Transport
Roads & Maritime
Services

Foxground and Berry bypass

Princes Highway upgrade

Volume 2 – Appendix I

Technical paper:
Urban design including landscape character and visual amenity

NOVEMBER 2012

RMS 12.457G
ISBN 978-1-922041-66-1

(blank page)

AECOM November 2012

Foxground and Berry bypass

Urban Design Report, Landscape Character and Visual Impact Assessment

Prepared for: NSW Government Transport Roads & Maritime Services

Prepared for

Roads and Maritime Services NSW

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000
T +61 2 8934 0000 F +61 2 8934 0001
www.aecom.com
ABN 20 093 846 925

November, 2012

Foxground and Berry bypass

Princes Highway upgrade

Table of Contents

Executive summary

The purpose of this report is to:

- Describe the urban design context of the Foxground Berry bypass (the project), identifying key built, natural, landscape and visual features, characteristics and qualities of the route and its setting.
- Describe the project including the proposed urban design and landscape features and aspects.
- Assess the urban and landscape design of the project (including landscape character and visual impacts).
- Address the Director-General's requirements relating to landscape and visual amenity.
- Identify and describe integrated mitigation measures.

While a specific 'Urban Design Framework' does not yet exist for the whole Princes Highway, the design objectives outlined in this report (Section 2.0) are derived from the RMS urban design policies as published in 'Beyond the Pavement: RTA Urban Design Policy, Procedures and Design Principles' (RTA, 2009), 'Bridge Aesthetics: Design Guidelines to Improve the Appearance of Bridges in NSW' (RTA, 2003), and are also consistent with the 'Gerringong to Bomaderry Princes Highway Upgrade Preliminary Urban and Regional Design Strategy' (AECOM, 2007).

Evaluation of the project

The project has been assessed with regard to:

- Urban design objectives and principles.
- Contextual and landscape character analysis.
- Landscape character and visual impact assessment.

The project has been designed to be consistent with the urban design objectives established during the overall route options assessment stage. The scale of the interventions required for the project (in what is generally an undulating pastoral landscape) will result in impacts that will vary in magnitude. Key specific impacts will include:

- Sections of new alignment, including a substantial cut through Toolijooa Ridge.
- A new interchange at the northern end of Berry.
- A significant new bridge over Broughton Mill Creek and Woodhill Mountain Road.
- A bypass around Berry including new alignment and noise attenuation walls, that run in close proximity to the existing North Street.
- A new interchange at the southern end of Berry with a connection into Kangaroo Valley Road.
- New cut and fill embankments along the route.
- The removal of vegetation and cultural landscape patterns that have evolved over a long period of time.

The integrated urban design concept plan included in this report represents the recommended mitigation strategies for minimising these impacts on landscape character and within the visual environment.

Due to the magnitude of the potential impacts on the landscape character of Berry and the close proximity of these impacts to town, an independent targeted urban design study was undertaken with a focus on the Berry bypass. This study involved detailed community consultation to incorporate community inputs into the concept design and potential mitigation measures.

Four landscape character units have been identified and assessed. The landscape character and visual impacts are considered high for two of these units and moderate to high for the remaining two units.

Nine viewpoints have been identified along the route to illustrate potential landscape character and visual impacts. Existing views and artist's impressions illustrating the project are presented for each viewpoint. The artist's impressions incorporate the recommended mitigation strategies derived from the urban design strategy and illustrate the likely outcomes.

The artist's impressions and the urban and landscape design concept plan combine to illustrate the following key urban design initiatives:

- The development of an alignment and road formation for the proposed highway, that has been designed to best fit with the landform and landscape along the route and to minimise the visual and landscape character impacts.
- The widening of the project footprint during the construction phase that will facilitate:
  - The construction of batter slopes ranging from 4:1 to 10:1, assisting with project cut / fill balances and providing more sympathetic landform integration along the corridor.
  - Maintaining the unique cultural landscape character of the region.
- The use of culturally significant tree species for revegetation strategically along the corridor.
- The reestablishment of open pastoral landscape, including pasture grasses, cultural hedge plantings and rural boundary fencing.
- The selective and prudent screening of some of the new infrastructure associated with the upgrade.
- The development of an alignment and design around Berry selected to minimise potential impact on the town's community open space and heritage features.
- The maintenance of internal connections and circulation patterns within the township of Berry.
- The generation of a design along North Street that recognises the potential substantial impact and change to visual connections between the northern edge of Berry and the ridges and escarpment to the north and west.
- The strengthening of the connection between the eastern side of Berry and its western expansion at the new southern interchange.
- The holistic and considered integration of bridge and retaining elements within the urban design framework.

Of key importance to the implementation of the suggested mitigation and management measures would be:

- To engage with the local community to gather feedback as the design develops, foster broader community support and ownership for the design outcome and facilitate integration with existing pedestrian access mobility plans for the township of Berry.
- To facilitate landscape and urban design outcomes that resolve other project opportunities and constraints including:
  - Balancing cut and fills.
  - Utilising RMS owned land along the corridor to facilitate increasing the short term footprint of the project to reduce the long term footprint and therefore maintenance requirements (primarily through the return to pasture land).

1

Introduction

1 Introduction

1.1 The project

The Roads and Maritime Services (RMS) is proposing to upgrade the Princes Highway between Toolijooa Road and Schofields Lane with a bypass to Foxground and the town of Berry. The project is part of the RMS's program to upgrade the Princes Highway between Gerringong and Bomaderry, providing increased road safety and traffic efficiency in the South Coast region.

The horizontal and vertical alignments of the existing largely two-lane highway between Toolijooa Road and Schofields Lane require upgrading to meet current design safety and traffic efficiency requirements. The highway has limited overtaking opportunities, many junctions with rural roads and private, uncontrolled accesses. The existing road also passes directly through the township of Berry (along Queen Street), having a detrimental effect on the safety and amenity of the street.

The preferred route option best meets the objectives applied across the program of projects for the Princes Highway upgrade between Toolijooa Road and Mullers Lane. The route performs well across a combination of the technical inputs gathered through investigations carried out to date (including a review of studies from previous investigations into the project), community feedback and the findings of the value management process.

Other projects included in the ultimate program of works to upgrade the Princes Highway between Gerringong and Bomaderry include:

- The Gerringong upgrade (GU).
- The Berry to Bomaderry upgrade (BBU).

The GU is currently within the detailed design phase. The BBU will be assessed in a future report.

1.1.1 The study area

The study area extends from Toolijooa Road in the north (the southern extent of the proposed GU), to Mullers Lane in the south. Mullers Lane is located just south of Berry township, refer to **Figure 1.1.** The study area varies in width from about one to three kilometres and is strongly influenced by the underlying natural landform and the past and present cultural settlement and pastoral practices. The northern and western sections of the study area are bordered by the southern end of the Illawarra escarpment, Curry's mountain and the Cambewarra range. The eastern and southern sections are bordered by Broughton Creek, Toolijooa Ridge and the South Coast railway line.

From north-east to south-west the study area includes Toolijooa Ridge and Broughton Village where it crosses the Broughton Creek floodplain. At Broughton, the terrain climbs and follows an undulating low ridge line towards the south-west before gently descending down into the township of Berry.

West of Berry the terrain starts to rise into the foothills of the Cambewarra Range while to the south and east, the broad floodplain of the lower Broughton Creek meanders toward the Shoalhaven river landscape.

The undulating landscape, pastureland and rural settlement patterns are defining features within the study area. The broader context is dominated by the almost constantly visible backdrop of the ridges and escarpment of the Cambewarra Range. The rural landscape includes a mix of past agricultural and pastoral activities that have been occurring since the first half of the nineteenth century combined with smaller scale rural allotments with varied practices.

The largest agricultural influence is dairy farming. This has defined the general pattern of vegetation clearance, rural boundaries (by linear cultural plantings) and the distribution of rural houses and farm buildings along the route.

Within the pastoral landscape, topography and drainage patterns provide the major source of variation. The character of the rural backdrop is markedly different between the undulating higher elevations associated with the forested foothills of the Cambewarra Range and the openness of the Broughton Creek floodplain. There is a constant interplay between areas of roadside vegetation and undulating open pastoral landscape that provides for a mix of intimate landscape experiences and broad vistas. North west of the confluence of Broughton and Broughton Mill creeks is the township of Berry. The older section of Berry is set out in a traditional grid pattern and is strongly contained by the South Coast railway line to the south and east and flood prone land to the north. For a detailed description of Berry refer to **Section 5.4.2.**

The rural backdrop is slowly changing due to the partial decline of the dairy industry. This has created a more complex landscape pattern with a wider variety of agricultural activities resulting in increased areas under cultivation.

For further description of the study area refer to **Section 5.0.**

1.1.2 Design constraints

Significant constraints which influence the location and design of the project include:

- The existing highway corridor.
- Extensive areas of slope steeper than 30 per cent.
- The existing sub-standard road geometry.
- Floodplains and soft soil conditions.
- Numerous creek crossings.
- Existing land uses and settlement patterns.
- The Berry township.
- The location of the eastern gas pipeline.
- Indigenous and non-indigenous cultural heritage locations within the study area.
- The residences and communities within and adjacent to the study area.

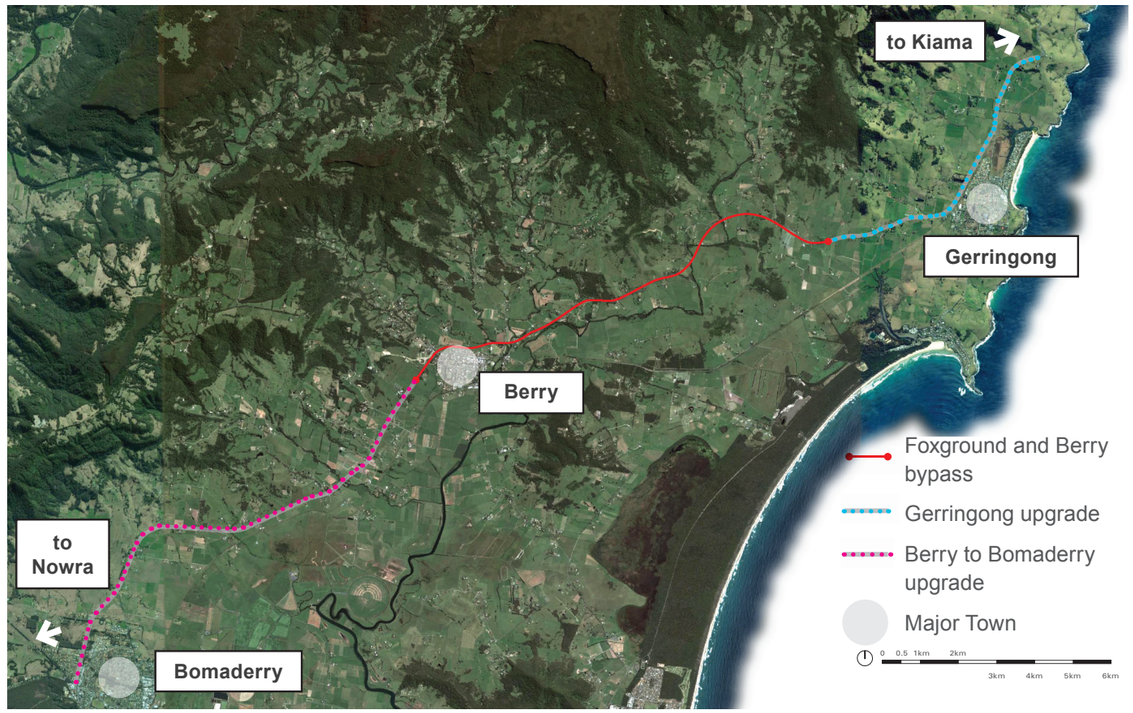


Figure 1.1 - The overall Princes Highway upgrade between Gerringong and Bomaderry

1.1.3 Major design elements

The project is about 11.6 kilometres in length. **Figure 1.1** highlights the project in the context of the three highway upgrade sections between Gerringong and Bomaderry. **Figure 1.2** illustrates the proposed route and the key elements of the project as they relate to the urban and landscape design. The project is part of the overall Princes Highway upgrade, the over arching objectives of which are to improve road safety and reduce travel times. A detailed description of the project elements is outlined in **Section 3.2**.

1.2 Study methodology

Early planning is the key to achieving an integrated urban design strategy for major infrastructure projects. The project would ultimately become part of the fabric of the community and landscape into which it is integrated. The establishment of a collaborative multidisciplinary design team prior to route selection has ensured consistent, high level awareness of the landscape and urban design objectives. This enables an integrated 'whole of corridor' outcome within the context of the entire Princes Highway.

Development of the urban design concept plan has been a process of informing and being informed by each of the design team disciplines to ensure a holistic integrated solution.

In this report the following studies are documented as part of the design process:

- Urban and landscape design objectives and principles in **Section 2.0** were developed for the strategic concept design (alignment) of the whole of the Princes Highway upgrade between Gerringong and Bomaderry. These objectives and principles were then used to develop and assess the project.
- A contextual analysis of the Princes Highway was documented to assist in understanding the environment around the project. This analysis was undertaken through field surveys and desktop studies to determine character units, identify key local and regional characteristics and qualities; and identify site opportunities and constraints.
- A landscape character assessment and visual analysis was undertaken in accordance with the 'Environmental Impact Assessment Guidance Note: Guidelines for Landscape Character and Visual Impact Assessment: EIA-N04' (RTA, 2009b) to identify key viewpoints and to review the character of the study area. The visual analysis was used to identify potential impacts of the proposed engineering concept design and to make recommendations for impact treatment and mitigation measures.

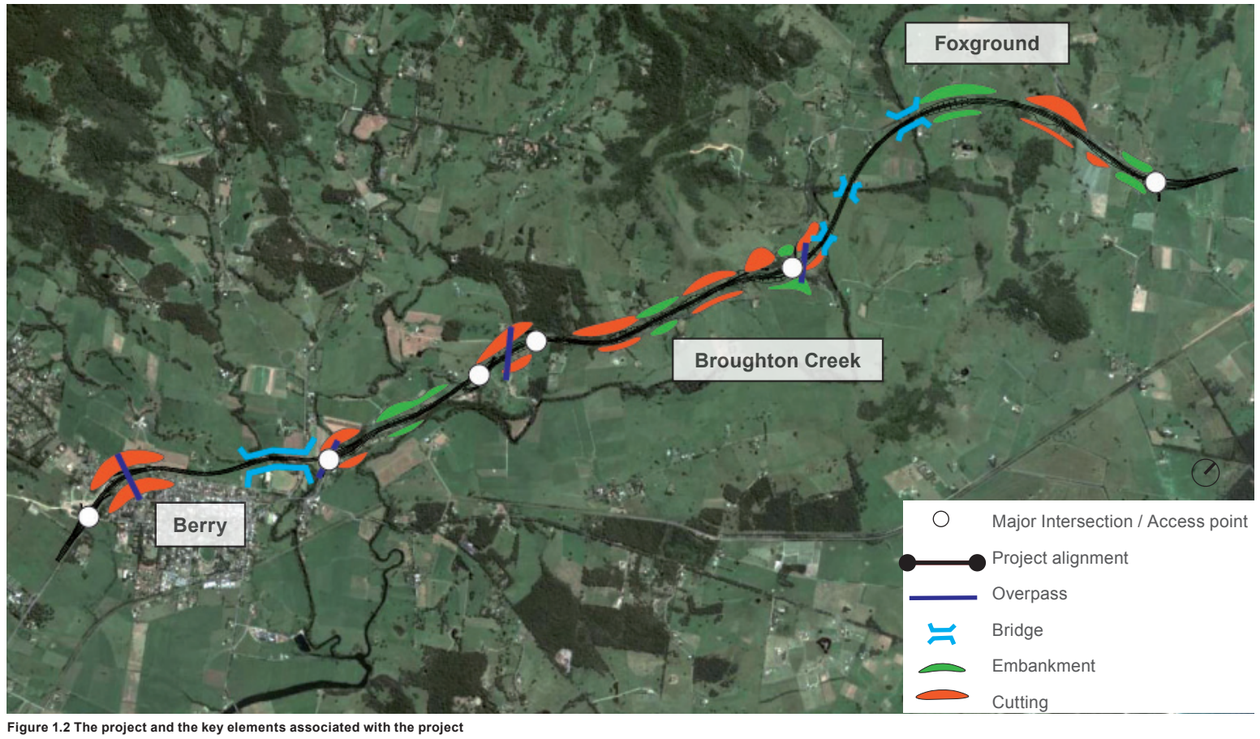


Figure 1.2 The project and the key elements associated with the project

In order to realise the full potential of the integrated approach used to develop the concept design and leave a positive legacy within the landscape and community, collaboration between design disciplines will continue through the detailed design phase of the project to ensure that the 'whole of corridor' landscape and urban design objectives are met.

This report uses both desktop and field studies to define the contextual landscape, physical characteristics and visual analysis of the project area. Information was gathered from the site by undertaking field surveys (in public areas such as, along local roads, within Berry township and along the existing Princes Highway corridor) to assess likely view points and impacts of the project.

1.2.1 Concept design development approach and process

Consistent with the overall philosophy and goals for urban design, as described within *'*Beyond the Pavement: RTA Urban Design Policy, Procedures and Design Principles*'* (RTA, 2009), the urban and landscape design team have been continually engaged throughout the concept design phase of the project.

Maintenance of the integrity of the urban design objectives has been met through a range of initiatives including:

- Participation in value management and value engineering workshops.
- The preparation of visualisations and diagrams to measure the potential impacts of the proposed design options.
- Collaboration with the environmental, geotechnical and earthworks; and road and drainage design disciplines to maximise opportunities for integrated concept design solutions.
- Urban design studies of Berry that illustrate the broader contextual impacts of the bypass and what opportunities and constraints these present.

Adjustments to the alignment were developed through consultation with residents in a community review group and an independent urban design review was undertaken by CM+ to assess the design of the Berry bypass section of the project. The agreed outcomes of the adjusted alignment have been included in this report. The artist's impressions prepared by CM+ are included in **Section 6.8.11** through **Section 6.8.14**, and **Appendix A.**

1.2.2 Landscape character units

The project was broken down into a series of landscape character units that were used as the basis for the strategy and assessment of the urban and landscape design.

The landscape character units are defined and discussed in **Section 5.5**.

1.2.3 Options identification and testing

A number of options were identified and tested during design refinement. These options were worked through in a collaborative process to provide a balanced multi-criteria analysis of all of the opportunities and constraints. The key areas of focus were:

- The Toolijooa Ridge cutting and transition onto the Broughton Creek floodplain.
- The Austral Park Road interchange and connection with the existing highway.
- The Berry east interchange and bridge at Berry alignment and arrangement.
- The North Street corridor and Town Creek alignment.
- The Kangaroo Valley Road interchange.

1.3 Director General's requirements

The Director-General's requirements (DGRs) relating to landscape and visual amenity for the project, and where they are addressed, are listed in **Table 1. 1.**

Table 1.1 - Director-General's requirements related to landscape and visual amenity

Director General's requirements	Where addressed
Landscape and visual amenity - including but not limited to:	
• Assessment of visual significance of the area, including the escarpment and ridges and the township of Berry, and impact of the proposed alignment.	• **Section 5.0** and **Section 6.7**
• Design of the project (including noise barriers, retaining walls and landscaping) consistent with the existing (and desired) character of affected localities, including consideration of RMS' 'Noise Wall Design Guideline: Design Guidelines To Improve The Appearance of Noise Walls in NSW' (RMS, 2006). The assessment should also consider highway/street lighting and the potential lightspill impacts on nearby residents.	• **Section 3.0**, **Section 4.0**, **Section 5.0** and **Section 7.0**

1.4 Structure of this report

The structure of the report is as follows:

- **Section 1.0 -** Introduction.
- **Section 2.0 -** Urban design objectives and principles.
- **Section 3.0** - Concept design description.
- **Section 4.0 -** Urban and landscape design strategy.
- **Section 5.0 -** Contextual and landscape character analysis.
- **Section 6.0 -** Landscape character and visual impact assessment (describing the likely visual impacts of the project through a review of key viewpoints towards and along the route).
- **Section 7.0 -** Mitigation and management measures (integrated design and management measures and reference design parameters for key project elements).
- **Appendix A -** This includes the Berry Bypass Urban Design Report prepared by CM+ documenting the outcomes of the community engagement process.

this page has been left blank intentionally

2

Urban design objectives and principles

2 Urban design objectives and principles

2.1 Purpose of project urban design objectives and principles

While a specific 'Urban Design Framework' does not yet exist for the whole Princes Highway, the design objectives outlined in this report (**Section 2.0**) are derived from the RMS's policies regarding urban design as published in 'Beyond the Pavement: RTA Urban Design Policy, Procedures and Design Principles' (RTA, 2009). This is explained in further detail in **Section 2.2** and **Section 4.0** - Urban and landscape design strategy.

The purpose of defining the project's urban design objectives and principles

Design objectives and principles provide a framework to ensure the project's design integrates harmoniously within the context of the natural and cultural landscape. Their intent is to guide the design process while allowing flexibility to refine the fine detail of the design to achieve a best-for-project outcome. The objectives and principles encourage integration with other road infrastructure upgrades within the region (including the North Kiama bypass, upgrade of the Princes Highway between Oak Flats and Dunmore, and the Sea Cliff bridge) which provide successful precedents for culturally relevant urban design.

The objectives and principles, along with the visual assessment and landscape character assessment (refer to **Sections 4.0** and **5.0**) are used as a basis for the interrogation of the preferred route and concept design for the project throughout this report. They will also continue to be used as a benchmark for future stages of the project design development.

2.2 Objectives and principles of the project

The objectives that form the urban and regional design framework for the project are supported by specific design principles which guide their achievement. These include:

Objective One: Provide a flowing highway alignment that is responsive and integrated with the natural landscape

- The route selection should respond to the grain of the landscape, including following the edges of valleys and hills and avoid, where possible the disruption of stands of vegetation, both natural and cultural.
- Integrate cut and fill embankments with surrounding terrain by grading out and varying slopes.
- Consider independently graded carriageways.
- Preserve existing cultural patterns within the landscape.
- Avoid where possible impact to significant local features through which the project passes.
- Vary the gradient of earthworks to provide visual interest and reflect the characteristics of the surrounding landform and landscape.
- Grade out cuttings and embankments, where possible to best fit the characteristics of the local landform, returning the land to its former use or replacing vegetation lost to the project.

Objective Two: Protect the natural systems and ecology of the corridor

- Avoid, where possible areas of natural vegetation, particularly those containing threatened species and communities.
- Minimise disruption to natural drainage patterns both through route selection and road design.
- Minimise the number of creek crossings.
- Use medians and road verges to maximise habitat value and maintain pollination paths and wildlife movement patterns.
- Integrate the landscape qualities and characteristics of the project landscape with the locality through which it passes.
- Integrate water quality basins within the landscape form and character.

Objective Three: Protect and enhance the heritage and cultural values of the corridor

- Avoid, where possible areas of identified historic and Aboriginal heritage and cultural value.
- Acknowledge and respond to the heritage and cultural values of the rural landscape.
- Acknowledge and respond to Aboriginal values placed on the broader landscape.
- Reduce the visual and noise impacts of the project.
- Consider the important value of productive landscapes.

Objective Four: Respect the communities and towns along the highway

- Minimise the project impacts to local township residents.
- Provide safe and efficient access to towns.
- Divert the highway around the town of Berry to improve the amenity of its centre in particular, Queen Street.
- Minimise, where possible the visibility of the highway from the edges of Berry, particularly those views along its north - south streets.
- Provide safe and efficient access from the highway into Berry, maintaining visual connections that encourage road users to visit the town.
- Minimise the disruption and loss of amenity to rural residents within the study area.

Objective Five: Provide a safe, enjoyable and interesting highway with strong visual connections to the Pacific Ocean, immediate hinterland, and mountains to the west

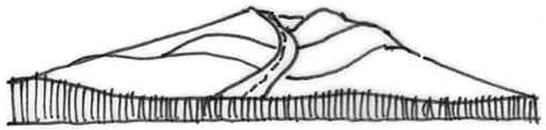
- Acknowledge the role of this section of the Princes Highway as an important part of a longer scenic drive along the New South Wales South Coast.
- Maximise the opportunities for high quality and varied views of the coast, the rural landscape and adjacent mountain ranges.
- Provide visual connections (way finding and directional signage) marking access to the towns/communities along the route.
- Use landscape treatments to soften the appearance of the road for its users without compromising opportunities for key views.
- Consider the heritage aspects of the route to enable road users, where practicable to experience them.

Objective Six: Develop a simple and unified palette of elements and details that are easily maintained

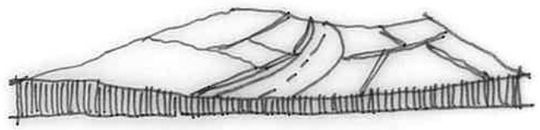
- Develop a consistent approach to the design of bridges along the project. Urban design principles to be consistent with those outlined in 'Bridge Aesthetics: Design Guidelines To Improve The Appearance of Bridges in NSW' (RTA, 2003).
- Develop a consistent approach to the design of noise walls along the project. Apply urban design principles consistent with those outlined in RMS' 'Noise Wall Design Guideline: Design Guidelines To Improve the Appearance of Noise Walls in NSW' (RTA, 2006).
- Develop an integrated strategy for the avoidance, minimisation and improved appearance of shotcrete as outlined in 'Shotcrete Design Guidelines: Design Guidelines to Avoid, Minimise and Improve the Appearance of Shotcrete' (RTA, 2005).
- Develop a consistent approach to the design of soft landscaping along the route. Planting design principles to be consistent with those outlined in 'Landscape Guideline: Landscape Design and Maintenance Guidelines to Improve the Quality, Safety and Cost Effectiveness of Road Corridor Planting and Seeding' (RTA, 2008).

The unifying philosophy behind these objectives (and associated design principles) is the goal to develop a project that not only meets functional and engineering criteria, but one that respects the environment in which it is located. The urban and regional design framework is intended to be a fundamental component of all stages of highway planning and design.

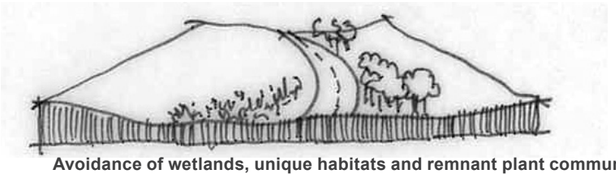
Conceptually, these principles are illustrated in **Figure 2.1.**



Preservation of and response to the natural landform

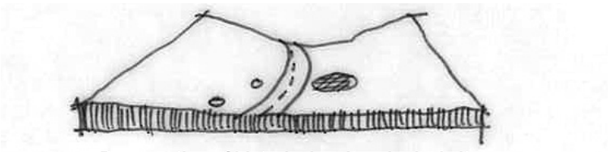


Preservation of cultural patterns in the landscape

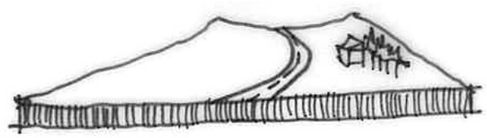


Avoidance of wetlands, unique habitats and remnant plant communities

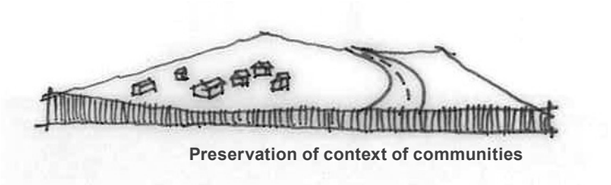
Respect for rivers, streams and natural drainage ways



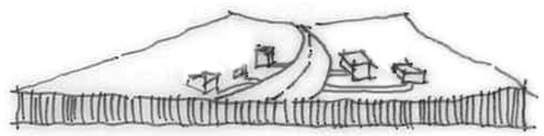
Preservation of historical archaeological sites



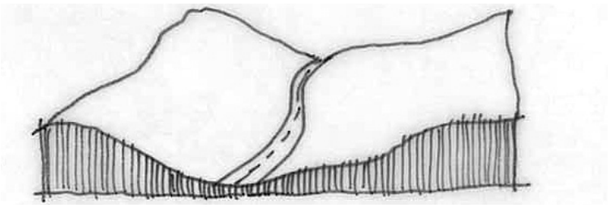
Preservation of historical cultural landscapes



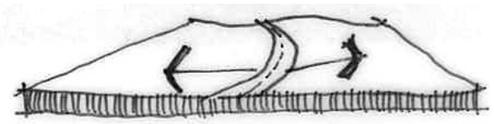
Preservation of context of communities



Consideration of adjacent land uses and access to and from highway



Highway location to engage with terrain



Recognition of special view sheds and scenic character

Figure 2.1 Design principles

3

Concept design description

3 Concept design description

3.1 The concept plan

The project concept design is illustrated and described in **Figure 3.1**. The urban design and landscape concept plans supported with sections, typical treatment illustrations and enlargement plans are illustrated in **Figure 3.2** through to **Figure 3.27.**

3.2 The design elements

RMS propose to upgrade 11.6 kilometres of the Princes Highway between Toolijooa Road north of Foxground and Schofields Lane south of Berry, in New South Wales (NSW) (the project), to achieve a four lane divided highway (two lanes in each direction) with median separation. The project includes bypasses of Foxground and Berry.

The project comprises the following key features:

- Construction of a four lane divided highway (two lanes in each direction) with median separation (wire rope barriers or concrete barriers where space is constrained, such as at bridge locations).
- Bypasses of the Foxground bends and the Berry township.
- Construction of around 6.6 kilometres of new highway where the project deviates from the existing highway alignment at Toolijooa Ridge, the Foxground bends and the Berry township.
- Provision for the possible widening of the highway (if required in the future) to six lanes within the road corridor and, in some areas, construction of the road formation to accommodate future additional lanes where safety considerations, traffic disruption and sub-optimal construction practices are to be avoided.
- Grade-separated interchanges at:
  - Toolijooa Road.
  - Austral Park Road.
  - Tindalls Lane.
  - East of Berry at the existing Princes Highway, referred to as the northern interchange for Berry.
  - West of Berry at Kangaroo Valley Road, referred to as the southern interchange for Berry.
- A major cutting at Toolijooa Ridge (around 900 metres long and up to 26 metres deep).
- Six lanes (two lanes plus a climbing lane in each direction) through the cutting at Toolijooa Ridge for a distance of 1.5 kilometres.
- Four new highway bridges:
  - Broughton Creek bridge 1, a four span concrete structure around 167 metres in length and nine metres in height.
  - Broughton Creek bridge 2, a three span concrete structure around 76 metres in length and eight metres in height.
  - Broughton Creek bridge 3, a six span concrete structure around 190 metres long and 13 metres in height.
  - A bridge at Berry, an 18 span concrete structure around 600 metres long and up to 12 metres in height.
- Three highway overbridges:
  - Austral Park Road interchange, providing southbound access to the highway.
  - Tindalls Lane interchange, providing southbound access to and from the highway
  - Southern interchange for Berry, providing connectivity over the highway for Kangaroo Valley Road along its existing alignment.
- Eight underpasses including roads, drainage structures and fauna underpasses:
  - Toolijooa Road interchange, linking Toolijooa Road to the existing highway and providing northbound access to the upgrade.
  - Property access and fauna underpass in the vicinity of Toolijooa Ridge at chainage 8400.
  - Dedicated fauna underpass in the vicinity of Toolijooa Ridge at chainage 8450.
  - Property access underpass between Toolijooa Ridge and Broughton Creek at chainage 9475.
  - Combined drainage and fauna underpass in the vicinity of Austral Park Road at chainage 12770.
  - Combined drainage and fauna underpass in the vicinity of Tindalls Lane at chainage 13320.
  - Dedicated fauna underpass in the vicinity of Tindalls Lane at chainage 13700.
  - Property access underpass between the Tindalls Lane interchange and the northern interchange for Berry in the vicinity of at chainage 15100.
- Modifications to local roads, including Toolijooa Road, Austral Park Road, Tindalls Lane, Gembrook Lane, North Street, Queen Street, Kangaroo Valley Road, Hitchcocks Lane and Schofields Lane
- Diversion of Town Creek into Bundewallah Creek upstream of its confluence with Connollys Creek and to the north of the project at Berry.
- Modification to about 47 existing property accesses.
- Provision of a bus stop at Toolijooa Road and retention of the existing bus stop at Tindalls Lane.
- Dedicated u-turn facilities at Mullers Lane, the existing highway at the Austral Park Road interchange and Rawlings Lane.
- Roundabouts at the southern interchange for Berry and the Woodhill Mountain Road junction with the exiting Princes Highway.
- Two cul-de-sacs on North Street and the western end of Victoria Street in Berry.
- Tie-in with the existing highway about 75 metres north of Toolijooa Road and about 440 metres south of Schofields Lane.
- Left in/left out only provisions for direct property accesses to the upgraded highway.
- Dedicated public space with shared pedestrian/cycle facilities along the southern side of the upgraded highway from the playing fields on North Street to Kangaroo Valley Road.
- Ancillary operational facilities, including permanent detention basins, stormwater treatment facilities and a permanent ancillary facility site for general road maintenance.

The project and the key features of the project are shown **Figure 3.1**

- Construction activities as part of the project would include the following:
  - Site preparation and establishment works.
  - Temporary construction facilities, including construction compounds, stockpile sites, creek crossings, sediment control basins and haulage roads.
  - Temporary works, including relocation/protection of services, tie-ins, traffic facilities and side tracks.
  - Earthworks and bridge construction.
  - Pavement construction.
  - Drainage construction.
  - Street furniture installation.
  - Site restoration.

3.3 Application of the urban and landscape design principles

The concept design utilises existing landscape elements to integrate a design response which is sensitive to its landscape context. The key design elements that relate to the overall strategy are:

- Widening the project footprint during construction to flatten batters, reestablish pasture grasses and ultimately minimise the footprint impact. This will also allow for better ultimate landform and land use integration.
- Reducing the size and scale of structural elements within the landscape.
- Minimising the impacts on the township of Berry and reinforcing the opportunities that the bypass presents.
- Reinforcing the cultural landscape by planting trees perpendicular to the carriageway at the interface of creeks, fence lines and existing vegetation lines.
- Extending the pastoral landscape to the edges of the carriageway.
- Responding to the open nature of the broader landscape setting.
- Integrating the design to minimise impacts to the existing landscape character.

3.4 Urban design and landscape concept plan

The urban design and landscape concept plans are illustrated in **Figure 3.2** through to **Figure 3.27**. The concept design responds to the Urban and Landscape Design Strategy (**Section 4.0**), which was informed by the visual assessment and contextual analysis as documented in **Sections 4.0** and **5.0**.

The visual assessment and contextual analysis identify impacts associated with the project and the Urban and Landscape Design Strategy proposes treatments and mitigation measures that have been integrated into the concept design to minimise its impacts.

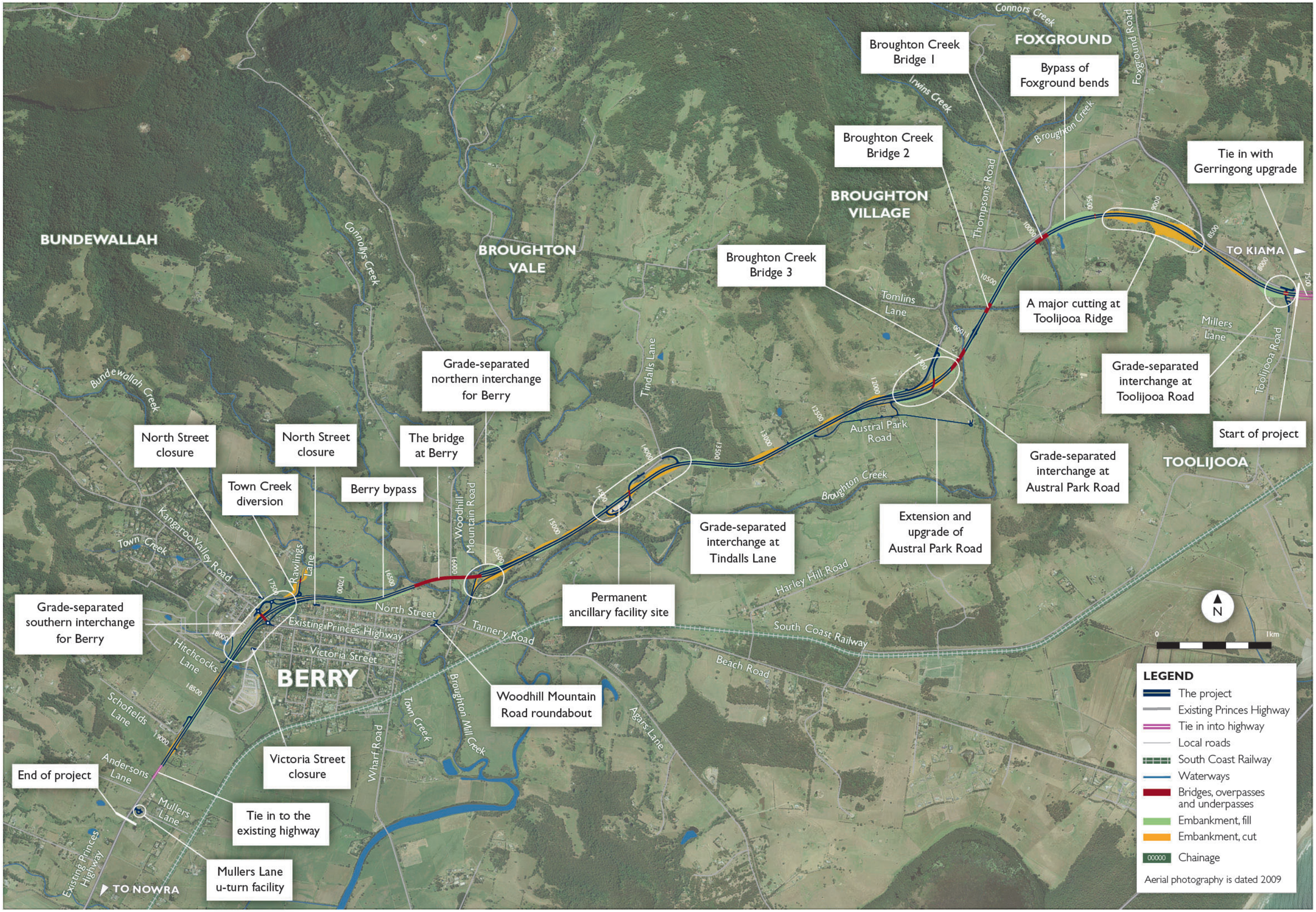


Figure 3.1 The project engineering concept drawing

Existing Princes Highway
CH9600
2
Water quality basin
Water quality basin
Existing Princes Highway
Broughton Creek bridge 1
3
CH9950
1
CH8650
Broaden out batter slopes at transition from Toolijooa Ridge to Broughton Creek
Open landscape across floodplain with portals and creek crossings
Reinforce Casuarina planting at creek crossings
4
CH10500
Toolijooa Ridge cutting
To Berry
Broughton Creek bridge 2
Broughton Creek
Screen plantings to provide privacy to residents adjacent to highway
Joins Figure 3.7
Water quality basin
The project
GU
To Gerringong and Kiama
Toolijooa interchange
Toolijooa Ridge
The project
GU
Toolijooa Road
Signature Livistona palm plantings at interchange consistent with Gerringong upgrade design

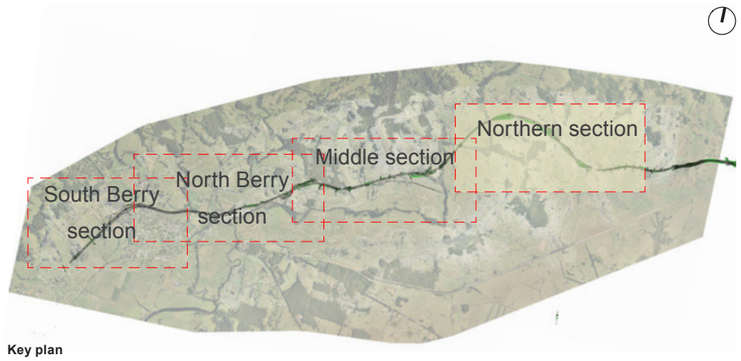
Figure 3.2 Concept for northern section of the project including Toolijooa and Broughton Creek

Legend

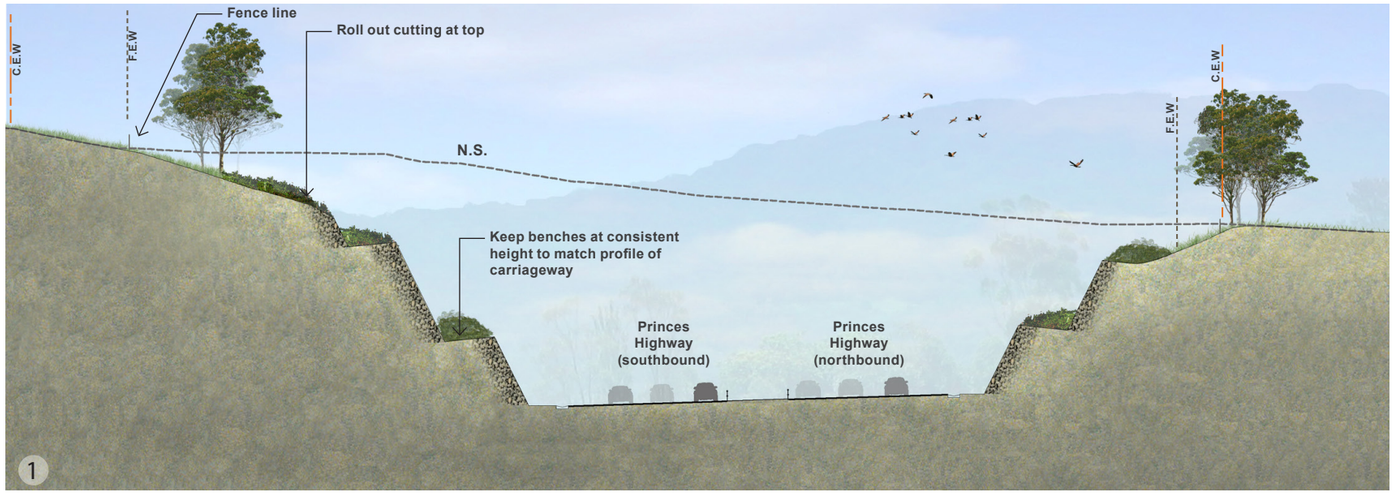
- Existing Princes Highway
- Proposed road alignment
- Pasture reestablishment to edge on embankments
- Livistonia palm tree (feature)
- Isolated tree plantings Eucalyptus and or Fig Trees
- Eucalyptus trees in forest style planting
- Riparian / Casuarina tree planting
- Water quality basin
- Noise attenuation barrier (indicative extent only)

- 1 Section number 1 at CH 8650
- 2 Section number 2 at CH 9600
- 3 Section number 3 at CH 9950
- 4 Section number 4 at CH 10500

0 100 200 300 400 500 600
1:8000 metres



Key plan



Legend:
N.S. Natural surface
C.E.W Construction extent of works
F.E.W Final extent of works
0 4 8 12 16 20 24 metres

Figure 3.3 Elevation / section 1 - Toolijooa - chainage 8650

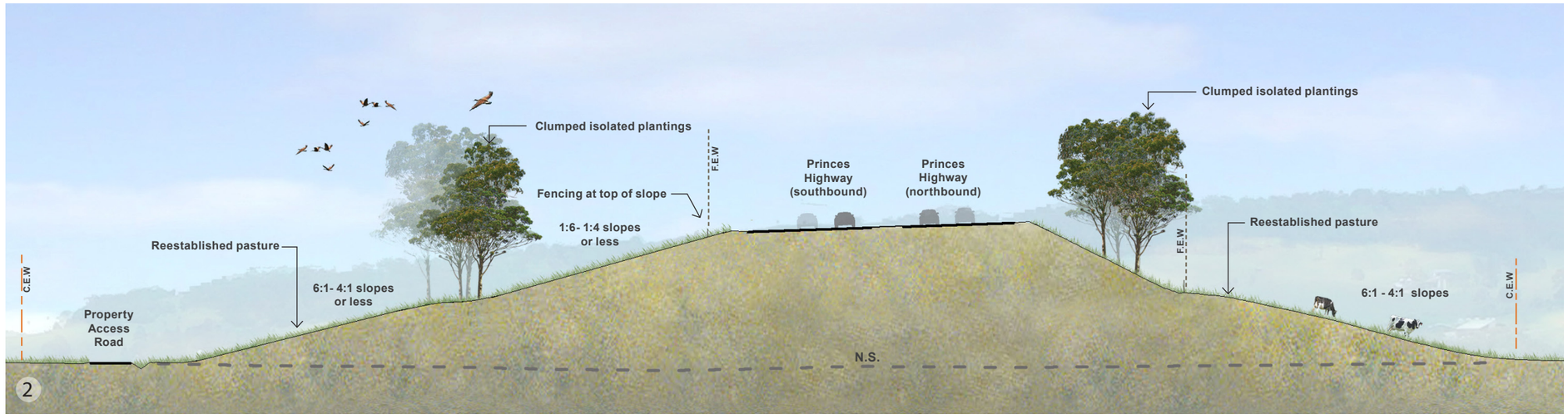


Figure 3.4 Elevation / section 2 -Broughton Creek - chainage 9600

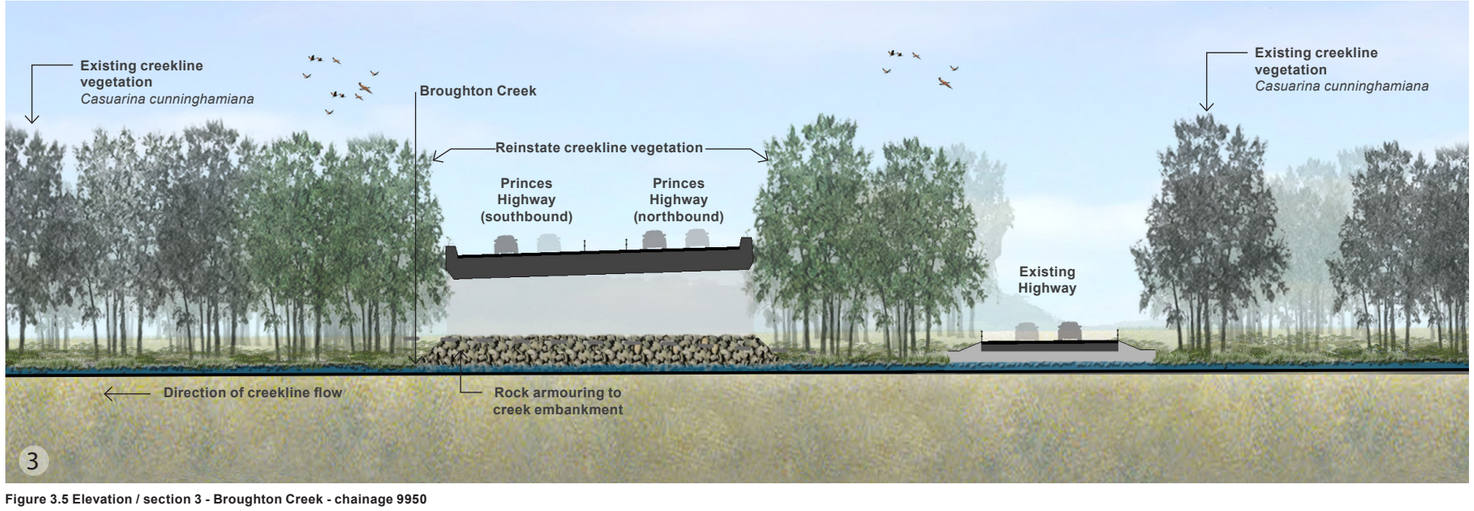


Figure 3.5 Elevation / section 3 - Broughton Creek - chainage 9950

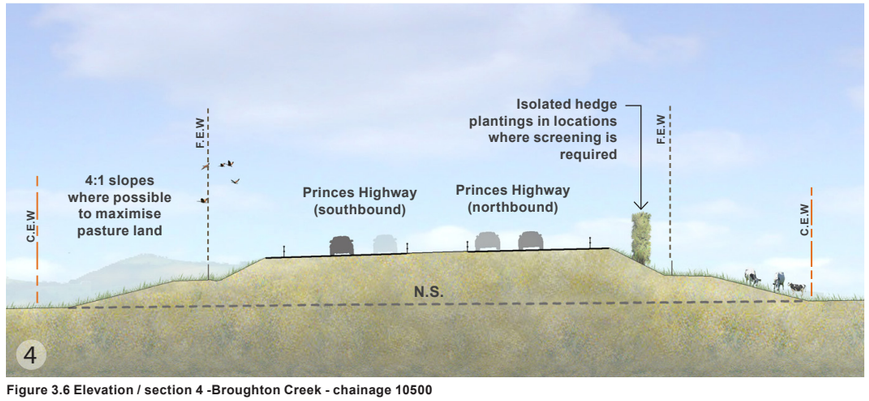


Figure 3.6 Elevation / section 4 -Broughton Creek - chainage 10500

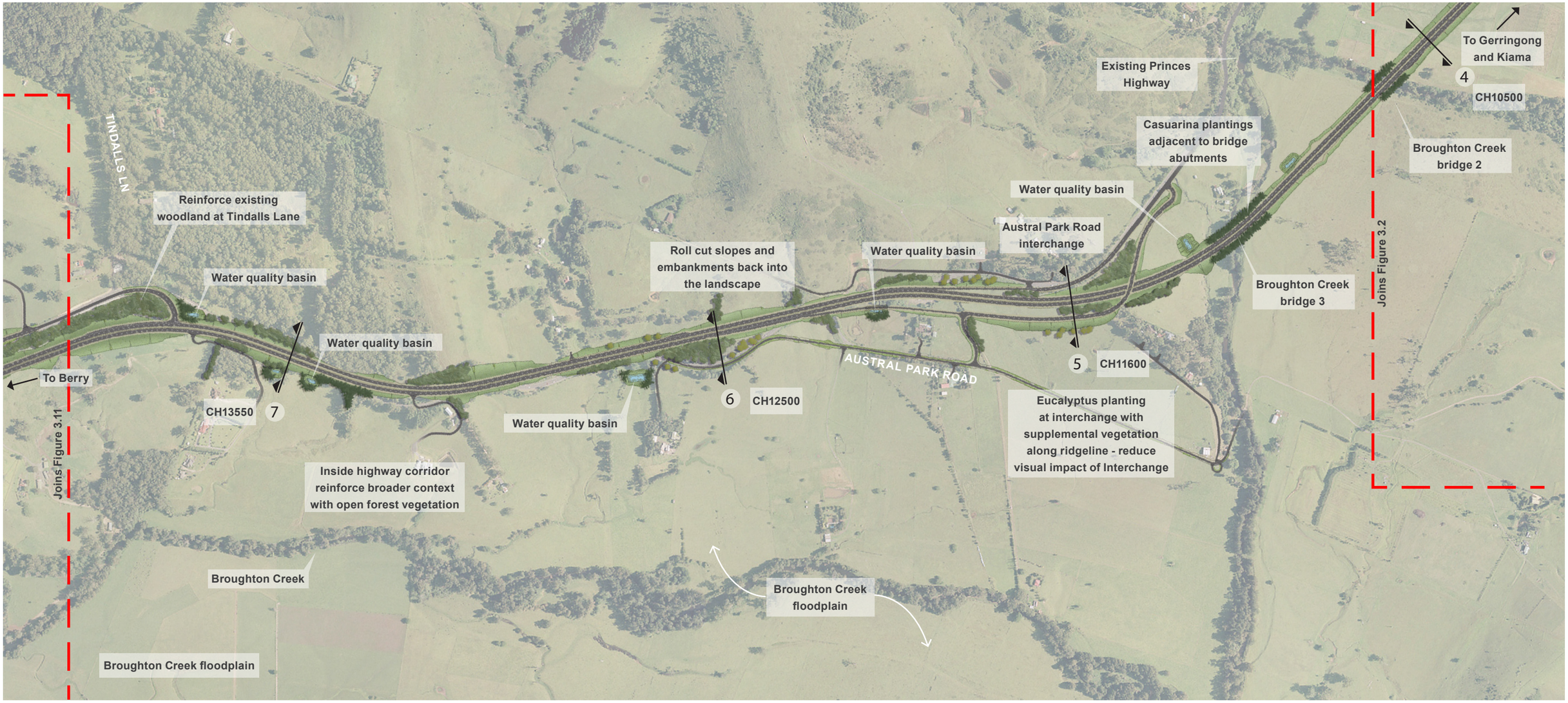


Figure 3.7 Concept for middle section of the project including Broughton Creek and North Berry

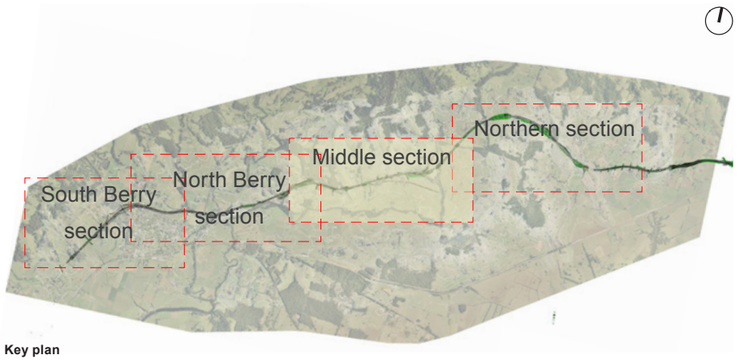
Legend

- Existing Princes Highway
- Proposed road alignment
- Pasture reestablishment to edge on embankments
- Livistonia palm tree (feature)
- Isolated tree plantings Eucalyptus and or Fig Trees
- Eucalyptus trees in forest style planting
- Riparian / Casuarina tree planting
- Water quality basin
- Noise attenuation barrier (indicative extent only)

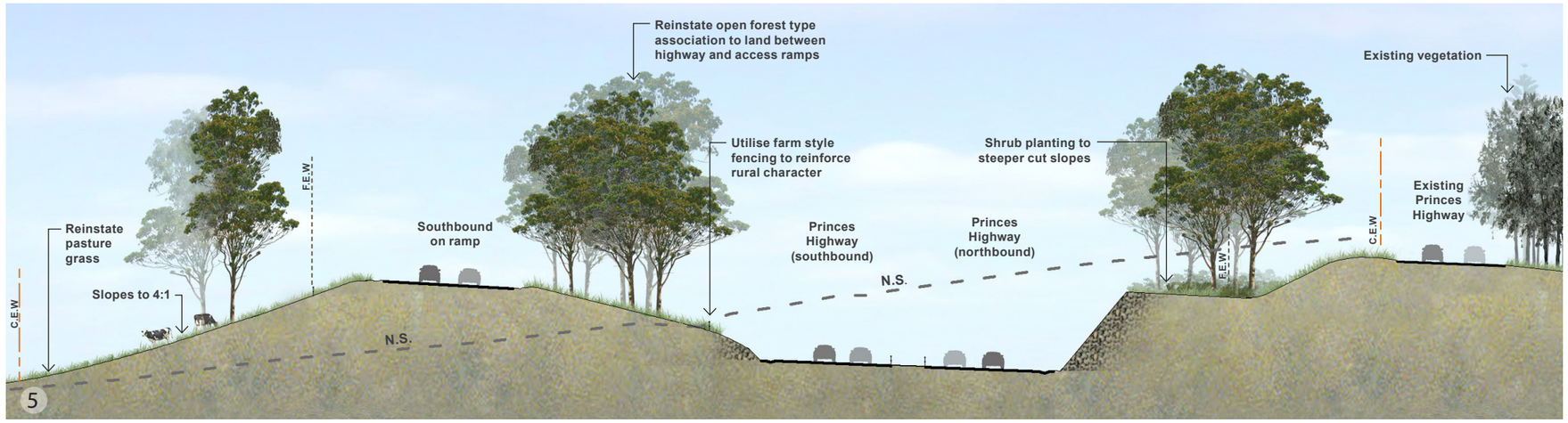
- 5 Section number 5 at CH 11600
- 6 Section number 6 at CH 12500
- 7 Section number 7 at CH 13550

0 100 200 300 400 500 600

1:8000 metres



Key plan



Legend:
N.S. Natural surface
C.E.W Construction extent of works
F.E.W Final extent of works

0 4 8 12 16 20 24 metres

Figure 3.8 Elevation / Section 5 - North Berry - Chainage 11600

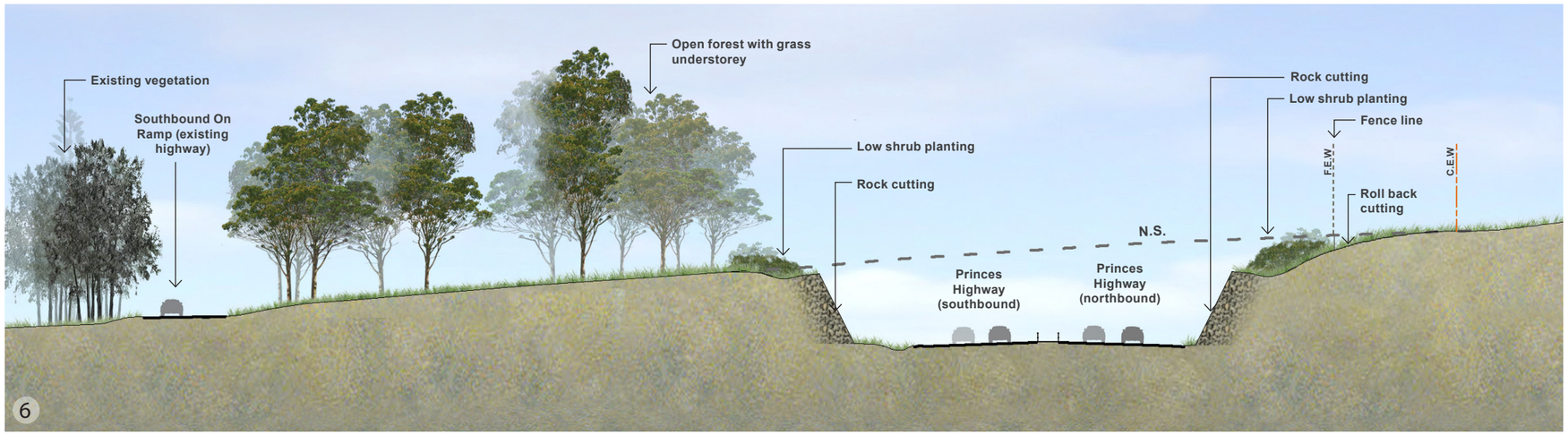


Figure 3.9 Elevation / Section 6 - Broughton Creek - Chainage 12500

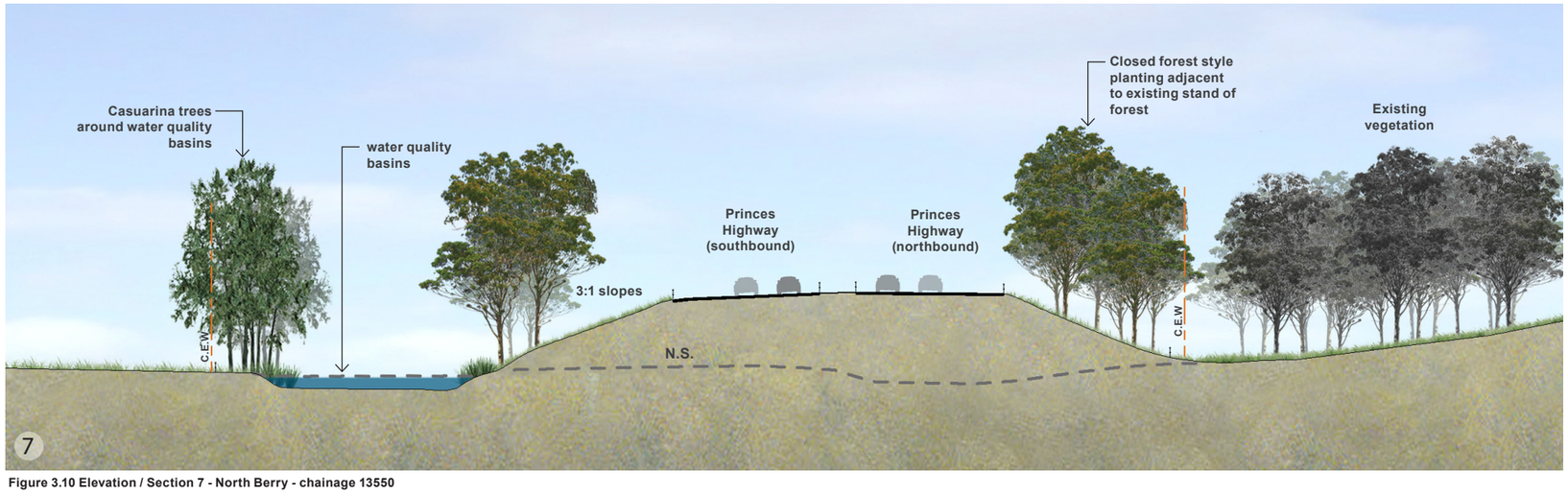


Figure 3.10 Elevation / Section 7 - North Berry - chainage 13550

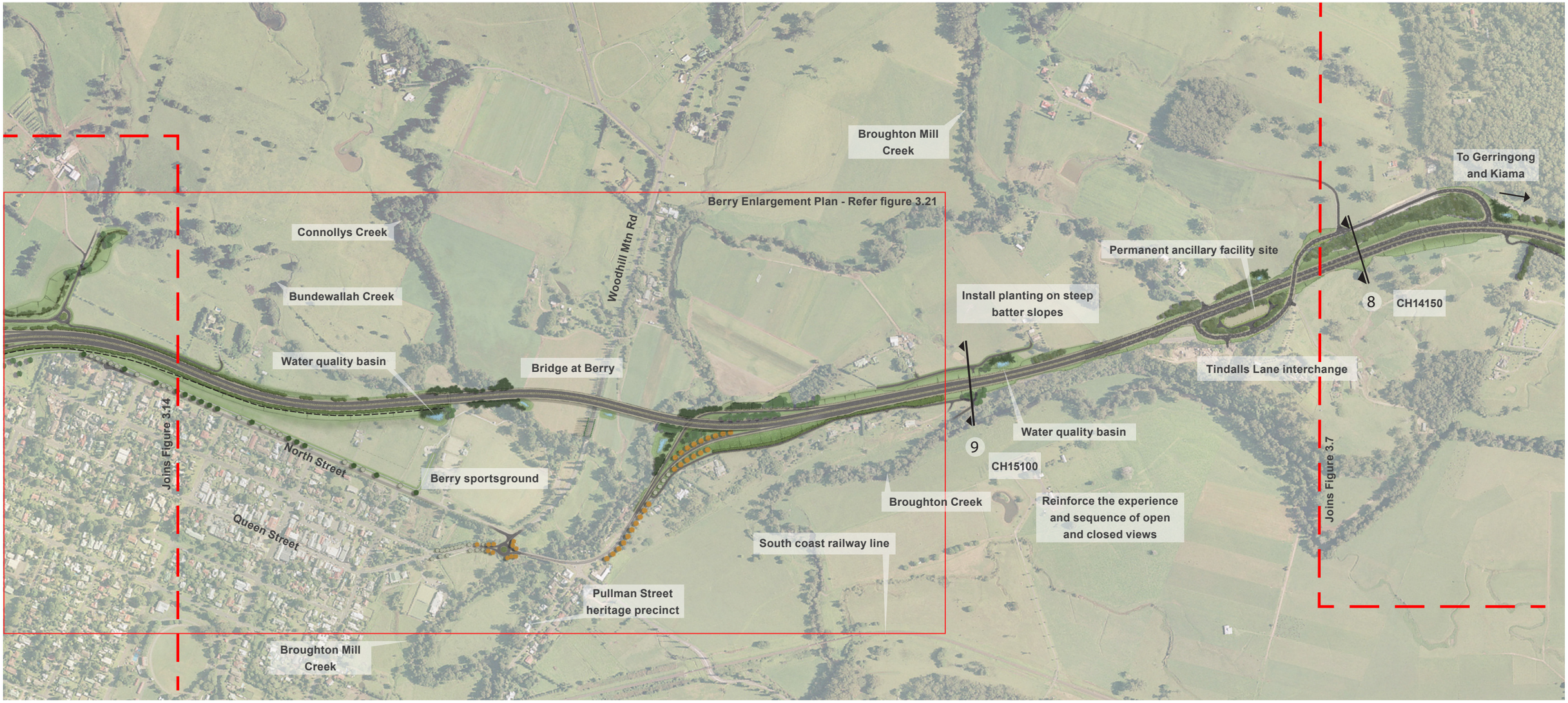


Figure 3.11 Concept for southern section of the project including North Berry and Berry

Legend

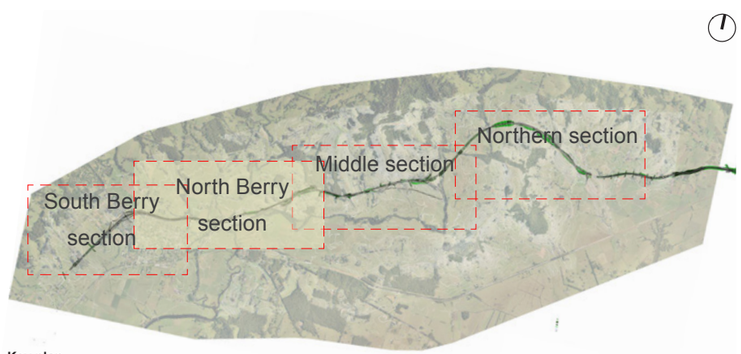
- Existing Princes Highway
- Proposed road alignment
- Pasture reestablishment to edge on embankments
- Livistonia palm tree (feature)
- Isolated tree plantings Eucalyptus and or Fig Trees
- Eucalyptus trees in forest style planting
- Riparian / Casuarina tree planting
- Water quality basin
- Noise attenuation barrier (indicative extent only)

8 Section number 8 at CH 14000

9 Section number 9 at CH 15100

0 100 200 300 400 500 600

1:8000 metres



Key plan

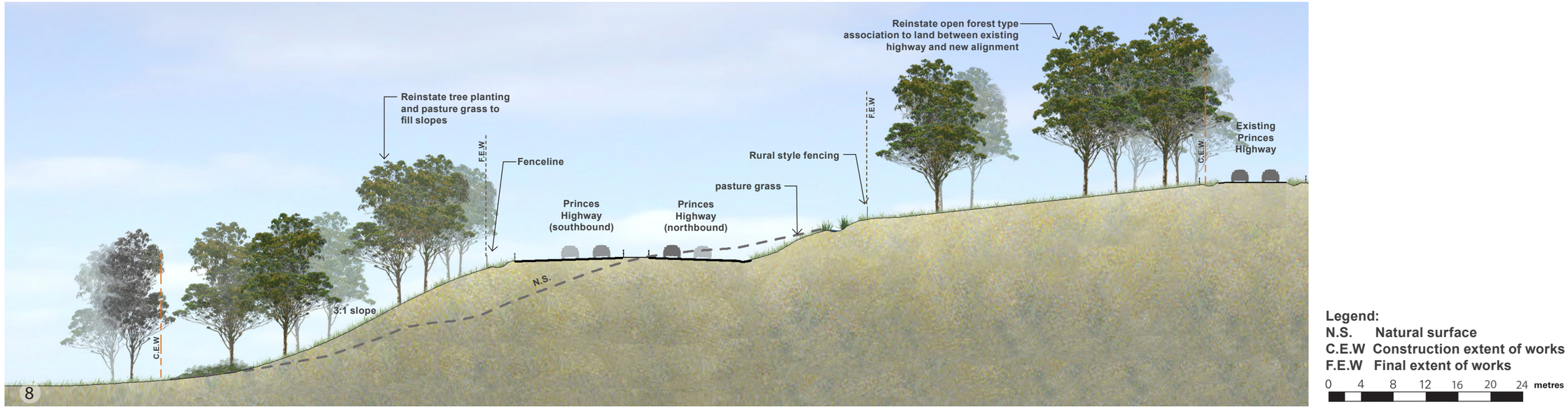


Figure 3.12 Elevation / section 8 - North Berry - chainage 14150

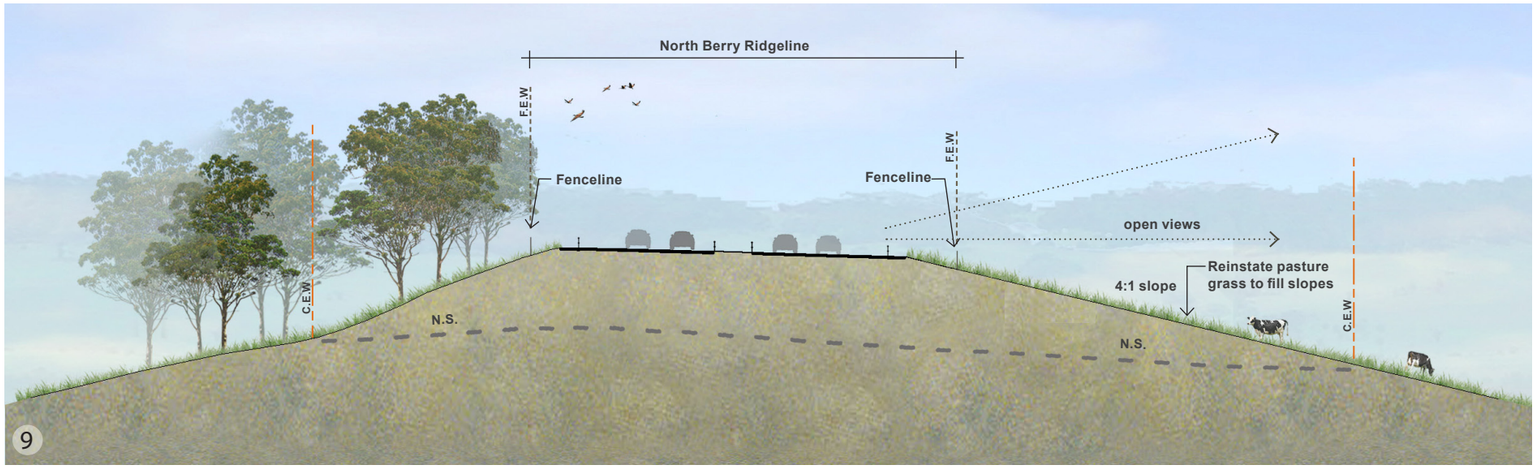


Figure 3.13 Elevation / section 9 -North Berry - chainage 15100

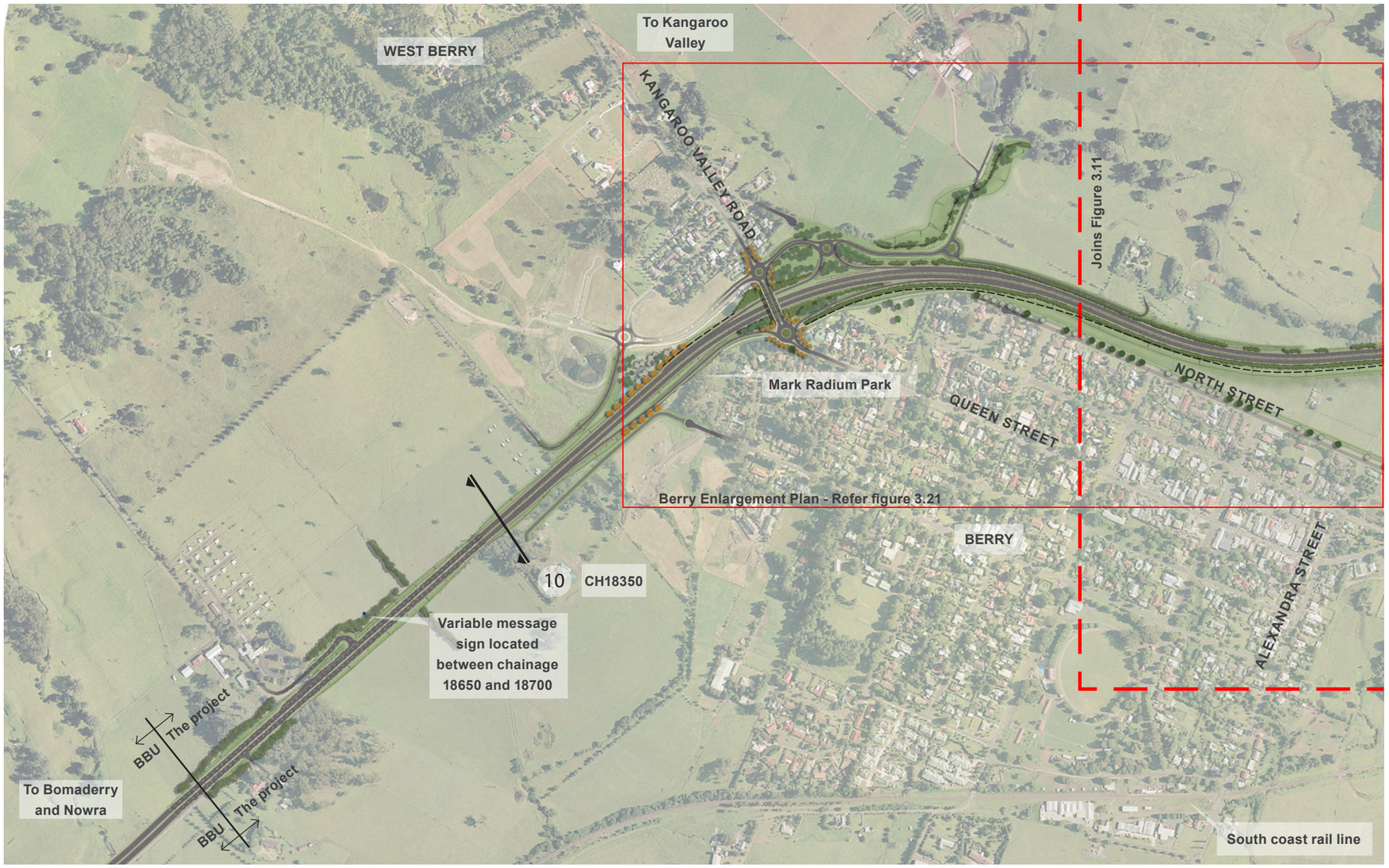


Figure 3.14 Concept for south Berry section of the project including North Berry and Berry

Legend

- Existing Princes Highway
- Proposed road alignment
- Pasture reestablishment to edge on embankments
- Livistonia palm tree (feature)
- Isolated tree plantings Eucalyptus and or Fig Trees
- Eucalyptus trees in forest style planting
- Riparian / Casuarina tree planting
- Water quality basin
- Noise attenuation barrier (indicative extent only)

10 Section number 10 at CH 18100

0 100 200 300 400 500 600

1:8000 metres

Typical treatment - Fills

The proposed fill treatment (refer **Figure 3.16** and **3.17**) will:

- Maintain consistency with the existing landscape character and patterns.
- Engage road users with the landscape.
- Reduce road width corridor by returning land to its former use.
- Integrate the ultimate road corridor by utilsing larger construction footprint during construction and construct broader flatter batters. Reestablish the adjacent pasture and return to prior use as much as practicable. This would ultimately minimise the apparent road corridor width.
- Reduce total area of maintenance.
- Balance project cut and fills.
- Reduce the perceived carriageway width.

Typical treatment - Cuts

The cut batters would be designed to ensure:

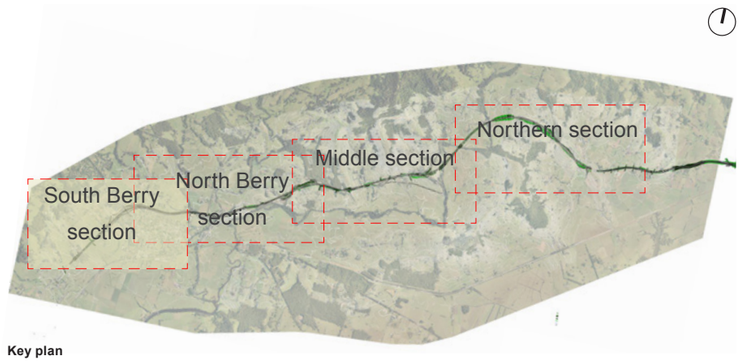
- Shotcrete is not required for stabilisation.
- A sufficient depth of soil is maintained in order to support vegetation.
- Ease of maintenance.

Where unstable rock exists consider:

- Slopes of 3:1 or flatter that can potentially be returned to existing use and/or better integrated within the surrounding landscape character (refer **Figures 3.18** and **3.20**).

Where stable rock exists consider:

- Close to vertical cuttings (refer **Figure 3.19**).
- Leaving room (a minimum of two metres) at the base of the cutting for vegetation (refer **Figure 3.19**).
- Where cuttings are made to include the ultimate widening of the corridor to six lanes the opportunity arises to include additional vegetation at the base of the cutting up until the widening occurs.



Key plan

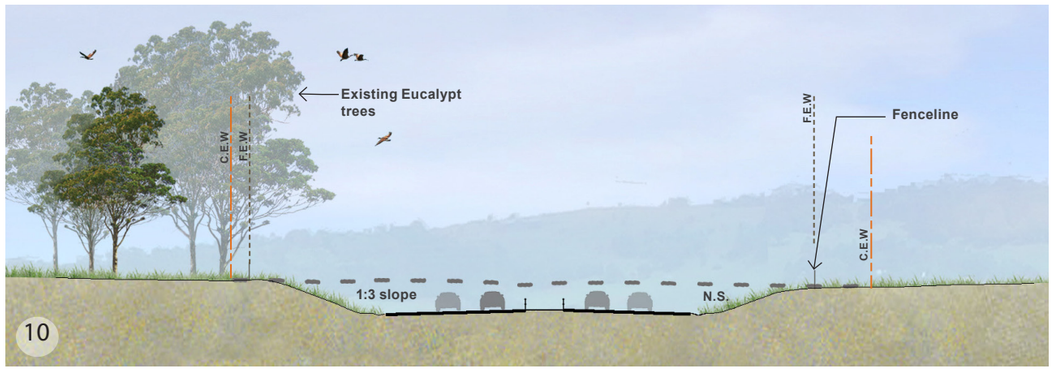


Figure 3.14 Elevation / section 10 - Berry - chainage 18350

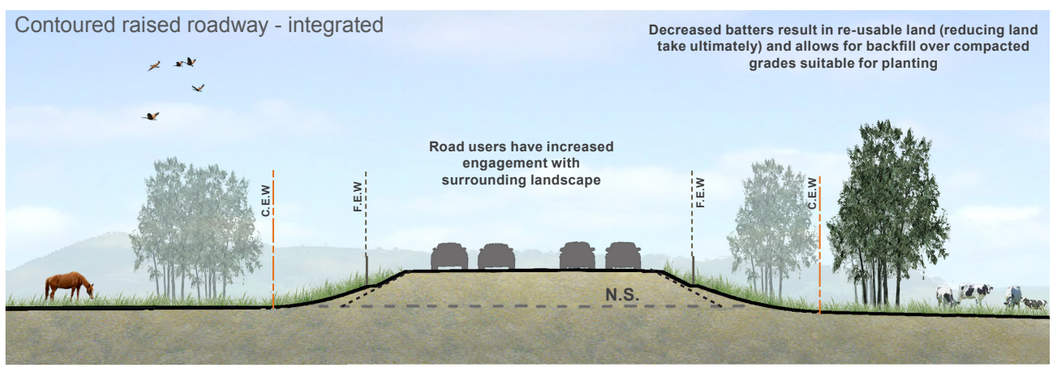


Figure 3.16 Section - Typical corridor approach (fills)

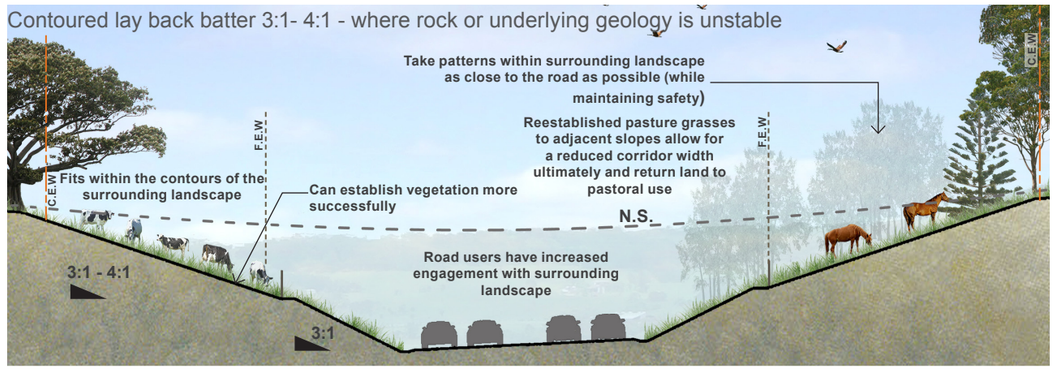


Figure 3.18 Section - Typical corridor approach (cuts)

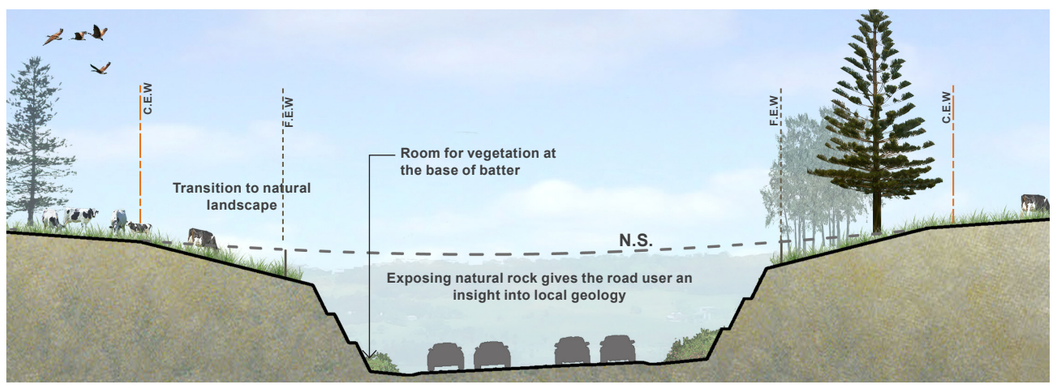


Figure 3.19 Section - rock cut batter 2:1-1:1 - in suitable rock formation

Legend:
N.S. Natural surface
C.E.W Construction extent of works
F.E.W Final extent of works

0 4 8 12 16 20 24 **metres**

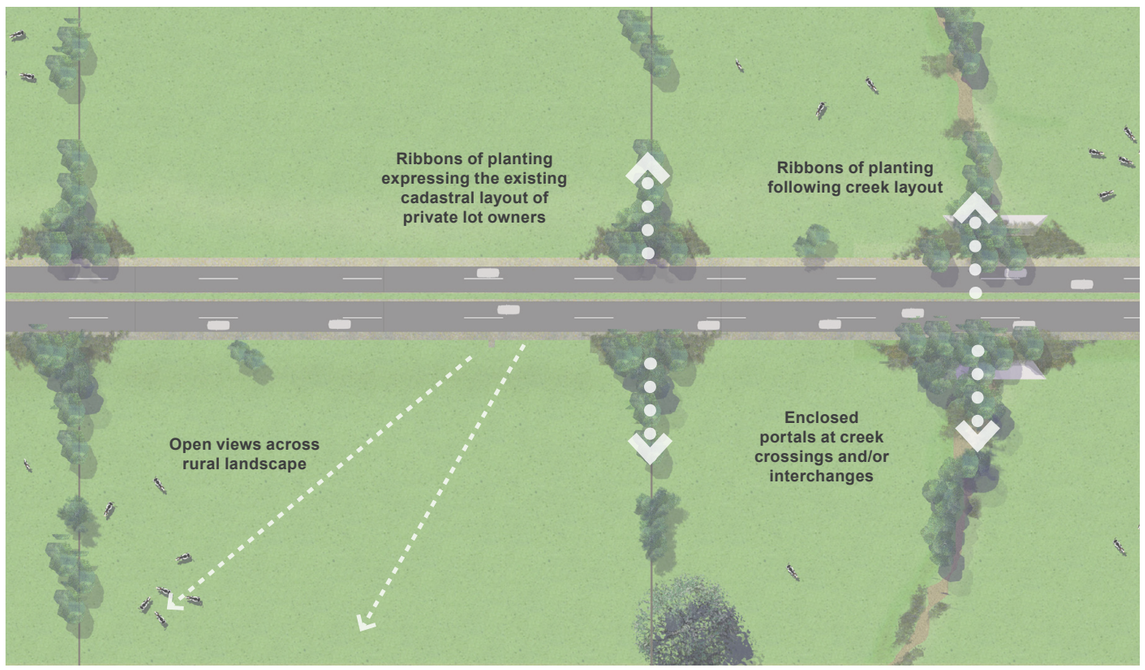


Figure 3.17 Typical corridor approach (fills)

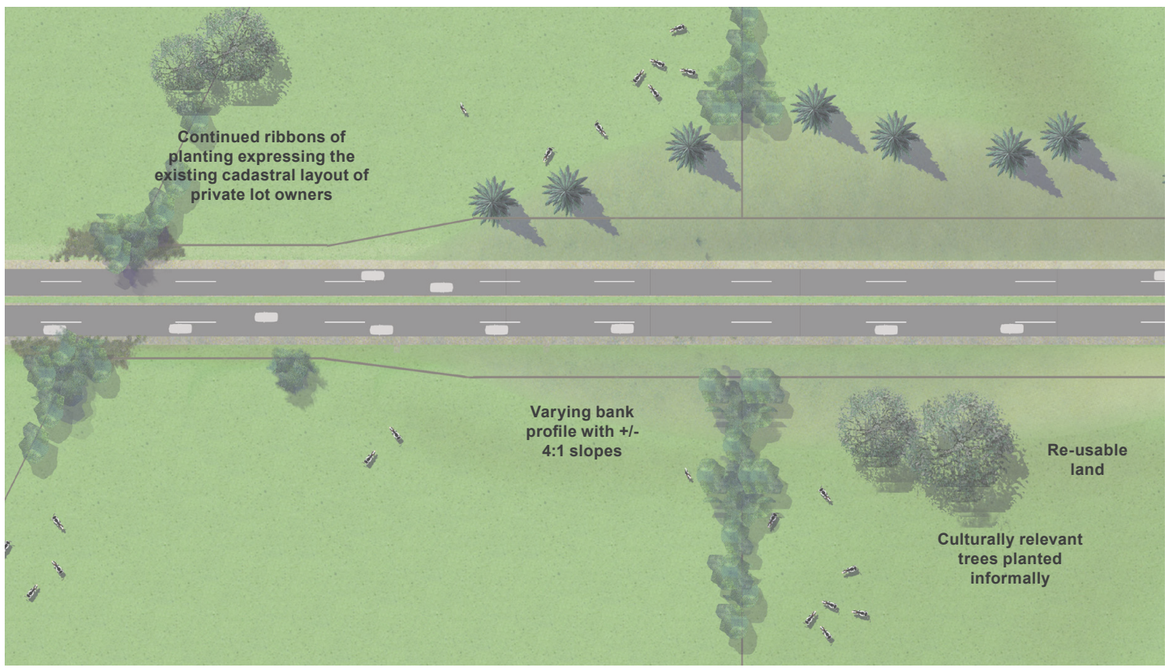
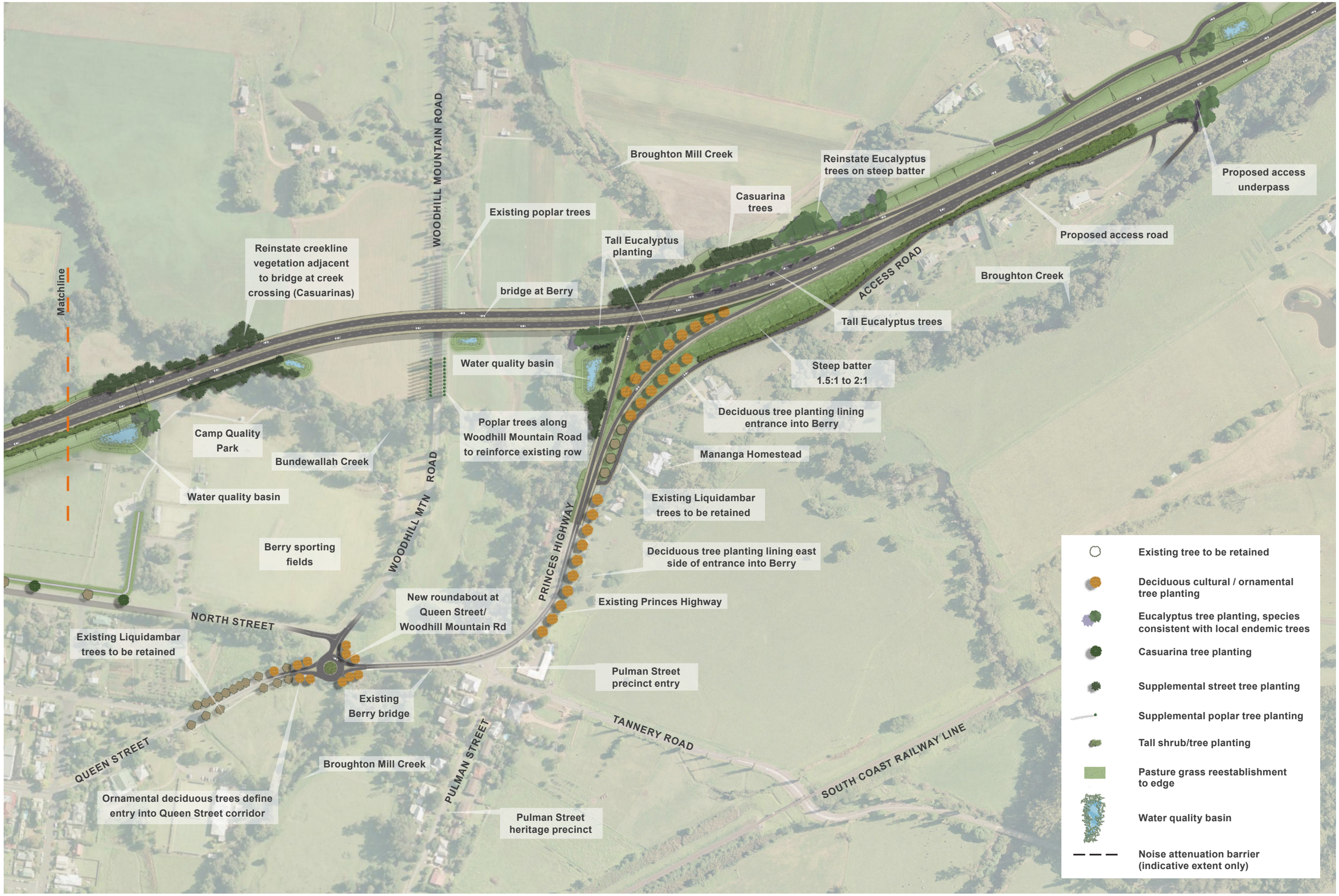


Figure 3.20 Typical corridor approach (cuts)

Figure 3.21 Concept enlargement plan - Berry township

1:4,000 metres
0 20 40 80 120 160 200 240


WOODHILL MOUNTAIN ROAD
Broughton Mill Creek
Reinstate Eucalyptus trees on steep batter
Casuarina trees
Proposed access underpass
Existing poplar trees
Tall Eucalyptus planting
Proposed access road
Reinstate creekline vegetation adjacent to bridge at creek crossing (Casuarinas)
Matchline
bridge at Berry
ACCESS ROAD
Broughton Creek
Tall Eucalyptus trees
Water quality basin
Steep batter 1.5:1 to 2:1
Deciduous tree planting lining entrance into Berry
Poplar trees along Woodhill Mountain Road to reinforce existing row
Camp Quality Park
Bundewallah Creek
Mananga Homestead
Water quality basin
Existing Liquidambar trees to be retained
WOODHILL MTN ROAD
PRINCES HIGHWAY
Berry sporting fields
Deciduous tree planting lining east side of entrance into Berry
New roundabout at Queen Street/ Woodhill Mountain Rd
Existing Princes Highway
NORTH STREET
Existing Liquidambar trees to be retained
Pulman Street precinct entry
Existing Berry bridge
TANNERY ROAD
SOUTH COAST RAILWAY LINE
QUEEN STREET
Broughton Mill Creek
PULMAN STREET
Ornamental deciduous trees define entry into Queen Street corridor
Pulman Street heritage precinct
Existing tree to be retained
Deciduous cultural / ornamental tree planting
Eucalyptus tree planting, species consistent with local endemic trees
Casuarina tree planting
Supplemental street tree planting
Supplemental poplar tree planting
Tall shrub/tree planting
Pasture grass reestablishment to edge
Water quality basin
Noise attenuation barrier (indicative extent only)
1:4,000
metres
0 20 40 80 120 160 200 240

4

Urban and landscape design strategy

4 Urban and landscape design strategy

4.1 Urban and landscape design process

Urban and landscape design objectives/issues and the goal of reducing visual impacts have been integral to the design process at all stages of the project to date and the development of the concept design has been continually assessed against these urban design objectives. A 'Gerringong to Bomaderry Princes Highway Upgrade Preliminary Urban and Regional Design Strategy' was prepared by AECOM in November 2007 prior to the identification of route options. This report informed the development of route options and the preferred option selection process.

This assessment was refined based on the:

- Urban design objectives and principles for the project study area as described in **Section 2.0.**
- Contextual analysis (based on landscape character units) of the project study area as described in **Section 5.0**.
- Landscape character and visual impact assessment and suggested mitigation measures (based on landscape character units and view shed analysis) of the project study area as described in **Section 6.0.**

4.2 Urban and landscape design assessment

The table shown in the following pages provide an assessment of the proposed concept design route against the urban design objectives and principles, and the design responses to that ongoing assessment.

Table 4.1 - Design assessment

Objective one **Provide a flowing highway alignment that is responsive and integrated with the landscape**		
	Design principles	**Design responses**
1)	Respond to the grain of the landscape, including following the edge of valleys and hills and avoiding disruption of stands of vegetation, both natural and cultural planting.	The project comprises an upgrade, including widening, of the existing highway alignment and new alignment in the vicinity of Toolijooa Ridge and the Broughton Creek floodplain. Some remnant stands of vegetation would be disturbed as part of the project. The creek crossings would impact on the mature stands of River She Oaks *(Casuarina cunninghamiana)* that line the banks. The surrounding landscape has developed around the existing road for more than 80 years therefore the project would impact adjacent stands of cultural vegetation that have evolved over time. The vertical alignment has been designed to improve grades and improve road safety. The landscape topography includes many areas where slopes are greater than 20 per cent and in some locations greater than 30 per cent. This presents a number of challenges to fitting a road with design speeds of 110 kilometres per hour (posted 100 kilometres per hour). Nevertheless, the road generally responds to the natural grain of the landscape by following the existing contours and utilising the existing road alignment where possible. Essential areas where topography is integrated with the road design include: • The interchanges at Austral Park Road and Tindalls Lane where utilising spurs result in road cuttings allowing for bridge overpasses. • Following the narrow ridgeline down into Berry.
2)	Integrate cut and fill embankments with surrounding terrain by grading out and varying slopes.	Cut and fill embankments would integrate with the adjacent landscape and be assessed at a detail level based on detailed geotechnical survey, slope, aspect and existing adjacent landscape character. Where significant embankments would be required, slopes would be decreased to improve visual and landscape character integration. Excess spoil would be used to soften batter slopes from 2:1 to 4:1 or less where the width of the corridor allows. The ultimate objective is that these flatter batter slopes would be restored to productive pastoral landscape consistent with the existing landscape character.
3)	Consider independently graded carriageways.	Independent grading of carriageways has been reviewed and the benefits to be gained are negligible. Generally, the nature of the landform through which the project passes does not require the consideration of independently graded carriageways.
4)	Preserve cultural patterns in the landscape.	The project alignment would minimise the long term impacts on productive land through appropriate earthworks and revegetation to essentially preserve the existing cultural patterns. This would be achieved by reinforcing the patterns of the broader landscape context. The use of cultural and local endemic species would be used to complement and reinforce existing landscape character.
5)	Avoid as much as possible impact to significant features of the areas through which the alignment passes.	The impact on significant landscape and landform features would be minimised as far as practicable without compromising road safety. The project would impact existing properties along the route (how they presently function and operate). The steep gradients and slopes in the vicinity of Toolijooa Ridge would necessitate the construction of a substantial cutting. The bridge to the north of Berry, while being a significant intervention, has been located to avoid severing the town's sporting facilities from the town centre. Along the North Street corridor, the strong visual and physical connection between the rural landscape (the foreground pastoral landscape and the background ridges and escarpments) and the townscape would be impacted. The project also aims to maximise the connectivity of west Berry to Queen Street along Kangaroo Valley Road with a 21 metre wide bridge over the proposed highway that would include space for a 3 metre wide shared path.
6)	Vary the gradient of the earthworks to provide visual interest and reflect the characteristics of the surrounding landform and landscape.	Earthworks would be integrated by incorporating where possible the opportunities and constraints identified by the geotechnical investigations. A number of embankment strategies have been developed including: • The increase in usability of pasture land adjacent to the road and integration of the highway with the surrounding landscape. • Reducing the visual impact of cuttings and embankments by introducing planting to the base and top of new batters where practicable. • Where corridor width permits and excess spoil is being generated, embankment widths would be increased to tie back into the existing landform.
7)	Grade out cuttings and embankments, wherever practicable, to best fit the characteristics of the local landform, returning the land to either its former use or replacing vegetation lost to the highway upgrade.	Cuttings and embankments would be graded to integrate with the local landform, land coverage and land use. Areas of vegetation lost would be reinstated, where possible. It is expected that there would be a large surplus of material resulting from the cutting at Toolijooa Ridge. To minimise this surplus it is proposed that some of that material be utilised to significantly soften the large (up to sixteen metres) 2:1 embankment to the west of Toolijooa Ridge. This land could then be reinstated to rural pasture blending in with the existing landscape more sympathetically. This would have no detrimental impact on the existing drainage patterns.

Objective two Protect the natural systems and ecology of the corridor		
	Design principles	**Design responses**
1)	Avoid areas of natural vegetation, particularly those containing threatened species and communities.	Much of the landscape surrounding the project has been cleared for agricultural purposes. Some of the remaining vegetation within the current road reserve would be impacted during construction. Impact to threatened species and communities would be minimised and any natural vegetation removed would be replaced and rehabilitated where possible. The most significant impact to existing vegetation would be at the creek crossing points and in the vicinity of Austral Park Road.
2)	Minimise disruption to natural drainage patterns both through route selection and road design.	Existing drainage systems would be retained and improved where appropriate. Upgraded and new crossings of Broughton Creek, Bundewallah Creek, and Broughton Mill Creek would be designed to minimise potential impacts on the existing drainage patterns. It is proposed that Town Creek would be diverted into Bundewallah Creek allowing for the bypass alignment to be lowered in the vicinity of North Street.
3)	Minimise the number of crossings of Broughton Creek and other creeks in the study area.	There are a total of five creek crossings within the study area. These include three crossings of Broughton Creek, one crossing of Broughton Mill Creek, and one crossing of Bundewallah Creek. All of these crossings are unavoidable as much of the proposed corridor runs through floodplain and natural drainage corridors. Broughton Creek meanders back and forth across the upper catchment resulting in the requirement for three crossing points.
4)	Use medians and road verges to maximise habitat value and maintain pollination paths and wildlife movement patterns where feasible.	The proposed planting areas include the embankments associated with new interchanges, and new embankments along the project and ribbon planting along property boundaries and waterways. The first crossing of Broughton Creek is a potential fauna movement corridor. Reinforcement of planting at this location would be considered in the detailed design phase of the project. Planting would also be carried out at the base of new cuttings where possible. Median widths are not sufficient to support planting of any major significance or scale. To reduce ongoing maintenance and occupational health and safety issues the median would be concrete pavement.
5)	Integrate the landscape qualities and characteristics of the highway corridor with the landscape form and character.	The project would pass through four landscape character unit types. These differ in topography, vegetation type, land use, land form and overall landscape character. The highway corridor would reflect and respond to the differences in these landscape units and their associated patterns. The four landscape units are: • Toolijooa Ridge. • Broughton Creek. • North Berry. • Berry.
6)	Integrate water quality basins with the landscape form and character.	Water quality basins would be integrated into the landscape to best represent how water bodies appear within the natural landscape. Design may consist of organic shapes, a low profile form by reducing steep batters, placing naturalistic objects in and around the basins and planting throughout the basins with native grass and ephemeral plant species. The detailed design would develop a mix of swale and basins for the treatment of runoff from the carriageway.

Objective three Protect and enhance the heritage and cultural values of the corridor		
	Design principles	**Design responses**
1)	Avoid items of identified European and Aboriginal heritage and cultural value.	Consultation in regard to Aboriginal heritage is ongoing. The cutting at Toolijooa Ridge has the potential to impact on both Aboriginal and European cultural and heritage items. Another area of European heritage where there are potential impacts from the project is at the intersection of Pullman Street and Queen Street at the entrance into Berry. These impacts have largely been avoided during the route selection process and any remnant impacts associated with the introduction of a roundabout at Tannery Road would be minor.
2)	Acknowledge and respond to the heritage and cultural values of the rural landscape.	Important values and connections to the cultural landscape would be maintained by using a range of strategies including: • Ribbon planting to emphasise property boundaries and waterways. • Reestablishment of pasture grasses. • Use of culturally relevant trees. • Reinstatement of rural fencing.
3)	Acknowledge and respond to indigenous value placed on the broader landscape.	The design would consider the recommendations of the heritage consultant and the outcomes of ongoing consultation with the Aboriginal community.
4)	Reduce the visual and noise impact of the highway through the design of the project.	Visual and noise impact to local residents may be significant for: • Isolated residences along the corridor. • The residents of Berry, particularly in the vicinity of the North Street corridor, the west end of Berry (between Queen Street and North Street) and Huntingdale Park Estate to the west of the proposed bypass of Berry. The alignment adjacent to the most populated section of Berry would be elevated for some of its length, up to two metres above existing grades at the western abutment of the bridge at Berry before a transition into cut underneath Kangaroo Valley Road. Detailed community engagement has been undertaken throughout the concept design. Feedback from a series of community working groups, focused on the development of the urban design treament along the North Street corridor has informed the design of the project and its interaction with its surroundings in this area. The inclusion of earth embankments and different noise wall treatments to minimise the visual impacts of the infrastructure in this area and maximise the use of the open space between North Street and the project have been carried through into the concept design (refer Appendix A).
5)	Consider the important value of the productive landscapes.	As the project involves both a widening of the existing alignment and bypasses of Foxground and Berry, it would impact on areas that are presently utilised as productive landscapes. New works would be integrated with the surrounding landscape to maximise the productive use of land (eg. by merging landscaping to the road edge and reducing batter slopes to gradients that would allow for grazing).

Objective four Respect the communities and towns along the highway		
	Design principles	**Design responses**
1)	Minimise the impact of the project on the amenity of residents of Berry.	The impact of the project to the township of Berry would be significant in its magnitude of change. Importantly, the project provides numerous opportunities for the town that could help to counteract identified constraints and / or adverse impacts. The amenity within Queen Street would be greatly enhanced by the removal of through traffic and heavy vehicles in particular. The proposed highway and bridge over Broughton Mill Creek and Woodhill Mountain Road, while large, would generally be obscured by the existing vegetation. The impacts have been greatly reduced through consultation with the community and multiple refinements of the design to reduce the height and scale of the proposed structure. As the project sweeps closer to town at the western end of the North Street corridor, there would be impacts on the existing amenity for residents and some form of noise attenuation would be required. The impact to amenity on the North Street corridor would be minimised by providing a legible circulation system, mounding, and suitable cultural and indigenous planting that would provide a refined pastoral landscape consistent in character with Berry. The longer term connectivity of the older established part of Berry and the newer growing western part of Berry (along Kangaroo Valley Road) has been considered, with the proposed provision of two shared paths over the Kangaroo Valley over bridge, to ensure that existing and future development is well integrated and suitable for pedestrians and cyclists. Residents living in Huntingdale Park Estate would be impacted with the north bound off ramp running immediately in front of Huntingdale Park Road before connecting into Kangaroo Valley Road.
2)	Provide effective and efficient access to Berry.	Connectivity between the project and Berry would be provided at the northern and western ends of town, which have been located and designed to ensure that the internal road structure and hierarchy of the township remains unaltered.
3)	Design new town access points as an important and integral part of the town, ensuring a clear and consistent way finding.	The new town access points would include landscaping and planting that is consistent with the existing landscape character of Berry. At the Berry east interchange, an appropriate relocation of the Alexander David Berry memorial would be considered. The City of Shoalhaven also utilises entry signage that would be considered for relocation. User views from the new access to the north of Berry (travelling southbound) would be restricted by embankments and bridge abutments. The Berry west interchange access to the town would be located in flatter terrain and the view of the township would be more evident than from the northern entrance. A self explanatory landscape environment would allow road users to transition from the highway into town in a legible and safe way. Generous landscape gestures and pedestrian and cycle integration would be integrated into this transitional landscape and road environment.
4)	Minimise the disruption and loss of amenity to rural communities in the study area.	There would be a range of loss of amenity to rural communities and residents depending on their proximity to the project. Access points would be provided at Austral Park Road and Tindalls Lane. The revegetation strategy would provide a balance of visual screening and reinforcement of the existing landscape character to minimise any loss of amenity.

Objective five Provide a safe, enjoyable and interesting highway with strong visual connections to the Pacific Ocean, immediate hinterland and mountains to the west		
	Design principles	**Design responses**
1)	Acknowledge the role of this section of Princes Highway as an important part of a longer scenic drive along the New South Wales South Coast.	The project has a visual connection to the ocean, township, rural land and forested escarpment. The visual experience shifts in this section from the dramatic coastal engagement seen further north, to the rural and rolling pastoral landscape. The urban design strategy takes advantage of this by maximising broader views, integrating the project with the existing landscape and using planting and design techniques for infrastructure that are culturally and visually relevant within the landscape context.
2)	Maximise opportunities for high quality and varied views of the coast, the rural landscape and adjacent mountain ranges.	The project would increase the opportunities for experiencing the coast, rural landscape and adjacent mountain ranges by opening up views across the rural landscape towards the Broughton Creek and Broughton Mill Creek catchments, the Toolijooa Ridge landscape, the coast (travelling north bound through Toolijooa Ridge) and the forested escarpment of the Cambewarra range. There would be a dramatic transition travelling southbound through the Toolijooa cutting and into the Broughton Creek landscape. Views to the ridges and escarpment specifically at the west end of North Street in Berry, would be impacted.
3)	Provide visual connections and easy, well marked access to the towns along the route.	The project locates the new southbound entrance (at the Northern Interchange) approximately 650 metres north of the existing entrance into the town. Visually the connection is difficult as the access (southbound off ramp) is in a cut on the ridge. The access would take users into the heritage precinct of Berry and to the main commercial centre along Queen Street. The second south bound exit would be at Kangaroo Valley Road and would have a stronger visual connections to the town with views from the bridge at Berry. Travelling northbound, an easy visual connection would be made with the township as the built form areas would be evident on both the eastern and western sides of the highway. The topography in this vicinity is generally flat to gently undulating.
4)	Use landscape treatments to soften the appearance of the road for the road user without compromising opportunities for key views.	The landscape is both a balance of the subtle detail of the foreground rolling open pasture, isolated trees, small forested clumps and tree lined creeks, contrasted against the dramatic escarpment beyond. The landscape treatment would endeavour to reinforce the existing landscape character and allow for the continuing engagement with it. Where possible the landform associated with the road corridor would be blended into the existing landscape. This would be further embellished with planting that is characteristic in form and species of the broader landscape. Around Berry the landscape treatments would embellish the existing landscape qualities and character to assist in integrating the proposed bridge at Berry, and earth mounds, low planting and noise attenuation walls along North Street into the landscape. The important cross connection between the established Berry (Queen Street) and West Berry (Kangaroo Valley Road) would include landscape treatments to reinforce connection and circulation. This would consider the connection at a pedestrian scale ensuring connectivity across the proposed highway.

Objective five **Provide a safe, enjoyable and interesting highway with strong visual connections to the Pacific Ocean, immediate hinterland and mountains to the west**		
	Design principles	**Design responses**
5)	Consider the heritage of the highway in the project so that where practicable road users may experience it.	Much of the heritage along the project may be experienced by the road user through the broader visual engagement with the landscape. The northern entrance into Berry takes the road user through the heritage precinct consistent with the existing town circulation.
Objective six **Develop a simple and unified palette of elements and details that are easily maintained**		
	Design principles	**Design responses**
1)	Develop a consistent approach to the design of bridges along the project. Urban design principles to be consistent with those outlined in the 'Bridge Aesthetics: Design Guidelines to Improve the Appearance of Bridges in NSW' (RTA, 2003).	There would be eight bridges associated with the project: • A bridge over the highway at the Toolijooa Road interchange. • Three bridges over Broughton Creek. • A bridge over the highway at the Austral Park Road interchange. • A bridge over the highway at Tindalls Lane interchange. • A large bridge north of Berry over Broughton Creek and Woodhill Mountain Road. • A bridge over the highway at Kangaroo Valley Road. The above would consist of a design family of bridges with their various contextual requirements influencing their individual specific elements. This approach is consistent with the 'Bridge Aesthetics: Design Guidelines to Improve the Appearance of Bridges in NSW' (RTA, 2003). The key driving objectives for the bridges are to make them as simple and elegant as possible to complement their landscape settings. The bridge at Berry would be located in close proximity to the main Berry sports grounds and the existing Camp Quality Park. The alignment and form of the bridge has undergone significant community consultation and design refinement to improve its form and reduce the height and scale of the structure. Careful consideration would be required through detailed design development with regard to the treatment of the bridge elements, particularly the soffits, headstocks, columns and abutments. The Kangaroo Valley Road bridge would serve as the key connection between the eastern side of Berry and the growing western side of Berry. The design of this bridge and adjacent connections onto the highway needs to consider pedestrians and cyclists and the connection into the landscape character of the town. Strategies around planting, lighting and bridge parapet detailing all require an integrated design approach to provide a legible and appropriate design outcome. Minimum design reference requirements would be provided (refer to **Section 7.0**) to ensure commitment to a quality design outcome for: • The overpass at Toolijooa Road. • The three Broughton Creek bridges. • The over bridges at Austral Park Road and Tindalls Lane. • The bridge at Berry. • The Kangaroo Valley Road interchange.

Objective six **Develop a simple and unified palette of elements and details that are easily maintained**		
	Design principles	**Design responses**
2)	Develop a consistent approach to the design of noise walls along the project. Urban design principles to be consistent with those outlined in the 'Noise Wall Design Guidelines: Design Guidelines to Improve the Appearance of Noise Walls in NSW' (RMS 2006).	Earth mounds, planting, and noise attenuation walls would be integrated as required particularly along the interface of the project with the township of Berry and in the vicinity of Huntingdale Park Road. Planting would be included to screen these elements where appropriate. This would be further addressed in the detailed design stage. A set of detailed design objectives is outlined in **Section 7.0**.
3)	Develop an integrated strategy for the avoidance, minimisation and improved appearance of shotcrete as outlined in the 'Shotcrete Design Guidelines: Design Guidelines to Avoid, Minimise and Improve the Appearance of Shotcrete' (RTA 2005).	A detailed geotechnical investigation would be undertaken during detailed design to investigate the need for shotcrete and minimise its use where possible.
4)	Develop a consistent approach to the design of soft landscape along the project. Planting design principles to be consistent with those outlined in the 'Landscape Guideline: Landscape Design and Maintenance Guidelines to Improve the Quality, Safety and Cost Effectiveness of Road Corridor Planting and Seeding' (RTA, 2008).	The project would include soft landscaping at the new interchanges, along embankments and at property boundaries and creek crossings, as well as along the project alignment where appropriate. The project would not pass through any large stands of existing vegetation, as the majority of the landscape consists of pasture lands with isolated clumps of either remnant or historic cultural planting. The soft landscaping approach would draw from this existing landscape character blending the new infrastructure with that character. A significant part of the soft landscape will be the reestablishment of pasture grasses disturbed during the construction of the project.

5

Contextual and landscape character analysis

5 Contextual and landscape character analysis

5.1 Regional context

The Princes Highway is the main north-south corridor between Sydney (the Illawarra and the South Coast of NSW) through to Victoria. It is a critical link for both passenger and freight transport and is a major route for tourism with significant peaks in holiday periods.

5.2 Local context

The project is located west of Gerringong, between the intersection of the Princes Highway and Toolijooa Road, and the intersection of the Princes Highway and Mullers Lane, south of Berry. The project traverses Toolijooa Ridge, Foxground bypass, crosses Broughton Creek in three locations and bypasses the town of Berry. The project lies partly within the Kiama local government area (LGA) and partly within the Shoalhaven LGA.

The surrounding landscape is strongly influenced both culturally and physically by the dairy industry. This activity has defined the general pattern of vegetation clearance, defined rural boundaries with linear cultural planting and influenced the distribution of rural houses and farm buildings.

The existing highway closely follows the interface between Broughton Creek floodplain and the foothills of the escarpment to the north and west. The landscape includes a number of minor ridge lines that radiate down into the floodplain. This association results in a number of sudden changes in grade from generally flat into slopes equal or greater than 25 per cent. This is reflected in the undulating alignment of the existing highway.

The backdrop is generally a pastoral and agricultural landscape on the flat and gently undulating slopes, punctuated by rows of cultural planting along field boundaries and isolated specimens or clumps of cultural planting. North and west of Broughton Creek and Foxground the terrain becomes steeper with pasture land and open forested slopes becoming more heavily forested.

5.3 Cultural landscape context

Within the study area the combination of the natural and cultural landscape forms a uniquely rich, engaging and tangibly enjoyable experience. This harmonious and attractive character is strongly identified with by local residents and more widely recognised as a key regional asset. The naturally occurring interaction between ocean, beaches and rocky headlands, narrow coastal floodplains, rolling hills and ridges and escarpments has greatly influenced the settlement patterns and land use types. The qualities of this interaction between the natural and cultural landscape are a defining feature for those who live and work within the study area and its broader surrounds. The valleys are verdant green and generally open, the ridges and escarpment enclose the landscape and reinforce its intimate and engaging properties while the trees are generally large and grand in stature. The cultural plantings and farming practices have developed in what appears as a harmonious and balanced way. The existing highway is very much part of this cultural landscape following each of the twists, bends and undulations. The highway also serves as direct access for many residents and has developed and influenced much of the local landscape response.

The significance of this natural and cultural landscape has been widely acknowledged and recorded. Navin Officer Heritage Consultants Pty Ltd (NOHC) prepared the *Foxground and Berry bypass – Princes Highway Upgrade, Cultural Heritage Assessment (Non-Aboriginal) Report (NOHC 2011)* which describes in detail the recorded cultural landscape framework. This report defines the broader region, including the project study area, as the Southern Illawarra Coastal Plain and Hinterland Cultural Landscape (SICPHCL). The recording of the landscape values associated with the SICPHCL are listed in **Table 5.1.** Consistent with all of these recordings is the recognition that the region retains a unique, aesthetically balanced and fundamentally nineteenth century pastoral structure.

For the road users there are many experiences and interpretations, the highway reveals a complex and harmonious landscape to its users. The coast and fertile coastal plains are often present in distant views across the rural landscape. There is a sense of prosperity due to the many well-established, stately trees (both indigenous and exotic) planted in both random and more formal arrangements. These create the 'portal' experience of travelling from open landscape with broad views to enclosed tunnel where canopies almost enclose the road corridor, before opening up again. Views also encapsulate the tree covered ridges and escarpments and meandering creeks and rivers that flow into the fertile coastal plains, lakes and wetlands. Creek lines are engaged frequently as the highway closely follows the varying topography.

The study area sits within the coastal hinterland west of Gerringong and Toolijooa Ridge and the floodplain and adjacent slopes of the Broughton and Broughton Mill Creeks. The topography varies from flat to undulating, graduating through to the relatively steep slopes around Toolijooa Ridge and a second ridge north of Berry. Immediately adjacent to the project are strong cultural patterns in the landscape associated with its ownership and agricultural and pastoral land uses.

The assessment of the landscape context is explored by its component parts of topography (slope), water courses, vegetation cover and land use. A visibility analysis has also been undertaken to assess the level of visibility of the project elements.

Table 5.1 - Cultural landscape framework

Southern Illawarra Coastal Plain and Hinterland Cultural Landscape*		
Cultural landscape framework identification	Recording background	Extents
Berry Bolong - Pastoral Landscape*	Defined by the 'Shoalhaven City Council heritage study' (Freeman, P. et al, 1998).	Extends south from the Southern Illawarra Range and includes the landscape between Mt Pleasant to the east, Browns Mountain to the west and Greenwall Point and the Shoalhaven River to the south. Refer **Figure 5.1**
Berry District Landscape Conservation Area*	Defined by the National Trust of NSW.	Refer **Figure 5.1** and **Figure 5.6**
Berry Township Urban Conservation Area (BTUCA)*	Defined by the Shoalhaven City Council heritage study. Listed on the National Trust register in 2011	Refer **Figure 5.1** and **Figure 5.6**

*** Refer to NOHC (2011) Foxground and Berry Bypass – Princes Highway Upgrade Cultural Heritage Assessment (Non Aboriginal) Report for detailed description of the Cultural Landscape Framework Identifications**

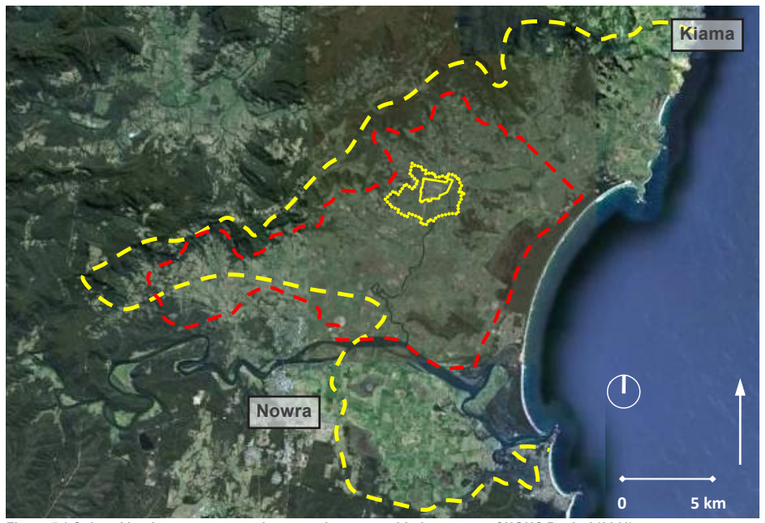
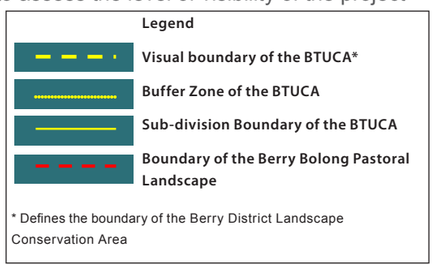


Figure 5.1 Cultural landscape conservation areas image provided courtesy of NOHC Pty Ltd (2011)



5.3.1 Topography (slope analysis)

There are four main geographic features that have an influence on the landscape character and visual qualities of the study area:

- The first is the Toolijooa Ridge which runs in a north south direction and separates the immediate coastal plain from the upper catchment of Broughton Creek.
- The second and most dominant features are the ridgelines and escarpment of the Cambewarra Range that forms the upper catchment for Broughton, Broughton Mill and Bundewallah Creeks. These ridgelines dominate views to the north, northwest and west within the study area.
- The third, Broughton Creek meanders across the study area from the escarpment in the west, to the Shoalhaven River catchment to the south east of Berry.
- Berry town is situated on the fourth geographic feature, an area of generally flat land, contained to the east and south by the South Coast railway line and pastoral flood prone land to the north. To the west of Berry is a ridge line that follows a valley up the escarpment. The future growth of Berry is almost exclusively to the west along the Kangaroo Valley Road corridor.

Figure 5.2 illustrates the relationship between the project route (in red) and the surrounding topography.

5.3.2 Land use

The main human influence on the landscape within the study area has been the agricultural practices that have occurred since European settlement. During early settlement of the Shoalhaven area, agricultural estates were established on land grants and much of the study area was progressively cleared for agricultural purposes. The predominant form of agriculture since the second half of the nineteenth century has been the dairy industry, resulting in a characteristic landscape of cleared rolling pasture with prominent cultural planting marking farmhouse locations, access roads and property boundaries. Corridors of native vegetation are often retained along drainage lines within the pastureland, while isolated native trees, particularly larger specimens of fig, remnant gum trees and cabbage tree palms, also occur.

Historically, the scale and character of settlement patterns were dependent on the distribution of small dairy farms. The town of Berry developed in response to the growing dairy industry. The settlement pattern today generally conforms to this historical pattern. **Figure 5.3** illustrates the relationship between the project route (in red) and its adjacent land uses.

5.3.3 Vegetation cover

Over time, much of the adjacent land surrounding the project has been cleared for agricultural and pastoral use, resulting in vast areas of grazing land. Extensive areas of native vegetation still remain, generally on the higher ridge lines and steeper slopes and escarpments which are unsuitable for grazing and along the existing drainage lines. Stands of cultural planting define property and fence lines and are particularly prominent as they flow downhill into the valley floors. There are isolated specimens of large gum trees in a number of open paddocks. At Tindalls Lane there is a larger remnant stand of eucalypt forest. When viewed in plan, the vegetation distribution seems sparse, however when viewed from ground level, its scale and size results in an alignment that appears well treed. **Figure 5.4** illustrates the relationship between the project route (in red) and the surrounding vegetation cover.

5.3.4 Water courses

There are four main water courses within the study area. Broughton Creek to the east of Berry and Broughton Mill Creek, Bundewallah Creek and Connollys Creek to the north and west of Berry.

These creeklines are generally well vegetated, dominated by large mature *Casuarina cunninghamiana* (River She Oak). **Figure 5.5** illustrates the relationship between the project route (in red) and the drainage lines/associated tributaries.

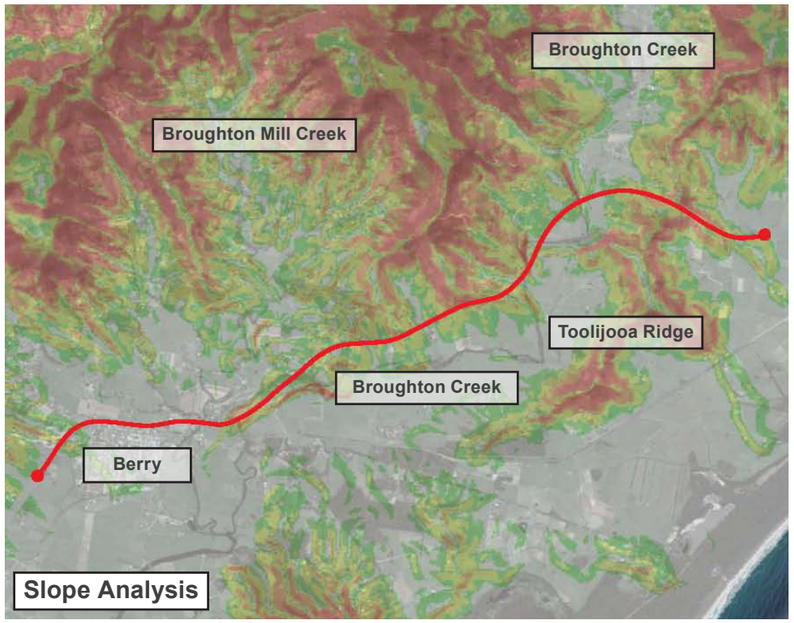


Figure 5.2 - Topography (slope analysis)

The slope analysis clearly illustrates the location of the project in relation to the surrounding topography, including the Upper Broughton Creek catchment between Toolijooa Ridge and the Cambewarra Range (ridges and escarpment). Minor ridge lines are also clearly evident fanning out into the Broughton Creek floodplain. The steep slope of Toolijooa Ridge is clearly evident.

Legend
- < 5%
- 5% - 10%
- 10% - 20%
- 20% - 30%
- +30%

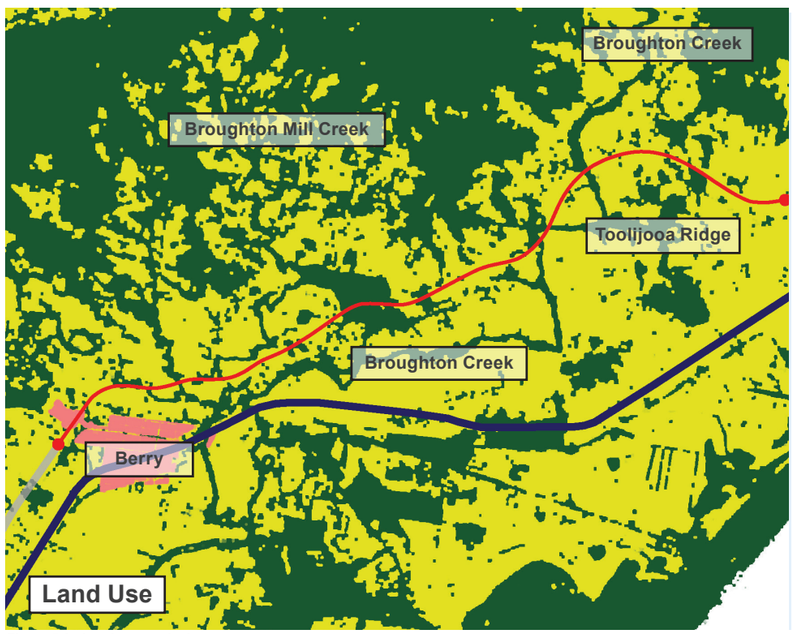


Figure 5.3 - Land use analysis

The land use diagram illustrates the project route traversing mostly farming / agricultural land. Vegetation is distributed chiefly along the drainage corridors or in isolated small clumps.

Legend
- Residential/ urban*
- Farm / Agricultural
- Vegetation
- Rail Corridor

* Not including scattered / isolated rural residences

Figure 5.4 - Vegetation cover

Adjacent to the project route vegetation cover is limited and planting consists of a mixture of cultural planting that identifies boundaries and fence lines with remnant River She Oaks defining the main drainage corridors. There are isolated clumps of large Eucalyptus trees on the undulating slopes of the escarpment. To the west and north the forested hills are clearly evident. There are larger stands of vegetation in the vicinity of Tindalls Lane adjacent to the existing highway.

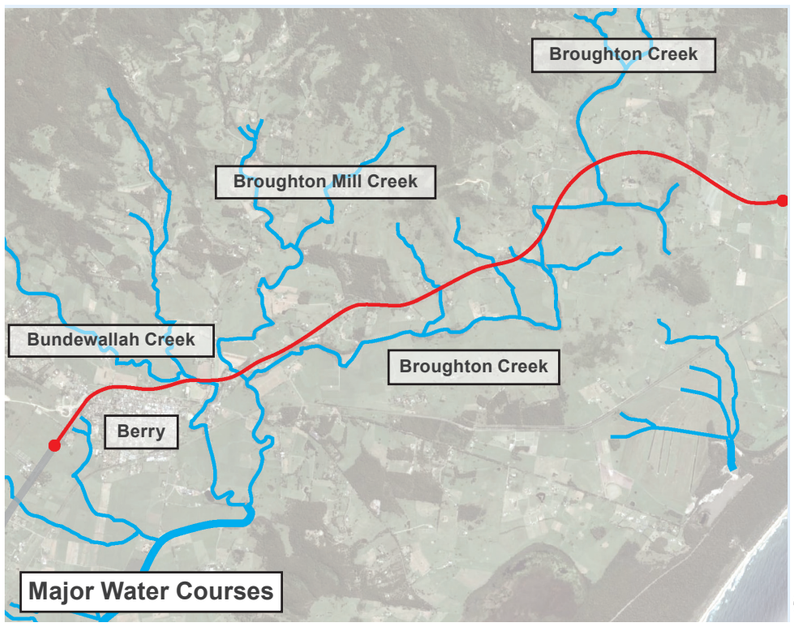


Figure 5.5 -Major water courses

Consistent with the slope analysis, the key drainages are clearly evident moving in a north to south/south-west direction and interacting with the highway in a number of locations.

5.4 Built form context

The built form and landscape elements together define the local character of the region. The towns that have developed in support of the farming and dairy industries (and later tourism) have evolved in harmony with the surrounding landscape.

5.4.1 The Princes Highway

The existing Princes Highway is a significant element in the context of the study area. From Toolijooa Road the highway traverses open landscape and scattered rural residential properties before it enters the urban area of Berry.

5.4.2 Berry township

Berry is located at the southern end of the study area and with its rich heritage it is a very popular stopover point and destination for tourists and travellers.

The town (originally called Broughton Creek) developed as an extension to the rural activities that were occurring in the area. The original township of Berry consists of a number of attractive buildings and quaint shop fronts reflecting the wealth of the surrounding agricultural landscape. More recent development is ongoing to the south and west of the town. Presently the town can be considered as having three component parts, these being:

- Original Berry or the Pullman Street Heritage Precinct.
- Established Berry.
- West Berry, where the majority of future expansion and growth will occur along Kangaroo Valley Road.

Figure 5.7 and 5.8 illustrates these three areas.

Original Berry is a small area occupying a narrow piece of flood free land just upstream of the confluence of Broughton and Broughton Mill creeks.

The street grid that comprises established Berry represents early development patterns with the growth area (west Berry) along Kangaroo Valley consisting of a less rigid development pattern.

The existing Princes Highway runs along established Berry's main street (Queen Street) with the resulting traffic generally creating a negative influence on the amenity of the town centre. Queen Street does however remain the focus of activity in the town both for locals and visitors, with the historic character of the built form largely maintained and a range of boutique stores and stores more typical of a country town occurring.

Berry is a key component of the broader cultural landscape that has been widely recognised and recorded (refer **Table 5.1)**. 'Foxground and Berry Bypass - Princes Highway Upgrade: Cultural Heritage Assessment (Non-Aboriginal) Report' (NOHC, 2011) describes in detail the important cultural landscape items within the BTUCA.

The BTUCA identifies a number of key elements that have strong influence on the landscape and visual character of the region including:

- The rural context of the town.
- The street tree and garden/ park plantings within the town.
- The strong containment of the town's urban footprint and the abrupt boundaries with the adjacent rural landscape.
- The views to the escarpment and rural landscape.
- The views into the town from the surrounding countryside.

The BTUCA outlines three zones:

- A visual boundary that is consistent with the regional boundary of the Berry Bolong District Landscape Conservation Area illustrated in **Figure 5.1.**
- A subdivision boundary defining the 19th century town grid illustrated in **Figure 5.6.**
- A buffer zone which aims to protect the adjacent rural setting of the town's grid **Figure 5.6.**

In general, Berry's character is one of an intimate historic rural town. This strong and well established identity suggests that a bypass of the town should enhance its visitor and resident experience by eliminating through traffic and heavy vehicles from the town centre.

The northern section of Berry is defined by North Street which forms a clear delineation of the northern edge of town, with adjacent rural landscape to the north and sporting grounds to the east. This land is flood prone and has limited the expansion of the town. The North Street corridor is well used by locals connecting the sporting grounds with the town and providing uninterrupted views across the rural landscape to the escarpment beyond.

The South Coast railway line defines the southern edge of Berry with the track line and station forming prominent features. Views south consist of generally flat and flood prone pastureland.

To the north and west the forested ridgelines and escarpment have a prominent visual presence from many locations within the town. They provide a strong connection with the surrounding natural environment influencing the character of the town (particularly that of Queen Street). Views towards the flatter pastureland to the east and south east are generally less prominent from within town, being most evident from the southern and eastern fringes of the town.

5.4.3 Berry township - constraints and potentials

A review of the proposed Berry bypass alignment was undertaken in order to understand the constraints and potentials.

The following bypass constraints have been identified.

- Maintaining escarpment views to the north and west of the town.
- Maintaining east west connection between the established town of Berry and the West Berry area.
- Maintaining farm viability to the north of Berry.

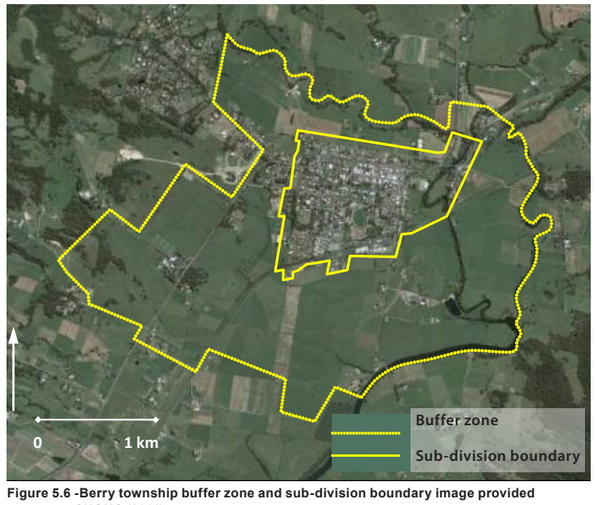


Figure 5.6 -Berry township buffer zone and sub-division boundary image provided courtesy of NOHC (2011)

- Noise attenuation requirements being visually dominant.
- Extensive areas of flood prone land, existing drainage patterns and high water table.
- Requirements for bypass user safety (engineering geometry standards) and 1: 100 year flood immunity.
- North Street streetscape integrity.
- Berry township urban integrity and legibility.
- Berry sportsground integration.

These constraints are illustrated in **Figure 5.7**.

The following bypass opportunities have been identified.

- Reducing impact on escarpment views.
- Maximising the east west connection within Berry.
- Minimising impacts on a viable farming property to the north of Berry.
- Minimising the visual prominence of the bypass and noise attenuation measures.
- Minimising the road corridor impacts on creek lines and flood prone land.
- Enhancing the new Berry arrival and departure interchange locations.
- Reinforcing the connectivity of recreational green space.
- Reinforcing the township street grid and North Street integrity.
- Improve the Town Creek flooding during storm events and reduce the frequency of nuisance flooding.

These opportunities are illustrated in **Figure 5.8.**

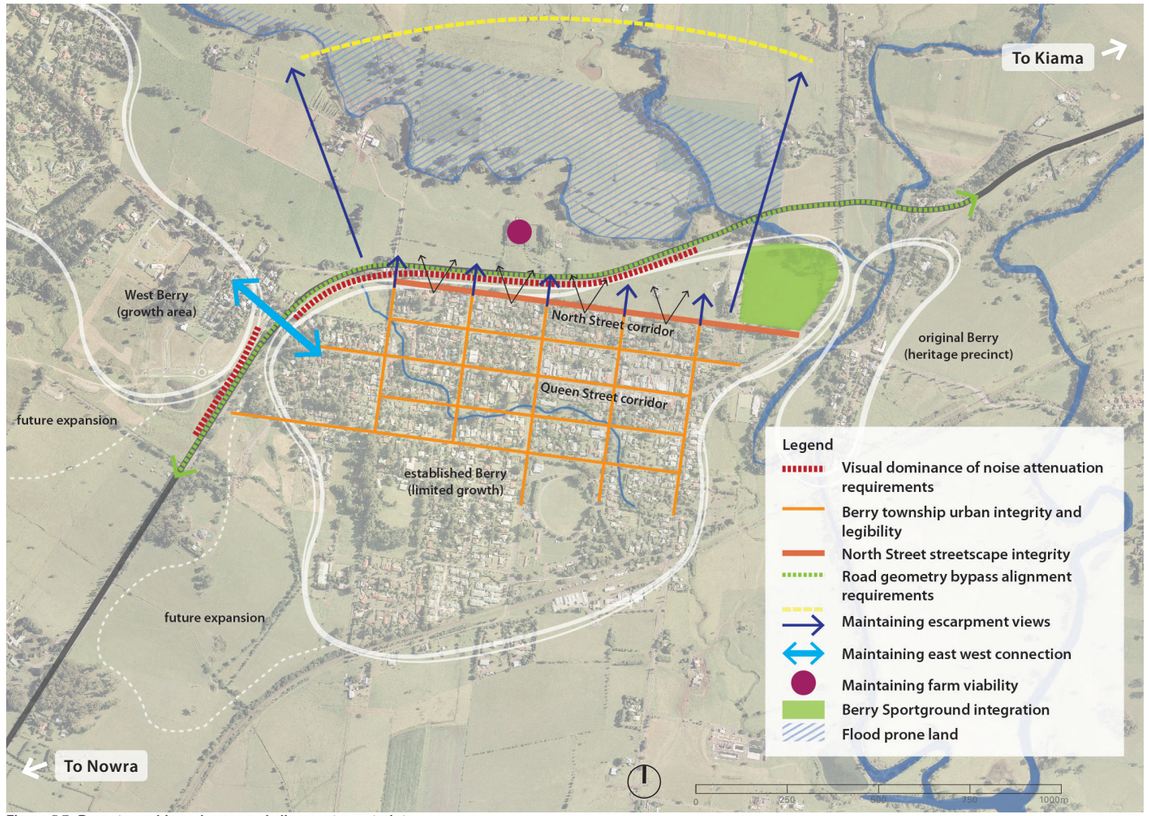


Figure 5.7 -Berry township and proposed alignment constraints

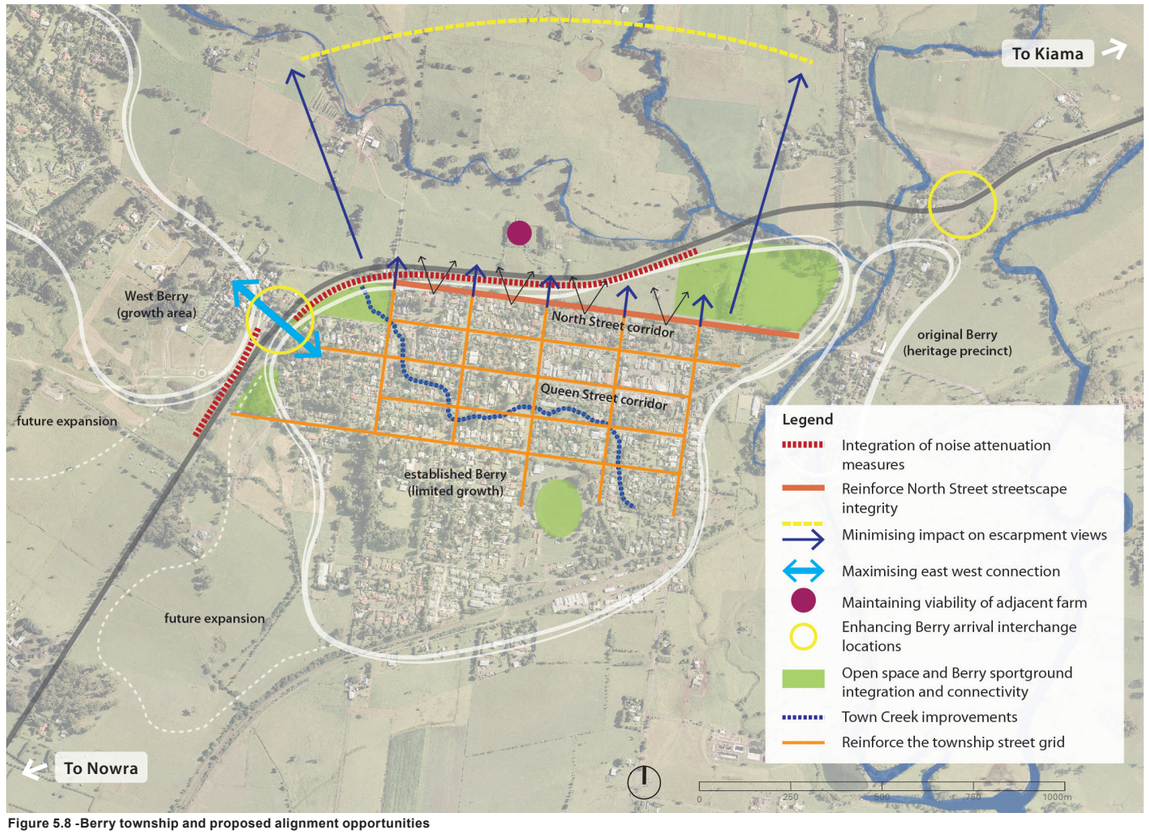


Figure 5.8 -Berry township and proposed alignment opportunities

5.5 Landscape character units

To assist with the assessment process landscape character and visual impact assessment, four landscape character units have been identified within the project study area. These are described below and illustrated in **Figure 5.9** and **5.10.**

1. **Toolijooa Ridge -** At the northern end of the project the prominent Toolijooa Ridge extends south from Currys Mountain. Its landscape consists of a mix of agricultural land and larger tracts of remnant vegetation including some Ecologically Endangered Communities (EECs).
2. **Broughton Creek -** Forms the valley between the western side of Toolijooa Ridge and the east facing lower slopes of the Cambewarra Range. Its landscape is characterised by a harmonious balance of small rural residencies, isolated clumps of native vegetation and cultivated landscapes set within broad open pastoral fields. The main areas of remnant vegetation are located adjacent to Broughton Creek, as illustrated in **Figure 5.11**. The creek banks are populated with mature stately River She Oaks *(Casuarina cunninghamiana)*. Small rural dams also punctuate the landscape and the patterns of land ownership, reinforced by fence lines, access drives and other cultural planting provides an organised element within the landscape. The meandering drainage lines and verdant backdrop combine to provide the experience of a harmonious, nurturing and intimate landscape.
3. **North Berry -** Undulating hills and a ridge line separate the Broughton Creek and Broughton Mill Creek drainages. This landscape is a mosaic of rolling pasture, remnant trees and isolated pockets of forest. The existing trees are large in stature and the terrain changes quickly in terms of steepness of slope and varying aspect. Travelling through this landscape highway users are exposed to a constant interplay between open or sparsely treed paddocks and densely forested stands. There are glimpses across the landscape to both the east and west as the highway encounters the ridge line. As the highway travels south into Berry views become more restricted.
4. **Berry -** The town developed to support rural activities that were occurring within the area. The established section of town occupies the flatter area west of Broughton Creek. Its overall growth has been constricted to the north and south by the limits of flood immunity and to the south east by the railway line which forms a physical barrier. East of this is the much smaller historic heritage precinct or original Berry. To maintain the town's growth, development is occurring on the higher ground along Kangaroo Valley Road to the north west. A detailed description of the town's character is provided within **Section 5.4.2.** A bypass of the main street of Berry was first proposed in 1968 and despite the reduced amenity caused by the current highway alignment the town has thrived. Berry's character is one of a richly diverse rural town. Three clearly identifiable sub-units relating to the project exist within Berry, illustrated in **Figure 5.10,** including:

- **Bridge at Berry -** a proposed bridge over Broughton Mill Creek, Woodhill Mountain Road and Bundewallah Creek (approximately 600 metres in length and up to 20 metres in height).
- **North Street Corridor -** defines the northern extent of the town. The bypass would be sited approximately 90 metres from the eastern end of North Street, approaching to 40 metres, before crossing North Street at its western end.
- **Kangaroo Valley Road interchange -** including a 55 metres long road bridge with associated access ramps into Berry and Huntingdale Estate.

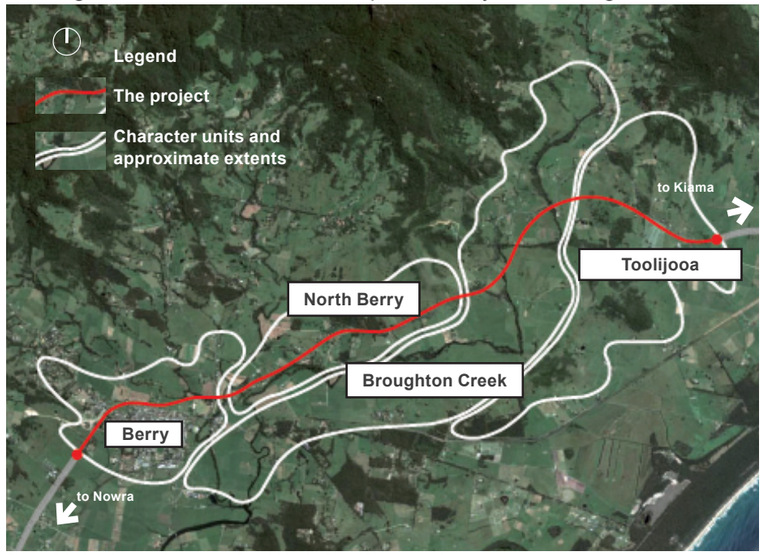


Figure 5.9 - Landscape character units within the Berry Bypass study area

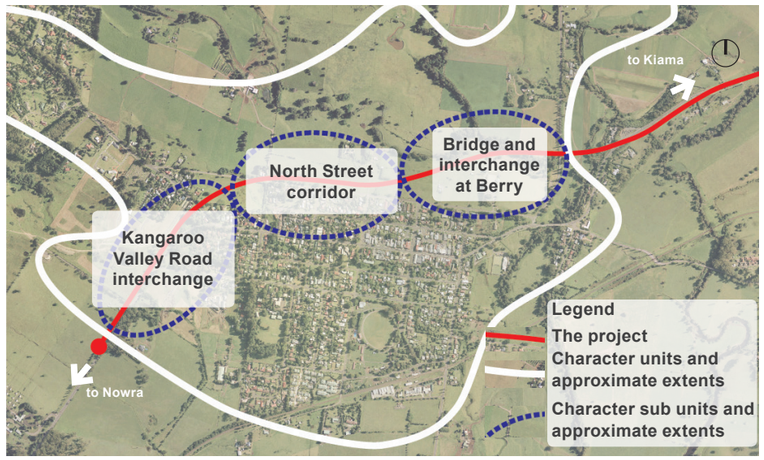


Figure 5.10 - Landscape sub - character units within the Berry landscape unit

5.6 Contextual and landscape character analysis: summary of findings

The key findings from the contextual analysis are:

- Within the study area the combination of the natural and cultural landscape forms a uniquely rich, engaging and tangibly enjoyable experience. This harmonious and attractive character is strongly identified with by local residents and widely recognised as a key regional asset.
- The surrounding landscape is strongly influenced both culturally and physically by the dairy industry. This activity has defined the general pattern of vegetation clearance, defined rural boundaries with linear cultural planting and influenced the distribution of rural houses and farm buildings.
- The nature of the terrain varies significantly between the four landscape character units, from the large extent of steep slope on Toolijooa Ridge, through to the flat floodplain of Broughton Creek, to the quickly changing and variable north Berry slopes and the flatter flood prone land around the northern and western sides of the Berry township.
- Berry is recognised as the first truly rural town south of Sydney and with its rich heritage, it is a very popular stopover point and destination for tourists and travellers.
- Presently the town can be considered as having three component parts, these being:
  - Original Berry or the Pullman Street Heritage Precinct.
  - Established Berry.
  - West Berry, where the majority of future expansion and growth will occur.
- The northern section of Berry is defined by North Street which forms a clear delineation of the northern edge of town, with adjacent rural landscape to the north and sporting grounds to the east. This provides for uninterrupted views across the rural landscape to the ridges and escarpment beyond.
- The existing Princes Highway alignment runs just north of original Berry and along established Berry's main street (Queen Street) with the resulting traffic generally creating a negative influence on the amenity of the town centre.
- The significance of the natural and cultural landscape has been widely acknowledged and recorded. 'The Foxground and Berry Bypass – Princes Highway Upgrade: Cultural Heritage Assessment (Non-Aboriginal) Report' (NOHC, 2011) report describes in detail the recorded cultural landscape framework and history.

- To the north and west, the forested ridgelines and escarpment have a prominent visual presence from many locations along the existing highway and within Berry. They provide a strong connection with the surrounding natural environment influencing the character of the town (particularly that of Queen Street).
- The route constantly interacts with existing creeks and drainage lines with crossings proposed at a number of locations.
- Corridors of native vegetation are often retained along drainage lines within the pastureland, while isolated native trees, particularly larger specimens of fig, remnant gum trees and cabbage tree palms, also occur. There are five dominant tree species which occur along the route. These include:
  - *Ficus macrophylla* (Moreton Bay Fig).
  - *Eucalyptus pilularis* (Blackbutt).
  - *Eucalyptus salignus x botryoides* (Blue Gum).
  - *Casuarina cunninghamiana* (River She Oak).
  - *Livistona australis* (Cabbage Tree Palm).
- The extent of vegetation cover appears much more substantial when experienced from ground level rather than viewed in plan. This is likely due to the scale of the existing trees many of which are mature and greater than 15 metres in height.
- With broad valleys, stately trees and rolling green pasture the landscape reflects a richness and vitality that constantly engages the road user. This is illustrated in **Figure 5.12.**
- The road user also experiences constantly changing open and enclosed views including broad expansive pasture, well vegetated portals and valley tunnels. This is illustrated in **Figures 5.13** and **5.14.**
- The immediate built form context of the route includes a number of small working farms/rural residences and the town of Berry.
- The study area can essentially be broken into four landscape character units, each of which are closely interrelated:
  - Toolijooa Ridge.
  - Broughton Creek.
  - North Berry.
  - Berry.
- Within the Berry landscape character unit three sub-units have been identified:
  - Bridge at Berry.
  - North Street corridor.
  - Kangaroo Valley Road interchange.

Fig Tree - *Ficus macrophylla*

Remnant cabbage tree palms - *Livistona australis*

Remnant existing Eucalyptus specimens

Existing River She Oaks - *Casuarina cunninghamiana*

Figure 5.11 - The dominant creek line vegetation contrasts sharply with the open pasture land across the Broughton Creek floodplain

Figure 5.13 - Remnant areas of closed forest form portals and contrast with long views over pasture

Figure 5.12- The combination of open undulating pasture, cultural planting, creek line vegetation and remnant open and closed forest combines to form an aesthetically pleasing landscape

Figure 5.14 - Open areas of rolling pasture often occurring on slopes greater than 20 per cent

6

Landscape character and visual impact assessment

6 Landscape character and visual impact assessment

6.1 Methodology

The methodology for the landscape character and visual impact assessment is based on the 'Environmental Impact Assessment Guidance Note: Guidelines for Landscape Character and Visual Impact Assessment: EIA-N04' (RTA, 2009b). The impact grading matrix for the relevant levels of impact is illustrated in **Table 6.1.**

The assessment has been divided in two parts, the first is an overall assessment of the project and the second is an assessment of the four key landscape character units. The four landscape character units as described in **Section 5.0** assessment are:

- Toolijooa Ridge.
- Broughton Creek.
- North Berry.
- Berry.

The following methodology was used in assessing landscape character and visual impact for each of those units:

- A description of the project components within each of the four landscape units.
- Assessment of existing landscape character.
- Descriptions of the impacts of the project.
- Description of the visibility of the project.
- Assessment of sensitivity to proposed change.
- Assessment of the magnitude of proposed change.
- The overall assessment of the impact.
- The recommended mitigation strategies.

These are supported by figures that illustrate the following:

- The context of the landscape unit and visual catchment of that landscape unit in relation to the project.
- The existing landscape context of the landscape character unit.
- The project design (generated from the 3D model of the project).

Artist's impressions from a series of selected viewpoints are included illustrating the likely final built outcome including suggested mitigation measures. The artist's impressions are represented with before and after images in **Section 6.7**.

It is assumed that viewers include road users and local residents. All of the visual assessments in the field were taken from publicly accessible land.

The visibility analysis was undertaken using a GIS based view shed analysis. Viewpoints were selected on the basis that they are vantage points or represent concentrations of people. Visual envelope maps were then produced illustrating the area of likely visual impact associated with the project to represent the range of views to the study area, including points both within and outside of the study area. View sheds for each of the selected viewpoints were mapped using GIS to illustrate the overall visual catchment.

6.2 Landscape character and visual assessment: overall project

General

Each landscape character unit is assessed in detail in **Section 6.3** through to **Section 6.6**. The overall ratings for sensitivity to change and magnitude of the proposed change are a consolidation of the detailed findings for each of the landscape units assessed.

Existing landscape character

The immediate study area associated with the project is set within what is widely recognised as a harmonious coastal hinterland/pastoral landscape. The existing landscape is a rich mosaic that balances cultural and natural patterns forming an intimate and engaging experience. The topography varies greatly from flat to undulating graduating through to relatively steep slopes on the west side of Toolijooa Ridge. In the valleys and adjacent to the highway, strong cultural patterns in the landscape associated with ownership and the agricultural and pastoral land use dominate.

Detailed project description

Refer to **Section 3.2** for a detailed description of the project design elements.

Impacts

Interventions associated with the project that would have a landscape character and visual impact on the four landscape character units would include:

- The relative scale of the project, this includes the footprint (width), structures (bridges and overpasses), significant lengths of new alignment and its increased elevation (flood mitigation measure).
- The introduction of large fill embankments and cut slopes.
- The potential for a reduction in amenity for the residents of Berry and west Berry/ Kangaroo Valley Road .
- The potential visual and physical separation for residents of west Berry (along the Kangaroo Valley Road corridor) from established Berry and Queen Street.
- The visual impact of eight new bridges.
- The scale of infrastructure required for the new town access points and access points along the alignment.
- The loss of existing roadside vegetation.

Visibility

Based on the generally open nature of the landscape and the variation in the localised topography, the project is within areas that have medium to high visibility. Visibility and viewer sensitivity to the project and modifications required for the project were analysed from the perspective of assumed viewer groups. These are primarily adjacent rural residents and users of the corridor itself.

Table 6.1 Landscape character and visual impact grading matrix - source RTA (2008)

Potential visual impact		Magnitude of change				
		High	High to moderate	Moderate	Moderate to low	Low
Sensitivity	High	High impact	High impact	High to moderate impact	High to moderate impact	Moderate impact
	High to moderate	High impact	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact
	Moderate	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact
	Moderate to low	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact
	Low	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact	Low impact

Sensitivity to proposed change

As discussed in **Section 5.0**, the existing highway and its setting and integration with the existing landscape character are inseparable. The development of the cultural landscape interface at the edges of the existing road has evolved over many years. A large number of residences directly access the highway, many with defined hedge rows, avenue plantings, fencing types and entry gates. Agricultural plots come right up to the road edge in some cases while in others remnant stands of vegetation occupy the thin strips of road verge and in some places completely envelop the highway. These interactions are all important contributors to the overall landscape character and experience of the place, providing immediate detail and framing broader district views.

There is also the need to recognise the greater level of separation that residents along the highway may feel as additional highway width may increase the sense of severance that may exist. The larger, broader experiences would still be evident, including visual engagement with the ridges and escarpments, but the rich detail presently experienced would be reduced in some places.

For Berry the impacts are at the same time positive and negative. The removal of traffic from the centre of town would improve the amenity for residents and town users of Queen Street. The visual impacts for the North Street corridor would be significant on the visual connection to the open pasture land and ridges and escarpment beyond. This is discussed in further detail in **Section 6.7.**

The viewer/user sensitivity (adjacent rural residents and road users) to the proposed change within the area is expected to be medium to high.

Magnitude to proposed change

Closely aligned with the impacts on the sensitivity of the place to proposed change, the impacts from the magnitude of the change generated by the project would be significant. The magnitude of upgrading from a two lane highway with a speed limit of 80 kilometres per hour to a four lane highway with central median and a speed limit of 100 kilometres per hour requires significantly more footprint than the existing highway. Much of the intimate landscape interactions presently experienced in the vicinity of the highway (by both residents and road users) would be either lost or greatly modified.

The scale of the upgraded highway would result in changes to residents' interactions with the highway from day to day direct highway access, agricultural operations and neighbourly connectivity, to larger scale physical relationship with alterations including potential house relocation, internal property circulation, cultural planting and visual outlook.

There is also the need to consider the likely timeframes for construction and the requirement for ancillary facilities during the construction period, which are all likely to add to the magnitude of change, especially in the short term.

Assessment of impact

The overall impact assessment was based on the average assessments completed for each of the four landscape character units:

- Toolijooa Ridge.
- Broughton Creek.
- North Berry.
- Berry, which includes the sub units of:
  - The bridge at Berry.
  - North Street corridor.
  - Kangaroo Valley Road interchange.

The impacts are summarised in **Table 6.2**.

For the detailed assessment of each of these impacts, refer to **Section 6.3** through to **Section 6.6**.

Based on the overall scale of the proposed intervention and the relative distance that the majority of users would experience these interventions from, the overall impact is rated as high to moderate.

Overall rating - High to Moderate.

Mitigation strategy

The recommended mitigation strategies to minimise impacts to the landscape and visual character of the project include:

- Minimise the apparent width of the corridor through reinforcement of the existing landscape patterns and integration of the project with the existing landscape context.
- Integrate new vegetation with the existing landscape character and vegetation communities.
- Ensure that the appropriate footprint is developed as part of the project, including consideration of the construction footprint versus the final footprint.
- Integrate large fill embankments and cut slopes through reestablishing pasture grasses and culturally relevant planting.
- Define minimum design standards for the bridge structures.
- Engage adjacent land owners and community groups in assessing whether early works mitigation (eg.; landscape planting) can be achieved to help soften or decrease likely impacts of the project.

Table 6.2 Landscape and visual impact summary table

Potential landscape and visual impact summary table				
Category	Character unit			
	Toolijooa Ridge	Broughton Creek	North Berry	Berry
Sensitivity	High to Moderate impact	High to moderate impact	High to moderate impact	High to Moderate impact
Magnitude	Moderate impact	High to moderate impact	High to moderate impact	High impact
Overall	High to Moderate impact	High to moderate impact	High to moderate impact	High impact
Overall (All units)	High to moderate impact			

6.3 Landscape character and visual impact analysis - Toolijooa Ridge

Existing landscape character

Travelling south west from Gerringong, the open pastoral landscape extends to the north and south of the existing highway which makes its way along an eastern spur of Toolijooa Ridge. Here the ridge contains the view and separates the coastal plain from Broughton Creek further to the west. There are isolated clumps of trees on steeper slopes separated by rolling pasture grasses. A small number of rural residences are located mostly to the north of the existing highway.

Project components

The project includes the continuation of the Gerringong upgrade two lane dual carriageway and involves the following components within the Toolijooa Ridge landscape character unit:

- A new alignment through Toolijooa Ridge for a separated dual carriageway.
- A new over bridge at Toolijooa Road.
- Large cut batters through Toolijooa Ridge (up to 25 metres in depth).
- Allowance for northbound and southbound climbing lanes.
- A northbound climbing lane from Broughton Creek.

Impacts

Interventions associated with the project that would have a landscape character and visual impact on the Toolijooa Ridge landscape character unit would include:

- A new alignment through Toolijooa Ridge.
- Large cut batters.
- Loss of some vegetation associated with corridor widening.
- Introduction of infrastructure into a landscape where there presently is none.

Visibility

To the east of Toolijooa Ridge the project would travel up a ridge line from Toolijooa Road within an open landscape before entering into a cutting. The nature of the surrounding terrain has low visual exposure to surrounding rural residents.

The main points of visibility to the cutting would be from the existing highway near the Foxground bends and north (towards Foxground). For road users, the cutting would be a visually dominant element and it would frame vistas both to the west (the escarpment) and to the east (Gerringong and the Tasman Sea).

Figure 6.1 illustrates the visibility of the Toolijooa Ridge landscape character unit proposal. **Figure 6.2** shows the overall existing landscape character of the Toolijooa Ridge landscape character unit, while **Figures 6.3** through **6.8** illustrate the project.

Sensitivity to proposed changes

The views to Toolijooa Ridge are mostly experienced by road users and an isolated number of rural residents. Residents south of Gerringong can also access distant views. The new cutting, while substantial, would run perpendicular to the ridge, minimising the extent of exposure to the east and west (location of most viewers). The cuttings would be large and would have an impact within the landscape, however considering viewer distance, the sensitivity to change would be moderate.

Rating - Moderate.

Magnitude of proposed changes

The topography of Toolijooa Ridge results in it being the divide between the immediate coastal landscape and the broader rural valley and escarpment. It is to be expected that this transitional experience will be maintained but that the scale of the intervention will cause moderate change to the Toolijooa Ridge profile and visual form.

Rating - Moderate.

Assessment of impact

Based on the overall scale of the proposed intervention and the relative viewer distance, the overall impact is rated as moderate.

Overall rating - Moderate impact.

Refer to **Table 6.3** for the impact assessment.

Mitigation strategy

The recommended mitigation strategies to minimise impacts to the landscape and visual character of the Toolijooa Ridge character unit include:

- Close to vertical cuttings in the suitable rock.
- Keeping the cutting benches at a consistent profile that matches the elevation of the roadway.
- Enclosing the view at the end of the cutting to frame views.
- Establishment of vegetation to the top of the cutting to ensure integration with the adjacent landscape.

For the application of these mitigation strategies and the concept design illustrated in **Section 3.0** refer to **Figure 3.2** through to **Figure 3.27**.

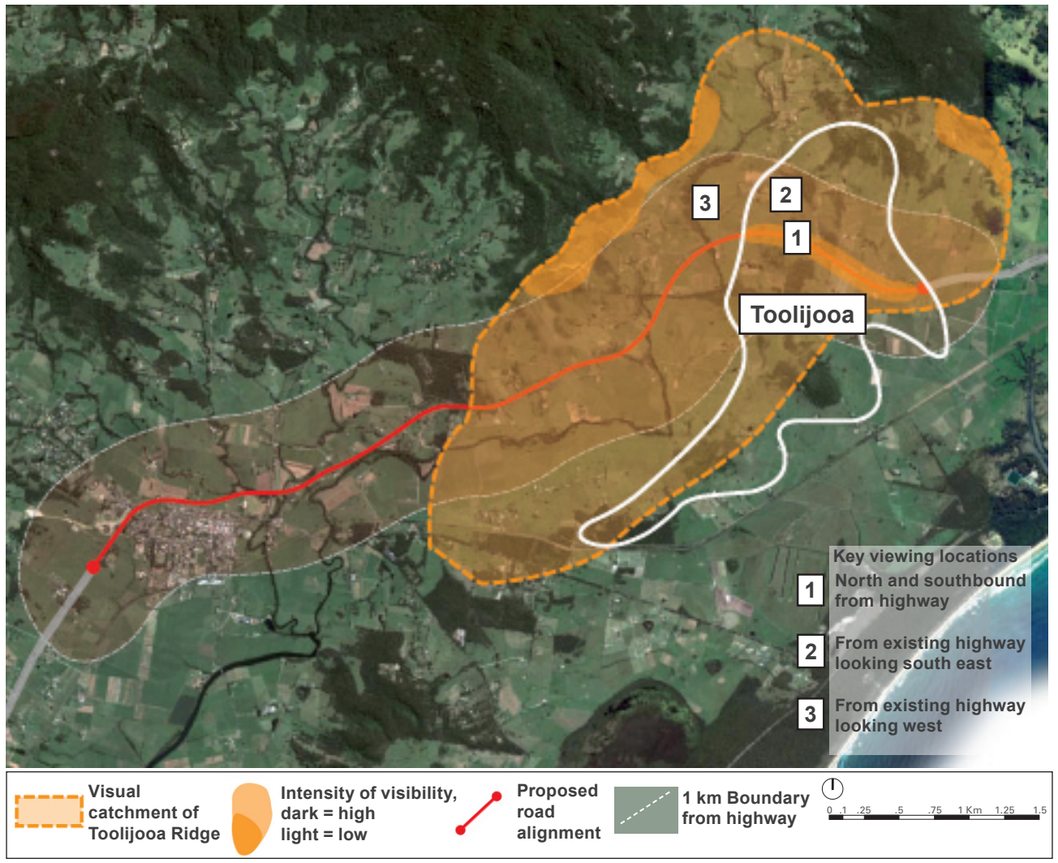


Figure 6.1 Visual catchment and key viewpoints of the Toolijooa landscape character unit

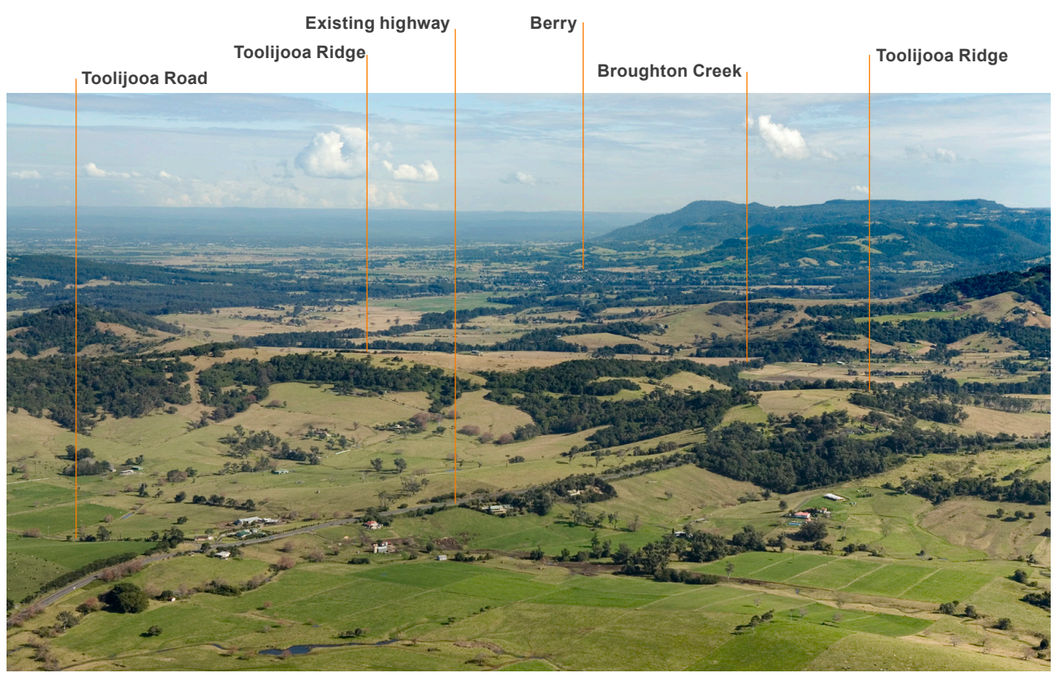


Figure 6.2 Toolijooa landscape looking south east

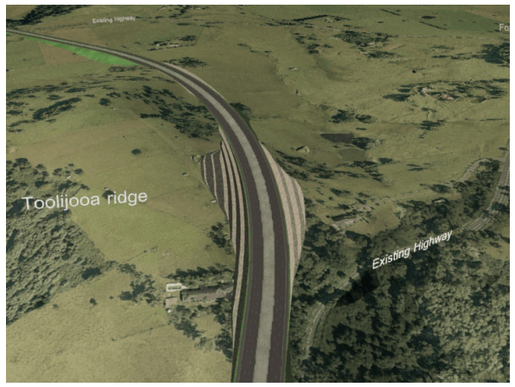


Figure 6.3 Significant cutting at Toolijooa Ridge

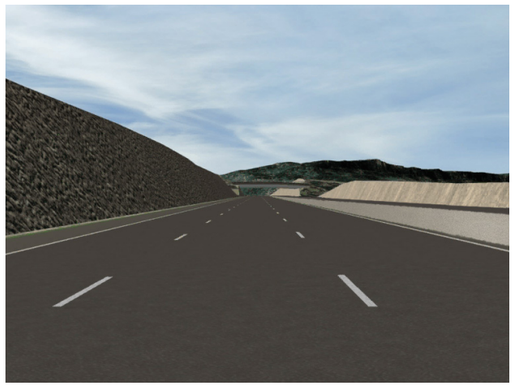


Figure 6.4 Travelling southbound on the eastern side of Toolijooa Ridge

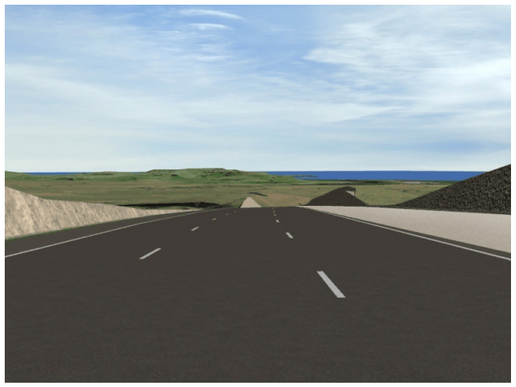


Figure 6.5 Travelling northbound on the eastern side of Toolijooa Ridge toward Gerringong

Figure 6.6 Travelling northbound across the eastern side of Broughton Creek

Table 6.3 Impact assessment table for the Toolijooa landscape character unit

Toolijooa Ridge landscape character unit potential landscape character and visual impact		Magnitude of change				
		High	High to moderate	Moderate	Moderate to low	Low
Sensitivity	High	High impact	High impact	High to moderate impact	High to moderate impact	Moderate impact
	High to moderate	High impact	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact
	Moderate	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact
	Moderate to low	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact
	Low	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact	Low impact

6.4 Landscape character and visual impact analysis - Broughton Creek

Existing landscape character

Broughton Creek and its adjacent floodplain is located between the western slopes of Toolijooa Ridge and the eastern slopes of Broughton Village. The Broughton Creek valley runs in a north south direction, while the creek line meanders back and forth across the floodplain.

The landscape is generally open pasture with vegetation (trees) mostly present along the creek corridor where mature *Casuarina cunninghamiana* form large walls to the open pasture. To the north is the upper catchment around Foxground with the valley opening up to the south. There are small numbers of rural residences and working farms along the floodplain, many of which contain cultural planting including hedges, avenue driveways, and windbreaks.

Project components

The project involves the following components within the Broughton Creek landscape character unit:

- A new road alignment across the Broughton Creek floodplain.
- Large embankments near Toolijooa across the floodplain.
- Three new bridges across Broughton Creek.

Impacts

Interventions associated with the project that would have a landscape character and visual impact on the Broughton Creek landscape character unit include:

- Introduction of infrastructure into a landscape where there presently is none.
- Introduction of large embankments (up to 16 metres) into a generally flat landscape.
- A large bridge over Broughton Creek (up to 200 metres) long and visible from the existing highway.
- The prominence of the elevated embankment across the floodplain between bridges one and three (providing the route with 1:100 year flood immunity).

Visibility

The visual catchment of Broughton Creek is contained by the western slope of the Toolijooa Ridge and the slopes south of Broughton Village. The project would be highly visible due to its elevation. The number of viewers within this landscape however is relatively low. The third bridge over Broughton Creek would be very visible from the existing highway and would have a significant impact on a private property adjacent to the alignment. For road users the dominate visual experience would be the surrounding landscape and bridge crossings as this whole section of highway would be elevated above the existing landscape.

Figure 6.7 illustrates the visibility of the Broughton Creek landscape character unit proposal. **Figure 6.8** shows the overall existing landscape while **Figures 6.9** through to **Figure 6.11** illustrate the project.

Sensitivity to proposed changes

The project at this point would bypass Foxground and would be furthest away from the existing alignment than at any other point along the project. This alignment results in the severance of some larger working properties.

There are no major stands of significant vegetation that would be impacted other than those associated with the three creek crossings of Broughton Creek (classified as a class one waterway) where some existing riparian vegetation would be removed.

Local residences with existing views of the upper Broughton Creek floodplain would be impacted in terms of visual amenity. The third crossing of Broughton Creek would require a bridge of up to 260 metres long and would be clearly visible from the existing highway.

Rating - High to moderate.

Magnitude of proposed changes

The impact on the existing landscape at Broughton Creek is significant when considering the large footprint of the project in this area. The height of the embankments, the length of the bridges and the number of bridges would all introduce new and significant infrastructure into this open landscape.

Rating - High to moderate

Assessment of impact

Based on the scale of the proposed interventions and the relative distance from which the majority of users would experience these interventions, the overall impact is rated as high to moderate. With the successful implementation of the recommended mitigation strategies, it would be expected that over time the impacts would be reduced as the landscape establishes.

Overall rating - High to moderate impact

Refer to **Table 6.4** for the impact assessment.

Mitigation strategy

The integration of the project into the existing landscape would require a combination of strategies to mitigate any potential adverse outcomes. Suggested mitigation strategies include:

- The large embankments at the interface between Toolijooa Ridge and Broughton Creek should be decreased as much as is feasible.
- The three bridges over Broughton Creek should be designed with simple clean forms.
- Vegetation adjacent to the bridges should be reestablished to maintain the viability of existing fauna corridors and portal experience within the landscape.
- Batters across the floodplain should be flattened to between 10:1 - 4:1 instead of 2:1 to utilise surplus spoil from Toolijooa Ridge and reestablish pasture landscape as close to the road edge as possible. This may also remove the requirement for road safety wire rope.

For the application of these mitigation strategies and the concept design illustrated in **Section 3.0** refer to **Figure 3.2** through to **Figure 3.27**.

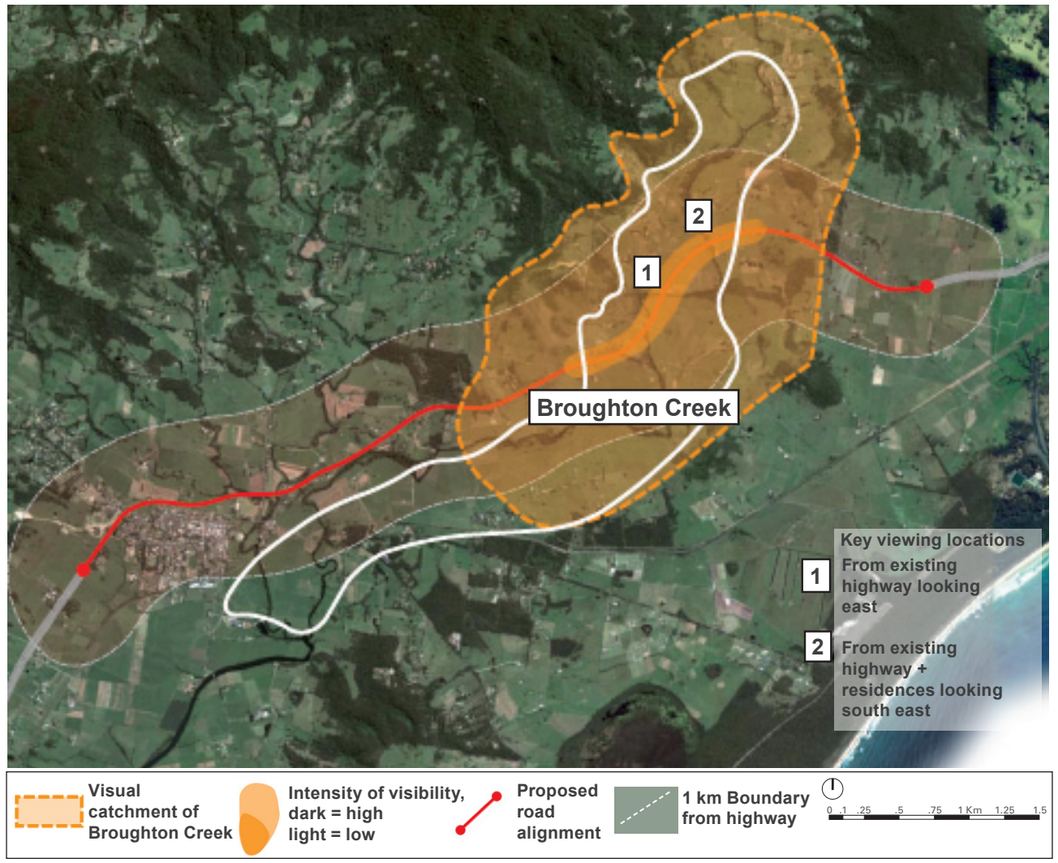


Figure 6.7 Visual catchment and key viewpoints of the Broughton Creek landscape character unit

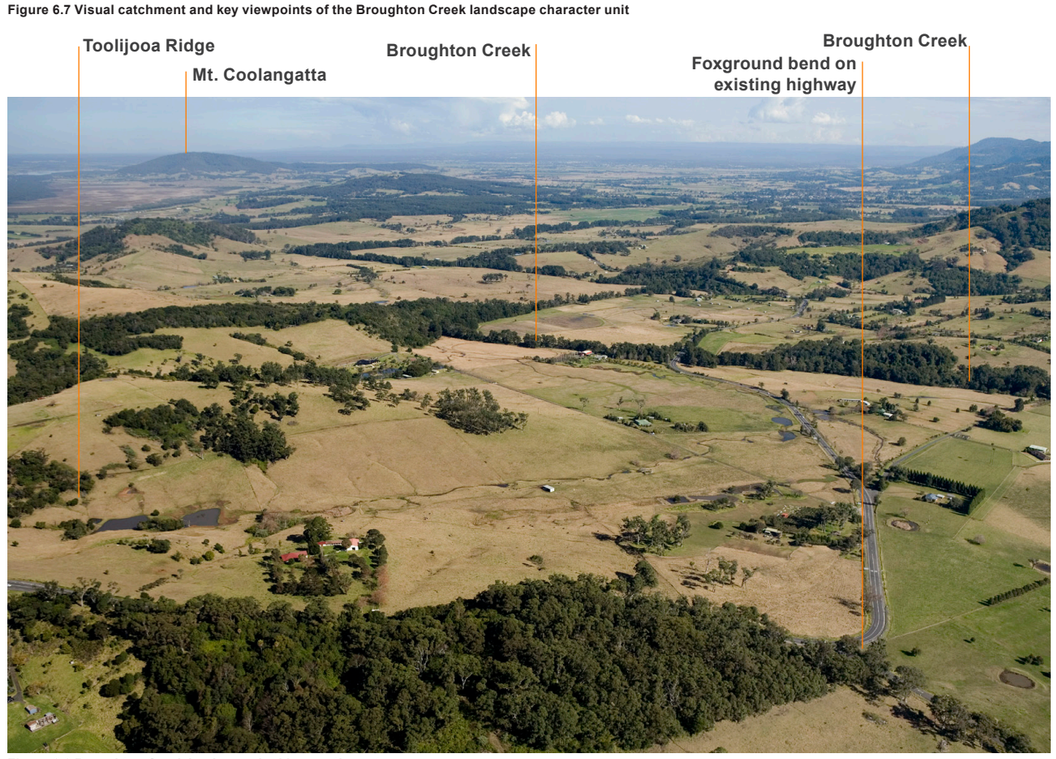


Figure 6.8 Broughton Creek landscape looking south west

Figure 6.9 Large embankments crossing the Broughton Creek floodplain

Figure 6.10 Travelling south bound (leaving the Toolijooa cutting) onto Broughton Creek floodplain

Figure 6.11 Broughton Creek Bridge in close proximity to the existing highway

Table 6.4 Impact assessment table for the Broughton Creek landscape character unit

Broughton Creek landscape character unit potential landscape character and visual impact		Magnitude of change				
		High	High to moderate	Moderate	Moderate to low	Low
Sensitivity	High	High impact	High impact	High to moderate impact	High to moderate impact	Moderate impact
	High to moderate	High impact	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact
	Moderate	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact
	Moderate to low	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact
	Low	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact	Low impact

6.5 Landscape character and visual impact analysis - North Berry

Existing landscape character

To the east of the Broughton Creek floodplain the road corridor follows the edge of the rolling hill and ridge line that separates the Broughton Creek drainage to the east and the Broughton Mill Creek drainage to the west.

This landscape is characterised by a mix of open rolling pastureland, isolated pockets of closed forest and undulating to steep terrain with views across the valley to the escarpment to the west. As the project gets closer to Berry the ridge line becomes narrower and views form to the east and south.

There are a number of isolated large Eucalyptus specimens (*Eucalyptus pilularis* and *Eucalyptus saligna x botryoides*) in open pastoral landscape that provide scale and frame views.

Figure 6.13 illustrates the existing landscape character of the North Berry landscape character unit.

Project components

The project involves the following components within the North Berry landscape character unit:

- A new interchange with the existing highway in the vicinity of Austral Park Road, including an over bridge.
- A new interchange at Tindalls Lane that makes use of the existing highway and includes an over bridge.
- Large extents of quickly transitioning cut and fill slopes.
- Left in / left out accesses along the highway allowing access to rural properties.

Impacts

Interventions associated with the project that would have a landscape character and visual impact on the North Berry landscape character unit include:

- Areas of significant earthworks required to improve the vertical alignment of the highway in a landscape that has many areas of slope at 30 per cent or steeper.
- The loss of roadside vegetation associated with the re-alignment and widening of the existing road corridor.
- The alteration to a number of property accesses along the existing route.
- Removal of vegetation along the ridge line just north of Berry.
- The potential visual impact of two over bridges on the tops of ridge lines at Austral Park Road and Tindalls Lane interchanges.
- Lighting - impacts at interchange intersections which would generally have ramp terminals, merge / diverge and weaving areas.

Visibility

The nature of the landform and vegetation cover combined with the relatively low number of adjacent rural residential viewers results in much of the highway not being highly visible. The primary viewing locations are from the existing highway itself and from a small number of local rural residences along the alignment. These are mostly clustered around the Austral Park Road area and Tindalls Lane. The increased footprint and loss of some large existing trees, as a result of the project, would likely result in the project being more visible particularly to the south-west. It is at this point that the ridge line narrows before entering into Berry and crossing Broughton Mill Creek.

Figure 6.12 illustrates the visibility of the North Berry landscape character unit proposal. **Figure 6.13** shows the overall existing landscape context.

Sensitivity to proposed changes

The project within the North Berry landscape character unit is generally a widening and or straightening of the existing highway alignment. Where the highway currently meanders and bends, a straighter alignment is proposed. The design also makes use of some of the residual existing highway to assist with safe access and circulation. The requirements for the vertical alignment would result in some large embankments that quickly transition from cut to fill through this undulating landscape.

Rating: Moderate

Magnitude of proposed changes

The existing highway alignment follows the undulating terrain very closely, but the design standards for a modern highway require flatter grades, the result being that large cut and or fill slopes follow in very quick succession. Additionally, areas of existing vegetation, including large trees would be impacted. As the project includes two new interchanges, a heavy vehicle rest stop and residual highway connections, the overall footprint on the landscape would be significant.

Rating: High to Moderate.

Assessment of impact

Based on the scale of the proposed intervention interfacing with the North Berry landscape character unit, the overall impact is rated as high to moderate.

Overall rating - High to Moderate impact.

Refer to **Table 6.5** for the impact assessment.

Mitigation strategy

The integration of the project into the existing landscape would require a combination of strategies to mitigate any potential adverse outcomes. Suggested mitigation strategies include:

- Consideration of in fill tree planting of the residual spaces between the existing highway and proposed highway.
- Reinstatement of vegetation along cuttings and embankments to help reduce the visual scale of the works, particularly close to ridge lines.
- The consideration of appropriate screening to adjacent rural residences.
- The planting of isolated single or small clumps of eucalypts to reinforce the broader landscape pattern.
- Rolling back the top of cut slopes to integrate with local topography and landform.
- Revegetation of any areas of existing highway left as residual landscape.
- Reinstatement of pasture grasses on flattened embankments where feasible.
- The use of farm style fencing in residual spaces between the existing highway and proposed highway to reinforce rural character.
- Integration of the water quality basins and swale systems within the landscape.
- Consistent detailing for the two over bridge structures.
- Vegetation to soften the sudden transitions from cut to fill slope.
- Lighting - all intersections are to be lit to ‘flag’ standard in accordance with ‘AS/NZS 1158 Code of Practice for Public Lighting’ and designed to avoid potential light spill impacts (measures to direct light source towards carriageway only).

For the application of these mitigation strategies and the concept design illustrated in **Section 3.0** refer to **Figure 3.2** through to **Figure 3.27.**

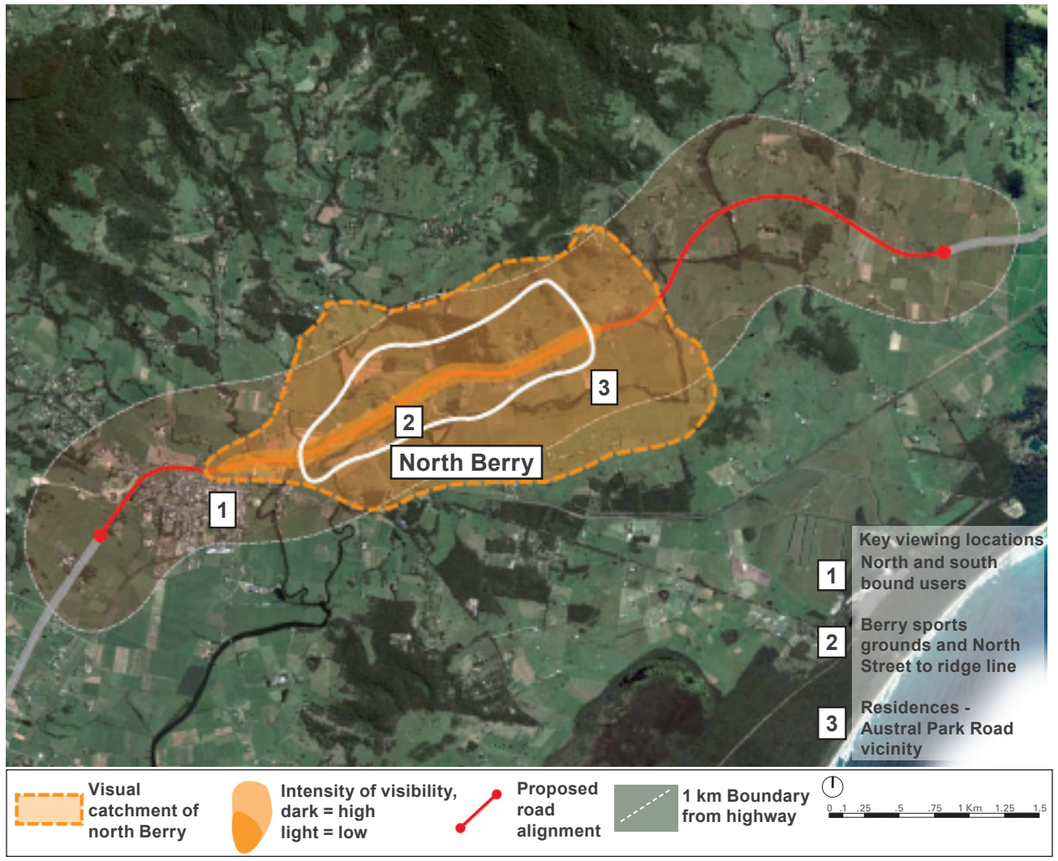


Figure 6.12 Visual catchment and key viewpoints of the North Berry landscape character unit

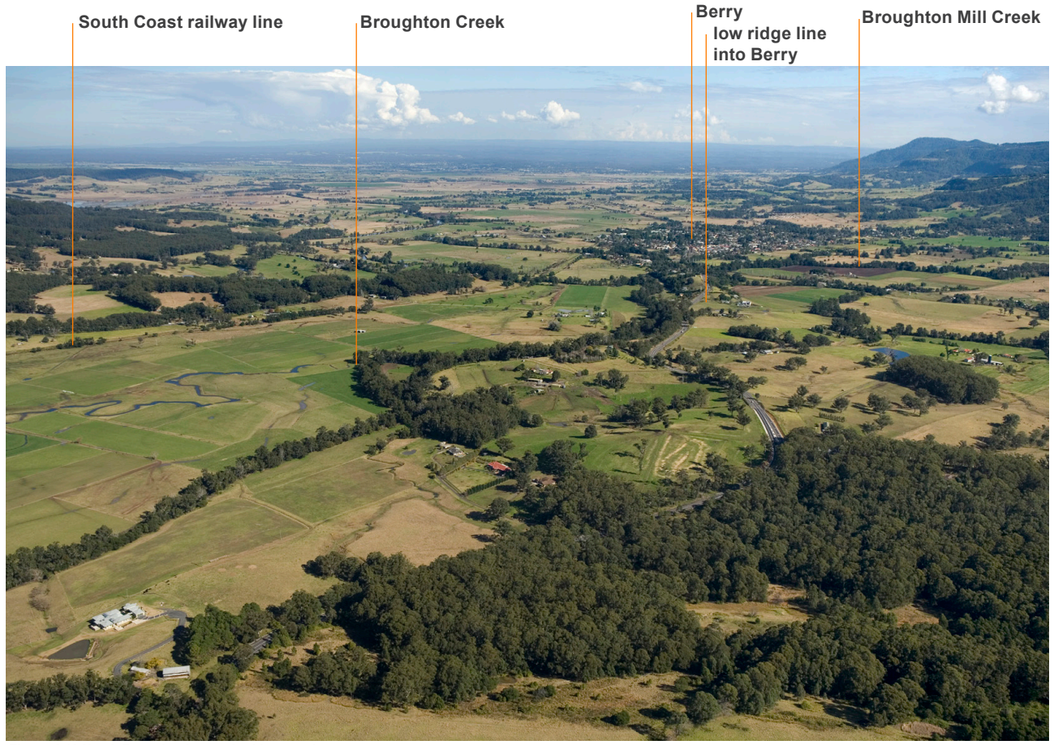


Figure 6.13 North Berry landscape looking south

Table 6.5 Impact assessment table for the North Berry landscape character unit

North Berry landscape character unit Potential landscape character and visual impact		Magnitude of change				
		High	High to moderate	Moderate	Moderate to low	Low
Sensitivity	High	High impact	High impact	High to moderate impact	High to moderate impact	Moderate impact
	High to moderate	High impact	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact
	Moderate	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact
	Moderate to low	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact
	Low	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact	Low impact

6.6 Landscape character and visual impact analysis - Berry

Existing landscape character

The township of Berry occupies the area of flat land just above the flood prone pasture of Bundewallah, Broughton and Broughton Mill Creeks. The town has clearly defined extents and strong visual connections with the surrounding rural landscape. The landscape within the town is a rich mix of traditional European cottage style gardens, hedges and isolated deciduous ornamental trees set against a back drop of remnant large Eucalyptus trees. The escarpment to the west and north is visually prominent and serves as a reference point within the town. To the west, the landscape of Berry's growth area is less formal in its street layout responding to existing topography.

Figure 6.15 illustrates the existing landscape character of the Berry landscape character unit.

Project components

The project would involve the following components within the Berry landscape character unit:

- A new interchange to the north of town that includes a southbound off ramp and a northbound on ramp.
- A new bridge over Broughton Mill Creek, Woodhill Mountain Road and Bundewallah Creek (approximately 600 metres in length) and up to 12 metres high.
- Significant new infrastructure along the North Street corridor.
- The diversion of Town Creek to the north of the highway to connect into Bundewallah Creek.
- A new interchange at Kangaroo Valley Road that includes southbound on and off ramps and northbound on and off ramps.
- A bridge over the highway at Kangaroo Valley Road.
- A new roundabout at the intersection of Woodhill Mountain Road and the existing Princes Highway.
- Closure of Victoria Street and the introduction of a cul-de-sac at the western end.
- South of Berry, on the western side of the upgrade, between the southern Berry interchange and Schofield's Lane a permanent variable message sign (VMS) that would service northbound traffic would be installed. The VMS would be around 6.1 metres in height and would be designed and constructed in accordance with the Guidelines for the location and placement of variable message signs.
- Noise walls located along the North Street corridor and adjacent to the northbound off ramp at the Southern Interchange for Berry.

Impacts

Interventions associated with the project that would have a landscape character and visual impact to the Berry landscape character unit include:

- A bypass of the township of Berry in close proximity to housing along North Street and Huntingdale Park Road including the introduction of new infrastructure where there presently is none.
- The bypass of Berry would be located within the area identified as the BTUCA. The BTUCA identifies a 'buffer zone' that seeks to protect the immediate rural setting along the North Street corridor. The proposed alignment of the bypass impacts directly on the distinct rural / urban boundary.
- A new interchange north of town located on a narrow ridge line requiring significant earthworks.
- Introduction of a significant bridge structure over Woodhill Mountain Road, Broughton Mill Creek and Bundewallah Creek.
- The loss of existing vegetation associated with the bridge at Berry.
- The loss of amenity along the North Street corridor and Huntingdale Park Road.
- The introduction of a new roundabout west of the existing Berry bridge.
- The potential 'perception of severance' in Berry by residents located west of the bypass alignment.
- Noise impacts and noise walls, to the residents of North Street and around Kangaroo Valley and Huntingdale Park roads.
- Some impact on vegetation and the amenity of Mark Radium Park.
- The loss of vegetation due to the road widening, works specifically:
  - Along the low ridge line at the entrance into Berry where the highway is at its widest point (including on and off ramps and the bridge abutment).
  - On the southern side of Berry where the bypass connects with the existing Princes Highway widening would require the removal of an existing row of Brush Box trees (*Lophostemon confertus*).
- Lighting - the interchange intersections would generally have ramp terminals, merge / diverge and weaving areas lit.
- South of Berry, the placement of the VMS introduces a large element into the western side of the road corridor.

Visibility

The key areas for viewing the project are from the North Street corridor, the Berry sports grounds, around Kangaroo Valley Road, Huntingdale Park Road, and Mark Radium Park.

The new interchange just north of Berry is large in scale and located on a narrow ridge and would be seen from a number of locations to the east, south and west.

The elevated nature of the bridge at Berry would have a visual impact, though this is somewhat mitigated by existing vegetation. North of town the longest unbroken visible elevation of the bridge would be from Woodhill Mountain Road.

Along North Street, the northern noise attenuation measures would be visible, with the highest intensity being toward the western end of North Street. The noise attenuation measures would be visible at the ends of each of the north-south streets. To the west the highway is closer to North Street before it goes underneath Kangaroo Valley Road in cut.

Along Huntingdale Park Road and the northbound off ramp, the noise attenuation measure located south of Kangaroo Valley Road would be visible. Proposed screening vegetation will help to mitigate this visibility. Refer CM+ design strategy in Appendix A.

Figures 6.16 through to **Figure 6.25** illustrate visual impacts from North Street towards the ridges and escarpment.

The Kangaroo Valley Road overbridge would be 21m wide.

The VMS would be around 6.1m high and would be located to ensure that conspicuity, legibility and comprehension are achieved.

Figure 6.14 illustrates the visibility of the proposal within the Berry landscape character unit. **Figure 6.15** shows the overall existing landscape context.

Sensitivity to proposed changes

The Berry sports ground, North Street corridor and Kangaroo Valley Road are all key elements of the landscape identity and functionality of the town and are very sensitive to intervention. The proximity, mass and scale of infrastructure present significant concerns with regard to visual and noise impacts. The Berry sports grounds are a focal community point as is the Camp Quality area located just north-west of the playing fields.

The North Street corridor is a quiet street that provides a delineation between the edge of town, the rural foreground and the background of the escarpment. This existing relationship would be significantly altered with the addition of the bypass.

The future expansion of Berry is restricted due to flooding, and currently predominantly occurs along the Kangaroo Valley Road corridor. Functionally, Kangaroo Valley Road is a continuation of Queen Street and with expansion to the west this connection will become more important. There is a requirement that the bypass not sever this key connection.

Rating - High to moderate.

Magnitude of proposed changes

The scale of the changes around the town are significant as would be expected with a bypass. The introduction of a large elevated bridge, potential noise attenuation measures, cuttings and over bridge as well as land acquisitions are all significant impacts.

Rating - High

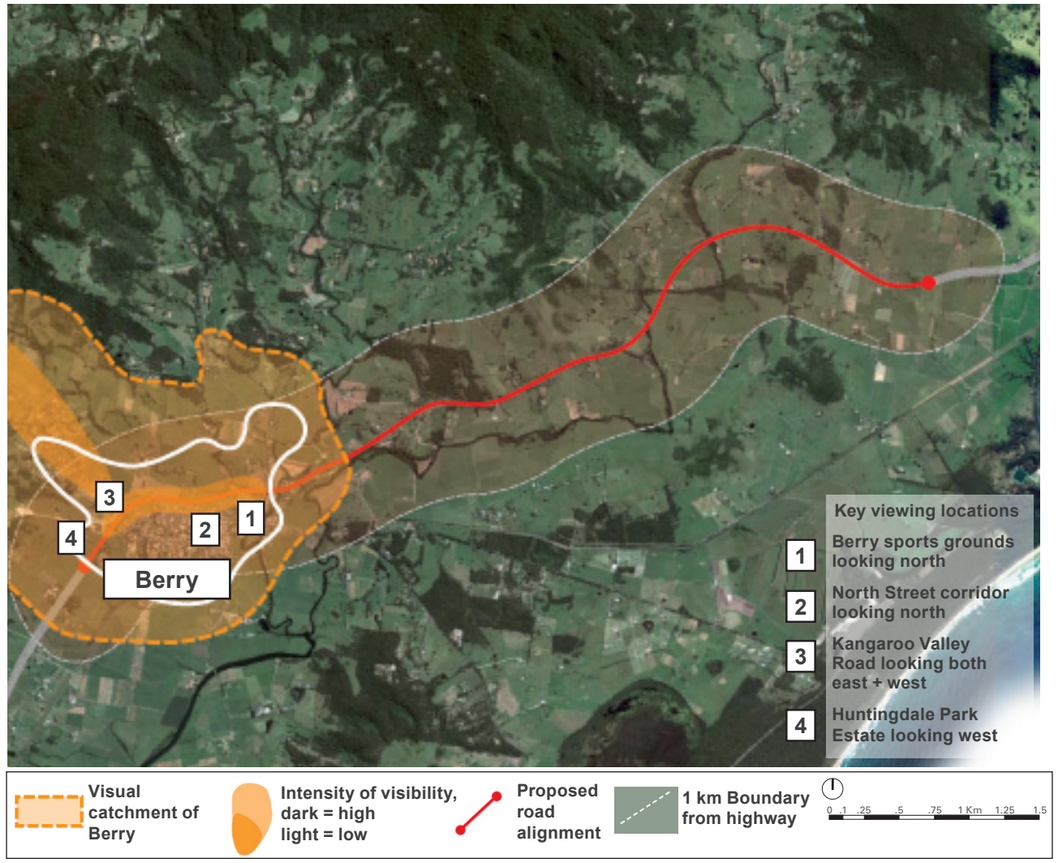


Figure 6.14 Visual catchment and key viewpoints of the Berry landscape character unit

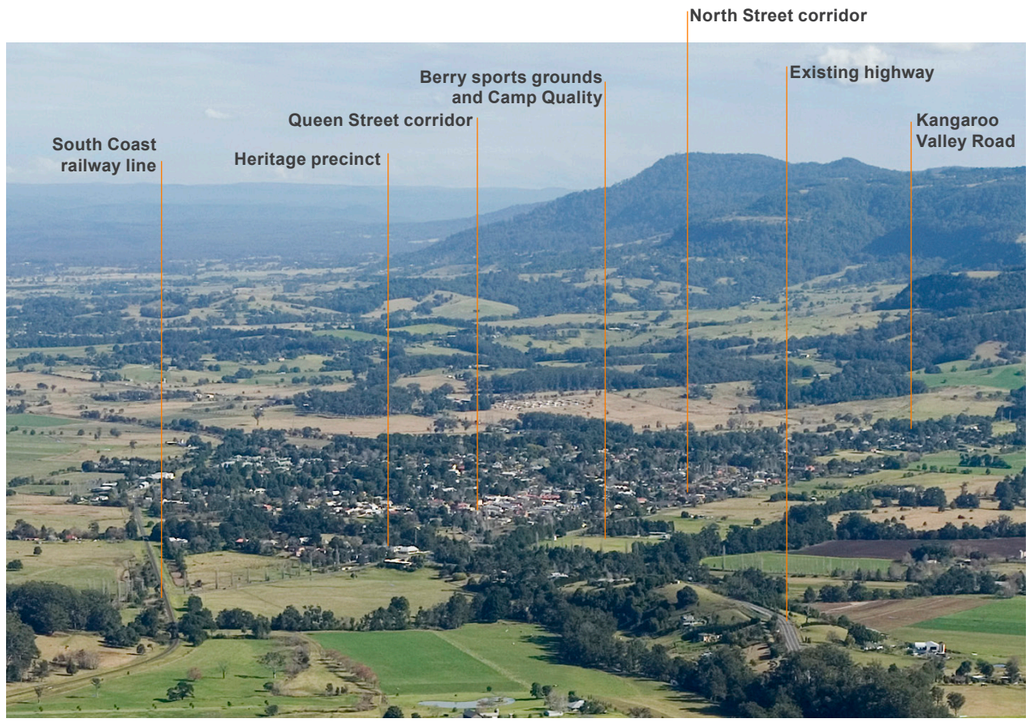


Figure 6.15 Berry landscape looking south west

Assessment of Impact

Based on the overall scale of the proposed intervention interfacing with the Berry landscape character unit, the overall impact is rated as high.

Overall rating - High impact.

Refer to **Table 6.6** for the impact assessment.

Mitigation strategy

Based on the High impact rating of the project on Berry, a series of focused community workshops and an independent urban design study was undertaken by CM+ and the findings of this have been incorporated into the concept design and the mitigation measures that follow. This study is documented in Appendix A.

The integration of the new highway alignment into the existing landscape would require a combination of strategies to mitigate any potential adverse outcomes. Consistent with the recommendations in RMS' 'Noise Wall Design Guidelines: Design Guidelines To Improve The Appearance of Noise Walls in NSW' (RMS, 2006), the recommendations for mitigation by considering;

- The existing landscape context and character.
- Utilising the space available for mounding.
- Proposing the use of locally relevant materials and planting.

Other suggested mitigation strategies for the Berry landscape character unit and sub units include:

- The bridge at Berry (sub unit):
  - Define the southbound town entry with culturally relevant planting and reinforce with an appropriate entry statement. This could be a suitable location for the Alexander and David Berry memorial.
  - Reinforce existing creek line vegetation to integrate the bridge within the landscape.
  - Minimise the number of columns for Berry bridge by maximising the span length (where feasible).
  - Utilise planting around the bridge abutments to blend the transition from bridge deck to embankment landscape.
  - Utilise background planting of Eucalyptus on the ridgeline at the interchange to soften the significant earthwork modifications.
- North Street (sub unit):
  - Blend the existing pastoral landscape up to the edge of the highway by reducing the steepness of the embankments.
  - Use a simple palette of low shrubs to screen the top of the sound attenuation wall, allowing the foreground landscape to blend in with the broader context.
  - Engage with the Berry community during the planning and design of the open space network.
  - Consider low screen planting to the northern side of the highway adjacent to the existing farming land and homestead.
  - Design planting within new roundabout at Queen Street and reinforce deciduous avenue planting that is consistent with the landscape garden character of Berry.
- Kangaroo Valley Road Precinct (sub unit):
  - Design planting within roundabouts and landscaped verges to the bridge that reinforce the landscape garden character of Berry.
  - At the north bound exit into town establish cultural tree planting consistent with that proposed at the northern interchange.
  - Consider the street lighting (scale and rhythm) and ornamental tree planting to unify the existing local road network with the new bridge and roundabouts.
  - Continue to engage with the Berry community during the planning and design of the open space network.
  - Lighting - all intersections are to be lit to 'flag' standard in accordance with AS/NZS 1158 Code of Practice for Public Lighting and designed to avoid potential light spill impacts (measures to direct light source towards carriageway only).
- Variable Message Sign
  - Consider locating the VMS between chainage 18650 and 18700 to;
  - Minimise impacts of any effects associated with silhouetting against the sky, between these chainages there is a very gradual down slope that will reduce any silhouetting
  - Minimise impacts on any vistas or views
  - Minimise impacts on any existing or planned built form
  - Maximise distance away from the interchange, signage and lighting that will be associated with the Kangaroo Valley Road Precinct.

For the application of these mitigation strategies and the concept design illustrated in **Section 3.0,** refer to **Figures 3.2** through to **Figure 3.28,** and CM+ study, Appendix A.

Table 6.6 Impact assessment table for the Berry landscape character unit

Berry landscape character unit potential landscape character and visual impact		Magnitude of change				
		High	High to moderate	Moderate	Moderate to low	Low
Sensitivity	High	High impact	High impact	High to moderate impact	High to moderate impact	Moderate impact
	High to moderate	High impact	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact
	Moderate	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact
	Moderate to low	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact
	Low	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact	Low impact

6.7 The ridges and escarpment - impact

A key requirement of the project DGRs is to:

"*Assess the visual significance of the area, including the escarpment and ridges and the township of Berry, and impact of the proposed alignment*'".

This requirement requires the assessment of:

- The visual connection to the ridges and escarpment.
- The visual significance of the township of Berry.

The escarpment and ridges and the township of Berry

As the escarpment and ridges are well outside the study area the assessment focuses on the loss of the visual connection to the escarpment and ridges due to the project concept design. The ridges and escarpment form a constant backdrop to the north, north west and west of the project. The only area where they cannot be seen is immediately east of Toolijooa Ridge. The ridges are almost exclusively heavily forested and form a dramatic contrast to the more 'managed' agricultural landscape of the rolling hills and floodplains below.

The township of Berry sits within two layers of landscape. The first is the immediate, generally open pasture and flood prone land, all set against the second broader Broughton Mill Creek valley defined by the ridges and escarpment.

The proposed alignment along North Street would introduce a third and significant element into this landscape setting of Berry. With its close proximity to North Street the visual interface would be significantly altered.

The impacts to views of the ridges and escarpment from Berry are due to two main factors. The first is the introduction of the bypass as a new element with a significant foot print into the area north of North Street. The second is the requirement for noise mitigation to the residents of Berry in the vicinity of North Street. Based on the concept design for the project, modelling indicates that a four metre high barrier would be required to mitigate the expected noise impacts.

There are six prominent points along the ridges and escarpments which are visible from Berry town; these are identified in plan in **Figure 6.16** and from aerial perspective in **Figure 6.17** and **Figure 6.18**. These points will provide a method of measuring the project's visual impact of views towards the escarpment.

Methodology

Through the assessment of various viewpoints along the east west aligned streets including North Street, Albert Street and Queen Street and the north south aligned streets including George, Edward, Albany and Alexandra Streets, a relative impact intensity map was produced to show level of impacts on the views to the ridges and escarpments to the west and north of Berry.

To further illustrate this, three viewpoints where selected to assess the relative impact on the visual connection to the ridges and escarpment. The three viewpoints selected were:

- Point A, from the eastern end of North Street near the intersection with Edward Street (refer **Section 6.7.1**).
- Point B, from the intersection of Albert Street and Edward Street (refer **Section 6.7.2**).
- Point C, from the intersection of Queen Street and Edward Street (refer **Section 6.7.3**).

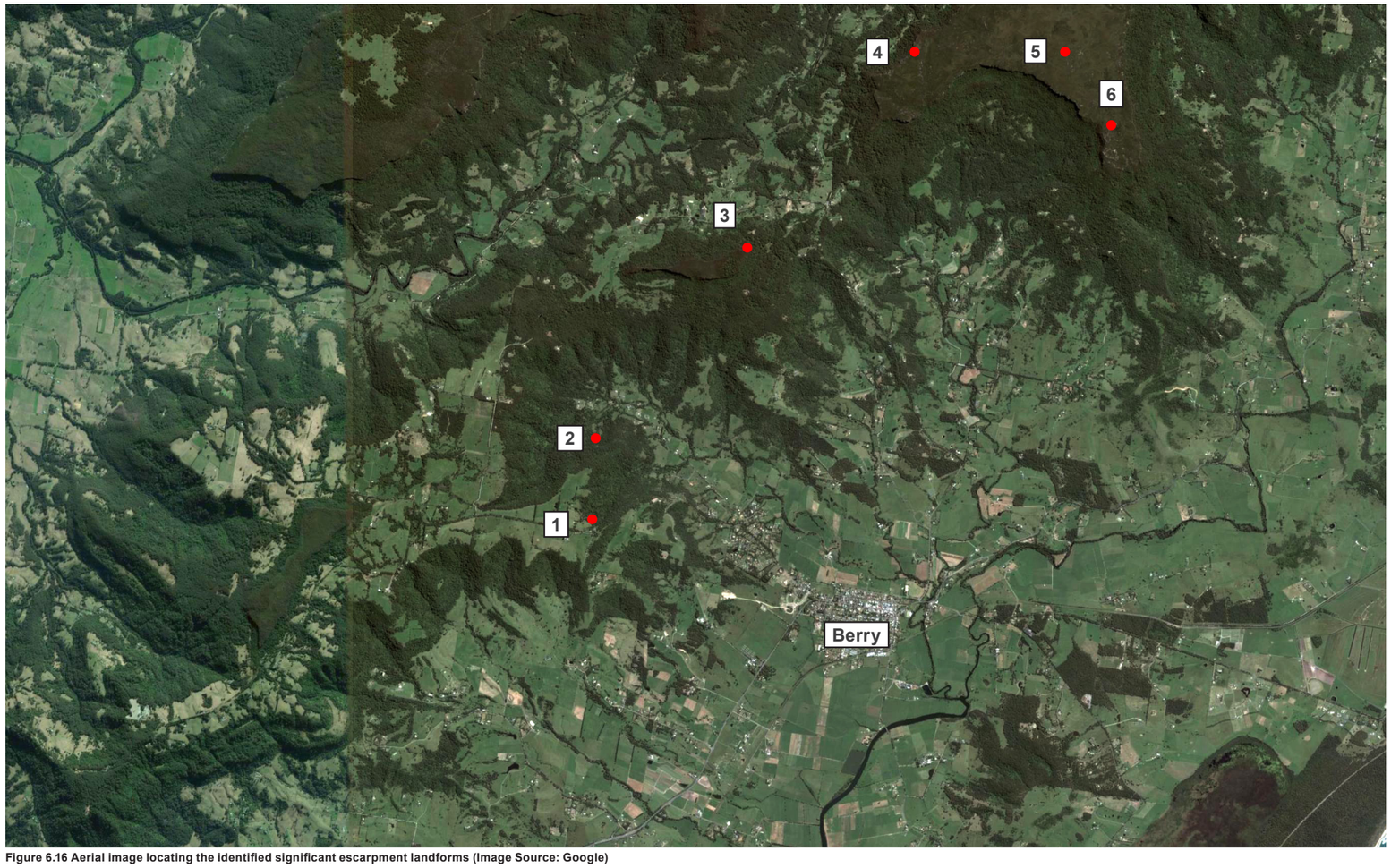


Figure 6.16 Aerial image locating the identified significant escarpment landforms (Image Source: Google)

Figure 6.17 Elevated view west to escarpment overlooking Berry township, highlighting significant points 1 and 2

Figure 6.18 Elevated view north to escarpment overlooking Berry township, highlighting significant points 3, 4, 5, and 6.

6.7.1 North Street view towards escarpment: Observer location A: North Street

Observer location A is sited on North Street near the intersection of Edward Street as shown in **Figure 6.19**. Potential noise attenuation measures at this location would be located along the southern side of the bypass of Berry. A noise attenuation wall treatment of up to four metres in height would impact the visual amenity looking north from this location. **Figure 6.20** demonstrate the potential impact of the noise attenuation treatment as viewed from eye level (1.6 metre height). Residents in this proximity would fall into what has been classified as Zone One for impacts as illustrated in **Figure 6.21**.

Assessment

For Zone One (refer **Figure 6.21**), North Street residents, the sensitivity and magnitude of change are both considered moderate. There would be only very minor impact on views to the ridges and escarpment, the more significant impacts would be on the foreground and middle ground pastoral views. This is clearly illustrated in **Figure 6.20**.

Overall rating - Moderate impact.

Refer to **Table 6.7** for the assessment table.

Summary

With regard to the impacts on views to the ridges and escarpments and the visual significance of township of Berry, the project would:

- Have moderate impacts for residents and users of the western end of North Street especially on foreground views. Views to the ridges and escarpments would not be impacted.
- The landscape setting and relationship of the interface on the north side of Berry would be impacted because of the proximity of the proposed highway to the western end of North Street.

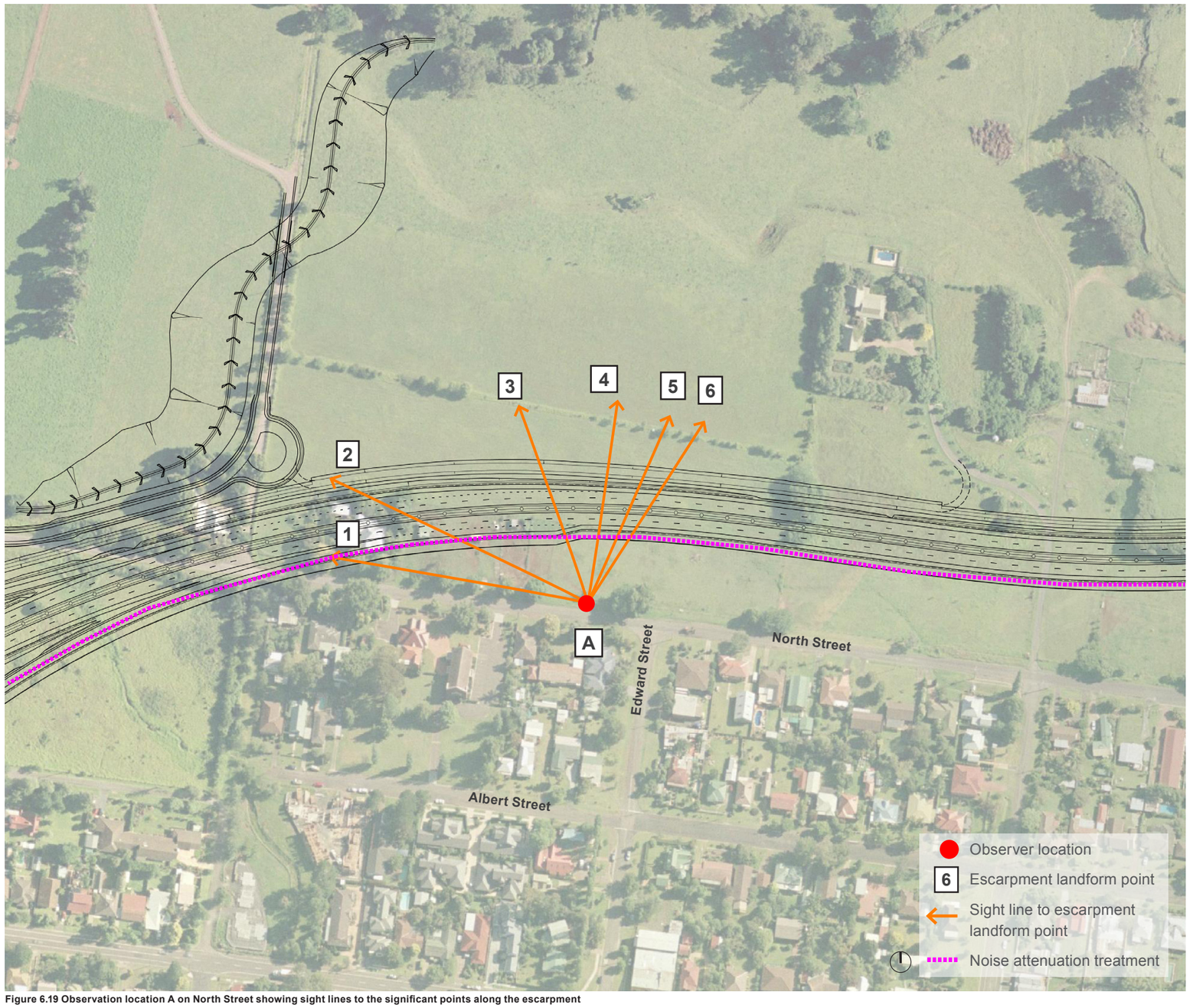


Figure 6.19 Observation location A on North Street showing sight lines to the significant points along the escarpment

Figure 6.20 Observer location A comparison, North Street

Table 6. 7 Impact assessment table for North Street - Zone 1

Berry (North Street Zone 1) potential landscape character and visual impact		Magnitude of change				
		High	High to moderate	Moderate	Moderate to low	Low
Sensitivity	High	High impact	High impact	High to moderate impact	High to moderate impact	Moderate impact
	High to moderate	High impact	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact
	Moderate	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact
	Moderate to low	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact
	Low	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact	Low impact

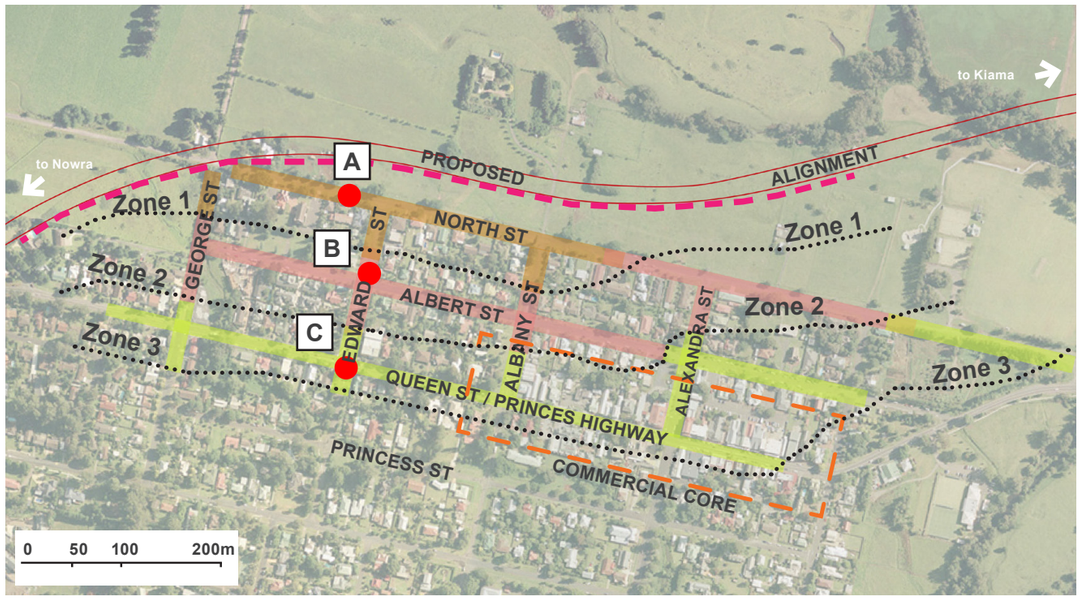


Figure 6.21 Ridges, escarpment, and foreground landscape views zones of impact from proposed bypass alignment

6.7.2 Albert Street view towards escarpment: Observer location B

Observer location B is sited at the intersection of Albert and Edward Streets as shown in **Figure 6.22**. Potential noise attenuation measures located along the southern side of the bypass at Berry would impact the visual amenity looking north along Edward Street. This impact is reduced as the observer location is further away from the noise mitigation measure (165 metres +/-). **Figure 6.23** demonstrate the potential impact of the noise attenuation treatment as viewed from eye level (1.6 metre height). Residents in this proximity would fall into what has been classified as Zone Two for impacts as illustrated in **Figure 6.24**.

Assessment

For Zone Two (refer **Figure 6.24**), Albert Street residents and some residents of George, Edward, Albany and Alexander Streets, the sensitivity and magnitude of change are both considered moderate to low. For the majority of this zone there would be some impacts on foreground views and no impact on views of the ridges and escarpment.

Foreground views, while not as much as a feature of North Street, would also be impacted at the cross street intersections. These impacts are clearly illustrated in **Figure 6.23.**

Overall rating - Moderate to low impact.

Refer to **Table 6.8** for the assessment table.

Summary

With regard to the impacts on views to the ridges and escarpments and the visual significance of township of Berry the project would:

- Have moderate to low impact on residents and users of Albert Street. Views to the ridges and escarpment would not be impacted but foreground views would experience some impact, especially at the north - south cross streets.

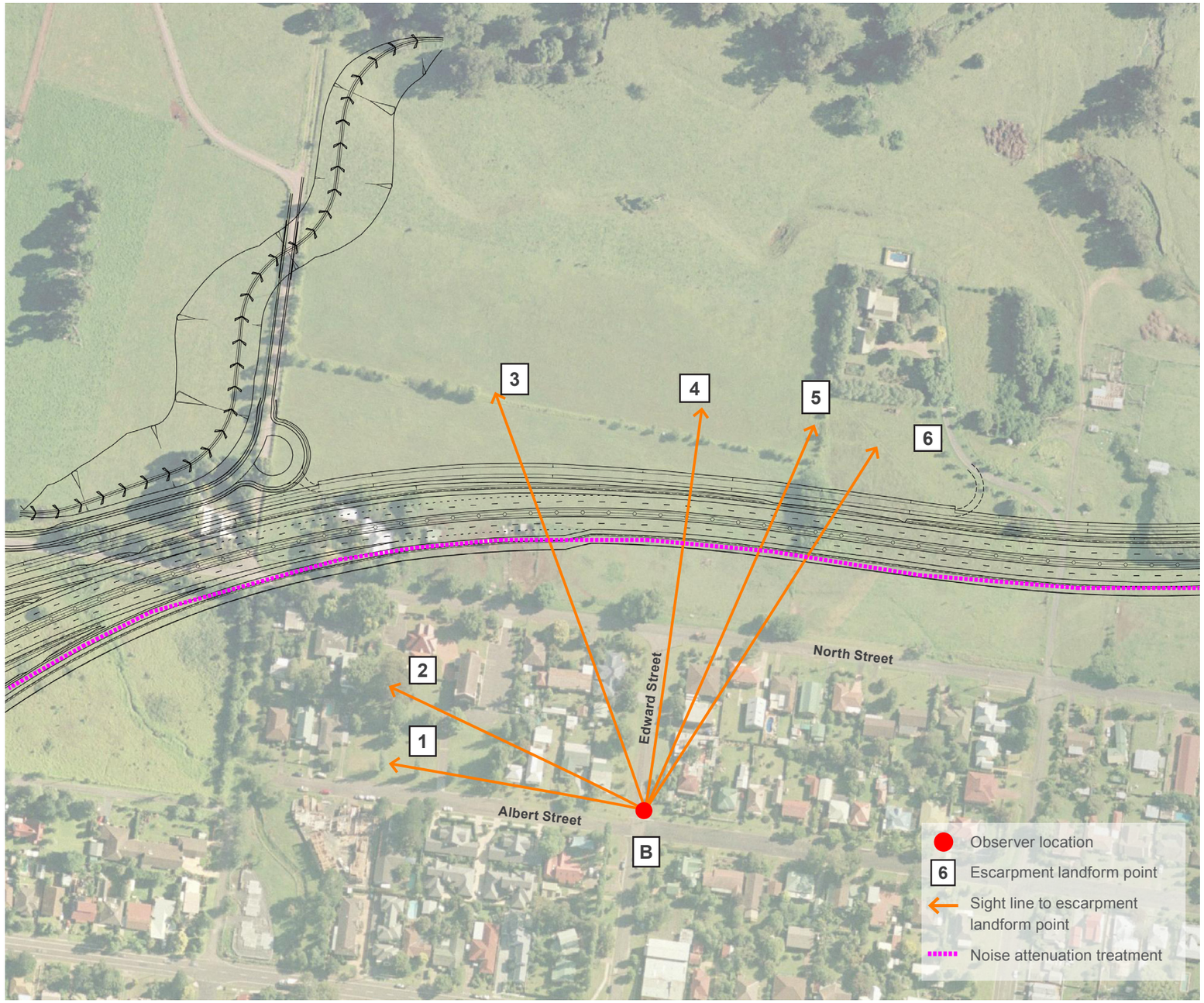


Figure 6.22. Observation location B on Edward Street showing sight lines to the significant points along the escarpment

Figure 6.23 Observer Location B comparison, Albert Street

Table 6. 8 Impact assessment table for Albert Street - Zone 2

Berry (Albert Street Zone 2) potential landscape character and visual impact		Magnitude of change				
		High	High to moderate	Moderate	Moderate to low	Low
Sensitivity	High	High impact	High impact	High to moderate impact	High to moderate impact	Moderate impact
	High to moderate	High impact	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact
	Moderate	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact
	Moderate to low	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact
	Low	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact	Low impact

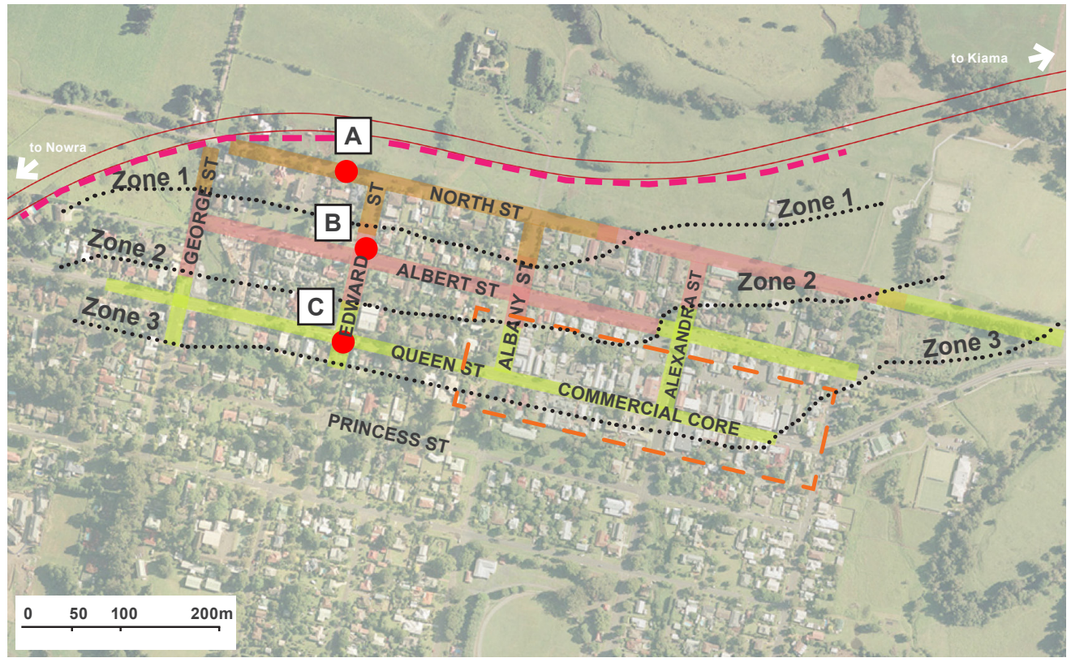


Figure 6.24 Ridges, escarpment, and foreground landscape views zones of impact from proposed bypass alignment

6.7.3 Queen Street view towards escarpment: Observer location C

Observer location C is sited at the intersection of Queen and Edward Streets as shown in **Figure 6.25**. Potential noise attenuation measures located along the southern side of the bypass at Berry would impact the visual amenity looking north along Edward Street. This impact is reduced further as the observer location is at a greater distance away from the noise mitigation measure (270 metres +/-). **Figure 6.26** demonstrate the potential impact of the noise attenuation treatment as viewed from eye level (1.6 metre height). Residents in this proximity would fall into what has been classified as Zone three for impacts as illustrated in **Figure 6.27**.

Assessment

For Zone three (refer **Figure 6.27**), Queen Street residents and commercial core, the sensitivity and magnitude of change are both considered low. From the majority of this Zone three area there would be no impact on the views of the ridges and escarpment.

There is some minor impact on the open views/vistas along the north south streets as they would be terminated by a noise attenuation wall. This would include George, Edward, Albany and Alexandra Streets. From Queen Street the impact however would be relatively minor as illustrated in **Figure 6.25.**

Overall rating - Low impact.

Refer to **Table 6.9** for the assessment table.

Summary

With regard to the impacts on views to the ridges and escarpments and the visual significance of township of Berry, the project would have low impact to residents, commercial property owners and users of Queen Street and the commercial core. There would be no impact on views to the ridges and escarpment.

When considered on a block by block basis, the level of impact decreases significantly as you move further south and further east.

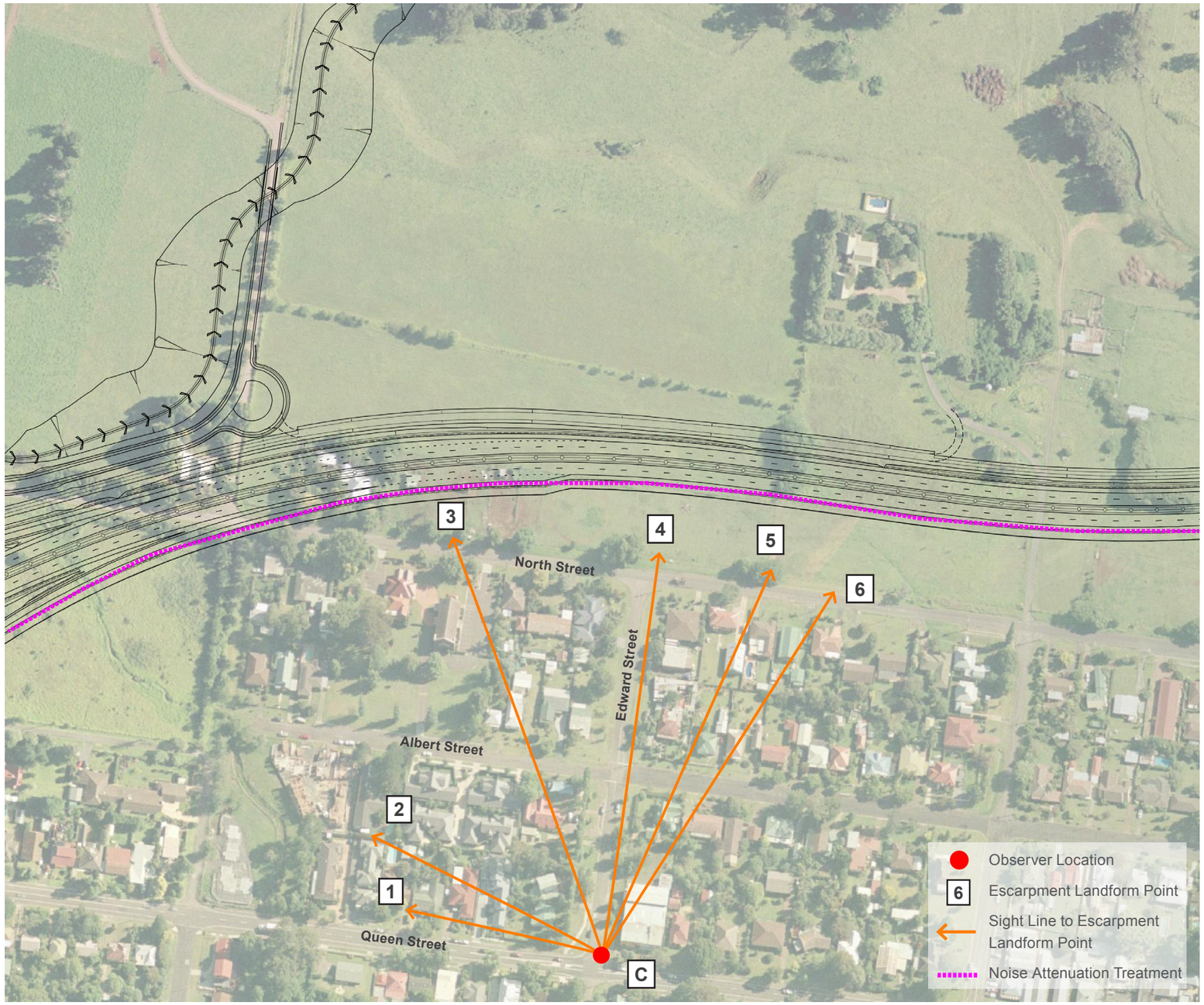


Figure 6.25 Observation location C on Edward Street showing sight lines to the significant points along the escarpment

Figure 6.26 Observer location C comparison, Queen Street

Table 6. 9 Impact assessment table for Queen Street - Zone 3

Berry (Queen Street Zone 3) potential landscape character and visual impact		Magnitude of change				
		High	High to moderate	Moderate	Moderate to low	Low
Sensitivity	High	High impact	High impact	High to moderate impact	High to moderate impact	Moderate impact
	High to moderate	High impact	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact
	Moderate	High to moderate impact	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact
	Moderate to low	High to moderate impact	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact
	Low	Moderate impact	Moderate impact	Moderate to low impact	Moderate to low impact	Low impact

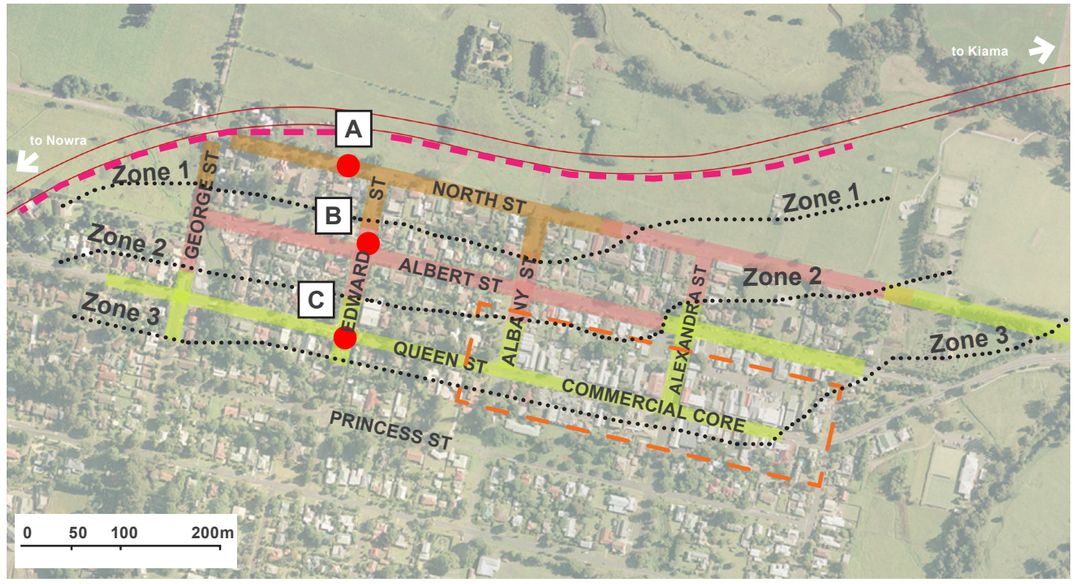


Figure 6.27 Ridges and escarpment and foreground landscape views zones of impact from proposed bypass alignment

6.8 Artist's impressions

Artist's impressions have been developed throughout the design process to:

- Help define the likely visual impacts.
- Inform the assessment of design options.
- Help clearly communicate and illustrate the landscape and urban design concepts.

To support the concept design, a series of artist's impressions are included in the following pages. Refer to **Figure 6.31** through to **Figure 6.51.**

Figure 6.28 identifies the locations.

Viewpoints one through seven are taken from locations along the existing highway.

The aerial perspective images A-C, have been produced to illustrate the design in locations where it is difficult to see the overall impact from ground level. These also use before and after figures for comparison.

Due to the sensitive nature of the bypass of Berry, four viewpoints were selected along the North Street corridor. These artist's impressions were developed in consultation with residents in the community review group. These artist's impressions were prepared by CM+ and the targeted urban design assessment undertaken with the local community.

Figure 6.29 identifies the location of the artist's impressions along the north Street corridor.

Viewpoint locations

1. From existing Princes Highway looking south west to the Toolijooa Ridge cutting.
2. From Broughton Creek looking north east across the creek to the west side of Toolijooa Ridge.
3. From existing Princes Highway looking east to Broughton Creek.
4. From existing Princes Highway just north of Austral Park Road looking east to Broughton Creek.
5. From Woodhill Mountain Road looking south to Bundewallah Creek and the proposed bridge at Berry.
6. From Bong Bong Road, looking south towards Berry.
7. From the intersection of North Street and Woodhill Mountain Road looking north across Berry sports grounds.

Aerial perspective images

A. North of residual highway interchange near Austral Park Road looking south west towards Berry.

B. Tindalls Lane interchange looking south west towards Berry.

C. West of Mark Radium Park looking north east to the south Berry interchange.

Figure 6.30 describes the image sequence for the artist's impressions.

North Street viewpoint locations

8. View from North Street (near Edward Street) looking north west.
9. View from the corner of North Street and Albany Street looking north west.
10. View from the corner of North Street and Alexandra Street looking north west.
11. View from the corner of North Street and Prince Alfred Street looking north west.

Figure 6.29 illustrates the viewpoint locations for the North Street artist's impressions.

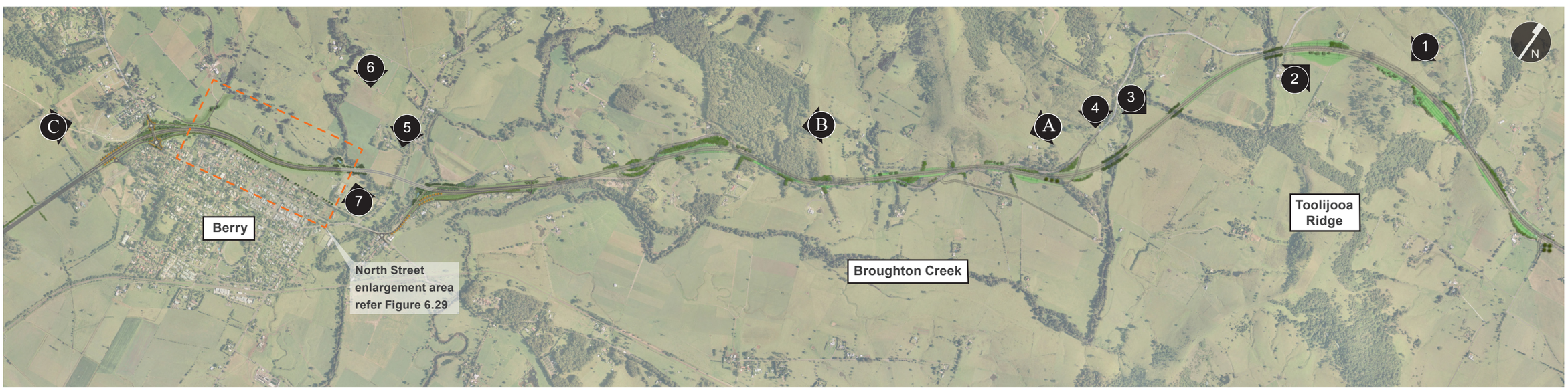


Figure 6.28 Locations of artist's impressions 1 through 7, and aerial perspective location A,B, and C, along the route

Figure 6.29 North Street enlargement area, showing locations of artist's impressions along North Street image provided courtesy of CM+ (2011)

Step 1 Legend illustrating the elements of the project captured in the artist's impression and the visual catchment from the photo location point

1 Photo location [number]
Intersection/interchange
Proposed road design
Overpass/underpass
Bridge
Major embankment
Major cut
Area of visual catchment

Visual assessment location showing view shed coverage

Step 2 Existing site condition

Step 3 The road engineering design model (wireframe) is inserted into the existing view, illustrating the approximate extent of the proposed construction works

Location #01: The viewpoint has been taken overlooking the west side of Toolijooa Ridge.
Location Lat: -34.742909° Long: 150.772193° Elev: 98 m (asl) Facing: South West

Existing View

Site photo showing extent of proposed construction works (wireframe) / 12D model

Step 4 Artist's impression illustrating the likely outcomes including recommended mitigation and management measures

Figure 6.30 Image sequence for artist's impressions

6.8.1 Artist's impression one - Toolijooa Ridge

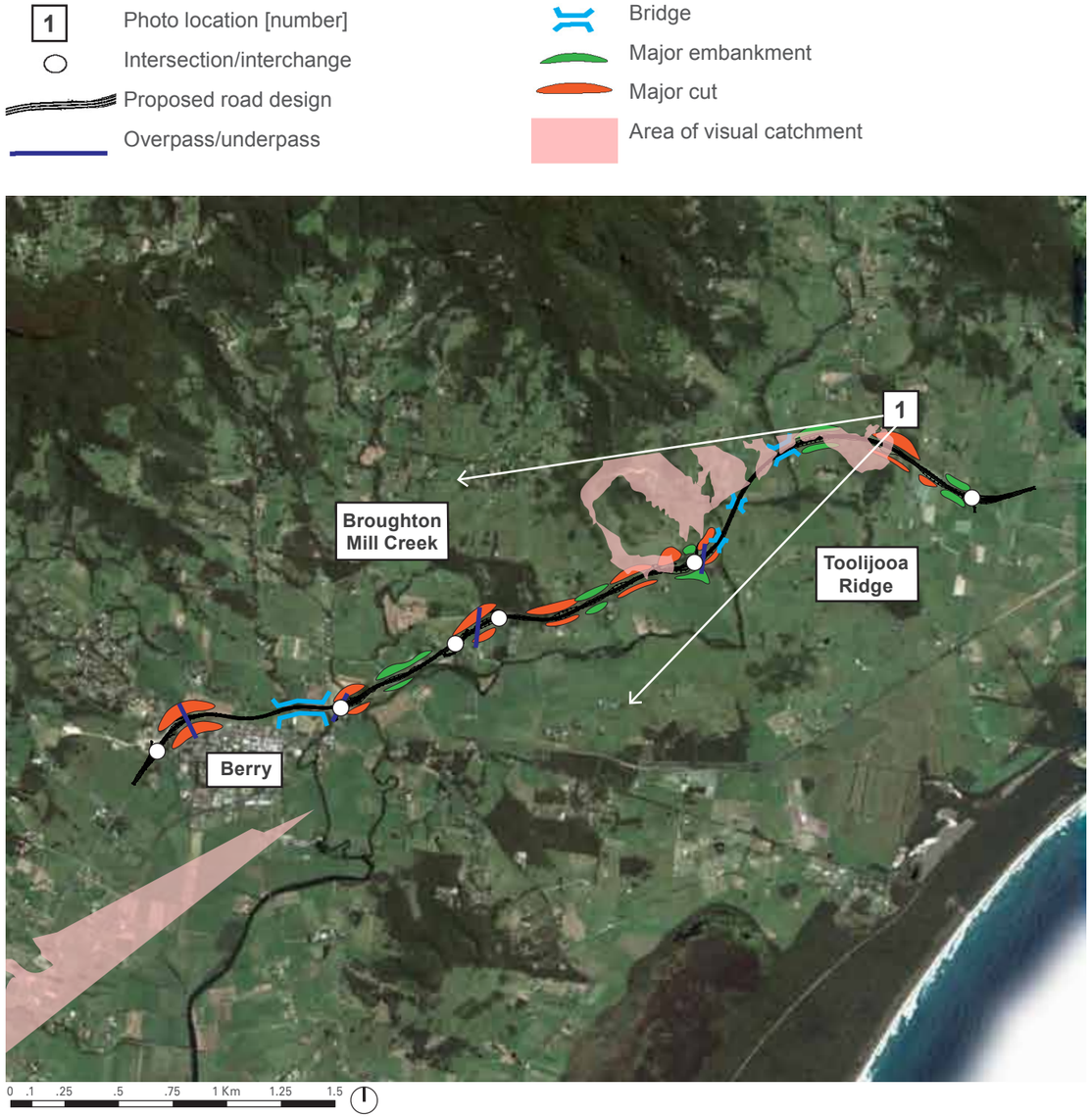


Figure 6.31 Visual assessment location 1 showing view shed coverage

Location 01: The viewpoint has been taken from the existing Princes Highway looking south west to the Toolijooa Ridge cutting.
Location Lat: -34.742909° Long: 150.772193° Elev: 98 m (asl) Facing: South West

Existing view

Site photo showing extent of proposed construction works (wireframe) / 12D model

Figure 6.32 Artist's impression from viewpoint 1 (Note: vegetation shown with approximately 10-15 years of growth)

6.8.2 Artist's impression two - Broughton Creek

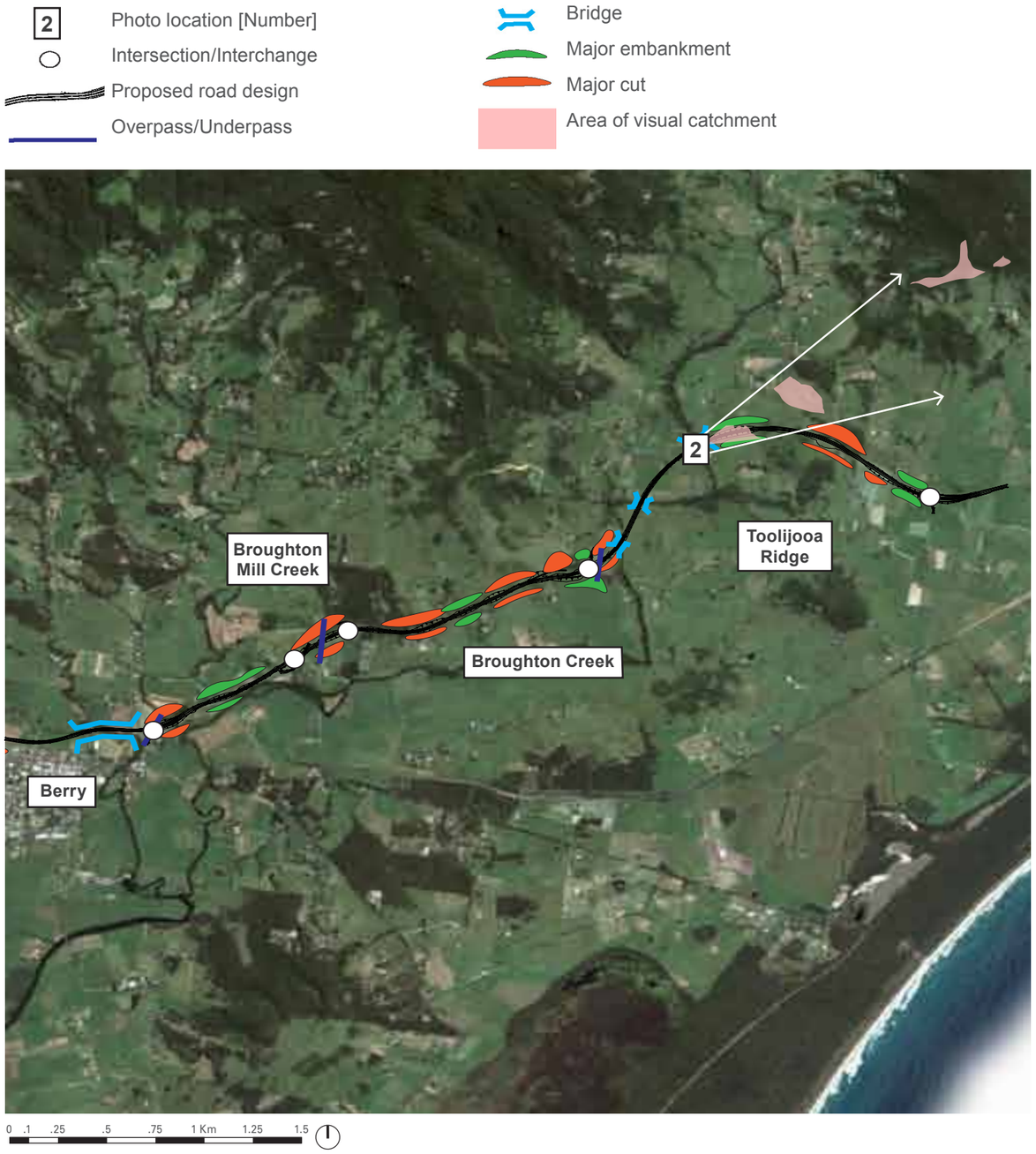


Figure 6.33 Artist's impression location 2 showing view shed coverage

Location #02: The viewpoint has been taken from Broughton Creek looking north east across the creek to the west side of Toolijooa Ridge.
Location Lat: -34.746335° Long: 150.760087° Elev: 36 m (asl) Facing: East North East

Existing view

Site photo showing extent of proposed construction works (wireframe) / 12D model

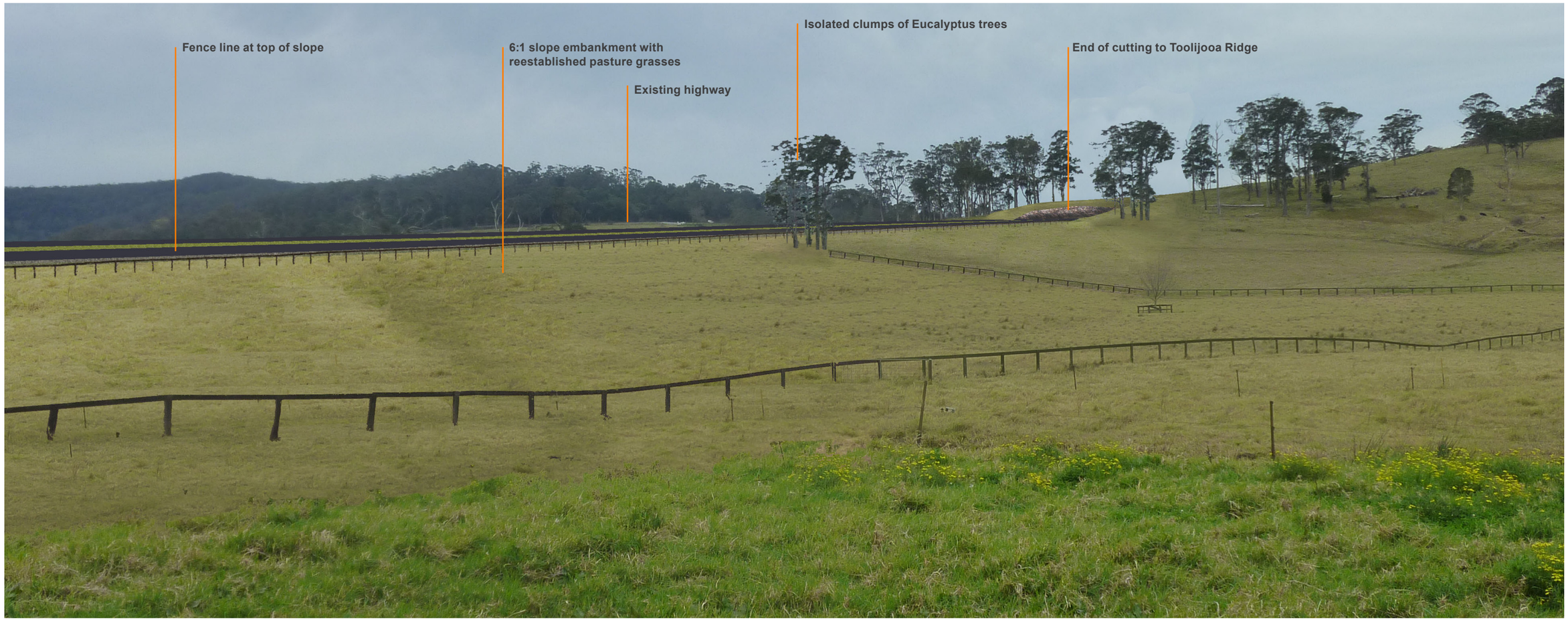


Figure 6.34 Artist's impression from viewpoint 2 (Note: vegetation shown with approximately 10-15 years of growth)

6.8.3 Artist's impression three - Bridge two over Broughton Creek

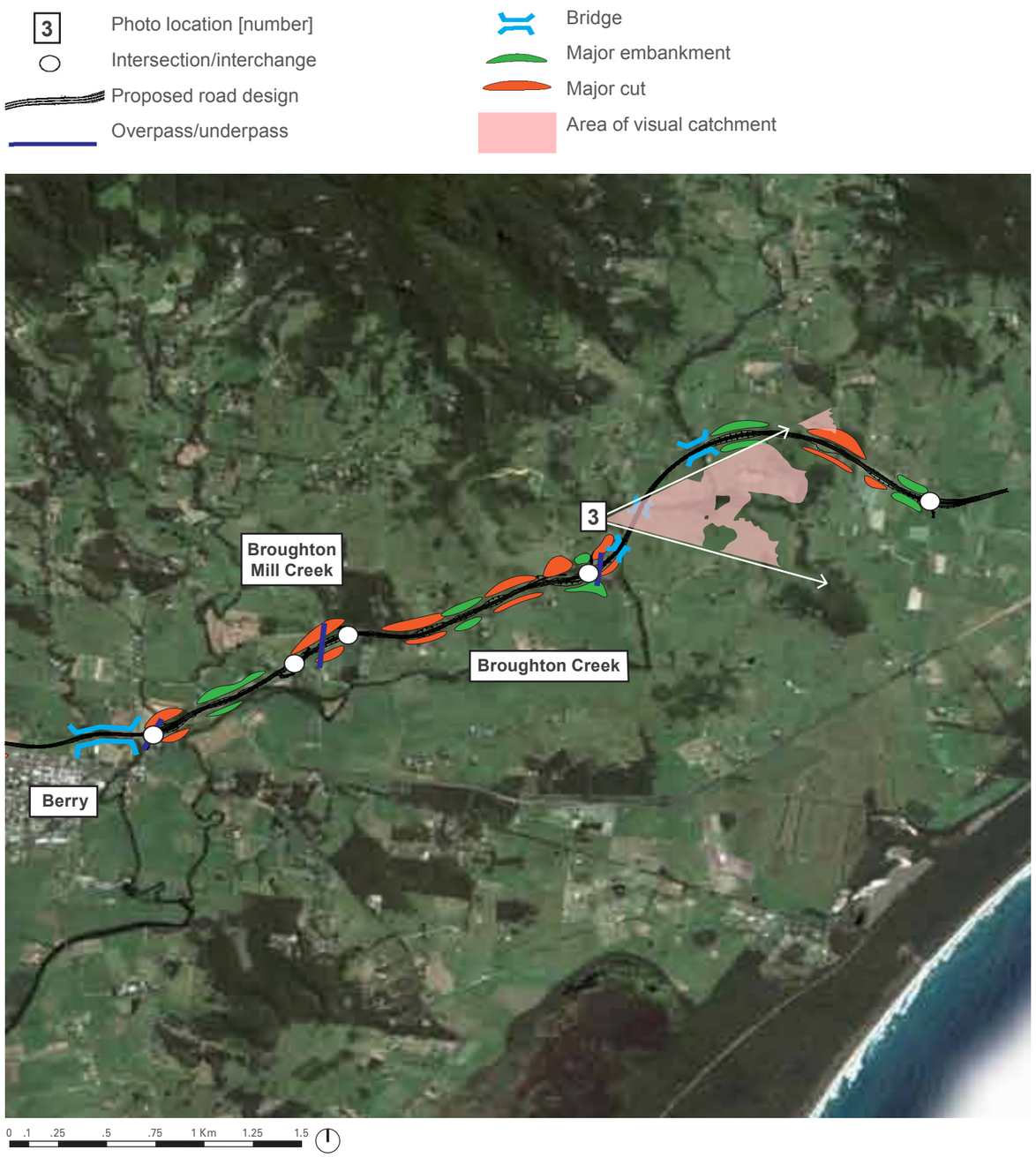


Figure 6.35 Artist's impression location 3 showing view shed coverage

Location 03: The viewpoint has been taken from the existing Princes Highway looking east to Broughton Creek.
Location Lat: -34.752235° Long: 150.749788° Elev: 54 m (asl) Facing: East

Existing view

Site photo showing extent of proposed construction works (wireframe) / 12D model

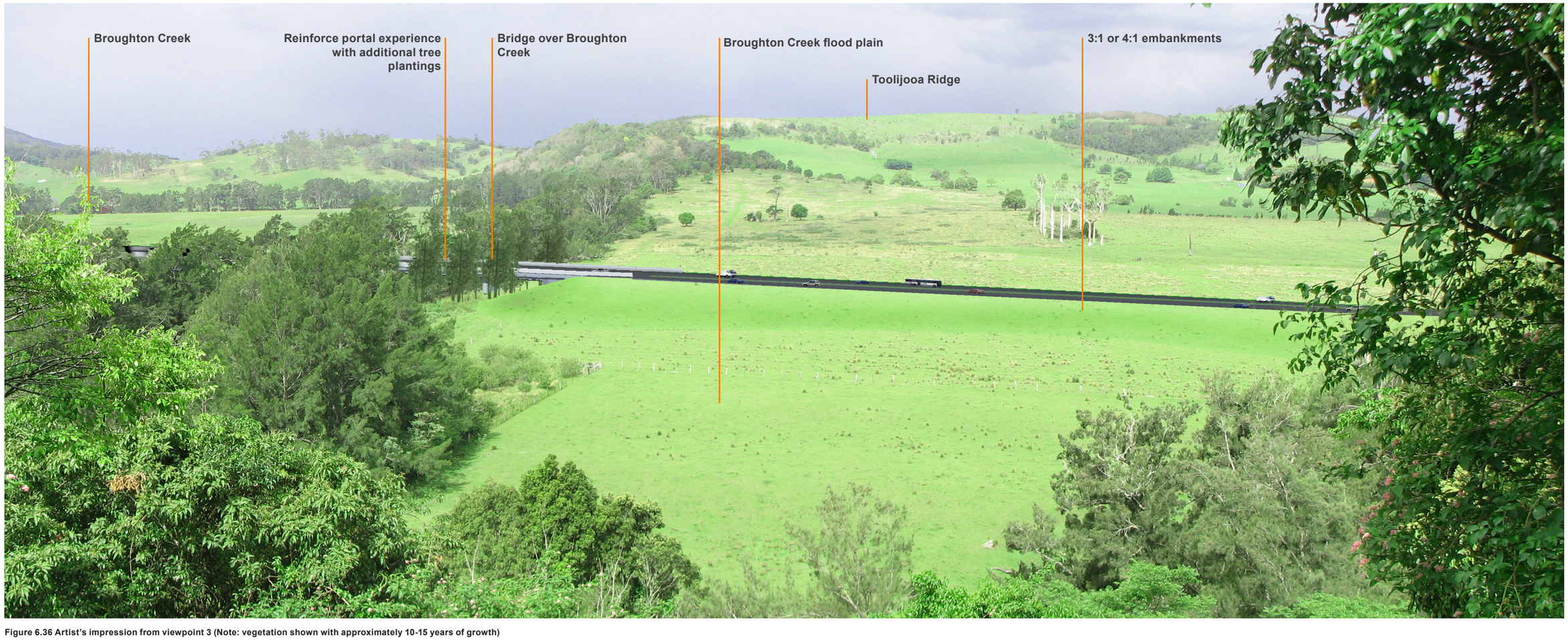


Figure 6.36 Artist's impression from viewpoint 3 (Note: vegetation shown with approximately 10-15 years of growth)

6.8.4 Artist's impression four - Bridge three over Broughton Creek

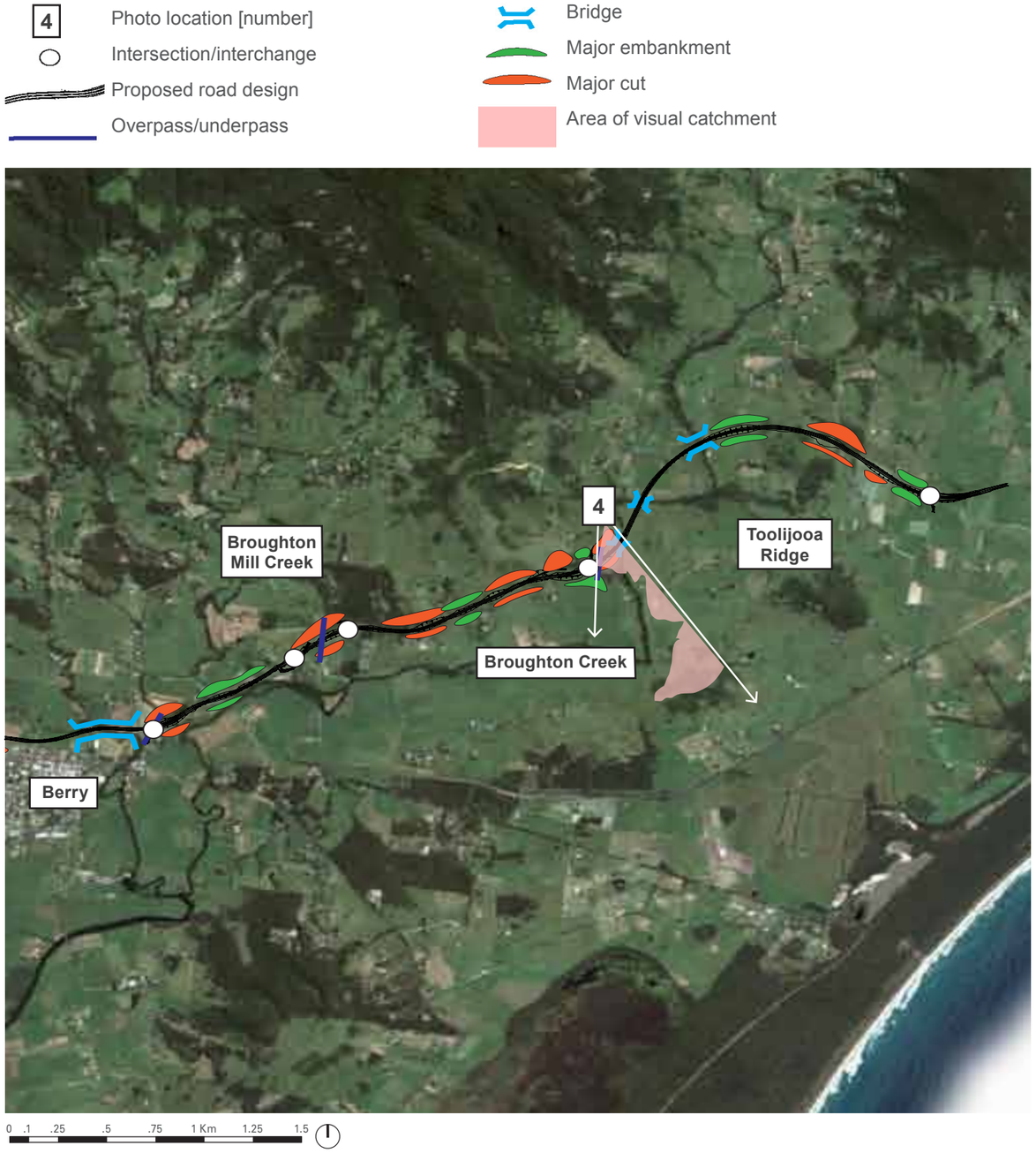


Figure 6.37 Artist's impression location 4 showing view shed coverage

Location 4: The viewpoint has been taken from the existing Princes Highway just north of Austral Park Road looking south east to Broughton Creek.
Location Lat: -34.754075° Long: 150.749562° Elev: 38 m (asl) Facing: South east

Existing view

Site photo showing extent of proposed construction works (wireframe) / 12D model

Figure 6.38 Artist's impression from viewpoint 4 (Note: vegetation shown with approximately 10-15 years of growth)

6.8.5 Artist's impression five - looking south to the bridge at Berry

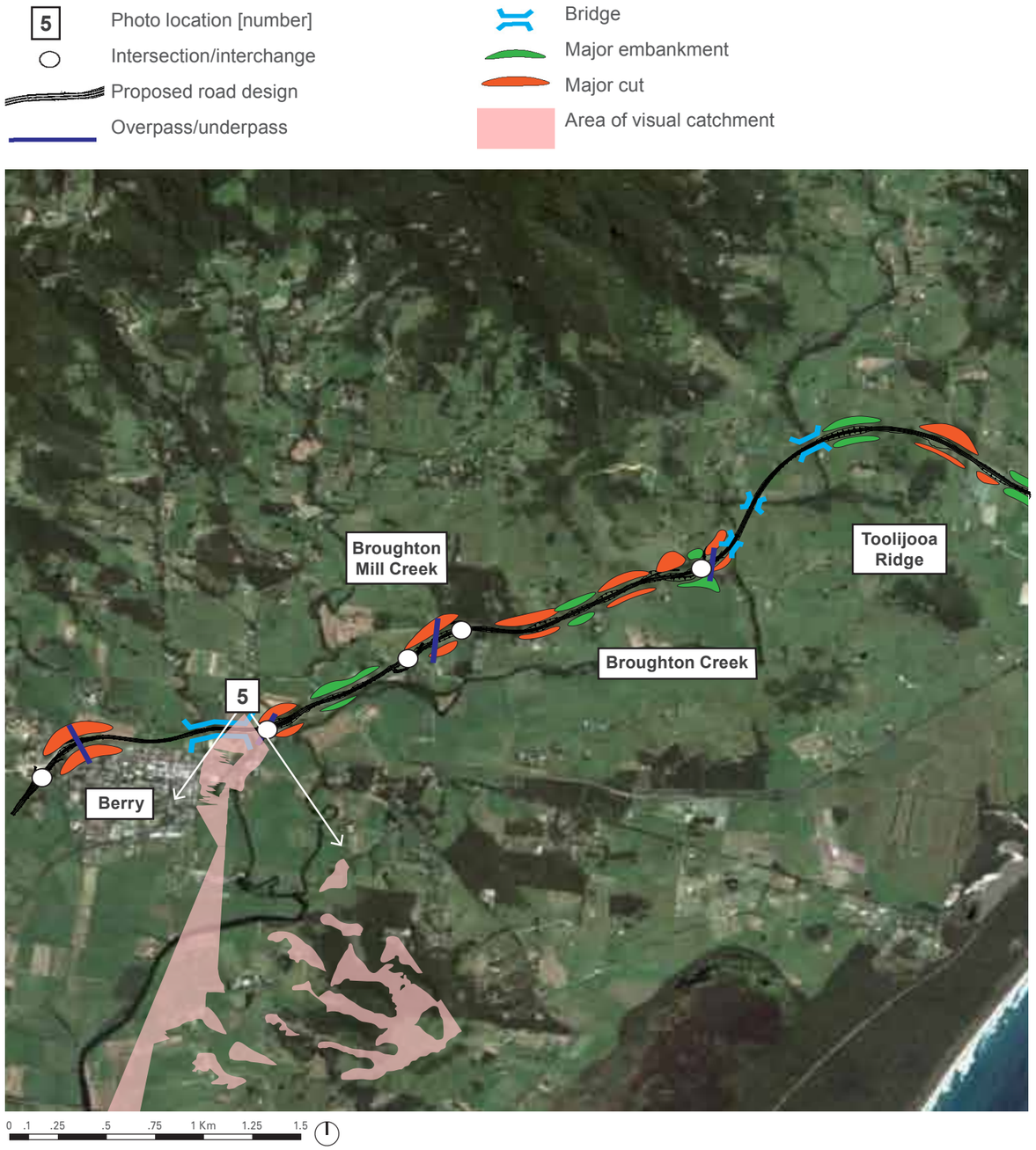


Figure 6.39 Artist's impression location 5 showing view shed coverage

Location 5: The viewpoint has been taken from Woodhill Mountain Road looking south to Bundewallah Creek and the proposed bridge at Berry.
Location Lat: -34.770440° Long: 150.703588° Elev: 9 m (asl) Facing: South

Existing view

Site photo showing extent of proposed construction works (wireframe) / 12D model

Figure 6.40 Artist's impression from viewpoint 5 - Bypass of Berry

6.8.6 Artist's impression six - looking south to Berry bypass

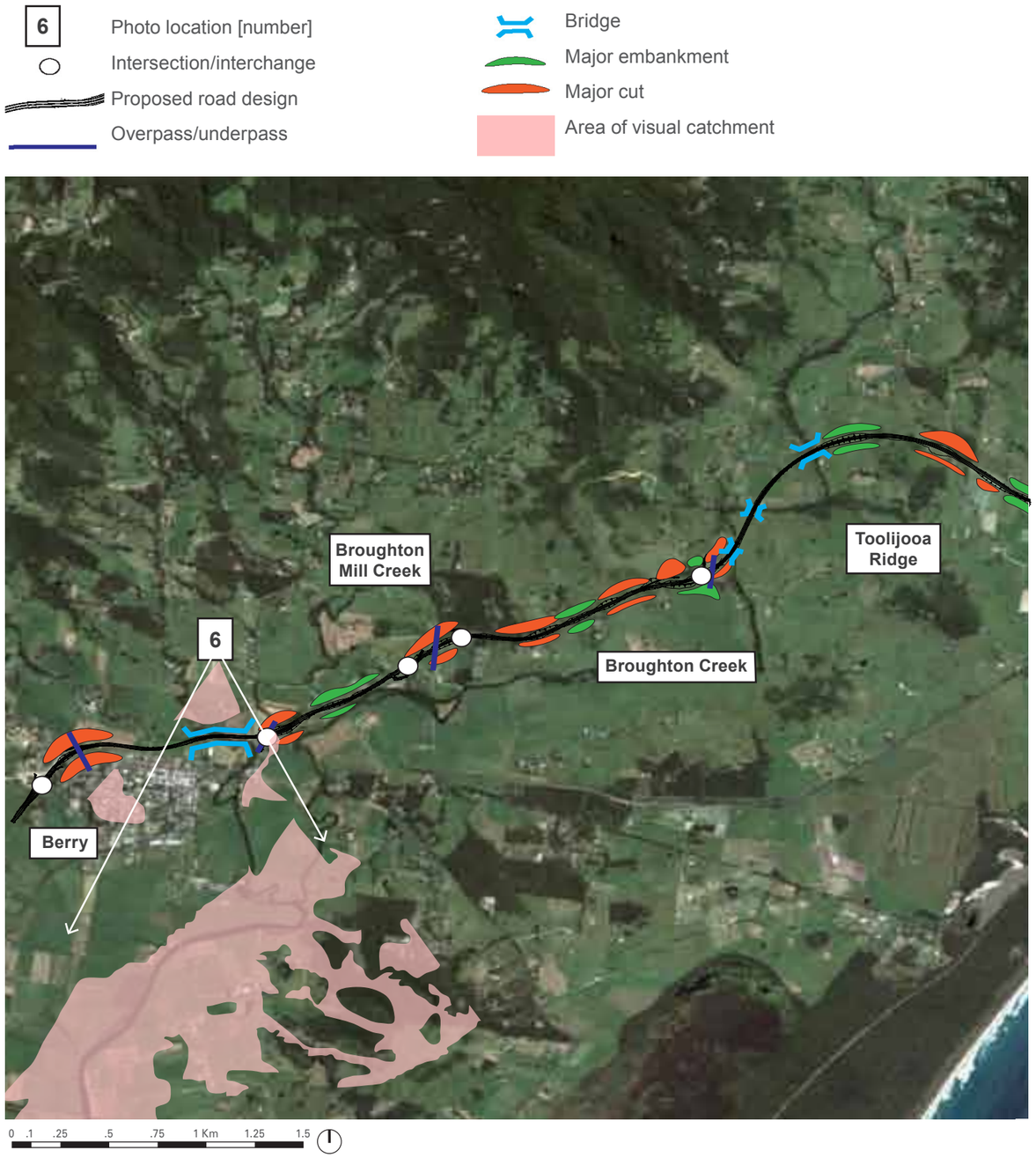


Figure 6.41 Artist's impression location 07 showing view shed coverage

Location 6: The viewpoint has been taken from Bong Bong looking south towards Berry.
Location Lat: -34.764212° Long: 150.701495° Elev: 13m (asl) Facing: south

Existing view

Site photo showing extent of proposed construction works (wireframe) / 12D model

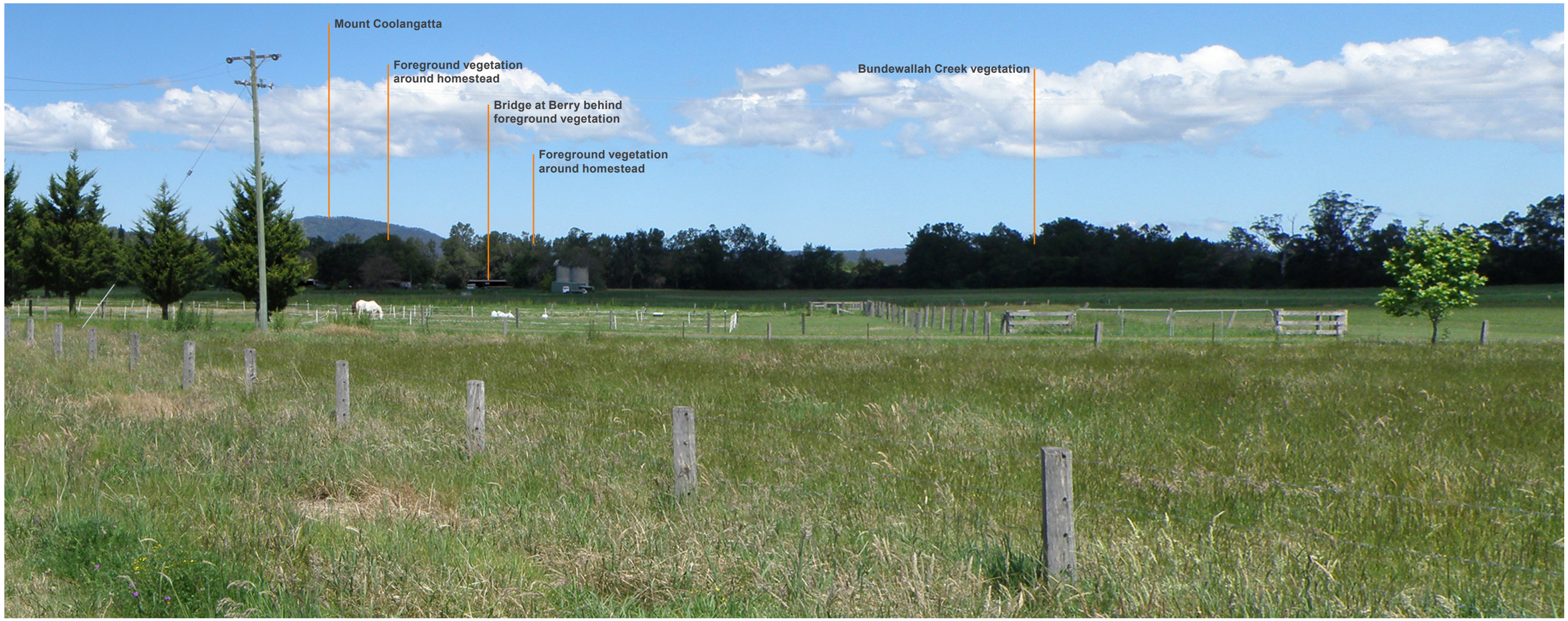


Figure 6.42 Artist's impression from viewpoint 6

6.8.7 Artist's impression seven - Berry sports grounds looking north

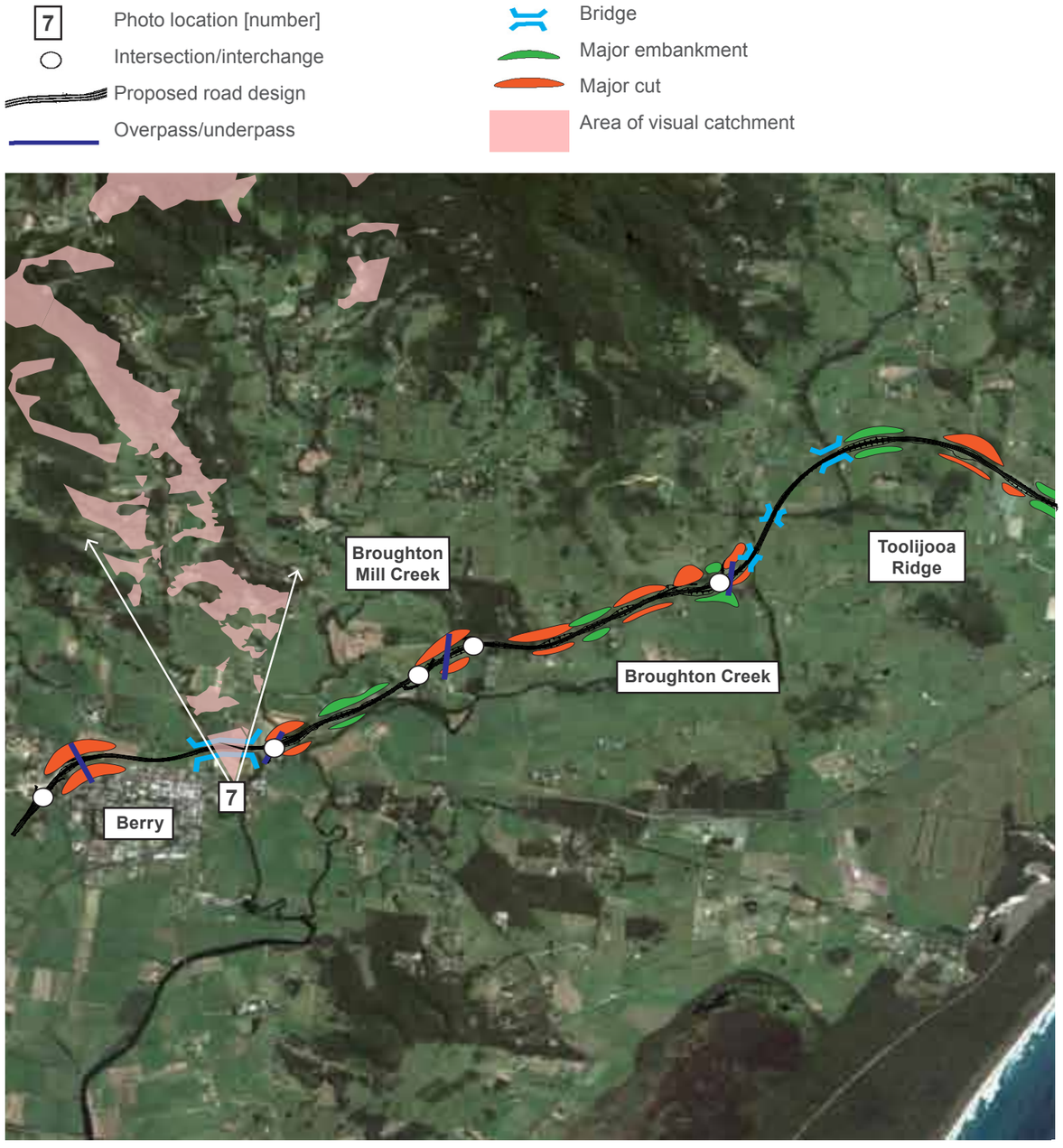


Figure 6.43 Artist's impression location 8 showing view shed coverage

Location 7: The viewpoint has been taken from intersection of North Street and Woodhill Mountain Road looking north across Berry sports grounds.
Location Lat: -34.773992° Long: 150.702185° Elev: 9m (asl) Facing: north

Existing view

Site photo showing extent of proposed construction works (wireframe) / 12D model

Figure 6.44 Artist's impression from viewpoint 7 (Note: vegetation shown with approximately 10-15 years of growth)

6.8.8 Aerial artist's impression #A - Austral Park Road

Location #A: North of residual highway interchange near Austral Park Road looking south west towards Berry.

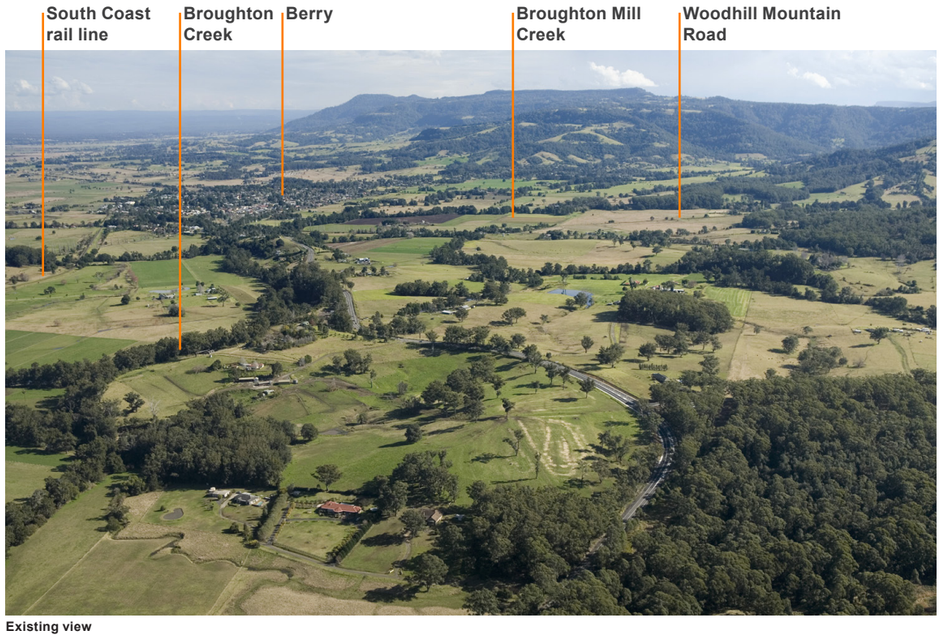
Existing view

Proposed view

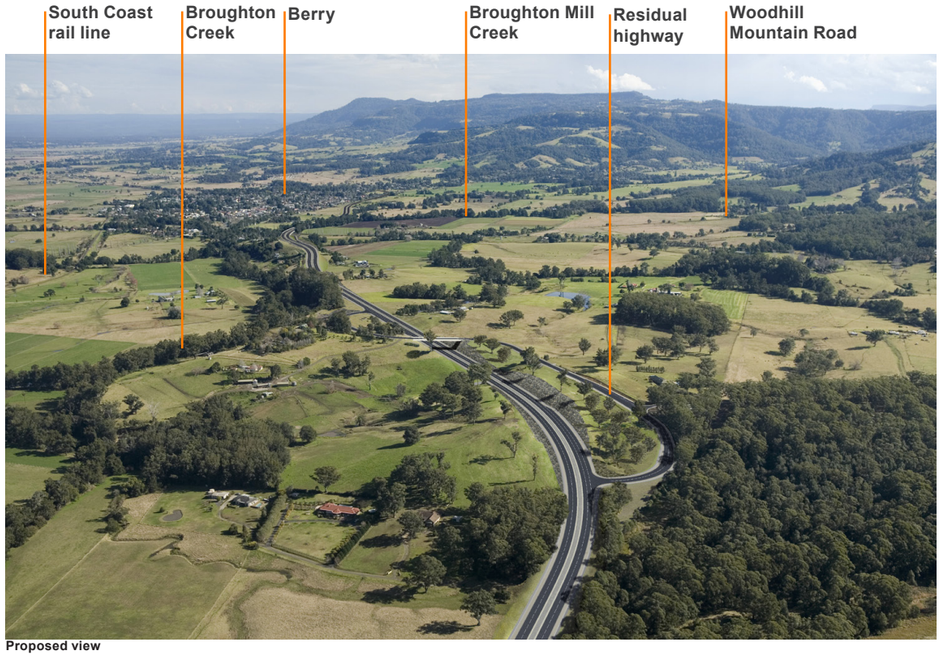
Figure 6.45 Before and after illustrations of the project at Austral Park Road (Note: vegetation shown with approximately 10-15 years of growth)

6.8.9 Aerial artist's impression #B - Tindalls Lane

Location #B: Tindalls Lane interchange looking south west towards Berry.



Existing view



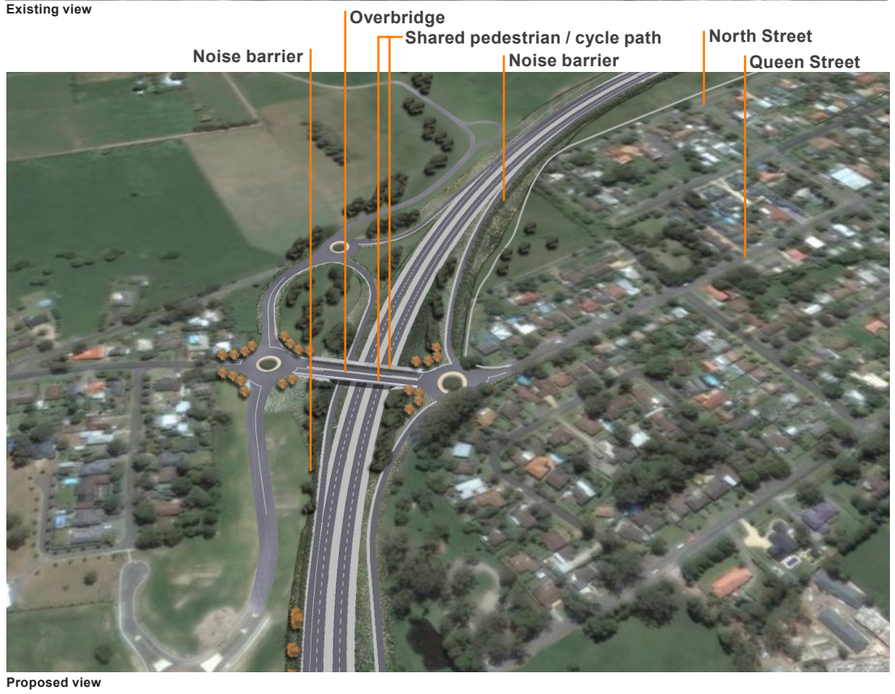
Proposed view

Figure 6.46 Before and after illustrations of the project at Tindalls Lane (Note: vegetation shown with approximately 10-15 years of growth)

6.8.10 Aerial artist's impression #C - Southern Berry interchange

Location #C: West of Mark Radium Park looking north east to south Berry interchange.

Existing view



Proposed view

Figure 6.47 Before and after impressions of the project at Kangaroo Valley Road

6.8.11 Artist’s impression eight - North Street near Edward Street

Existing view (refer to Figure 6.29 for location on North Street)

Proposed view - without landscape treatment

Figure 6.48 Artist’s impression from location eight showing established landscape. Image provided courtesy of CM+ (2012)

6.8.12 Artist’s impression nine - North Street and Albany Street

Existing view (refer to Figure 6.29 for location on North Street)

Proposed view - without landscape treatment

Figure 6.49 Artist’s impression from location nine showing established landscape. Image provided courtesy of CM+ (2012)

6.8.13 Artist's impression ten - North Street and Alexandra Street

Existing view (refer to Figure 6.29 for location on North Street)

Proposed view - without landscape treatment

Figure 6.50 Artist's impression from location ten, showing established landscape. Image provided courtesy of CM+ (2012).

6.8.14 Artist's impression eleven - North Street and Prince Alfred Street

Existing view (refer to Figure 6.29 for location on North Street)

Proposed view - without landscape treatment

Figure 6.51 Artist's impression from location eleven, showing established landscape. Image provided courtesy of CM+ (2012).

7

Mitigation and management measures

7 Mitigation and management measures

Landscape character impacts and visual impacts from the project are described in **Section 6.0** with recommended mitigation measures outlined. In this section, actual mitigation and management strategies to be applied to the project are identified in response to the impacts that arise from the project. In general, the mitigation measures would seek to:

- Reduce the physical impacts of the project to the minimum required to achieve the project objectives.
- Facilitate landscape and urban design outcomes that resolve other project opportunities and constraints including:
  - Balancing cut and fills.
  - Utilising RMS owned land along the corridor to facilitate increasing the short term footprint of the project to reduce the long term footprint and therefore maintenance requirements (primarily through the return to pasture land).
- Integrate new vegetation with the existing landscape character by using culturally relevant species planted to existing patterns.
- Engage with the local community to gather feedback as the design develops, foster broader community support and ownership for the design outcome and facilitate integration with existing pedestrian access mobility plans (PAMP) for the township of Berry.
- Clearly define where the transition points occur between the highway and local street networks.
- Design retaining wall structures, cut embankments, fill slopes and bridges and associated elements in accordance with the Urban and Landscape Design Strategy (refer to **Section 4.0**).
- Engage adjacent land owners to assess whether early works mitigation (eg. landscape planting) can help reduce or soften the visual impacts of the project.
- Clarify minimum reference design requirements of the following project components:
  - The eight bridges within the project.
  - The embankments across Broughton Creek west of Toolijooa Ridge.
  - The noise mitigation measures required along the North Street corridor and at Huntingdale Park Road.

Table 7.1 sets out the specific mitigation and management measures that would be implemented in response to the impacts at the eight viewpoints analysed in **Section 6.0** and through the community engagement and the outcomes of that process captured in Appendix A.

These mitigation measures are implemented in the Concept Urban Design plan in **Section 3.0,** within the artist's impressions for each of the eight viewpoints in **Section 6.0.**

It is assumed in this assessment that all of the relevant environmental management requirements relating to sound, dust control, minimum buffer distances, noise and vibration will be met. The landscape and urban design recommendations are focused on requirements that would integrate with and support the proposed environmental management strategies.

7.1 Reference design parameters

Reference design elements

During the concept design process it was determined that the following components of the project would be required to meet a set of minimum reference design requirements. These components include:

- The first two bridge crossings of Broughton Creek.
- The third bridge crossing of Broughton Creek.
- The two overpasses of the proposed highway at Austral Park Road and Tindalls Lane.
- The bridge at Berry.
- The noise mitigation measures to North Street and the North Street corridor.
- The Kangaroo Valley Road interchange and bridge and noise attenuation, at the northbound off ramp.

Table 7.2 outlines the reference design parameters for each of the proposed bridge structures.

Table 7.3 outlines the reference design considerations for the North Street sound attenuation and south Berry interchange.

Table 7.1 Mitigation and management measures

Landscape unit and Artist's impression viewpoint no:	Potential impacts identified in landscape character and visual impact assessment	Design responses mitigation and management measures
VP 1 Looking north east from existing highway to proposed highway and cutting. Landscape unit - Toolijooa.	• Large intervention in the landscape where there is currently no infrastructure. • Relative open nature of the landscape means that the cutting is clearly visible.	• Steepen rock batters at base of cutting. • Keep benching levels consistent and in parallel with the vertical geometry of the highway. • Roll out top of cutting and reestablish pasture grasses and scattered tree planting. • Establish tree planting across the top of the cutting to provide visual integration with adjacent landscape and to satisfy environmental requirements for fauna corridor connectivity.
VP 2 Looking north east from existing highway to proposed highway and cutting. Landscape unit - Broughton Creek.	• Large 2:1 batter slopes up to 16 metres in height contrast strongly with the existing landscape. • Open landscape means that new infrastructure is clearly visible.	• Flatten embankments and widen project footprint, which would be returned to pastureland following construction. • Reestablish pasture grasses and rural fencing to top of embankment slopes, maximising pastoral landscape. • Plant isolated clumps of Eucalyptus trees consistent with the immediate local context.

Landscape unit and Artist's impression viewpoint no:	Potential impacts identified in landscape character and visual impact assessment	Design responses mitigation and management measures
VP 3 Looking east from existing highway to proposed second bridge over Broughton creek. Landscape unit - Broughton Creek.	• Large intervention in the landscape where there is currently no infrastructure. • Flood immunity requirements result in elevated road and adjacent batter slopes that impact on agricultural landscape.	• Reinforce portal landscape at creek crossing. • Flatten batter slopes (where possible) from 2:1 to 4:1 to 10:1. • Reestablish pasture grasses and rural fencing as high as possible on embankment slopes, maximising agricultural and pastoral landscape. • Clearly identify construction works areas to reduce the extent of vegetation removed along the banks of Broughton Creek.
VP 4 - Looking east from existing highway to proposed third bridge over Broughton Creek. Landscape unit - Broughton Creek.	• Large elevated bridge would be clearly visible from the existing highway. • Removal of some existing creek line vegetation. • Bridge located in very close proximity to an existing residence. • Bridge abutment at southern end interfaces with a steep slope.	• Clearly identify construction works areas to reduce the extent of vegetation be removed along the banks of Broughton Creek. • Reinstate creek line vegetation to satisfy both environmental and aesthetic requirements. • Provide supplemental planting to the southern bridge abutment to reinforce the existing vegetation. • Provide minimum reference design requirements for the bridge. • Consult with property owner and consider relocation of residence.
VP 5 View of bridge at Berry from Woodhill Mountain Road. Landscape unit - Berry.	• Large piece of elevated infrastructure in close proximity to the town. • Heritage trees (Poplars) along Woodhill Mountain road screen the bridge in part but the northern elevation is relatively unbroken by existing vegetation. • To the east existing vegetation does help screen and reduce the overall bulk of the structure as it descends from the ridge line east of Berry.	• Consider early planting works to reduce visual impact of bridge structure. • Provide minimum reference design requirements for the bridge. • Provide *Casuarina cunninghamiana* planting at and around the abutment and adjacent embankments of the bridge landing. • Locate clumps of planting to reduce unbroken elevation of the bridge around Bundewallah Creek crossing point. • Minimise the loss of vegetation at the point where the bridge crosses Bundewallah Creek.
VP 6 North Street corridor looking south towards Berry from North of Bundewallah Creek. Landscape unit - Berry.	• There is little to no visual and or landscape character impact from this location.	• Consistent with the those recommended mitigation measures for the bridge at Berry and bypass from other viewpoint locations.
VP 7 Looking north from the corner of North Street across the sports ground to the Bridge at Berry. Landscape unit - Berry.	• Large piece of elevated infrastructure in close proximity to the town. • Proximity to sports grounds would result in visual and potential noise impacts. • Existing vegetation would help screen and reduce the overall bulk of the structure. • Bridge would be at its lowest elevation at the western end adjacent to proposed pedestrian linkages and the existing Camp Quality grounds.	With reference to the findings of the CM+ Urban Design Study outlined in Appendix A; • Consider early planting works to reduce visual impact of the bridge structure. • Provide minimum reference design requirements for the bridge. • Provide Casuarina planting at and around the abutment and adjacent embankments of the bridge landing. • Locate clumps of planting to reduce unbroken elevation of the bridge around Bundewallah Creek crossing point. • Minimise the loss of vegetation at the point where the bridge crosses Bundewallah Creek. • Engage with the local community to gather feedback as the design develops, foster broader community support and ownership for the design outcome and facilitate integration with existing PAMP for the township of Berry.
VP 8, VP 9, VP 10 and VP 11 North Street, looking north across to Bundewallah Creek and the ridges and escarpment. Landscape unit - Berry.	• Large piece of infrastructure in relative open flat landscape. • Potential to reduce viability of existing farmland. • Proximity to North Street would reduce amenity and outlook. • Visual impacts from noise attenuation walls.	With reference to the findings of the CM+ Urban Design Study outlined in Appendix A; • Use extensive mounding with maximum slopes of 4:1 to reduce the overall free standing height of noise walls. • Use planting to the top of mounding to screen the exposed facades of noise wall. • Engage with the local community to gather feedback as the design develops, foster broader community support and ownership for the design outcome and facilitate integration with existing PAMP for the township of Berry.

Table 7.2 Reference design requirements for proposed bridges

The project Bridge Reference Design requirements:								
Bridge Id	Bridge 1 Underpass at Toolijooa Road.	Bridge 2 Broughton Creek 1	Bridge 3 Broughton Creek 2	Bridge 4 Broughton Creek 2	Bridge 5 Overpass 1 Austral Park Road	Bridge 6 Overpass 2 Tindalls Lane	Bridge 7 Bridge at Berry	Bridge 8 Kangaroo Valley Road Bridge
Context	Open	Creek crossing open landscape with dense vegetation over creek line only .	Creek crossing open landscape with dense vegetation over creek line only.	Creek crossing and landing onto a steep hill in open landscape.	Open	Creek crossing open landscape with dense vegetation over creek line only.	Open pastoral landscape and well vegetated creek line.	Within the town of Berry, bridge over road cutting with highway below.
Visibility	Medium (open landscape in exposed location).	Low	Low	Medium to high.	Low to medium (high for road users).	Low – medium (high for road users)	Medium - due to overall length	Medium to high
Objectives	Make the bridge simple and elegant to complement the landscape. Keep consistent with other underpasses on the network upgrade (Gerringong upgrade).	Make the bridge as unobtrusive as possible to hide it in the landscape.	Make the bridge as unobtrusive as possible to hide it in the landscape.	Make the bridge as simple and elegant as possible to complement the landscape.	Make the bridge as simple and elegant as possible to complement the landscape.	Make the bridge as simple and elegant as possible to complement the landscape.	Make the bridge as simple and elegant as possible to complement the landscape.	Integrate the bridge into the existing urban arrangement and function of the township of Berry. Make the bridge as simple and elegant as possible to complement the landscape.
Bridge Type	Continuous super T – 1500mm deep	Continuous super T – 1500mm deep.	Continuous super T – 1500mm deep.	Continuous super T – 1500mm deep or alternative cast in place voided slab girder.	Cast in-situ box girder – single span.	Continuous super T – 1200mm deep.	Continuous super T – 1800mm deep.	Cast in-situ post tension voided slab.
Bridge Dimensions								
Approximate Width (m)	25	24	24	2.4	9.5	12.9	26.5	20
Approximate deck length (m)	32	16.7	7.6	19	55.2	60	600	47.8
Approximate Spans (m)	Single span	4 spans max 36 x 2 - min 24.5 x 2	3 spans max 36, x 1 - min 20 x 2	6 spans max 36, x 6 - min 23 x 2	Single span	3 spans max 40 x 1 - min 10 x 2	19 spans	Single span
Design elements								
Abutment	Spill through – equal proportion Stone pitched embankment underneath on 1.5:1 slope	Spill through – equal proportion Stone pitched embankment underneath bridge on 2:1 slope	Spill through – equal proportion Stone pitched embankment underneath bridge on 2:1 slope	Spill through – equal proportion Stone pitched embankment underneath bridge on 2:1 slope	Spill through – equal proportion. Stone pitched embankment underneath on 1.5:1 slope.	Spill through – equal proportion. Stone pitched embankment underneath bridge on 2:1 slope.	Spill through – equal proportion. Stone pitched embankment underneath bridge on 2:1 slope at southern end.	Reinforced soil wall, precast concrete panels. Stone pitched embankment underneath bridge on 1.5:1 slope.
Pier form and dimensions	Not applicable	Twin ‘Y‘ shape, 3000 x 1800 with typical fillet of 600 millimeters	Twin ‘Y‘ shape, 3000 x 1800 with typical fillet of 600 millimeters	Twin ‘Y‘ shape, 3000 x 1800 with typical fillet of 600 millimeters	Not applicable.	Twin ‘Y‘ shape, 3000 x 1800 with typical fillet of 600 millimeters .	3 x circular column pier, 1200 millimeter diameter.	Not applicable.
Parapet / Bridge Barriers	Standard RMS integrated concrete barrier and double rail	Standard RMS integrated concrete barrier and double rail	Standard RMS integrated concrete barrier and double rail	Standard RMS integrated concrete barrier and double rail	Standard RMS integrated concrete barrier and double rail	Standard RMS integrated concrete barrier and double rail	Standard RMS integrated concrete barrier and double rail	Standard RMS integrated concrete barrier and double rail to south side, pedestrian railing integrated with safety screen to north side
Headstocks (exposed)	Not applicable	None	None	None	Not applicable.	None	Expressed	None/not applicable.
Safety screens	Not required	Not required	Not required	Not required	Required	Not required	Not required	Required
Lighting	Not required	Not required	Not required	Not required	Not required	Required	Not required	Required to be setout symmetrically with the bridge spans.
Noise screens	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required
Colour	Natural concrete	Natural concrete	Natural concrete	Natural concrete	Natural concrete	Natural concrete	Natural concrete	Natural concrete

Table 7.3 Reference design requirements for North Street sound attenuation and South Berry interchange

North Street - Sound attenuation requirements
Consistent with the requirements of RMS' 'Noise Wall Design Guidelines: Design Guidelines To Improve The Appearance of Noise Walls in NSW' (RMS, 2006), and with reference to the findings of the CM+ Urban Design Study outlined in Appendix A, the detailed design of the noise attenuation measures along the North Street corridor would:
• Use mounding to reduce the free standing height of the noise wall. The mounding would have a maximum slope of 2:1 at pinch points with a preferred maximum of 4:1.
• Establish a rhythm with the noise attenuation wall and its planting that reflects the Berry street grid.
• Use planting on the northern side of the wall, consistent with RMS planting guidelines, a canopy and ground cover species consistent with the local landscape character.
• Use planting on the southern side of the noise wall consistent with the existing character along North Street.
• Engage with the local community to gather feedback as the design develops, foster broader community support and ownership for the design outcome and facilitate integration with existing PAMP for the township of Berry.
South Berry interchange / Kangaroo Valley Road precinct
With reference to the findings of the CM+ Urban Design Study outlined in Appendix A, the detailed design of the Kangaroo Valley Road bridge precinct would:
• Consider the broader context of the project including the roundabouts and the connections into Queen Street and Kangaroo Valley Road.
• Allow for a 2.5 metres wide shared path on both sides of the bridge that connects with the broader PAMP plan for Berry.
• Include a landscape verge between the shared path and carriageway across the bridge.
• Include landscaping to the roundabouts that is consistent with the landscape character of Berry.
• Use street lighting arranged to compliment the rhythm of the bridge and of a scale consistent with the local road network.
• Use ornamental tree planting to define and identify the space as a continuation of the Queen Street / Kangaroo Valley Road corridor.

Appendix A

this page has been left blank intentionally

Conybeare Morrison

Berry Bypass Urban Design Strategy

October 2012

Conybeare Morrison International
52 - 58 William Street
East Sydney, NSW 2011
T. +612 8244 8888 F. +612 8244 8877
E. mail@cmplus.com.au
www.cmplus.com.au
12001

Conybeare Morrison

Berry Bypass Urban Design Strategy

Ocotober 2012

Prepared for Roads and Maritime Services

Conybeare Morrison International
52 - 58 William Street
East Sydney, NSW 2011
T. +612 8244 8888 F. +612 8244 8877
E. mail@cmplus.com.au
www.cmplus.com.au

12001

Revision	Date	Description	By	Chk	App
01	10/08/12	Final Report	DA/ICT	EC	DC
02	16/08/12	Final Report - Client comments	DA/ICT	EC	DC
03	20/08/12	Final Report - Aecom comments	DA/ICT	EC	DC
04	30/10/12	Final Report - Update	DA	EC	DC

Glossary

Carriageway
Road surface used by vehicles, including both traffic lanes and shoulders.

CLD
Context Landscape Design

CRG
Community Reference Group.

CPTED
Crime Prevention Through Environmental Design - the design of the built environment which can lead to a reduction in fear of crime and incidence of crime.

CM+
Conybeare Morrison

Cycle Path
A path dedicated for cyclist use.

EA
Environmental Assessment.

Footpath
Pavement for use by pedestrians and the disabled.

Footway
Zone between road kerb and road reservation boundary, typically incorporating a footpath and/or nature strip.

LGA
Local Government Area.

Parapet
Traffic crash barrier at the edge of a bridge, viaduct or tunnel portal structure.

Road Reservation
Corridor for road carriageway, footways, batter slopes, etc.

RMS
Roads and Maritime Services, NSW

SCC
Shoalhaven City Council

Shared Path
Pathway shared by both pedestrians and cyclists.

Shoulder
The portion of a carriageway beyond the traffic lanes adjacent to, and flush with, the pavement surface.

The Proposal
Works associated with the proposed Foxground and Berry Bypass, including associated parks, local road, pedestrian and cyclist facilities.

Type F Barrier
Tapered, redirective, concrete traffic safety barrier.

Undercroft
Area under a bridge without access to direct sunlight and rain.

Verge
Part of a road formation, not sealed, with a carriageway, footpath or cycleway.

Visual Catchment
The area from which an object is viewed.

Contents

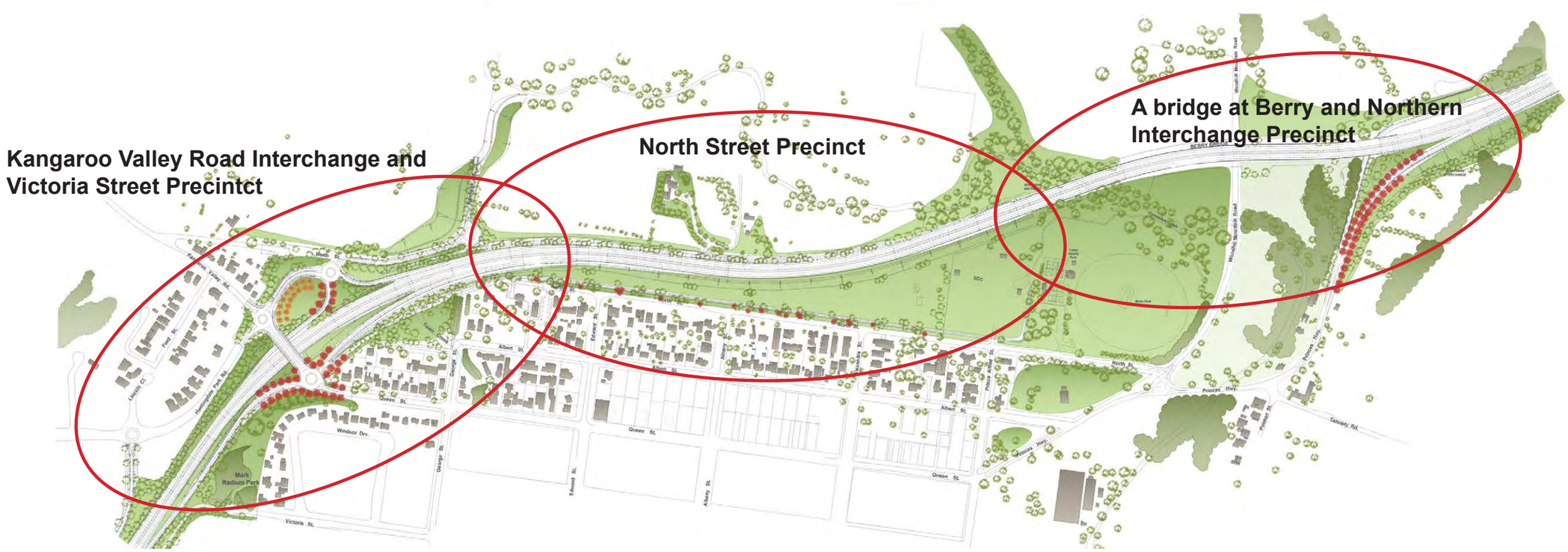


Figure 1: North Berry bypass route study precincts.

1.0 Introduction

1.1 Purpose

This report describes the Urban Design Strategy for the bridge at Berry and Northern Interchange Precinct, the North Street Precinct, and the Kangaroo Valley Road and Victoria Street Precinct, of the Foxground and Berry Bypass project. Refer to Figure 3.

1.2 Study objectives

The study objectives are to:

- Establish an integrated urban design vision for the Foxground and Berry Bypass.
- To develop an urban design strategy report for Berry that is consistent with and supports the overall Urban Design Report, Landscape Character and Visual Impact Assessment for the Foxground and Berry Bypass project.
- To identify urban design opportunities and concepts for adjoining Berry streets and interfaces that are consistent with community feedback and any existing pedestrian access and mobility plans (PAMP).
- To prepare a suite of preferred urban design mitigation measures that informs the setting of reference design parameters for future detailed design works.

1.3 Scope

The study focuses on the approximately 2.5km section of the Foxground and Berry Bypass (FBB) route that is proposed to the north of Berry, in the vicinity of the township, extending from the Northern Interchange to the northeast of Berry, to the Kangaroo Valley Road Interchange to the west.

The study area includes the bridge at Berry and Northern Interchange Precinct, the North Street Precinct, the Kangaroo Valley Road and Victoria Street Precinct, and all associated works required to integrate the project with the local street network, property access, pedestrian and cyclist connections, and includes the urban and landscape design of ‘residual land parcels’ that would be utilised for the agistment of stock or for public open space.

1.4 Consultation - a collaborative design process

The development of the Urban Design Strategy has involved an iterative working process - identifying urban design opportunities, developing concept design options, and testing these through 3D modelling and photomontage.

The urban design process has benefited from the feedback provided from a community engagement process commenced in 2011 and followed by a series of community workshops held in Berry in 2012. Also from meetings with key stakeholders such as Shoalhaven City Council (SCC) and through the review of fellow design professionals - a collaborative design process, working with the RMS Project Design Team, including the RMS Project Manager, Environmental Assessment (EA) Manager and Urban Design Manager, including the design engineers at Aecom and the specialist Bridge Designers of the Aurecon Group.

1.5 Study precincts

The Berry Bypass Urban Design Strategy encompasses three interconnected study precincts:

Refer to Figure 1.

- A bridge at Berry and Northern Interchange Precinct
- North Street Precinct
- Kangaroo Valley Road Interchange and Victoria Street Precinct

This report and the associated community consultation groups are structured, based on these three interconnected precincts.

Figure 2: Urban design opportunities.

Opportunities

1. Township street grid and North Street integrity
2. Berry north-south streets
3. Maximise views to the Cambewarra Escarpment
4. Recreational green space
5. Celebrate Berry arrival/departure
6. Minimise the visual prominence of the bypass and noise mitigation barriers
7. A new pedestrian/cycle circuit
8. Facilitate viable dairy farming
9. Preserve existing stands of trees
10. Improve Town Creek environment

2.0 Opportunities and constraints

2.1 Key Constraints

During the analysis phase of the project the following bypass urban design constraints were identified:

Flooding, drainage and water table

Drainage issues, due to the high water table, limit the potential for the bypass to be significantly depressed.

Homestead curtilage and farm viability

The bypass alignment and footprint has in part been guided by the need to establish a reasonable visual curtilage of the existing homestead and garden (to the north of North Street), to provide alternate vehicular access, and sufficient flood-free high ground for regular pastureland for a viable dairy farm.

Berry township urban integrity and legibility

The Berry township street grid and development blocks should be retained wherever possible, and the alignment of the Berry Bypass should respect the existing street and development pattern.

North Street streetscape integrity

The integrity of the North Street streetscape should be retained and strengthened through urban and landscape design improvements.

Bypass user safety (engineering geometry standards)

A safe Bypass roadway at 100km/hour speed limit is a mandatory design requirement. This includes ensuring minimum radius road curvatures and a horizontal rise and fall necessary to achieve sightline and safety requirements.

Construction factors

There would be a significant increase in road construction cost if the bypass alignment was to encroach north of Bundewallah Creek into flood prone areas.

Berry sports field

Berry sports field provides an important recreational facility for the Berry community. The field and surrounding landscape backdrop to the north should be protected.

Maintain escarpment views

The height of the Bypass road level and associated noise mitigation devices should be carefully designed, in order to maximise views from North Street to the Cambewarra Escarpment.

CRG agreed major road alignments

The bypass alignment, as agreed with the Community Reference Group (CRG) in 2011, is now established.

Noise attenuation requirements

Noise attenuation barriers would be necessary at various locations along the bypass alignment.

2.2 Opportunities

The following bypass urban design opportunities were been identified: (refer to Figure 2)

(1) Township street grid and North Street integrity

Preserve existing street corridor and improve streetscape definition and amenity through the design of recreational green space and street trees.

(2) Berry north-south streets

Provide a fitting northern, physical and visual, resolution of the Berry township north-south oriented streets: George, Edward, Albany, Alexandra and Prince Alfred Streets.

(3) Maximise views to the Cambewarra Escarpment

Lower the alignment as much as drainage requirements would allow and explore noise mitigation measures that maximise views to the escarpment.

(4) Recreational green space

Provide an ‘arc’ of connected recreational green spaces along the southern edge of the bypass, extending from Berry sports field in the east to Mark Radium Park and potentially further to the southwest.

(5) Celebrate Berry arrival/departure

Kangaroo Valley Road Interchange (and Queen Street, west) and the Northern Interchange are opportunities to incorporate special feature planting and high quality overbridge design to mark the arrival in Berry.

(6) Minimise the visual prominence of the bypass and noise mitigation barriers

Incorporate ‘Ha Ha’ landforms and landscaped mounds to integrate noise mitigation devices in the landscape, and to screen the bypass roadway from view - retaining escarpment views.

(7) A new pedestrian/cycle circuit

There would be an opportunity to establish a new walking/cycle route along the bypass corridor, extending from Mark Radium Park and Kangaroo Valley Road in the west along North Street to Berry sports field in the east.

(8) Facilitate viable dairy farming

Maintain conditions for viable dairy farming - maintaining sufficient flood free, high ground and general pastureland to the north of the bypass alignment.

(9) Preserve existing stands of trees

Consolidate existing trees to the north of Berry sports field (along Connolly’s Creek), at the Queen Street and Kangaroo Valley Road intersection and at Mark Radium Park.

(10) Improve Town Creek environment

Restore the upper reaches of Town Creek (to the south of the bypass), as the beginnings of a potential new recreational green space following the creekline.

Figure 3: Overall Berry Bypass plan.

3.0 Overall urban design strategy

The urban design approach has been one that pursues an integrated outcome. We understand there needs to be an overall urban design 'vision' for the future development of Berry (i.e. not simply a focus on the Bypass corridor in isolation). The design approach has been holistic in outlook, considering the urban design of the Berry Bypass in relationship to the urban structure, character and evolution of the Berry township as a whole. The strategy aims to achieve integrated urban planning outcome that would be forward looking, and serve Berry in the long term.

3.1 Overall urban design objective

The following overall urban design objective has guided the Urban Design Strategy:

3.1.1 A bridge at Berry and Northern Interchange Precinct

To integrate the bridge at Berry and Northern Interchange structures and earthworks within the picturesque rural landscape of northeast Berry.

3.1.2 Northern Precinct

To integrate the Berry Bypass within the northern township periphery and the picturesque rural landscape to the north of Berry.

3.1.3 Kangaroo Valley Road Interchange and Victoria Street Precinct

To integrate the Berry Bypass within the western edge of the township, including the Kangaroo Valley Road and Huntingdale Park communities, and within the picturesque rural landscape of Berry.

3.2 Coordinated project elements

The Urban Design Strategy seeks to realise a design outcome where all project elements are fully coordinated and contribute towards the overall project 'vision'.
Project elements include:

- Interchanges, bridges and throw screens.
- Cut and fill batters, retaining walls, noise walls/mounds.
- Lighting, township place making signage.
- Corridor endemic and cultural landscape.

Figure 4: Overall Berry Bypass photomontage.

3.3 Berry recreational circuit and key pedestrian/cycle links

3.3.1 Township recreational circuit

To understand the broader town planning context of the Berry Bypass project, an analysis of the Berry township urban structure was undertaken. This study identified a potential future recreational opportunity for those who live and work in the township.

The shared path and footpaths proposed as part of the Berry Bypass works, could in the future become part of a more extensive recreational circuit around the township that would link major destinations such as Berry Oval and sports area, the commercial Main Street, the Lawn Bowls Club, Berry Railway Station, Berry Showground, several retirement villages, Berry Primary School, Mark Radium Park and the Huntingdale Park residential community.

The shared path circuit could be designed with gradients and radii that accommodate retiree's motorised scooters, and would attract local families for recreational cycling, joggers, and school children. The recreational circuit would potentially be of community health and social benefit. Visitors to Berry may also be attracted to hiring a bike and sightseeing, if a well laid out and sign posted trail was established.

3.3.2 Key pedestrian links

The key pedestrian and cycle links proposed as part of the project include:

- Linking North Street to Kangaroo Valley Road.
- Linking the footpaths of the Berry Oval sports facilities, via North Street to the existing footpaths along Queen Street and in Mark Radium Park to provide access to an interconnected arc of green spaces.
- Linking the existing Queen Street footpaths to Kangaroo Valley Road and to the existing Huntingdale Park residential estate footpaths.

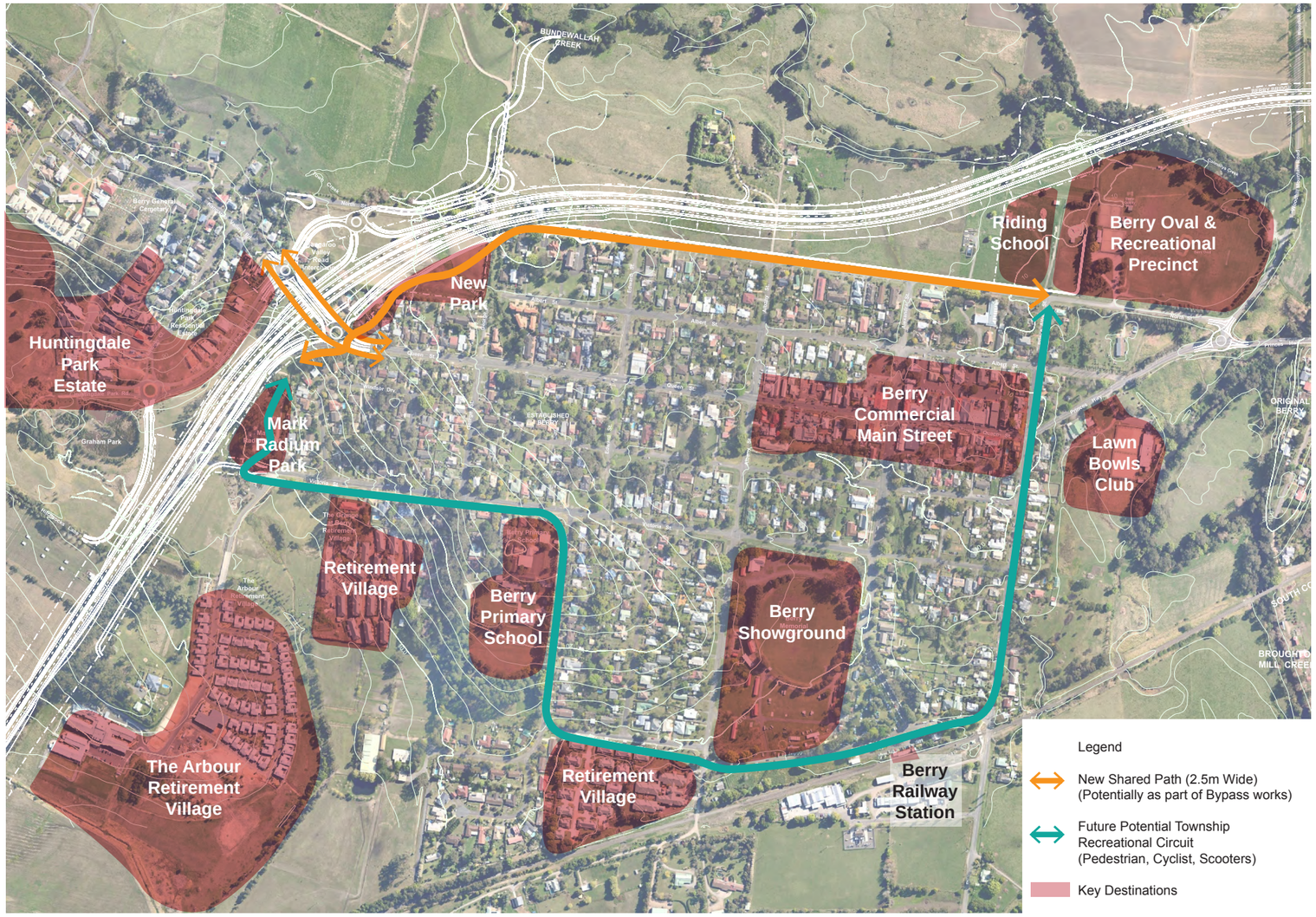


Figure 5: Recreation circuit and key links.

3.4 Interconnected green spaces

There would be an opportunity to utilise the residual open space that would remain following construction to establish a series of interconnected green spaces along the southern edge of the Berry Bypass. Current recreational open space includes the Berry Oval and sports facilities in the east and Mark Radium Park in the west. There would be potential to link these existing green spaces together, with a new strip of green space, as part of the Berry Bypass project.

These green spaces could be utilised as pastureland for agistment, for a relocated Riding School green, to establish a new local public park and for special event parking. SCC has stated that they do not wish to maintain in perpetuity large tracts of green space due to the maintenance costs involved. For this reason the proposed park (Town Creek Park) would be small in size and is envisaged as a simple low maintenance park landscape.

Figure 6: Arc of interconnected green space.

This page has been left blank intentionally.

3.5 Acoustic analysis outcomes

Acoustic analysis undertaken by Aecom consultants has established that two noise barriers would be necessary to achieve the NSW Environment Protection Authority (EPA) noise mitigation requirements. The extent of the two noise barriers is illustrated on the adjoining plan.

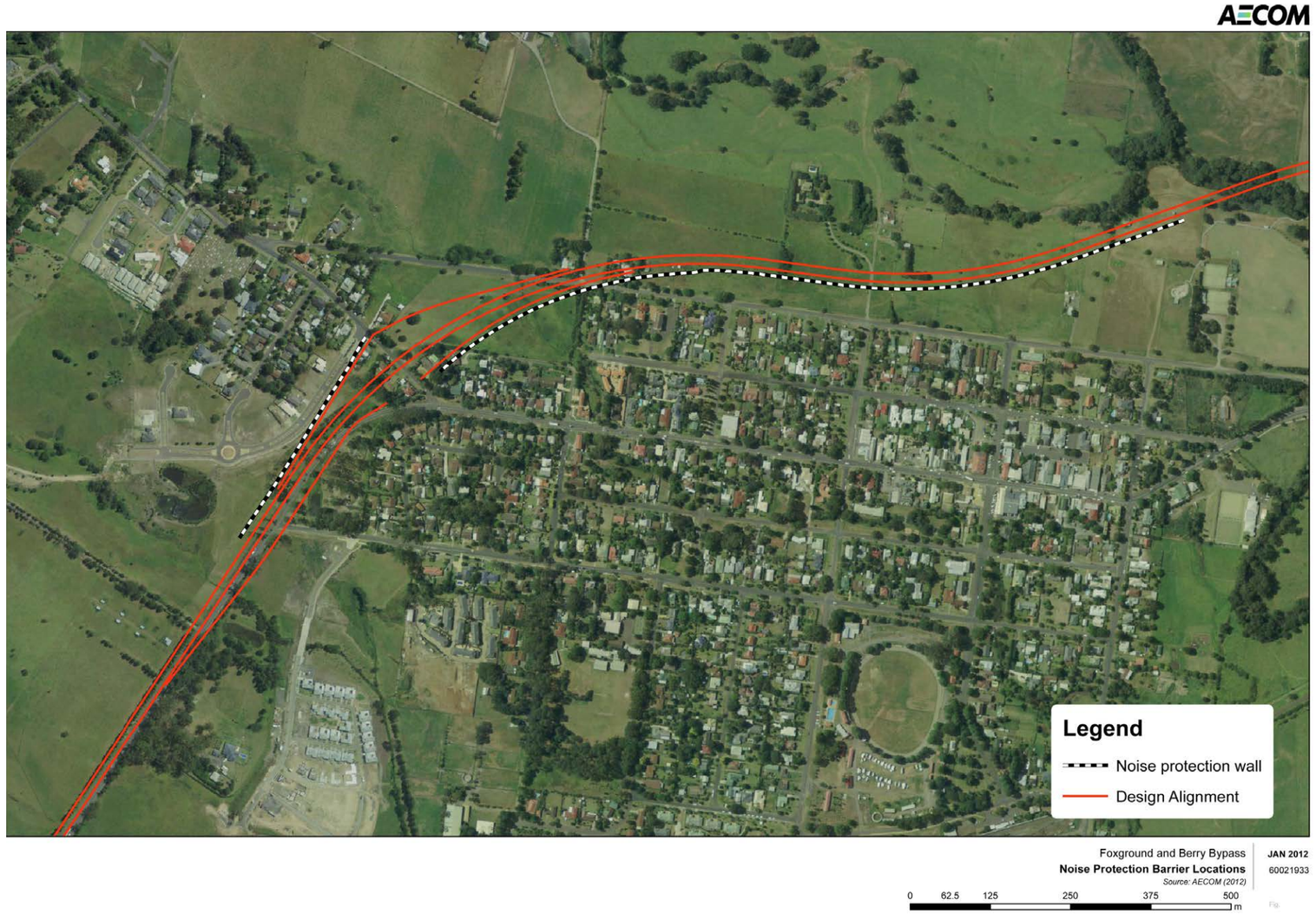


Figure 7: Acoustic analysis - noise barrier locations.

Figure 8: A bridge at Berry - in context.

4.0 A bridge at Berry and Northern Interchange Precinct

4.1 A bridge at Berry

4.1.1 A bridge at Berry - design process

In late 2011, Roads and Maritime Services engaged a number of industry specialists to critically review the concept design for the bridge at Berry and a number of community suggestions relating to the form and alignment of the bridge. The outcome of this review established the current concept design alignment for the Northern Route, including the bridge at Berry. The most significant change was the realignment of the northern section of the bridge by some 90metres away from the township at Woodhill Mountain Road and the lowering of the bridge by up to 6.4metres.

From February 2012 to May 2012, the design of the bridge at Berry was further developed through a collaborative process with the Berry community. Conybeare Morrison (CM^+) and Aurecon were engaged by RMS to work with the community, RMS and AECOM to review in more detail the following aspects of the bridge:

- Overall appearance of the bridge in its urban design context including development of options for the pier and traffic barrier form.
- Pier spacing and orientation.
- Bridge deck depth and height.

Refer to Figure 8.

4.1.2 Setting and vantage points

The bridge traverses, on the whole, a rural landscape of pastureland, turf farming, rural residential homesteads and properties, densely vegetated creek lines; and to the south, Berry sports field, recreational precinct and Camp Quality.

Apart from those driving over the bridge, the bridge at Berry would only ever be seen in parts. There would be no single vantage point where one would overview the whole of the bridge. This is due to the existing landforms and landscape (that would be retained), that would break potential views of the bridge into smaller partial views.

The main vantage points are from Woodhill Mountain Road: looking north from Bundewallah Creek and looking south to Bundewallah Creek. It would also be seen in part from a limited number of adjoining rural properties, inpart by northbound on-ramp users, and the south abutment would be seen up close by pedestrians utilising the parkland.

Refer to Figures 9 and 10.

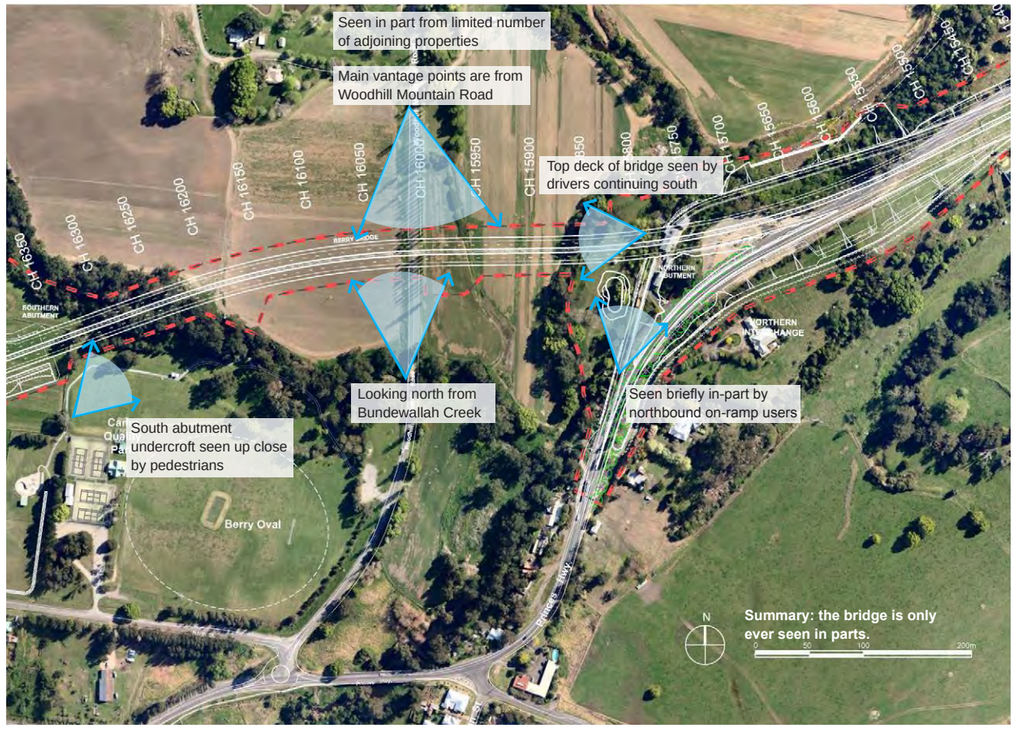


Figure 9: Vantage points.

Figure 10: A bridge at Berry - Aerial view from northeast.

4.1.3 Design philosophy

The following urban design philosophy has guided the design of the bridge at Berry:

- The bridge should be appropriate to its place – the picturesque rural setting.
- In scale with the township, landforms and existing landscape.
- Not draw attention to itself – a grand statement is inappropriate.
- Emphasis should remain on the picturesque setting: the dramatic backdrop of escarpment, the attractive pastoral valley/floodplain and creek-line vegetation.
- There should be no 'tack-on' decoration.
- The bridge should have clean lines and neat detailing – should not be fussy or cluttered.
- The architectural expression of the bridge should be one of simplicity and of straightforward structural expression: of spanning elements and support structures.
- The design should respond to the creek and floodplain environment.
- The bridge would be 'naturally' viaduct-like in character – a rhythm of piers/columns (not a forest) is an appropriate response.
- The design of the columns/piers needs to consider how they pick up the natural light and shadow – reading as an appropriate built form in the landscape.
- The bridge should age and weather well - minimising maintenance. Design for self cleaning surfaces, and designout opportunities for graffiti or vagrancy.
- Get the details right: articulation of surfaces - consider the bridge 'architecture' of light and shade to provide articulation of form.

4.1.4 Urban design principles

The following urban design principles have guided the bridge design:

- Develop bridge architecture that complements the pastoral setting.
- Maximise retention of existing screening landscape.
- Minimise bridge piers and elevation profile.
- Keep undercroft areas open, ventilated and with access to light.
- Maintain a consistent bridge profile without awkward junctions, steps or faceting.
- Explore opportunities to reflect the unique character of Berry and the Shoalhaven.
- Utilise locally sourced stone for abutment linings and scour protection wherever appropriate.

4.1.5 Cultural and heritage response

In the design of the bridge at Berry the following principles have guided the response to the important physical and cultural heritage of Berry and its rural setting:

- The bridge alignment has been relocated further north, away from the township to respect the town's heritage curtilage.
- The new bridge would be screened from Berry by the existing vegetation that follows Bundewallah Creek.
- The Alexander/David Berry Memorial would be relocated to a suitable new setting accessible to residents and visitors.
- Mark the turn off into Berry with appropriate signage.
- Draw inspiration for the project finishes palette from locally available materials – such as stone and timber.
- Incorporate endemic landscape themes and cultural plantings.

4.1.6 RMS Bridge Aesthetics Guidelines

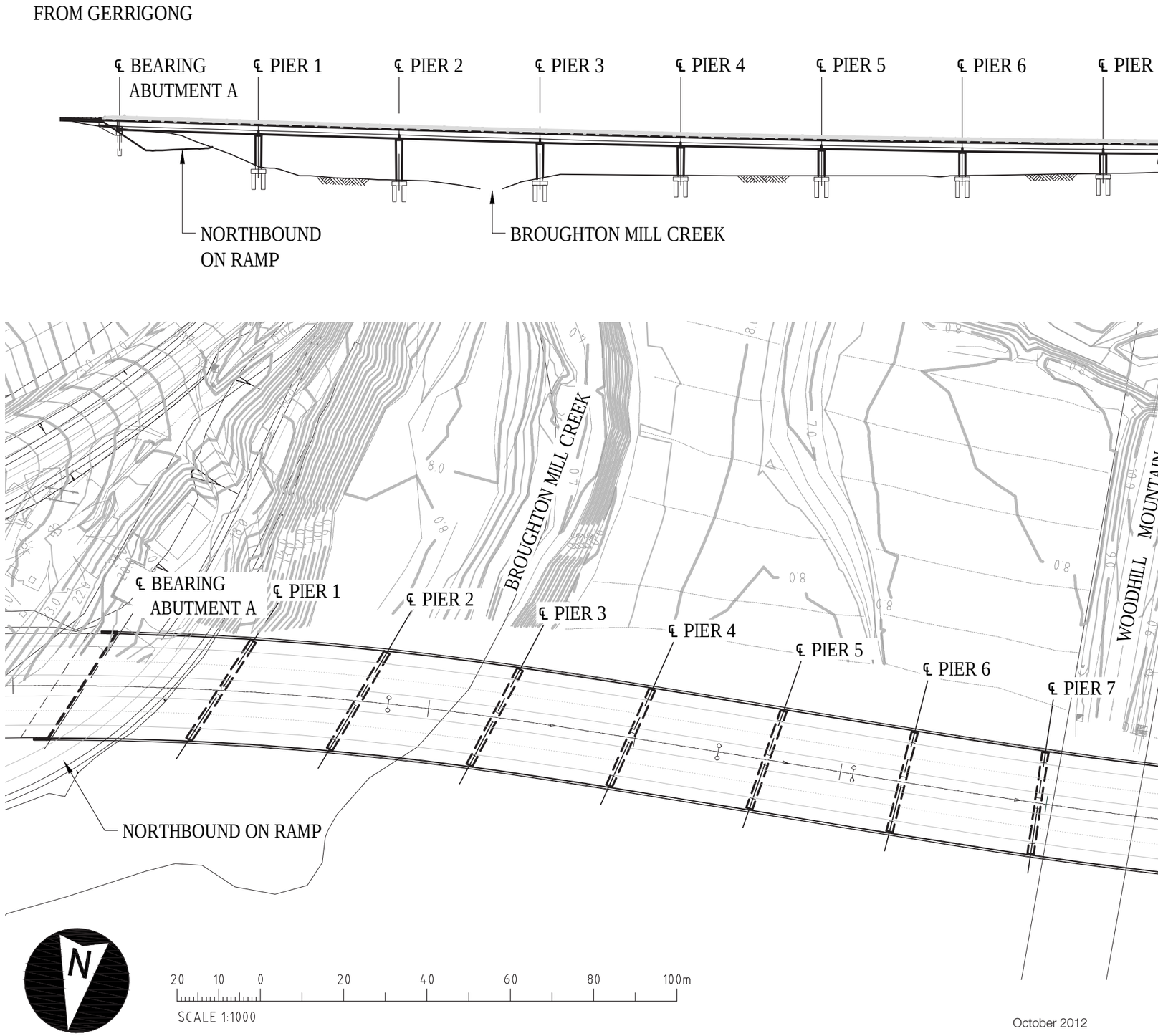
As part of the 'family' of bridges of the Foxground and Berry Bypass Project, and to be consistent with other bridges on the Princes Highway, the design of the bridge at Berry has been prepared with reference to the *RTA Bridge Aesthetic Guidelines, 2004.*

4.1.6 Bridge design overview

The bridge at Berry is designed to maintain 1:100 year flood free access to Berry. It is characterised by its overall gently sweeping, serpentine form. The bridge sweeps down off the ridgeline to then run almost parallel to the floodplain. The Super T primary structure provides a pleasing span and deck profile, leading to a sense of openness beneath the bridge, in keeping with the generally open pastureland along Woodhill Mountain Road.

The regular rhythm of support piers would provide a measured and refined architectural expression suited to the rural, floodplain context. The piers and abutments progressively vary in alignment to provide a comfortable relationship to the alignment of the northbound on-ramp, to Woodhill Mountain Road, and to the creeks and tributaries the bridge crosses. This 'fanning' effect should provide an attractive elevation when viewed from Woodhill Mountain Road, and a sense of openness when travelling beneath the bridge at the north abutment.

Refer to Figure 11.



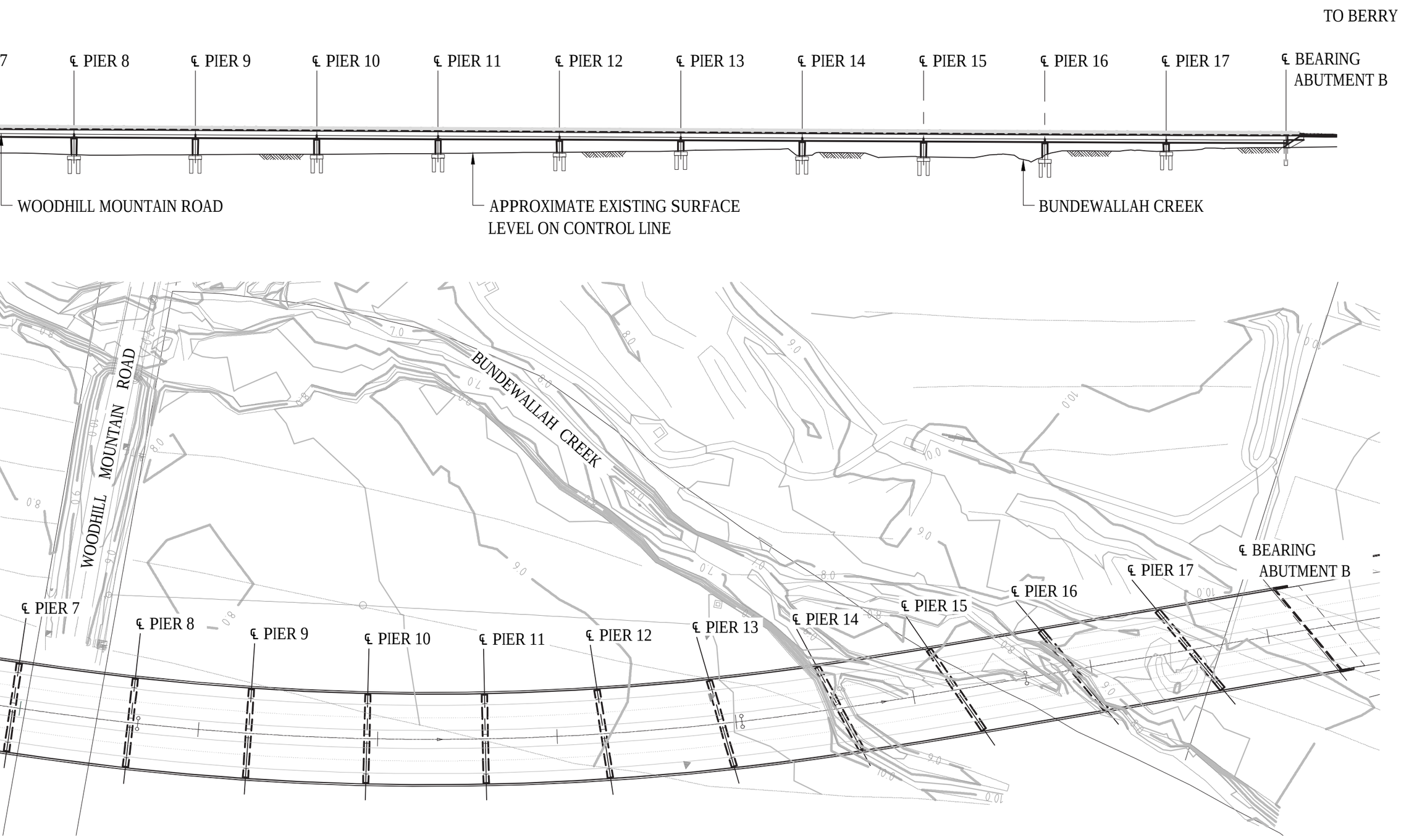


Figure 11: General arrangement

4.1.7 Technical criteria

Bridge Design Criteria	Parameter	Notes
Bridge length	600metres	Primary driver for the bridge length is to provide sufficient waterway opening in the event of a flood.
Overall bridge width	26.5metres	This width includes two traffic lanes for the northbound and southbound carriageways with provision to upgrade the bridge to carry three lanes in the future.
Bridge height from ground level to underside of bridge deck	5.3metres at Northern end 4.6metres at Woodhill Mountain Road 1.8metres to underside of deck	Driven by a 5.3metres clearance to the Bypass on-ramp that travels under the end span of the bridge. Minimum required road clearance to bridge structures. Minimum required clearance for maintenance
Distance between piers	33metres	This is a nominal dimension that changes across the length of the bridge to account for creek and road crossings. Maximising the spacing between piers creates a more open feel to the bridge structure. The 33metres bridge spans are also economical with regard to the supply and delivery costs of the Super-T girders.
Orientation of piers		Generally the piers are perpendicular to the road centreline, however in some locations the bridge piers are orientated parallel to the creeks and roads that pass beneath them.
Bridge deck type	Super-T girders	Super-T girders are precast bridge beams that are commonly used in Australia and provide a very high quality finish and durable product. A concrete deck slab is cast on top of the precast elements to enhance their strength.
Overall depth of bridge deck	1800millimetres	For the 33metres span length,1500millimetres deep Super-T girders with a 225 concrete slab would be provided. The bridge would then be covered by a 75millimetres thick layer of asphaltic concrete.

Bridge Design Criteria	Parameter	Notes
Substructure type	Reinforced concrete pier elements	Four separate pier options have been presented to the community. Pier options that accommodate the changing height from existing ground level to the bridge deck without taking away from the aesthetic were chosen.
Foundations	Cast in-place concrete bored piles	The piers would be supported on cast inplace bored piles that would be socketed into rock. These piles would be buried in the ground.
No. of expansion joints	3 or 4	Expansion joints would be a finger joint type in order to minimise joints across the bridge length. Finger joints have a better noise performance compared with compression seal type joints. The exact number of expansion joints would be determined at the detailed design stage following a detailed structural analysis. Typically a large spacing between the bridge expansion joints would result in a larger bridge bearing footprint to account for movements of the bridge due to transient load effects such as temperature changes. Larger bridge bearings also influence the width of the piers.
Traffic barrier type	Concrete barrier with twin galvanised steel railing	Height from road surface = 1300millimetres Overall height of concrete when viewed from ground level = ~ 1800millimetres. The geometry of the traffic barrier is driven by road safety on the inside face and aesthetics on the outside face. The overall height of the barrier on the outside is set to hide the longitudinal drainage pipes that run along the bridge deck to collect rainfall run-off from the road surface. The Northbound and Southbound Carriageways would be separated by a 1100millimetres high reinforced concrete barrier.
Noise barriers	Nil	Noise modelling has shown that no noise walls are required across the bridge.

4.1.8 Bridge design elements

The development of the bridge at Berry concept design involved a series of specific studies into the bridge components.

Pier design study

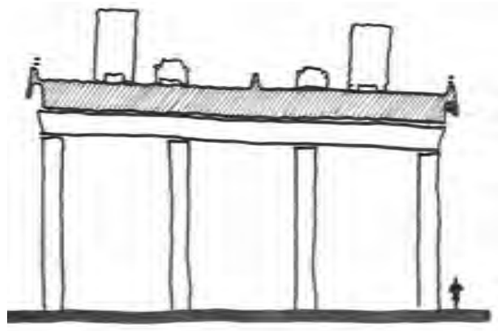
Initially six generic bridge pier options were investigated to establish the most appropriate. The types are illustrated in Figure 12.

The six generic pier options and the reasons for the subsequent shortlisting of types for further development was presented to the Berry Bridge and Northern Interchange Precinct Community Working Group for feedback in March 2012.

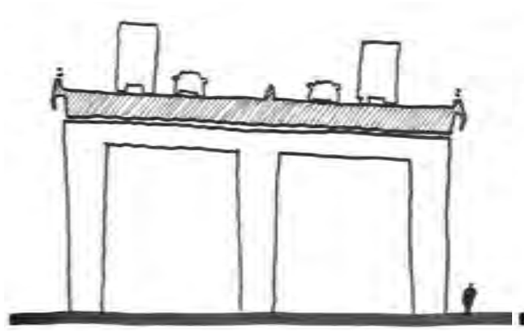
The three generic bridge pier types that showed the most promise for further development were:

1. Circular Columns – Integrated Headstock (developed as Option D)
2. Portal Frame – Integrated Headstock (developed as Options B and C)
4. Circular Columns – Expressed Headstock (developed as Option A)

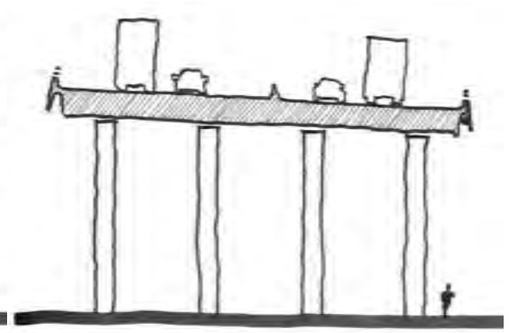
The reasons that generic bridge pier options 3, 5 and 6 were not developed further are as follows:



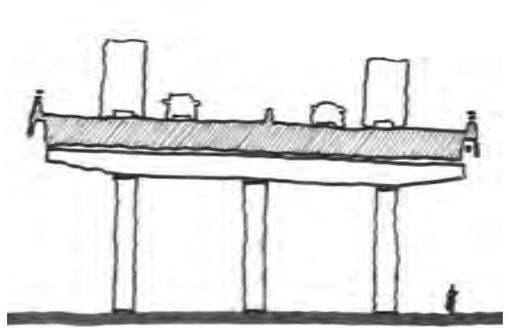
1. Circular columns - integrated headstock.



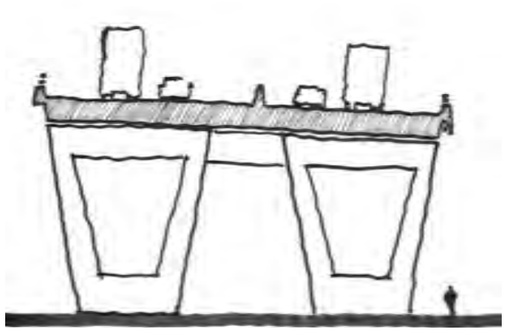
2. Portal frame (‘m’ shaped) – integrated headstock.



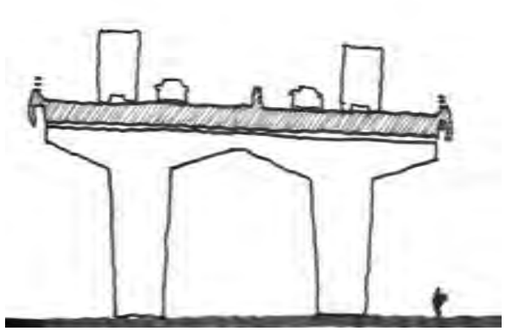
3. Circular columns – recessed headstock.



4. Circular columns - expressed headstock.



5. Double ‘V’ shaped piers.



6. Double ‘T’ shaped piers.

Figure 12: Generic pier types.

Double ‘V’ shaped piers

- A visually ‘low key’ expression in the environment was sought - a simple rhythm of piers and spanning elements (creating light and shade) as the bridge traversed the picturesque floodplain landscape. This pier type has an unnecessarily complex form, drawing attention to itself and was therefore seen as an inappropriate type to pursue.
- It did not address the need for a pier type that on an aesthetic level, could successfully transition from two or three meters of clearance height, at either end, to as much as twelve meters at Broughton Mill Creek.
- This option, due to the complexity of formwork involved, was likely to be the most expensive to pursue – the Working Group agreed that a simple, elegant solution, at moderate cost was preferred.

Double ‘T’ shaped piers

- This pier type did not address the need to transition from two or three meters of clearance, at either end, to as much as twelve meters at Broughton Mill Creek. Whilst the ‘T’ shape would have attractive proportions for the three to four highest pier locations, for the majority of the bridge length the clearance would be much less and the ‘T’ shape would look squat, as if sinking. For as much as half the length of the bridge the pier would end up simply as a beam/wall. The bridge should be considered in its totality, and the relatively low clearance required did not suit this pier type.

Circular columns – recessed headstock

- The Working Group did not respond well to this option. It was seen as a somewhat unrefined structure without any architectural character or design response to location.
- This pier type required the Super T beams to have a step in their ends, and the RMS had highlighted cracking problems with this arrangement on other bridges in NSW.
- The ‘recessed’ cross beam required would need to be very wide – the inverted ’T’ shape end of the headstock would be clearly visible in elevation. The flush alignment of the headstock end and the Super T faces on a curved horizontal and vertical alignment like this would be difficult to achieve. This concern was illustrated with a photo of a flyover ramp at Sydney Airport of similar construction.

Study Outcome

The three most promising generic pier type options were further developed into four shortlisted options that were then re-presented to the Working Group (and issued to the group in a draft report) and also published and exhibited to allow the broader community an opportunity to comment.

Short-listed bridge pier options

The following four pier types were short-listed for further consideration:

The short-listed bridge pier options were presented to the CRG for comment and were loaded onto the RMS website to provide an opportunity for further community feedback.

A - Original Pier Option – Refined

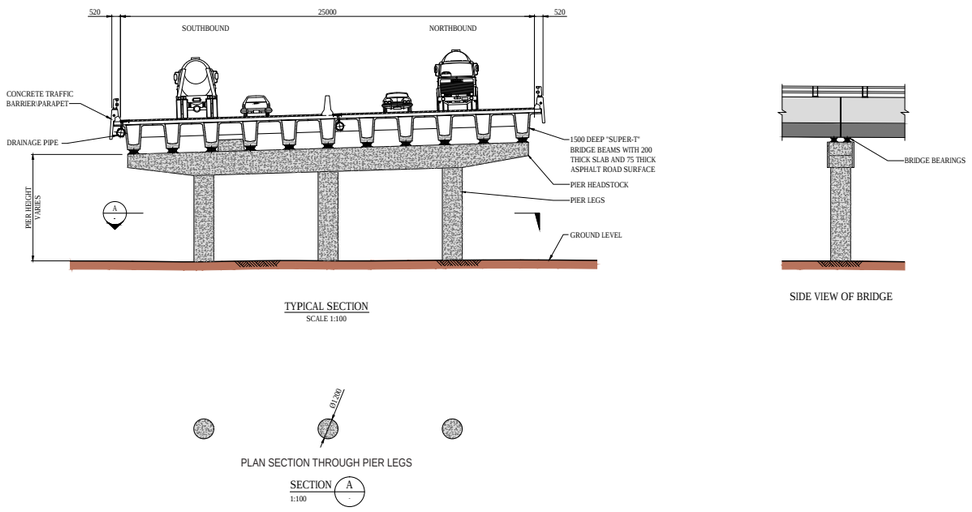
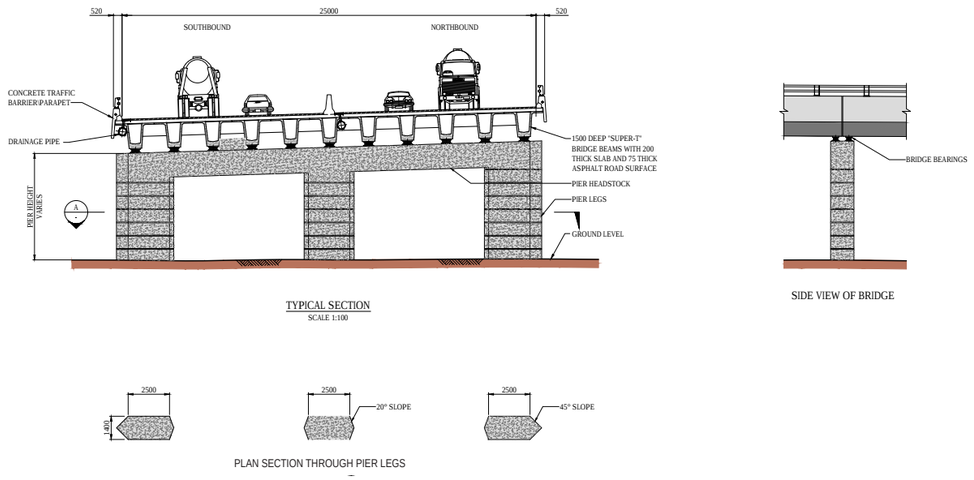


Figure 13: A - Original pier option - refined.

CM+ 2012

CM+ 2012

B - Flood Plain/Expressed Coursing



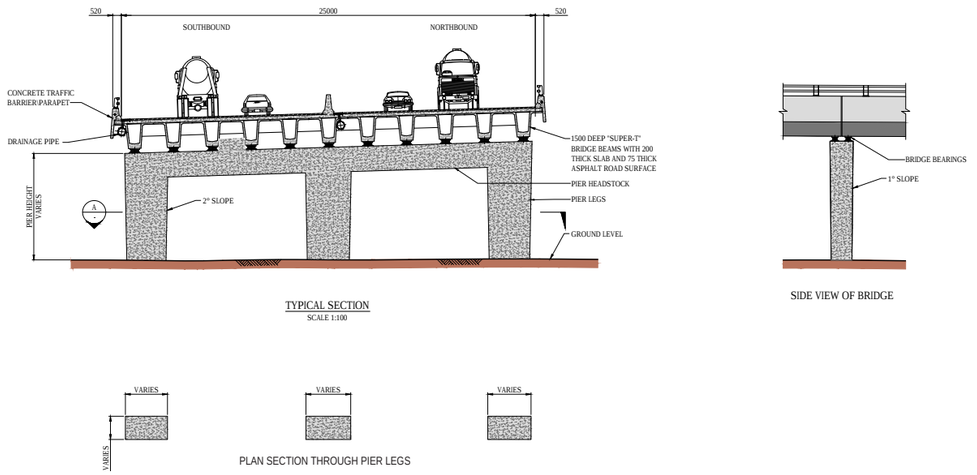
CM+ 2012

Figure 14: B - Flood plain/expressed coursing.

Example: Third Hunter River Crossing, Maitland.

CM+ 2012

C - Contemporary Portal Frame



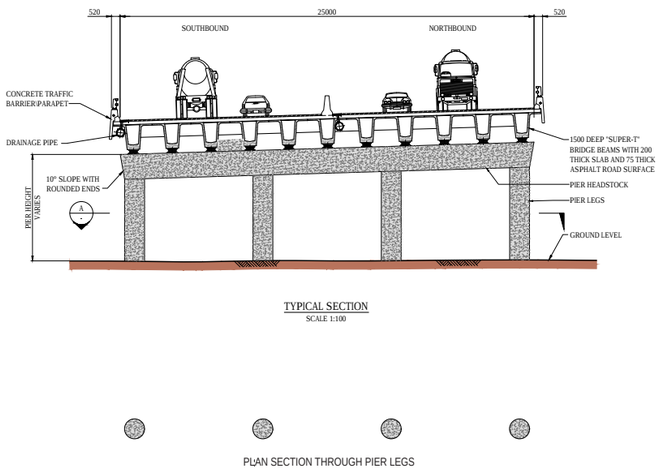
CM+ 2012

Figure 15: C - Contemporary portal frame.

Example: Mehi River Bridge, Moree.

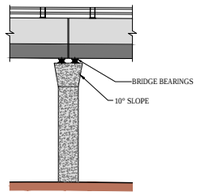
CM+ 2012

D - Flared Capital/Integrated Headstock



TYPICAL SECTION
SCALE 1:100

PLAN SECTION THROUGH PIER LEGS



SIDE VIEW OF BRIDGE

CM+ 2012

Figure 16: D - Flared capital/integrated headstock.

Example: Pacific Highway, Bonville.

CM+ 2012

Parapet options

Three parapet types were investigated. From a construction point of view, the selection of parapet type would be independent of pier type. However, some parapet types tend to suit the pier architecture more than others. The three pier types investigated were:

1. Straight Sloped Face

This option provides a simple, clean, modern expression.

2. Angled Face

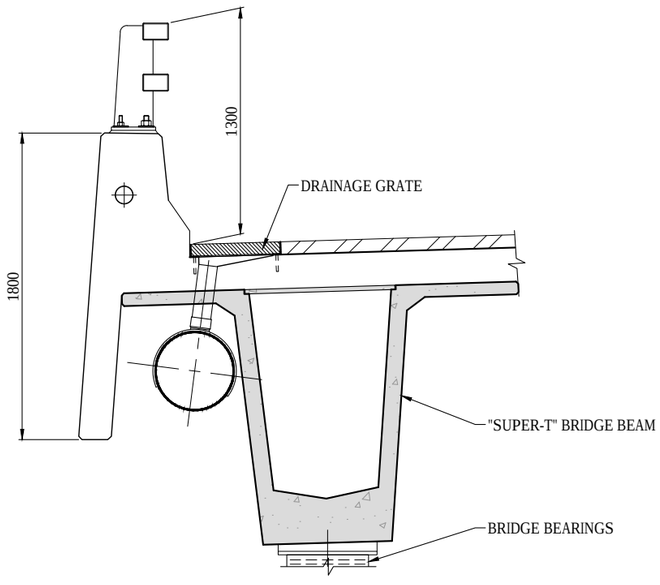
An angled parapet profile works well in conjunction with angled piers below.

3. Grooved Face

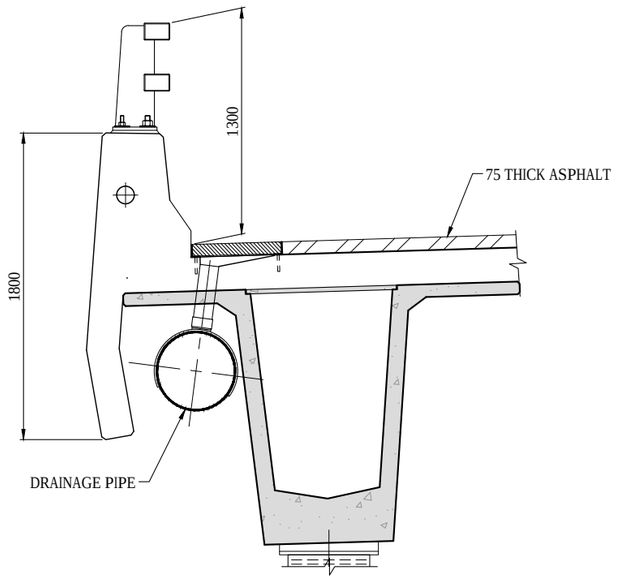
A horizontal groove introduces a ‘false joint’ shadow line, adding additional detail into the parapet panels.

All parapet types extend down the same length, on both north and south elevations, to screen the bridge drainage pipes when viewed from the side. They all incorporate twin rail safety barriers, provide an angled surface profile to catch the light and the top of the parapets slope away from the parapet face to avoid staining.

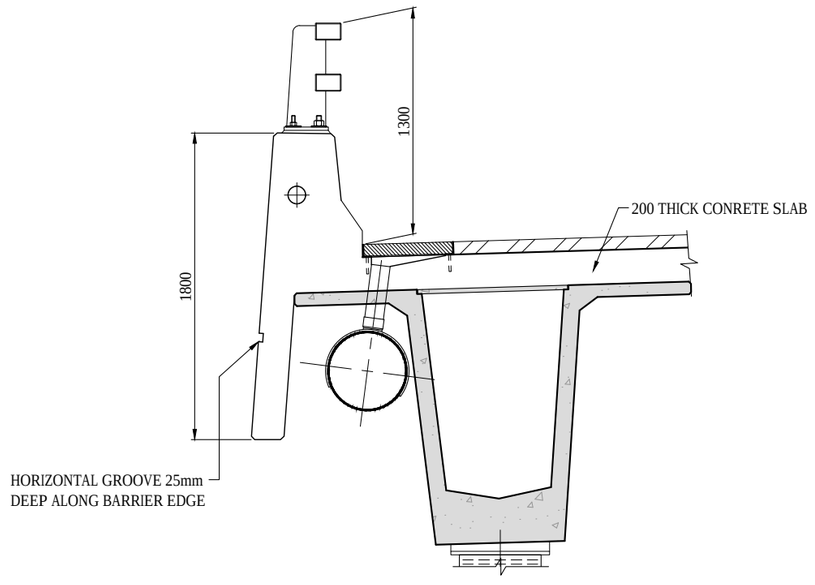
The three bridge parapet options were presented to the community working group for comment and were uploaded onto the RMS website to provide an opportunity for further community feedback.



BRIDGE BARRIER - OPTION 1



BRIDGE BARRIER - OPTION 2



BRIDGE BARRIER - OPTION 3

Figure 17: Parapet options.

Traffic barriers

Twin rail type safety barriers with a modified Type F concrete upturn arc are proposed for the outside edges of the bridge at Berry. This traffic barrier type:

- Reduces unnecessary parapet depth and heaviness.
- Provides a lighter and contrasting top profile.
- Emphasise the bridge's streamlining and horizontal lines.
- Provides a sense of openness and allows views.

An example of this barrier type in use, can be seen in the Sea Cliff Bridge, located at Stanwell Park/Coal Cliff.

Figure 18: Traffic barriers.

North abutment

The northern bridge abutment is proposed to be:

- A spill through type (this abutment type comprises a sloped embankment rather than a vertical wall).
- Is seen up close from the northbound on-ramp.
- Continues as a 2H:1V (a slope of the proportion two horizontal to one vertical) cut batter within the Northern Interchange.
- Would be rock faced in the bridge undercroft area (locally sourced stone).
- Would integrate maintenance access stair and landing in the abutment design.

Figure 19: Stone faced abutment.

Figure 20: View of north abutment from north bound on-ramp.

South abutment

The southern bridge abutment is proposed to be:

- A spill through type.
- Is seen close up by pedestrians using the adjoining sports/recreation precinct.
- Is angled to follow the creek alignment.
- Incorporates scour protection on embankment slopes (locally sourced stone).
- Would be rock faced in the bridge undercroft area (locally sourced stone).
- Would integrate maintenance access in the abutment design.

The southernmost bridge spans would maintain a clearance of 3.0metres (minimum 1.8metres for maintenance access), wherever possible, to:

- Deter graffiti.
- Deter vagrancy.
- Maximise light and rain penetration to undercroft and Connollys Creek.
- Properly ventilate.

If flood modelling necessitates the setbacks of the south bridge abutment from Connollys Creek, then bridge clearances may be achieved through local excavation, subject to an assessment of undercroft drainage levels.

Figure 21 : Stone faced abutment - showing maintenance access stair.

Figure 22: Aerial view of south abutment.

Lighting strategy

No lighting on the bridge at Berry is currently envisaged. The overhead power supply along Woodhill Mountain Road would need to be re-routed and local road lighting reassessed as the proposed alignment would interfere with the current service. Existing park lighting for the sport/ recreation precinct to the south of the bridge at Berry alignment may need to be reassessed in light of the need to ensure pedestrian safety.

4.1.9 Landscape design strategy

Where the bridge crosses over existing creeks, suitable riparian vegetation would need to be re-established, following the completion of bridge construction, in order to maximise the continuity of the creek ecology and habitat.

The historic Woodhill Mountain Road avenue of Poplar trees could be strengthened through the replacement of lopped trees and the inter-planting of gaps in the avenue, with new trees. The localised realignment of the power supply would prevent future lopping of trees by power supply utilities.

The 26.5metres wide bridge deck, combined with the lower height sections of the bridge (as low as 3.0metres) would result in an undercroft middle-zone that would not support pasture grasses – due to the rain shadow and lack of sunlight. Surface treatment suited to this microclimate would be an important consideration in order to avoid a ‘dead zone’ beneath these lower southern sections of the bridge.

Figure 23: Northern Interchange - setting.

4.2 Northern Interchange

The Berry Northern Interchange is located approximately 500metres to the northeast of the township, and connects into the Princes Highway continuing north to Sydney. The existing Princes Highway sweeps to the southwest, crossing Broughton Mill Creek before heading into town. The northbound on-ramp and the southbound off-ramp connect into this existing road that leads to the Main Street (Queen Street) of Berry. The bypass alignment sweeps westwards down across the floodplain, becoming the bridge at Berry. Refer to Figure 23.

4.2.1 Setting

A series of rural residential homesteads are located to the southeast and northeast of the interchange and are nestled within the bush vegetation of the ridgeline. A new driveway passing beneath the bypass carriageways at its northern extent would maintain vehicular access to those properties located west of the alignment.

4.2.2 Urban design principles

The following urban design principles have guided the interchange design:

- Minimise the visual presence of interchange structures.
- Minimise impacts on existing properties and access.
- Minimise the interchange footprint.
- Retain mature trees along the highway.
- Consider the sequential views on the northern approach to Berry.
- Contribute to the township arrival/departure experience and to legibility.
- Develop Berry township entry signage strategy.
- Frame rural and township views from elevated vantage points.
- Relocate Berry memorial sculptures.

4.2.3 3D study

A 3D computer generated model was prepared of the Northern Interchange to develop a better understanding of the experience of driving through the interchange from various directions, including the arrival sequence from the north into Berry; and also for continuing south on the bypass travelling on the bridge at Berry. Six views are illustrated with accompanying view location key plans.

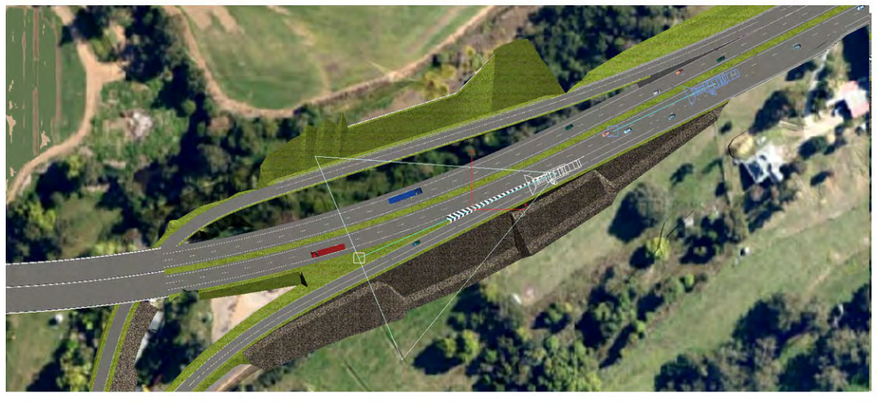
View 1- View from Berry Bypass South Bound

N

CM+ Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

Berry Bypass Urban Design Strategy
Northern Interchange Views
March 2012
Dwg. No: 12001-SK027

View 2- View from Berry Bypass South Bound Exit Lane



N

Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

Berry Bypass Urban Design Strategy
Northern Interchange Views
March 2012 **12001-SK028**

View 3- View from Berry Bypass South Bound Exit Lane looking West

N

Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

Berry Bypass Urban Design Strategy
Northern Interchange Views
March 2012 **12001-SK029**

View 4 - View from Berry Bypass North Bound Entry Lane Looking North

N

CM+ Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

Berry Bypass Urban Design Strategy
Northern Interchange Views
March 2012
12001-SK030

View 5- View from Berry Bridge South Bound Lane at Ch 15800

N

CM+ Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

Berry Bypass Urban Design Strategy
Northern Interchange Views
March 2012 **12001-SK031**

View 6- View from Berry Bridge South Bound Lane at Ch 15925

N

Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

Berry Bypass Urban Design Strategy
Northern Interchange Views
March 2012
12001-SK032

4.2.4 Interchange design elements

The Northern Interchange would comprise the following component elements.

Cut and fill batters

The interchange sits atop a local ridgeline, the main alignment cutting into the ridge to the south, extending the existing cut batter of yellow-orange coloured, exposed, rock face. A further cut batter would be required to the east of the northbound on-ramp. This batter would be at a slope of 1V:2H and can therefore be planted out with suitable grasses, shrubs and scattered trees.

Retaining wall

Although most of the interchange main alignment and ramps follow the contours of the ridge landform, the levels are such that to the north of the interchange the northbound on-ramp necessitates a significant fill embankment. To prevent the toe of this embankment impinging upon the Turf Farm operation below, an approximately 100metres long retaining wall structure would be proposed.

Lighting

Sections of the interchange roadway would need to be illuminated to ensure compliance with road safety standards. The final light pole design is yet to be confirmed.

Figure 24: Northern Interchange - Aerial view from the west.

4.2.5 Landscape design strategy

The landscape design of the interchange and northern approach to Berry will choreograph the arrival sequence into Berry township. The landscape design will capitalise upon the potentially expansive views that will be possible from the elevated location atop the ridge, looking south and west across the rural valley landscape and new bridge at Berry, and to the escarpment beyond.

Typical cross sections

Three cross sections illustrate the new landform profile compared to the existing, and illustrate the opportunities for landscaping of the corridor to frame views along the highway, and then across the valley to provide a fitting arrival experience at Berry.

Refer to Figure 23 for location of cross sections.

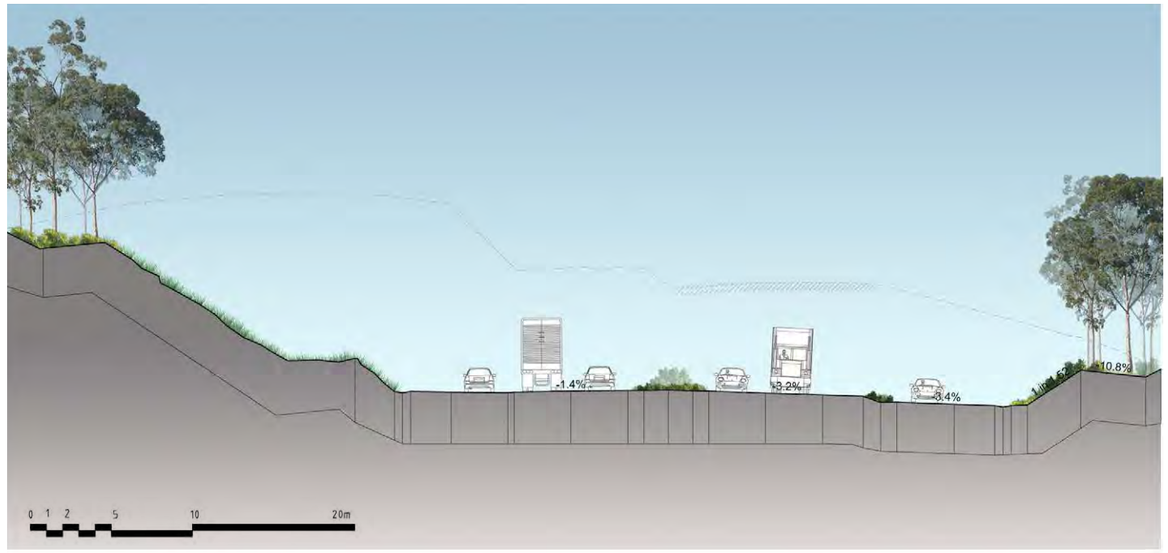


Figure 25: Section A

Figure 26: Section B

Typical planting selections

Plantings that are endemic to the region are proposed that would suit the climate, soils and provide appropriate fauna habitat. The planting palette would be selected with the objective of achieving a low establishment and maintenance regime.

Figure 27: Section C

Northern interchange

The design of the landscape at the northern interchange would reinforce the landmark location and feature endemic tree plantings, natural rock embankments, colourful signature trees at the gateway to Berry and elevated views of surrounding fields from the bridge structure.

On the approach towards the interchange, the roadside embankments would be planted with native grasses, shrubs and copses of endemic trees to blend with the existing rural landscape.

As the cut embankments become higher and steeper (refer to Section B) the underlying rock surface would be exposed as a feature, with native trees planted at the top of the cuts to create a green ridgeline . The road median would be planted with native grasses and shrubs strategically placed to screen headlights at critical areas.

The turnoff to Berry will be distinguished by a colourful mix of native and exotic low shrubs framed by an avenue of Claret Ash (*Fraxinus oxycarpa aurea*)

The use of exotic species, highlighting the former heritage plantings in the town, would be echoed in the southern entry into Berry .

Where unaffected by earthworks within the road corridor, the existing landscape adjacent to the current Princes Highway alignment will be retained and reinforced with similar indigenous tree and shrub plantings. Existing drainage areas and dams will be retained and highlighted with riparian species to blend with the rural landscape character.

Proposed species:
Eucalypt trees to reinforce existing trees, which would be retained.

Eucalyptus punctata (Grey Gum)
Eucalyptus globoidea (White Stringybark)
Eucalyptus eugenoides (Thin Leaved Stringybark)
Hakea dactyloides
Melaleuca linarifolia

Possible exotic highlight trees:
Fraxinus oxycarpa aurea (Claret Ash)

Refer to Figures 28 to 30.

Figure 28: North Interchange typical landscape plan.

Figure 29: Species selection.

Figure 30: Typical cross section.

Figure 31: North Street - West.

Figure 32: North Street - Centre.

Figure 33: Rural character - pasture for agistment.

Figure 34: North Street - East.

5.0 North Street Precinct

The North Street precinct is located at the north edge of the Berry township, and includes the North Street streetscape, the Berry Bypass alignment and the strip of rural land between. At the precinct's western extent are George Street, and a triangular parcel of grazing land. The proposed Kangaroo Valley Road Interchange adjoins this parcel to the northwest. In the east the precinct extends to Prince Alfred Street, the Berry sports facilities; that include tennis courts and skate park; Berry Oval and Camp Quality facilities.

5.1 Setting and streetscape character

The precinct benefits from spectacular panoramic views to the north, across picturesque pastureland to the dramatic backdrop of the Cambewarra Escarpment. Small creeks and tributaries wander across the floodplain and support strings of dense vegetation. The pasture to the north of North Street is currently utilised for agistment, with horses grazing a common sight.

North Street varies in character along its length. The west end (between George and Edward Streets), is quiet and intimate in scale, has a narrow central pavement, grassed swales (rather than kerb and gutter) and informal avenue tree planting along each side. The mature tree planting tightly frames views west along the street to the escarpment – defining a quintessential country laneway. A mix of native and exotic street trees is proposed. Natives predominate with the occasional burst of colour provided by lighter coloured exotic foliage or Jacarandas.

Between Edward and Alexandra Streets (the middle section) there is sparser street tree planting on both sides (occasional groups of trees), that open up views north to pastureland. The residential frontages change in character in this section. There are tended front lawns, overhead power lines, concrete driveways and typical suburban residential house construction, that tends to contrast with the attractive rural character of the north side of the street.

Between Alexandra Street and Prince Alfred Street (the eastern section) there are even fewer street trees and the streetscape is exposed and lacks definition. Residences are set back in this section and the mid-block southern frontage is defined by a section of dense planting.

The precinct forms the transition from urban to rural land uses - from the regular town grid of residential streets and blocks, to the expanse of rural pastureland.

Refer to Figures 31 to 34.

5.2 Design philosophy

The guiding urban design philosophy for the North Street Precinct, has been to maintain as much as possible the:

- Small scale 'country laneway' character of North Street.
- Rural outlook and character of the pastoral landscape to the north.
- Expansive views to the impressive Cambewarra Escarpment.

5.3 Urban design principles

The following urban design principles have guided the urban and landscape design of the North Street precinct:

- Enhance township green space connectivity and recreational opportunities.
- Maintain North Street pedestrian and cycle connectivity.
- Integrate noise mitigation structures within the landscape setting.
- Re-establish facilities valued by the community, such as the Riding School green, and attractive pastures for agistment.
- Provide an attractive journey and outlook for drivers on the Berry Bypass.
- Provide a safe pedestrian and cyclist environment for parks and walkways through adopting Crime prevention through Environmental Design (CPTED) principles.
- Develop an urban and landscape design that would be low maintenance, durable and that deters graffiti.
- Develop a materials and finishes palette that wherever practical incorporates elements of locally sourced stone and timber, and colour finishes that complement the natural colours of the environment.
- Generally utilise native plantings that are endemic to the region, whilst also incorporating cultural exotic plantings, when warranted, as highlight or feature plantings.

5.4 North Street pedestrian and cyclist connectivity

At the workshops held with the community working group, it was related that North Street is currently used as an informal jogging and cycling route, and that this access was important to the community. Subsequent 3D modelling and costing studies showed that pedestrian overbridges on or near the North Street alignment were expensive and would impinge on the northern views and outlook of residents along North Street. The scale of the structures that would be necessary was also of concern to North Street residents in attendance.

Due to the cost and likely low level of use, the readily available alternative route (via the proposed bridge connecting Kangaroo Valley Road and Queen Street), and in light of residents concerns relating to scale and impact on views and amenity, the RMS decided not to pursue a pedestrian overbridge at this location. The adjoining map illustrates the short additional distance of 100metres and small additional walking time of 1.25 minutes of the alternative pathway.

Figure 35: North Street access study.

5.5 Berry Bypass infrastructure

The Berry Bypass consists of a highway standard roadway, designed to a 100 kilometre/hour posted speed. Initially the bypass would be four lanes, with the capacity to expand to six lanes (built-in to the design and cross sectional footprint) if required in the future.

North Street (west) would be connected to Rawlings Lane to maintain vehicular access to the two farm properties located to the north of the Bypass.

A vegetated, noise reinforced, soil mound is proposed along the southern edge of the bypass corridor. A 2.5metre wide shared pathway would be provided along the north side of North Street, connecting east and west into the existing network of township footpaths.

Figure 36: Berry Bypass infrastructure.

5.6 Urban design strategy

The proposed construction of the highway-scale Berry Bypass infrastructure would bring changes for the township of Berry. Some of these changes would be positive including:

- Completion of this important section of the Princes Highway would provide a quicker and safer route for locals travelling regionally and along the NSW coast, tourists visiting South Coast destinations and day-trippers visiting the popular heritage and festival destination of Berry travelling to/from Sydney; boosting tourist accommodation, cafe/restaurant and retail business opportunities and employment in the township.
- The upgrade to a highway standard roadway would reduce fatalities and accidents along this currently difficult stretch of highway.
- The volume of truck and through traffic on the Queen Street retail 'Main Street' would be considerably reduced. There would be an opportunity to refocus 'Main Street' as a pedestrian friendly zone with increased and safer crossings, more opportunities for outdoor cafe-style seating, street tree planting and urban furniture.

The highway corridor and interchanges are large physical structures and the urban strategy has been to investigate means by which these structures could be integrated into the northern edge of the township and into the surrounding attractive rural floodplain landscape - minimising the urban, landscape and visual impacts on the environment.

The strategy incorporates a series of urban and landscape design initiatives to reinforce the attractive rural character of the North Street Precinct, including:

- Reducing the visual impact of the road corridor through adjustments to the highway's vertical and horizontal alignment – moving the alignment and Northern Interchange further north of the township.
- Introducing generous open space buffers between Berry Bypass and the north and northwest edges of the township.
- Wherever possible re-establishing rural land uses on RMS residual, non-operational, property – Riding School, pastures for agistment, re-establishing land suitable for dairy farming, re-establishing the riparian vegetation and habitat along creek lines.
- Reducing the noise impacts through incorporation of landscaped noise barriers along the edges of the alignment to EPA requirements.
- Screening the roadway from the township with innovative landscaped 'Ha Ha' sloped landform.
- Retaining as much as possible existing landscape defines the rural character of the region and which screens from view the new roadway, bridge and interchange structures.
- Establishing a landscape strategy that reinforces the small scale, rural, 'country lane' character of North Street.

The Urban Design Strategy diagram illustrates the key initiatives that are proposed to integrate Berry Bypass within this uniquely picturesque setting.

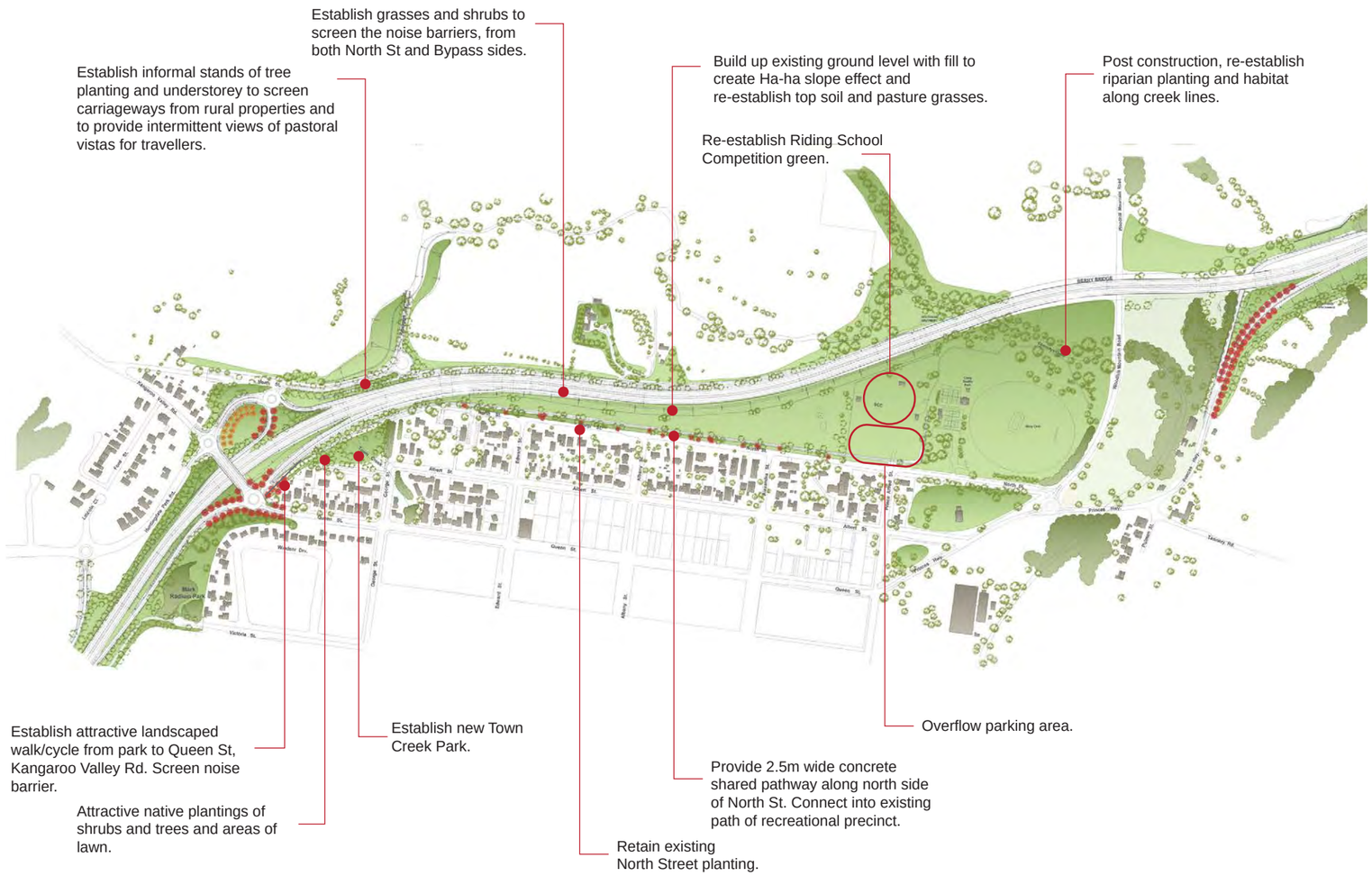


Figure 37: Urban design strategy.

5.7 Precinct plan

The Precinct Plan illustrates the proposed urban and landscape concept design for the North Street Precinct.

Figure 38: Precinct Plan - North Street.

5.8 Cross section and vantage point study

At the end of 2011 and beginning of 2012 a series of cross sectional studies were undertaken that aim to minimise the potential acoustic and visual impacts of the proposed Berry Bypass. It was during this period that the 'Ha Ha' concept was developed. A 'Ha Ha' is basically an artificially created, gently sloping, usually grass covered landform, that screens from view a distant structure, such as a security fence, or in this case, traffic passing along a highway.

The slope would be so gentle that the progressively increasing height would not be noticed. When viewed from North Street the grassed 'Ha Ha' slope would provide a foreground of pastureland, whilst allowing occasional views of the taller tree canopies to the north of the Bypass and importantly to the dramatic backdrop of the Cambewarra Escarpment. The 'Ha Ha' slope and landscaped noise mound would screen views of traffic along the highway, whilst achieving the required acoustic barrier height of 4.0metres above the Bypass carriageway.

A series of photomontage images, generated by accurate 3D computer modelling, were prepared at four key locations along North Street. The existing view is provided on top, whilst for direct comparison purposes, the same view with the noise barrier mound and proposed screen landscaping in place, is illustrated below.

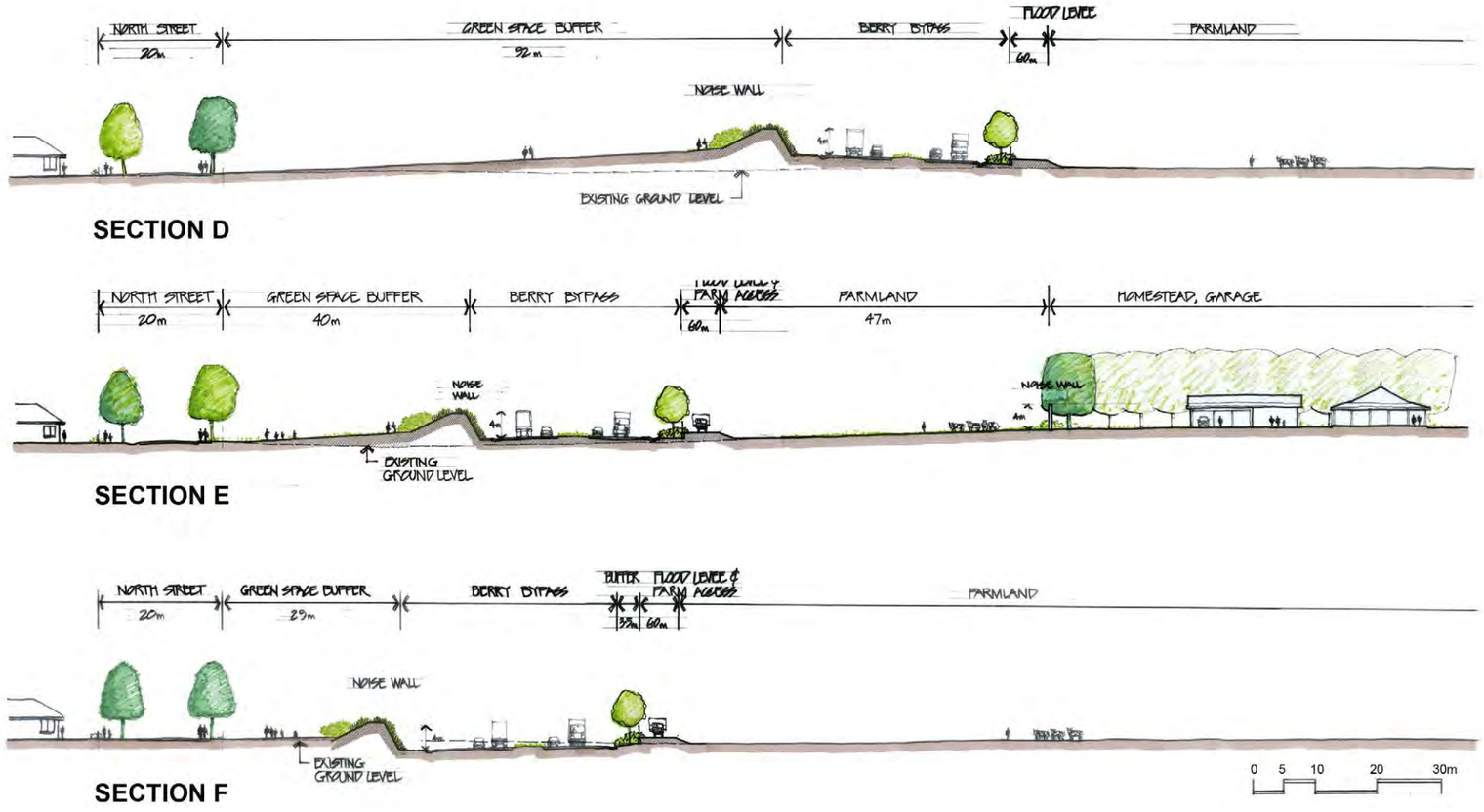


Figure 39: North Street cross section study.

Figure 40: Cross section and photomontage viewpoint location plan.

Figure 41: Viewpoint 1 (near Edward Street) - existing view.

Figure 42: Viewpoint 1 (near Edward Street) - with noise barrier and landscaping.

Figure 43: Viewpoint 2 (at Albany Street) - existing view.

Figure 44: Viewpoint 2 (at Albany Street) - with noise barrier and landscaping.

Figure 45: Viewpoint 3 (at Alexandra Street) - existing view.

Figure 46: Viewpoint 3 (at Alexandra Street - with noise barrier and landscaping.

Figure 46: Viewpoint 4 (at Prince Alfred Street) - existing view.

Figure 48: Viewpoint 4 (at Prince Alfred Street) - with noise barrier and landscaping.

5.9 Urban design elements

The North Street Precinct section of the Berry Bypass would incorporate a number of urban design elements. These include an approximately 800metre long and 4.0metre high noise barrier, a shared path and associated footpath connections, street and local park furniture and precinct lighting. All these elements have been considered as contributing to an overall coordinated design outcome.

5.9.1 Noise barrier options study

Three noise barrier design options were investigated, presented to the North Street Precinct working group, then published in local news media and exhibited at the RMS project office in Berry,; to provide an opportunity for broader community comment. The three options are:

1. Precast concrete wall

A precast concrete retaining wall, at a 10 degree slope from vertical. Angling the wall reduces the sense of being walled in, and reduces the incidence of reflected vehicular noise. A 2.0metre wide landscaped planter bed would be raised up 815millimetres above the carriageways on the bypass side, and planted with shrubs and grasses – this breaks down the apparent overall barrier height and introduces some contrasting green vegetation into the bypass corridor. On the North Street side there would be a 2H:1V sloped earth batter. The wall extends 1.2m above the top of the batter to provide a balustrade for pedestrian safety. The batter would be planted with native grasses, shrubs and small trees to screen the top of the wall from view. All visible surfaces of the noise wall are finished in a charcoal-dark green colour to visually recede in the overall pastoral landscape.

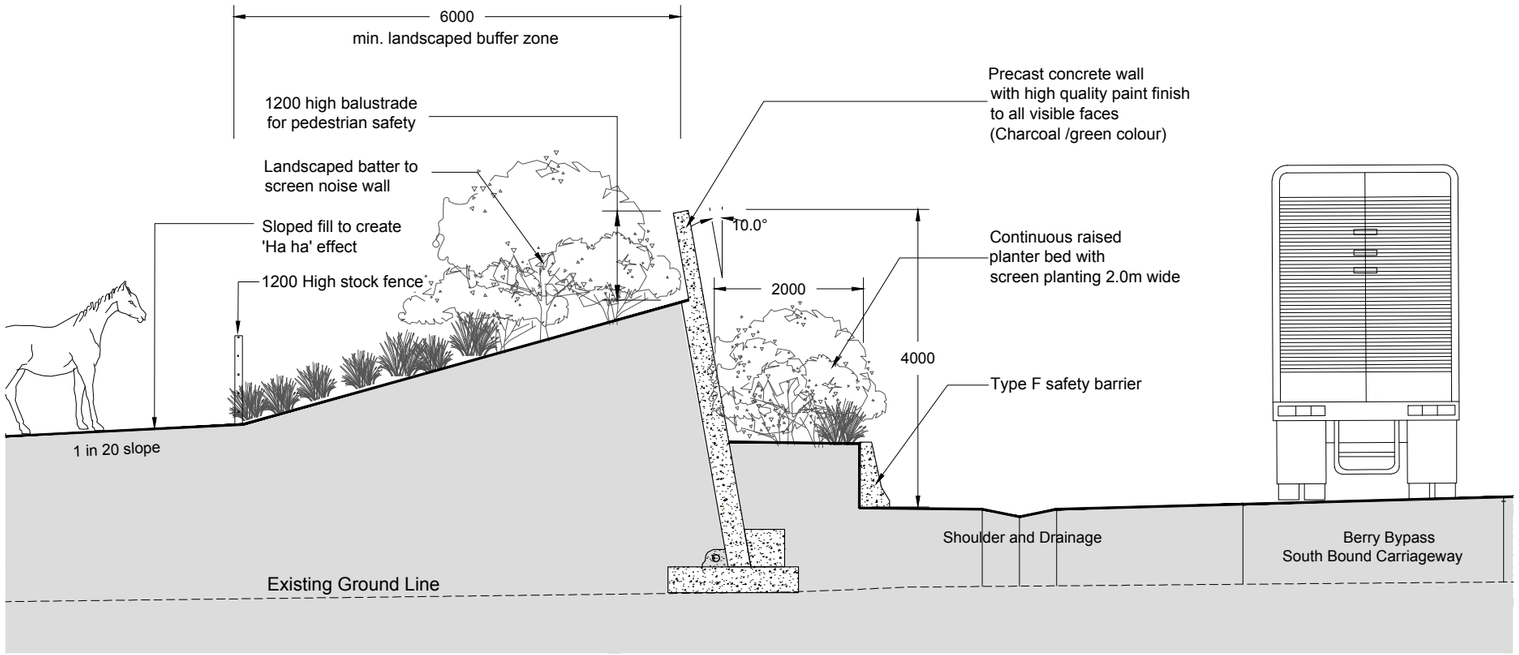


Figure 49: Noise barrier option 1 - precast concrete wall typical cross section.

Figure 50: Noise barrier option 1 - precast concrete wall photomontage.

2. Planted soil reinforced mound

This barrier type was suggested by Berry Alliance/BOB. The noise barrier consists of a 4.0m high reinforced soil mound, with a thirty degree slope face, from vertical, on the bypass carriageway side. This would be hydroseeded with pasture grasses, whilst on the North Street side there would be a 2H:1V sloped earth batter, planted with native grasses, shrubs and small trees to screen the mound from view. RMS Maintenance has advised that this type of planted soil retaining structure has been used on a number of RMS projects in NSW and if carried out in accordance with the relevant technical specifications, would be acceptable to the RMS. Photos and diagrams of proprietary reinforced soil systems are illustrated in Figure 53. This option would be the preferred barrier type to proceed to the next stage of development.

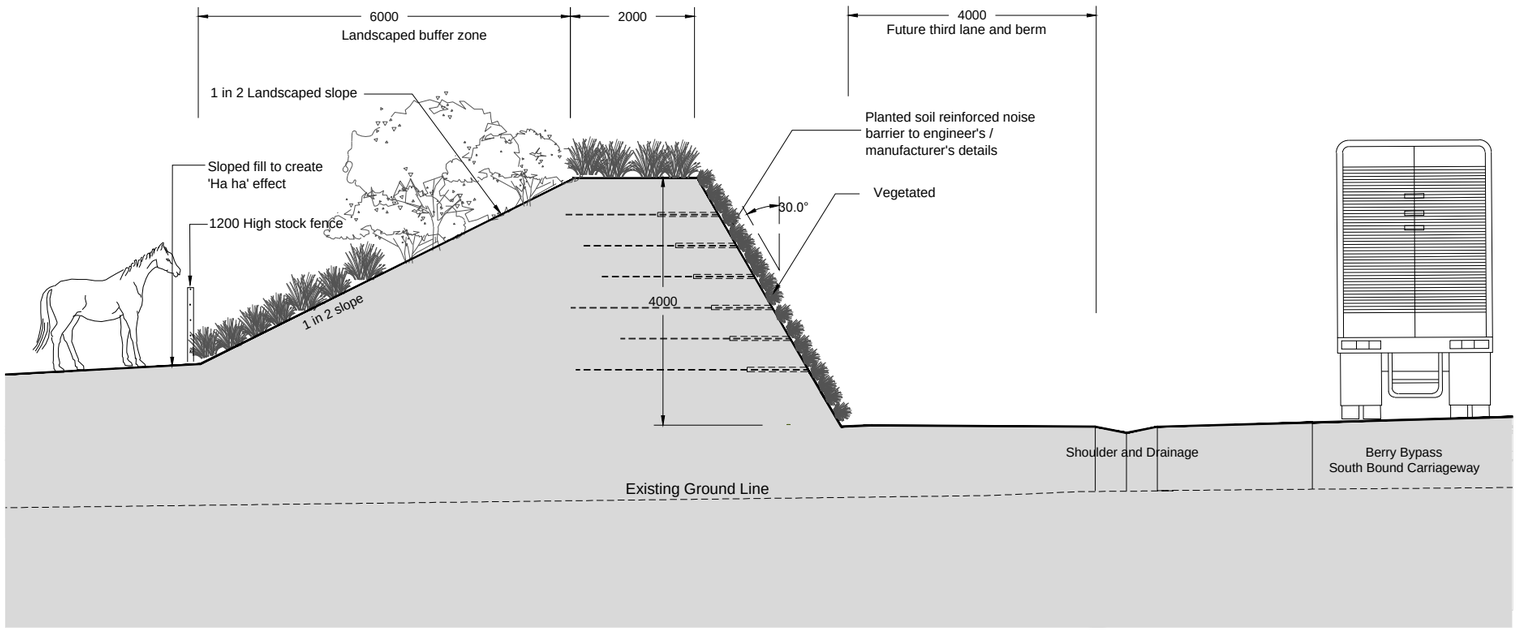


Figure 51: Noise barrier option 2 - Planted soil reinforced mound typical cross section.

Figure 52: Noise barrier option 2 - Planted soil reinforced mound photomontage.

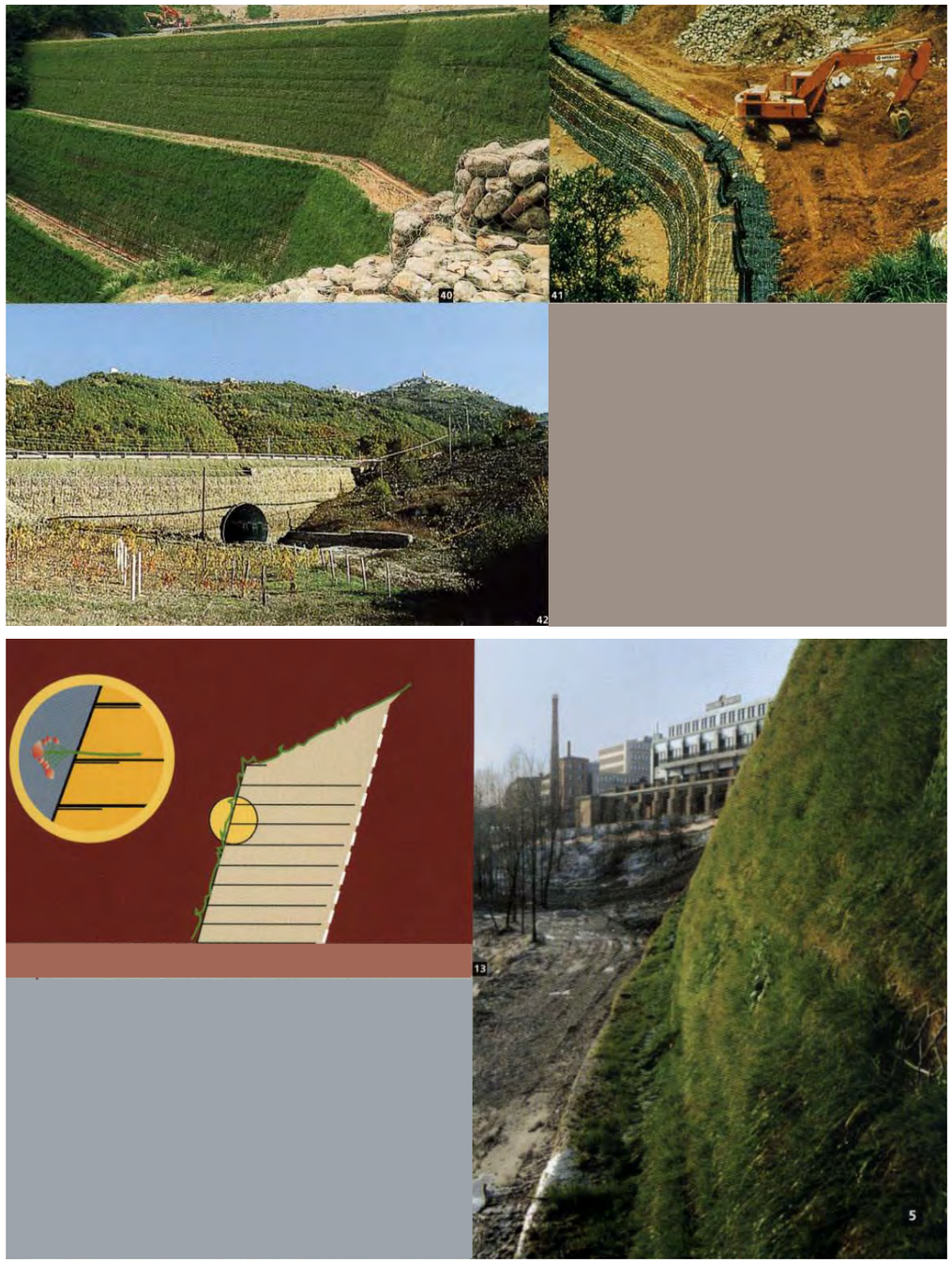


Figure 53 : Noise barrier option 2 - Planted soil reinforced mound examples of proprietary systems.

3. Combined stone wall and timber fence

This hybrid noise barrier option, is part local stone retaining wall, part timber noise wall, part landscaped mound – reducing the apparent scale of the barrier by breaking it into a series of steps and terraces. A palisade fence would be required at the top of the stone retaining wall for OH&S reasons. An advantage of this barrier configuration is that the landscape can be maintained from the North Street side without the need, on occasions, to close off the bypass road shoulder.

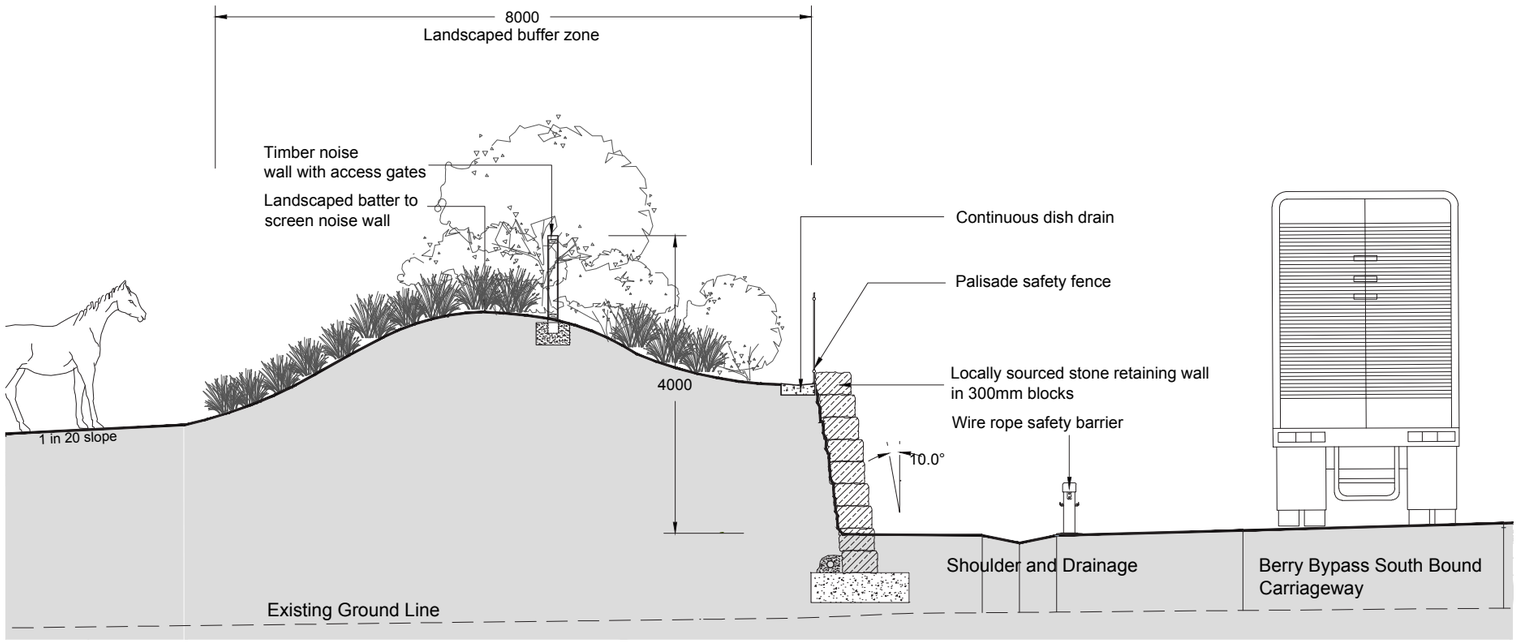


Figure 54: Noise barrier option 3 - combined stone wall and timber fence typical cross section.

Figure 55: Noise barrier option 3 - combined stone wall and timber fence photomontage.

5.9.2 Shared path

A shared pathway is a generous width concrete pathway that can accommodate both pedestrians and cyclists. Shared paths often incorporate line markings and signage identifying their intended use. A strict speed limit allows cyclists and pedestrians to share the same pathway safely. Shared paths cater for recreational cyclists, prams, motorised mobility scooters, children on bikes, joggers and walkers, and often become a focus for community interaction and socialising.

5.9.3 Street and park furniture

The proposed Town Creek Park and North Street shared pathway would incorporate comfortable bench seating at intervals along its length, to provide opportunities to rest and to enhance the enjoyment and amenity of these local green spaces.

5.9.4 Lighting

North Street currently has overhead power supply and street lights on about every second power pole along the south side of the street. Additional pole mounted street lights may need to be installed on the existing poles without lights, to adequately illuminate the shared pathway on the north side of the street.

The proposed Town Creek Park and landscaped pedestrian link from North Street through to Queen Street, would require pedestrian scaled lighting to supplement adjoining street lighting and to provide a safe passage in the evening. The proposed type of pole top light is illustrated below.

Pathways - a catalyst for community.

Proposed park seating.

Proposed park lighting.

Murase Plaza Memorial Park, Wilsonville, OR, USA Source: Louis Poulsen Projects & Products 2011-1012.

Example of recreational pathway.

5.10 Landscape design strategy

The landscaping would complement and unify the proposed cross section, to blend seamlessly with the surrounding context. An informal rural landscape character is proposed, with groupings of endemic native trees and shrubs planted in grasslands to create a 'parkway'.

Road embankments, either in cuttings or raised, would be planted with low groundcovers or native grasses, endemic shrubs and trees. Mowable embankments with slopes less than 1:3, would be planted with pasture grasses and copses of trees. Sound barrier mounds, where required, are softened by endemic trees and shrubs.

The use of native species would strengthen the local ecology and provide potential wildlife and habitat corridors for local fauna. Refer to Figures 56.

5.10.1 Bypass verges and noise barrier

View from Bypass Road side

Embankment batters to be planted with native grasses and groundcovers.

Proposed species:
Lomandra longifolia

View from Bypass road side:
Informal copses of Eucalypts, tall shrubs, occasional groundcovers and pasture grasses.

View from property:
Informal copses of Eucalypts and tall shrubs in grassland.

Proposed species :
Eucalyptus punctata (Grey Gum)
Eucalyptus globoidea (White Stringybark)
Eucalyptus eugenoides (Thin Leaved Stringybark)
Eucalyptus amplfoia (Cabbage Gum)
Hakea dactyloides
Melaleuca linarifolia
Groundcover:
Pasture grasses

Refer to Figures 57 and 58.

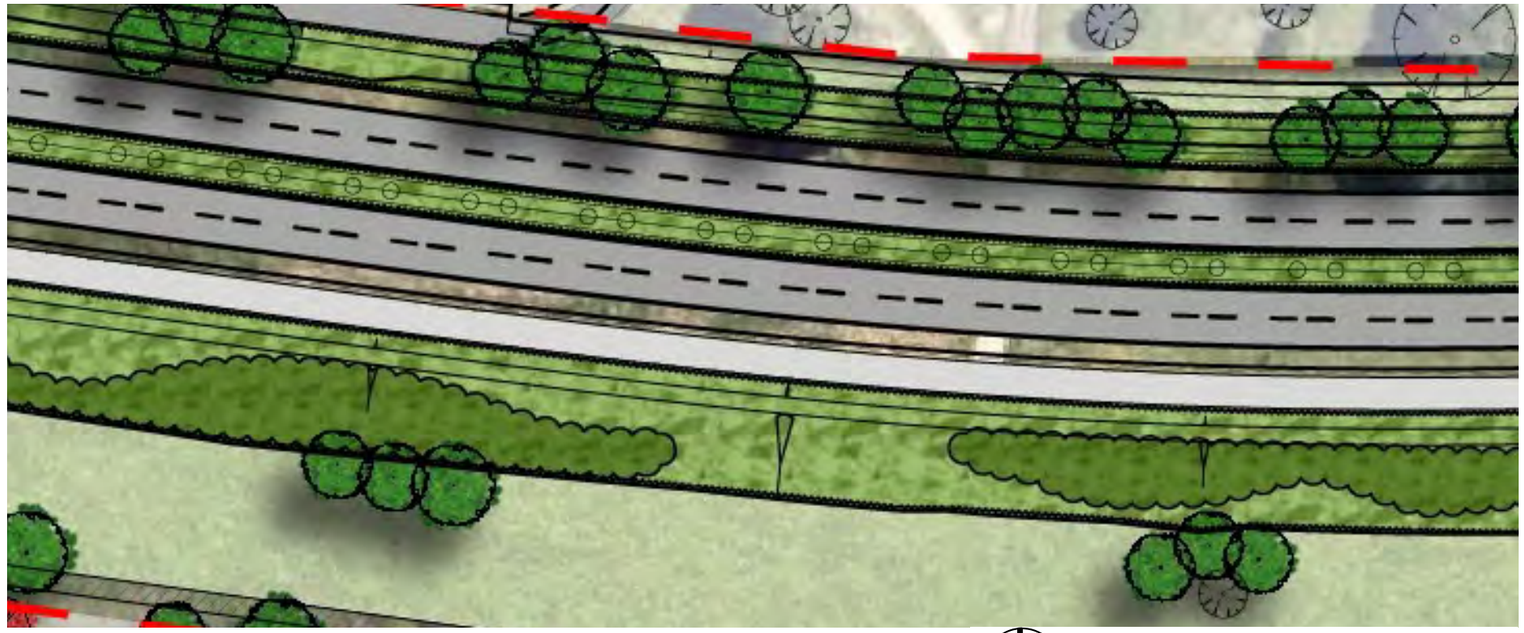


Figure 56: Bypass verges and noise barrier typical landscape plan.


Melaleuca linarifolia bark


Melaleuca linarifolia


Hakea dactyloides


Euc. eugenoides


Euc. punctata

Figure 57: Species selection.

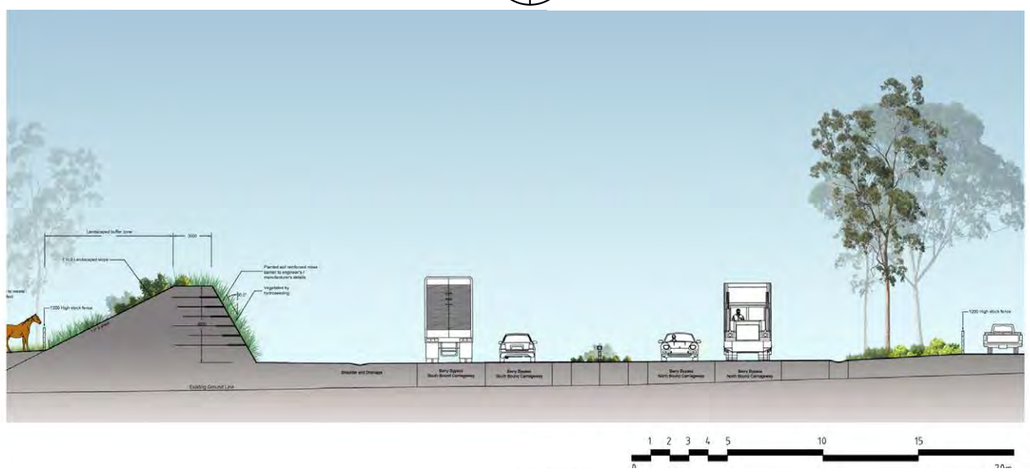


Figure 58: Typical cross section.

5.10.2 North Street

Road side character:
Informal country lane character overlooking open fields, fringed by groups of indigenous Eucalypt trees. Occasional exotic trees to add colour and to complement existing character. Refer to Figure 59.

Proposed species:
Eucalypt trees to reinforce existing trees, which would be retained, as shown in Figure 60.

Eucalyptus punctata (Grey Gum)
Eucalyptus globoidea (White Stringybark)
Eucalyptus eugenoides (Thin Leaved Stringybark)

Possible exotic highlight trees:
Jacaranda mimosifolia (Jacaranda)
Fraxinus oxycarpa aurea (Claret Ash)

View from North Street

Backdrop of informal groupings of Eucalypts trees and shrubs planted on the bypass noise mound, providing partial screening to the new bypass.

Proposed species :

Eucalyptus punctata (Grey Gum)
Eucalyptus globoidea (White Stringybark)
Eucalyptus eugenoides (Thin Leaved Stringybark)
Hakea dactyloides
Melaleuca linarifolia
Groundcover:
Pasture grasses

Refer to Figure 61.

Figure 59: North Street typical landscape plan.


Euc. amplifolia bark


Euc. punctata

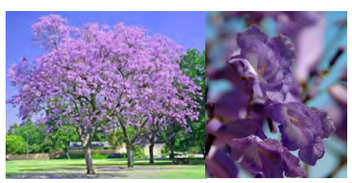

Euc. globoidea


Euc. eugenoides


Euc. amplifolia


Melaleuca linarifolia


Hakea dactyloides


Jacaranda mimosifolia


Fraxinus oxycarpa

Figure 60: Species selection.

Figure 61: Typical cross section.

This page has been left blank intentionally

5.10.3 Town Creek Park and Queen Street link

A new open space incorporating the upper reaches of the former Town Creek, and shared path link to Queen Street.

Character:
Informal parkland with central open grass area, native trees defining the perimeter and new road embankment. A new gateway into park to be created at the corner of George Street and Albert Street. Clear sightlines into the park are maintained for safety and security. Refer to Figure 62.

Activities:
Passive recreation, seating areas. Running and jogging trail. Shared path from the Berry sports precinct to Mark Radium Park traverses the precinct.

Proposed tree species:
Indigenous Eucalypts such as
Euc.microcorys (Tallowood)
Euc.botyroides (Bangalay)
Euc.pilularis (Blackbutt)
Eucalyptus robusta (Swamp Mahogany) highlighted with
Ficus coronata (Sandpaper Fig)
Melaleuca quinquinervia (Wide Leaved Paperbark)

Refer to Figure 63.

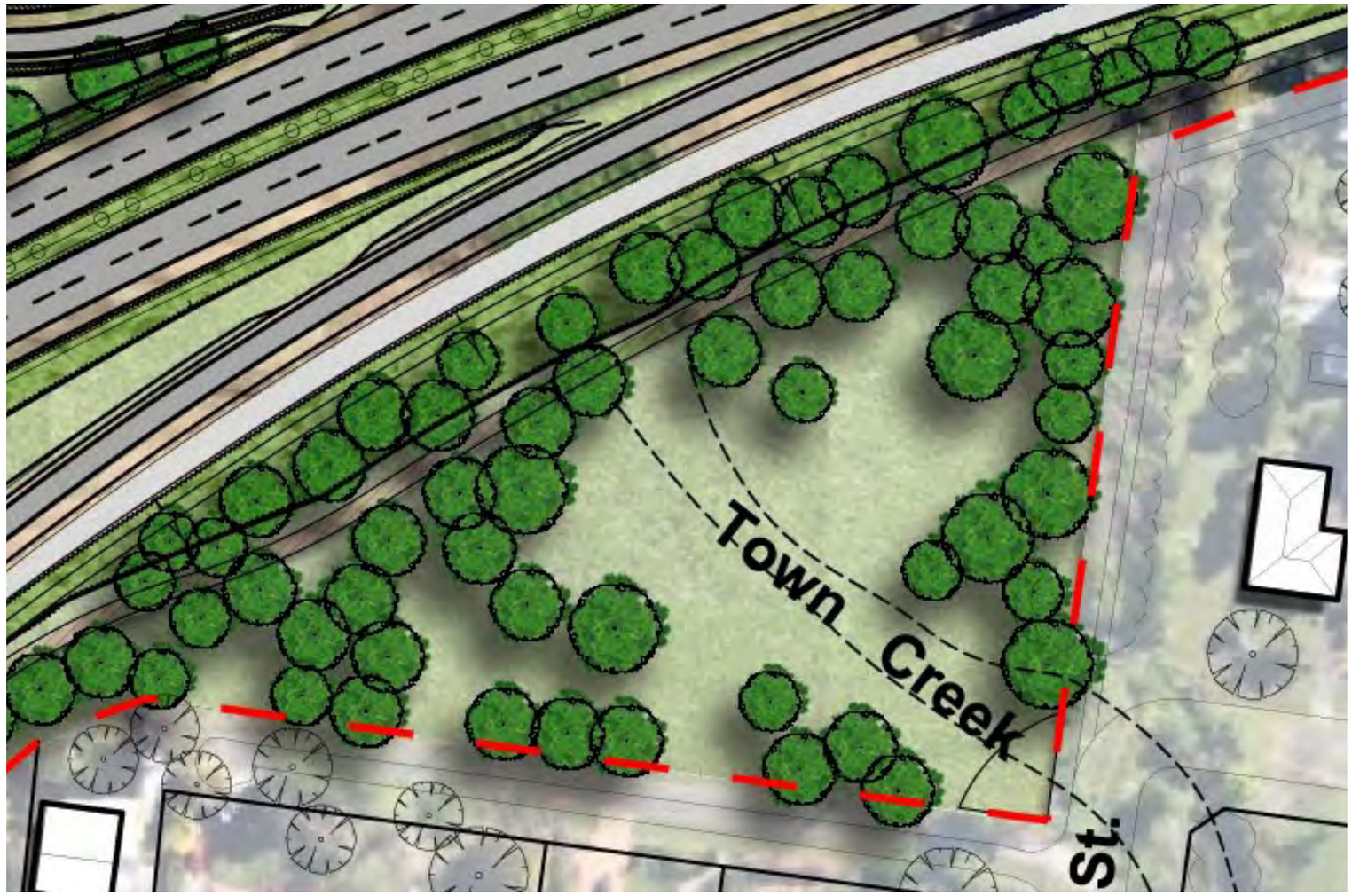


Figure 62: Town Creek Park and Queen Street link typical landscape plan.


Euc. microcorys


Euc. botryoides


Euc. pilularis


Euc. robusta


Ficus coronata


Melaleuca quinquenervia

Figure 63: Species selection.

Figure 64: Attractive Queen Street vista south, to proposed Kangaroo Valley Road Interchange.

Figure 65: Queen Street and Kangaroo Valley Road intersection.

Figure 66: Climbing up the ridge to Queen Street.

Figure 67: Existing southern Princes Highway approach to Berry.

6.0 Kangaroo Valley Road Interchange and Victoria Street Precinct

The precinct is located at the western edge of the township of Berry, and extends in a broad arc, commencing in the southwest at the current Princes Highway southern approach to Berry, sweeping to the northeast, intersecting with Kangaroo Valley Road and the west end of Queen Street (the township's Main Street). The northeast extent of the precinct, and the northern extent of township development, would be defined by North Street.

The precinct includes the western end of Victoria Street and Queen Street, a proposed new connection from Hitchcock's Lane to Huntingdale Park Road, the eastern end of Kangaroo Valley Road, the western end of North Street and the entry to Huntingdale Park estate (currently in development). In the overlap between this precinct and the North Street Precinct there would be a triangular parcel of vacant land defined by George Street (to the east) and a private access driveway (to the south).

6.1 Setting and urban character

The township of Berry and urban development to the west along Kangaroo Valley Road is elevated above the surrounding floodplains, by a northwest-to-southeast ridgeline. In the southwest, between Hitchcock's Lane and Victoria Street lies an open grassed valley including a small creek, wetlands and scattered stands of trees, following the watercourses and property boundaries.

To the east of the Princes Highway two retirement villages are established – The Grange at Berry and The Arbour. These recent developments consist of clusters of one and two storey residences that have incorporated open space improvements to creek and drainage lines, feature estate entry landscaping, new footpaths and have improved Victoria Street with new street tree planting.

Mark Radium Park is located at the corner of the Princes Highway and Victoria Street and features a large stand of tall mature Eucalypt trees. The popular picnic spot incorporates a small pond, picnic tables, playground, public toilets, walking paths, vehicular loop and parking area.

To the west of the Princes Highway is the Huntingdale Park residential estate that is in its early development phase. The main entry to the estate is established on Kangaroo Valley Road, featuring sandstone estate signage and tree planting. Huntingdale Park Road, the main access for the estate, is elevated above the Princes Highway atop a retaining wall approximately 200metres long and reaches up to 5metres in height.

The western end of Queen Street and the eastern end of Kangaroo Valley Road are characterised by residential properties, set back from the street frontage with mostly informal street tree planting; supplemented by mature trees and shrub plantings, within well kept residential front gardens.

Private front gardens along Queen Street are generally open and defined by low scale fences, whilst on the south side, near the intersection with Kangaroo Valley Road and continuing down to Mark Radium Park, timber paling back fences face the street. A row of large Eucalypt trees is a feature of this corner. The verges have grass nature strips, standard municipal kerb and gutter, and concrete footpaths on both sides.

Currently the main traffic thoroughfare of Berry, Queen Street is an attractive undulating streetscape, with a vista west to the ranges framed by attractive street trees.

Kangaroo Valley Road is an intimate local scale residential street, with significant street tree planting supplementing front gardens. Generally verges are unformed with grass swales providing drainage and generally no footpaths are provided.

Refer to Figures 64 to 75.

Figure 68: Princes Highway and Victoria Street intersection.

Figure 69: The attractive mature stands of Eucalypts in Mark Radium Park.

Figure 70: Victoria Street vista west to Princes Highway.

Figure 71: Victoria Street view east, entry to The Arbour retirement village on right.

Figure 72: Kangaroo Valley Road vista northwest.

Figure 73: Scenic panorama north from the centre of proposed interchange.

Figure 74: Huntingdale Park residential estate entry off Kangaroo Valley Road.

Figure 75: Large retaining wall supports east side of Huntingdale Park Road.

6.2 Design philosophy

The guiding philosophy for the urban design of the Kangaroo Valley Road Interchange and Victoria Street Precinct, has been to:

- Integrate the new interchange within the existing topography and landscape.
- Integrate the new interchange infrastructure within the existing Main Street and the hierarchy of township local access streets.
- Provide a fitting Berry arrival and departure experience.
- Improve pedestrian and cyclist access and amenity and provide a safe pedestrian and cyclist environment for parks and walkways through adopting CPTED principles.
- Integrate noise mitigation structures within the urban landscape.
- Provide an attractive journey and outlook for drivers on the Berry Bypass.
- Develop an urban and landscape design that is low maintenance, durable and deters graffiti.
- Develop a materials and finishes palette that wherever practical incorporates elements of locally sourced stone and timber and colour finishes, that complement the natural colours of the environment.
- Generally utilise native plantings that are endemic to the region, whilst also incorporating cultural exotic plantings, when warranted, as highlight or feature plantings.

6.3 Urban design principles

The following urban design principles have guided the precinct urban and landscape design (refer to Figure 76):

1. Establish a continuity of streetscape from Queen Street to Kangaroo Valley Road.
2. Provide an attractive vista west along Queen Street.
3. Provide a footpath connection from Queen Street to Mark Radium Park.
4. And from Mark Radium Park to the adjoining Windsor Drive residential area.
5. Provide a recreational pathway from Kangaroo Valley Road to North Street.
6. Develop an arc of interconnected green spaces following the southern edge of the bypass corridor.
7. Incorporate the upper reaches of Town Creek as a feature within green spaces.
8. Capture attractive valley and escarpment views as part of the Bypass travelling experience.
9. Establish an attractive Berry township arrival experience
10. Incorporate signature existing eucalypts into township arrival experience.

Figure 76: Urban design principles.

6.4 Berry Bypass infrastructure

The Berry Bypass corridor is generally 34.0metres wide, widening to accommodate the on and off ramps of the Kangaroo Valley Road Interchange. The Kangaroo Valley Road Interchange consists of an overbridge and associated roundabouts to the east and west providing legible local road access. A full northbound and southbound Bypass interchange would be provided with on and off slip roads. Different to the standard 'diamond' interchange configuration the northbound off ramp would continue beneath the overpass bridge to loop around and connect into the proposed interchange roundabout on Kangaroo Valley Road. This configuration would simplify the access arrangements to the entry of the Huntingdale Park estate, and would potentially reduce the visual impacts of the noise barrier on Huntingdale Park residents. North Street (west) would be connected to Rawlings Lane to maintain vehicular access to the two farm properties located to the north of the bypass.

A noise barrier would be proposed along the southern edge of the bypass corridor, extending to Queen Street.

A 2.5metre wide shared pathway would be provided connecting North Street with Queen Street, and on both sides of the interchange overbridge linking Queen Street to Kangaroo Valley Road.

Access to Mark Radium Park and to The Arbour retirement village would be maintained at the western end of Victoria Street, however it is proposed that there would be no access to the upgraded Bypass from Victoria Street. Access would be maintained to the Hitchcock's Lane rural properties with a new road link to Huntingdale Park Road.

Figure 77: Berry Bypass infrastructure.

6.5 Urban design strategy

The proposed construction of the highway-scale Berry Bypass infrastructure would bring changes for the township of Berry. Some of these changes would be positive including:

- Completion of this important section of the Princes Highway would provide a quicker and safer route for locals travelling regionally and along the NSW coast, tourists visiting South Coast destinations and day-trippers visiting the popular heritage and festival destination of Berry travelling to/from Sydney; boosting tourist accommodation, cafe/restaurant and retail business opportunities and employment in the township.
- The upgrade to a highway standard roadway would reduce fatalities and accidents along this currently difficult stretch of highway.
- The volume of truck and through traffic on the Queen Street retail 'Main Street' would be considerably reduced. There would be an opportunity to refocus 'Main Street' as a pedestrian friendly zone with increased and safer crossings, more opportunities for outdoor cafe-style seating, street tree planting and urban furniture.

The highway formation and interchanges are large physical structures and the urban strategy has been to investigate means by which these structures could be integrated at the edge of the township and into the surrounding attractive rural landscape - minimising the urban, landscape and visual impacts on the environment.

The strategy incorporates a series of urban and landscape design initiatives, including:

- Reducing the visual impact of the road formation through adjustments to the highway's vertical and horizontal alignment.
- Introducing generous open space buffers between the Berry Bypass and urban development to the west and east.
- Wherever possible, re-establishing the riparian vegetation and habitat along creek lines.
- Reducing noise impacts through incorporation of landscaped noise barriers along the edges of the alignment.
- Retaining as much as possible existing landscape, that defines the region and screens from view the new roadway and interchange structures.

The Urban Design Strategy diagram illustrates the key initiatives that are proposed to integrate Berry Bypass within this uniquely urban setting.

An aerial view is provided in Figure 79.

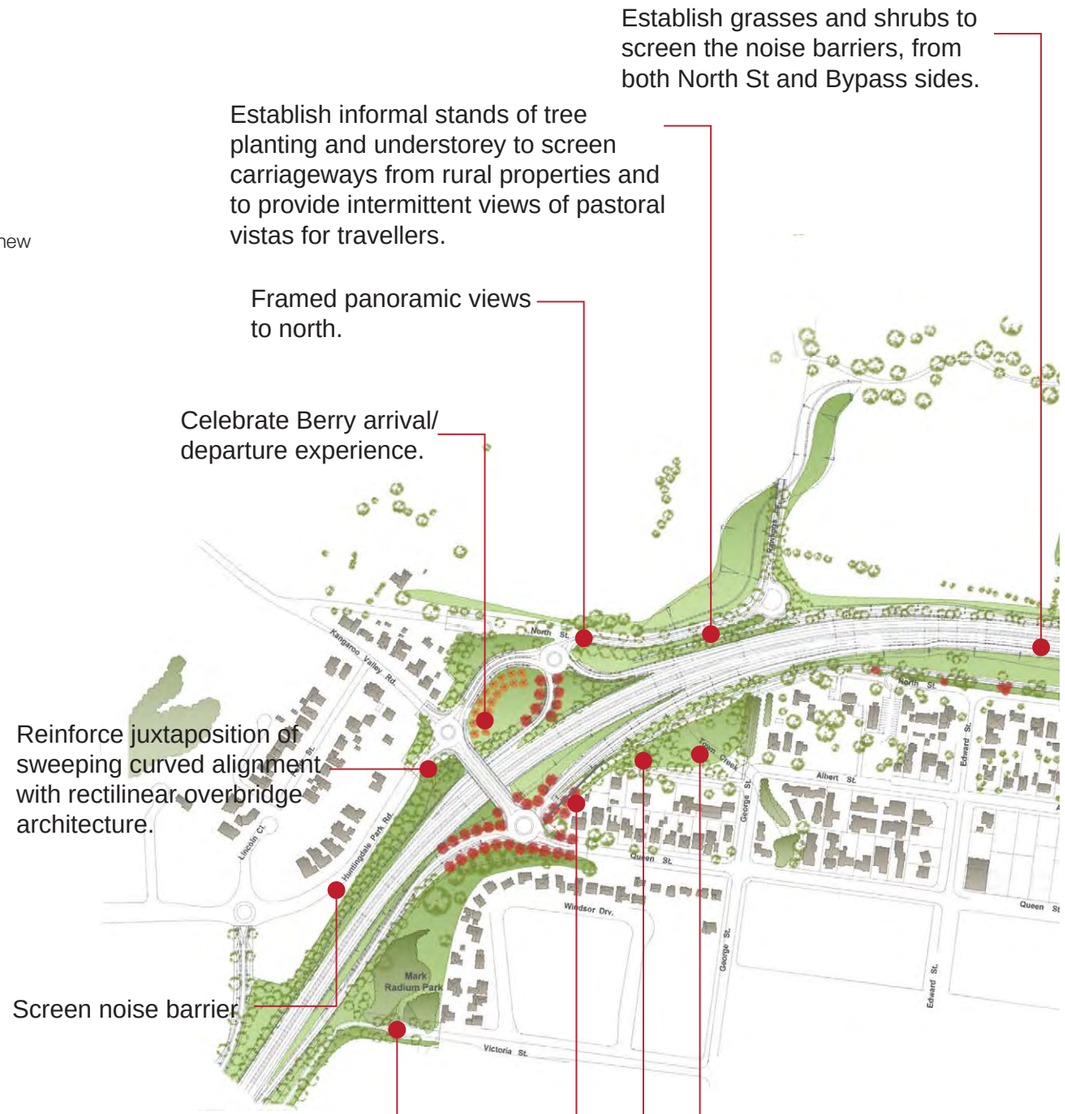


Figure 78: Urban design strategy.

Figure 79: Aerial view looking northeast.

6.6 Precinct plan

The Precinct Plan illustrates the proposed urban and landscape concept design for the Kangaroo Valley Road Interchange and Victoria Street Precinct.

Figure 80: Precinct Plan - Kangaroo Valley Road Interchange and Victoria Street Precinct.

6.7 Cross section studies

Four cross sectional studies were prepared at the Kangaroo Valley Interchange (Refer to Figure 77). The existing ground level is shown as a dashed line. At Kangaroo Valley Road the Bypass is in a cutting, with sloped batters that are landscaped with native grasses and informal tree planting. The predominant landscape plantings are of natives, primarily Eucalypts, with some feature tree plantings of Birch and Ash to highlight arrival and departure.

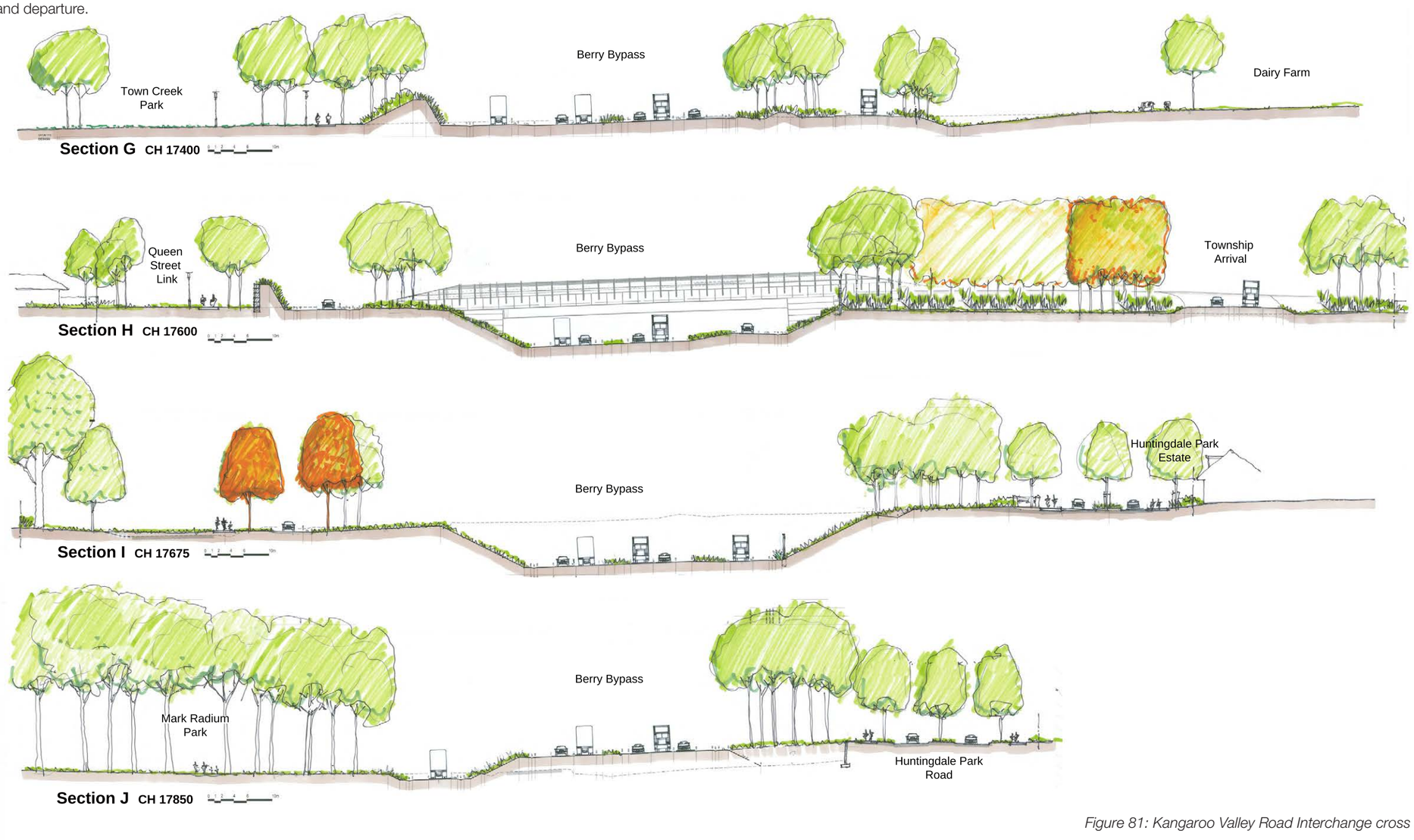


Figure 81: Kangaroo Valley Road Interchange cross sectional studies.

6.8 Urban design elements

The Kangaroo Valley Road Interchange and Victoria Street Precinct of the Berry Bypass would comprise urban design elements ranging from large scale, such as the interchange overbridge, on-off ramps, roundabouts and local access connections, to the smaller scale, including footpaths, street and park lighting, street furniture and signage. Integrated with the urban design would be the landscape design of the interchange, adjoining streets and associated local green spaces. All urban and landscape design elements have been considered as contributing to the overall coordinated design outcome.

6.8.1 Kangaroo Valley Road Interchange

The Kangaroo Valley Road Interchange requires road, ramp, overbridge and noise barrier infrastructure of significant scale. Considerable care would be necessary to fully integrate the interchange within the sensitive residential neighbourhoods situated to the east and west, the open rural pastureland to the north and the valley, creekline and green spaces to the south.

The 100 kilometre/hour highway design standard necessitates a broad sweeping road alignment for the main bypass carriageways. This dramatic curve would be reiterated by 2H:1V sloped cut batters along each side of the roadway as it passes through the local ridgeline. A counterpoint to this dramatic sweeping alignment would be the overbridge that connects Queen Street with Kangaroo Valley Road. The continuity of the curved road alignment, associated landforms and noise barriers should be emphasised, with views beneath the bridge remaining as open as possible to maximise the vistas along the curved corridor to adjoining picturesque rural pastures, local ranges and to the distant escarpment.

As a counterpoint to the curved road alignment the architecture of the bridge should emphasize its inherent horizontal qualities, with streamlined superstructure, abutments, parapet and throw screens.

Two roundabouts are proposed at either end of the bridge. The east roundabout provides an opportunity to complete the Queen Street visual axis. In addition to retaining the row of large Eucalypt trees on the south side to mark the location, colourful feature trees planting and a central planter would be proposed, to provide a fitting arrival/point of departure for travellers. The west roundabout would complete the Huntingdale Park estate entry; a central feature planter, combining with the existing sandstone estate signage, feature posts and street trees.

Distinctive feature planting would be proposed as part of the arrival approach to Berry, from the south. The Bypass off-ramp continues beneath the overbridge and then curves upwards in a broad sweep to arrive at the west roundabout. The large open space at the centre of the curved ramp would accommodate a large stand of feature Birch trees, with their seasonal foliage colour and distinctive trunks creating a memorable landmark.

Figure 82: Kangaroo Valley Road Interchange design concept.

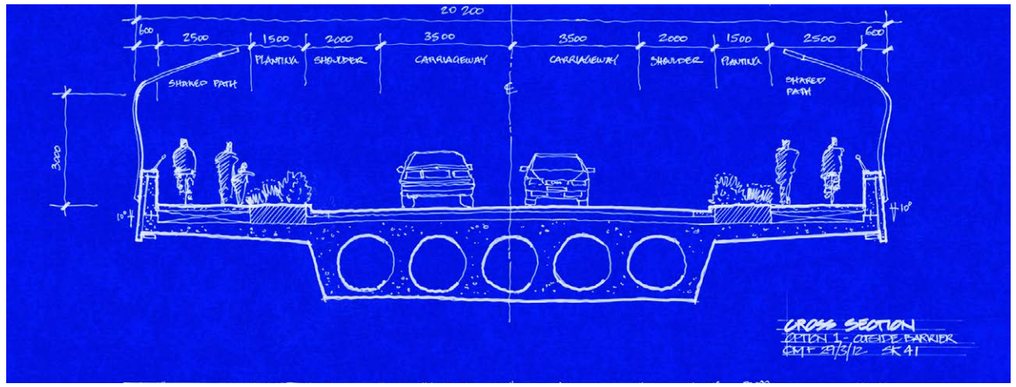
6.8.2 Interchange overbridge design options

Two options were explored for the design of the cross section of the interchange overpass bridge. Option 1 located the vehicular safety barrier on the outside edge of the bridge deck, provided a more or less standard local street cross section of kerb and gutter and landscaped verge, and explored the possibility of introducing a sculptural profile to the throw screen. This offers a sense of protection from the inherent exposed nature of such elevated bridges, and introduce a sense of delight and lightness for those crossing the bridge. Two landscaped strips approximately 1.5metres were proposed to soften the otherwise hard paved surfaces and to introduce some attractive landscaping along the shared use pathway. This was the preferred design option at the Community Working Group (CWG) meeting held in Berry on the 29th March 2012.

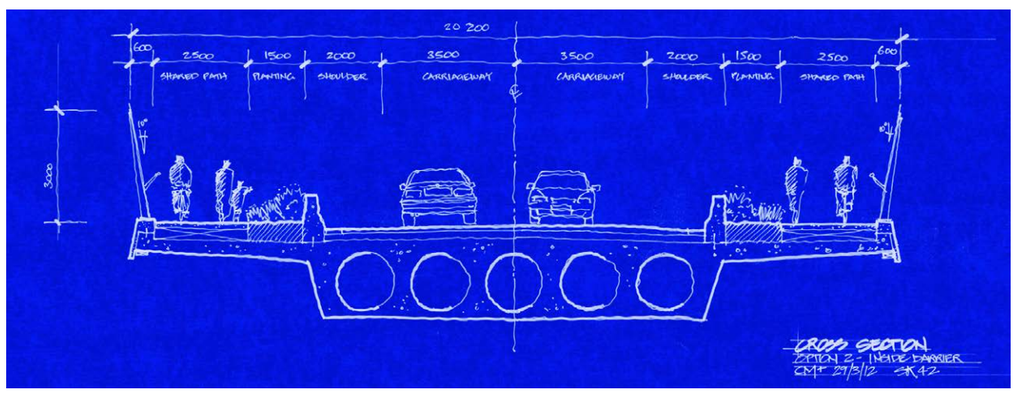
Option 2 looked at locating the vehicle safety barrier at the street kerb. This allowed the throw screen to be full height, providing a more open crossing experience. The CWG preferred Option 1 as it was seen to provide a better sense of protection from the elements when crossing the bridge (this was seen as particularly important for children).

Figure 83: Option 1 - Outside barrier photomontage.

Figure 84: Option 2 - Inside barrier photomontage.



Option 1 - Outside barrier indicative cross section.



Option 2 - Inside barrier indicative cross section.

6.8.3 Preferred interchange overbridge design

The preferred overbridge design would be a concrete structure of a post tensioned, cast in situ, voided slab construction that would achieve a single, clear span of approximately 47.8metres. The abutments would consist of reinforced soil walls incorporating precast concrete facing panels with emphasized horizontal joints in a 2.0metre wide by 1.0metre high grid. Alternate bridge structural types that utilise spill-through abutments would also be assessed to see whether the view corridor beneath the bridge can be opened up further.

The bridge deck would be approximately 20.0metres wide and 2.3metres deep, and accommodates at two way carriageway with paved shoulders. The bridge cross section would be kept as close as possible in appearance to a regular local street: with generous width, pathways, and a standard kerb and gutter and 'nature strip'.

Shared use paths of 2.5metres width would be provided on both sides of the bridge. Between the shared use path and the carriageways would be a landscaped strip of 1.5metres width. To prevent seepage into the bridge structure below, completely separate planter boxes, constructed of glass reinforced concrete (GRC) sit atop the deck and house the minimum 450millimetres depth to accommodate the necessary mulch, soil and drainage course. Hardy plants would be selected, such as Lomandra and the like to ensure a long term low maintenance landscape. Irrigation would be necessary during the initial plant establishment period.

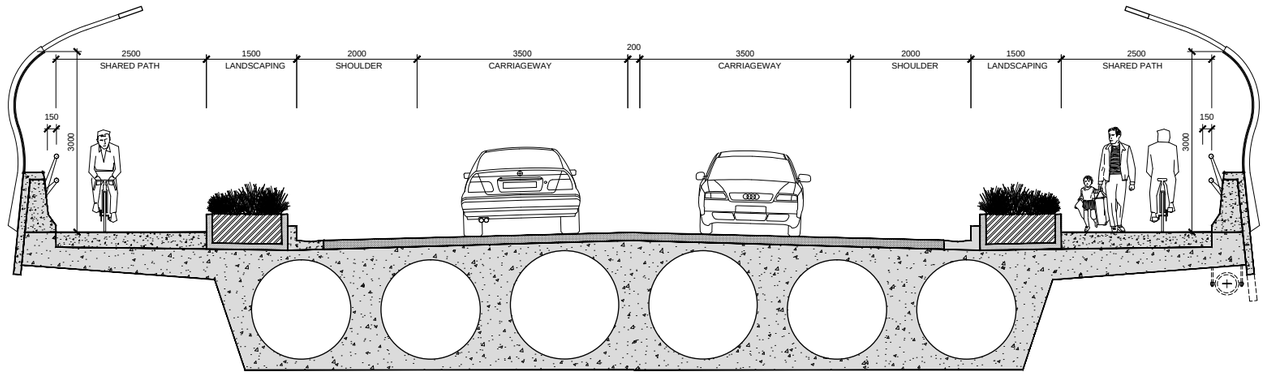
Figure 85: Kangaroo Valley Road Interchange preferred design.

The bridge parapet top and outside face would consist of high quality precast concrete units (visible from the main carriageways) and would be integrated in design with the throw screen structure above. Additional precast concrete 'skirt' length would be provided to screen any services that are required to be hung from beneath the bridge.

The shared use pathways would be lit at night for pedestrian safety (it is recommended that the faces of pedestrians using the paths be illuminated), with efficient long life light fittings integrated within the throw screen structure. A bicycle rail and pedestrian height handrail would be provided along the outside edge of the shared use path.

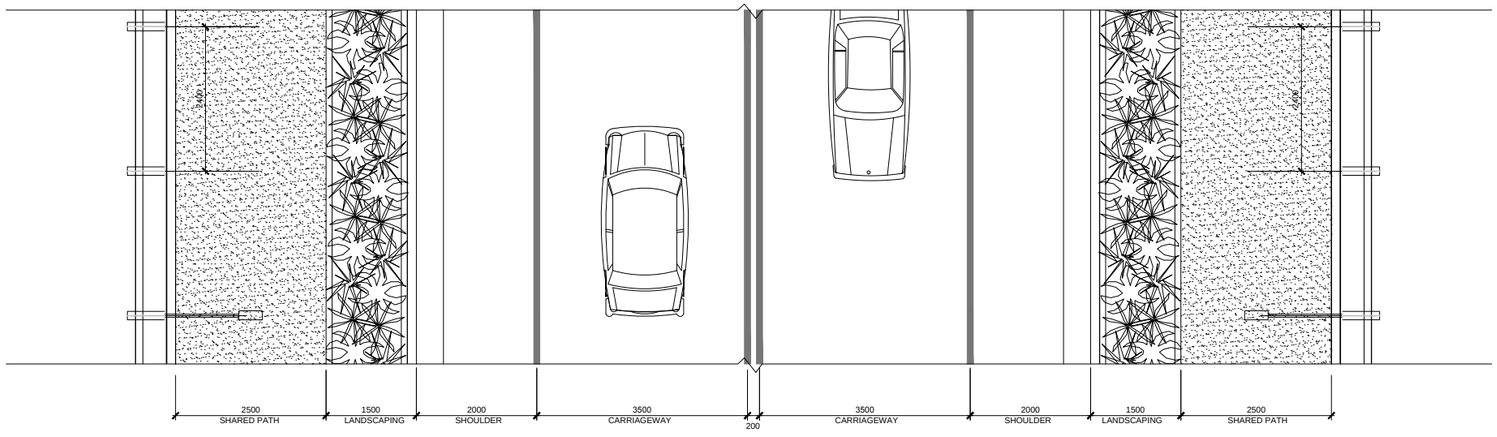
The bridge has a 4.0% slope from the west to the east. It is envisaged that this slope would facilitate drainage of the deck along its length, avoiding the need for scuppers or drain pipes to be fixed to the underside of the bridge.

Utility services would be accommodated in conduits cast in the concrete shared use path slab and in the Type F edge safety barrier.



CROSS SECTION

SCALE 0 1 2 5m



PLAN

CM+ Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

KANGAROO VALLEY ROAD INTERCHANGE
BRIDGE CROSS SECTION - OPTION 1- PREFERRED DESIGN
Dwg No 12001-SK-057
Issued 16 July 2012

KANGAROO VALLEY ROAD INTERCHANGE

VIEW FROM NORTH BOUND LANES

Dwg No 12001-SK-059
Issued 13 July 2012

Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

KANGAROO VALLEY ROAD INTERCHANGE

VIEW FROM SOUTH BOUND LANES

Dwg No 12001-SK-060
Issued 13 July 2012

KANGAROO VALLEY ROAD INTERCHANGE

PEDESTRIAN VIEW LOOKING NORTH WEST FROM KANGAROO VALLEY ROAD BRIDGE

Dwg No 12001-SK-062
Issued 13 July 2012

CM+ Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

KANGAROO VALLEY ROAD INTERCHANGE

PEDESTRIAN VIEW LOOKING SOUTH EAST FROM KANGAROO VALLEY ROAD BRIDGE

Dwg No 12001-SK-063
Issued 13 July 2012

Conybeare Morrison International Pty Ltd
Architecture + Interior + Heritage + Urban Design + Masterplanning
52-58 William Street East Sydney NSW 2011 Australia
T. 61 2 8244 8888 F. 61 2 8244 8877 E. mail@cmplus.com.au

6.8.4 Noise barrier

Noise modelling studies undertaken by Aecom have established that two 4.0metre high noise barriers would be required in the vicinity of the interchange. The first noise barrier would be required along the outer edge of the southbound off-ramp. This barrier would be a continuation of the planted reinforced soil ‘green wall’ that runs along the south edge of the corridor in the North Street precinct. To realise the expression of an uninterrupted, streamlined barrier when seen from the Bypass corridor, it is envisaged that the ‘green wall’ face would continue up to Queen Street following the grade of the off-ramp.

The width available to the south of the noise barrier is limited in the North Street to Queen Street link. This would necessitate a vertical face to the rear of the barrier through this section. A galvanised steel mesh gabion wall structure is envisaged that would be filled with local stone sourced from project excavation.

A second noise barrier would be required along the northbound off-ramp leading up to the overbridge. It is approximately 140metres long and 4.0metres high (above the level of the main carriageways).

Refer to Figures 86 and 87.

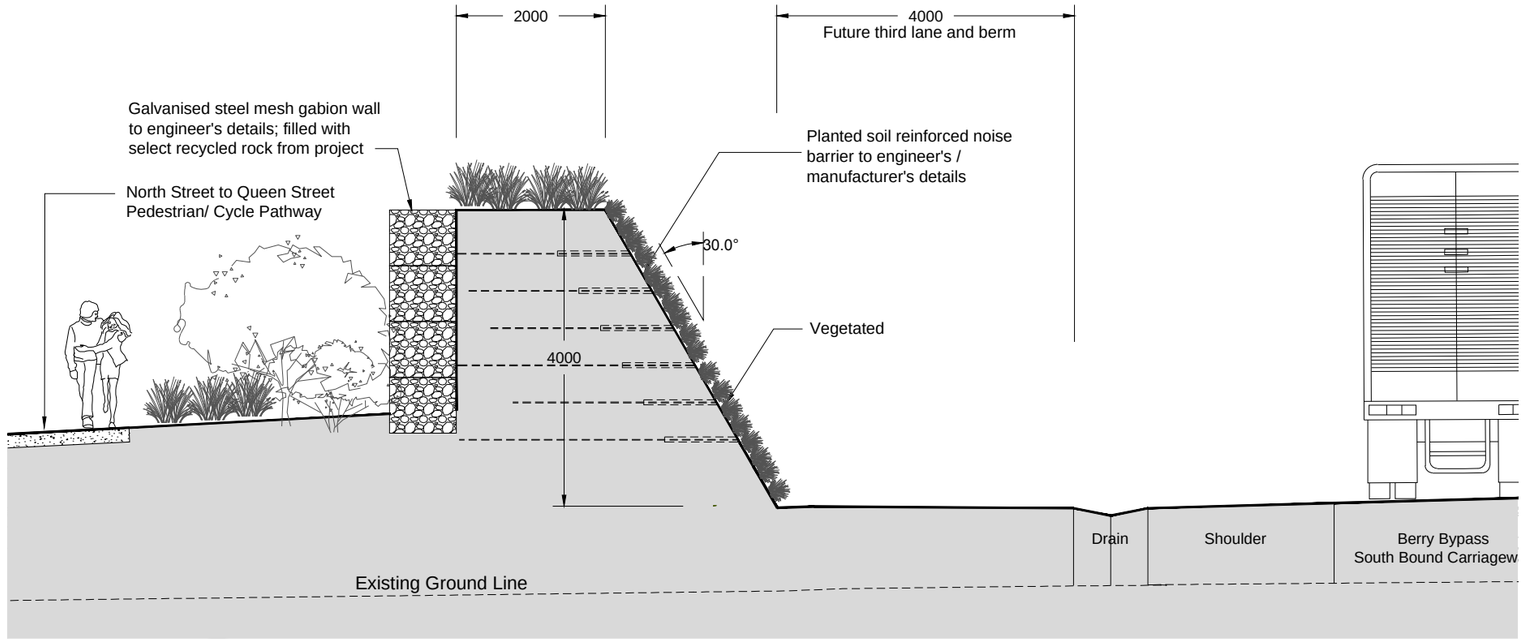


Figure 86: Noise barrier - planted soil reinforced typical cross section.

Example of gabion wall with select local stone.

Figure 87: Noise barrier - planted soil reinforced mound photomontage.

6.8.5 Overbridge throw screen

Throw screens are required on both sides of the overbridge, extending 6.0metres beyond the bridge abutments and extending to 3.0metres height above the finished level of the bridge deck. A sculptural 'S' shaped profile is proposed with galvanised steel mesh and integrated pedestrian safety lighting.

Shared use paths of 2.5metres clear width are proposed on both sides of the interchange overbridge. Refer to photomontages on pages 76 and 77.

6.8.6 Furniture

The proposed Town Creek Park shared pathway would incorporate comfortable bench seating at intervals along its length, to provide opportunities to rest and to enhance the enjoyment and amenity of these local green spaces.

6.8.7 Lighting

Queen Street, Kangaroo Valley Road and the Princes Highway currently have overhead power supply and street lights along the south side of the street.

With the construction of the new interchange, the electrical supply would need to be rationlised in the vicinity. A lighting design would be prepared at detail design stage to ensure appropriate lighting levels are achieved for driver and pedestrian safety.

The proposed Town Creek Park and landscaped pedestrian link from North Street through to Queen Street, would require pedestrian scaled lighting to supplement adjoining street lighting and to provide pedestrian safety at night.

The proposed pole top light is illustrated on page 55.

6.9 Landscape design strategy

The ‘arrival’ landscape into Berry would be designed to highlight the Kangaroo Valley Road Interchange and reinforce the rural Berry township character.

The landscape design would enhance the endemic tree canopy and habitat corridors, mitigate the visual impact of the road engineering and create a memorable, signature gateway to the Berry township.

6.9.1 Kangaroo Valley Road Interchange

Southern approach

The roadway from the south would be gradually lowered into a cut, densely planted on both sides with Eucalypts, on embankments seeded with native grasses and shrubs. The plantings are designed to create pleasant ‘walls of green’ along the roadway, and to screen out views of the freeway from the township and adjacent residential estates. As the road rises up to the Berry turn off, groves of Claret Ash (*Fraxinus oxycarpa aurea*) and Birches (*Betula pendula*) would provide colour and contrast against the backdrop of Eucalypt trees. The exotic trees are grouped in groves with generous gaps in between to retain views of the surrounding hills and rural landscape. The roundabouts would be planted with robust and colourful native and exotic groundcovers and incorporate opportunities for public art and signage. Refer to Figure 88.

Proposed native tree species:
Eucalyptus punctata (Grey Gum)
Eucalyptus globoidea (White Stringybark)
Eucalyptus eugenoides (Thin Leaved Stringybark)
Hakea dactyloides
Melaleuca linarifolia

Proposed exotic tree species:
Fraxinus oxycarpa aurea (Claret Ash)
Betula pendula (Silver Birch)

Proposed groundcover:
Native pasture grass

Refer to Figure 89.

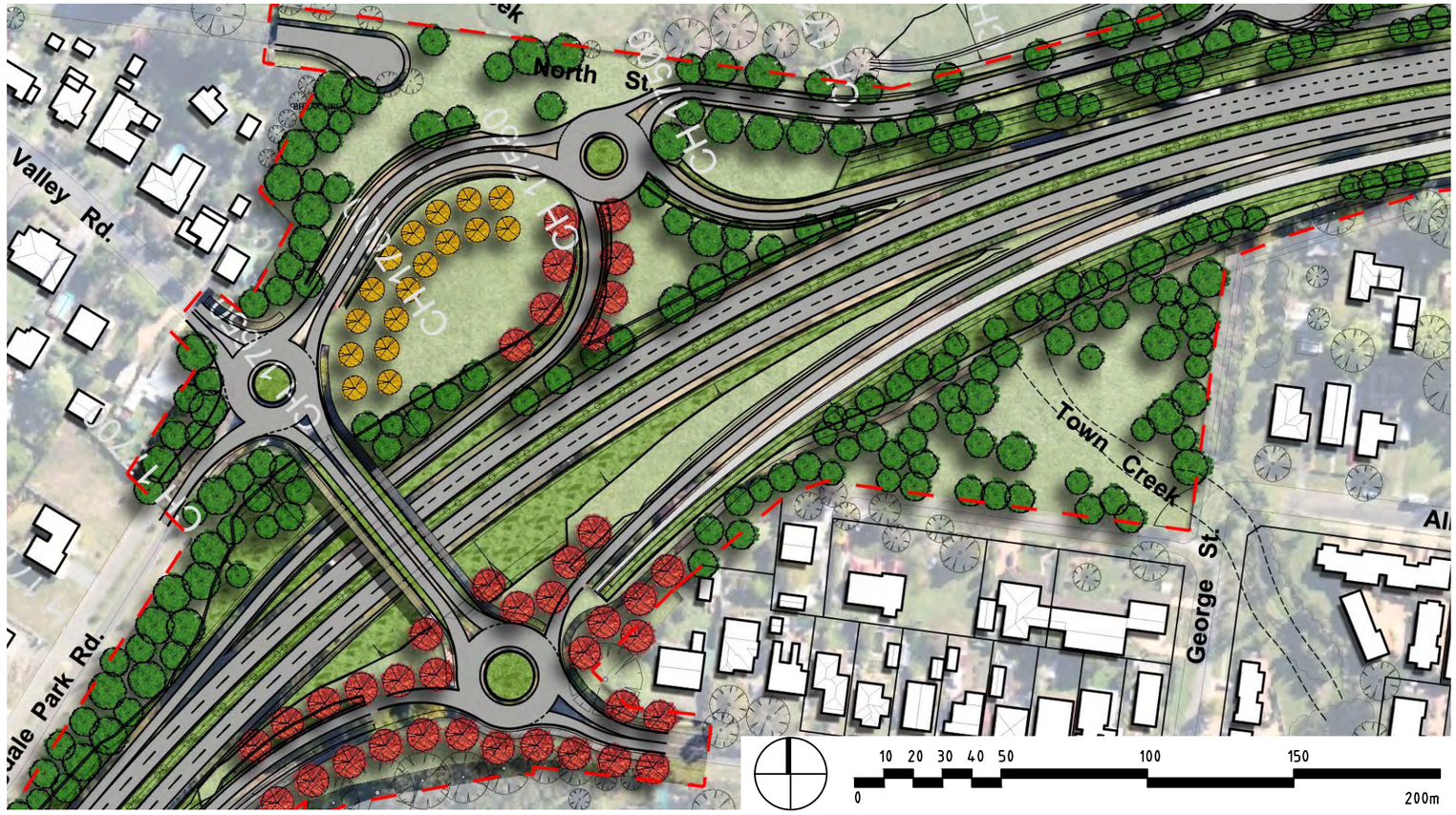


Figure 88: Kangaroo Valley Road Interchange typical landscape plan.

Northern approach

The northern approach ramp into Berry would be defined by a generously planted median complementing the structure of the overhead bridge that connects Kangaroo Valley Road and Queen Street.

The left embankment would be a continuation of the southern acoustic mound, and would be densely planted with native grasses and tall Eucalypts as a backdrop.

An avenue of Claret Ash is proposed at the roundabout into Queen Street, reinforcing the species and colour proposed for the southern approach .

The groundcovers in this roundabout would include exotic shrubs to highlight the 19th and 20th century garden traditions of the heritage township.

Refer to Figure 88.

Similar robust and colourful groundcovers would also be planted on both sides of the overhead bridge, to create a welcoming and seamless entry statement into the Town’s main street.

Proposed native tree species:
Eucalyptus punctata (Grey Gum)
Eucalyptus globoidea (White Stringybark)
Eucalyptus eugenoides (Thin Leaved Stringybark)
Melaleuca linarifolia

Proposed exotic tree species:
Fraxinus oxycarpa aurea (Claret Ash)

Proposed groundcover:
Lomandra longifolia (Spiny-Head Mat-Rush)
Native pasture grass

Refer to Figure 89.

Figure 89: Species selection.

6.9.2 Victoria Street

Victoria Street would be closed at its western end to create a cul de sac, adjacent to Mark Radium Park.

The former road would be turfed over and Eucalypts would be planted on the edges, visually extending the size of the park. Refer to Figure 90.

Proposed native tree species:
Eucalyptus punctata (Grey Gum)
Eucalyptus globoidea (White Stringybark)
Eucalyptus eugenoides (Thin Leaved Stringybark)
Hakea dactyloides
Melaleuca linarifolia

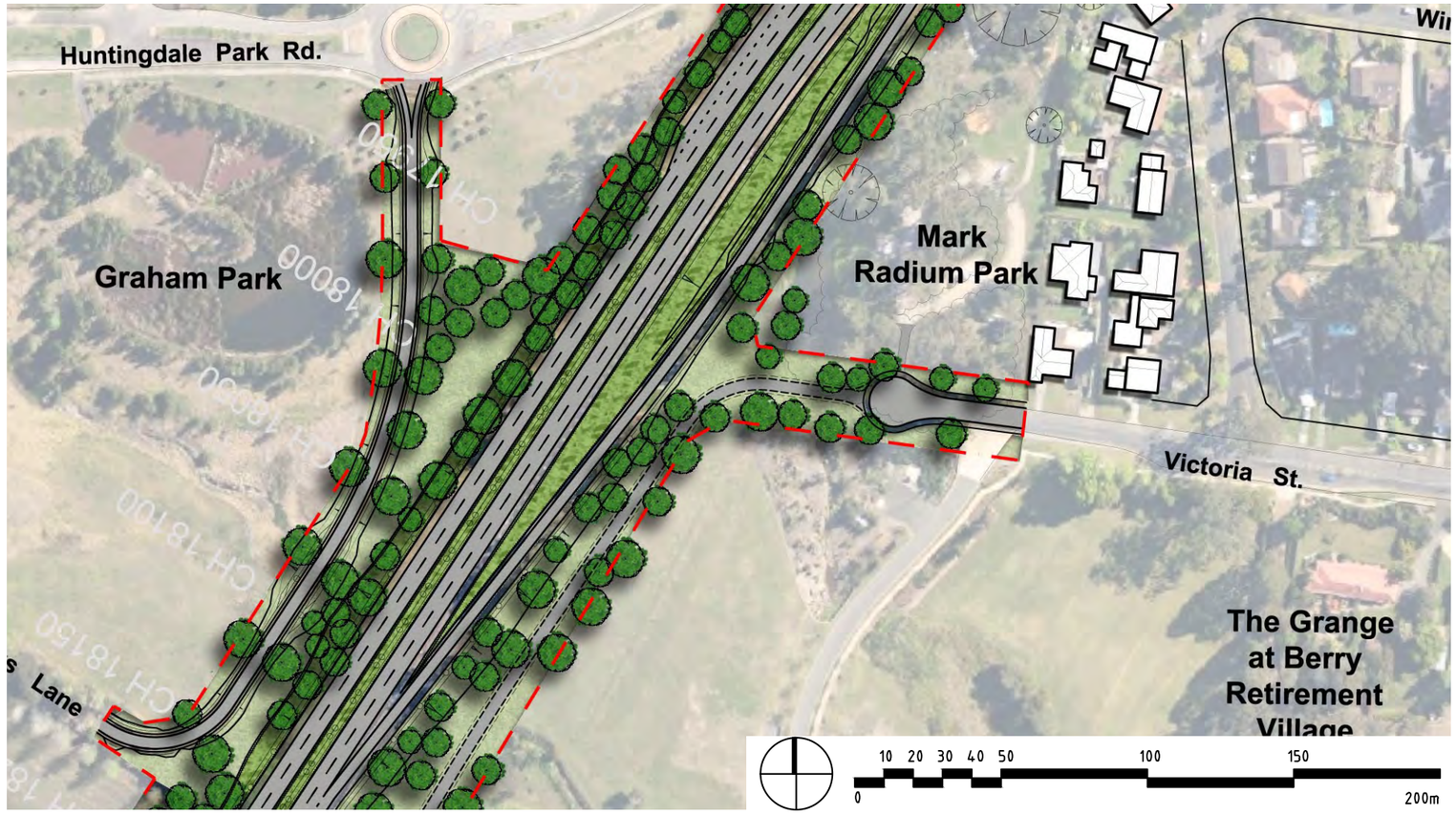


Figure 90: Victoria Street typical landscape plan.

7.0 Materials, finishes and colour strategy

7.1 Philosophy

The following urban design philosophy has guided the selection of the project materials and finishes palette:

- Taking a low-key approach.
- Complementing the natural environment.
- 'Natural' finishes preferred rather than applied.
- Utilising locally sourced stone and timber.
- Selecting finishes that weather and age well.
- Detailing that minimises staining and is self-cleaning.

7.2 Finishes selections

The adjoining sample photos (Refer to Figure 91) illustrate the proposed approach - including utilising local stone and timber when appropriate, and selecting materials and finishes that are generally low-key, robust and that weather well.

7.3 Graffiti strategy

The approach to deterring graffiti is to wherever possible 'design-out' situations where the potential for walls or surfaces that could be defaced are removed. Maximising the opportunity for passive surveillance through creating places that are attractive to people, are easily accessible and well lit at night would deter and minimise the occurrence of graffiti.

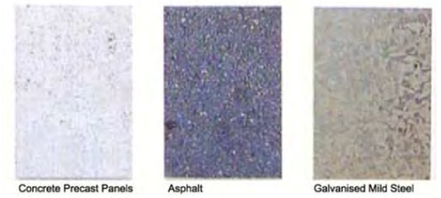
Local stone.

Destination signage.

Berry memorial.

Estate signage.

Local timber.



Stone faced retaining wall.

Complementing the natural contours of the region.

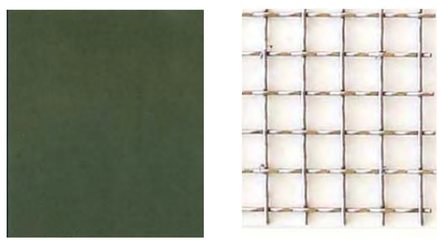


Figure 91: Materials, finishes and colour strategy.

NOTE: The images are for illustration purposes only.