biodiversity value score, which is lower in comparison to A0, A1 and C2 which impacts on 8 zones of endangered EVC status vegetation with a low strategic biodiversity value score. Therefore, a score of 1 is allocated to C0, while a score of 1.150 is allocated to A0, A1 and C2.**
Depleted	33	1.000	44	1.330	36	1.090	38	1.150	**A0 impacts on 33 zones of depleted EVC status vegetation with medium strategic biodiversity value score, which is approximately between 3 to 11 zones lower in comparison to CO, C2 and A1 which impacts on 36, 38 and 44 zones of depleted EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 1 is allocated to A0, while a score of 1.090 is allocated to C0, 1.150 to C2 and 1.330 to A1.**
Vulnerable	6	1.000	6	1.000	21	3.500	6	1.000	**A0, A1 and C2 impacts on 6 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score, which is significantly lower in comparison to C0 which impacts on 21 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 3.5 is allocated to C0.**
Endangered	98	1.530	97	1.520	64	1.000	71	1.110	**C0 impacts on 64 zones of endangered EVC status vegetation with a medium strategic biodiversity value score, which is approximately between 7 to 34 zones lower in comparison to C2, A1 and A0, which impacts on 71, 97 and 98 zones of endangered EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 1 is allocated to C0, while a score of 1.110 is allocated to C2, 1.520 to A1 and 1.530 to A0.**
High Score (0.8 +)									

Least Concern		0.000		0.000	3	1.500	2	1.000	**A0 and A1 does not impact of any least concern EVC status vegetation with a high strategic biodiversity value score, while C2 and C0 impacts on 2 and 3 zones of least concern EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 0 is allocated to both A0 and A1, while a score of 1 is allocated to C2 and a score of 1.5 is allocated to C0.**
Depleted	6	1.000	6	1.000	11	1.830	11	1.830	**A0 and A1 impacts on 6 zones of depleted EVC status vegetation with a high strategic biodiversity value score, while both C2 and C0 impacts on 11 zones of depleted EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 1 is allocated to both A0 and A1, while a score of 1.830 is allocated to both C2 and C0.**
Vulnerable	1	1.000	1	1.000	2	2.000	1	1.000	**A0, A1 and C2 impacts on 1 zone of vulnerable EVC status vegetation with a high strategic biodiversity value score, while C0 only impacts on 2 zones of vulnerable EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 2 is allocated to C0.**
Endangered	6	1.500	4	1.000	11	2.750	5	1.250	**A1 impacts on 4 zones of endangered EVC status vegetation with a high strategic biodiversity value score, which is between 1 to 7 zones lower in comparison to C2, A0 and C0, which impacts on 5, 6 and 11 zones of endangered EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 1 is allocated to A1, while a score of 1.250 is allocated to C2, 1.5 to A0 and 2.75 to C0.**
Condition score of native vegetation to be removed by EVC Conservation Status									
Low Score - Less than 0.3									
Least Concern	13	1.180	14	1.270	11	1.000	13	1.180	**C0 impacts on 11 zones of least concern EVC status vegetation with a low condition score, which is between 2 to 3 zones lower in comparison to C2, A0 and A1, which impacts on 13, 13 and 14 zones of least concern EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to C0, while a score of 1.180 is allocated to both C2 and A0 and a score of 1.270 to A1.**
Depleted	3	1.500	8	4.000	2	1.000	3	1.500	**C0 impacts on 2 zones of depleted EVC status vegetation with a low condition score, which is between 1 to 6 zones lower in comparison to C2, A0 and A1, which impacts on 3, 3 and 8 zones of depleted EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to C0, while a score of 1.5 is allocated to both C2 and A0 and a score of 4 to A1.**
Vulnerable	4	1.000	4	1.000	10	2.500	4	1.000	**A0, A1 and C2 impacts on 2 zones of vulnerable EVC status vegetation with a low condition score, while C0 impacts on 8 zones of vulnerable EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 2.5 is allocated to C0.**

Endangered	39	1.300	39	1.300	30	1.000	36	1.200	**C0 impacts on 30 zones of endangered EVC status vegetation with a low condition score, which is between 6 to 9 zones lower in comparison to C2, A0 and A1, which impacts on 36 and 39 zones of endangered EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to C0, while a score of 1.2 is allocated to C2 and a score of 1.3 is allocated to both A0 to A1.**
Medium Score - between 0.31 - 0.59									
Least Concern	8	1.000	8	1.000	11	1.370	11	1.370	**A0 and A1 impacts on 8 zones of least concern EVC status vegetation with a medium condition score, while C0 and C2 impacts 11 zones of least concern EVC status vegetation with a medium condition score. Therefore, a score of 1 is allocated to both A0 and A1, while a score of 1.37 is allocated to both C0 and C2.**
Depleted	12	1.000	15	1.250	25	2.080	34	2.830	**A0 impacts on 12 zones of depleted EVC status vegetation with a medium condition score, which is between 3 to 22 zones lower in comparison to A1, C0 and C2, which impacts on 15, 25 and 34 zones of depleted EVC status vegetation with a medium condition score. Therefore, a score of 1 is allocated to A0, while a score of 1.25 is allocated to A1, 2.08 to C0 and 2.830 to C2.**
Vulnerable	2	2.000	2	2.000	9	4.000	1	1.000	**C2 impacts on 1 zone of vulnerable EVC status vegetation with a medium condition score, which is between 1 to 8 zones lower in comparison to A0, A1 an C0, which impacts on 2 and 9 zones of vulnerable EVC status vegetation with a medium condition score. Therefore, a score of 1 is allocated to C2, while a score of 2 is allocated to both A0 and A1 and a score of 4 is allocated to C0.**
Endangered	65	1.580	63	1.540	41	1.000	46	1.120	**C0 impacts on 41 zones of endangered EVC status vegetation with a medium condition score, which is between 5 to 24 zones lower in comparison to C2, A1 and A0, which impacts on 46, 63 and 65 zones of endangered EVC status vegetation with a medium condition score. Therefore, a score of 1 is allocated to C0, while a score of 1.12 is allocated to C2, 1.54 to A1 and 1.58 to A0.**
High Score - above 0.6									
Least Concern	1	1.000	1	1.000	1	1.000	1	1.000	**All 4 alignments impact on 1 zone of least concern EVC status vegetation with a high condition score and as such are allocated a score of 1.**
Depleted	24	2.000	27	2.250	20	1.660	12	1.000	**C2 impacts on 12 zones of depleted EVC status vegetation with a high condition score, which is between 8 to 15 zones lower in comparison to C0, A1 and A0, which impacts on 20, 24 and 27 zones of depleted EVC status vegetation with a high condition score. Therefore, a score of 1 is allocated to C2, while a score of 1.660 is allocated to C0, 2 to A0 and 2.250 to A1.**
Vulnerable	1	1.000	1	1.000	4	4.000	2	2.000	**A0 and A1 impacts on 1 zone of vulnerable EVC status vegetation with a high condition score, which is only 1 and 3 zones lower in comparison to C2 and C0, which impacts on 2 and 4 zones of vulnerable EVC status vegetation with a high condition score.**

									Therefore, a score of 1 is allocated to both A0 and A1, while a score of 2 is allocated to C2 and a score of 4 is allocated to C0.
Endangered	7	3.500	7	3.500	7	3.500	2	1.000	**C2 impacts on 2 zones of endangered EVC status vegetation with a high condition score, which is 5 zones lower in comparison to A0, A1 and C0, which impacts on 7 zones of endangered EVC status vegetation with a high condition score. Therefore, a score of 1 is allocated to C2, while a score of 3.5 is allocated to A0, A1 and C0.**
Construction within floodplains									
Total number of waterway crossings	16	1.140	16	1.140	14	1.000	16	1.140	**C0 includes a total of 12 waterway crossings, which is 2 waterway crossings less then A0, A1 and C2. Therefore, a score of 1 is allocated to C0, while a score of 1.140 is allocated to A0, A1 and C2.**
Total number of designated waterway crossings	3	1.000	3	1.000	3	1.000	3	1.000	**All 4 alignments cross 3 designated waterways and as such are allocated a score of 1.**
Greatest 1% AEP flood depth intersecting bypass alignment option	1.34m	1.000	1.34m	1.000	1.5m	1.120	1.34m	1.000	**A0, A1 and C2 intersect modelled flood depth at its greatest point at 1.34 m, while C0 intersect flood depth at its greatest point at 1.5m. Therefore, a score of 0.893 is allocated to A0, A1 and C2, while a score of 1 is allocated to C0.**
Max Flooding width at Yam Holes Creek crossing (1% AEP base case)	750m	2.500	750m	2.500	300m	1.000	810m	2.700	**C0 has a maximum modelled flood width of 300 m at the Yam Holes Creek crossing, while A0, A1 and C2 has a maximum modelled flood width of 750 m and 810 mat the Yam Holes Creek crossing respectively.** **Therefore, a score of 1 is allocated to C0, while a score of 2.5 is allocated to both A0 and A1 and a score of 2.7 to C2.**
Total length of alignment within the 1% AEP base case floodplain	1307m	1.110	1175m	1.000	1550m	1.320	2090m	1.780	**A1 has a total length of 1175 m within the modelled 1% AEP base case floodplain, while A0 and C0 has a total length of 1307 m and 1550 m respectively within the modelled 1% AEP base case floodplain. C2's total length is nearly doubled that of A1 at 2090 m.** **Therefore, a score of 1 is allocated to A1, while a score of 1.110 is allocated to A0, 1.320 to C0 and a score of 1.780 to C2.**
Total watercourse crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	990m	1.190	835m	1.000	1380m	1.650	1475m	1.770	**A1 has a total watercourse crossing length of 835 m modelled that could allow an increase of 10 mm or greater in flood levels, while A0, C0 and C2 has a total watercourse crossing length of 990 m, 1380 m and 1475 m respectively modelled that could allow an increase of 10 mm or greater in flood levels.** **Therefore, a score of 1 is allocated to A1, while a score of 1.190 is allocated to A0, 1.650 to A1 and a score of 1.770 to C2.**

Yam Hole Creek crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	610m	1.230	610m	1.230	495m	1.000	570m	1.150	**C0 has a total crossing length of 495 m modelled at the Yam Holes Creek that could allow an increase of 10 mm or greater in flood levels, while C2, A0 and A1 has a total crossing length of 570 m and 610 m respectively modelled at the Yam Holes Creek that could allow an increase of 10 mm or greater in flood levels.** **Therefore, a score of 1 is allocated to C0, while a score of 1.150 is allocated to C2 and a score of 1.230 to both A0 and A1.**
Yam Hole Creek crossing average 1% AEP depth allowing 10 mm or greater (up to 100 mm) flood level increase	600mm	1.500	600mm	1.500	400mm	1.000	600mm	1.500	**C0 has a modelled average depth of 400 mm at Yam Holes Creek crossing allowing an increase of 10 mm or greater in flood levels, while A0, A1 and C2 has a modelled average depth of 600 mm.** **Therefore, a score of 1 is allocated to C0, while a score of 1.50 is allocated to A0, A1 and C2.**
The extent of ground disturbance works within 50 m of watercourse	11.6ha	1.000	12.45ha	1.070	19.5ha	1.680	24.5ha	2.110	**A0 has a total of 11.6 hectares of ground disturbance work within 50 m of watercourse, which is lower in comparison with A1 which has a total of 12.45 hectares of ground disturbance work within 50 m of watercourse. The extend of ground disturbance works with 50 m of watercourses is significantly higher for C0 and C2, which has a total area of 19.5 hectares and 24.5 hectares respectively.** **Therefore, a score of 1 is allocated to A0, while a score of 1.070 is allocated to A1, 1.680 to C0 and a score of 2.110 to C2.**
Impact on number of known or registered sites by proposed alignment.									
Aboriginal	2	1.000	2	1.000	2	1.000	2	1.000	**All 4 alignments impact on 2 registered aboriginal sites and as such are allocated a score of 1.**
% of alignment within an area of Aboriginal sensitivity	14%	1.330	14%	1.330	15%	1.410	11%	1.000	**C2 has the least amount of its alignment corridor within an area of aboriginal sensitivity with 11%, which is only 3% and 4% lower in comparison to A0, A1 and C0, which has 14% and 15% of its alignment corridor within an area of aboriginal sensitivity. Therefore, a score of 1 is allocated to C2, 1.330 to both A0 and A1 and a score of 1.410 to C0.**
European	4	2.000	3	1.500	4	2.000	2	1.000	**C2 impacts on 2 registered historic sites, which between 1 and 2 registered sites lower in comparison to A1, A0 and C0, which impact on 3 and 4 registered historic sites. Therefore, a score of 1 is allocated to C2, 1.5 to A1 and a score of 2 to both A0 and C0.**
Acquisition and property impacts									
Total areas to be acquired	278.47ha	1.087	278.88ha	1.088	256.12ha	1.000	262.59ha	1.025	**C0 will result in the total acquisition of approximately 256.12 hectares of land, which is between 6 to 22 hectares lower in comparison to C2, A0 and A1, which will result in the total acquisition of approximately 262.59, 278.47 and 278.88 hectares**

									respectively. Therefore, a score of 1 is allocated to C0, 1.025 to C2, 1.087 to A0 and a score of 1.088 allocated to A1.
Number of lots directly impacted by alignment corridor	65	1.040	62	1.000	72	1.160	73	1.170	**A1 will directly impact on 62 lots, which is between 3 to 11 lots lower in comparison to A0, C0 and C2, which will directly impact on 65, 72 and 73 lots respectively. Therefore, a score of 1 is allocated to A1, 1.040 to A0, 1.160 to C0 and 1.170 to C2.**
Number of landowners directly impacted by alignment corridor	26	1.130	23	1.000	23	1.000	25	1.080	**A1 and C0 will directly impact on 23 landowners, which is 2 to 3 lower in comparison to C2 and A0, which will directly impact on 25 and 26 landowners respectively. Therefore, a score of 1 is allocated to both A1 and C0, 1.080 to C2 and 1.130 to A0.**
Number of dwellings directly impacted by alignment corridor	2	1.000	3	1.050	5	2.500	4	2.000	**A0 and A1 will directly impact on 2 & 3 dwellings respectively, which is marginally lower than C0 and C2 will directly impacts on 5 and 4 dwellings. Therefore, a score of 1 is allocated to A0, a score of 1.050 to A1, a score of 2.000 to C2 and a score of 2.500 to C0.**
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	**23**	**1.000**	**23**	**1.000**	**27**	**1.170**	**27**	**1.170**	**Without implementing noise mitigation, A0 and A1 will directly impact on 23 residential properties post construction, which is slightly lower than C0 and C2 which will directly impact on 27 residential properties. Therefore, a score of 1 is allocated to both A0 and A1 and a score of 1.170 to both C0 and C2.**
Air quality impacts									
Sensitive receptors within 100 m of alignment	4	2.000	2	1.000	2	1.000	2	1.000	**There will be 2 sensitive receptors (dwellings) within 100 m of A1, C0 and C2, which is marginally lower than A0 will have 4 sensitive receptors within the same distance. Therefore, a score of 1 is allocated to A1, C0 and C2 while a score of 2 is allocated to A0.**
Sensitive receptors within 200 m of alignment	5	1.250	5	1.250	6	1.500	4	1.000	**There will be 4 sensitive receptors (dwellings) within 200 m of C2, which is marginally lower than A1, A0 and C0 which has 5 and 6 sensitive receptors within the same distance. Therefore, a score of 1 is allocated to C2, 1.250 to both A0 & A1 and a score of 1.50 to C0.**
Sensitive receptors within 300 m of alignment	12	1.330	10	1.110	12	1.330	9	1.000	**There will be 9 sensitive receptors (dwellings) within 300 m of C2, which is lower than A1, A0 and C0 which has 10, and 12 sensitive receptors within the same distance. Therefore, a score of 1 is allocated to C2, 1.110 to A1, 1.330 to both A0 and C0.**
Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**1.080**	**37**	**1.000**	**61**	**1.600**	**66**	**1.720**	**A1 has a total number of 37 dwellings within 500 m of its alignment corridor, which is marginally lower than A0 and significantly lower than C0 and C2 which has total number of 40, 61 and 66 dwellings within the same distance. Therefore, a score of 1 is allocated to A1, 1.080 to A0, 1.600 to C0 and a score of 1.720 to C2.**
Construction cost per alignment	**Estimate: $405.6 Million**	**1.040**	**Estimate: $391.3 Million**	**1.000**	**Estimate: $424.5 Million**	**1.080**	**Estimate: $482.5 Million**	**1.230**	**A1 is estimated to have the lowest construction cost at $391.3 million which is lower than A1, C0 and C2 which is estimated to have a construction cost of $405.6 million, $424.5 million and $482.5 million.**

									Therefore, a score of 1 is allocated to A1, 1.040 to A0 and 1.080 to C0 and 1.230 to C2.
Total Scores		**81.03**		**77.59**		**93.98**		**74.12**	**Under this scoring scenario, C2 has the lowest total score of 74.12 across all assessment criteria followed by A1 with 77.59, A0 with 81.03 and C0 with 93.97. Therefore, C2 is the alignment with the least impact under scoring scenario 4.**

6.6.1 Impacts scores by Key assessment Criteria

Table 18 below provides a breakdown of the impact scoring by each key assessment criteria per alignment.

Table 18 Impact Scoring Breakdown by Key Assessment Criteria per Alignment

Key Assessment Criteria	Alignment A0	Alignment A1	Alignment C0	Alignment C2
Total Environment Criteria Scores	**64.74**	**63.23**	**76.23**	**58.72**
Extent of native vegetation to be cleared (all classes) per alignment	8.77	8.67	7.59	6.11
Threatened vegetation communities within alignment corridor	7.52	4.44	8.59	3
Wild life corridor/connectivity impact	7.89	6.88	9.50	7.07
Strategic Biodiversity Value Score per alignment by EVC Conservation Status	10.83	10.7	15.67	12.19
Condition score of native vegetation to be removed by EVC Conservation Status	18.06	21.11	24.11	16.2
Construction within floodplains	11.67	11.44	10.77	14.15
Total Social Criteria Scores	**15.25**	**13.36**	**16.67**	**14.17**
Impact on number of known or registered sites by proposed alignment.	4.33	3.86	4.41	3
Acquisition and property impacts	4.26	4.14	5.66	5.28
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	1	1	1.17	1.17
Air quality impacts	4.58	3.36	3.83	3
Visual Impact - Number of dwellings within 500 m of proposed alignment	1.08	1	1.6	1.72
Total Economic Criteria Scores	1.04	1	1.08	1.23
Construction cost per alignment	1.04	1	1.08	1.23
Total Overall Combined Scores	**81.03**	**77.59**	**93.98**	**74.12**

6.6.2 Scoring Scenario 4 Conclusions

Utilising the assessment and evaluation framework outlined under scoring scenario 4, C2 is identified as the alignment with the least overall impact with a score of 74.12 points, followed by A1 with a score of 77.59, A0 with a score of 81.03 points and C0 with the highest impact score of 93.98 points. Like the results of scoring scenario 1, 2 and 3, the key difference in the scoring between C2 and the A1, C0 and A0 alignments relates to its better performance against the Environment Criteria. Overall, C2 was 4 point lower then the next best being A1, which is a large difference given the scoring methodology adopted. Specifically, this was due to C2 having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area; and
- The least amount of impact on native vegetation with high conditions to be removed by EVC Conservation Status.

Similar to the results of scoring scenario 1, 2 and 3, C2 had the highest impact score for potential construction within floodplains criterion when compared to the other 3 alignments. For this assessment Criteria, C0 has the least impact with an overall score of 10.77. Also, C2 performed marginally worst then the A0 & A1 alignments against the impact on Strategic Biodiversity Value Score criterion. This was due to the C2 alignment resulting in a higher removal of EVC conservation status that were classified as least concern and depleted in comparison to the these 2 “A” alignments. However, C2 would result in a significantly lower amount of native vegetation with vulnerable and Endangered EVC status to be removed when compared to all 3 alignments. This is further demonstrated under scoring scenario 5 & 6 where the impacts on vulnerable and Endangered EVC status are only considered in the impact assessment.

A1 is considered to have the impact from a social impact perspective with a score of 13.36, marginally lower then C2 with score of 14.17, followed by A0 with a score of 15.25 and C0 with a score of 16.67. Specifically, A1 performed better than C2 on:

- Acquisition and property impacts. While A1 would result in a higher amount of land to be acquired when compared to C2, its however impact on a smaller number of properties, landowners and dwellings that would directly be impacted by the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass; and
- Visual Impact in that there will be a lower number of dwellings within 500 m of the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.

Specifically, C2 performed better than A1 on:

- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

A1 is the best performing alignment for the economic criteria due to it being the alignment with lowest construction cost, followed by A1, C0 and C2.

Based on the above discussions and like the outcomes of scoring scenario 1, 2 and 3, RRV considers alignment option C2 to be the preferred alignment under scoring scenario 4.

RRV considers the methodology and framework adopted for scoring scenario 4 to be appropriate and considers that scoring scenarios 4 appropriately captures the differences in the quantifiable data outlining potential impacts between the 4 alignments in its scoring allocation to select and identify the preferred alignment for the Beaufort Bypass.

6.7 Scoring Scenario 5 – Same scoring system as Scenario 3 but minus criterions that can be mitigated.

The same scoring system as scenario 3 is applied. The key difference being criterions that can be mitigated were removed biodiversity impacts that that were not impacting on vulnerable or endangered EVCs and construction costs were removed. The following criterion were removed:

- Node, stepping stones, terrestrial corridor and wetlands were removed from the Wildlife corridor/connectivity criterion;
- Least concern, depleted EVCs were removed from Strategic Biodiversity Value Score Per Alignment criterion;
- Least concern, depleted EVCs were removed from the condition score of native vegetation to be removed criterion;
- Construction within floodplains criterion;
- Impact on number of known or registered sites by proposed alignment (Aboriginal and historic) criterion;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass criterion;
- Construction cost criterion.

The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

Table 19 below outlines the assessment outcomes under scoring scenario 5.

Table 19 Scoring Scenario 5 Evaluation Outcomes

Assessment Criteria	Alignment A0	A0 Scores	Alignment A1	A1 Scores	Alignment C0	C0 Scores	Alignment C2	C2 Scores	Assessment Discussion
Extent of native vegetation to be cleared (all classes) per alignment	**62.61ha**	**1.000**	**62.55ha**	**0.999**	**62.3ha**	**0.995**	**50.7ha**	**0.810**	**The extent of native vegetation to be removed associated with C2 is significantly lower (approximately 11 hectares lower) when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is considered to have the least impact and as such is allocated a score of 0.810. The difference in total areas of native vegetation to be removed between Alignments A0, A1 and C0 are minimal and it is considered that this is reflected in the scoring. A score of 0.995 is allocated to C0 as the next least impact after C2 while a score of 0.999 and 1 is allocated to A1 and A0 respectively.**
Scattered trees	2.70ha	0.925	2.92ha	1.000	2.23ha	0.764	2.48ha	0.849	**The extent of native scattered trees to be removed associated with C0 is slightly lower (approximately 0.7 hectares lower) when compared with C2, A0 and A1 & C2. For this criteria Alignment C0 is considered to have the least impact (marginally) and as such is allocated a score of 0.764.** **A score of 0.849 is allocated to C2 as the next least impact after C0 while a score of 0.925 and 1 is allocated to A0 and A1 respectively.**
Large trees in patches	3.8ha	0.964	3.94ha	1.000	2.67ha	0.678	2.67ha	0.678	**The extent of large trees in patches to be removed associated with alignment C0 and C2 are lower (approximately 1.3 hectares lower) when compared with Alignments A0 & A1. For this criteria Alignment C0 and C2 are considered to have the least impact and as such are both allocated a score of 0.678.**

									A score of 0.964 is allocated to A0 as the next least impact after C0 and C2 while a score of 1 is allocated to A1.
Number of large trees to removed	396	1.000	374	0.944	322	0.813	317	0.801	**The number of large trees to be removed associated with alignment C2 is lower (approximately 5 tree) when compared with Alignment C0 and approximately between 50-70 trees when compared to Alignments A0 & A1. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 0.801, while a score of 0.813 is allocated to C0.** **A score of 0.944 is allocated to A1 as the next least impact after C2 and C0 while a score of 1 is allocated to A0.**
Impact on Endangered EVC habitat	16.89ha	1.000	14.78ha	0.875	9.53	0.564	9.03	0.535	**The extent of impact on endangered EVC habitat associated with alignment C2 is lower (approximately 0.5 hectares) when compared with Alignment C0 and approximately between 5-7 hectares when compared to Alignments A1 & A0. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 0.535, while a score of 0.564 is allocated to C0.** **A score of 0.875 is allocated to A1 as the next least impact after C2 and C0 while a score of 1 is allocated to A0.**
Native vegetation offset requirement	143.712 Specific Unit	0.763	147.134 Specific Units	0.781	188.161 Specific Units	1.000	80.413 Specific Units	0.427	**The extent of native vegetation offset required to replace those proposed to be removed is lower for Alignment C2 when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is allocated a score of 0.427, while A0, A1 & C0 were allocated a score of 0.763, 0.781 and 1 respectively.**
Threatened vegetation communities within alignment corridor		**0.932**		**0.879**		**1.000**		**0.716**	**There is a total of 31.62 hectares of threatened vegetation communities within C2, 38.8 hectares for A1 and 41.13 hectares for A0 and 44.14 hectares for C0. For this criteria Alignment C2 is allocated a score of 0.716, 0.879 for A1, 0.931 for A0 and a score of 1 for C0 respectively.**
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06 ha	0.023	0.06 ha	0.023	2.58 ha	1.000	0.06 ha	0.023	**Alignments A0, A1 and C2 have the same impacts (0.06 hectares) on seasonal herbaceous wetlands and as such are allocated a score of 0.023.** **Alignment C0 with an impact area of 2.58 hectares has a slightly larger impact on seasonal herbaceous wetlands with compared to the other 3 alignments and as such is allocated a score of 1.**
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act)	2.64 ha	0.665	0.65 ha	0.164	3.97 ha	1.000	0 ha	0.000	**Alignment C2 does not impact on this EPBC critically endangered woodland and as such is allocated a score of 0.** **Alignment A1 has an impact area of 0.65 hectares on this critically endangered woodland, which is marginally higher then C2 and as such is allocated a score of 0.164.**

									A0 and C0 have a higher impact area (2-3 hectares higher) when compared to C2 and A1 and as such are allocated a score of 0.665 and 1 respectively.
Victorian Woodland Bird community (Threatened under FFG Act)	38.43 ha	1.000	38.09 ha	0.991	37.59 ha	0.978	31.56 ha	0.821	**C2 has an impact area of 31.56 hectares on this FFG threatened vegetation community, which is approximately 6-7 hectares lower then C0, A1 & A0, therefore, a score of 0.821 is allocated.** **A score of 0.978 is allocated to C0 with an impact area of 37.59, while a score of 0.991 and 1 are allocated to A1 and A0 respectively.**
Wild life corridor/connectivity impact	**38.852ha**	**1.000**	**38.739ha**	**0.997**	**37.683ha**	**0.970**	**32.52ha**	**0.837**	**C2 has an impact area of 32.52 hectares on wildlife corridor/connectivity, which is approximately 5-6 hectares lower then C0, A1 & A0, therefore, a score of 0.837 is allocated.** **A score of 0.970 is allocated to C0 with an impact area of 37.68, while a score of 0.997 and 1 are allocated to A1 and A0 respectively.**
Core	24.181ha	0.952	25.389ha	1.000	16.03ha	0.631	10.81ha	0.426	**C2 has an impact area of 10.81 hectares on core wildlife corridor/connectivity, which is approximately 6-15 hectares lower then C0, A0 & A1, therefore, a score of 0.426 is allocated.** **A score of 0.631 is allocated to C0 with an impact area of 16.03 hectares, f while a score of 0.952 and 1 are allocated to A0 and A1 respectively.**
Strategic Biodiversity Value Score per alignment by EVC Conservation Status									
Low Score (0.0 - 0.3)									
Endangered	8	1.000	8	1.000	3	0.375	8	1.000	**C0 impacts on 3 zones of endangered EVC status vegetation with a low strategic biodiversity value score, which is lower in comparison to A0, A1 and C2 which impacts on 8 zones of endangered EVC status vegetation with a low strategic biodiversity value score. Therefore, a score of 0.375 is allocated to C0, while a score of 1 is allocated to A0, A1 and C2.**
Medium Score (0.31 - 0.79)									
Vulnerable	6	0.286	6	0.286	21	1.000	6	0.286	**A0, A1 and C2 impacts on 6 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score, which is significantly lower in comparison to C0 which impacts on 21 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 0.286 is allocated to A0, A1 and C2, while a score of 1 is allocated to C0.**

Endangered	98	1.000	97	0.990	64	0.653	71	0.724	**C0 impacts on 64 zones of endangered EVC status vegetation with a medium strategic biodiversity value score, which is approximately between 7 to 34 zones lower in comparison to C2, A1 and A0, which impacts on 71, 97 and 98 zones of endangered EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 0.653 is allocated to C0, while a score of 0.724 is allocated to C2, 0.990 to A1 and 1 to A0.**
High Score (0.8 +)									
Vulnerable	1	0.500	1	0.500	2	1.000	1	0.500	**A0, A1 and C2 impacts on 1 zone of vulnerable EVC status vegetation with a high strategic biodiversity value score, while C0 only impacts on 2 zones of vulnerable EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 0.5 is allocated to A0, A1 and C2, while a score of 1 is allocated to C0.**
Endangered	6	0.545	4	0.364	11	1.000	5	0.455	**A1 impacts on 4 zones of endangered EVC status vegetation with a high strategic biodiversity value score, which is between 1 to 7 zones lower in comparison to C2, A0 and C0, which impacts on 5, 6 and 11 zones of endangered EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 0.364 is allocated to A1, while a score of 0.455 is allocated to C2, 0.545 to A0 and 1 to C0.**
Condition score of native vegetation to be removed by EVC Conservation Status									
Low Score - Less than 0.3									
Vulnerable	4	0.400	4	0.400	10	1.000	4	0.400	**A0, A1 and C2 impacts on 2 zones of vulnerable EVC status vegetation with a low condition score, while C0 impacts on 8 zones of vulnerable EVC status vegetation with a low condition score. Therefore, a score of 0.4 is allocated to A0, A1 and C2, while a score of 1 is allocated to C0.**
Endangered	39	1.000	39	1.000	30	0.769	36	0.923	**C0 impacts on 30 zones of endangered EVC status vegetation with a low condition score, which is between 6 to 9 zones lower in comparison to C2, A0 and A1, which impacts on 36 and 39 zones of endangered EVC status vegetation with a low condition score. Therefore, a score of 0.769 is allocated to C0, while a score of 0.923 is allocated to C2 and a score of 1 to both A0 to A1.**
Medium Score - between 0.31 - 0.59									
Vulnerable	2	0.222	2	0.222	9	1.000	1	0.111	**C2 impacts on 1 zone of vulnerable EVC status vegetation with a medium condition score, which is between 1 to 8 zones lower in comparison to A0, A1 an C0, which impacts on 2 and 9 zones of vulnerable EVC status vegetation with a medium condition score. Therefore, a score of 0.111 is allocated to C2, while a score of 0.222 is allocated to both A0 and A1 and a score of 1is allocated to C0.**

Endangered	65	1.000	63	0.969	41	0.631	46	0.708	**C0 impacts on 41 zones of endangered EVC status vegetation with a medium condition score, which is between 5 to 24 zones lower in comparison to C2, A1 and A0, which impacts on 46, 63 and 65 zones of endangered EVC status vegetation with a medium condition score. Therefore, a score of 0.631 is allocated to C0, while a score of 0.708 is allocated to C2, 0.969 to A1 and 1 to A0.**
High Score - above 0.6									
Vulnerable	1	0.250	1	0.250	4	1.000	2	0.500	**A0 and A1 impacts on 1 zone of vulnerable EVC status vegetation with a high condition score, which is only 1 and 3 zones lower in comparison to C2 and C0, which impacts on 2 and 4 zones of vulnerable EVC status vegetation with a high condition score. Therefore, a score of 0.250 is allocated to both A0 and A1, while a score of 0.500 is allocated to C2 and a score of 1 is allocated to C0.**
Endangered	7	1.000	7	1.000	7	1.000	2	0.286	**C2 impacts on 2 zones of endangered EVC status vegetation with a high condition score, which is 5 zones lower in comparison to A0, A1 and C0, which impacts on 7 zones of endangered EVC status vegetation with a high condition score. Therefore, a score of 0.286 is allocated to C2, while a score of 1 is allocated to A0, A1 and C0.**
Acquisition and property impacts									
Total areas to be acquired	278.47ha	0.999	278.88ha	1.000	256.12ha	0.918	262.59ha	0.942	**C0 will result in the total acquisition of approximately 256.12 hectares of land, which is between 6 to 22 hectares lower in comparison to C2, A0 and A1, which will result in the total acquisition of approximately 262.59, 278.47 and 278.88 hectares respectively. Therefore, a score of 0.918 is allocated to C0, 0.942 to C2, 0.999 to A0 and a score of 1 allocated to A1.**
Number of lots directly impacted by alignment corridor	65	0.890	62	0.849	72	0.986	73	1.000	**A1 will directly impact on 62 lots, which is between 3 to 11 lots lower in comparison to A0, C0 and C2, which will directly impact on 65, 72 and 73 lots respectively. Therefore, a score of 0.849 is allocated to A1, 0.890 to A0, 0.986 to C0 and 1 toC2.**
Number of landowners directly impacted by alignment corridor	26	1.000	23	0.885	23	0.885	25	0.962	**A1 and C0 will directly impact on 23 landowners, which is 2 to 3 lower in comparison to C2 and A0, which will directly impact on 25 and 26 landowners respectively. Therefore, a score of 0.885 is allocated to both A1 and C0, 0.962 to C2 and 1 to A0.**
Number of dwellings directly impacted by alignment corridor	2	0.400	3	0.600	5	1.000	4	0.800	**A0 and A1 will directly impact on 2 & 3 dwellings, which is marginally lower than C0 and C2 will directly impacts on 5 and 4 dwellings. Therefore, a score of 0.400 is allocated to A0, a score of 0.600 to A1, a score 0.800 to C2 and a score of 1 to C0.**
Air quality impacts									
Sensitive receptors within 100 m of alignment	4	1.000	2	0.500	2	0.500	2	0.500	**There will be 2 sensitive receptors (dwellings) within 100 m of A1, C0 and C2, which is marginally lower than A0 will have 4 sensitive receptors within the same distance. Therefore, a score of 0.500 is allocated to A1, C0 and C2 while a score of 1 is allocated to A0.**
Sensitive receptors within 200 m of alignment	5	0.833	5	0.833	6	1.000	4	0.667	**There will be 4 sensitive receptors (dwellings) within 200 m of C2, which is marginally lower than A1, A0 and C0 which has 5 and 6 sensitive receptors within the same distance. Therefore, a score**

									of 0.667 is allocated to C2, 0.833 to both A0 and A1 and a score of 1 to C0.
Sensitive receptors within 300 m of alignment	12	1.000	10	0.833	12	1.000	9	0.750	**There will be 9 sensitive receptors (dwellings) within 300 m of C2, which is lower than A1, A0 and C0 which has 10 and 12 sensitive receptors within the same distance. Therefore, a score of 0.750 is allocated to C2, 0.833 to A1 and a score of 1 to both A0 and C0.**
Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**0.606**	**37**	**0.560**	**61**	**0.924**	**66**	**1.000**	**A1 has a total number of 37 dwellings within 500 m of its alignment corridor, which is marginally lower than A0 and significantly lower than C0 and C2 which has total number of 40, 61 and 66 dwellings within the same distance. Therefore, a score of 0.560 is allocated to A1, 0.606 to A0, 0.924 to C0 and a score of 1 to C2.**
Total		**24.16**		**22.70**		**27.03**		**19.44**	**Under this scoring scenario, C2 has the lowest total score of 19.44 across all assessment criteria followed by A1 with 22.70, A0 with 24.16 and C0 with 27.03. Therefore, C2 is the alignment with the least impact under scoring scenario 5.**

6.7.1 Impacts scores by Key assessment Criteria

Table 20 below provides a breakdown of the impact scoring by each key assessment criteria per alignment.

Table 20 Impact Scoring Breakdown by Key Assessment Criteria per Alignment

Key Assessment Criteria	**Alignment A0**	**Alignment A1**	**Alignment C0**	**Alignment C2**
Total Environment Criteria Score	**17.43**	**16.64**	**19.82**	**12.82**
Extent of native vegetation to be cleared (all classes) per alignment	5.65	5.60	4.81	4.10
Threatened vegetation communities within alignment corridor	2.62	2.06	3.98	1.56
Wild life corridor/connectivity impact	1.95	1.99	1.60	1.26
Strategic Biodiversity Value Score per alignment by EVC Conservation Status	3.33	3.14	4.03	2.96
Condition score of native vegetation to be removed by EVC Conservation Status	3.87	3.84	5.4	2.93
Total Social Criteria Score	**6.73**	**6.06**	**7.21**	**6.62**
Acquisition and property impacts	3.29	3.33	3.79	3.70
Air quality impacts	2.83	2.17	2.5	1.92
Visual Impact - Number of dwellings within 500 m of proposed alignment	0.61	0.56	0.92	1
Total Overall Combined Scores	**24.16**	**22.70**	**27.03**	**19.44**

6.7.2 Scoring Scenario 5 Conclusions

Utilising the assessment and evaluation framework outlined under scoring scenario 5, C2 is identified as the alignment with the least overall impact with a score of 19.44 points, followed by A1 with a score of 22.70, A0 with a score of 24.16 points and C0 with the highest impact score of 27.03 points.

Unlike scoring scenarios 1, 2, 3 & 4, criterions that can be mitigated, biodiversity impacts that that were not impacting on vulnerable or endangered EVCs and construction costs were removed. The following criterion were removed:

- Node, stepping stones, terrestrial corridor and wetlands were removed from the Wildlife corridor/connectivity criterion;
- Least concern, depleted EVCs were removed from Strategic Biodiversity Value Score Per Alignment criterion;
- Least concern, depleted EVCs were removed from the condition score of native vegetation to be removed criterion;
- Construction within floodplains criterion;
- Impact on number of known or registered sites by proposed alignment (Aboriginal and historic) criterion;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass criterion;
- Construction cost criterion.

Like the results of scoring scenarios 1, 2, 3 and 4, the key difference in the scoring between C2 and the A1, C0 and A0 alignments relates to its better performance against the Environment Criteria. Overall, C2 was 4 points lower than the next best being A1, which is a large difference given the scoring methodology adopted. Specifically, this was due to C2 having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area;
- The least amount of impact on native vegetation with vulnerable and endangered EVC Conservation Status and
- The least amount of impact on native vegetation with high conditions to be removed with vulnerable and endangered EVC Conservation Status.

A1 is considered to have the impact from a social impact perspective with a score of 6.06, marginally lower then C2 with score of 6.62, followed by A0 with a score of 6.73 and C0 with a score of 7.21. Specifically, A1 performed better than C2 on:

- Acquisition and property impacts. While A1 would result in a higher amount of land to be acquired when compared to C2, its however impact on a smaller number of properties, landowners and dwellings that would directly be impacted by the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township; and
- Visual Impact in that there will be a lower number of dwellings within 500 m of the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.

Specifically, C2 performed better than A1 from an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

Based on the above discussions and like the outcomes of scoring scenario 1, 2, 3 and 4, RRV considers alignment option C2 to be the preferred alignment under scoring scenario 5.

6.8 Scoring Scenario 6 – Same scoring system as Scenario 4 but minus criterions that can be mitigated.

The same scoring system as scenario 4 is applied. The key difference being criterions that can be mitigated, biodiversity impacts that that were not impacting on vulnerable or endangered EVCs and construction costs were removed. The following criterion were removed. The following criterion were removed:

- Node, stepping stones, terrestrial corridor and wetlands were removed from the Wildlife corridor/connectivity criterion;
- Least concern, depleted EVCs were removed from Strategic Biodiversity Value Score Per Alignment criterion;
- Least concern, depleted EVCs were removed from the condition score of native vegetation to be removed criterion;
- Construction within floodplains criterion;
- Impact on number of known or registered sites by proposed alignment (Aboriginal and historic) criterion;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass criterion;
- Construction cost criterion.

The alignment option with the lowest total score across all assessment criteria is considered to have the least impact.

Table 21 below outlines the assessment outcomes under scoring scenario 6.

Table 21 Scoring Scenario 6 Evaluation Outcomes

Assessment Criteria	Alignment A0	A0 Scores	Alignment A1	A1 Scores	Alignment C0	C0 Scores	Alignment C2	C2 Scores	Assessment Discussion
Extent of native vegetation to be cleared (all classes) per alignment	**62.61ha**	**1.235**	**62.55ha**	**1.234**	**62.3ha**	**1.229**	**50.7ha**	**1.000**	**The extent of native vegetation to be removed associated with C2 is significantly lower (approximately 11 hectares lower) when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is considered to have the least impact and as such is allocated a score of 1. The difference in total areas of native vegetation to be removed between Alignments A0, A1 and C0 are minimal and it is considered that this is reflected in the scoring. A score of 1.229 is allocated to C0 as the next least impact after C2 while a score of 1.234 and 1.235 is allocated to A1 and A0 respectively.**
Scattered trees	2.70ha	1.210	2.92ha	1.309	2.23ha	1.000	2.48ha	1.112	**The extent of native scattered trees to be removed associated with C0 is slightly lower (approximately 0.7 hectares lower) when compared with C2, A0 and A1 & C2. For this criteria Alignment C0 is considered to have the least impact (marginally) and as such is allocated a score of 1.** **A score of 1.112 is allocated to C2 as the next least impact after C0 while a score of 1.210 and 1.309 is allocated to A0 and A1 respectively.**
Large trees in patches	3.8ha	1.420	3.94ha	1.476	2.67ha	1.000	2.67ha	1.000	**The extent of large trees in patches to be removed associated with alignment C0 and C2 are lower (approximately 1.3 hectares lower) when compared with Alignments A0 & A1. For this criteria Alignment C0 and C2 are considered to have the least impact and as such are both allocated a score of 1.**

									A score of 1.420 is allocated to A0 as the next least impact after C0 and C2 while a score of 1.476 is allocated to A1.
Number of large trees to removed	396	1.249	374	1.180	322	1.015	317	1.000	**The number of large trees to be removed associated with alignment C2 is lower (approximately 5 tree) when compared with Alignment C0 and approximately between 50-70 trees when compared to Alignments A0 & A1. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 1, while a score of 1.015 is allocated to C0.** **A score of 1.180 is allocated to A1 as the next least impact after C2 and C0 while a score of 1.249 is allocated to A0.**
Impact on Endangered EVC habitat	16.89ha	1.870	14.78ha	1.637	9.53	1.006	9.03	1.000	**The extent of impact on endangered EVC habitat associated with alignment C2 is lower (approximately 0.5 hectares) when compared with Alignment C0 and approximately between 5-7 hectares when compared to Alignments A1 & A0. For this criteria Alignment C2 is considered to have the least impact (marginally) over alignment C0 and as such is allocated a score of 1, while a score of 1.006 is allocated to C0.** **A score of 1.637 is allocated to A1 as the next least impact after C2 and C0 while a score of 1.870 is allocated to A0.**
Native vegetation offset requirement	143.712 Specific Unit	1.786	147.134 Specific Units	1.829	188.161 Specific Units	2.340	80.413 Specific Units	1.000	**The extent of native vegetation offset required to replace those proposed to be removed is lower for Alignment C2 when compared with Alignments A0, A1 & C0. For this criteria Alignment C2 is allocated a score of 1, while A0, A1 & C0 were allocated a score of 1.786, 1.829 and 2.340 respectively.**
Threatened vegetation communities within alignment corridor		**1.300**		**1.230**		**1.400**		**1.000**	**There is a total of 31.62 hectares of threatened vegetation communities within C2, 38.8 hectares for A1 and 41.13 hectares for A0 and 44.14 hectares for C0. For this criteria Alignment C2 is allocated a score of 1, 1.230 for A1, 1.3 for A0 and a score of 1.4 for C0 respectively.**
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06 ha	1.000	0.06 ha	1.000	2.58 ha	2.000	0.06 ha	1.000	**Alignments A0, A1 and C2 have the same impacts (0.06 hectares) on seasonal herbaceous wetlands and as such are allocated a score of 1.** **Alignment C0 with an impact area of 2.58 hectares has a slightly larger impact on seasonal herbaceous wetlands with compared to the other 3 alignments and as such is allocated a score of 2.**
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act)	2.64 ha	4.000	0.65 ha	1.000	3.97 ha	4.000	0 ha	0.000	**Alignment C2 does not impact on this EPBC critically endangered woodland and as such is allocated a score of 0.** **Alignment A1 has an impact area of 0.65 hectares on this critically endangered woodland, which is marginally higher then C2 and as such is allocated a score of 1.**

									A0 and C0 have a higher impact area (2-3 hectares higher) when compared to C2 and A1 and as such are allocated a score of 4 respectively.
Victorian Woodland Bird community (Threatened under FFG Act)	38.43 ha	1.220	38.09 ha	1.210	37.59 ha	1.190	31.56 ha	1.000	**C2 has an impact area of 31.56 hectares on this FFG threatened vegetation community, which is approximately 6-7 hectares lower then C0, A1 & A0, therefore, a score of 1 is allocated.** **A score of 1.190 is allocated to C0 with an impact area of 37.59, while a score of 1.210 and 1.220 are allocated to A1 and A0 respectively.**
Wild life corridor/connectivity impact	**38.852ha**	**1.194**	**38.739ha**	**1.191**	**37.683ha**	**1.158**	**32.52ha**	**1.000**	**C2 has an impact area of 32.52 hectares on wildlife corridor/connectivity, which is approximately 5-6 hectares lower then C0, A1 & A0, therefore, a score of 1 is allocated.** **A score of 1.158 is allocated to C0 with an impact area of 37.68, while a score of 1.191 and 1.194 are allocated to A1 and A0 respectively.**
Core	24.181ha	2.230	25.389ha	2.340	16.03ha	1.480	10.81ha	1.000	**C2 has an impact area of 10.81 hectares on core wildlife corridor/connectivity, which is approximately 6-15 hectares lower then C0, A0 & A1, therefore, a score of 1 is allocated.** **A score of 1.480 is allocated to C0 with an impact area of 16.03 hectares, while a score of 2.230 and 2.340 are allocated to A0 and A1 respectively.**
Strategic Biodiversity Value Score per alignment by EVC Conservation Status									
Low Score (0.0 - 0.3)									
Endangered	8	2.700	8	2.700	3	1.000	8	2.700	**C0 impacts on 3 zones of endangered EVC status vegetation with a low strategic biodiversity value score, which is lower in comparison to A0, A1 and C2 which impacts on 8 zones of endangered EVC status vegetation with a low strategic biodiversity value score. Therefore, a score of 1 is allocated to C0, while a score of 2.7 is allocated to A0, A1 and C2.**
Medium Score (0.31 - 0.79)									
Vulnerable	6	1.000	6	1.000	21	3.500	6	1.000	**A0, A1 and C2 impacts on 6 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score, which is significantly lower in comparison to C0 which impacts on 21 zones of vulnerable EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 3.5 is allocated to C0.**

Endangered	98	1.530	97	1.520	64	1.000	71	1.110	**C0 impacts on 64 zones of endangered EVC status vegetation with a medium strategic biodiversity value score, which is approximately between 7 to 34 zones lower in comparison to C2, A1 and A0, which impacts on 71, 97 and 98 zones of endangered EVC status vegetation with a medium strategic biodiversity value score. Therefore, a score of 1 is allocated to C0, while a score of 1.110 is allocated to C2, 1.520 to A1 and 1.530 to A0.**
High Score (0.8 +)									
Vulnerable	1	1.000	1	1.000	2	2.000	1	1.000	**A0, A1 and C2 impacts on 1 zone of vulnerable EVC status vegetation with a high strategic biodiversity value score, while C0 only impacts on 2 zones of vulnerable EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 2 is allocated to C0.**
Endangered	6	1.500	4	1.000	11	2.750	5	1.250	**A1 impacts on 4 zones of endangered EVC status vegetation with a high strategic biodiversity value score, which is between 1 to 7 zones lower in comparison to C2, A0 and C0, which impacts on 5, 6 and 11 zones of endangered EVC status vegetation with a high strategic biodiversity value score. Therefore, a score of 1 is allocated to A1, while a score of 1.250 is allocated to C2, 1.5 to A0 and 2.75 to C0.**
Condition score of native vegetation to be removed by EVC Conservation Status									
Low Score - Less than 0.3									
Vulnerable	4	1.000	4	1.000	10	2.500	4	1.000	**A0, A1 and C2 impacts on 2 zones of vulnerable EVC status vegetation with a low condition score, while C0 impacts on 8 zones of vulnerable EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to A0, A1 and C2, while a score of 2.5 is allocated to C0.**
Endangered	39	1.300	39	1.300	30	1.000	36	1.200	**C0 impacts on 30 zones of endangered EVC status vegetation with a low condition score, which is between 6 to 9 zones lower in comparison to C2, A0 and A1, which impacts on 36 and 39 zones of endangered EVC status vegetation with a low condition score. Therefore, a score of 1 is allocated to C0, while a score of 1.2 is allocated to C2 and a score of 1.3 is allocated to both A0 to A1.**
Medium Score - between 0.31 - 0.59									
Vulnerable	2	2.000	2	2.000	9	4.000	1	1.000	**C2 impacts on 1 zone of vulnerable EVC status vegetation with a medium condition score, which is between 1 to 8 zones lower in comparison to A0, A1 an C0, which impacts on 2 and 9 zones of vulnerable EVC status vegetation with a medium condition score. Therefore, a score of 1 is allocated to C2, while a score of 2 is allocated to both A0 and A1 and a score of 4 is allocated to C0.**

Endangered	65	1.580	63	1.540	41	1.000	46	1.120	**C0 impacts on 41 zones of endangered EVC status vegetation with a medium condition score, which is between 5 to 24 zones lower in comparison to C2, A1 and A0, which impacts on 46, 63 and 65 zones of endangered EVC status vegetation with a medium condition score. Therefore, a score of 1 is allocated to C0, while a score of 1.12 is allocated to C2, 1.54 to A1 and 1.58 to A0.**
High Score - above 0.6									
Vulnerable	1	1.000	1	1.000	4	4.000	2	2.000	**A0 and A1 impacts on 1 zone of vulnerable EVC status vegetation with a high condition score, which is only 1 and 3 zones lower in comparison to C2 and C0, which impacts on 2 and 4 zones of vulnerable EVC status vegetation with a high condition score. Therefore, a score of 1 is allocated to both A0 and A1, while a score of 2 is allocated to C2 and a score of 4 is allocated to C0.**
Endangered	7	3.500	7	3.500	7	3.500	2	1.000	**C2 impacts on 2 zones of endangered EVC status vegetation with a high condition score, which is 5 zones lower in comparison to A0, A1 and C0, which impacts on 7 zones of endangered EVC status vegetation with a high condition score. Therefore, a score of 1 is allocated to C2, while a score of 3.5 is allocated to A0, A1 and C0.**
Acquisition and property impacts									
Total areas to be acquired	278.47ha	1.087	278.88ha	1.088	256.12ha	1.000	262.59ha	1.025	**C0 will result in the total acquisition of approximately 256.12 hectares of land, which is between 6 to 22 hectares lower in comparison to C2, A0 and A1, which will result in the total acquisition of approximately 262.59, 278.47 and 278.88 hectares respectively. Therefore, a score of 1 is allocated to C0, 1.025 to C2, 1.087 to A0 and a score of 1.088 allocated to A1.**
Number of lots directly impacted by alignment corridor	65	1.040	62	1.000	72	1.160	73	1.170	**A1 will directly impact on 62 lots, which is between 3 to 11 lots lower in comparison to A0, C0 and C2, which will directly impact on 65, 72 and 73 lots respectively. Therefore, a score of 1 is allocated to A1, 1.040 to A0, 1.160 to C0 and 1.170 to C2.**
Number of landowners directly impacted by alignment corridor	26	1.130	23	1.000	23	1.000	25	1.080	**A1 and C0 will directly impact on 23 landowners, which is 2 to 3 lower in comparison to C2 and A0, which will directly impact on 25 and 26 landowners respectively. Therefore, a score of 1 is allocated to both A1 and C0, 1.080 to C2 and 1.130 to A0.**
Number of dwellings directly impacted by alignment corridor	2	1.000	3	1.050	5	2.500	4	2.000	**A0 and A1 will directly impact on 2 & 3 dwellings, which is marginally lower than C0 and C2 will directly impacts on 5 and 4 dwellings. Therefore, a score of 1 is allocated to A0, a score of 1.050 to A1, a score of 2.000 to C2 and a score of 2.500 to C0.**
Air quality impacts									
Sensitive receptors within 100 m of alignment	4	2.000	2	1.000	2	1.000	2	1.000	**There will be 2 sensitive receptors (dwellings) within 100 m of A1, C0 and C2, which is marginally lower than A0 will have 4 sensitive receptors within the same distance. Therefore, a score of 1 is allocated to A1, C0 and C2 while a score of 2 is allocated to A0.**
Sensitive receptors within 200 m of alignment	5	1.250	5	1.250	6	1.500	4	1.000	**There will be 4 sensitive receptors (dwellings) within 200 m of C2, which is marginally lower than A1, A0 and C0 which has 5 and 6 sensitive receptors within the same distance. Therefore, a score**

									of 1 is allocated to C2, 1.250 to both A0 and A1 and a score of 1.50 to C0.
Sensitive receptors within 300 m of alignment	12	1.330	10	1.110	12	1.330	9	1.000	**There will be 9 sensitive receptors (dwellings) within 300 m of C2, which is lower than A1, A0 and C0 which has 10 and 12 sensitive receptors within the same distance. Therefore, a score of 1 is allocated to C2, 1.110 to A1 and a score of 1.330 to both A0 and C0.**
Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**1.080**	**37**	**1.000**	**61**	**1.600**	**66**	**1.720**	**A1 has a total number of 37 dwellings within 500 m of its alignment corridor, which is marginally lower than A0 and significantly lower than C0 and C2 which has total number of 40, 61 and 66 dwellings within the same distance. Therefore, a score of 1 is allocated to A1, 1.080 to A0, 1.600 to C0 and a score of 1.720 to C2.**
Total		**47.74**		**42.69**		**56.16**		**35.49**	**Under this scoring scenario, C2 has the lowest total score of 35.49 across all assessment criteria followed by A1 with 42.69, A0 with 47.74 and C0 with 56.16. Therefore, C2 is the alignment with the least impact under scoring scenario 6.**

6.8.1 Impacts scores by Key assessment Criteria

Table 22 below provides a breakdown of the impact scoring by each key assessment criteria per alignment.

Table 22 Impact Scoring Breakdown by Key Assessment Criteria per Alignment

Key Assessment Criteria	**Alignment A0**	**Alignment A1**	**Alignment C0**	**Alignment C2**
Total Environment Criteria Score	**37.83**	**34.20**	**45.07**	**25.49**
Extent of native vegetation to be cleared (all classes) per alignment	8.77	8.67	7.59	6.11
Threatened vegetation communities within alignment corridor	7.52	4.44	8.59	3
Wild life corridor/connectivity impact	3.42	3.53	2.64	2
Strategic Biodiversity Value Score per alignment by EVC Conservation Status	7.73	7.22	10.25	7.06
Condition score of native vegetation to be removed by EVC Conservation Status	10.38	10.34	16	7.32
Total Social Criteria Scores	**9.92**	**8.50**	**11.09**	**10**
Acquisition and property impacts	4.26	4.14	5.66	5.28
Air quality impacts	4.58	3.36	3.83	3
Visual Impact - Number of dwellings within 500 m of proposed alignment	1.08	1	1.6	1.72
Total Overall Combined Scores	47.74	42.69	56.16	35.49

6.8.2 Scoring Scenario 6 Conclusions

Utilising the assessment and evaluation framework outlined under scoring scenario 6, C2 is identified as the alignment with the least overall impact with a score of 35.49 points, followed by A1 with a score of 42.69, A0 with a score of 47.74 points and C0 with the highest impact score of 56.16 points.

Like scoring scenarios 5, criterions that can be mitigated, biodiversity impacts that that were not impacting on vulnerable or endangered EVCs and construction costs were removed. The following criterion were removed:

- Node, stepping stones, terrestrial corridor and wetlands were removed from the Wildlife corridor/connectivity criterion;
- Least concern, depleted EVCs were removed from Strategic Biodiversity Value Score Per Alignment criterion;
- Least concern, depleted EVCs were removed from the condition score of native vegetation to be removed criterion;
- Construction within floodplains criterion;
- Impact on number of known or registered sites by proposed alignment (Aboriginal and historic) criterion;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass criterion;
- Construction cost criterion.

Like the results of scoring scenarios 1, 2, 3, 4 and 5, the key difference in the scoring between C2 and the A1, C0 and A0 alignments relates to its better performance against the Environment Criteria. Overall, C2 was 8 points lower than the next best being A1, which is a large difference given the scoring methodology adopted. Specifically, this was due to C2 having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area;
- The least amount of impact on native vegetation with vulnerable and endangered EVC Conservation Status and
- The least amount of impact on native vegetation with high conditions to be removed with vulnerable and endangered EVC Conservation Status.

A1 is considered to have the impact from a social impact perspective with a score of 8.50, marginally lower then A0 with a score of 9.92, followed by C2 with a score of 10 and C0 with a score of 11.09. Specifically, A1 performed better than C2 on:

- Acquisition and property impacts. While A1 would result in a higher amount of land to be acquired when compared to C2, its however impact on a smaller number of properties, landowners and dwellings that would directly be impacted by the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township; and
- Visual Impact in that there will be a lower number of dwellings within 500 m of the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.

Specifically, C2 performed better than A1 from an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

Based on the above discussions and like the outcomes of scoring scenario 1, 2, 3, 4 and 5, RRV considers alignment option C2 to be the preferred alignment under scoring scenario 6.

6.9 Scoring Sensitivity Scenario 1

Under this sensitivity scenario, the following scoring system was applied:

- Alignment Options with the least impact and other options within 5% of the least impact are apportioned a score of 1 point and a Green light.
- Alignment Options within 5 - 20% of the least impact option are apportioned a score of 0 point and an Amber light.
- Alignment Options with an impact of 20% or greater than the least impact option is apportioned a score of -1 and a Red light.

The alignment option with the highest positive total score across all assessment criteria is considered to have the least impact and best performing alignment.

Table 23 below outlines the assessment outcomes under scoring sensitivity scenario 1.

Table 23 Scoring Sensitivity Scenario 1 Evaluation Outcomes

Assessment Criteria	Alignment A0	% diff from Least Impact	A0 score	Alignment A1	% diff from Least Impact	A1 score	Alignment C0	% diff from Least Impact	C0 score	Alignment C2	% diff from Least Impact	C2 score
Extent of native vegetation to be cleared (all classes) per alignment	**62.61**	**23**	**-1**	**62.55**	**23**	**-1**	**62.3**	**23**	**-1**	**50.7**	**0**	**1**
Scattered trees	2.7	21	-1	2.92	31	-1	2.23	0	1	2.48	11	0
Large trees in patch	3.8	1.42	-1	3.94	1.48	-1	2.67	1.00	1	2.67	1.00	1
Number of large trees to removed	396	1.25	-1	374	1.18	0	322	1.02	1	317	1.00	1
Impact on Endangered EVC habitat	16.89	1.87	-1	14.78	1.64	-1	9.53	1.06	1	9.03	1.00	1
Native vegetation offset requirement	143.712	1.79	-1	147.134	1.83	-1	188.161	2.34	-1	80.413	1.00	1
Threatened vegetation communities within alignment corridor	41.13	1.30	-1.00	38.8	1.23	-1.00	44.14	1.40	-1.00	31.621	1.00	**1**
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06	1.00	1	0.06	1.00	1	2.58	43.00	-1	0.06	1.00	1
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act)	2.64	2640.00	-1	0.65	650.00	-1	3.97	3970.00	-1	0.001	1.00	1
Victorian Woodland Bird community (Threatened under FFG Act)	38.43	1.22	-1	38.09	1.21	-1	37.59	1.19	0	31.56	1.00	1
Wild life corridor/connectivity impact	**38.852**	**1.19**	**0**	**38.739**	**1.19**	**0**	**37.683**	**1.16**	**0**	**32.52**	**1.00**	**1**
Core	24.181	2.24	-1	25.389	2.35	-1	16.03	1.48	-1	10.81	1.00	1
Node	0.169	169.00	-1	0.169	169.00	-1	0.001	1.00	1	0.169	169.00	-1

Stepping Stones	5.453	1.00	1	5.556	1.02	1	10.788	1.98	-1	14.462	2.65	-1
Terrestrial Corridors	6.3	1.15	0	6.351	1.16	0	6.044	1.10	0	5.474	1.00	1
Wetlands	2.749	2.16	-1	1.274	1.00	1	4.821	3.78	-1	1.605	1.26	-1
Strategic Biodiversity Value Score per alignment												
Low Score (0.0 - 0.3)												
Endangered	8	2.67	-1	8	2.67	-1	3	1.00	1	8	2.67	-1
Medium Score (0.31 - 0.79)												
Least Concern	22	1.10	0	23	1.15	0	20	1.00	1	23	1.15	0
Depleted	33	1.00	1	44	1.33	-1	36	1.09	0	38	1.15	0
Vulnerable	6	1.00	1	6	1.00	1	21	3.50	-1	6	1.00	1
Endangered	98	1.53	-1	97	1.52	-1	64	1.00	1	71	1.11	0
High Score (0.8 +)												
Least Concern	1	1.00	1	1	1.00	1	3	3000.00	-1	2	2000.00	-1
Depleted	6	1.00	1	6	1.00	1	11	1.83	-1	11	1.83	-1
Vulnerable	1	1.00	1	1	1.00	1	2	2.00	-1	1	1.00	1
Endangered	6	1.50	-1	4	1.00	1	11	2.75	-1	5	1.25	-1
Condition score of native vegetation to be removed												
Low Score - Less then 0.3												
Least Concern	13	1.18	0	14	1.27	-1	11	1.00	1	13	1.18	0
Depleted	3	1.50	-1	8	4.00	-1	2	1.00	1	3	1.50	-1
Vulnerable	4	1.00	1	4	1.00	1	10	2.50	-1	4	1.00	1
Endangered	39	1.30	-1	39	1.30	-1	30	1.00	1	36	1.20	0
Medium Score - between 0.31 - 0.59												
Least Concern	8	1.00	1	8	1.00	1	11	1.38	-1	11	1.38	-1
Depleted	12	1.00	1	15	1.25	-1	25	2.08	-1	34	2.83	-1
Vulnerable	2	2.00	-1	2	2.00	-1	9	9.00	-1	1	1.00	1
Endangered	65	1.59	-1	63	1.54	-1	41	1.00	1	46	1.12	0
High Score - above 0.6												
Least Concern	1	1.00	1	1	1.00	1	1	1.00	1	1	1.00	1
Depleted	24	2.00	-1	27	2.25	-1	20	1.67	-1	12	1.00	1
Vulnerable	1	1.00	1	1	1.00	1	4	4.00	-1	2	2.00	-1
Endangered	7	3.50	-1	7	3.50	-1	7	3.50	-1	2	1.00	1
Construction within floodplains												
Total number of waterway crossings	16	1.14	0	16	1.14	0	14	1.00	1	16	1.14	0
Total number of designated waterway crossings	3	1.00	1	3	1.00	1	3	1.00	1	3	1.00	1
Greatest 1% AEP flood depth intersecting bypass alignment option	1.34	1.00	1	1.34	1.00	1	1.5	1.12	0	1.34	1.00	1

Max Flooding width at Yam Holes Creek crossing (1% AEP base case)	750	2.50	-1	750	2.50	-1	300	1.00	1	810	2.70	-1
Total length of alignment within the 1% AEP base case floodplain	1307	1.11	0	1175	1.00	1	1550	1.32	-1	2090	1.78	-1
Total watercourse crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	990	1.19	0	835	1.00	1	1380	1.65	-1	1475	1.77	-1
Yam Hole Creek crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	610	1.23	-1	610	1.23	-1	495	1.00	1	570	1.15	0
Yam Hole Creek crossing average 1% AEP depth allowing 10 mm or greater (up to 100 mm) flood level increase	600	1.50	-1	600	1.50	-1	400	1.00	1	600	1.50	-1
The extent of ground disturbance works within 50 m of watercourse	11.6	1.00	1	12.45	1.07	0	19.5	1.68	-1	24.5	2.11	-1
Impact on number of known or registered sites by proposed alignment.												
Aboriginal	2	1.00	1	2	1.00	1	2	1.00	1	2	1.00	1
% of alignment within an area of Aboriginal sensitivity	14	0.95	1	14.3	0.97	1	14.8	1.00	1	10.5	0.71	1
European	4	2.00	-1	3	1.50	-1	4	2.00	-1	2	1.00	1
Acquisition and property impacts												
Total areas to be acquired	278.47	1.09	0	278.88	1.09	0	256.12	1.00	1	262.59	1.03	1
Number of lots directly impacted by alignment corridor	65	1.05	1	62	1.00	1	72	1.16	0	73	1.18	0
Number of landowners directly impacted by alignment corridor	26	1.13	0	23	1.00	1	23	1.00	1	25	1.09	0
Number of dwellings directly impacted by alignment corridor	2	1.00	1	3	1.50	-1	5	2.50	-1	4	2.00	-1
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	**23**	**1.00**	**1**	**23**	**1.00**	**1**	**27**	**1.17**	**0**	**27**	**1.17**	**0**
Air quality impacts												
Sensitive receptors within 100 m of alignment	4	2.00	-1	2	1.00	1	2	1.00	1	2	1.00	1
Sensitive receptors within 200 m of alignment	5	1.25	-1	5	1.25	-1	6	1.50	-1	4	1.00	1
Sensitive receptors within 300 m of alignment	12	1.33	-1	10	1.11	0	12	1.33	-1	9	1.00	1

Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**1.08**	**1**	**37**	**1.00**	**1**	**61**	**1.65**	**-1**	**66**	**1.78**	**-1**
Construction cost $m	**405.6**	**1.04**	**1**	**391.3**	**1.00**	**1**	**424.5**	**1.08**	**0**	**482.5**	**1.23**	**-1**
Total Scores			**-6**			**-3**			**-5**			**9**

6.9.1 Sensitivity scores by Key assessment Criteria

Table 24 below provides a breakdown of the impact scoring by each key assessment criteria per alignment.

Table 24 Impact Scoring Breakdown by Key Assessment Criteria per Alignment

Key Assessment Criteria	Alignment A0	Alignment A1	Alignment C0	Alignment C2
Total Environment Criteria Scores	**-9**	**-8**	**-5**	**5**
Extent of native vegetation to be cleared (all classes) per alignment	-6	-5	2	5
Threatened vegetation communities within alignment corridor	-2	-2	-3	4
Wild life corridor/connectivity impact	-2	0	-2	0
Strategic Biodiversity Value Score per alignment by EVC Conservation Status	2	2	-2	-2
Condition score of native vegetation to be removed by EVC Conservation Status	-1	-4	-2	1
Construction within floodplains	0	1	2	-3
Total Social Criteria Scores	**2**	**4**	**0**	**5**
Impact on number of known or registered sites by proposed alignment.	1	1	1	3
Acquisition and property impacts	2	1	1	0
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	1	1	0	0
Air quality impacts	-3	0	-1	3
Visual Impact - Number of dwellings within 500 m of proposed alignment	1	1	-1	-1
Total Economic Criteria Scores	**1**	**1**	**0**	**-1**
Construction cost per alignment	1	1	0	-1
Total Overall Combined Scores	**-6**	**-3**	**-5**	**9**

6.9.2 Scoring Sensitivity Scenario 1 Conclusions

Utilising the assessment and evaluation framework outlined under scoring sensitivity scenario 1, C2 is identified as the alignment with the least overall impact with a score of 9, followed by A1 with a score of -3, C0 with a score of -5 and A0 with the highest impact score of -6. The key difference in the sensitivity scoring between C2 and the A1, C0 and A0 alignments relates to its positive performances against both the Environment and social Criteria. Overall, C2 was 12 points higher than A1. Specifically, this was due to C2 having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area;
- The least amount of impact on native vegetation with high conditions to be removed by EVC Conservation Status.
- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor

Conversely, C2 received a negative score for its potential construction within floodplains within the project area. For this assessment Criteria, C0 has the least impact with a score of 2. Also, C2 received a negative score for the impact on Strategic Biodiversity Value Score criterion. As stated earlier this was due to the C2 alignment resulting in a higher removal of EVC conservation status that were classified as least concern and depleted in comparison to the other 3 alignment. However, C2 would result in a significantly lower amount of native vegetation with vulnerable and Endangered EVC status to be removed when compared to the 3 alignments. This was further demonstrated under scoring scenario 5 & 6 when the impacts on vulnerable and Endangered EVC status were only considered in the impact assessment.

C2 is considered to have the best preforming from a social impact perspective with a score of 5, marginally higher then A1 with score of 4, followed by A0 with a score of 2 and C0 with a score of 0. Specifically, C2 performed significantly better than A1 on:

- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

Specifically, A1 performed better than C2 on:

- Acquisition and property impacts. While A1 would result in a higher amount of land to be acquired when compared to C2, its however impact on a smaller number of properties, landowners and dwellings that would directly be impacted by the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass; and
- Visual Impact in that there will be a lower number of dwellings within 500 m of the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.

A1 is the best performing alignment for the economic criteria due to it being the alignment with lowest construction cost, followed by A1, C0 and C2.

Based on the above discussions and like the outcomes of scoring scenarios 1, 2, 3, 4, 5 and 6, RRV considers alignment option C2 to be the preferred alignment under scoring sensitivity scenario 1.

6.10 Scoring Sensitivity Scenario 2

Under this sensitivity scenario, the following scoring system was applied:

- Alignment Options with the least impact and other options within 5% of the least impact are apportioned a score of 1 point and a Green light.
- Alignment Options within 5 - 25% of the least impact option are apportioned a score of 0 point and an Amber light.
- Alignment Options with an impact of 25% or greater than the least impact option is apportioned a score of -1 and a Red light.

The alignment option with the highest positive total score across all assessment criteria is considered to have the least impact and best performing alignment.

Table 25 below outlines the assessment outcomes under scoring sensitivity scenario 2.

Table 25 Scoring Sensitivity Scenario 2 Evaluation Outcomes

Assessment Criteria	Alignment A0	% diff from Least Impact	A0 score	Alignment A1	% diff from Least Impact	A1 score	Alignment C0	% diff from Least Impact	C0 score	Alignment C2	% diff from Least Impact	C2 score
Extent of native vegetation to be cleared (all classes) per alignment	**62.61**	**1.23**	**0**	**62.55**	**1.23**	**0**	**62.3**	**1.23**	**0**	**50.7**	**1.00**	**1**
Scattered trees	2.7	1.21	0	2.92	1.31	-1	2.23	1.00	1	2.48	1.11	0
Large trees in patch	3.8	1.42	-1	3.94	1.48	-1	2.67	1.00	1	2.67	1.00	1
Number of large trees to removed	396	1.25	0	374	1.18	0	322	1.02	1	317	1.00	1
Impact on Endangered EVC habitat	16.89	1.87	-1	14.78	1.64	-1	9.53	1.06	1	9.03	1.00	1
Native vegetation offset requirement	143.712	1.79	-1	147.134	1.83	-1	188.161	2.34	-1	80.413	1.00	1
Threatened vegetation communities within alignment corridor	41.13	1.30	-1.00	38.8	1.23	-1.00	44.14	1.40	-1.00	31.621	1.00	**1**
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06	1.00	1	0.06	1.00	1	2.58	43.00	-1	0.06	1.00	1
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act)	2.64	2640.00	-1	0.65	650.00	-1	3.97	3970.00	-1	0.001	1.00	1
Victorian Woodland Bird community (Threatened under FFG Act)	38.43	1.22	0	38.09	1.21	0	37.59	1.19	0	31.56	1.00	1
Wild life corridor/connectivity impact	**38.852**	**1.19**	**0**	**38.739**	**1.19**	**0**	**37.683**	**1.16**	**0**	**32.52**	**1.00**	**1**
Core	24.181	2.24	-1	25.389	2.35	-1	16.03	1.48	-1	10.81	1.00	1
Node	0.169	169.00	-1	0.169	169.00	-1	0.001	1.00	1	0.169	169.00	-1

Stepping Stones	5.453	1.00	1	5.556	1.02	1	10.788	1.98	-1	14.462	2.65	-1
Terrestrial Corridors	6.3	1.15	0	6.351	1.16	0	6.044	1.10	0	5.474	1.00	1
Wetlands	2.749	2.16	-1	1.274	1.00	1	4.821	3.78	-1	1.605	1.26	-1
Strategic Biodiversity Value Score per alignment												
Low Score (0.0 - 0.3)												
Endangered	8	2.67	-1	8	2.67	-1	3	1.00	1	8	2.67	-1
Medium Score (0.31 - 0.79)												
Least Concern	22	1.10	0	23	1.15	0	20	1.00	1	23	1.15	0
Depleted	33	1.00	1	44	1.33	-1	36	1.09	0	38	1.15	0
Vulnerable	6	1.00	1	6	1.00	1	21	3.50	-1	6	1.00	1
Endangered	98	1.53	-1	97	1.52	-1	64	1.00	1	71	1.11	0
High Score (0.8 +)												
Least Concern	1	1.00	1	1	1.00	1	3	3000.00	-1	2	2000.00	-1
Depleted	6	1.00	1	6	1.00	1	11	1.83	-1	11	1.83	-1
Vulnerable	1	1.00	1	1	1.00	1	2	2.00	-1	1	1.00	1
Endangered	6	1.50	-1	4	1.00	1	11	2.75	-1	5	1.25	0
Condition score of native vegetation to be removed												
Low Score - Less then 0.3												
Least Concern	13	1.18	-1	14	1.27	-1	11	1.00	1	13	1.18	0
Depleted	3	1.50	-1	8	4.00	-1	2	1.00	1	3	1.50	-1
Vulnerable	4	1.00	1	4	1.00	1	10	2.50	-1	4	1.00	1
Endangered	39	1.30	-1	39	1.30	-1	30	1.00	1	36	1.20	0
Medium Score - between 0.31 - 0.59												
Least Concern	8	1.00	1	8	1.00	1	11	1.38	-1	11	1.38	-1
Depleted	12	1.00	1	15	1.25	0	25	2.08	-1	34	2.83	-1
Vulnerable	2	2.00	-1	2	2.00	-1	9	9.00	-1	1	1.00	1
Endangered	65	1.59	-1	63	1.54	-1	41	1.00	1	46	1.12	0
High Score - above 0.6												
Least Concern	1	1.00	1	1	1.00	1	1	1.00	1	1	1.00	1
Depleted	24	2.00	-1	27	2.25	-1	20	1.67	-1	12	1.00	1
Vulnerable	1	1.00	1	1	1.00	1	4	4.00	-1	2	2.00	-1
Endangered	7	3.50	-1	7	3.50	-1	7	3.50	-1	2	1.00	1
Construction within floodplains												
Total number of waterway crossings	16	1.14	0	16	1.14	0	14	1.00	1	16	1.14	0
Total number of designated waterway crossings	3	1.00	1	3	1.00	1	3	1.00	1	3	1.00	1
Greatest 1% AEP flood depth intersecting bypass alignment option	1.34	1.00	1	1.34	1.00	1	1.5	1.12	0	1.34	1.00	1

Max Flooding width at Yam Holes Creek crossing (1% AEP base case)	750	2.50	-1	750	2.50	-1	300	1.00	1	810	2.70	-1
Total length of alignment within the 1% AEP base case floodplain	1307	1.11	0	1175	1.00	1	1550	1.32	-1	2090	1.78	-1
Total watercourse crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	990	1.19	0	835	1.00	1	1380	1.65	-1	1475	1.77	-1
Yam Hole Creek crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	610	1.23	0	610	1.23	0	495	1.00	1	570	1.15	0
Yam Hole Creek crossing average 1% AEP depth allowing 10 mm or greater (up to 100 mm) flood level increase	600	1.50	-1	600	1.50	-1	400	1.00	1	600	1.50	-1
The extent of ground disturbance works within 50 m of watercourse	11.6	1.00	1	12.45	1.07	0	19.5	1.68	-1	24.5	2.11	-1
Impact on number of known or registered sites by proposed alignment.												
Aboriginal	2	1.00	1	2	1.00	1	2	1.00	1	2	1.00	1
% of alignment within an area of Aboriginal sensitivity	14	0.95	1	14.3	0.97	1	14.8	1.00	1	10.5	0.71	1
European	4	2.00	-1	3	1.50	-1	4	2.00	-1	2	1.00	1
Acquisition and property impacts												
Total areas to be acquired	278.47	1.09	0	278.88	1.09	0	256.12	1.00	1	262.59	1.03	1
Number of lots directly impacted by alignment corridor	65	1.05	-1	62	1.00	1	72	1.16	0	73	1.18	0
Number of landowners directly impacted by alignment corridor	26	1.13	0	23	1.00	1	23	1.00	1	25	1.09	0
Number of dwellings directly impacted by alignment corridor	2	1.00	1	3	1.50	-1	5	2.50	-1	4	2.00	-1
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	**23**	**1.00**	**1**	**23**	**1.00**	**1**	**27**	**1.17**	**0**	**27**	**1.17**	**0**
Air quality impacts												
Sensitive receptors within 100 m of alignment	4	2.00	-1	2	1.00	1	2	1.00	1	2	1.00	1
Sensitive receptors within 200 m of alignment	5	1.25	0	5	1.25	0	6	1.50	-1	4	1.00	1
Sensitive receptors within 300 m of alignment	12	1.33	-1	10	1.11	0	12	1.33	-1	9	1.00	1

Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**1.08**	**1**	**37**	**1.00**	**1**	**61**	**1.65**	**-1**	**66**	**1.78**	**-1**
Construction cost $m	**405.6**	**1.04**	**1**	**391.3**	**1.00**	**1**	**424.5**	**1.08**	**0**	**482.5**	**1.23**	**0**
Total Scores			**-3**			**2**			**-4**			**11**

6.10.1 Sensitivity scores by Key assessment Criteria

Table 26 below provides a breakdown of the impact scoring by each key assessment criteria per alignment.

Table 26 Impact Scoring Breakdown by Key Assessment Criteria per Alignment

Key Assessment Criteria	Alignment A0	Alignment A1	Alignment C0	Alignment C2
Total Environment Criteria Scores	**-5**	**-4**	**-4**	**6**
Extent of native vegetation to be cleared (all classes) per alignment	-3	-4	3	5
Threatened vegetation communities within alignment corridor	-1	-1	-3	4
Wild life corridor/connectivity impact	-2	0	-2	0
Strategic Biodiversity Value Score per alignment by EVC Conservation Status	2	2	-2	-1
Condition score of native vegetation to be removed by EVC Conservation Status	-2	-3	-2	1
Construction within floodplains	1	2	2	-3
Total Social Criteria Scores	**1**	**7**	**0**	**5**
Impact on number of known or registered sites by proposed alignment.	1	1	1	3
Acquisition and property impacts	0	3	1	0
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	1	1	0	0
Air quality impacts	-2	1	-1	3
Visual Impact - Number of dwellings within 500 m of proposed alignment	1	1	-1	-1
Total Economic Criteria Scores	**1**	**1**	**0**	**0**
Construction cost per alignment	1	1	0	0
Total Overall Combined Scores	**-3**	**4**	**-4**	**11**

6.10.2 Scoring Sensitivity Scenario 2 Conclusions

Utilising the assessment and evaluation framework outlined under scoring sensitivity scenario 2, C2 is identified as the alignment with the least overall impact with a score of 11, followed by A1 with a score of 4, A0 with a score of -3 and C0 with a score of -4. The key difference in the sensitivity scoring between C2 and the A1, C0 and A0 alignments relates to its positive performances against both the Environment and social Criteria. Overall, C2 was 8 points higher than A1. Specifically, this was due to C2 having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area;
- The least amount of impact on native vegetation with high conditions to be removed by EVC Conservation Status.
- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

Conversely, C2 received a negative score for its potential construction within floodplains within the project area. For this assessment Criteria, A1 and C0 has the least impact with a score of 2. Also, C2 received a negative score for the impact on Strategic Biodiversity Value Score criterion. As stated earlier this was due to the C2 alignment resulting in a higher removal of EVC conservation status that were classified as least concern and depleted in comparison to the other 3 alignment. However, C2 would result in a significantly lower amount of native vegetation with vulnerable and Endangered EVC status to be removed when compared to the 3 alignments. This was further demonstrated under scoring scenario 5 & 6 when the impacts on vulnerable and Endangered EVC status were only considered in the impact assessment.

A1 is considered to have the best preforming from a social impact perspective with a score of 7, slightly higher then C2 with score of 5, followed by both A0 and C0 with a score of 0. Specifically, A1 performed better than C2 on:

- Acquisition and property impacts. While A1 would result in a higher amount of land to be acquired when compared to C2, its however impact on a smaller number of properties, landowners and dwellings that would directly be impacted by the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass; and
- Visual Impact in that there will be a lower number of dwellings within 500 m of the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.

Specifically, C2 performed better than A1 on:

- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

A1 is the best performing alignment for the economic criteria due to it being the alignment with lowest construction cost, followed by A1, C0 and C2.

Based on the above discussions and like the outcomes of scoring scenarios 1, 2, 3, 4, 5, 6 and scoring sensitivity scenario 1, RRV considers alignment option C2 to be the preferred alignment under scoring sensitivity scenario 2.

6.11 Scoring Sensitivity Scenario 3

Under this sensitivity scenario, the following scoring system was applied:

- Alignment Options with the least impact and other options within 5% of the least impact are apportioned a score of 1 point and a Green light.
- Alignment Options within 5 - 15% of the least impact option are apportioned a score of 0 point and an Amber light.
- Alignment Options with an impact of 15% or greater than the least impact option is apportioned a score of -1 and a Red light.

The alignment option with the highest positive total score across all assessment criteria is considered to have the least impact and best performing alignment.

Table 27 below outlines the assessment outcomes under scoring sensitivity scenario 3.

Table 27 Scoring Sensitivity Scenario 3 Evaluation Outcomes

Assessment Criteria	Alignment A0	% diff from Least Impact	A0 score	Alignment A1	% diff from Least Impact	A1 score	Alignment C0	% diff from Least Impact	C0 score	Alignment C2	% diff from Least Impact	C2 score
Extent of native vegetation to be cleared (all classes) per alignment	**62.61**	**1.23**	**-1**	**62.55**	**1.23**	**-1**	**62.3**	**1.23**	**-1**	**50.7**	**1.00**	**1**
Scattered trees	2.7	1.21	-1	2.92	1.31	-1	2.23	1.00	1	2.48	1.11	0
Large trees in patch	3.8	1.42	-1	3.94	1.48	-1	2.67	1.00	1	2.67	1.00	1
Number of large trees to removed	396	1.25	-1	374	1.18	-1	322	1.02	1	317	1.00	1
Impact on Endangered EVC habitat	16.89	1.87	-1	14.78	1.64	-1	9.53	1.06	1	9.03	1.00	1
Native vegetation offset requirement	143.712	1.79	-1	147.134	1.83	-1	188.161	2.34	-1	80.413	1.00	1
Threatened vegetation communities within alignment corridor	41.13	1.30	-1.00	38.8	1.23	-1.00	44.14	1.40	-1.00	31.621	1.00	**1**
Seasonal Herbaceous wetlands (Freshwater) of the Temperate lowland plains (Critically endangered under EPBC Act)	0.06	1.00	1	0.06	1.00	1	2.58	43.00	-1	0.06	1.00	1
White box - Yellow Box - Blakely's Red Gum Grassy Woodland (Critically Endangered under EPBC Act)	2.64	2640.00	-1	0.65	650.00	-1	3.97	3970.00	-1	0.001	1.00	1

Victorian Woodland Bird community (Threatened under FFG Act)	38.43	1.22	-1	38.09	1.21	-1	37.59	1.19	-1	31.56	1.00	1
Wild life corridor/connectivity impact	**38.852**	**1.19**	**-1**	**38.739**	**1.19**	**-1**	**37.683**	**1.16**	**-1**	**32.52**	**1.00**	**1**
Core	24.181	2.24	-1	25.389	2.35	-1	16.03	1.48	-1	10.81	1.00	1
Node	0.169	169.00	-1	0.169	169.00	-1	0.001	1.00	1	0.169	169.00	-1
Stepping Stones	5.453	1.00	1	5.556	1.02	1	10.788	1.98	-1	14.462	2.65	-1
Terrestrial Corridors	6.3	1.15	0	6.351	1.16	-1	6.044	1.10	0	5.474	1.00	1
Wetlands	2.749	2.16	-1	1.274	1.00	1	4.821	3.78	-1	1.605	1.26	-1
Strategic Biodiversity Value Score per alignment												
Low Score (0.0 - 0.3)												
Endangered	8	2.67	-1	8	2.67	-1	3	1.00	1	8	2.67	-1
Medium Score (0.31 - 0.79)												
Least Concern	22	1.10	0	23	1.15	0	20	1.00	1	23	1.15	0
Depleted	33	1.00	1	44	1.33	-1	36	1.09	0	38	1.15	0
Vulnerable	6	1.00	1	6	1.00	1	21	3.50	-1	6	1.00	1
Endangered	98	1.53	-1	97	1.52	-1	64	1.00	1	71	1.11	0
High Score (0.8 +)												
Least Concern	1	1.00	1	1	1.00	1	3	3000.00	-1	2	2000.00	-1
Depleted	6	1.00	1	6	1.00	1	11	1.83	-1	11	1.83	-1
Vulnerable	1	1.00	1	1	1.00	1	2	2.00	-1	1	1.00	1
Endangered	6	1.50	-1	4	1.00	1	11	2.75	-1	5	1.25	-1
Condition score of native vegetation to be removed												
Low Score - Less then 0.3												
Least Concern	13	1.18	-1	14	1.27	-1	11	1.00	1	13	1.18	-1
Depleted	3	1.50	-1	8	4.00	-1	2	1.00	1	3	1.50	-1
Vulnerable	4	1.00	1	4	1.00	1	10	2.50	-1	4	1.00	1
Endangered	39	1.30	-1	39	1.30	-1	30	1.00	1	36	1.20	-1
Medium Score - between 0.31 - 0.59												
Least Concern	8	1.00	1	8	1.00	1	11	1.38	-1	11	1.38	-1
Depleted	12	1.00	1	15	1.25	-1	25	2.08	-1	34	2.83	-1
Vulnerable	2	2.00	-1	2	2.00	-1	9	9.00	-1	1	1.00	1
Endangered	65	1.59	-1	63	1.54	-1	41	1.00	1	46	1.12	0
High Score - above 0.6												
Least Concern	1	1.00	1	1	1.00	1	1	1.00	1	1	1.00	1
Depleted	24	2.00	-1	27	2.25	-1	20	1.67	-1	12	1.00	1
Vulnerable	1	1.00	1	1	1.00	1	4	4.00	-1	2	2.00	-1
Endangered	7	3.50	-1	7	3.50	-1	7	3.50	-1	2	1.00	1
Construction within floodplains												
Total number of waterway crossings	16	1.14	0	16	1.14	0	14	1.00	1	16	1.14	0

Total number of designated waterway crossings	3	1.00	1	3	1.00	1	3	1.00	1	3	1.00	1
Greatest 1% AEP flood depth intersecting bypass alignment option	1.34	1.00	1	1.34	1.00	1	1.5	1.12	0	1.34	1.00	1
Max Flooding width at Yam Holes Creek crossing (1% AEP base case)	750	2.50	-1	750	2.50	-1	300	1.00	1	810	2.70	-1
Total length of alignment within the 1% AEP base case floodplain	1307	1.11	0	1175	1.00	1	1550	1.32	-1	2090	1.78	-1
Total watercourse crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	990	1.19	0	835	1.00	1	1380	1.65	-1	1475	1.77	-1
Yam Hole Creek crossing length allowing 10 mm or greater (up to 100 mm) flood level increase	610	1.23	-1	610	1.23	-1	495	1.00	1	570	1.15	0
Yam Hole Creek crossing average 1% AEP depth allowing 10 mm or greater (up to 100 mm) flood level increase	600	1.50	-1	600	1.50	-1	400	1.00	1	600	1.50	-1
The extent of ground disturbance works within 50 m of watercourse	11.6	1.00	1	12.45	1.07	0	19.5	1.68	-1	24.5	2.11	-1
Impact on number of known or registered sites by proposed alignment.												
Aboriginal	2	1.00	1	2	1.00	1	2	1.00	1	2	1.00	1
% of alignment within an area of Aboriginal sensitivity	14	0.95	1	14.3	0.97	1	14.8	1.00	1	10.5	0.71	1
European	4	2.00	-1	3	1.50	-1	4	2.00	-1	2	1.00	1
Acquisition and property impacts												
Total areas to be acquired	278.47	1.09	0	278.88	1.09	0	256.12	1.00	1	262.59	1.03	1
Number of lots directly impacted by alignment corridor	65	1.05	-1	62	1.00	1	72	1.16	-1	73	1.18	-1
Number of landowners directly impacted by alignment corridor	26	1.13	0	23	1.00	1	23	1.00	1	25	1.09	0
Number of dwellings directly impacted by alignment corridor	2	1.00	1	3	1.50	-1	5	2.50	-1	4	2.00	-1
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	**23**	**1.00**	**1**	**23**	**1.00**	**1**	**27**	**1.17**	**-1**	**27**	**1.17**	**-1**
Air quality impacts												
Sensitive receptors within 100 m of alignment	4	2.00	-1	2	1.00	1	2	1.00	1	2	1.00	1

Sensitive receptors within 200 m of alignment	5	1.25	-1	5	1.25	-1	6	1.50	-1	4	1.00	1
Sensitive receptors within 300 m of alignment	12	1.33	-1	10	1.11	0	12	1.33	-1	9	1.00	1
Visual Impact - Number of dwellings within 500 m of proposed alignment	**40**	**1.08**	**0**	**37**	**1.00**	**1**	**61**	**1.65**	**-1**	**66**	**1.78**	**-1**
Construction cost $m	**405.6**	**1.04**	**1**	**391.3**	**1.00**	**1**	**424.5**	**1.08**	**0**	**482.5**	**1.23**	**-1**
Total Scores			**-11**			**-6**			**-9**			**5**

6.11.1 Sensitivity scores by Key assessment Criteria

Table 28 below provides a breakdown of the impact scoring by each key assessment criteria per alignment.

Table 28 Impact Scoring Breakdown by Key Assessment Criteria per Alignment

Key Assessment Criteria	Alignment A0	Alignment A1	Alignment C0	Alignment C2
Total Environment Criteria Scores	**-11**	**-11**	**-7**	**3**
Extent of native vegetation to be cleared (all classes) per alignment	-6	-6	2	5
Threatened vegetation communities within alignment corridor	-2	-2	-4	4
Wild life corridor/connectivity impact	-3	-2	-3	0
Strategic Biodiversity Value Score per alignment by EVC Conservation Status	2	2	-2	-2
Condition score of native vegetation to be removed by EVC Conservation Status	-2	-4	-2	-1
Construction within floodplains	0	1	2	-3
Total Social Criteria Scores	**-1**	**4**	**-2**	**3**
Impact on number of known or registered sites by proposed alignment.	1	1	1	3
Acquisition and property impacts	0	1	0	-1
Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass	1	1	-1	-1
Air quality impacts	-3	0	-1	3
Visual Impact - Number of dwellings within 500 m of proposed alignment	0	1	-1	-1
Total Economic Criteria Scores	**1**	**1**	**0**	**-1**
Construction cost per alignment	1	1	0	-1
Total Overall Combined Scores	**-11**	**-6**	**-9**	**5**

6.11.2 Scoring Sensitivity Scenario 3 Conclusions

Utilising the assessment and evaluation framework outlined under scoring sensitivity scenario 2, C2 is identified as the alignment with the least overall impact with a score of 5, followed by A1 with a score of -6, C0 with a score of -9 and A0 with the highest impact score of -11. The key difference in the sensitivity scoring between C2 and the A1, C0 and A0 alignments relates to its positive performances against both the Environment and social Criteria. Overall, C2 was 9 points higher than A1. Specifically, this was due to C2 having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area;
- The least amount of impact on native vegetation with high conditions to be removed by EVC Conservation Status.
- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

Conversely, C2 received a negative score for its potential construction within floodplains within the project area. For this assessment Criteria, C0 has the least impact with a score of 2. Also, C2 received a negative score for the impact on Strategic Biodiversity Value Score criterion. As stated earlier this was due to the C2 alignment resulting in a higher removal of EVC conservation status that were classified as least concern and depleted in comparison to the other 3 alignment. However, C2 would result in a significantly lower amount of native vegetation with vulnerable and Endangered EVC status to be removed when compared to the 3 alignments. This was further demonstrated under scoring scenario 5 & 6 when the impacts on vulnerable and Endangered EVC status were only considered in the impact assessment.

A1 is considered to have the best preforming from a social impact perspective with a score of 4, slightly higher than C2 with score of 3, followed by A0 with a score of -1 and C0 with a score of -2. Specifically, A1 performed better than C2 on:

- Acquisition and property impacts. While A1 would result in a higher amount of land to be acquired when compared to C2, its however impact on a smaller number of properties, landowners and dwellings that would directly be impacted by the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township;
- Number of residential properties (without mitigation) that would be directly impacted by noise post construction of bypass; and
- Visual Impact in that there will be a lower number of dwellings within 500 m of the alignment corridor. This is due to the location being more rural when compared to the “C” alignments being semi-rural and closer to the Beaufort Township.

Specifically, C2 performed better than A1 on:

- Potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

A1 is the best performing alignment for the economic criteria due to it being the alignment with lowest construction cost, followed by A1, C0 and C2.

Based on the above discussions and like the outcomes of scoring scenarios 1, 2, 3, 4, 5, 6 and scoring sensitivity scenario 1 and 2, RRV considers alignment option C2 to be the preferred alignment under scoring sensitivity scenario 3.

6.12. Qualitative Assessment

Table 29 below provides an assessment of the criterions that were considered to have the same or minimal or temporary impact differences between the 4 alignment options. Based on the qualitative assessment below, it was concluded that the inclusion of these criterion within the Revised Options Assessment Matrix would not have altered the outcomes of the assessment and selection of the preferred alignment.

Table 29 Qualitative Assessment

Environment	
Assessment Criteria	**Comments**
Potential impacts to groundwater.	The groundwater impact assessment for all 4 alignment options determined that the overall impacts to groundwater was considered to be low. All 4 routes were assessed as having the same impact and risk profile and as such any potential impacts to groundwater within the study area were considered to be the same across the 4 alignments.
Potential to increase flooding risk in Beaufort and surrounds.	Potential increase to flooding in Beaufort and surrounds can be mitigated through design and standard engineering solutions to the satisfaction of the Glenelg Hopkins Catchment Management Authority, as such all 4 options were assessed as having the same potential impact from a flooding risk perspective.
Potential for unsuitable soil conditions to support the proposed bypass, including the potential for unearthing acid sulphate and contaminated soils.	There is no significant difference in impacts on soil and geology between the alignment options. The risks that have been identified are largely consistent across the alignment options and of a nature that would normally be managed and mitigated within the framework of an Environmental Management Plan.
The risk of interacting with contaminated land.	Based on the existing conditions, the potential for contaminated/acid sulphate soil to impact the construction and operation of the Beaufort Bypass is low. The risks that have been identified are largely consistent across the alignment options and of a nature that would normally be managed and mitigated within the framework of an Environmental Management Plan.
Potential for increased salinity.	All 4 alignment options were considered to have the same risk rating (negligible) in relation to interaction with salinity affected land within the study area. Therefore, the potential for increased salinity within the study area are considered to be the same across the 4 alignments.
Social	
Assessment Criteria	**Comments**
Potential Social impacts on existing land uses and operations.	Potential impacts on existing land uses is considered comparable across the 4 alignments. While it is acknowledged that some land uses, and current operations maybe impacted through potential severance or limited access during construction this will, however, be temporary. Also, the bypass alignments will not change the current planning controls with the project area (other than applying a PAO to land required for the preferred bypass) and as such is unlikely to change the land use requirements under the current zoning and overlays controls. Therefore, this should not inhibit existing land uses (from expansion etc) or any other new/planned land uses from being considered by the relevant planning authority in the future.
Potential to impact on access and travel times to community facilities and recreational facilities during and post construction eg. Camp Hill.	The impacts on access and travel time to community and recreational facilities are considered to be the same across all 4 alignments. While there will be some impacts during the construction phase on access and travel time (generally) around Beaufort, these impacts will be temporary. With respect to access arrangements, RRV as part of its construction management plan would further discuss with the relevant stakeholders regarding the potential temporary and permanent arrangements to ensure that appropriate access to these community and recreational facilities are maintained/created during and after construction of the bypass.
Impact on emergency response time eg. Firefighting purposes.	The Option C alignments severe one fire access track and this can be realigned on the northern side of the bypass and to minimise impacts existing access tracks can be utilised during the realignment

	construction work. The Option A alignments severs 3 fire access tracks and all 3 will need to be realigned and bridge structure built over the bypass to maintain access. The designs have not been refined sufficiently to fully understand the financial costs associated with the 3 additional bridge structures for the Option A alignments. In addition, to maintain access for emergency purposes, the works associated with the 3 additional bridge structure would need to be constructed prior to the tracks being severed and this potentially could extend the construction period duration. From this perspective, the C alignments would require the least amount of constructions works to maintain access for emergency purposes when compared to the A alignments. However, without fully understanding the detailed designs and costings for the 3 new bridge structures, it was considered challenging to quantify what the likely overall advantages and disadvantages were between the access arrangements identified for the alignment options.
Potential impacts on the future growth and development of Beaufort.	The 4 bypass alignments will not impact the future growth and development of Beaufort. Clause 21.06-1 (Beaufort) of the Pyrenees Planning Scheme identifies the areas to the south of the current township for future residential growth. The 4 alignments are to the north of the current township.
Potential for inconsistency with existing strategic land use planning objectives, policies or plans for Beaufort.	The Pyrenees Planning Scheme currently recognises Beaufort as a highway town and it could be argued that with its bypass it is no longer a highway town and as such does not accord with this policy direction for Beaufort. From this perspective all 4 alignments will have the same impact on this policy direction.
Change to access arrangement during and after construction.	The impacts on access for adjoining affected properties and landowners are considered to the same across all 4 alignments. While there will be some impacts during the construction phase on access, these impacts will be temporary. With respect to access arrangements, RRV as part of its construction management plan would further discuss with the relevant affected properties and landowners regarding the potential temporary and permanent arrangement to ensure that appropriate access is maintained/created during and after construction of the bypass.
Changes to noise, air quality, headlight disturbance and public safety due to traffic bypassing the town.	The Beaufort bypass would significantly reduce vehicle noise, improved air quality, headlight disturbance and public safety within Beaufort township when compared to the current Western Highway route through the township. It is considered that these improvements between the 4 alignments would be minimal with the A alignments slightly better due to its location further away from the Beaufort township.
Area of Crown Land (Camp Hill) traversed by option.	The Option A alignments will affect approximately 19.86ha of Camp Hill, while the Option C alignments will affect approximately 4.12ha. While there is a difference in the total impact area between the A and C alignments, it was not considered to be a significant factor in the selection of the preferred alignment.
Effect of construction dust on sensitive receptors / number of sensitive receptors within 200m of road, or dust impact zone, whichever is greater.	There are a small number of sensitive receptors adjacent to each of the alignment options where there will be periodic short term increases in dust levels during the construction phase. Generally, the impacts will be similar across the 4 alignments, with the A alignments marginally better due to its location further away from the Beaufort township.
Effect of vehicle emissions during operations at sensitive receptors.	The predicted greenhouse gas emissions are estimated to be small and similar across the 4 alignments. Transfer of traffic from the current highway route through the centre of town, with traffic lights and pedestrian crossings the road, to the 4 bypass route will result in a small reduction in greenhouse gas emission.
The potential for significant adverse effects on landscape and visual values to local areas (i.e., Camp Hill State Forest, Snowgums Bushland Reserve, Beaufort Trotting Track, Main lead Common, Beaufort Motorcycle Track and significant watercourses).	Alignment C0 & C2 impacts on a greater number of residents and properties and would result in an impact on the town's existing character due to its proximity to the Beaufort township. However, the imposition of an urban structure within the A0 & A1 alignment areas could be considered to be more inconsistent with the existing rural/valley environ than the impact of the imposition of the bypass structure on the existing urban environ of the Beaufort township.

	Neither the township nor the rural/valley landscapes are protected by legislation or significant policy. Nevertheless, both areas are of high value to the Beaufort community and therefore, it is challenging to assign one alignment comparative greater impact from a landscape and visual perspective.
Economic	
Assessment Criteria	**Comments**
Potential economic impact on local business.	The economic impacts of the 4 alignments on the Beaufort township is considered to be the same. Any bypass of the existing town centre is likely to impact on those existing businesses that are reliant on passing traffic along the existing Western Highway. While there were some suggestions that a bypass alignment closer to the existing township would have a smaller impact in comparison to an alignment further from the township, there is no economic evidence to suggest that this is the case.
Economic performance of project alternatives in terms of relative benefits and costs.	As outlined above, the impacts on highway reliant businesses are considered to be same across all 4 alignments. Travel time cost savings and the economic benefits that could be derived through the transportation of products to market quicker is marginal given the 21 seconds differences between the 4 alignments. In respect to which alternative alignment would generate the biggest economic output for Beaufort and the regional economy over the construction phase, it is generally the alignment with the highest construction cost (C2) as this would result in a much larger investment with greater flow on effect to the wider economy. Overall, it was considered that there would be economic benefits and cost to the Beaufort economy regardless of which alignment is selected.
Potential to limit/restrict access to Beaufort Town centre.	All 4 alignments have the same starting and end points with a full diamond interchange at Beaufort-Lexton Road. Therefore, it is considered that access from the respective bypass route to the Beaufort town centre is the same across all 4 alignments noting that the A alignments would be located further from the town centre.
Transport	
Assessment Criteria	**Comments**
Freight and private vehicle travel time improvements compared to the "do nothing" alternative.	Overall, any of the 4 alignment options will significantly improve travel time when compared to the current Western Highway alignment through the Beaufort township. However, the comparative travel time saving is considered minimal given the travel time difference of 21 seconds between the 4 alignment options.
Road safety in Beaufort during construction and operation.	All 4 alignment options would require a significant amount of imported fill and pavement materials to be transported to the construction zone. Importation of fill and pavement materials will add a significant number of additional heavy vehicle trucks and trailers onto the road network and through the Beaufort township during the construction phase regardless of which alignment is selected. Therefore, the impact of the 4 alignment options on the safety of Beaufort's road network during construction would be the same. Again, all 4 alignment options once operational would improve road safety within Beaufort when compared to the current Western Highway alignment through the township. Overall, improved road safety is considered the same across the 4 alignments post construction regardless of the alignment selected.
Travel time savings for road users and businesses that utilise the Melbourne to Adelaide corridor.	The bypass of the Beaufort township would significantly reduce travel time for businesses and visitors travelling between Melbourne and Adelaide and to major tourism destinations such as the Grampians National Park, Ararat Hills Regional Park, Great Western and Pyrenees wine region. As outlined above, there will only be a travel time difference of 21 seconds between the 4 alignment options around Beaufort, therefore, this is considered minimal.

7 Conclusion on the Selection of the Preferred Alignment for the Beaufort Bypass

As outline in previous sections of this report, RRV has undertaken extensive work to develop and refined the Beaufort Bypass corridors and alignments as part of the process to identify and select the preferred alignment for the project.

In addition to the previous investigative work outlined in Section 2 of this report, RRV has been undertaking investigations into road corridor options (250m wide) within the study area to the north of the Beaufort township with the purpose of these further investigation to focus on specific alignments (or a single specific alignment) to progress through to public engagement/consultation and the EES assessment and the application of a Public Acquisition Overlay (PAO).

A 3-phase process was adopted by RRV in the development of alignment options for the Beaufort bypass, its refinements and the identifications, assessment and selection of the preferred alignment. The 3-phases being:

- Phase 1 – Concept Alignment Development;
- Phase 2 – Option Development and Assessment;
- Phase 3 – Identification of Preferred Alignment.

As part of phase 3, a revised impact evaluation and scoring framework was developed including 6 scoring scenarios and 3 scoring sensitivity scenarios to be used in the evaluation and determination of the preferred alignment for the project. RRV has undertaken an assessment of the 4 alignment options (A0, A1, C0 and C2) under consideration for the Beaufort Bypass ESS against the 6 scoring scenarios and 3 scoring sensitivity scenarios. The 6 scoring scenarios and 3 scoring sensitivity analysis undertaken as part of the options assessment identified C2 as the alignment option that would result in the least impact overall from an Environmental, social and economic perspective. The was due to the C2 alignment having:

- The least amount of total native vegetation to be removed;
- The least amount of impact on threatened vegetation communities identified under both the EPBC and FFG acts;
- The least amount of impact on wildlife corridors, in particular, the core habitat areas within the project area;
- The least amount of impact on native vegetation with high conditions to be removed by EVC Conservation Status.
- The least amount of potential impacts on the number of known or registered sites for aboriginal and historic importance; and
- From an air quality impact with a smaller number of sensitive receptors (dwellings) being within 100m, 200m & 300m of the alignment corridor.

Based on the above assessment, RRV concludes that overall the preferred alignment for the Beaufort Bypass project is Alignment C2.

Table 30 Overall Scoring Summary and Conclusions

	Scoring Scenario 1	Scoring Scenario 2	Scoring Scenario 3	Scoring Scenario 4	Scoring Scenario 5	Scoring Scenario 6	Scoring Sensitivity Scenario 1	Scoring Sensitivity Scenario 2	Scoring Sensitivity Scenario 3
1	C2: 111	C2: 27	C2: 43.95	C2: 74.12	C2: 19.44	C2: 35.49	C2: 9	C2: 11	C2: 5
2	A1: 123	A1: 22	A1: 44.89	A1: 77.59	A1: 22.70	A1: 42.69	A1: -3	A1: 2	A1: -6
3	C0: 126	C0: 20	A0: 45.85	A0: 81.03	A0: 24.16	A0: 47.74	C0: -5	A0: -3	C0: -9
4	A0: 128	A0: 18	C0: 50.01	C0: 93.98	C0: 27.03	C0: 56.16	A0: -6	C0: -4	A0: -11

	1st Overall
	2nd Overall
	3rd Overall
	4th Overall