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)

Legend

- **Visual boundary of the BTUCA***
- **Buffer Zone of the BTUCA**
- **Sub-division Boundary of the BTUCA**
- **Boundary of the Berry Bolong Pastoral Landscape**

* Defines the boundary of the Berry District Landscape Conservation Area

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.

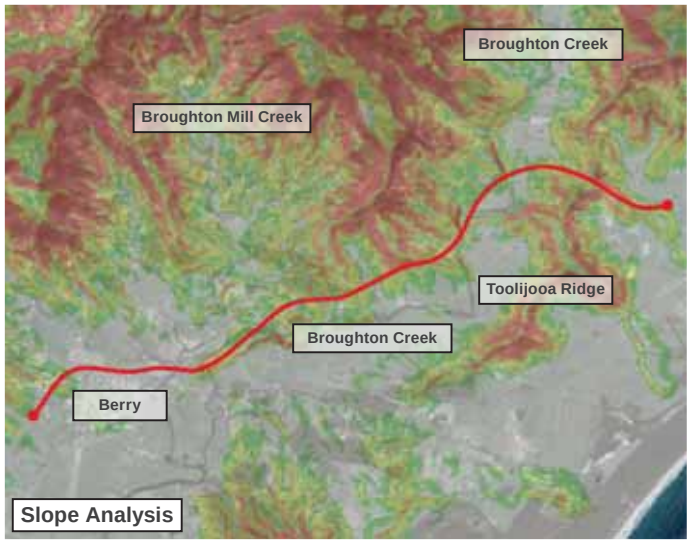


Figure 5.2 - Topography (slope analysis)

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%

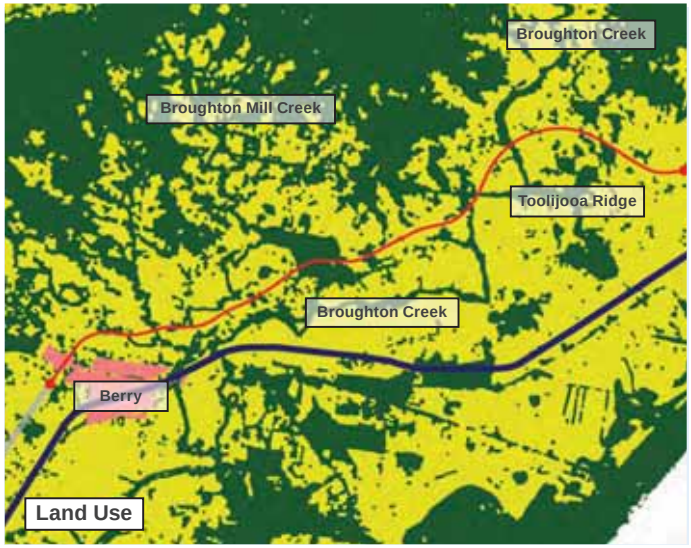


Figure 5.3 - Land use analysis

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.

Legend
Vegetation

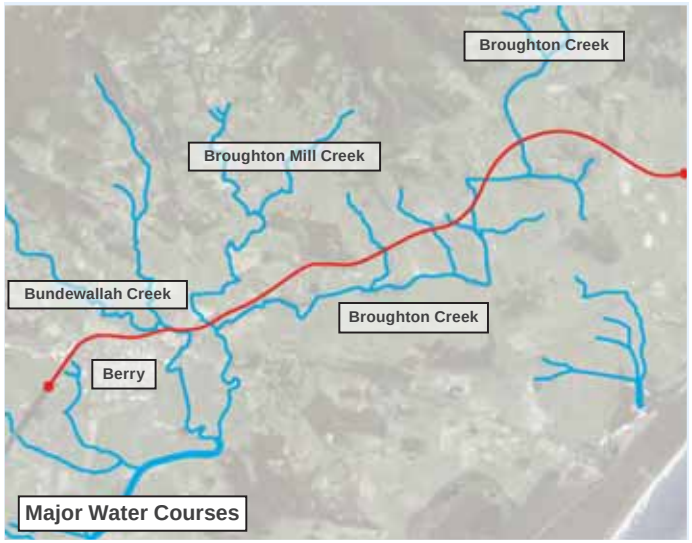


Figure 5.5 -Major water courses

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.

Legend
Water course

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.**

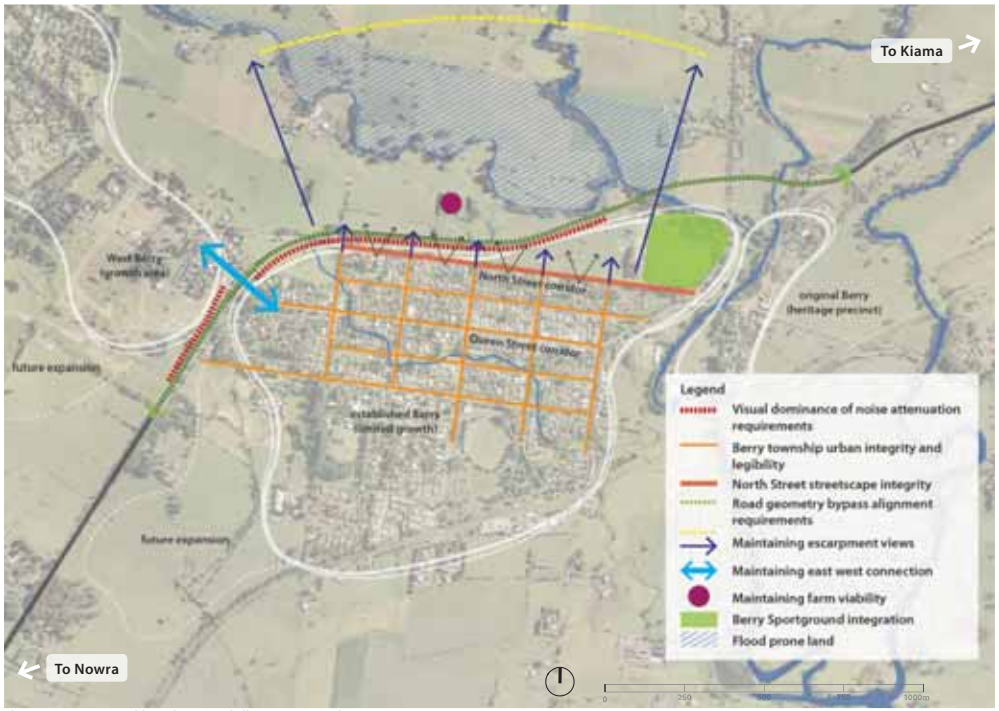


Figure 5.7 -Berry township and proposed alignment constraints

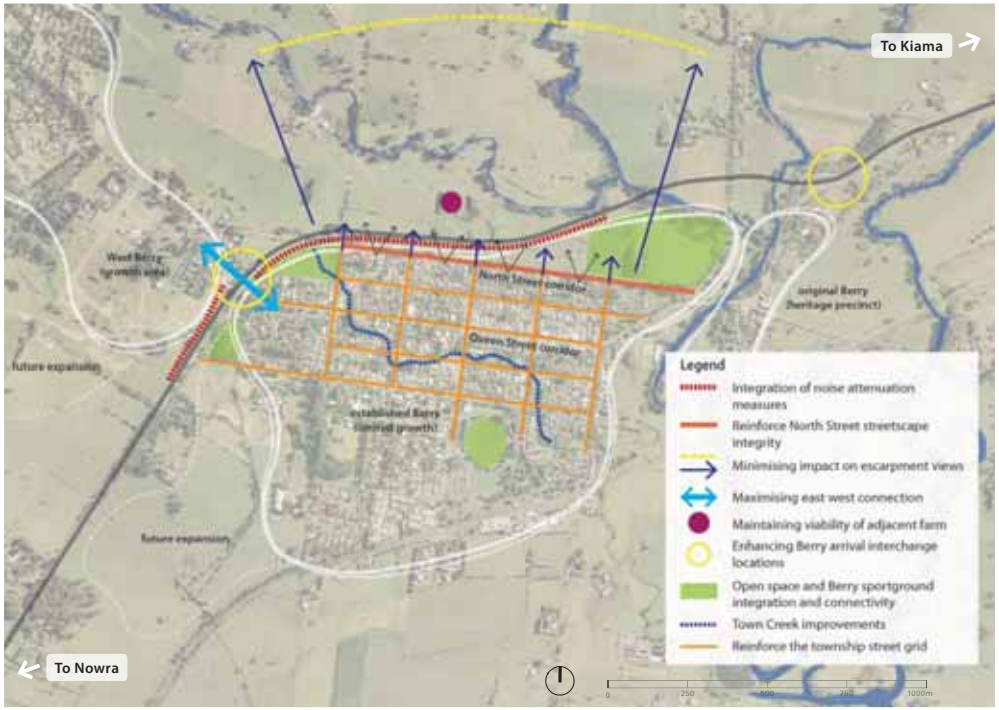


Figure 5.8 -Berry township and proposed alignment opportunities

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.

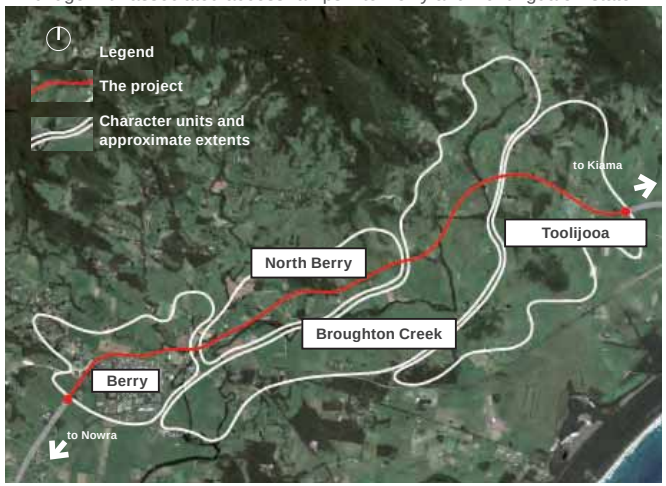


Figure 5.9 - Landscape character units within the Berry Bypass study area

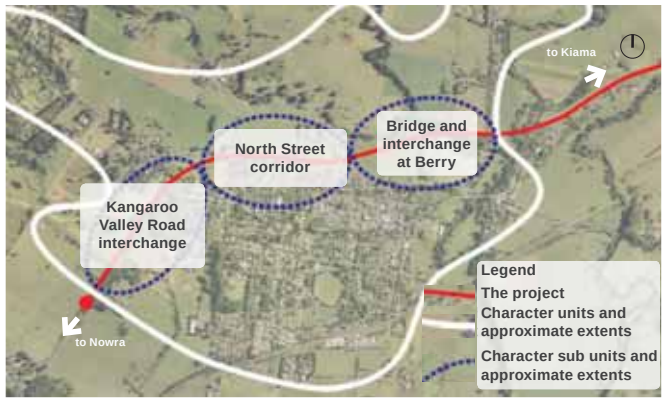


Figure 5.10 - Landscape sub - character units within the Berry landscape unit

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**.

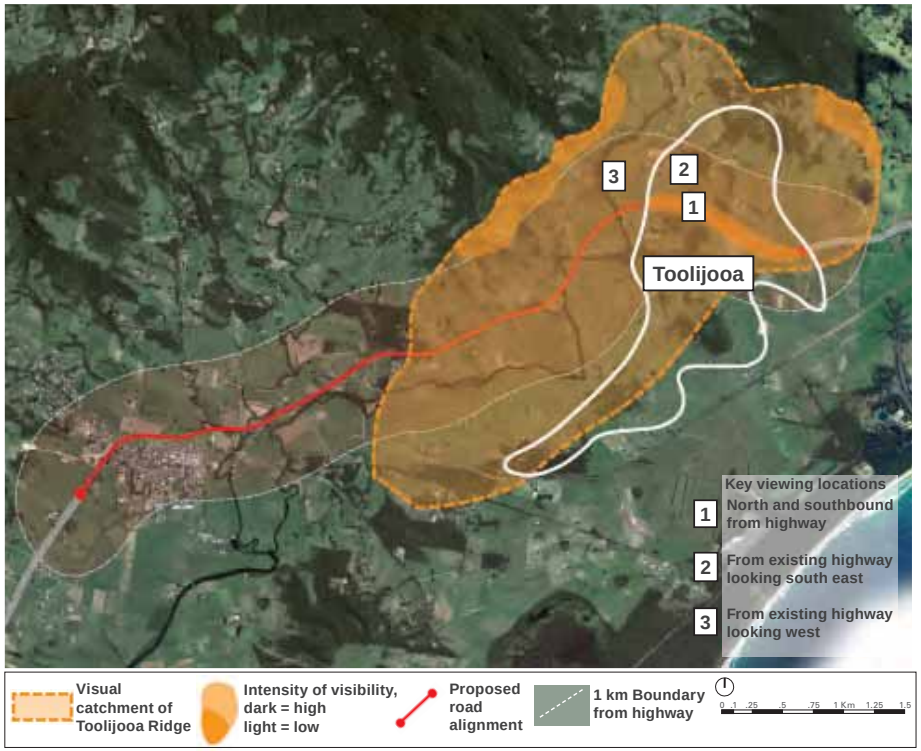


Figure 6.1 Visual catchment and key viewpoints of the Toolijooa landscape character unit

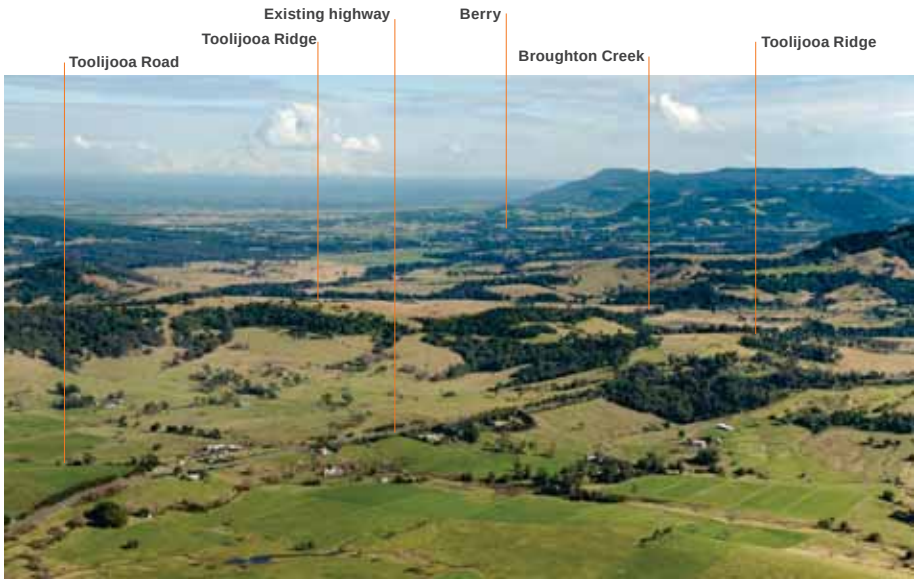


Figure 6.2 Toolijooa landscape looking south east

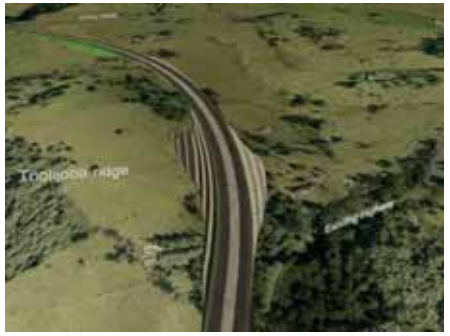


Figure 6.3 Significant cutting at Toolijooa Ridge

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**.

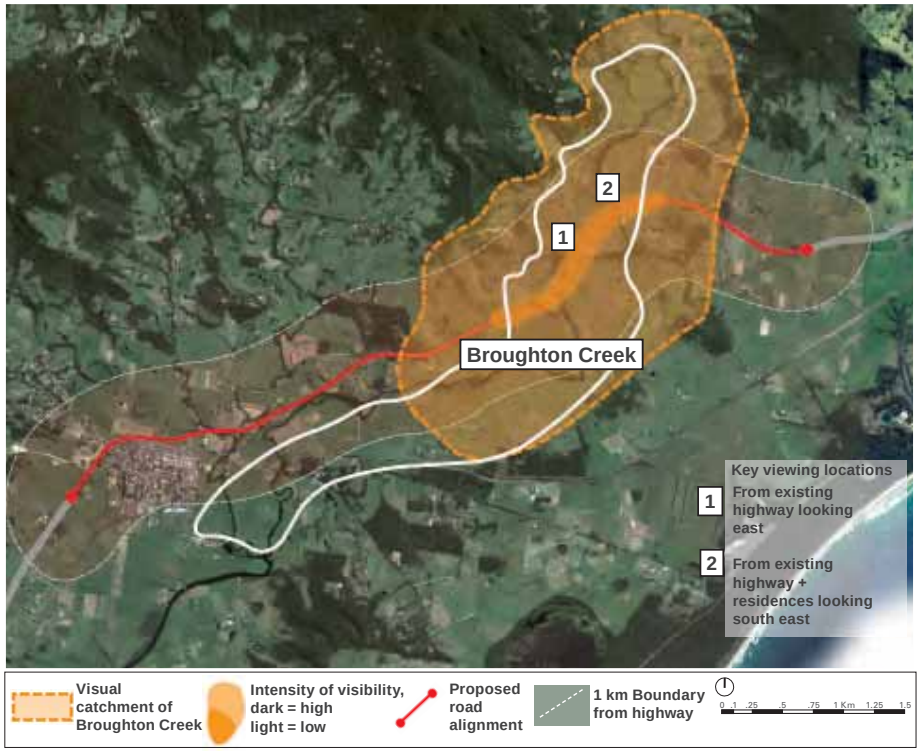


Figure 6.7 Visual catchment and key viewpoints of the Broughton Creek landscape character unit

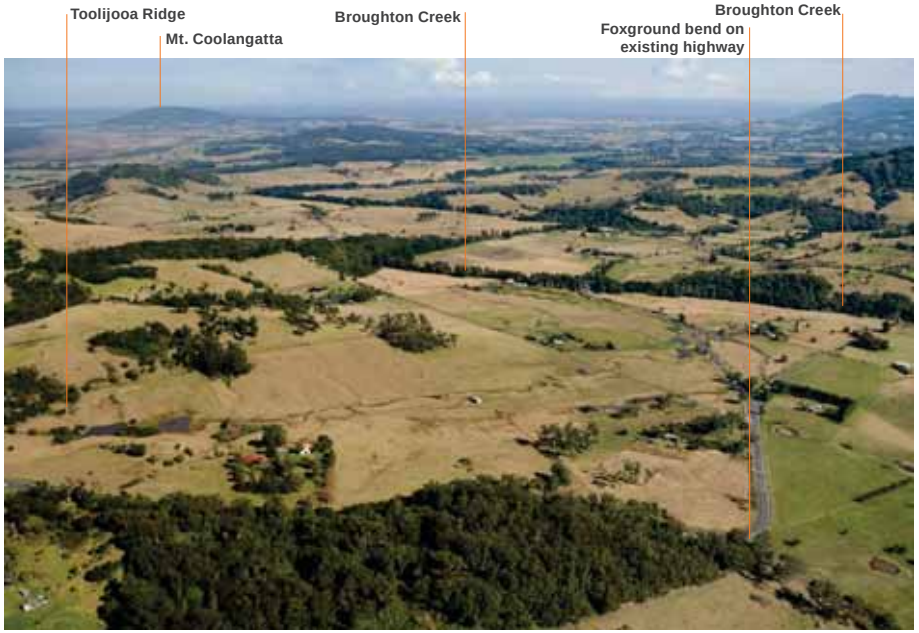


Figure 6.8 Broughton Creek landscape looking south west

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.**

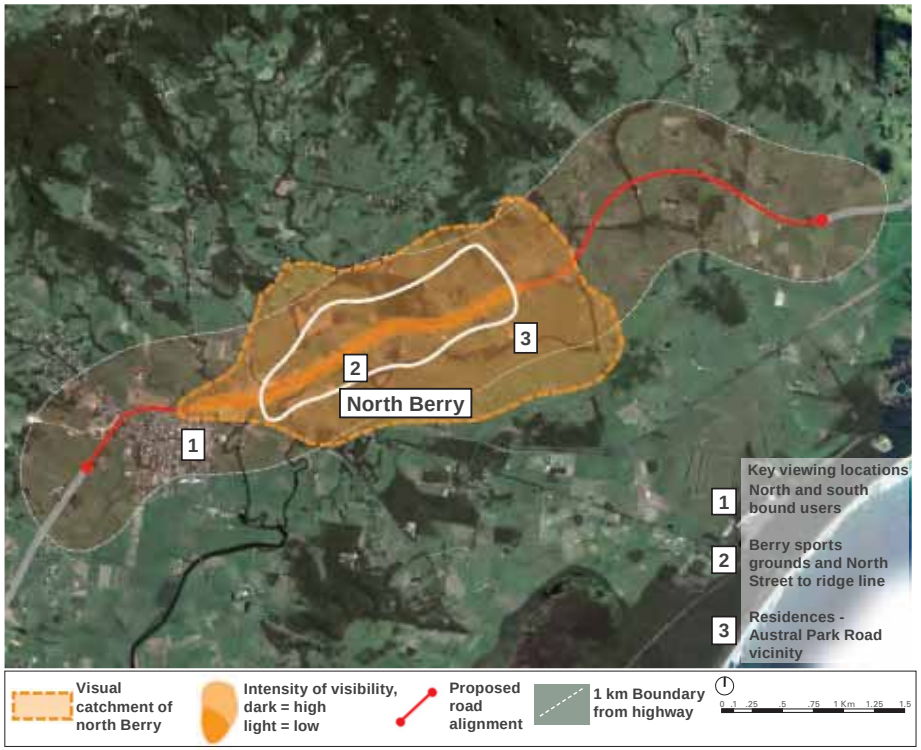


Figure 6.12 Visual catchment and key viewpoints of the North Berry landscape character unit

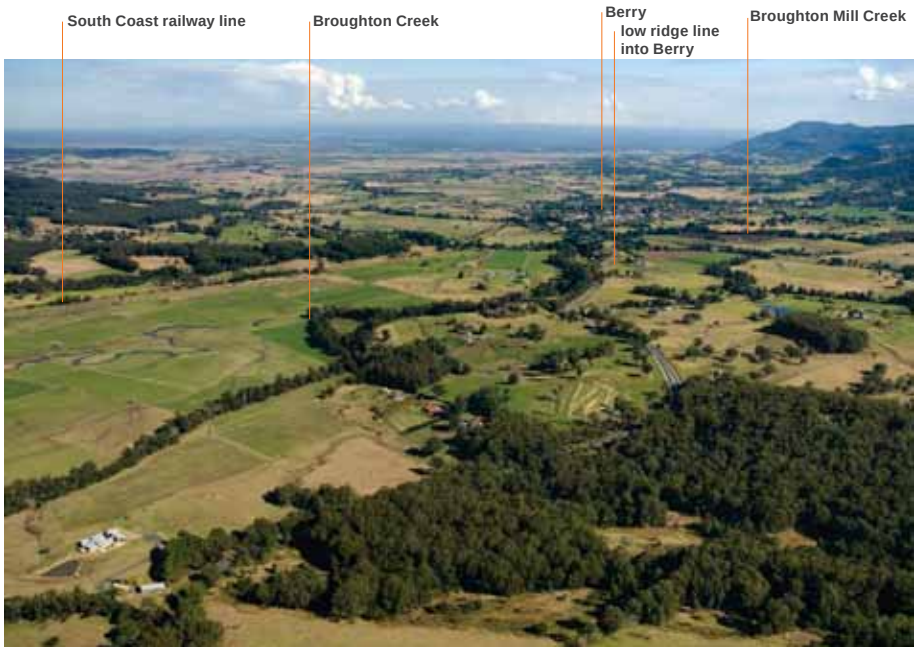


Figure 6.13 North Berry landscape looking south

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

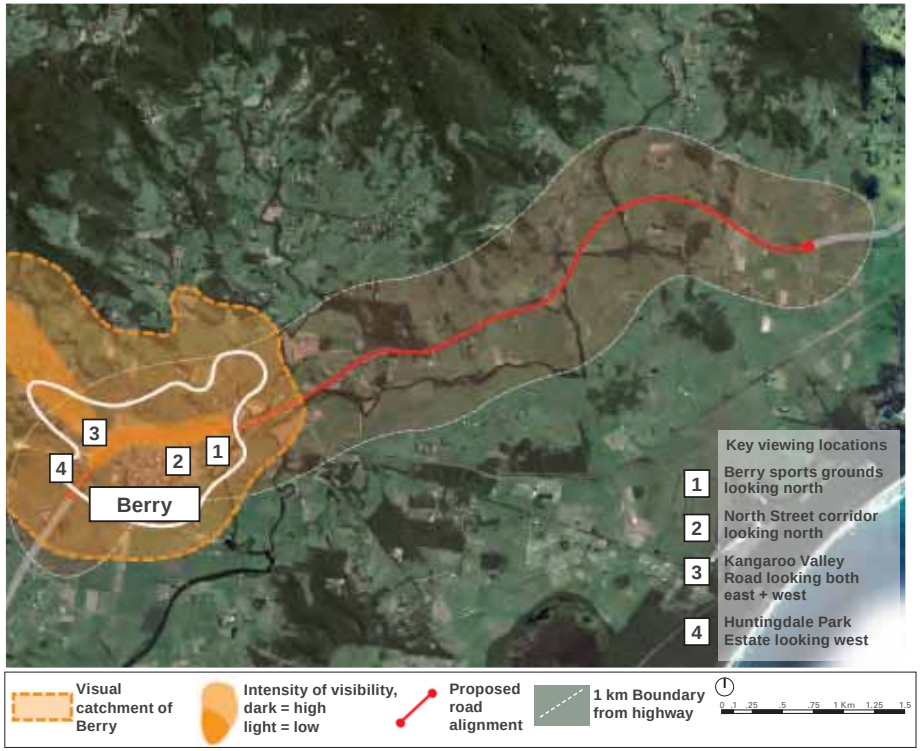


Figure 6.14 Visual catchment and key viewpoints of the Berry landscape character unit

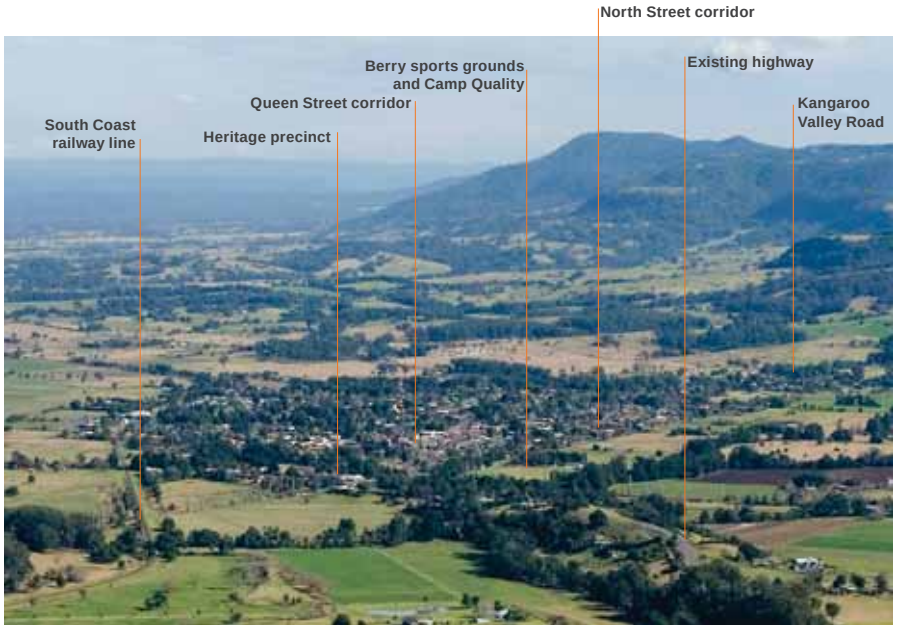


Figure 6.15 Berry landscape looking south west

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**).

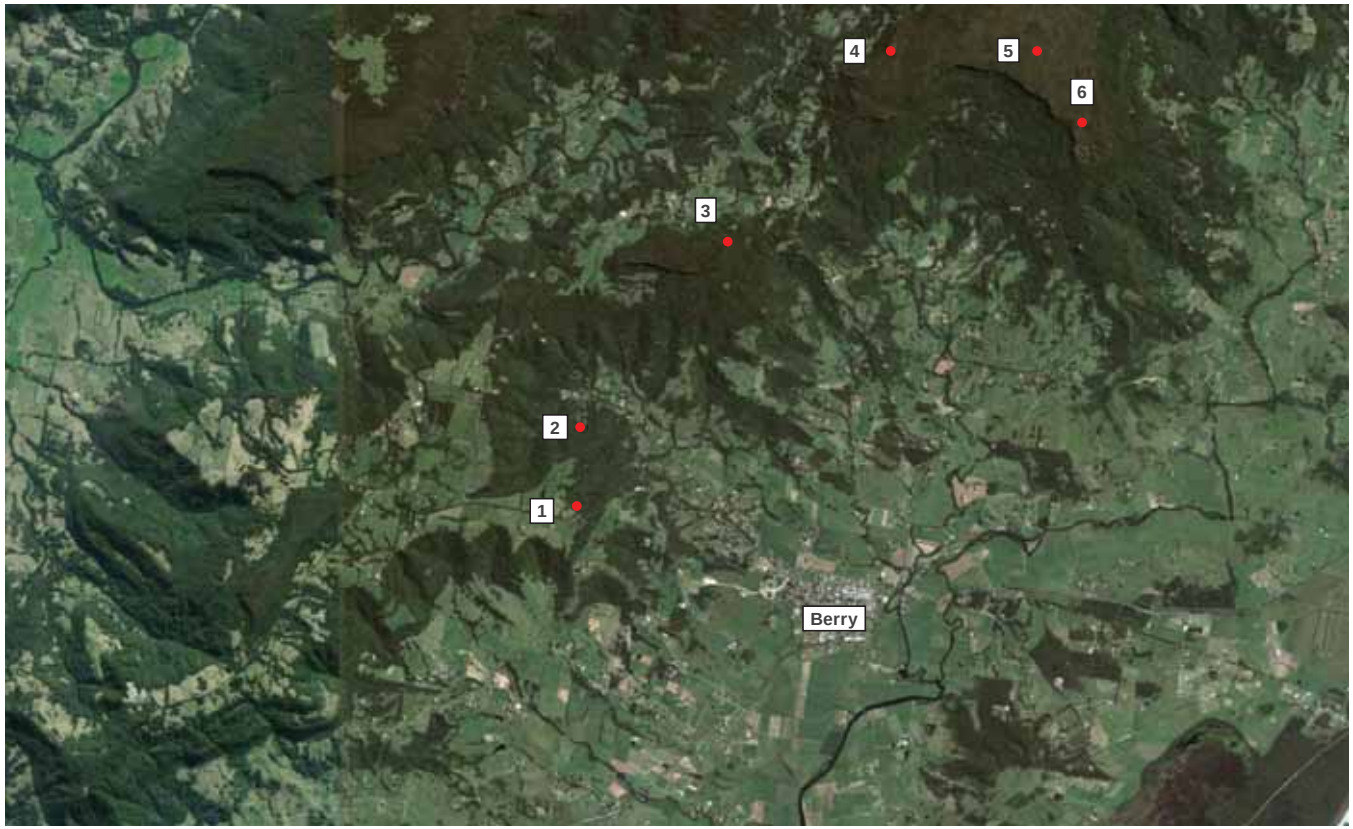


Figure 6.16 Aerial image locating the identified significant escarpment landforms (Image Source: Google)

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.

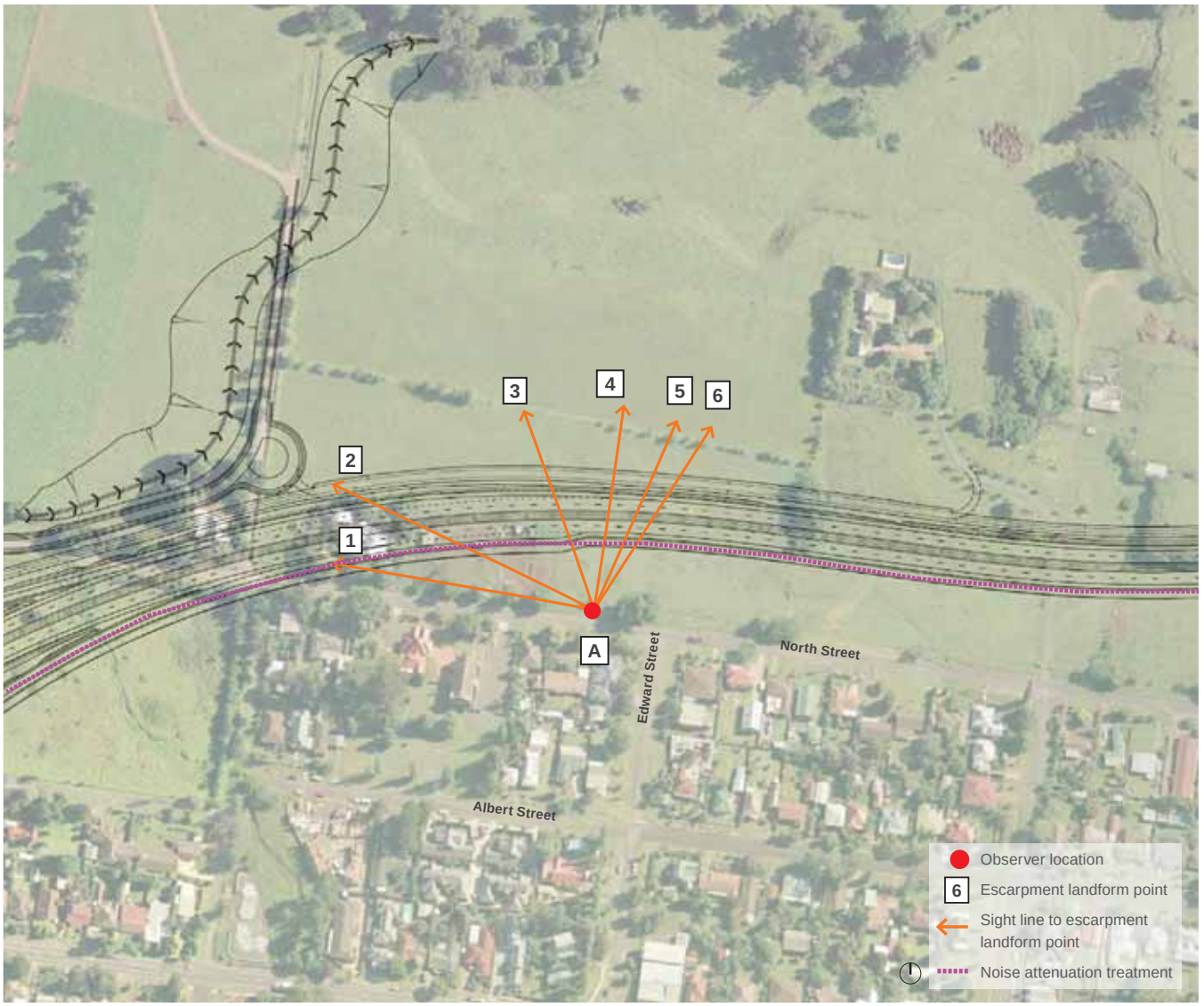


Figure 6.19 Observation location A on North Street showing sight lines to the significant points along the escarpment

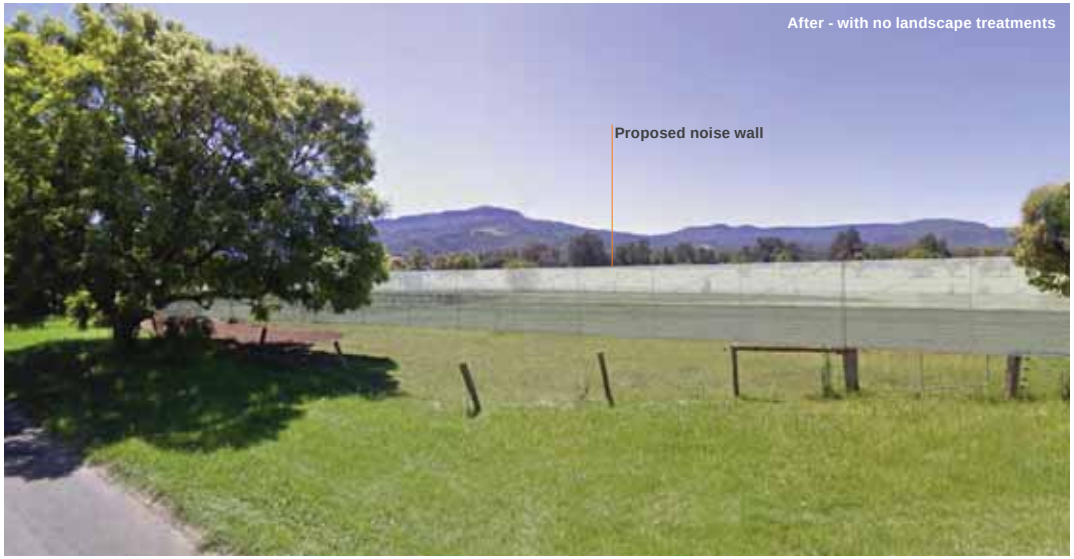


Figure 6.20 Observer location A comparison, North Street

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

Legend

- Zone 1: moderate impact, impacts on foreground views but ridges and escarpment visible
- Zone 2: moderate to low impact, minor impacts on foreground views, no impact on views to ridges and escarpments
- Zone 3: low impact, very minor to no impacts on foreground views, no impact on views to ridges and escarpments
- Noise attenuation wall, indicative
- Proposed alignment
- Commercial core
- Impact assessment observer location points (A,B,C)

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.

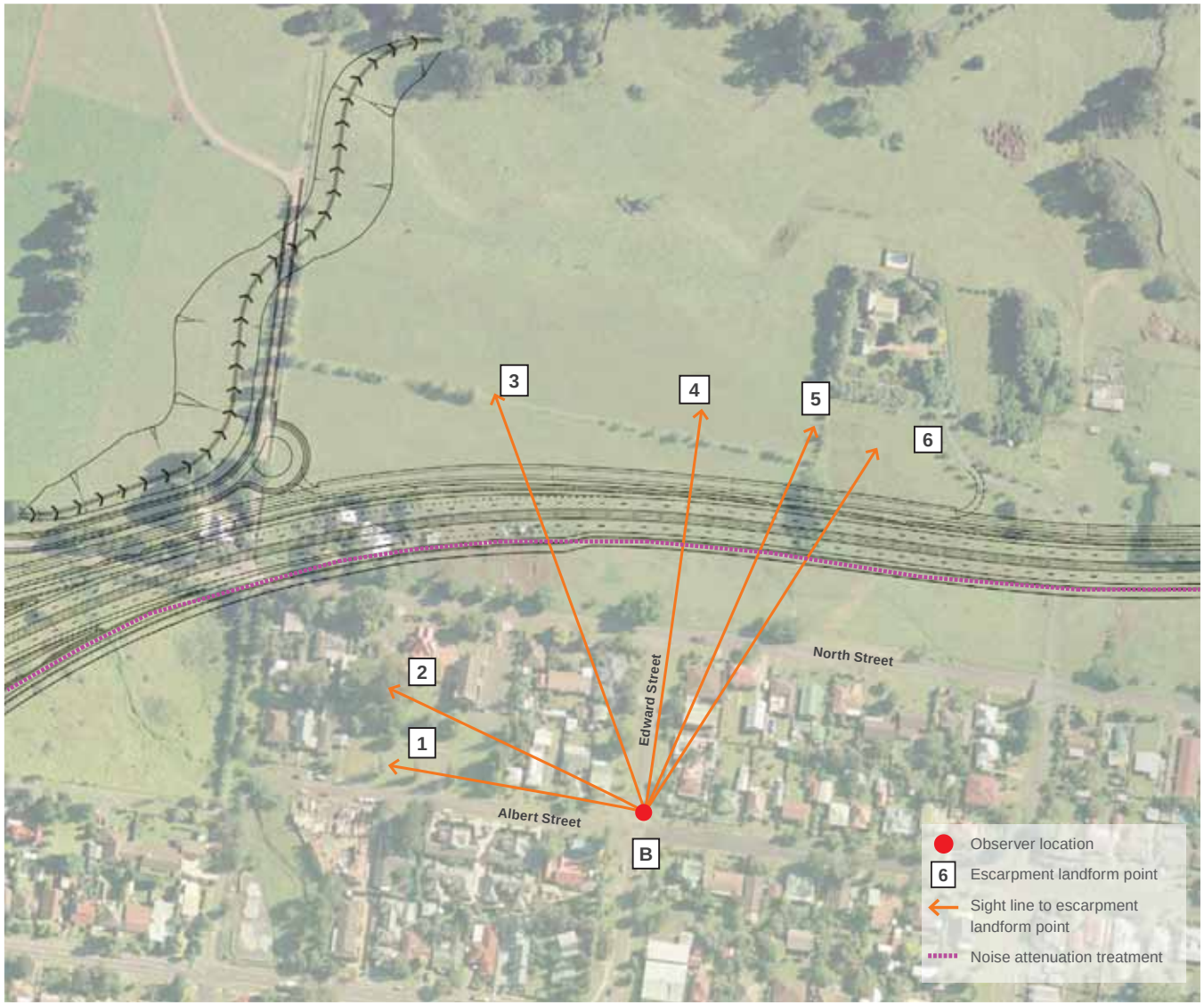
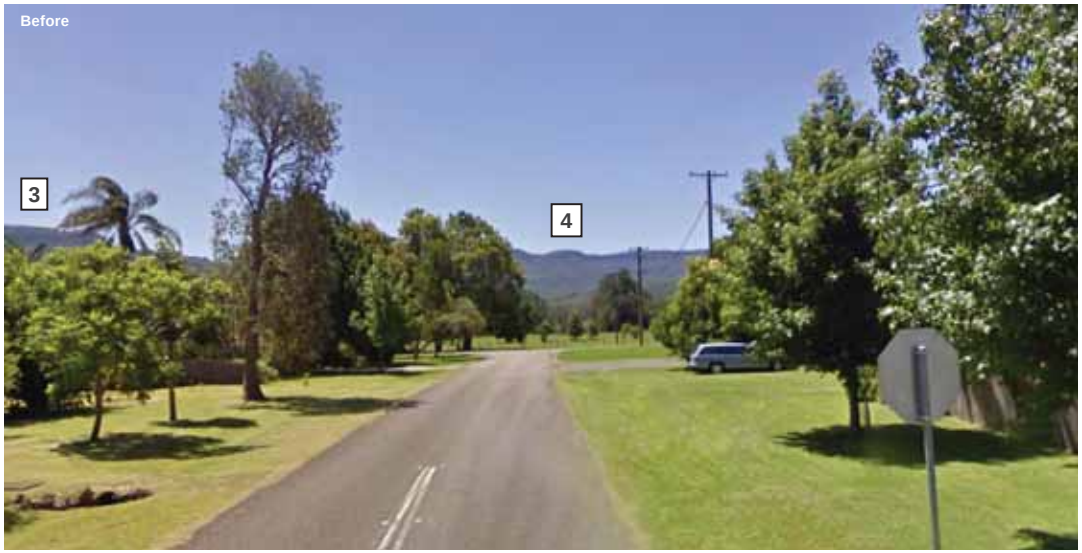


Figure 6.22. Observation location B on Edward Street showing sight lines to the significant points along the escarpment



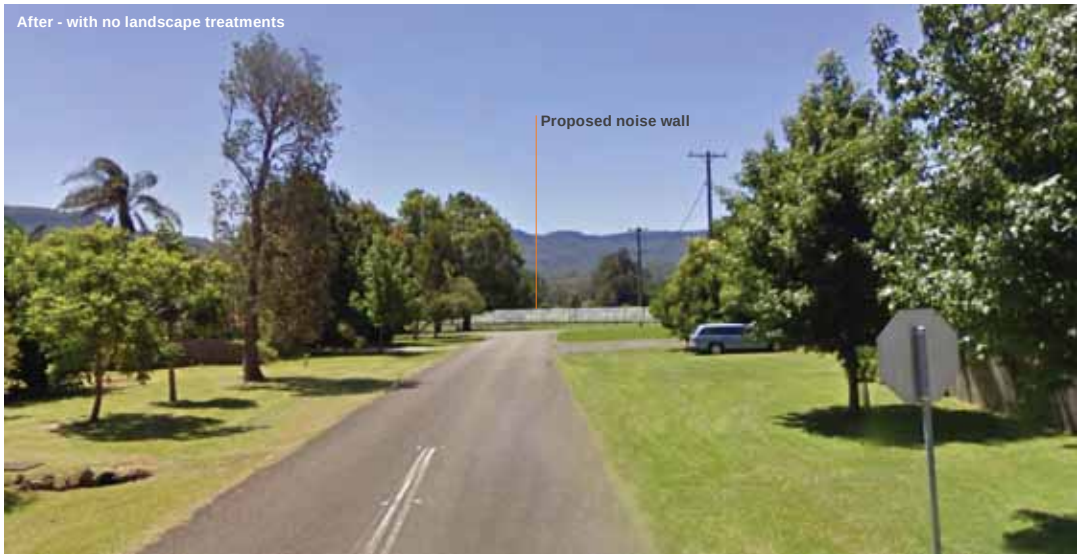
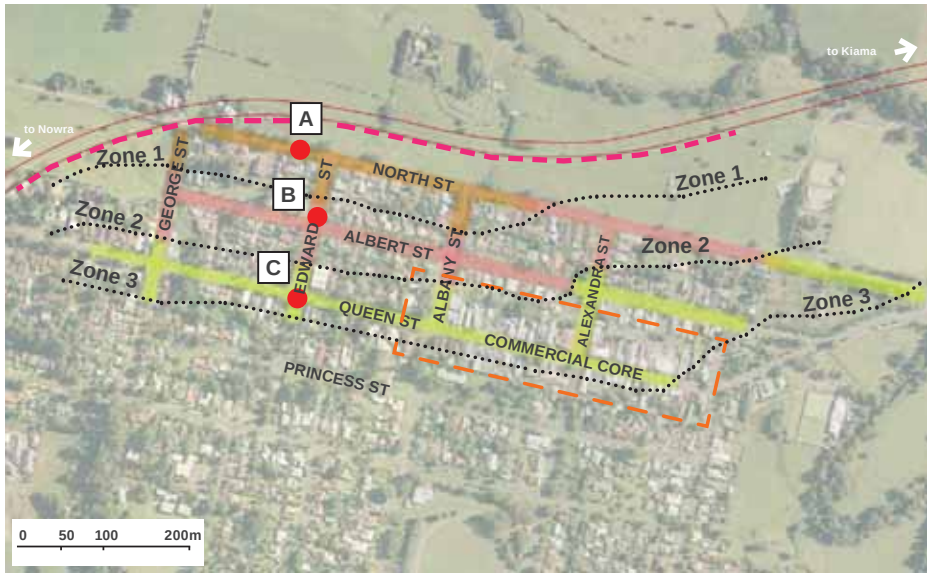


Figure 6.23 Observer Location B comparison, Albert Street

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



Legend

- Zone 1: moderate impact, impacts on foreground views but ridges and escarpment visible
- Zone 2: moderate to low impact, minor impacts on foreground views, no impact on views to ridges and escarpments
- Zone 3: low impact, very minor to no impacts on foreground views, no impact on views to ridges and escarpments
- Noise attenuation wall, indicative
- Proposed alignment
- Commercial core
- Impact assessment observer location points (A,B,C)

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

Legend

- Zone 1: moderate impact, impacts on foreground views but ridges and escarpment visible
- Zone 2: moderate to low impact, minor impacts on foreground views, no impact on views to ridges and escarpments
- Zone 3: low impact, very minor to no impacts on foreground views, no impact on views to ridges and escarpments
- Noise attenuation wall, indicative
- Proposed alignment
- Commercial core
- Impact assessment observer location points (A,B,C)

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

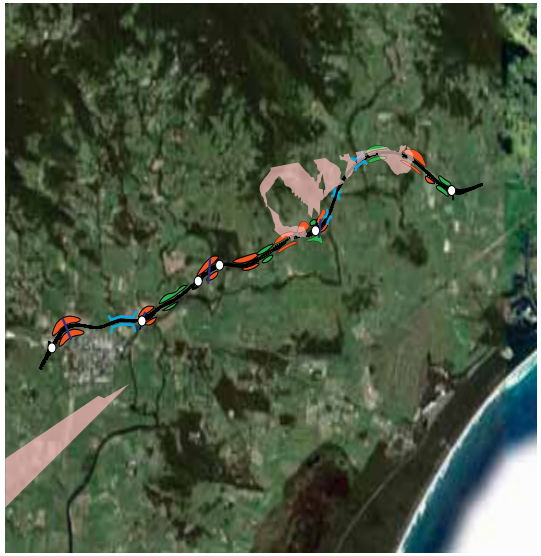
8. View from North Street (near Edward Street) looking north west.
9. View from the corner of North Street and Albany Street looking north west.
10. View from the corner of North Street and Alexandra Street looking north west.
11. View from the corner of North Street and Prince Alfred Street looking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



Visual assessment location showing view shed coverage

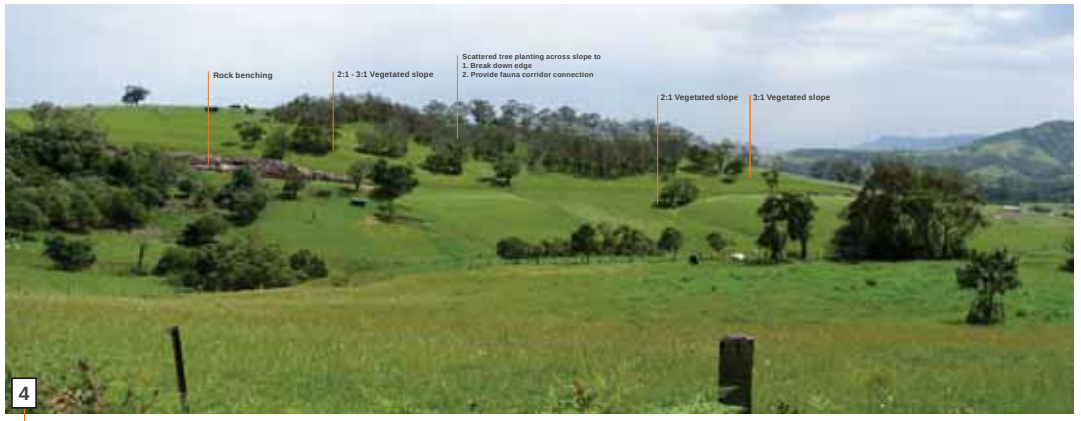
Step 2 Existing site condition

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

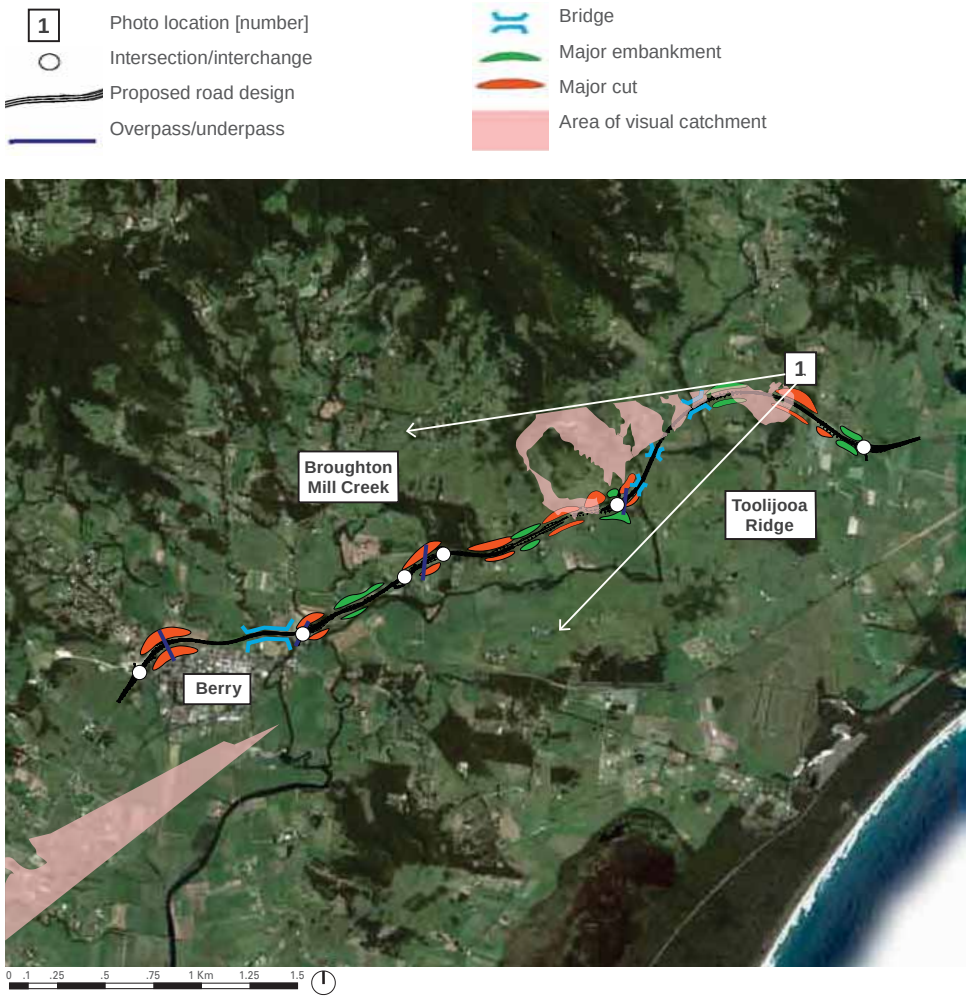


Figure 6.31 Visual assessment location 1 showing view shed coverage

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

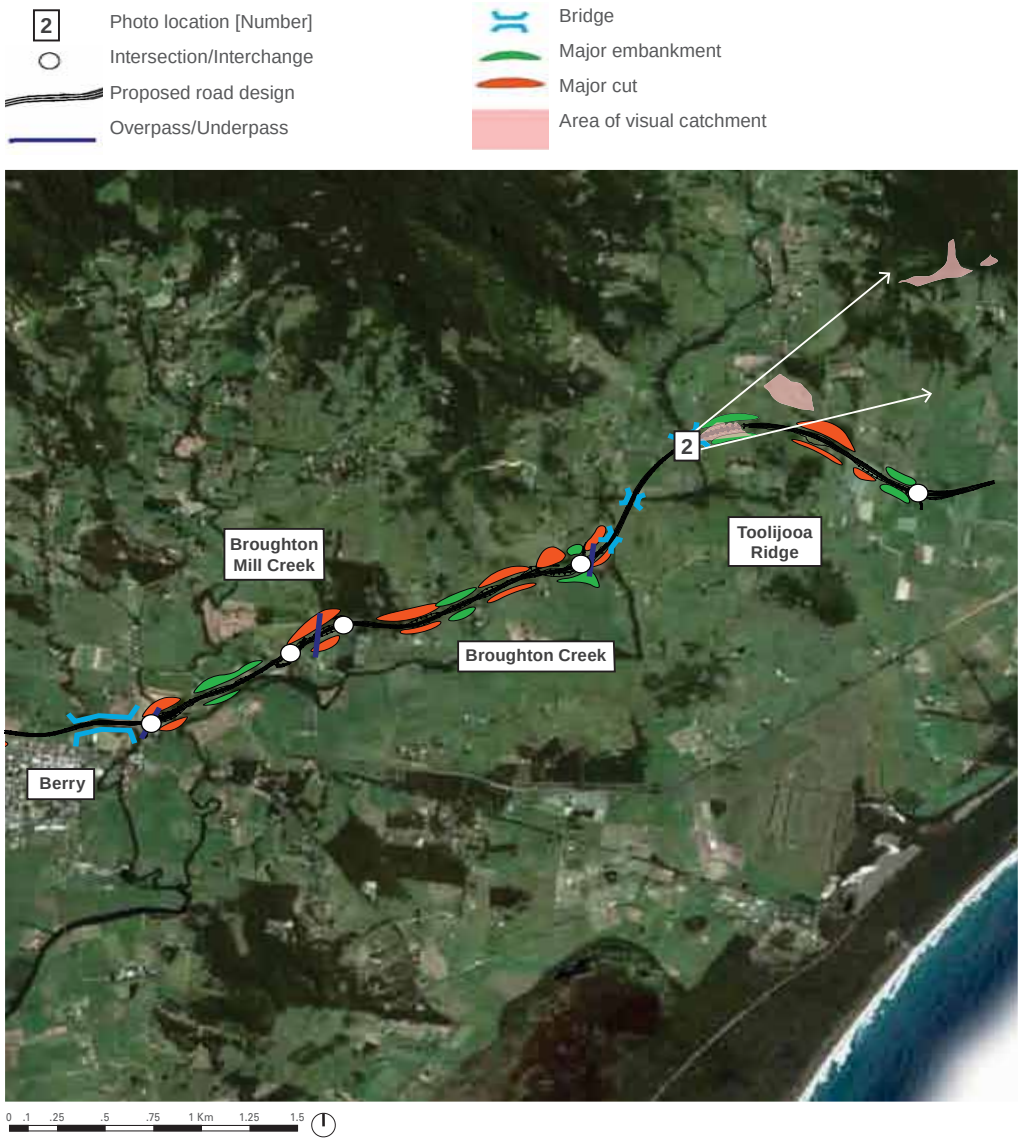


Figure 6.33 Artist's impression location 2 showing view shed coverage

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

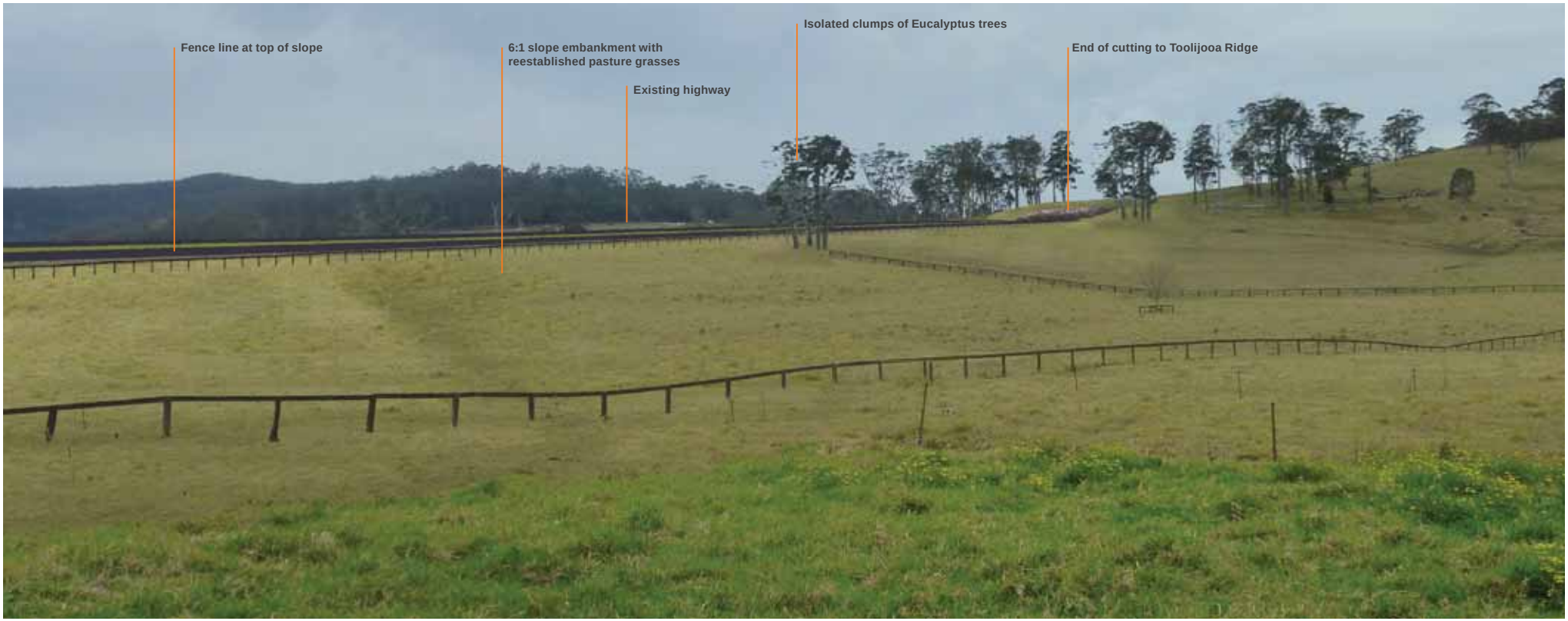


Figure 6.34 Artist's impression from viewpoint 2 (Note: vegetation shown with approximately 10-15 years of growth)

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

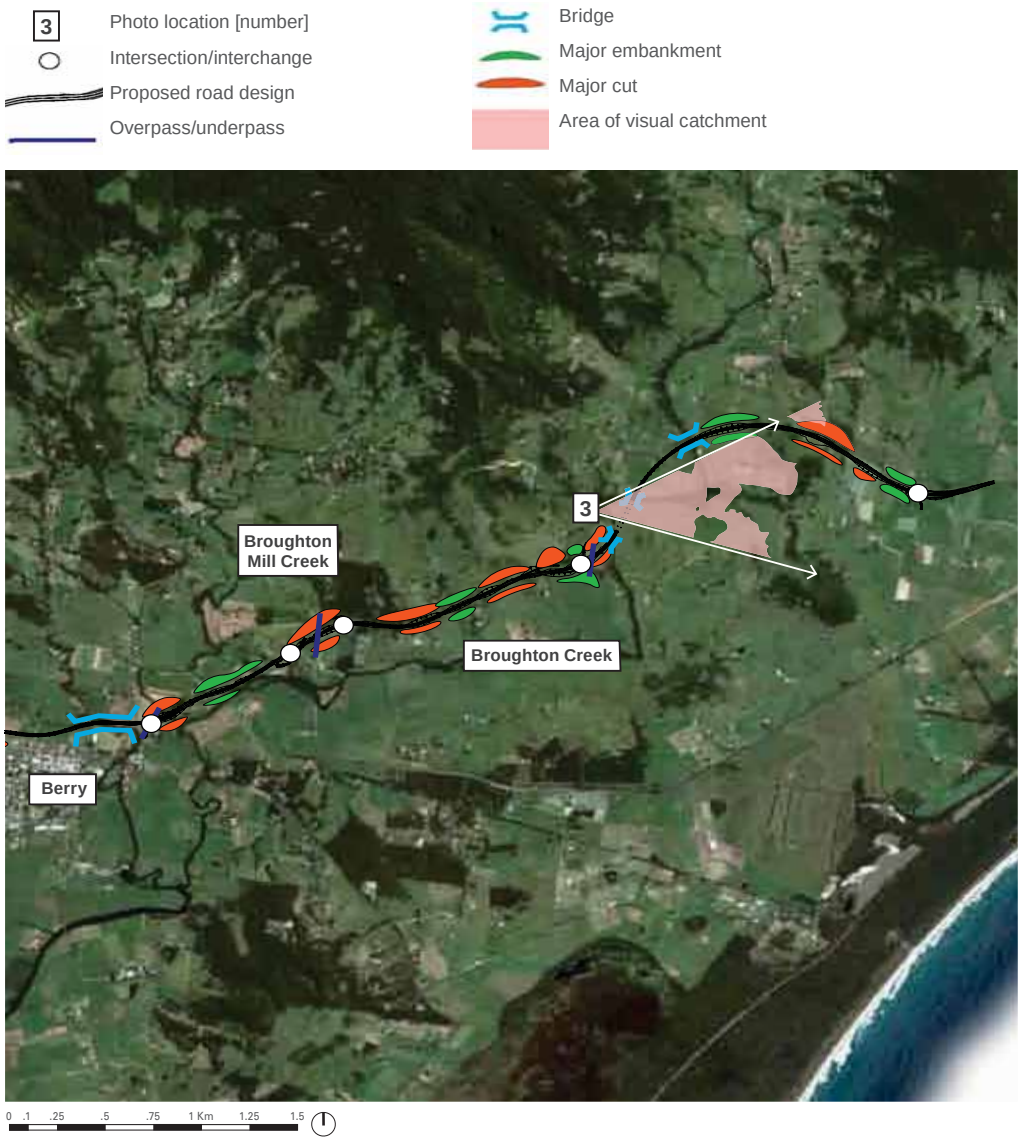


Figure 6.35 Artist's impression location 3 showing view shed coverage

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

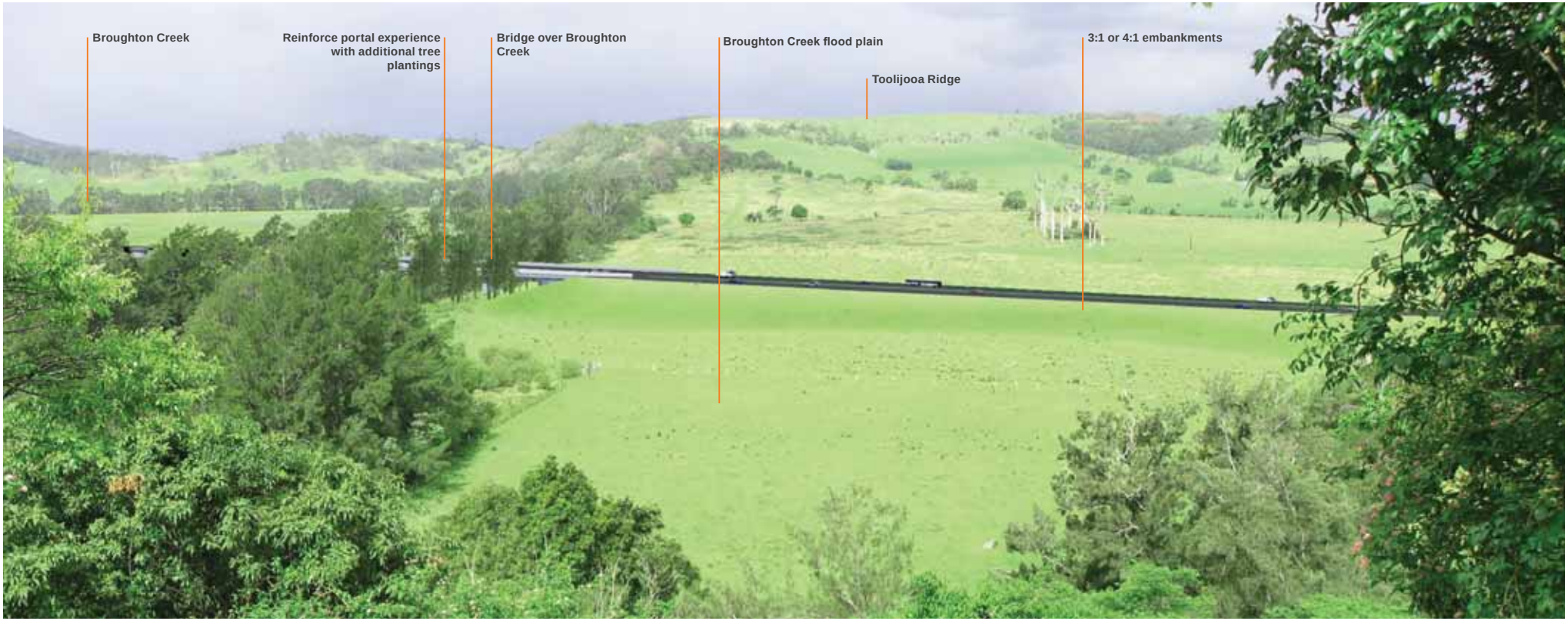


Figure 6.36 Artist's impression from viewpoint 3 (Note: vegetation shown with approximately 10-15 years of growth)

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

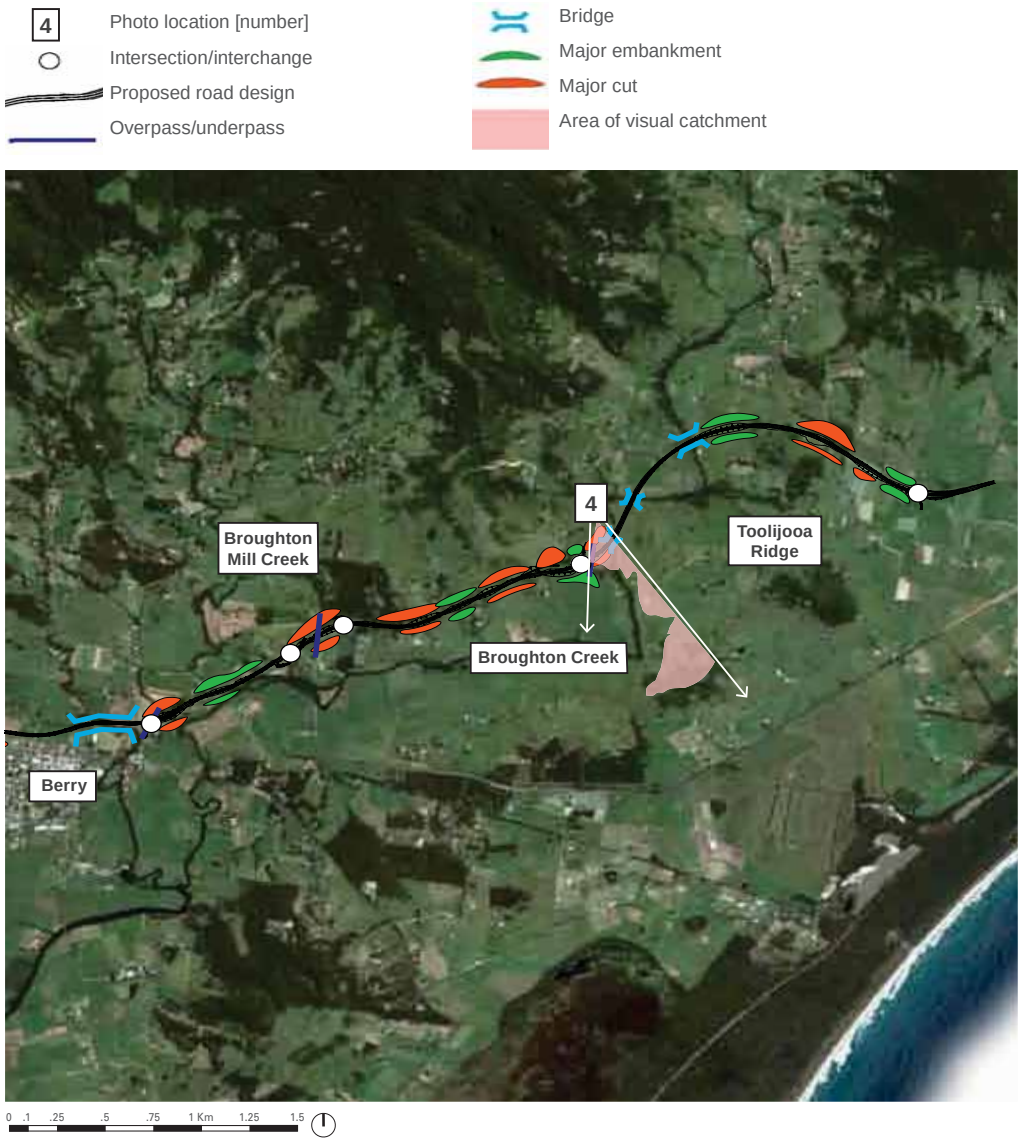


Figure 6.37 Artist's impression location 4 showing view shed coverage

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

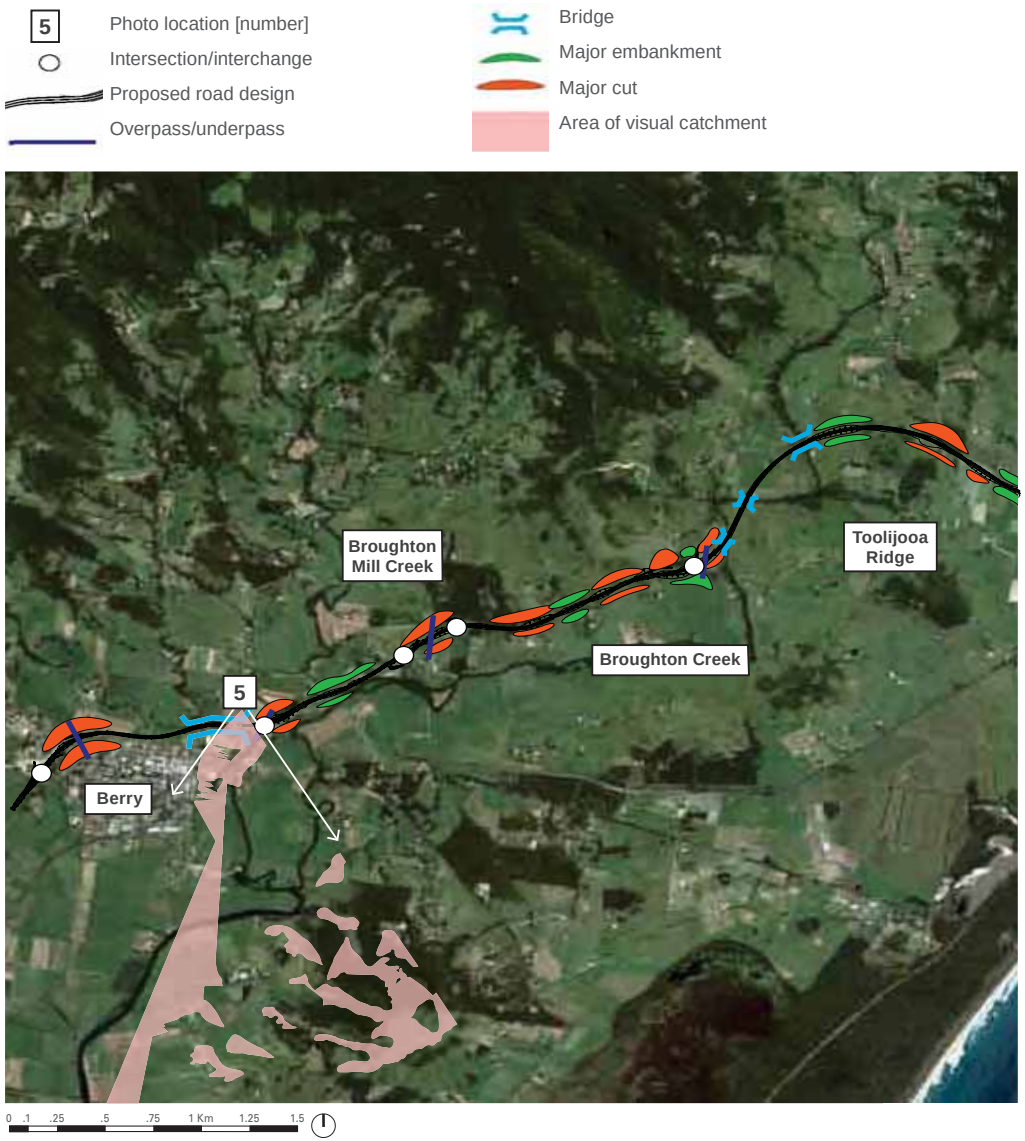


Figure 6.39 Artist's impression location 5 showing view shed coverage

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

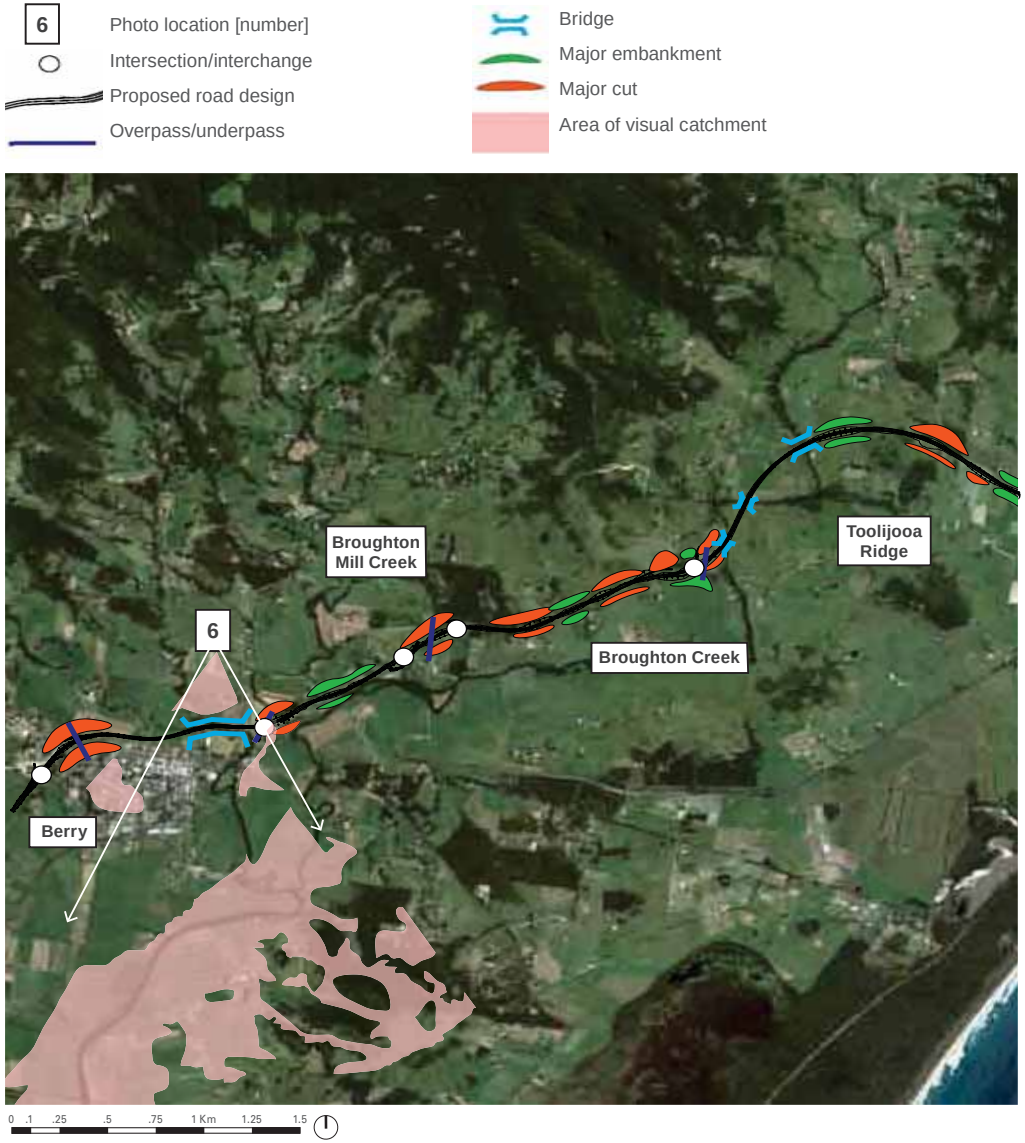


Figure 6.41 Artist's impression location 07 showing view shed coverage

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

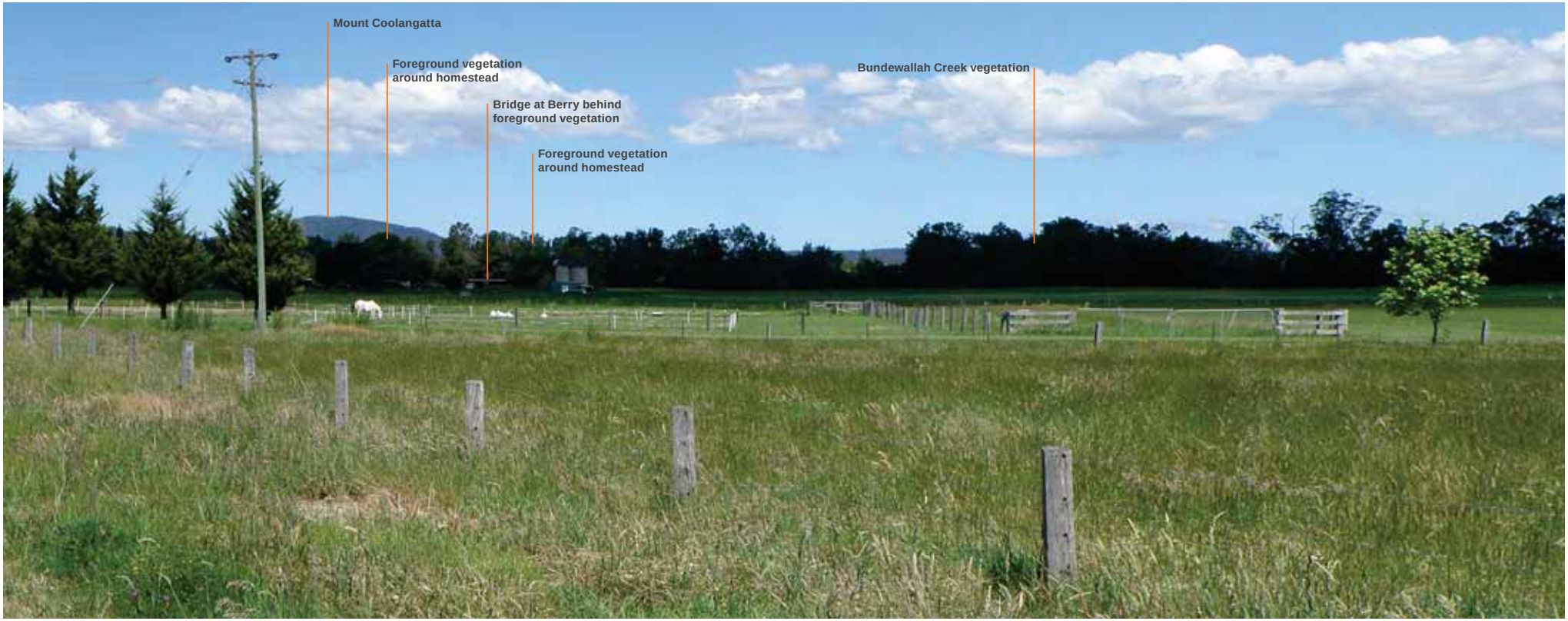


Figure 6.42 Artist's impression from viewpoint 6

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

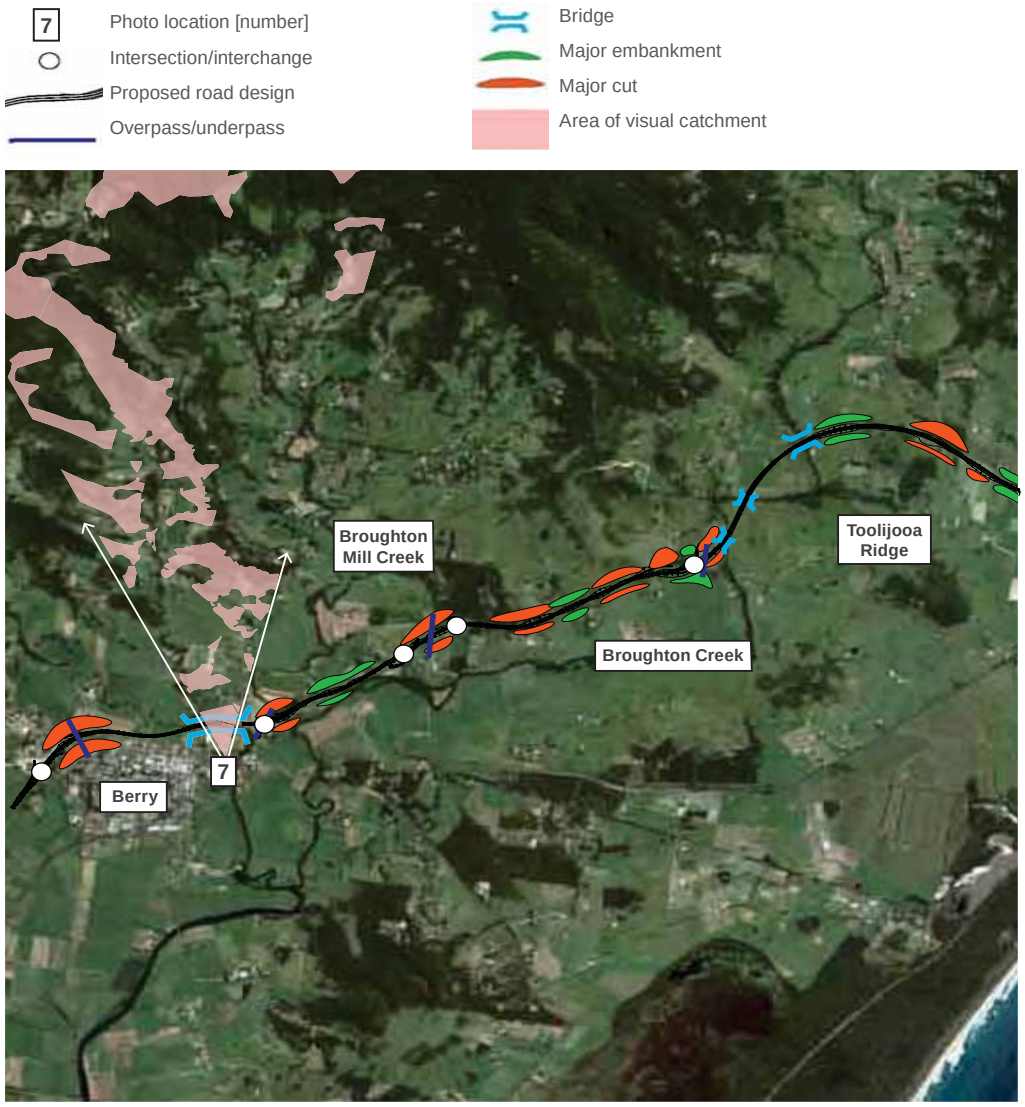


Figure 6.43 Artist's impression location 8 showing view shed coverage

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

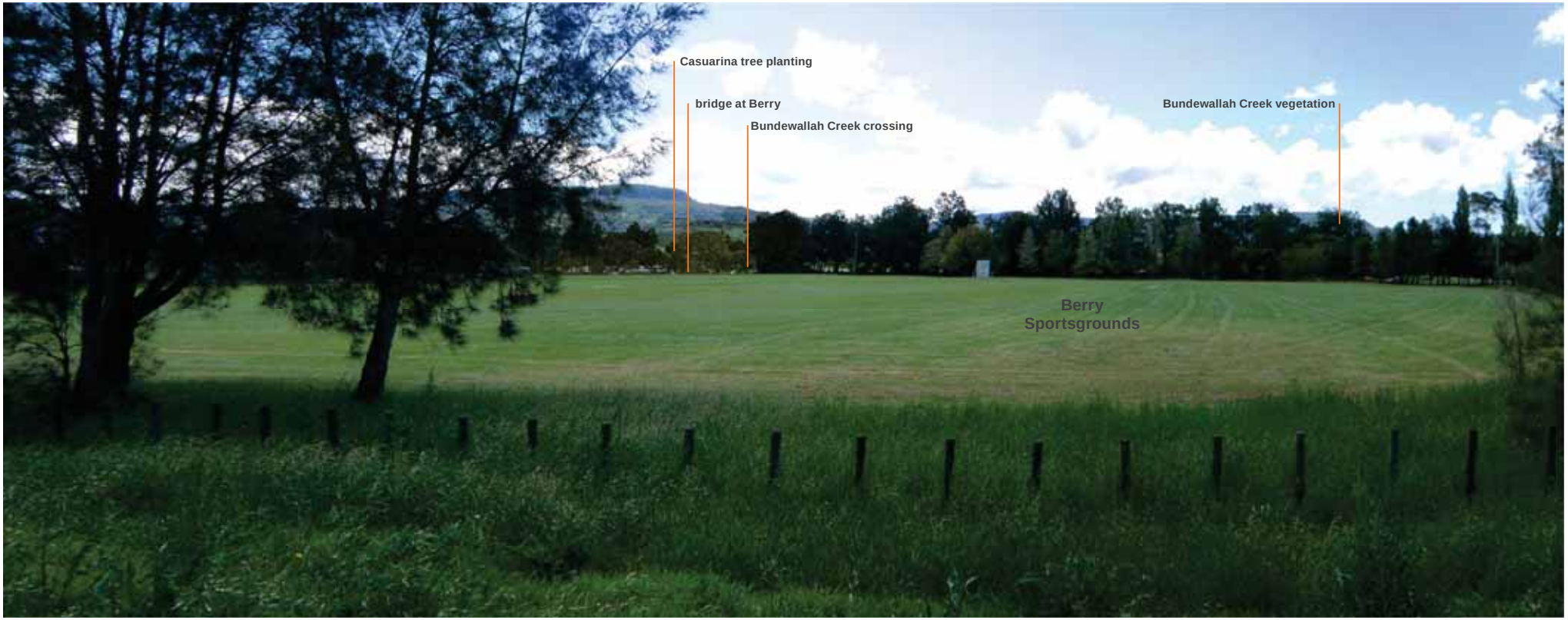
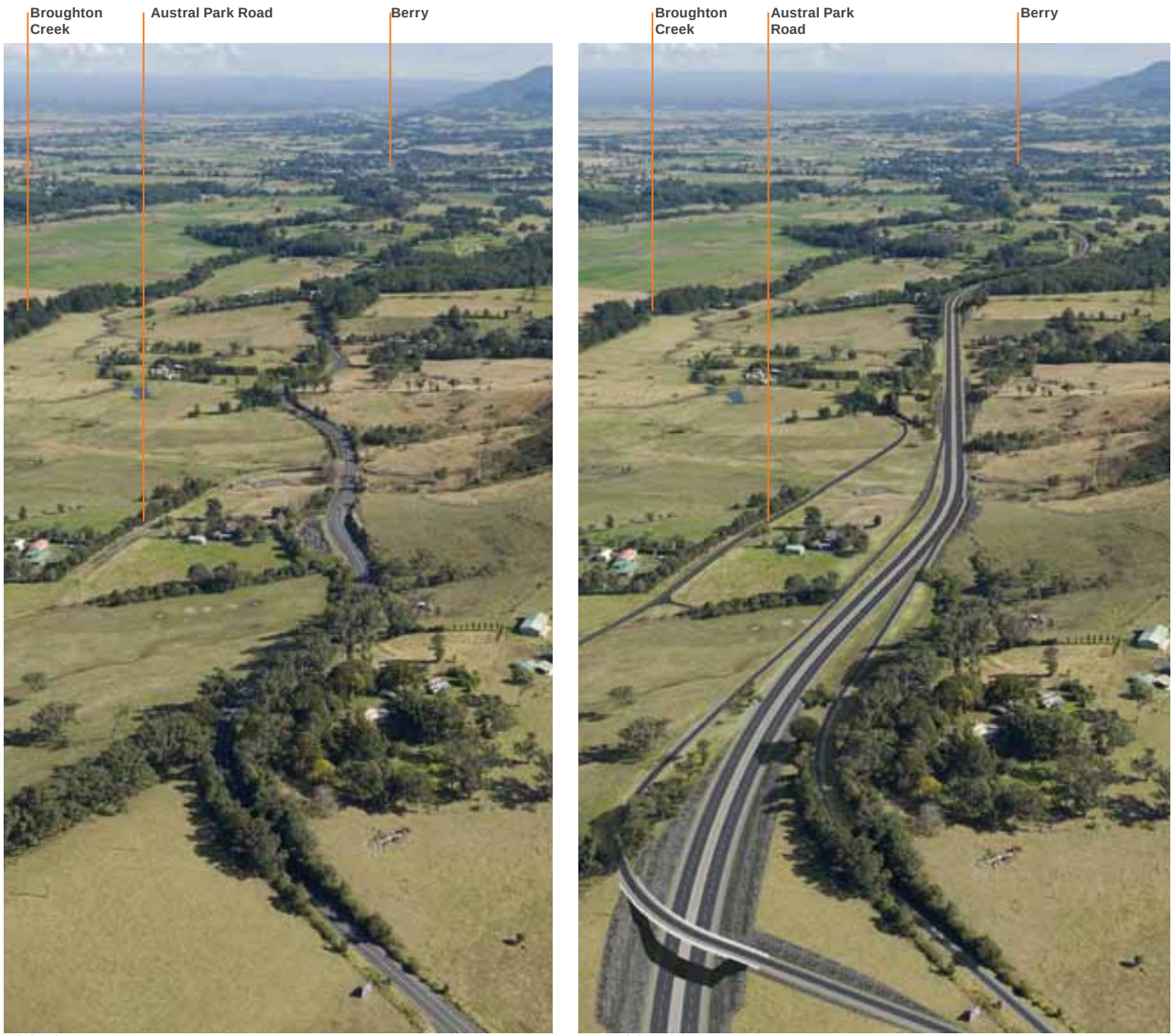


Figure 6.44 Artist's impression from viewpoint 7 (Note: vegetation shown with approximately 10-15 years of growth)

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.



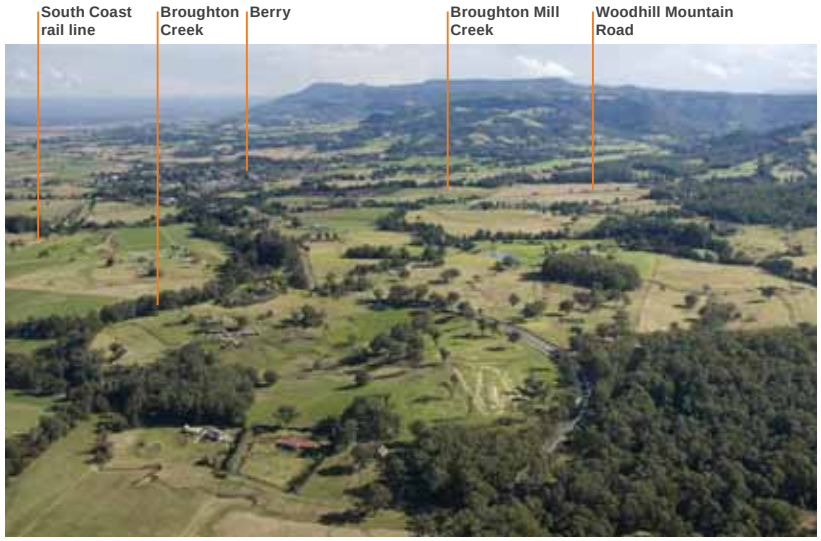
Existing view

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

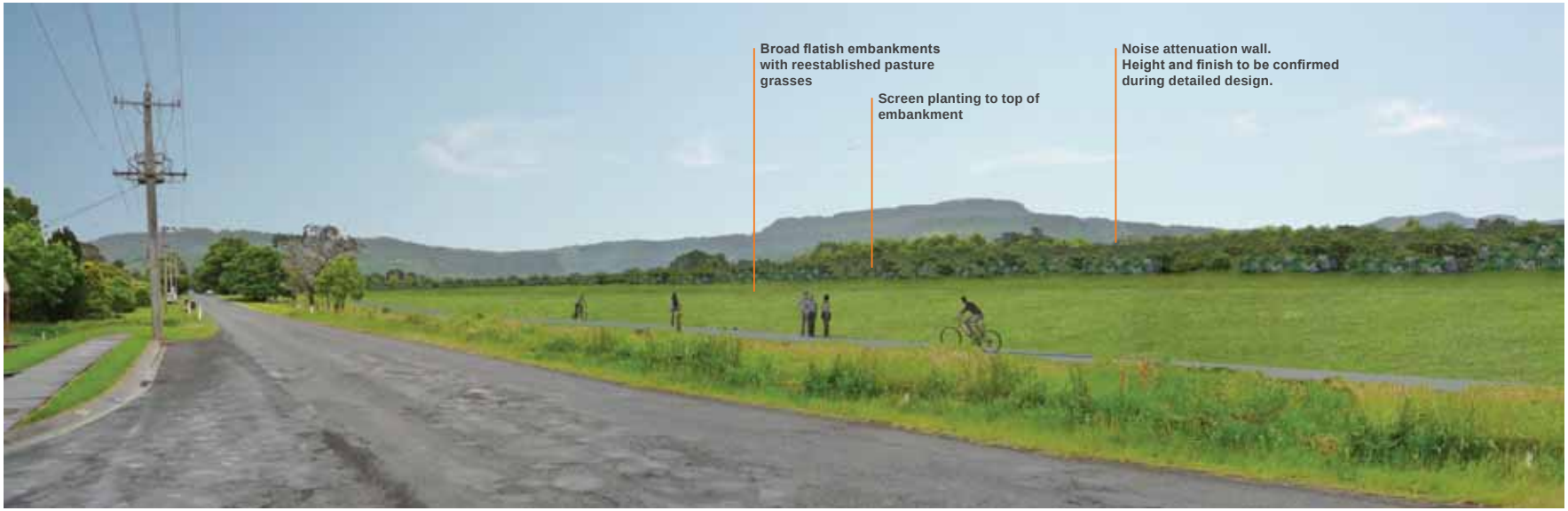


Figure 6.49 Artist's impression from location nine showing established landscape. Image provided courtesy of CM+ (2012)

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

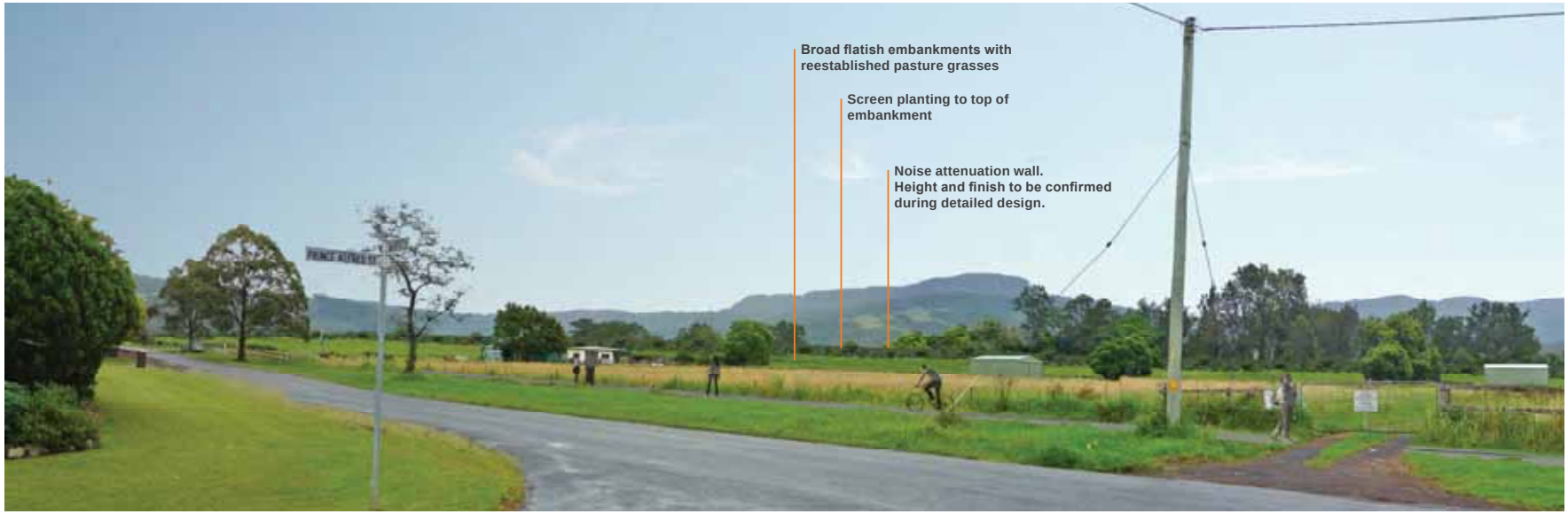


Figure 6.51 Artist's impression from location eleven, showing established landscape. Image provided courtesy of CM+ (2012).

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.