PRINCES HIGHWAY UPGRADE – FOXGROUND AND BERRY BYPASS

URBAN DESIGN & LANDSCAPE PLAN

12 September 2014

Prepared for

Fulton Hogan *by* JACKSON TEECE *in association with* Tract

CONTENTS

RESPONSES TO THE MINISTER'S CONDITIONS OF APPROVAL

Condition No.	Condition	Response
Terms of Approval		
A1.	The Proponent shall carry out the project generally in accordance with the: (a) Major Project Application MP10_0240; (b) Princes Highway upgrade - Foxground and Berry bypass - Environmental Assessment (Volumes 1-2), prepared by AECOM Australia Pty Ltd for Roads and Maritime Services and dated November 2012; (c) Princes Highway upgrade - Foxground and Berry bypass - Submissions Report, prepared by AECOM Australia Pty Ltd for Roads and Maritime Services and dated May 2013, including the revised Statement of Commitments contained therein; and (d) conditions of this approval.	This report demonstrates responses and compliance with the Environmental Assessment and Conditions of Approval relevant to urban design.
Design		
B1.	The Proponent shall, in consultation with the relevant council/s, investigate the need for a) potential future on and off ramps at Woodhill Mountain Road; and b) potential future left turn lane onto the new highway from Toolijooa Road. The investigation shall be undertaken to the satisfaction of , and include consideration of the relevant environmental impacts (noise, flooding, heritage, biodiversity, traffic etc.)	Roads and Maritime Services Responsible for Condition B1.
B2.	The bridge piers at the Connollys Creek / Bundewallah Creek / Broughton Mill Creek crossing shall be located and designed in such a way to minimise visual impacts to Berry and the bridge piers at Broughton Creek crossing 3 are located and designed in such a way to minimise visual impacts to RMB 353 Princes Highway, Broughton Village. Evidence of how visual impacts have been minimised shall be provided to the Secretary prior to the commencement of works that would influence the design of the bridge in this location.	See pages 86 and 119.
Biodiversity		
B3.	The Proponent shall design (and implement) the fauna crossings identified in Table 5.1 of Appendix F of the document listed under condition A1(b), at the locations and in accordance with the minimum design principles identified in Table 5.1, unless othenruise agreed by the Secretary.	Refer Chapter 6 - Section 6.3.10
B4.	Investigations into the design of fauna crossings identified in Table 5.1 of Volume 2 Appendix F of the document listed under condition A1(b) during detailed design shall be undertaken with the input of a suitably qualified and experienced ecologist and in consultation with OEH and DPI (Fishing and Aquaculture).	Refer Chapter 6 - Section 6.3.10
B5.	The Proponent shall prepare a report on the final design of fauna and/or waterway crossings identified in Table 5.1 of Appendix F of the document listed under condition A1(b), where the location of the crossing has changed and/or the crossing does not meet the minimum design principles identified in Table 5.1. The report shall be submitted to the Secretary prior to the commencement of construction of the relevant crossing, and shall demonstrate how the new location and/ or design would result in acceptable biodiversity outcomes. The report shall clearly identify how the fauna and/ or watenruay crossing will work in conjunction with complementary fauna exclusion fencing measures to be implemented for the project. The report shall be accompanied by evidence of consultation with OEH and DPI (Fishing and Aquaculture) in relation to the suitability of any changes to the location and/or crossing design.	Refer Chapter 6 - Section 6.3.10
B6.	The Proponent shall, in consultation with OEH and DPI (Fishing and Aquaculture), ensure that all watenrvay crossings are designed and constructed consistent with the principles of the Guidelines for Controlled Activities Watercourse Crossings (Department of Water and Energy, February 2008), Policy and Guidelines for Fish Friendly Waterway Crossrngs (NSW Fisheries, February 2004) and Policy and Guidelines for Design and Construction of Bridges, Roads, Causeways, Culverts and Similar Structures (NSW Fisheries 1999,). Where multiple cell culverts are proposed or creek crossings, at least one cell shall be provided for fish passage, with an invert or bed level that mimics creek flows.	Refer Chapter 6 - Section 6.3.10
Urban Design and Landscaping		
B23.	The Proponent shall prepare and implement an Urban Design and Landscape Plan for the project. The Plan shall be prepared in consultation with the relevant council and shall present an integrated urban design for the project. The Plan shall include, but not necessarily be limited to: (a) a principal goal of achieving the urban design objectives outlined in Section 2.2 Volume 2 Appendix I of the document referred to in Condition A1(b); (b) location of existing vegetation and proposed landscaping (including use of indigenous and endemic species where possible) and design features;	Chapter 7 Plan illustrates this.

Table A: Responses to the Minister's Conditions of Approval

Condition No.	Condition	Response
	(c) graphics such as sections, perspective views and sketches for key elements of the project (including, but not limited to built elements such as retaining walls, cuttings, embankments, bridges, and noise barriers);	Refer Chapters 6 and 7.
	(d) a description of locations along the project corridor directly or indirectly impacted by the construction of the project (e.9. temporary ancillary facilities, access tracks, watercourse crossings, etc.) and details of the strategies to progressively rehabilitate regenerate and/ or revegetate the locations with the objective of promoting biodiversity outcomes and visual integration. Details of species to be replanted/ revegetated shall be provided, including their appropriateness to the area and considering existing vegetation and habitat for threatened species;	Refer Chapters 7 and 10. Refer to Fauna Crossings Report for Fauna management and details of individual crossings.
	(e) an assessment of the visual screening affects of existing vegetation and the proposed landscaping. Where residences and businesses have been identified as likely to experience high visual impact as a result of the project and high residual impacts are likely to remain, the Proponent shall in consultation with affected receptors, identify opportunities for providing at-receptor landscaping to further screen views of the project. Where agreed to with the landowner, these measures shall be implemented during the construction of the project;	See Table 2.1 on page 12 To be managed as part of the property adjustment strategy.
	(f) take into account appropriate roadside plantings and landscaping in the vicinity of heritage items and ensure no additional heritage impacts;	Refer Chapter 7 in general and page 69.
	(g) specific details on the landscape treatments for the North Street corridor, Town Creek diversion and Town Park;	Refer Chapter 7 page 108.
	(h) strategies for progressive landscaping of other environmental controls such as erosion and sedimentation controls, drainage and noise mitigation;	Refer Chapter 10 and the Construction Environmental Management Plan.
	(i) location and design treatments for any associated footpaths and cyclist elements, and other features such as seating, lighting (in accordance with AS 4282-1997 Control of the Obtrusive Effect of Outdoor Lighting), fencing, and signs;	Refer Chapter 6 page 67 and Chapter 7.
	(j) evidence of consultation with the relevant council and community on the proposed urban design and landscape measures prior to its finalisation; and	Refer Chapter 3 - Section 3.2 and Appendix 2.
	(k) monitoring and maintenance procedures for the vegetated built elements, rehabilitated vegetation and landscaping (including weed control) including performance indicators, responsibilities, timing and duration and contingencies where rehabilitation of vegetation and landscaping measures fail. The Plan shall be submitted for the approval of the Secretary prior to the commencement of construction, unless otherwise agreed by the Secretary. The Plan may be submitted in stages to suit the staged construction program of the project.	Refer Chapter 11.

Condition No.	Condition	Response
Community involvement		
B33.	The Proponent shall prepare and implement a Community Communication Strategy for the project. This Strategy shall be designed to provide mechanisms to facilitate communication between the Proponent, the Contractor, the Environmental Representative, the relevant council and the local community (broader and local stakeholders) on the construction and environmental management of the project. The Strategy shall include, but not necessarily be limited to: (a) identification of stakeholders to be consulted as part of the Strategy, including affected and adjoining landowners; (b) procedures and mechanisms for the regular distribution of information to stakeholders on the progress of the project and matters associated with environmental management; (c) procedures and mechanisms through which stakeholders can discuss or provide feedback to the Proponent and/ or Environmental Representative in relation to the environmental management and delivery of the project; (d) procedures and mechanisms through which the Proponent can respond to enquires or feedback from stakeholders in relation to the environmental management and delivery of the project; and (e) procedures and mechanisms that would be implemented to resolve issues/disputes that may arise between parties on the matters relating to environmental management and the delivery of the project. This may include the use of an appropriately qualified and experienced independent mediator. Key issues that should be addressed in the Community Communication Strategy should include (but not necessarily be limited to): (i) traffic management (including property access, pedestrian access); (ii) landscaping/urban design matters; (iii) construction activities; and (iv) noise and vibration mitigation and management. The Proponent shall maintain and implement the Strategy throughout construction of the project. The Strategy shall be approved by the Secretary prior to the commencement of construction, or as otherwise agreed by the Secretary.	Urban and Landscape design is identified as a key component of the community consultation strategy. This is discussed as part of the Community Involvement Plan for the Project.

Table A: Responses to the Minister's Conditions of Approval (cont.)

HIGHLIGHTS OF THE DESIGN

This Urban Design & Landscape Plan Report documents the Urban and Landscape Design concept for the Design and Construction of the Foxground and Berry Bypass Upgrade of the Princes Highway between Toolijooa Road west of Gerringong and Mullers Lane south of the Berry township. It includes an analysis of the Project context and outlines the urban and landscape design principles adopted in the design of the corridor. The designs and strategies proposed are a response to the community, land use and landscape environment of the Project.

Context and Project Description

The Project is located in the southern part of the Illawarra Region and the northern part of the South Coast Region of New South Wales within the Kiama and Shoalhaven Local Government Area's (LGA) respectively. This area is situated between Illawarra and Cambewarra Ranges to the north and west, and the extensive South Coast to the south. The ranges contain a number of nature reserves and a National Park and are drained by numerous creeks such as Broughton Creek and its tributaries, Broughton Mill Creek, Connollys Creek and Bundewallah Creek.

The South Coast region is dominated by its expansive coastline and is characterised by a highly diverse natural environment, agricultural settlements and a string of townships located throughout the region along the existing Princes Highway. In addition to Berry, urban settlements approximate to the Project area are Kiama, Gerringong, Gerroa and Shoalhaven Heads, which are predominantly concentrated along the coastline.

The Fulton Hogan Design

The urban design and landscape strategies positively integrate the upgraded highway and its associated structures and landforms closely with its context, enhancing visual connections to significant landscape features; supporting a safe, legible and enjoyable driving experience; and providing cost-effective solutions which address potential maintenance issues.

The proposed road corridor traverses through four distinctly different environments that influence the character of the Project and the experience of it. The approach to the design of the highway and of its various built elements responds to these four different characters. These are:

Character Zone 1 - Toolijooa

Character Zone 2 - Broughton Creek

Character Zone 3 - Broughton Mill Creek

Character Zone 4 - Berry and its four subzones:

A. Sport and Recreation Precinct

B. North Street Corridor

C. Kangaroo Valley Road Precinct

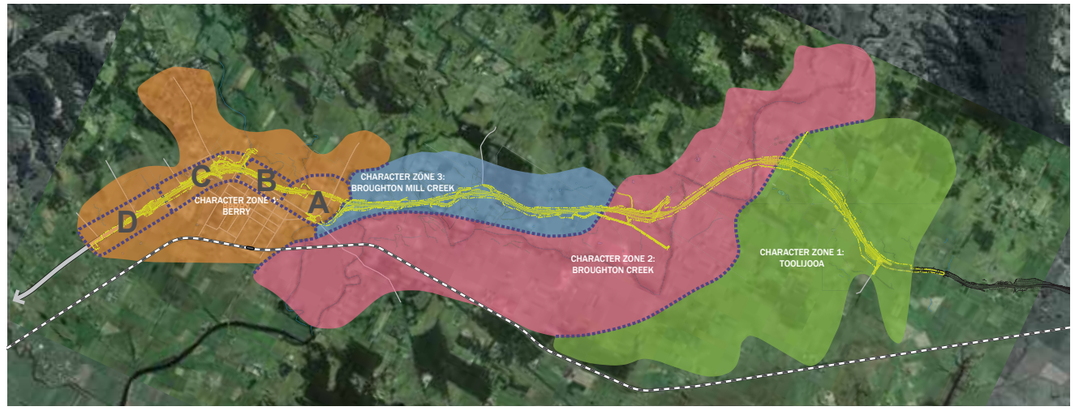
D. Jasper Brush Rural Interface

Approach to Design and Key Strategies

The urban design approach adopted for the Project is one that considers several factors including,

- The continuity of design approach and language adopted for the highway in the design of the Gerringong Upgrade by Fulton Hogan.
- Design response to the rural farmland context of the Foxground to Berry section of the works.
- Design response to the Berry township and its surrounds in the Berry Bypass section of the works.

The general approach adopted in the design of the road and its engineering elements in the Foxground to Berry section of the works, achieves a simple and elegant design outcome that responds to the highly scenic and semi-rural context of the Project linking it with the Gerringong Upgrade Project.



Character Zones of the Project corridor

Within the Berry Bypass section of the works, a more detailed and place-specific approach is adopted responding to the Berry township and the requirements of its community. These requirements have been understood as documented primarily in *Appendix A – Berry Bypass Urban Design Strategy* (October 2012), *EA Technical Paper: Urban Design including Landscape and Visual Amenity* (November 2012), *EA Submissions Report* (2013); and the *Foxground and Berry Bypass Community Discussion Commitments* (Roads and Maritime Services undated).

The design of engineering elements and related landscape treatments enhance the sense of place, and provide legibility to the entrances and exits to Berry township.

In general, the design minimises the visibility of structures and engineering elements in the existing landscape through their design and the use of landscape; mitigating their impacts as far as possible. The Design provides a clear response to the needs of the context and community in the area and meets the requirements identified in the Scope of Works documents.

Several strategies have been adopted to achieve the above. These are:

- The impact of built elements has been reduced by:
  - a reduction in the number of structures to be incorporated within the landscape by using soft landscape solutions to minimise the need for these.
  - a simple and elegant design with neat finishes to the engineering elements of the Project including bridges, retaining walls, noise walls and headlight screens.
- A sense of arrival and departure to the town is created by the use of the design to forewarn the motorists of the town's proximity. This includes changing vegetation patterns, the incorporation of the Berry Memorial and the formation of the road itself.
- Key visual corridors to the escarpment are retained where possible ensuring that the connections with the ridges to the west are maintained, particularly from the town.
- The pastoral landscape of the valleys and foot slopes is maintained and reinforced. Plantings have been used strategically in order to enhance this character and existing vegetation communities. Existing views across the valleys and towards the escarpment are retained.
- Creeklines are emphasised with vegetation communities restored to enhance connectivity and habitat and retain or improve water quality.

- Landform is worked so that cuts and fills are blended into the surrounding landscape, reducing the visual scarring that may occur.

Maintenance of Views

Views form an important component of the journey through this section of Southern NSW. The most striking views experienced from the corridor are views across long flat valleys from elevated ridges or to the escarpment. The design acknowledges and maintains where possible, views to the escarpment.

Critical views include:

- Views of Toolijooa Ridge and the maintenance of the ridge line when viewed from afar.
- Views from Toolijooa Ridge as you move into the Broughton Creek Valley.
- Views of the escarpment to the west particularly as one heads north out of Berry.
- Views from Berry of the escarpment and the rural context.

The views identified reflect the potential for views to be affected in terms of both the motorists' experience but also that of the adjoining residents. It is important to ensure that the views of the adjoining properties are addressed and the impact of changes moderated where possible. The following are considered important considerations in regard to views from adjoining properties:

- Retain district views for residents of Berry particularly to the escarpment to the west.
- Reduce the visual impacts of the Project from adjacent properties through planting and earth mounding and the creation of a perceived sunken alignment when viewed from the town.

Design of Structural Elements

The design of structural elements achieve the following outcomes:

- Minimise the number / extent of structures and its visual impact as far as possible.
- A consistent design language while responding to their different roles and functions.
- Relate and integrate with the surrounding landscape context both visually and physically.

Perspective view of Berry Bridge

- Integrate with the proposed landscape design to soften the visual impact of structures.
- Be simple, cognisant of maintenance issues and compliant with Roads and Maritime Services standards.

Bridges

The design of bridges is consistent with the Bridge Aesthetics (RTA, 2003) document and SWTC Appendix 15 (Urban Design Performance and Design Requirements).

The following key principles have been adopted in the design of the bridges:

- Bridges are designed as a consistent family, with consideration given to the context of the bridge and the design of bridges on adjoining sections of the Princes Highway.
  - The highway overbridges are generally designed to be similar in language to the overbridge on the Gerringong Upgrade i.e. single span bridge with no central column. However the Kangaroo Valley Road Overbridge is designed to a greater level of finish forming part of the interchange 'gateway statement' treatments. Here the bridge abutments will be finished in natural sandstone and the safety screen is proposed to be an artwork screen creating a visual marker for Berry town to passing motorists on the highway as well as people using Kangaroo Valley Road for movement within the local area.

Perspective view of Tindalls Lane Overbridge

Perspective view of Broughton Creek Bridge No. 3

  - Berry Bridge and its structural elements are designed to be simple and elegant with a two column pier (rectangular) and integrated headstock. The two column pier enables maximum views through underneath the bridge minimising the extent of built structure as far as practicable. The height of the bridge has been kept consistent with the EA Concept Design as negotiated with the community. The three Broughton Creek Bridges feature the same pier design for consistency through the Project.
- The main bridge elements have a smooth finish and clean lines, with minimum structural depth consistent with their spans and method of construction. All bridge elements including piers, parapets, headstocks, sill beams, abutments, transition panels, road traffic barriers and leading edges are fully integrated in the design.

Noise Barriers and Headlight Screens

The design of noise barriers and headlight screens on the Project is based on the principle that walls are to be avoided where possible. Preference has been given to the provision of landscaped mounds where possible or half wall/ half mound solutions. Walls are provided where neither of these is feasible due to the availability of space. Type F barriers have also been used as headlight screens where the height is adequate and the barrier is required for road safety.

Entrance Strategies

The town entrance statements comprise a combination of landscape treatments, road design, and strategically placed artworks including the relocation of the existing Alexander and David Berry Memorial. The final location of the memorial will be confirmed in consultation with the Shoalhaven City Council, the artist and the community. The existing Kiama Municipal Council area and Shoalhaven City Council area entry statements will also be relocated in consultation with the two councils, where they are affected by the Project.

Perspective view of Kangaroo Valley Road Overbridge (from the highway)

Northern Berry town entry statement: The northern entry to Berry when travelling southbound is visually separated from the township. Therefore, it is proposed that the Alexander and David Berry Memorial is relocated slightly to the north of Berry North Interchange, prior to the turn off to Berry town between chainage 14900 and 15000. At present this Memorial is a key visual marker for Berry town and is currently located to the west of the alignment at the Berry Rest Area.

Southern Berry town entry statement: The overbridge at Kangaroo Valley Road will be a visual marker for Berry, viewed by motorists using the highway as well as pedestrians and local traffic using Kangaroo Valley Road. It will also be the Southern Berry Interchange town entry statement. Kangaroo Valley Road Overbridge is designed to complement the unique character of Berry town and stand out as a key visual marker.

Perspective view of Kangaroo Valley Road Overbridge (from the bridge)

Landscape Response

The landscape response has been determined by the vegetation patterns of the existing landscape and the character zones in which they fall. Five main landscape types have been identified which include:

1. Illawarra Gully Wet Forest
2. Warm Temperate Layered Forest
3. Riverbank Forest
4. Grassland
5. Berry Cultural Landscape

Earthworks and Alignment Profiles

Earthworks and alignment profile play important roles in the way the road sits within its landscape context.

The design of **cuttings** has been responsive to the underlying geology and has sought a desire to limit land take. Cutting design has adopted the use of variable batter slopes that can transition gradually back into the natural ground. In general, a maximum slope of 2h:1v has been adopted with topsoiling and revegetation used to stabilise the slope. Beyond this the batter has moved into stone and this is to be expressed. Where rock is deemed to be erodible a specialised revegetation mix such as ecoblanket will be used.

Toolijooa Cutting (Cut 2) is a significant cutting, primarily a rock (Latite) which has used near vertical walls. The latite cut is a dark grey appearance similar to other rock cuttings to the north including the Kiama bends. Its leading edge however transitions to interface with the adjoining ground profile and enables the cut to be successfully integrated with the adjoining landform and the upper batters revegetated.

Other rock cuttings to the south are a high strength sandstone and present as a warm red rock.

Embankments are typically to be constructed at a slope of 2h:1v or flatter and vegetated. This reflects the typical angle of stability for a slope. Where a low embankment is adopted a flatter slope may be used to enhance the integration of the slope with the adjoining landform.

Perspective view of the North Street noise mound from the highway

Surplus material, where available, is proposed to be used to flatten embankment profiles to better integrate the embankment with its surrounds. This will be developed further as part of the design development.

The crossing of Broughton Creek no.1 is limited in terms of space. The embankment slope here is to be a steep rock filled slope. This treatment extends from 100m north of the creek abutment and ties into the rock armouring of the embankment under the bridge. Where exposed to the existing Princes Highway the opportunity to revegetate the embankment is to be explored. By doing so the visual impact of the alignment will be reduced.

Perspective view of the Toolijooa cutting

1. INTRODUCTION

1.1 BACKGROUND

Roads and Maritime Services is undertaking a program of upgrading the Princes Highway between Waterfall and Jervis Bay Road, Falls Creek in order to improve road safety and traffic efficiency on the New South Wales (NSW) South Coast.

Foxground and Berry Bypass (the Project) is the second section of the proposed Gerringong to Bomaderry Upgrade (Fig.1.1), and follows the Gerringong Upgrade, which is currently under construction.

The Project ties into the Gerringong Upgrade at Toolijooa Road around five kilometres west of Gerringong and extends 11.6 kilometres to Mullers Lane, approximately 1.3 kilometres south of Berry township. It entails the upgrade of the existing highway to a four lane divided carriageway with provisions for future widening to six lanes. The Project includes around 6.6 kilometres of new constructed highway, where the alignment deviates from the existing road, bypassing the Foxground bends and Berry township.

Extensive consultation has been undertaken to date by Roads and Maritime Services on the Project with the local community and local government agencies including Shoalhaven City Council and Kiama Municipal Council. Consultation with the community will continue during the detailed design stage of the Project.

Active engagement of state and local government authorities has commenced; and the first community meeting is to be held 19th of July.

Fig. 1.1: The Princes Highway locality map

(Source: Roads and Maritime Services website, *http://www.Roads and Maritime Services.nsw.gov.au/road projects/projects/princes_hway/foxground_berry_bypass/the_project.html*)

1.2 SCOPE AND PURPOSE OF THE REPORT

The overall purpose of this report is to describe the Design of the Project, its relation to its context and how the proposed solutions respond to specific demands by the context and the community and included in the environmental approvals, the SWTC and the Project Deed.

The urban and landscape design takes as its starting point the Concept Design as presented in the Foxground and Berry Bypass – Princes Highway Upgrade: Environmental Assessment (EA) (Roads and Maritime Services, November 2012), and in particular the Technical Paper: Urban Design including Landscape Character and Visual Amenity (EA Appendix I, Roads and Maritime Services, November 2012), the Scope of Works and Technical Criteria and its Appendices and the draft Foxground and Berry Bypass - Concept Design Report (Roads and Maritime Services, May 2013).

The Design complies with the Minister's Conditions of Approval, set out in Table A.

1.3 PROJECT OBJECTIVES

The section of the existing Princes Highway covered by the Project has a poor safety record, with a horizontal and vertical alignment that does not satisfy current design safety and traffic efficiency criteria. The highway has limited overtaking opportunities, numerous at-grade junctions with rural roads and uncontrolled accesses to private properties.

The highway also runs through the town of Berry, creating conflicts between through traffic, local traffic and pedestrians, contributing to reduced levels of amenity in the town of Berry.

There is a need to provide a highway that meets Roads and Maritime Services network planning targets and minimises conflicts for current and future road users by providing an appropriate and consistent road design. If the highway is not upgraded, the efficiency, safety and amenity along the highway and within Berry will continue to deteriorate as traffic volumes increase over time.

Fig. 1.2: The existing Princes Highway approaching Berry

The Environmental Assessment – Volume I (November 2012) states the overall Project objectives as follows:

- *Improve road safety.*
- *Improve efficiency of the Princes Highway between Toolijooa Road and Schofields Lane.*
- *Support regional and local economic development.*
- *Provide value for money.*
- *Enhance potential beneficial environmental effects and manage potential adverse environmental impacts.*
- *Optimise the benefits and minimise adverse impacts on the local social environment.*

1.4 STRUCTURE OF THE REPORT

This report is presented in the following order:

Chapter 1 – Introduction: Presents the introduction and background to the Project.

Chapter 2 – Contextual Analysis: Provides an analysis of the Project corridor context including landform, land use, views, geology, vegetation, heritage, hydrology, and flooding in order to establish the appropriate design responses and determinants of urban and landscape design.

Chapter 3 – Community Consultation and Inputs to Date: Summarises the issues raised by the community during community consultation undertaken by Roads and Maritime Services to date on the Project.

Chapter 4 – Issues, Opportunities and Constraints: Summarises the issues, opportunities and constraints on the Project.

Chapter 5 – Urban and Landscape Design Objectives: Identifies the design objectives for the Project as distilled from the relevant Environmental Assessment, Scope of Work and Technical Criteria (SWTC) and Roads and Maritime Services guideline documents.

Chapter 6 – Urban and Landscape Design Concepts and Principles: Presents the design approach, key concepts and principles adopted in the design and the various urban design and landscape elements in particular.

Chapter 7 - Urban and Landscape Design Concept Plan: Presents the urban and landscape concept for each of the four character zones identified Chapter 2.0 and expanded upon in Chapter 6.0. It describes how the principles established in Chapter 6.0 are applied to the specific circumstances of each character zone, including details of road character and its various elements.

Chapter 8 – Urban Design Finishes: Presents the Project colour palette and the Urban Design Finishes Schedule.

Chapter 9 – Urban Design Implementation Strategy: Provides an overview of the strategy and methodology that will be adopted during the Project to provide advice on the implementation of the urban and landscape design.

Chapter 10 – Landscape Implementation Strategy: Describes the approach to be taken in the implementation of the landscape design, including the retention and protection of existing vegetation, soil management, revegetation and seed collection.

Chapter 11 – Landscape Management Plan: Presents the management plan for the landscape design.

This is followed by **References** and **Appendices**.

2. CONTEXTUAL ANALYSIS

The context of the Project is made up of a range of attributes that combine to provide the unique character of the place. These include:

- Landform – defined by topography and geology
- Land use – including residential, commercial and agricultural uses
- Vegetation cover – native and cultural plantings
- Heritage – Aboriginal and non-Aboriginal.

The Design of the road alignment and all associated elements responds to the contextual attributes ensuring that the Project is well integrated and as unobtrusive as possible within its surroundings.

The Project corridor traverses across the valley floors, edge slopes and spurs of the Southern Illawarra Coastal plain. To the west of the Project lies the Cambewarra Range (a southern extension of the Illawarra Escarpment).

2.1 REGIONAL CONTEXTUAL ANALYSIS

The Project is located in the southern part of the Illawarra Region and the northern part of the South Coast Region of New South Wales within the Kiama and Shoalhaven LGA's respectively. This area is situated between Illawarra and Cambewarra Ranges to the north and west, respectively, and the extensive South Coast to the south. The ranges contain a number of nature reserves and a National Park and are drained by a number of creeks such as Broughton Creek and its tributaries, Broughton Mill Creek, Connollys Creek and Bundewallah Creek.

The South Coast region is dominated by its expansive coastline and is characterised by a highly diverse natural environment, agricultural settlements and a string of townships located throughout the region along the existing Princes Highway. In addition to Berry, urban settlements approximate to the Project area are Kiama, Gerringong, Gerroa and Shoalhaven Heads, which are predominantly concentrated along the coastline.

The *South Coast Regional Strategy* (Department of Planning; 2007) identifies Nowra-Bomaderry, Batemans Bay and Bega as major regional centres for the region. The nearest major centre is Nowra-Bomaderry, located approximately 13km south of the Project. The South Coast Rail Line runs to the south of the Project terminating at Nowra-Bomaderry. An indirect rail service between Bomaderry and Sydney is available.

The Princes Highway is the primary north-south transport route along the south coast of NSW, linking Sydney and Wollongong to destinations along the NSW South Coast and north-eastern Victoria. It performs a vital role as a:

- commuter route between Sydney, Wollongong and Nowra-Bomaderry
- local transport corridor for locals between smaller urban areas and rural residences
- major route for tourist destinations such as Berry and the greater South Coast
- freight and bus route.

In the regional context the 'Sandtrack', Gerroa Road, forming part of Tourist Road 6, serves a similar role to the Princes Highway, as a road of regional and local importance. The 'Sandtrack' is limited to light vehicles only and is commonly used by regional traffic to bypass the project area. It is an important part of the local road network for residents and businesses as it also intersects with numerous local roads.

2.2 LOCAL CONTEXTUAL ANALYSIS

The Project is located within a coastal hinterland defined by Toolijooa Ridge (Fig. 2.1 and 2.2), the foothills of the Cambewarra range and Berry township. A ridge starting at Currys Mountain in the north and extending south to Toolijooa Ridge, Moeyan Hill and eventually to Coolangatta Mountain, separates the Project from the flat coastal areas along the Shoalhaven Bight. Located along the coastline are: Coomonderry Swamp, a wetland protected by State Environmental

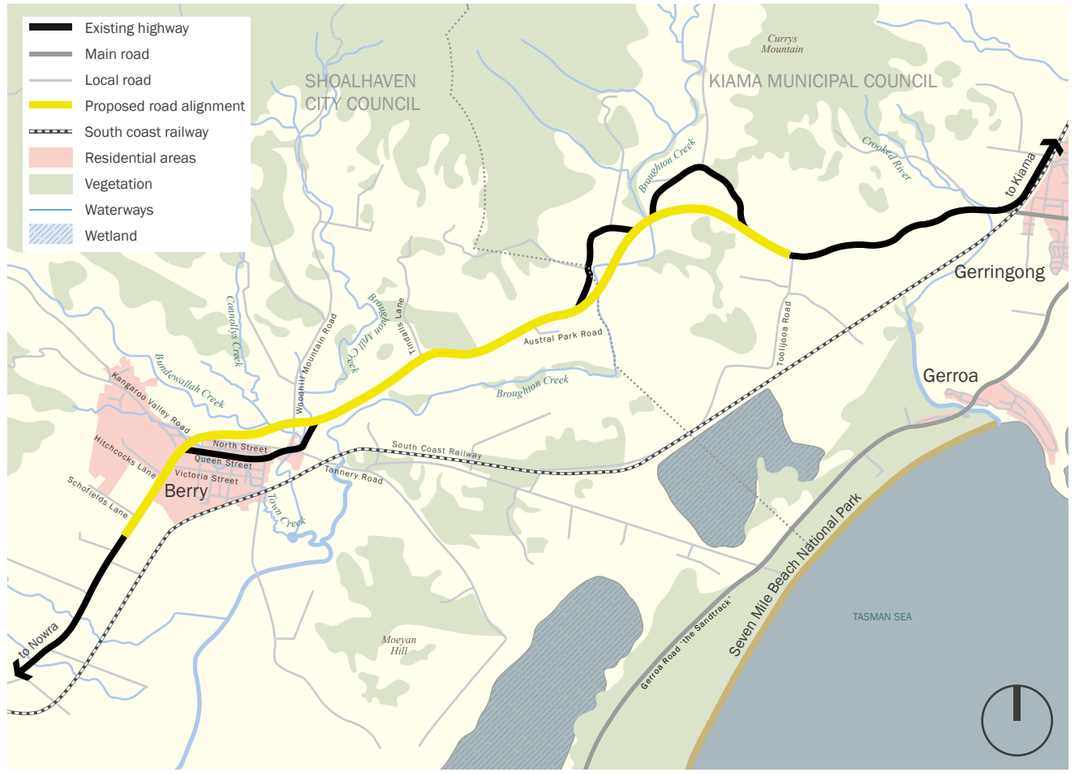


Fig. 2.1: The Project extent (NTS)

Planning Policy No.14; Coastal Wetlands; Foy's Swamp; and Seven Mile Beach National Park.

At its northern end the Project commences at the tie-in with the Gerringong upgrade near the intersection of the highway and Toolijooa Road. The proposed highway alignment traverses Toolijooa Ridge before bypassing the Foxground Bends and Broughton Village, crossing Broughton Creek in three locations, and finally bypassing the town of Berry.

The surrounding landscape is characterised by agricultural activities and is notable for its rolling, partly wooded pasturelands and its creek lines, and cultural plantings marking rural settlements. Farming has shaped the landscape within the area since European settlement. The town of Berry developed in response to the growing agricultural businesses in the area, reflecting the wealth of the surrounding industry. At present Berry is accessed via the existing highway from the east and the west, following Queen Street through the historic centre of the town. Queen Street presents itself as a historic and prosperous shopping destination with parallel parking and wide footpaths on both sides. There are numerous at-grade intersections with local roads within the town and the highway also intersects with Tannery Road, Woodhill Mountain Road, Prince Alfred Street and Kangaroo Valley Road providing access to the local and wider regional road network.

2.2.1 CORRIDOR CHARACTER ZONES

There are four key Character Zones described below and identified in the Environmental Assessment. These Character Zones are defined by landform, vegetation, land use among other physical attributes and have been used to inform both the determination of impacts but also how these impacts may be addressed within the construction works (See Fig. 2.3)

2.2.1.1 Character Zone 1 - Toolijooa Ridge

Toolijooa Ridge is the eastern most section of the Project site area and the most significant ridge line within the corridor. It also marks the division of the two drainage catchments one which drains to the coast (the Crooked River Catchment) and the other which drains to the Shoalhaven (Broughton Creek).

Toolijooa Ridge is not only significant as a character zone for its elevation but also has played an important part in the Aboriginal heritage of the region and forms a cultural landscape of significance to them as a key pathway between the escarpment and the coast.

The ridge is a combination of remnant vegetation on the steeper slopes and grasslands reflecting the agricultural development of the region. The ridge also has been identified as a fauna corridor between the coast and inland landscapes.

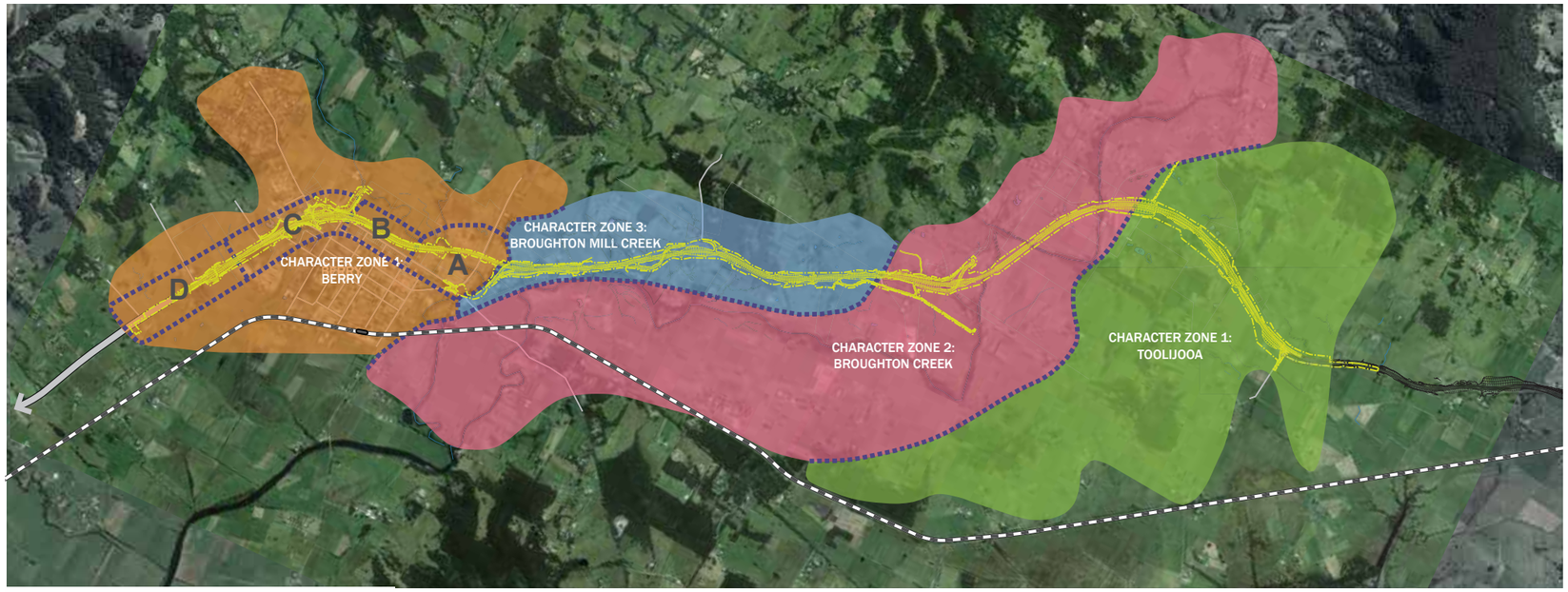


Fig. 2.3: Character Zones (NTS)

Fig. 2.2: View of Character Zone 1 - Toolijooa Ridge

Fig. 2.4: View of Character Zone 2 - Broughton Creek

2.2.1.2 Character Zone 2 - Broughton Creek

The Broughton Creek Character Zone is defined largely by the catchment of Broughton Creek. It falls on the western side of Toolijooa Ridge, runs parallel to the ridge and is located in the eastern foot slopes of the Cambewarra Range. Essentially a pastoral valley it provides an intimate landscape punctuated by rural residences, including the Broughton Village, isolated clumps of vegetation and the cultivated grasslands of the dairy industry. The dominant vegetation community is found along the creek itself where mature River Oak trees (*Casuarina cunninghamiana*) form dense stands.

2.2.1.3 Character Zone 3 - Broughton Mill Creek

This Character Zone marks the interface between the Broughton Creek and Broughton Mill Creek catchments. It is an undulating landscape with steep slopes and changing aspects. A combination of substantial stands of remnant vegetation and isolated trees are present. Its dominant vegetation is the Illawarra Gully Wet Forest which is an important vegetation community both within the valley but also the broader region. Views are restricted and come and go as the vegetation cover increases or opens and the land rises and falls, providing views across undulating pasturelands and to the escarpment beyond.

2.2.1.4 Character Zone 4 – Berry

This Character Zone is marked by the township of Berry and its built form. Berry occupies the flood immune lands between the confluence of Bundewallah Creek, Broughton Mill Creek and Broughton Creek. It is a historic town which has grown to service the rural community around it. Today it has evolved and services an expanded population which extends to the south west along Kangaroo Valley Road and is contained to the east by the South Coast Railway. The corridor passes to the north of the town between the creeks and escarpment. Along this edge four (4) distinct sub units have been identified which relate to how the Project relates to Berry. These zones are defined as:

Zone A: Sport and Recreation Precinct Berry – This zone is located where Broughton Mill Creek, Woodhill Mountain Road, and Bundewallah Creek converge. It is slightly to the north of the traditional entry to town from the north. The area is defined to the east by steep terrain as you come off the ridge and down to the floodplains of the two creek systems. This interface is to be bridged as part of the proposed alignment. The new alignment is separated from the main entry to town by parklands which line the existing Princes Highway alignment. This includes Berry Oval/Camp Quality, APEX Park and the Berry Sports and Social Club which all provide a sense of green entering into the township. This recreational green edge forms the new interface of the alignment along with the river bank vegetation community along the creek lines.

Zone B: North Street Corridor – The North Street corridor is the northern edge of the town of Berry. This limit has been determined by flood limits of Bundewallah Creek and looks out across pasture lands to the Cambewarra Range and its foothills. The proposed alignment addresses this scenic interface.

Zone C: Kangaroo Valley Road Precinct – This location marks the edge of the historic town form and the start of the newer development areas of Berry. The new alignment is proposed between the two developments areas. The new residential developments occur on a spur line above the flood boundaries of the Bundewallah Creek The built form contrasts with that of the old town with modern project homes and an informal estate layout which contrasts with the regular grid of Berry.

Zone D: Jasper Brush Rural interface - This occurs at the southern edge of the urban limits of Berry. The landscape returns to its rural character with open pasture lands the dominant view with the escarpment to the west. This landscape is punctuated by isolated farm holdings and remnant stands of vegetation.

Fig. 2.5: View of Character Zone 3 - Broughton Mill Creek

Fig. 2.6: View of Character Zone 4 – Berry

2.2.2 LAND USES AND COMMUNITIES

2.2.2.1 Existing Development

Land uses along the Project consist predominantly of agricultural uses, dotted with isolated rural settlements, while most residential, commercial and light industrial uses occur in the urban area of Berry (Fig. 2.12 and 2.13).

Rural Land

Grazing, associated with either dairy farming or beef production, is the predominant agricultural activity within the proximity of the Project. A number of agricultural businesses operating in the area are associated with dairy farming cooperatives, such as the Berry Dairy Co-operative and Gerringong Dairy Co-operative. Other agricultural activities include turf farming, cultivation (such as livestock feed), vineyards, organic faRoads and Maritime Services, alpaca farms and hobby farms. These uses are accommodated on lots of typically less than 40 hectares, though some lots are consolidated into larger land holdings. Dispersed through the Project area are rural-residential land holdings that are typically smaller lots. Clusters of rural-residential lots occur at Broughton Village, Foxground, near Tindalls Lane, and west of Berry along Agars Lane (near the David Berry hospital). Bed and breakfast accommodation businesses are found scattered within the rural section of the Project area. An abandoned quarry is located just north of Berry, outside and directly adjacent to the Project area.

Berry Township

The historic part of Berry is largely located to the south of the proposed alignment. The town has expanded over time to the north along Kangaroo Valley Road. The town centre of Berry is contained within a traditional 'street grid'. The north - south aligned roadways offer vistas to the Cambewarra range and its surrounding pastoral landscape, providing a strong relationship to its context.

The retail and commercial areas of Berry are largely concentrated along Queen Street (Princes Highway) between Prince Alfred Street and Albany Street. Due to its proximity to Nowra and Bomaderry, Berry acts as a commuter town to these larger towns as well as providing a range of retail services including acting as a popular rest and refreshment stop for highway traffic and a tourist destination.

A light industrial area is located south of the railway line including automotive repair operations, self-storage facilities, and agricultural suppliers as well as commercial/retail businesses, such as the Treat Factory (a wholesale food supplier). South of the light industrial area is located the Berry sewerage treatment plant on Wharf Road.

Fig. 2.7: Grazing, the predominant agricultural activity within the proximity of the Project

Fig. 2.8: The Alexander and David Berry Memorial at entry to the town

Two retirement villages – The Arbour and The Grange - are under development near the intersection of the highway and Victoria Street. Both these developments are accessed from Victoria Street.

The more recent residential expansions are located to the north of the proposed alignment along the western side of Kangaroo Valley Road in estates such as Huntingdale Park Estate, Graham Park, and the Gables, with the two former developments located directly adjacent to the Project. The Huntingdale Park Estate is still under development with approval for 243 lots and completed residences located along Huntingdale Park Road, Lincoln Close and Boran Place. The Graham Park development, yet to commence, is composed of an equestrian centre, manager's residence, and a four cabin tourist development that was approved by Shoalhaven City Council in 2010.

Fig. 2.9: Retail and commercial areas of Berry along Queen Street

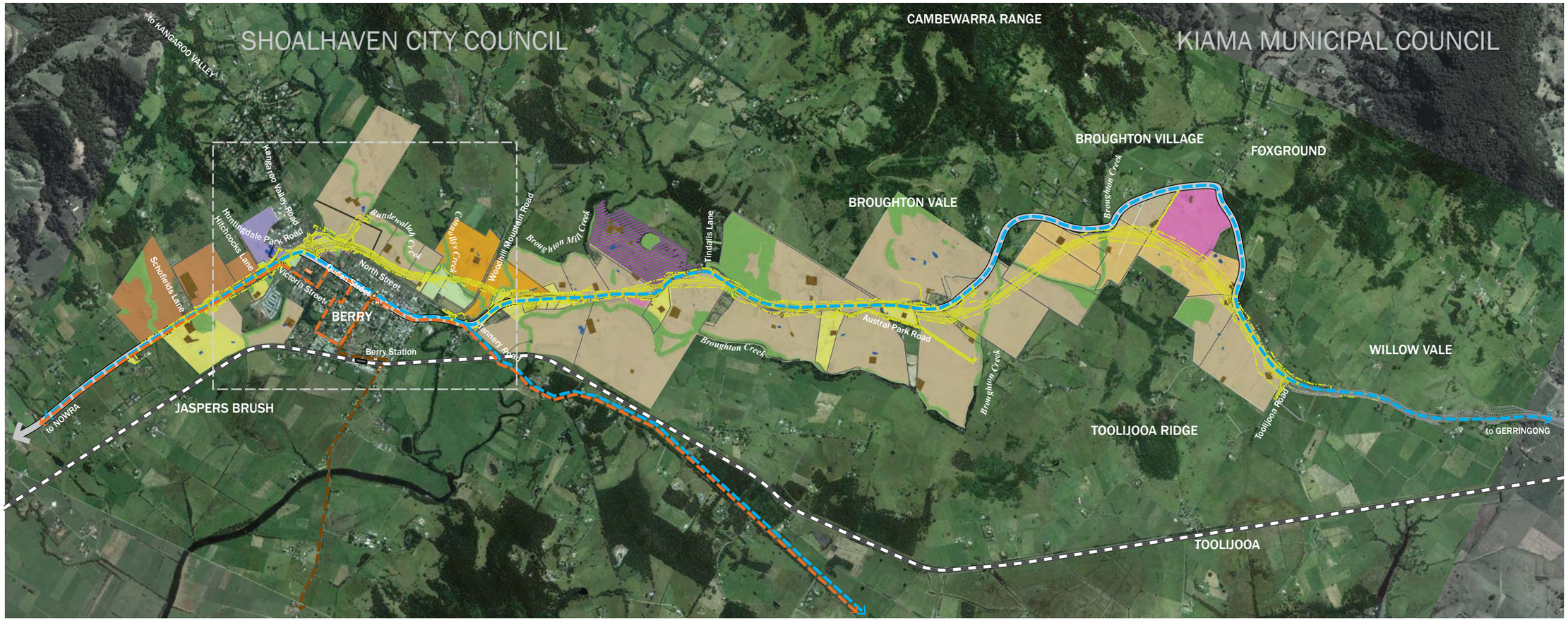
Recreational and open space areas in proximity of the Project are the Mark Radium Park; Hazelberry Park (Berry Showground); David Berry Memorial Park; Apex Park, the sportsground at the eastern end of North Street; and the Camp Quality Memorial Park. A number of equestrian clubs, including the Berry Riding Club, Woodhill Mountain Pony Club and the Shoalhaven Show Jumping Club, operate from a property owned by Shoalhaven City Council on North Street adjacent to the sportsground. Other than these recreational areas, land immediately north of North Street is used for grazing (dairy), horse agistment, and rural-residential purposes. Two churches are located on North Street and are listed as local heritage items under the Shoalhaven LEP.

2.2.2.2 Future Development

Berry is the only urban settlement located along the Project corridor and is not identified for any major future development in greenfield areas. Some further development is identified in the areas to the west at Berry South Interchange and Huntingdale Park. The regional strategies for Illawarra and the South Coast identify future population and employment growth in centres outside of the areas immediately surrounding the Project. This includes infill development and major new release areas in Nowra-Bomaderry. Both strategies identify that it is important and necessary to protect the rural (agricultural) and environmental assets (such as biodiversity corridors) of the regions.

Fig. 2.10: Berry Sports Complex at the eastern end of North Street

Fig. 2.11: The Huntingdale Park Estate



KEY

Cultivation	Rural residential
Hobby farm	Rural residential (vacant)
Dam	Turf farming
Dwelling / Out buildings	Vacant (rural)
Future road corridor (vacant)	Other
Grazing	
Horse agistment	Bus route
Natural area	School bus run
Open space	Proposed road alignment
Private access road	Proposed road reserve boundary
Residential	Existing highway
Residential (vacant)	Gerringong upgrade
Road reserve	South Coast Railway

(Note: Land use information source: Princess Highway upgrade – Foxground and Berry bypass, Environmental Assessment; RMS; 2012)

Scale 1:40000 @ A3

0 0.4 1 2 kilometre

N

Fig. 2.12: Local context

KEY

- Grazing
- Turf farming
- Open space
- Residential
- Residential (vacant)
- Rural residential
- Commercial / retail
- Light Industrial
- Bus route
- School bus run
- Existing highway
- Local road
- Proposed road alignment
- Proposed road reserve boundary
- South Coast Railway
- Waterways

Key Land Uses:

1. Mark Radium Park
2. Berry Central Cemetery
3. St. Patrick's Catholic Church
4. Uniting Church in Australia
5. Berry equestrian centre
6. Berry sporting complex
7. Camp Quality Memorial Park
8. Berry Public School
9. Hazelberry Park, Berry Showground, David Berry Memorial Park
10. Apex Park
11. Pullman Street Heritage Precinct
12. Berry Rest Area
13. Berry sewerage treatment plant
14. David Berry Hospital

Scale 1:10000 @ A3

0 100 200 500m

N

Fig. 2.13: Land uses in Berry township

2.2.3 LANDFORM

The Project traverses a series of ridges and spurline slopes, interspersed by valley floors and fringing toe slopes (Fig. 2.17). The north eastern end consists of a traverse of the east facing slopes of the Toolijooa Ridge. Toolijooa Ridge is the highest point in the Project area reaching approximately 100 metres AHD. The ridge is a locally dominant topographic feature which bisects the coastal plain, and is of cultural significance to the Aboriginal population. It extends from Currys Mountain (around 320 metres AHD), two kilometres to the north of the Project area, to within one kilometre of Seven Mile Beach, four kilometres to the south-east.

West of Toolijooa Ridge, the Project traverses obliquely across the basal slopes and floor of the Broughton Creek valley.

From Tindalls Lane, the Project corridor follows the crest of a low spurline which forms the watershed between Broughton Creek to the east, and Broughton Mill Creek to the west. The Project traverse of this spurline descends from around 50 metres, to less than 10 metres AHD, at the crossing of Broughton Mill Creek.

The Project corridor then traverses the floodplains of the Broughton Mill Creek, and Bundewallah Creek (a tributary of the former), to the north of the Berry township, before crossing a low spurline at the western end of the town (Kangaroo Valley Road). From this point the Project corridor turns south-west, paralleling the current Princes Highway and traversing a series of unnamed minor tributary drainage lines, which drain to a former wetland basin which form part of the lower flood plain of Broughton Creek.

2.2.4 SIGNIFICANT VIEWS

The corridor alignment generally does not provide a significant outlook but rather provides a sequence of spatial experiences which alternate between enclosed woodlands and open picturesque views across the undulating pastoral landscape of the valleys. It is a community expectation to emphasise specific features and views of the adjacent terrain.

Toolijooa Ridge is the first significant view. The ridge line marks the beginning of the alignment, provides a connection between the coast and the escarpment and holds significance to the Aboriginal populations for this. It also marks the commencement (within the corridor) of the rolling grassed landscape which characterises the region as a whole and is the basis of the areas listing for scenic quality, as part of the Southern Illawarra Coastal Plain and Hinterland Cultural Landscape.

North Street and adjacent streets provide the opportunity to view the escarpment from the historic township of Berry. These views provide a layered vista of grassland, river bank vegetation, foot slopes and the rugged escarpment beyond.

The climb out of Berry, heading north, on the ridge between Broughton Creek and Broughton Mill Creek provides highly scenic views of the escarpment.

As part of the project development a review of the key properties which adjoin and overlook the proposal was undertaken in order to determine whether property adjustment works are necessary to mitigate the proposed works or whether the mitigation can be addressed within the corridor of the proposed alignment. Key properties adjoining the alignment were identified as falling within 250 metres of the project. These are reflected in the Figure 2.17.

Property impacts will vary according to the following:

- Whether the alignment moves closer to a property and whether that property was previously impacted by the highway.
- Whether the alignment is in cut or on fill.
- Whether vegetation is located between the corridor and the view receptor.
- Whether the property presently has a view of scenic quality.

Table 2.1 assesses the visual impact of these locations.

Fig. 2.14: View at Toolijooa Ridge

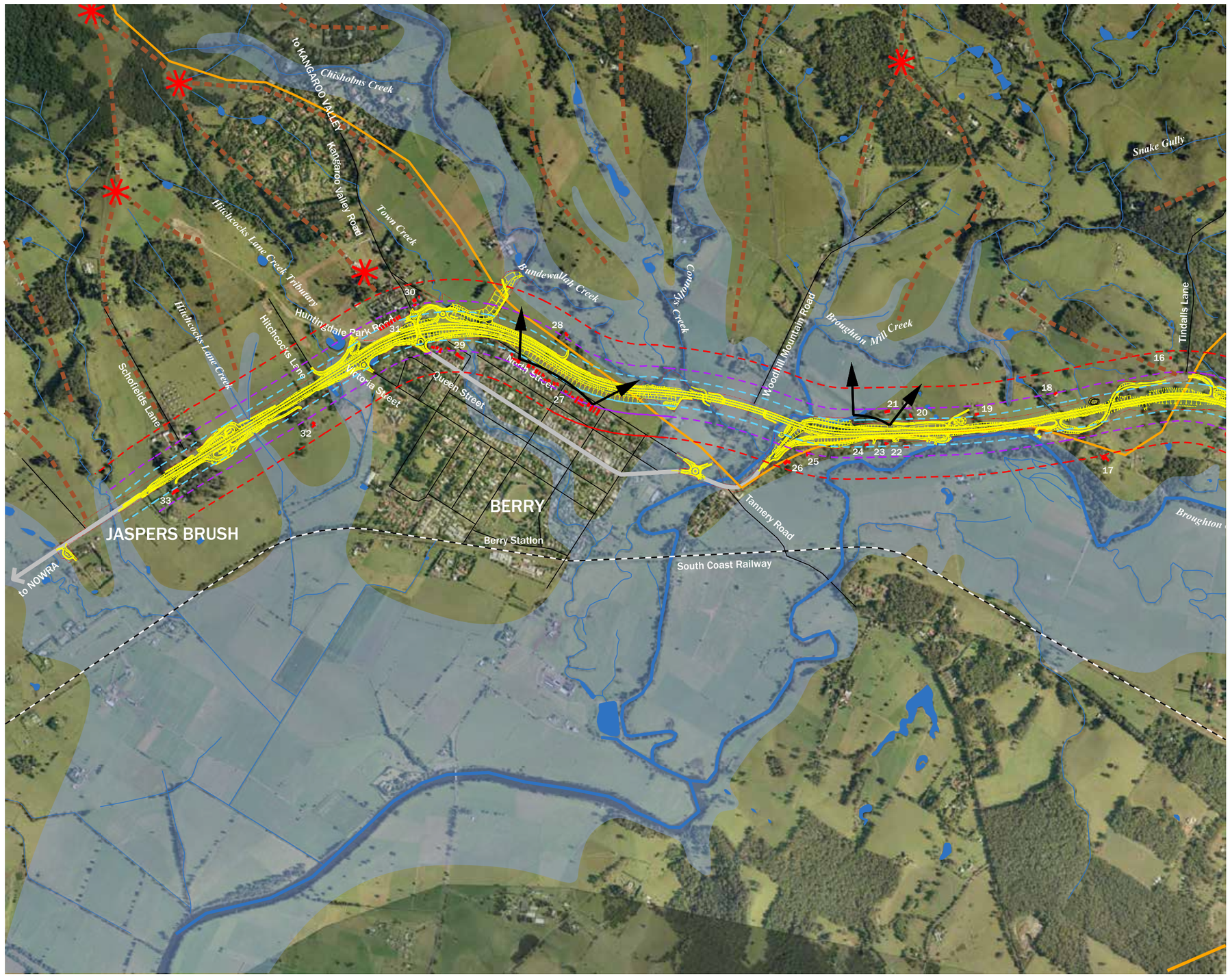
Fig. 2.15: View to the escarpment from North Street, Berry

Fig. 2.16: View just northbound from Berry

KEY

- Ridgelines
- High point
- Major catchment boundary
- Waterways
- 1:100 year flood extents
- Key views
- Proposed Road Alignment
- Proposed Road reserve boundary
- Existing highway
- Local road
- South Coast Railway
- 50m offset from road
- 100m offset from road
- 200m offset from road
- Dwellings overlooking road

32



Scale 1:20000 @ A3

0 0.2 0.5 1 kilometre

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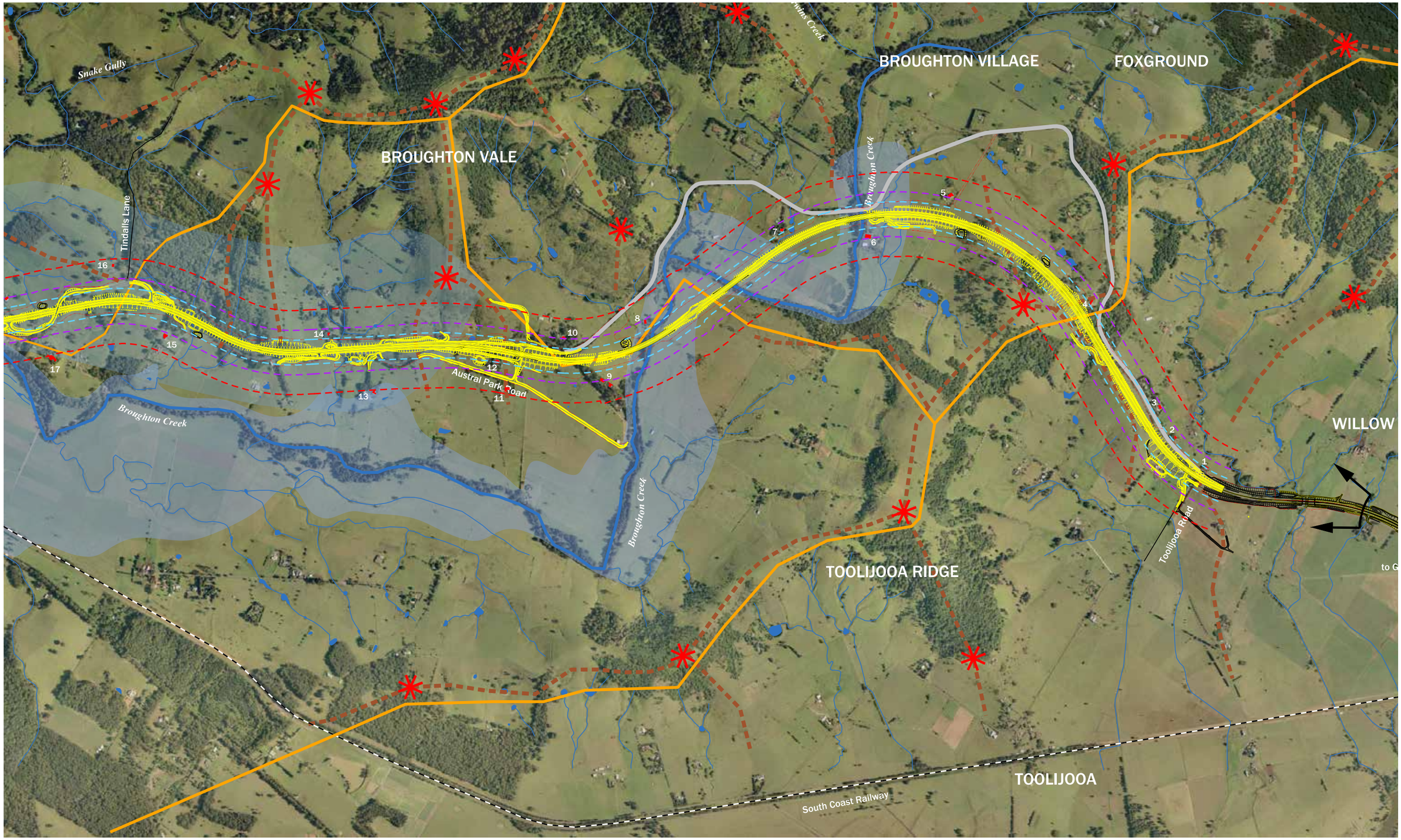
Based on: AECOM(2012), Cardno (2011), LPMA (2011)

Fig. 2.17: Landform and hydrology


BROUGHTON VALE
BROUGHTON VILLAGE
FOXGROUND
WILLOW
TOOLIJOOA RIDGE
TOOLIJOOA
Snake Gully
Tindalls Lane
Broughton Creek
Broughton Creek
Broughton Creek
Broughton Creek
Austral Park Road
Toolijooa Road
South Coast Railway
to G
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Location	No.	Context	Sensitivity	Magnitude	Impact	Mitigation
Ch 7650 West	1	Located west of the existing highway this property is presently surrounded by screen planting and set below the existing alignment. The proposed alignment will be raised some 5m and is located 50 m nom. to the east	Moderate	Moderate	Moderate	The interchange is raised above the property and screened by present property planting. The landscape proposed for the interchange will provide partial screening of the alignment.
Ch 7900 West	2	Located west of the existing highway this property is presently surrounded by screen planting along its eastern side but looks northwards along the existing highway alignment. The proposed alignment will be raised some 5m and is located 60 m nom. to the east	Moderate	Moderate	Moderate	Landscape of the alignment formation will provide partial screening of the alignment breaking down its scale when viewed from the northern façade of the property.
Ch 8100 West	3	Located west of the existing highway this property is presently surrounded by screen planting. The proposed alignment will be located in cut some 65m nom. to the east of the property	Low	Low	Low	Views are limited of the works. Landscape planting to the top of the batter will integrate the works with the adjoining surroundings
Ch 8650 West	4	Property is located within the project boundary at the top of the Toolijooa Ridge	High	Low	Moderate	Located at the top of Toolijooa cut this property is within Roads and Maritime Services Ownership. Its impact has been reduced from the concept design and the proposed cut is below the line of sight. Clearance of vegetation above the cut will open up views during construction. These will be temporary as the landscape strategy is for additional planting along the top of the cut removing this view. Distant views of the alignment on the floodplain will be possible.
Ch 9600 West	5	Located 250m east of the existing highway alignment. The property will fall within 100m of the proposed alignment. Partially screened by trees it will have filtered views across the valley to the formation.	High	Moderate	Moderate - High	The proximity of the residence to the alignment has been identified within the landscape plan with strategic copses used to breakdown the scale of the formation and screen the alignment.
Ch 9900 East	6	Located east of the existing alignment, it has an entry avenue of trees and adjoins Broughton Creek. Presently located within 125m of the existing alignment the new alignment is within 80 m of the dwelling and is elevated to eliminate flood risk	High	Moderate	Moderate - High	The proximity of the residence to the alignment has been identified within the landscape plan with strategic copses used to breakdown the scale of the formation and screen the alignment. The retention of existing vegetation also goes some way to mitigate the scale of the fill formation.
Ch 10350 West	7	Located 120 m east of the existing highway alignment. It will fall within 50 m west of the proposed alignment. Partially screened by trees it will have filtered views across the valley towards the formation	High	Moderate	Moderate - High	The proximity of the residence to the alignment has been identified within the landscape plan with strategic copses used to breakdown the scale of the formation and screen the alignment.
Ch 11200 West	8	Located 100m east of the existing highway alignment. It will fall within 80 m west of the proposed alignment. Partially screened by trees it presently overlooks to the east a number of farm sheds. Creekline planting along Broughton Creek provides potential screening of the bridge and formation	Moderate	Moderate	Moderate	The quality of view is diminished by the farm sheds. However revegetation along the creekline should reinforce the existing vegetation within the landscape and reduce the visual mass of the bridge and road formation
Ch 11450 East	9	Two properties set within a wooded setting They are presently located between 180 and 200m east of the old alignment. The new alignment falls within 80 m of the property but is set within cut	Low	Low	Low	These properties are heavily screened by existing vegetation the alignments construction within cut further reduces any potential impact.

Table 2.1: Visual impact assessment

Location	No.	Context	Sensitivity	Magnitude	Impact	Mitigation
Ch 11650 West	10	Located on a small ridge this property presently is well screened from the existing highway. The proposed alignment is moved eastward away from the property and is set within cutting.	Low	Low	Low	Retention of existing vegetation and its reinforcement with new planting will ensure the impact is minimised. The presence of the alignment within cutting reduces its potential impact.
Ch 11900 East	11	Located on Austral Park Road the property is east of the existing alignment. The proposed alignment moves 80 m closer and is located on fill.	Moderate	Low	Low - Moderate	The raised nature and slip lane add to the visual complexity when viewed from this property. Planting works in and around this interchange will reduce the scale of the formation.
Ch 12000 East	12	Located between Austral Park Road and the south bound on ramp at the Austral Park Interchange this property immediately adjoins (within 10 m) the slip road	High	High	High	Roads and Maritime Services owns this property. If retained the opportunity to screen from the alignment exists within the verge and property. The orientation of the property should be reversed to reflect the new address.
Ch 12650 East	13	Located 160 m from the present alignment this property has a dense planting to its west that screens the present alignment. The new alignment moves to the west away from the property	Low	Low	Low	Screen planting associated with the property already screens the alignment. The impact of the alignment is further reduced by planting associated with the turning head of Austral Park Road.
Ch 12850 West	14	Located west of the present and proposed alignment this property is below the proposed alignment and is screened by a treed garden surrounding the house.	Moderate	Moderate	Moderate	Maximisation of the retention of screen planting is to be considered as part of the works. Strategic planting associated with the drainage line will be used to limit the visibility of the underpass.
Ch 13700 East	15	Located a 100 m east of the present and proposed alignment this property is screened by a woodland canopy before reaching the house.	Low	Low	Low	Retention of the existing screen planting limits the potential for views
Ch 14000 West	16	Located 85 m from the present alignment this property partially overlooks it being at the crest of a small hill. The proposed alignment moves up to 160 m away from the property and is set within cut limiting the exposure.	Low	Low	Low	The proposed offset combined with the location of the corridor within cut limits the potential visibility of this property.
Ch 14400 East	17	Located within a wooded lot this lot is 120 m from the existing alignment. The proposed alignment moves west a further 80 m and is part in cut	Low	Low	Low	The impact on this proposal is reduced by the movement of the alignment away from the residence and retention of existing screening vegetation.
Ch 14500 West	18	Located 200 m west and below the existing alignment with relatively open views of rolling hills. To the south a stand of trees screens the residence. The proposed alignment moves within 100 m of the property and is to be constructed on fill.	Moderate	Moderate	Moderate	Maximise retention of trees screening views from the south. Screening to the east is minimal with a desire to maintain panoramic views from the alignment to the escarpment. Property adjustment or an adjustment to landscape response is required to mitigate views.
Ch 14900 West	19	Set on a small ridge it is screened from the existing road alignment by a stand of trees and small cutting. The new alignment moves closer to this property but retains a cutting and some of the screening trees.	Moderate	Low	Low - Moderate	The retention and reinforcement of screen planting both within and adjoining the corridor and the placement of the alignment within cut mitigates against the proposal impacts
Ch 15200 West	20	This property is largely screened by vegetation to the front of the house and set below the ridge on which the alignment sits. The proposed alignment moves marginally closer and requires the construction of an access road. Minimal change is to occur in relation to screen planting	Moderate	Moderate	Moderate	Maximise retention of existing screening.
Ch 15300 West	21	This property is set below the crest and presently is not visible from the current alignment. The proposal is for the alignment to be in cut and so this property will remain concealed from the alignment	Low	Low	Low	The property remains out of view of the proposed work due to their position in cut. The property's outlook will remain largely unchanged

Table 2.1: Visual impact assessment (cont.)

Location	No.	Context	Sensitivity	Magnitude	Impact	Mitigation
Ch 15250 East	22	Presently set below the alignment this property is partially screened from the alignment. The terrain between the alignment and house is steep.	Moderate	High	Moderate – High	Roads and Maritime Services owned - the proposal sees the construction of a service road on the property accessing the property and its neighbours. The scale of this is small. A vegetated embankment separates the property from the main alignment. Focus is to the south east away from the highway
Ch 15350 East	23	Presently set below the alignment this property is partially screened from the alignment. The terrain between the alignment and house is steep.	Moderate	High	Moderate – High	Roads and Maritime Services owned - the proposal sees the construction of a service road on the property accessing the property and its neighbours. The scale of this is small. A vegetated embankment separates the property from the main alignment. Focus is to the south east away from the highway
Ch 15450 East	24	Presently set below the alignment this property is partially screened from the alignment. The terrain between the alignment and house is steep.	Moderate	High	Moderate – High	Roads and Maritime Services owned - the proposal sees the construction of a service road on the property accessing the property and its neighbours. The scale of this is small. A vegetated embankment separates the property from the main alignment. Focus is to the south east away from the highway
Ch 15700 East	25	Located on the service road above the Berry off ramp, this property is presently screened from the alignment. The relocation of the service road removes some of this screening. The property however is contained by planting and looks to the south across the floodplain	Moderate	Low	Low - Moderate	Street tree planting provides a sense of separation from the off ramp and existing vegetation within the property and a focus of the house to the south limits the impact.
Ch 15765 East	26	Located on the service road above the Berry off ramp, this property is presently screened from the alignment. The property is contained by planting and looks to the south across the floodplain	Moderate	Low	Low - Moderate	Street tree planting provides a sense of separation from the off ramp and existing vegetation within the property and a focus of the house to the south limits the impact.
Ch 16600 - 17300 North Street	27	Properties are located along the southern side of North Street and look north towards the escarpment. These are scenic views which have been identified as of significance in the EA. Distance from the alignment various from 130 to 60 m. A noise mound removes from view the road infrastructure and provides a vegetated foreground.	High	Moderate	Moderate - High	The formation of the noise mound conceals the alignment from view and provides a vegetated backdrop which creates a transition between foreground and the escarpment back drop. The landscape response seeks to retain a sense of openness between North Street and the mound landscape so that background views are retained.
Ch 17000 West	28	The property is set within farm land remote from North Street and surrounded by perimeter planting and tree lined entry drive. The proposed alignment separates the property from the town of Berry passing between the property and North Street. The access to this property is revised. The property screen planting is retained with a reduced curtilage of grassland of nominally 50m.	High	Moderate	Moderate - High	The properties proximity to the road and loss of context cannot be avoided. Visually the property is separated from the alignment by a raised embankment and headlight screen. Its views of the alignment remain filtered by the perimeter planting of vegetation around the house.
Ch 17500 – 17600 East	29	Queen Street Properties located at the entrance into Berry at the termination of the proposed Kangaroo Valley bridge. They overlook the off-ramp on the western edge.	High	Moderate	Moderate - High	The construction of the noise mound and the interchange landscape environment provide a treed outlook replacing the loss of housing
Ch 17600 – 17700	30	Kangaroo Valley Road located at the western end of the Kangaroo Valley Interchange they adjoin the north bound on ramp to the bypass	High	Moderate	Moderate - High	The landscape of the interchange will provide a treed outlook replacing the loss of housing

Table 2.1: Visual impact assessment (cont.)

Location	No.	Context	Sensitivity	Magnitude	Impact	Mitigation
Ch 17700 – 17899 West	31	Huntingdale Estate overlooks grassland with scattered mature trees. The proposed alignment will alter this outlook with the construction of noise mound and wall.	High	Moderate	Moderate - High	Minimisation of noise wall height and integration of earth form will limit the scale and visual mass of the alignment and enable the landscape to form the dominant backdrop.
Ch 18300 East	32	Located to the east of the existing alignment behind a stand of remnant trees. The visibility of the alignment is reduced further by being located within a cutting	Moderate	Low	Low - Moderate	Maximise retention of remnant vegetation within the corridor and beyond. Revegetation of cutting to provide understorey to further restrict views.
Ch 19000	33	Located east of the existing alignment the residence is screened by mature trees and shrubs and set 50 m from the alignment	Moderate	Low	Low - Moderate	Existing property landscape retained. The alignment of the road is to be set within cut reducing the exposure from the adjoining property.

Table 2.1: Visual impact assessment (cont.)

The assessment identifies a number of properties with moderate to high impact. Generally it is considered that the treatment within the corridor is able to address the visual impact in the medium to long term. At this stage a requirement for individual property adjustments has not been considered necessary.

As part of the property adjustments those ranked Moderate to High, and not within Roads and Maritime ownership should be further assessed to determine if plantings within the property would assist in the long-term management of impacts.

This would be captured in the property adjustment plans as part of the ongoing negotiation of property adjustments.

2.2.5 HERITAGE

2.2.5.1 Aboriginal Heritage

The South Coast region is the traditional land of a number of Aboriginal groups, including the Yuin and Dharawal people. The *EA Appendix J – Technical paper: Aboriginal Cultural Heritage* (Roads and Maritime Services, 2012) identifies 29 Aboriginal heritage items within the Project area. These items consist of two lithic artefact occurrences (G2B A3, G2B A38), 23 potential archaeologically sensitive areas (PASAs) (PASA 12-29 and PASA 40-44), and four non-archaeological recordings for places of Aboriginal cultural heritage significance. These are summarised in Table 2.2 (only items subject to impact are shown) and mapped on Figure 2.18.

Twenty-three Aboriginal sites have been identified across the nineteen PASAs that were found to contain archaeological deposits relating to Aboriginal occupation. Two PASAs were excluded from the test program because the sites were not expected to be impacted by the Project or the impact will be to a currently highly disturbed section of the PASA.

The identified sites were assessed as follows:

- Eleven sites as having low archaeological significance within a local context (G2B A15, G2B A17, G2B A19, G2B A20, G2B A21, G2B A23, G2B A25, G2B A27, G2B A34, G2B A35 and G2B A37)
- Nine sites as having moderate archaeological significance within a local context (G2B A16, G2B A18, G2B A22, G2B A24, G2B A26, G2B A28, G2B A32, G2B A33 and G2B A36)
- Three sites as having moderate to high archaeological significance within a local context based on their association with the Brookside encampment and Dicky Wood's Meadow battleground (G2B A29, G2B A30 and G2B A31).

The assessment concluded:

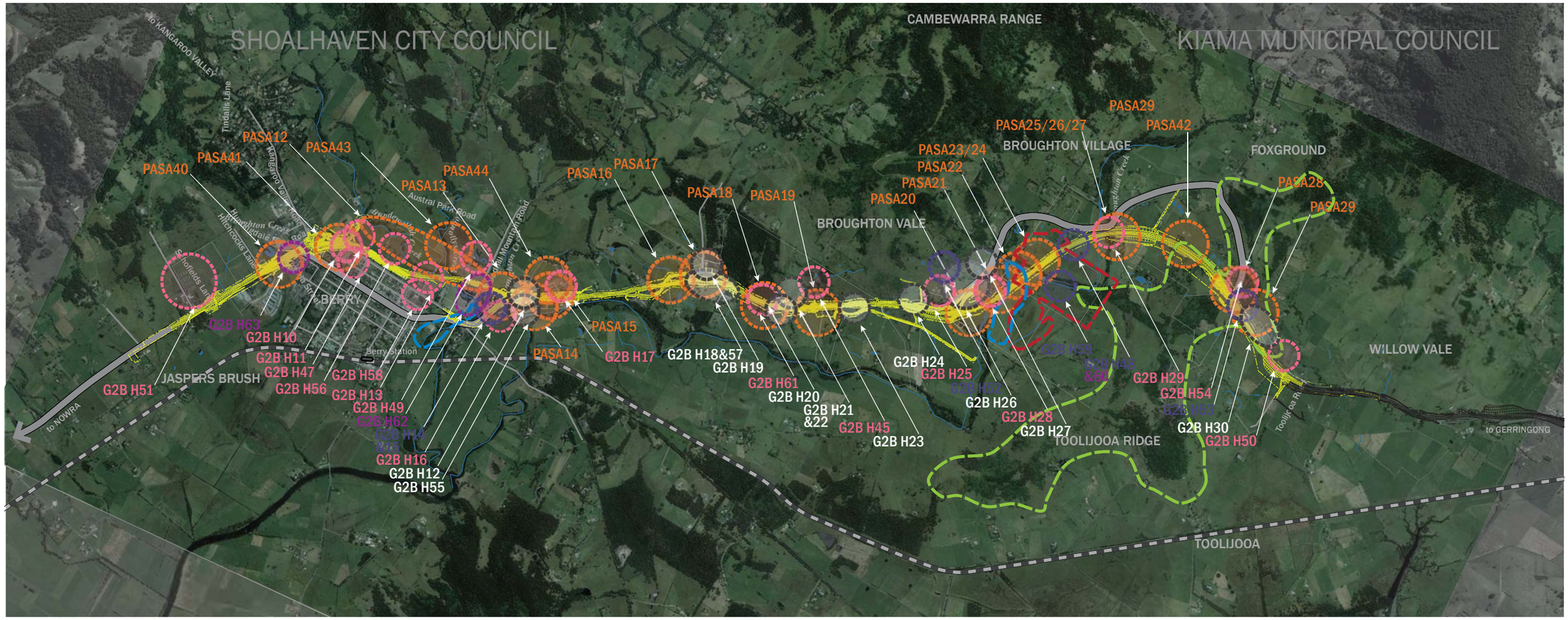
- Sixteen will experience no impact by the Project
- Eighteen sites, including two ethno-historical recordings and one cultural landscape, will be partially impacted and
- Eight sites, all consisting of archaeological deposits with the exception of one fig tree, will be fully impacted.

The non-archaeological recordings are comprised of three places relating to historical events or occupation: the 'Little Mountain' or 'Dicky Wood's Meadow' battle ground (G2B A13); the Aboriginal Encampments at 'Brookside' (Broughton Village) (G2B A14) and Berry (G2B A39); and one cultural landscape, the Toolijooa Ridge Aboriginal cultural landscape.

Two generalised Aboriginal cultural heritage values are recognised; large and old growth fig trees, and Aboriginal burial sites. Twelve large or old growth fig trees have been identified in or near to the Project area (MFT12 – 23). It is probable that high cultural significance will be unanimously accepted amongst the Project's Aboriginal stakeholders for the pre-European high canopy forest remnant fig tree (MFT22) identified on the banks of Bundewallah Creek. The tree's importance will be based not only on the traditional lore associated with large trees of this kind, but also for the education, representative and rarity value of this specimen. In both form and proportion it is reminiscent of a forest structure, and associated traditional lifestyle, no longer found on the Coastal Plain.

Places or landscapes with, or that potentially have, historical or cultural Aboriginal significance within the Project area include:

- The historical encampments at Broughton Village, 'Brookside' Aboriginal Encampment (G2B A14) where local oral tradition dictates that Aboriginal people camped along the banks of Broughton Creek in the vicinity of 'Brookside' at Broughton Village until at least the turn of the 19th century. The report is limited, to a place only, as to date no archaeological evidence has been found to support it. It retains Aboriginal cultural significance for its association with the actions and destinies of local community ancestors and their families in the late nineteenth century, in particular the interaction between Aboriginal and European people, and camping adjacent to homesteads.
- The 'Little Mountain' or Dicky Wood's Meadow battle ground (G2B A13) is located in the vicinity of Broughton Village. From an account provided by a local Aboriginal person the place has high significance for Aboriginal people as it relates to traditional lore and practice.
- The historical Aboriginal encampments at Berry - the Boongaree Aboriginal encampment and the Berry Pickers encampments (collectively referred to as G2B A39). It is surmised that camping may have occurred in this area throughout the nineteenth century while numerous oral accounts record that in the twentieth century, as far as the 1960s, Aboriginal people regularly camped on the creek flats while engaged in seasonal employment as crop pickers The location of the Boongaree encampment, which was centred on the former meadow lands at the intersection of Broughton and Broughton Mill Creeks (outside of the Project area), has high Aboriginal cultural significance within a regional context. This is due to range of factors including its importance as an Aboriginal encampment recorded at the time of European contact, and the home of important local identities Toodwick (known to Europeans as Broughton) and his brother Broger. Further cultural associations can be found in the identification with the ancestors of contemporary Aboriginal people with the lower Shoalhaven River district as well as the potential of this area for burials. These camps remain part of living memory for many local Aboriginal people and relate to both their own experiences and to the lives of community and family members now deceased.
- The Toolijooa Ridge Aboriginal Cultural Landscape (TRACL) has Aboriginal cultural significance as a traditional access route and pathway between the Illawarra Range and the coastal fringe. Archaeological test excavations conducted for this Project and previous investigations confirm that discontinuous subsurface artefact distributions occur along the ridge crest and some of its prominent spurs. There are also unconfirmed reports of ceremonial grounds on the ridgeline. The ridgeline is a central visual feature in the landscape, and has an assumed significance as a wildlife corridor. These values relate to a sense of belonging and custodianship to the land and the health of its plants and animals.



KEY

ABORIGINAL HERITAGE SITES:

- Potential archaeologically sensitive Aboriginal sites
- Area within which the Brookside and Berry encampments may have been situated
- Area within which Dicky Wood's Meadow battle ground may be situated
- Toolijooa Ridge Aboriginal cultural landscape

NON–ABORIGINAL HERITAGE SITES:

- Road remnant
- Standing building/structure
- Archaeological deposit only
- Other

- Proposed road alignment
- Road acquisition boundary
- Gerringong upgrade
- Existing highway
- Local road
- South Coast Railway
- Waterways

Scale 1:40000 @ A3

0 0.4 1 2 kilometre

N

Fig. 2.18: Location of Aboriginal and Non-Aboriginal heritage sites (Source: EA Documents - Appendices J and K, Roads and Maritime Services, 2012)

2.2.5.2 Non-Aboriginal Heritage

In 1822 Alexander Berry arrived in the area exploring the coastal rivers by ship and seeking out land to settle on. He, his business partner Edward Wollstonecraft, and his brother David Berry set up an extensive farming and cedar cutting business.

Until the late nineteenth century Berry was known as Broughtons Creek, named after the Aboriginal guide, tracker and constable Broughton. The town was strategically placed on parts of Alexander Berry's estate and became the focal point for the surrounding agricultural settlements. The town flourished and was named Berry after David Berry's death in 1889. The rail line arrived in 1983 and today the town continues to provide daily needs for the community and serve as a tourist destination.

Forty non-Aboriginal field recordings have been identified within or near (within 200 metres) the Project area (EA Appendix K Technical Paper: Non-Aboriginal (historic) Heritage; Roads and Maritime Services; 2012). These consist of 39 site specific recordings and the Southern Illawarra Coastal Plain and Hinterland Cultural Landscape (SICPH CL). The latter defines the cultural heritage values of the landscape through which the Project passes, and in particular the landscape context of the Berry township. These items relate to two previously defined landscape and conservation areas, the Berry Bolong Pastoral Landscape (from the Shoalhaven Heritage Study (Peter Freeman Pty Ltd 1998) and the Berry District Landscape Conservation Area (from a recent National Trust Register citation).

Of the 40 recordings, 30 are considered to have local heritage significance, one is assessed as having State significance, three cannot be given definite assessment and six are considered to fall below the significance assessment thresholds. Eight of the considered heritage items are included on existing statutory heritage listings (G2B H16, G2B H29, G2B H45, G2B H47, G2B H54, G2B H58, G2B H62 and G2B H63).

The Glen Devan house will be wholly impacted. It is of local significance as a representative example of Federation period housing on the Berry Estate. This house is to be relocated/ removed by Roads and Maritime Services.

These are summarised in Table 2.2 (six items below the threshold are not shown) and mapped on Figure 2.18.

In summary, of the 34 identified heritage items nine will be wholly impacted, six will be partially impacted and nineteen items will not be directly impacted. Thirteen occurrences are within 50 metres of the Project footprint and eleven will be subject to indirect impacts relating to their landscape contexts.

The scale and curvilinear nature of a modern structural component will impact the heritage values of the SICPH CL by its imposition on, and contrast with, the existing, and broadly nineteenth century character and features of the landscape. In relation to Berry, the bypass will impact on the short and mid-distance view-sheds from the town streetscapes and also impose a distinct and modern road form relative to those parts of the town structured on a grid pattern. Finally there will be an impact upon the remnant pastoral open space along the northern margin of the town grid, a margin that typically provides a visually appealing contrast between the urban and rural, as well as contributing towards a broad pastoral character for the town.

Three items are included on non-government registers with no statutory role. Two relate to the Berry District Landscape Conservation Area which is a broad scale, landscape based recording, originally defined by the National Trust of Australia (New South Wales). It is listed on the Trust's Register, and was also placed on the Register of the National Estate as an Indicative Place.

A recent addition to the Register of the National Trust is the Berry Township Urban Conservation Area. This listing incorporates three levels:

- A broad scale visual boundary which adopts the regional boundary of the Berry District Landscape Conservation Area
- A subdivision boundary which relates to the closer urban settlement of the nineteenth century Berry town grid
- A buffer zone which seeks to protect the immediate rural setting of the urban grid (Clark and Duyker 2010).

The Mananga homestead is included on the Royal Australian Institute of Architects 20th Century Register of Significant Buildings (no. 47022656) and on the Shoalhaven LEP Heritage Schedule. It is identified simply as a residence on the Princes Highway, with an approximate date of 1910. The presence of an elaborate gable treatment to the southern verandah is noted.

Fig. 2.19: Historic avenue of poplar trees along Woodhill Mountain Road

ID	Recording type	Local significance	Direct impact	Degree of impact
G2B A13	Ethno-historic place (Dicky Wood's Meadow battleground)		Yes	Partial
G2B A14	Ethno-historic place ('Brookside' Aboriginal historic encampment)		Yes	Partial
TRACL	Cultural Landscape (Toolijooa Ridge)		Yes	Partial
MFT12	Fig tree		Yes	Full
G2B A15	Archaeological deposit	Low	Yes	Full
G2B A16	Archaeological deposit	Moderate	Yes	Partial
G2B A17	Archaeological deposit	Low	Yes	Partial
G2B A18	Archaeological deposit	Moderate	Yes	Partial
G2B A19	Archaeological deposit	Low	Yes	Partial
G2B A21	Archaeological deposit	Low	Yes	Partial
G2B A22	Archaeological deposit	Moderate	Yes	Full
G2B A23	Archaeological deposit	Low	Yes	Full
G2B A24	Archaeological deposit	Moderate	Yes	Full
G2B A25	Archaeological deposit	Low	Yes	Partial
G2B A26	Archaeological deposit	Moderate	Yes	Full
G2B PAD1	Potential archaeological deposit	Low to high	Yes	Partial
G2B A27	Archaeological deposit	Low	Yes	Partial
G2B A28	Archaeological deposit	Moderate	Yes	Partial
G2B A29	Archaeological deposit	Moderate to high	Yes	Partial
G2B A30	Archaeological deposit	Moderate to high	Yes	Partial
G2B A31	Archaeological deposit	Moderate to high	Yes	Partial
G2B A32	Archaeological deposit	Moderate	Yes	Partial
G2B A33	Archaeological deposit	Moderate	Yes	Partial
G2B A34	Archaeological deposit	Low	Yes	Partial
G2B A35	Archaeological deposit	Low	Yes	Full
G2B A36	Archaeological deposit	Moderate	Yes	Full

Table 2.2: Summary of anticipated construction related impacts to Aboriginal heritage recordings
(Source: EA, Roads and Maritime Services, 2012)

ID	Name / Location	Significance	Direct impact	Degree of impact
G2B H11	Glen Devan Federation House (77 North Street, Berry).	Local	Yes	Whole of the site
G2B H13	Burnett Estate Overseer's Cottage (143 North Street, Berry).	Local	No	Located within 50 metres
G2B H14	Archaeological deposit (former 19th century Broughton Creek town buildings).	Local	Yes	Partial impact
G2B H15	Remnant portion of 20th century highway (mid 1950s).	Local	Yes	Partial impact
G2B H16	Mananga, homestead complex and grounds, former Berry Estate Manager's residence (A40 Princes Highway, Berry).	Local	No	Located within 50 metres
G2B H17	Hillview homestead (A111 Princes Highway, Berry).	Local	No	Located within 50 metres
G2B H19	Remnant portion of 19th century road.	Local	Yes	Whole of the site
G2B H20	Remnant portion of 20th century highway.	Local	No	Located within 50 metres
G2B H21	Remnant portion of 20th century highway.	Local	Yes	Whole of the site
G2B H22	Remnant portion of 19th century road.	Local	Yes	Whole of the site
G2B H23	Remnant portion of 19th century road.	Local	Yes	Whole of the site
G2B H25	Sedgeford homestead and grounds (A495 Princes Highway, Broughton Village).	Local	No	Located within 50 metres
G2B H26	Remnant portion of 20th century highway ("Binks' Corner").	Local	No	Southern located within 50 metres
G2B H27	Remnant portion of 19th century road.	Local	No	Located more than 150 metres away
G2B H28	Brookside homestead (A540 Princes Highway, Broughton Village).	Local	Yes	Partial impact
G2B H29	20th century concrete bridge (Princes Highway, Broughton Creek).	Local	No	Located within 50 metres
G2B H30	Remnant portion of 19th century road.	Local	Yes	Whole of site
G2B H45	Glenvale homestead, (A371 Princes Highway, Broughton).	Local	No	Located 120 metres from the Project

Table 2.3: Summary of identified non-Aboriginal heritage items and potential impacts
(Source: EA, Roads and Maritime Services, 2012)

ID	Name / Location	Significance	Direct impact	Degree of impact
G2B H47	Former St Patrick's Convent (1921), St Patricks Church (1936), and grounds (80 North Street, Berry)	Local	No	Located within 50 metres
G2B H48	PAD, former Berry Estate tenant farm (now location of Greystanes Lodge).	Local (subject to confirmation through test excavation)	No	Located within 50 metres
G2B H49	Oakleigh farmhouse (59 Woodhill Mountain Road, Berry).	Local	No	Located 100 metres away
G2B H51	Graham Park former agricultural research institution (8, 9 and 13 Schofields Lane, Berry).	State	No	Located within 50 metres.
G2B H52	PAD, former Berry Estate tenant farm (A441 Princes Highway, Broughton Village).	Local (subject to confirmation through test excavation)	No	Located 300 metres away
G2B H53	PAD, site of a former Berry Estate tenant farm structure (just east of the Toolijooa Ridge).	Local (subject to confirmation through test excavation)	Yes	Whole of site
G2B H54	Remnant portion of 19th century dry stone wall, (west side of current highway, just east of Toolijooa Ridgesaddle).	Local	Yes	Partial impact
G2B H55	Remnant portion of 19th century road.	Local	Yes	Whole of site
G2B H56	Broughton Mill homestead and Dairy (disused) (former Berry Estate tenant farm, 117 North Street,Berry).	Local	No	Located within 50 metres.
G2B H58	Uniting Church Hall (formerly Wesleyan Chapel 1884).	Local	No	Located 200 metres away
G2B H59	Archaeological Deposit and remnant plantings of former homestead (outside Berry Estate – Finn/Wood/Grant/ Stewart/Dinning families).	Local	No	Located 180 metres away
G2B H60	Skid mounted worksite shed (movable item).	Local	No	Located within 50 metres
G2B H61	Quarried rock outcrop, Broughton.	Local	Yes	Whole of the site
G2B H62	Avenue of Poplar trees (Woodhill Mountain Road, Berry).	Local	No	Located within 50 metres
G2B H63	Mark Radium Park.	Local	Yes	Partial impact
Southern Illawarra Coastal Plain and Hinterland	Cultural landscape	Local	Yes	Partial impact

Table 2.3: Summary of identified heritage items and potential impacts (cont.)

2.2.6 PUBLIC TRANSPORT NETWORKS

Patronage for public transport services within the Kiama and Shoalhaven LGA's is very low, representing approximately 5% of the travel mode share, with the vast majority (83% in Kiama, 86% in Shoalhaven) of the average weekday trips made by private vehicle (EA Appendix D - Technical Paper: Traffic and Transport; Roads and Maritime Services, 2012).

2.2.6.1 Bus Services

The Princes Highway is utilised by local and regional bus and coach services as well as school buses during term time. Twice daily, long distance services in each direction between Sydney and Melbourne via Kiama, Gerringong and Nowra are provided by a private service provider (as at May 2013). Locally, Berry is connected to the north and the south by Shoal Bus Service 705 (Fig. 2.12 and 2.13). This service connects Werri Beach and Gerringong to Berry via the 'Sandtrack' and Beach Road, without utilising this section of the highway, and then connects to Bomaderry and Nowra via the Princes Highway. Service frequency is limited to a maximum of four per day. Shoal Bus school service SB connects Berry with Shoalhaven Heads to the south via Prince Alfred Street and Coolangatta Road without utilising any sections of the highway. One morning service and one afternoon service operate on a typical weekday. There is a single service on Saturday and no service on Sundays or Public Holidays.

Several school bus services and coaches use the Princes Highway and local roads during the morning pick-up and afternoon drop-off periods. The service between the Foxground area and Nowra has informal pick-up and drop-off locations along the highway, stopping where children reside and at numerous intersections.

The limited frequency of the bus services through the Project area has resulted in a low bus passenger mode with bus travel representing between 2% - 4% of the mode share of average weekday travel in the Shoalhaven and Kiama LGAs respectively. Patronage figures for school buses indicate approximately 20 students use these services on a daily basis (EA Appendix D - Technical Paper: Traffic and Transport; Roads and Maritime Services, 2012).

2.2.6.2 Rail Services

The South Coast line connects the study area to Sydney, Wollongong and North Nowra/Bomaderry. The service terminates at Bomaderry and stops at Berry Station on Station Road (Fig.2.12 on page 9).

The rail line runs at some distance to the south of the Project, avoiding Toolijooa Ridge and the foothills of the escarpment to the north of the Project. The rail line Overbridges Tannery Road and crosses Prince Alfred Street/ Wharf Road and Albany Street to the south of Berry. The latter being a non-signalised level crossing.

Services from Berry, in both directions, are approximately hourly during the morning and afternoon peak times. Between these peak times services are provided every two hours. Passengers wishing to travel from Berry to Sydney are required to change trains at Wollongong, Dapto or Kiama.

Rail passengers represent 1% of average weekday travel mode share in the Project area, partly due to the south coast line terminating at Bomaderry, north of the Shoalhaven River.

2.2.6.3 Pedestrian and Cyclists

The only dedicated footpaths within proximity of the Project are located within Berry. These are provided between Woodhill Mountain Road and Kangaroo Valley Road to service commercial and retail businesses on Queen Street. The only pedestrian refuge to cross Queen Street is located between Prince Alfred Street and Alexandra Street. Along residential streets either one-sided, partial, or no footpaths are provided. There is an existing shared path from Woodhill Mountain Road to the recreational area at North Street.

Within the rural areas of the Project there are no footways provided and very few pedestrian routes have been identified along the Princes Highway. Though shoulders and verges provide some means for pedestrians to travel, the speed of traffic on this route, combined with significant travel distances between towns (e.g. Gerringong and Berry), result in very low pedestrian flows.

While there are highly limited provisions for dedicated cycle paths within the Project area, Shoalhaven City Council promotes various cycle routes to and from Berry utilising the Princes Highway and other local and regional roads (for example Berry to Kangaroo Valley via Berry Mountain). A coastal cycleway stretching from the Queensland border via New South Wales to the Victorian border has been proposed and would follow the 'Sandtrack' within the study area.

Fig. 2.20: Queen Street, Berry

2.2.7 GEOLOGY AND SOILS

The basal slopes bordering the coastal plain have formed from the Berry Formation (siltstone, shale and sandstones), the Broughton Tuff (tuff and tuffaceous sandstone), and the Bombo Latite. The former two are metamorphic sedimentary formations, the latter a series of igneous lava flows.

The Bombo Latite has formed the watershed ridges and higher ground that subdivide the various catchments and valley floors in the Kiama and Gerringong region. It dominates the higher relief of the eastern Project area, notably the crest and upper slopes of Toolijooa Ridge and the mid-range of the western slopes of the Broughton Creek valley adjacent to Broughton Village. This igneous rock is a hard stable rock which will enable the use of near vertical cuttings to reduce the footprint of the corridor.

The lower slopes of Toolijooa Ridge are comprised of the Kiama Tuff (trachytic tuff). Elsewhere across the western half of the Project area, basal slopes and watershed ridges have formed from the Berry formation.

The valley floor of the coastal plain presents a low relief topography of quaternary fluvial sedimentary deposits which typically includes a suite of depositional landforms such as colluvial fans, flood plain, terrace sequences, current and former streambeds (including palaeochannels), wetland basins and old delta deposits. Across the Project area quaternary fluvial deposits are encountered on the floor of the Broughton and Broughton Mill Creek valleys.

2.2.8 HYDROLOGY AND FLOODING

The Project traverses the Broughton Creek floodplain in the north, crosses a number of local ephemeral drainage lines through the hills between Tomlins Road and Tindalls Lane, and then crosses the floodplain a second time near the confluence of Bundewallah, Connollys and Broughton Mill Creeks. It passes to the north of Berry before crossing a series of ephemeral creek lines between Berry and Jaspers Brush.

Named creeks and tributaries in the vicinity of the Project include (from east to west):

- Broughton Creek
- Broughton Mill Creek
- Connollys Creek
- Bundewallah Creek
- Town Creek
- Hitchcocks Lane Creek.

These creeks and tributaries are described in the following sections. There are also 14 minor unnamed waterway crossings that are traversed by the Project.

Broughton Creek

Toolijooa Ridge forms the watershed between the Crooked River (to the north) and Broughton Creek (to the south) catchments. Broughton Creek is a major drainage line and the largest catchment of the Southern Illawarra Coastal Plain, north of the Shoalhaven. It is also the dominant drainage line adjoining the route. It commences just south of the Toolijooa Ridge before crossing the alignment three times and running to the east of much of the alignment. A number of unnamed tributaries feed Broughton Creek from the footslopes to the west.

Broughton Mill Creek and Bundewallah Creek

From Tindalls Lane, the Project area follows the crest of a low spurline which forms the watershed between Broughton Creek to the east, and Broughton Mill Creek to the west. Broughton Mill Creek flows to the south before being joined by Bundewallah Creek and passing under the highway, then the South Coast Railway line before flowing into Broughton Creek near Berry Sewerage Plant.

Bundewallah Creek (a tributary of Broughton Mill Creek), runs to the north of the Berry township (west of the alignment). After passing under Woodhill Mountain Road it converges with Broughton Mill Creek.

Connollys Creek enters Bundewallah Creek from the north upstream of the confluence with Broughton Mill Creek.

Town Creek

Town Creek (also referred to as Princess Creek) meanders eastwards through the Berry town centre, running adjacent to Princess Street before entering a culvert and travelling to the edge of town, before joining Broughton Mill Creek.

Flooding

The current highway alignment is overtopped by flood waters at varying intervals. Table 2.4 illustrates this frequency.

Connollys Creek, Bundewallah Creek, Broughton Mill Creek and Town Creek are the main sources of flooding in Berry. Town Creek in particular presents a flood risk to a significant number of properties within Berry.

	ARI event			
Waterway	2 year	5 year	20 year	100 year
Broughton Mill Creek	Overtops	Overtops	Overtops	Overtops
Town Creek			Overtops	Overtops
Hitchcocks Lane Creek	Overtops	Overtops	Overtops	Overtops
Hitchcocks Lane Tributary				Overtops

Table 2.4: Flooding (Source: Cardno 2012)

2.2.9 FLORA AND FAUNA

2.2.9.1 Flora

The majority of the Project area is covered by cleared lands and grazed paddocks which contain a variety of introduced grasses and fodder species. This reflects the dominant but declining land use of dairy farming. The vegetation cover that remains is fragmented and occurs as a variety of forms including:

- Linear forms - associated with roads, fence lines and creek lines,
- Individual remnants - solitary specimens of large trees, and
- Remnant stands of a group of species impacted by edge effects caused by clearing.

Eight communities were mapped as occurring within the study area. These are:

- Illawarra Gully Wet Forest
- Currambene- Batmans Lowland Forest
- Riverbank Forest
- Warm Temperate Layered Forest
- Constructed wetland
- Closed grassland
- Closed grassland/sedgeland
- Riparian Open Woodland

A complete list of flora species observed or recorded within the corridor is appended.

The dominant natural communities which occur within the corridor being:

- ***Illawarra Gully Wet Forest*** is a tall eucalypt forest with moist understorey and occurs on moist sheltered sites with loamy soils. The most significant distribution of this community is at Tindalls Lane.
  - Canopy - *Eucalyptus pilularis, E. paniculata, E. saligna x botryoides* and *Syncarpia glomulifer*
  - Understorey - *Acacia binervata, Pittosporum undulatum, Breynia oblongifolia, Persoonia linearis*
  - Groundcovers - *Tylophora barbata, Pteridum esculentum, Carex longebrachiata* and *Poa labillardieri*
- ***Warm Temperate Layered Forest*** is a tall eucalypt forest characterised by an open emergent canopy and dense small tree layer with a moist shrubby understorey. It occurs on sheltered slopes and low ridges primarily at the northern end of the alignment.

  Dominant species include:
  - Canopy - *Eucalyptus botryoides x saligna, Euc. quadrangulata* with a mid-storey tree layer co dominated by *Acmena smithii, Cryptocarya glaucescens, Pittosporum undulatum* and *Livistonia australis.*
  - Understorey shrub layer – *Notelaea venosa, Clerodendrum tomentosum, Eupomatia laurina*
  - Groundcovers and climbers – *Adiantum formosum, Pandorea pandorana, Doodia aspera, Blechnum cartilagineum.*
- ***Riverbank Forest:*** is a tall *Casuarina cunninghamiana* forest with open shrub layer. This community occurs along the riparian corridors of freshwater creeks, adjoining the alignment.

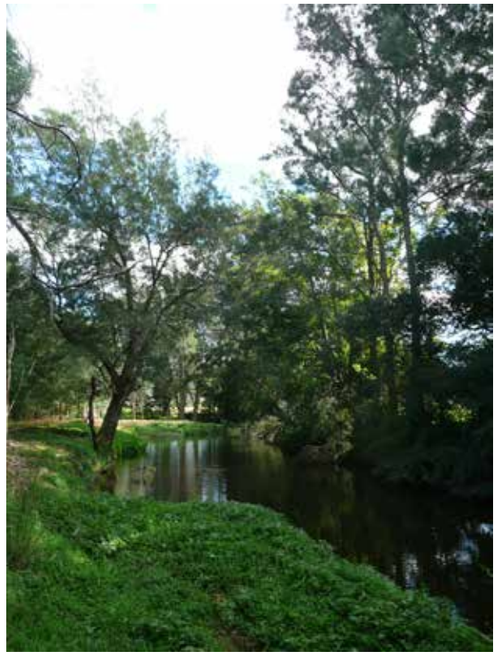


Fig. 2.21: Riverbank forests

  - Canopy- Casuarina cunninghamiana
  - Understorey - Hymenanthera dentata
  - Groundcovers - *Sigesbeckia orientalis, Lomandra longifolia, Microleana stipoides, Dichondra repens, Commelina cyanea*
- ***Cleared land and paddocks*** are the dominant community throughout the foothills slopes and floodplains of the alignment. They are dominated by exotic grasses and include *Bromas catharticus, Pennisetum clandestinum, Paspalum* spp. Within this community scattered remnants either solitary trees or small copses exist within the farmland indicating some of the structure of the original vegetation communities.

Fig. 2.22: Illawarra Gully Wet forests

In addition to the natural communities the disturbed nature of the site has led to the ingress of weeds. Eight exotic species that are listed as noxious weeds in the Shoalhaven local government area (LGA) were recorded in the study area, four of which are also listed as noxious in the Kiama LGA. Table 2.5 provides a list of the recorded species and the noxious weed class to which they belong.

Alligator weed is a Class 2 noxious weed in the Shoalhaven and Kiama LGAs, and as such it must be eradicated when identified. The regulatory requirements for Class 4 noxious weeds is that the growth and spread of these weeds must be controlled according to the measures specified in a management plan published by the local control authority.

Weeds recorded in the study area		
Weed Species	Common Name	Weed Class
Alternanthera philoxeroides	Alligator weed	2
Ageratina riparia	Mistflower	4
*Lantana camara**	Lantana	4
Ligustrum lucidum	Large-leaved privet	4
Ligustrum sinense	Small-leaved privet	4
*Lycium ferocissimum**	African boxthorn	4
Rubus fruiticosus8	Blackberry complex	4
Senecio madagascariensis	Fireweed	4

Table 2.5: Noxious weeds recorded in the study area

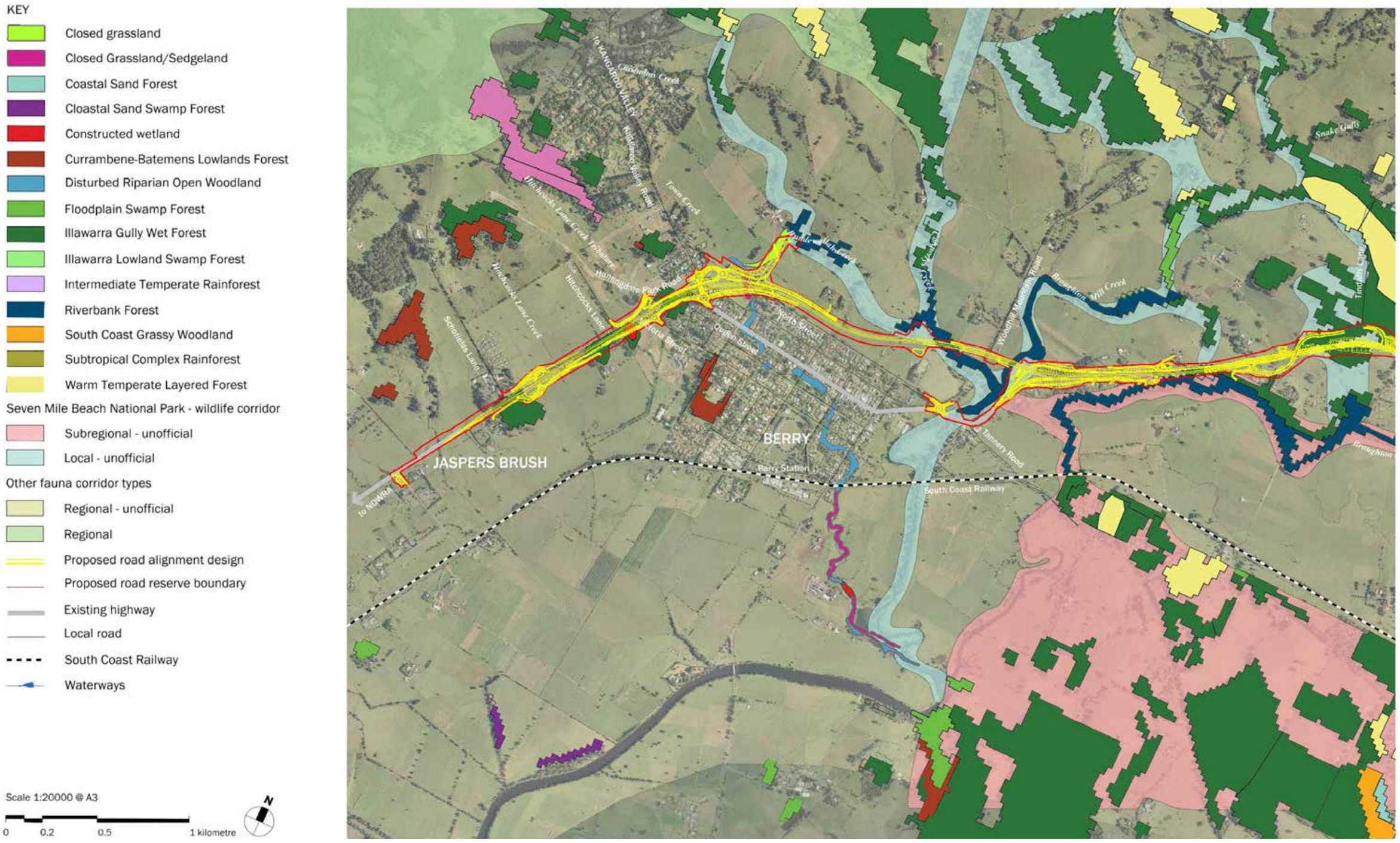
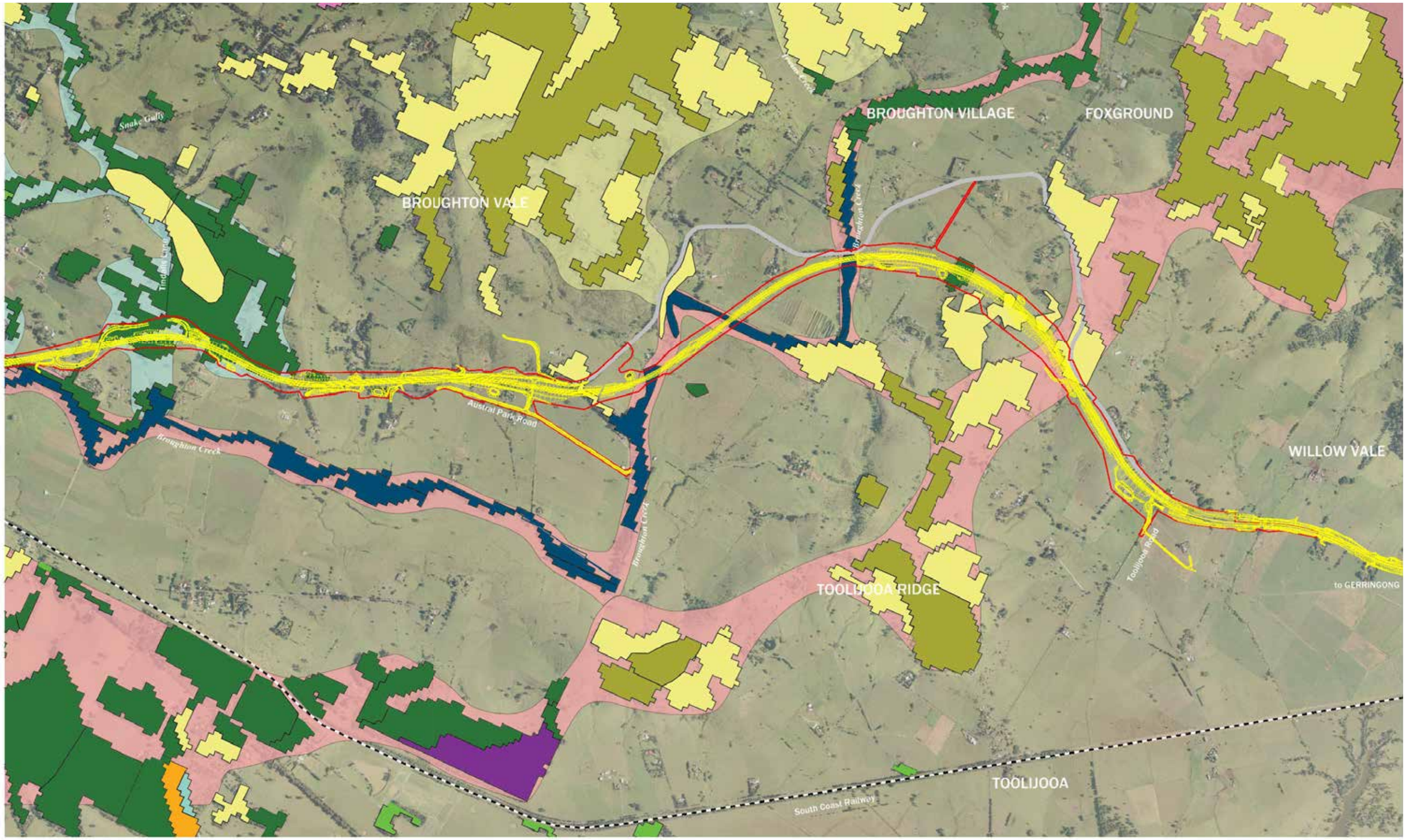


Fig. 2.23: Vegetation and fauna mapping


BROUGHTON VALE
BROUGHTON VILLAGE
FOXGROUND
WILLOW VALE
TOOLIJOOA RIDGE
TOOLIJOOA
to GERRINGONG
Snake Gully
Tindalls Lane
Broughton Creek
Austral Park Road
Toolijooa Road
South Coast Railway

2.2.9.2 Fauna

The alignment and its study boundary had 125 bird species (nine of which were introduced), 34 mammal species (5 of which were introduced) and nine frog and nine reptile species identified during surveys. Of these nine species were identified as threatened including bats and birds and 6 identified as migratory.

Corridors are a vegetation unit which may or may not be continuous but which facilitates the movement of fauna. Corridors can be considered in terms of Structural connectivity i.e. the spatial continuity of the corridor; or functional connectivity the ability of a species to move between two habitats.

Of particular concern is the Seven Mile Beach National Park – Barren Grounds Nature Reserve Wildlife corridor. Scattered patches of bushland between these two include Toolijooa Ridge, Hartley Hill, Moeyan Hill and Broughton Creek, as depicted in Figure 2.23

A second corridor is identified by the Southern Rivers Catchment Management Authority and which is a long term goal. This corridor intersects the alignment between Broughton Creek 1 and Tindalls Lane. These corridor need to be recognised and reinforced as part of the Project works to maximise their role in maintaining fauna connectivity.

2.2.10 NOISE

An assessment of predicted operational noise levels of the Project has been undertaken in accordance with the Road Noise Policy (RNP) (EPA, 2011) and the Environmental Noise Management Manual (ENMM) (Roads and Maritime Services, 2001). For the purpose of the noise assessment, the Project is considered a ‘new road’ and a ‘redevelopment’ of an existing road.

The traffic noise assessment undertaken for the EA Appendix E - Technical Paper: Noise and Vibration (Roads and Maritime Services, 2012) identifies 164 receivers that will experience exceeded applicable operational noise criteria. Some of these receivers are considered to be acutely affected as a direct result of the new road alignment. The assessment projected the likely traffic noise levels for both daytime and night-time, for the year of the Project opening in 2017 and ten years after opening in 2027. Noise receptors impacted by the Project comprise isolated rural residences and residential developments within Berry.

The assessment concluded that residences along Queen Street will experience a decrease in noise levels due to the redirection of traffic flow to the proposed alignment of the Project and receivers on north-south local roads within Berry would not be adversely impacted by predicted noise levels of the Project. A number of residences along North Street, between the Berry Sportsground and Kangaroo Valley Road and along Huntingdale Park Road will be exposed to increased noise levels and will require some form of noise attenuation.

The assessment recommends operational noise mitigation measures in the form of a low noise pavement, a four metre high noise protection barrier to the north of North Street, a four metre high noise protection barrier on the north bound exit ramp alongside Huntingdale Park Road, and twenty architectural treatments for isolated properties.

2.2.11 PROPERTY IMPACTS

The Project involves adjustment to the road reserve of the existing highway corridor. The impacts of the Project are mostly upon larger rural lots resulting in the loss, severance or fragmentation of some land for grazing purposes and horse agistment as well as some rural residential lands. Within Berry the impacts would be mostly on residential lands, land reserved for the future road corridor, and some open space.

Property acquisition will mostly be limited to partial or strip acquisition. A few of the effected properties have already been acquired in full by Roads and Maritime Services. All acquisitions will be in accordance with the Land Acquisition (Just Terms) Act 1991 and the Roads and Maritime Services Land Acquisition Information Guide (March 2011) and will occur prior to construction.

Property adjustments, such as the retention of external property access, drainage, reinstating of existing dams, the extension of an existing cattle underpass and reinstatement of landscape works where impacted may also be required as part of the Project.

Property impacts are not limited to the direct physical impacts with a number of properties adjacent the corridor indicated as potentially requiring screening from the highway to mitigate the visual impact of the works.

3. COMMUNITY CONSULTATION

3.1 CONSULTATION (PRE-TENDER)

Community input has been a significant element in the development of the Project to date. As part of the review of the Environmental Assessment and submissions the Roads and Maritime Services has continued this dialogue responding to community concerns and refining the design where applicable. The following chapter identifies those issues where clear actions were resolved or ongoing discussion is required.

Roads and Maritime Services commenced consultation with the community and key stakeholders in March 2006 during the development of the route options for the Princes Highway Upgrade from Gerringong to Bomaderry. The following extract from the EA Chapter 6 – Consultation (Roads and Maritime Services 2012) outlines the consultation of the Project which included:

- *Public display of the preferred option and preferred Berry township access arrangements.*
- *Meetings with government agencies including NSW Office of Environment and Heritage (OEH), Industry and Investment NSW (I&I (now Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS)), Department of Planning and Infrastructure (DP&I), NSW Office of Water (NOW) and Southern Rivers Catchment Management Authority (CMA).*
- *Consultation with the local fishing community about potential impacts on recreational fishing access and opportunities in Broughton Creek, Broughton Mill Creek and Bundewallah Creek, including consultation with 13 local fishing clubs via letter and invitation to comment.*
- *Interviews with potentially directly affected and potentially indirectly affected property owners to discuss the development of Berry township access options (43 interviews), potential impacts of construction noise / proposed extended working hours (37 interviews), the review of the Berry bypass alignment / Berry (south) interchange (27 interviews) and potential impacts on individual properties (21 interviews).*
- *Sixteen Aboriginal Focus Group (AFG) meetings.*
- *Meetings with specialist interest groups, including:*
  - *Berry Landcare.*
  - *Southern Rivers CMA.*
  - *National Trust of Australia.*
  - *Berry and District Historic Society.*
  - *Shoalhaven Historical Society.*
  - *Berry Chamber of Commerce.*
  - *Camp Quality.*
  - *Berry Rural Co-operative Society.*
  - *PHocus task force of the Southern Councils Group.*
  - *Berry Alliance.*
  - *Better Options for Berry.*
  - *North Street Corridor Amenity Group.*
  - *Residents of Huntingdale Park and surrounds.*
  - *Berry Equestrian Club.*
- *Seven meetings with a community review group (see Section 6.2.3 for details) which included about 20 representatives from:*
  - *Better Options for Berry.*
  - *Berry Chamber of Commerce.*
  - *North Street Corridor Amenity Group.*
  - *Representative of the local member for Kiama, Gareth Ward.*
  - *Landowners in the study area identified at the start of the review process.*
  - *Shoalhaven City Council.*
  - *South Coast Dairy.*
- *Publication of the Berry bypass alignment issues report in January 2012 summarising issues raised by the community during the public display of the revised Berry bypass alignment and Berry (south) interchange.*
- *Telephone calls to residents on Huntingdale Park Road and Kangaroo Valley Road to advise them of amendments to Berry (south) interchange.*
- *Community meeting to discuss the revised Berry bypass alignment.*
- *Public display and comment period for the revised Berry bypass alignment.*
- *A total of 13 meetings with four separate community working groups on community and design issues for the Foxground and Berry bypass:*
  - *North Street precinct (three working group meetings).*
  - *Austral Park Road interchange and heavy goods vehicle rest area working group (two working group meetings and, one site meeting and a site visit to review wildlife corridors).*
  - *Berry north interchange and the bridge at Berry (three working group meetings).*
  - *Kangaroo Valley Road interchange and Victoria Street precinct (five working group meetings).*
- *Costing review for a southern Berry bypass option.*
- *Telephone calls to potentially directly affected property owners and potentially indirectly affected property owners to advise NSW Government's decision to progress with a northern alignment for the Berry bypass.*
- *Distribution of community updates and 'letters to the householder'.*

The key changes incorporated into the concept design in response to community input include amendments and modifications to the following (EA Submissions Report; May 2013 p. 49):

"Individual property accesses following discussions with property owners..

- *The alignment of the Berry bypass to avoid the Berry sports fields, Camp Quality Park and the Pulman Street heritage area.*
- *Berry access arrangements to aim for southbound flood free access.*
- *The Berry bypass alignment, including:*
  - *Moving the bypass 26 metres further north, providing a 40 metre buffer between the northern edge of North Street (between Albany and Edward streets) and the revised alignment.*
  - *Diverting Town Creek, decreasing flood risk and allowing the roadway to be lowered.*
  - *Lowering the bypass between Alexandra and George streets by two metres. This responds to the community's desire to reduce the visual impact of the bypass.*
  - *The height of the noise mitigation has been reduced from five metres to four metres while maintaining appropriate levels of noise mitigation for Berry.*
- *The bridge at Berry, including:*
  - *Moving the bridge around 95 metres further away from the town as it crosses Woodhill Mountain Road.*
  - *Decreasing the bridge height to 6.4 metres lower than the previous design.*
  - *Providing a design that aims to maintain larger numbers of existing locally heritage listed Poplar trees.*
- *The Kangaroo Valley Road interchange to avoid linking directly into Huntingdale Park Road, including:*
  - *Re-aligning the northbound off-ramp to pass under the Kangaroo Valley Road Bridge and avoid Huntingdale Park Road.*
  - *Retaining the Huntingdale Park Road junction with Kangaroo Valley Road at its current location.*
  - *Minimising impacts to properties.*
- *Removal of the proposed heavy vehicle rest area at Austral Park Road.*
- *Altering the end point of Austral Park Road to allow for better integration with existing property access points.*
- *Inclusion of above and below ground wildlife crossings.*

Roads and Maritime Services has held over 20 community information sessions / Q&A forums in addition to 13 topic specific working group meetings to gain community wide feedback and input into the concept design".

The issues raised by the community of relevance to urban design and landscape, as recorded in the community submissions report, are extracted and commented upon below. It is presented in the following order from the start of the Project at Toolijooa Road to the end past Kangaroo Valley Road:

General

- Buses along the alignment
- Headlight glare
- Noise
- Visual impact including loss of rural character, and escarpment views
- Use of endemic plants to address biodiversity impacts

Toolijooa Cut

- Visual impact of cutting

Berry Bridge and Northern Interchange

- Berry Bridge (Note - covered in greater detail in Chapter 6)
- Berry Sports Fields
- Woodhill Mountain Road
- Bundewallah Creek
- Broughton Mill Creek
- Berry Sculpture at rest area
- Illawarra Gully Wet forest and its role as an entry/exit to Berry

North Street Precinct

- Noise wall at North Street (Note - covered in greater detail in Chapter 6)
- Berry Equestrian Centre
- Berry Sports Fields
- Treatment of green space buffer

Kangaroo Valley Road Interchange and Victoria Street Precinct

- Noise wall at Huntingdale Park Estate
- Victoria Street / Princes Highway Intersection
- Mark Radium Park
- Kangaroo Valley Road
- Kangaroo Valley Road Interchange
- Kangaroo Valley Road Overbridge (Note - covered in greater detail in Chapter 6)

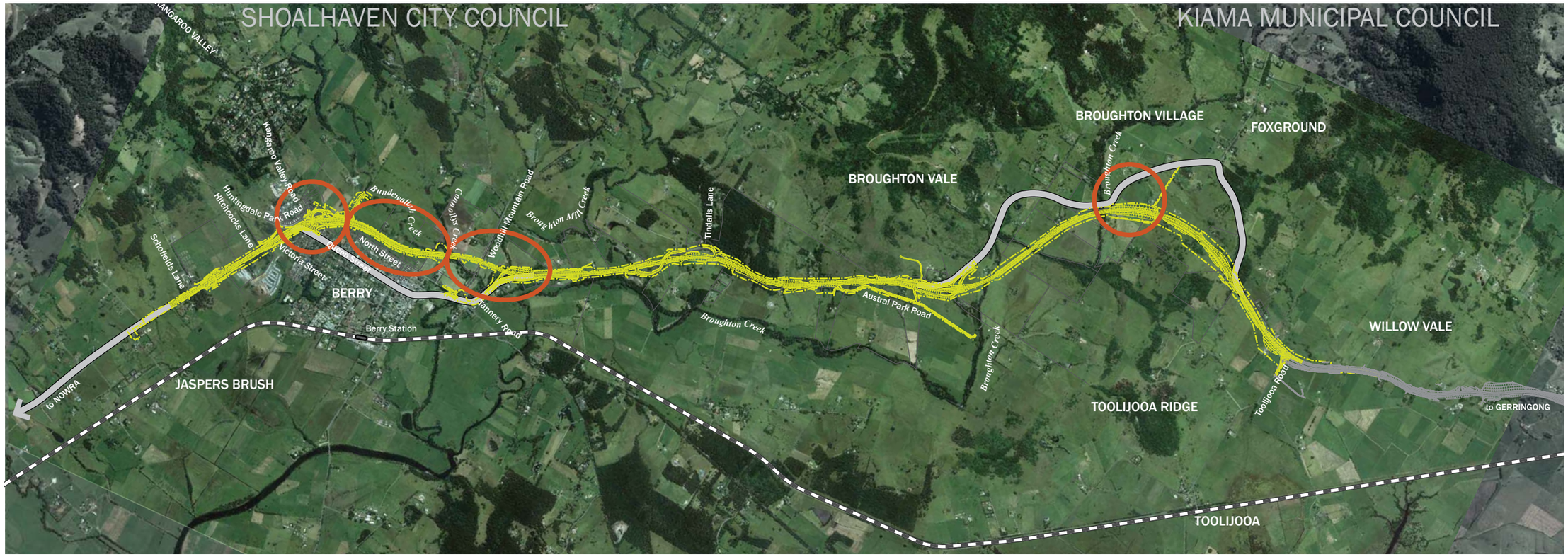


Fig. 3.1: Community consultation key plan

Source	Key Issue	Description	Response by Roads and Maritime Services	Relevance for Detailed Design
General				
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Design of bus stops including pick-up/ drop-off areas along the Project	*"Limited dedicated bus stops require adequate parking areas for pick-up and drop-off of children".*	*"Public and school buses would only stop at dedicated facilities for this purpose at the grade separated interchanges at Tindalls Lane (existing) and Toolijooa Road (new). Parent drop off and parking facilities at the new Toolijooa Road bus stop would be developed during the detailed design stage of the project.*	▪ The parking/ waiting area is designed to Roads and Maritime Services design and safety standards.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013 (p.84)	2.8.10 Operation traffic road safety	*"Glare from the sun is dangerous, particularly in winter along North Street".*	"Roads and Maritime Services would aim to minimise the risk of glare created by noise barriers; it is however difficult to mitigate glare on open roads across the existing and future road network (eg Berry bypass), particularly as the impacts would be both weather and time dependant. A well-designed road such as the proposed upgrade would help motorists deal with the issue of glare; as part of the detailed design stage of the project, a thorough lighting strategy and design would be developed, including a headlight glare assessment".	▪ Minimise risk of glare created by noise barriers through the use of landscape screening. ▪ Undertake lighting strategy assessment including headlight glare assessment.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Highway and interchange visual impacts (p. 193) Visual impact of the permanent ancillary site near Tindalls Lane interchange	*"Provide screening for the permanent ancillary site near Tindalls Lane interchange".*	*"Permanent screening of the permanent ancillary site at Tindalls Lane is proposed in the current concept plan. Mitigation of the visual impacts of the permanent ancillary site would be further developed during the detailed design phase of the project. There would be opportunity for ongoing input from stakeholders during this phase".*	▪ Incorporate screening into the detail design ▪ Facilitate stakeholder consultation regarding this site
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Noise barrier impacts and treatments (p. 196) Form of noise barriers	*"Concrete noise barriers are not the preferred form of mitigation of noise impacts to dwellings adjacent to the new highway. Retro-fitting the existing dwellings or through landscape earth mounding is the preferred mitigation measure".*	*"For any noise barriers in Berry, the mitigation strategy is for the use of a locally relevant combination of earth mounding and walling (not necessarily concrete). The development of the noise barrier would be consistent with the requirements of Roads and Maritime Services' 'Noise Wall Design Guidelines'".*	▪ Noted and incorporated in to Design.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Operational noise attenuation (p. 206) Visual impact of noise attenuation barriers	*"The visual impact of the two noise attenuation barriers to the north of Berry would be a defining feature for passing motorists and adjacent residents".*		▪ Noted. The extent of noise barriers as walls have been minimised in the Design. ▪ Dense landscape screening is provided where walls are required.
Foxground and Berry Bypass Community Discussion Commitments - Berry northern interchange and Berry bridge working group Working group meeting 28/03/2012	Shoalhaven Tourist Masterplan	*"Roads and Maritime Services to contact Shoalhaven Tourism to discuss tourist signage and how the Shoalhaven Tourism Masterplan will fit in with Roads and Maritime Services signposting plan".*	*"Roads and Maritime Services has approached council and has commenced discussions".*	▪ Continue discussions with Shoalhaven Council ▪ Incorporate tourist signage as appropriate as per the SWTC.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Revegetation and restoration of native vegetation (p.152)	*Use of locally occurring native plant species consistent with retained vegetation*	*The vegetation management plan and landscape plan would include detailed planting schedules, inventories of appropriate locally occurring native species (to match specific vegetation communities) and design layouts.*	▪ To be prepared in consultation with Landcare groups, CMA and affected landowners

Table 3.1: Summary of relevant issues raised by the community

Source	Key Issue	Description	Response by Roads and Maritime Services	Relevance for Detailed Design
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Weed management	*The ongoing the management of terrestrial and aquatic weeds post construction.*	*The following mitigation measure would be implemented:* ▪ *Control drainage that may contain weed seeds or high levels of nutrients.* ▪ *Use weed-free topsoil in landscaping and re-vegetate disturbed sites with locally indigenous species (local provenance).* ▪ *Monitor and control weed populations that establish in disturbed areas, with particular attention to eradication of noxious weeds. Weed invasions would be monitored and controlled by a person experienced in weed management.* ▪ *Incorporate weed management strategies into the vegetation management plan, detailing necessary weed control works, particularly in areas where the weeds may impact on threatened species and/or their habitats.*	▪ Incorporated in Vegetation Management Plan and landscape management plan
Submissions report May 2013	Riparian Corridors (p.161)	*Temporary crossings should be rehabilitated with fully structured local native vegetation*	*The preparation of the vegetation management plan would be guided by best practice methods for collection and establishment of local provenance planting stock, a planting program, planting maintenance and monitoring.*	▪ To be captured as part of VMP
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Highway and interchange visual impacts (p.193)	*Specific issues relate to potential loss of views, impact on views, the environmental landscape value and scale of highway related infrastructure.*	*The Environmental impact assessment has considered and rated the issues consistent with the DGR's requirements. Detailed design will continue to develop and be mindful of the need to address these issues.*	▪ On- going consideration will be given to the mitigation of visual impacts ,
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Landscape vegetation species / timing (p.200)	*Issues regarding appropriate revegetation, indigenous sourcing of plant material, local consultation and the timing for planting.*	*Engage adjacent land owners and community groups in assessing whether mitigation prior to construction (such as landscape planting) can be achieved to help soften or decrease likely impacts of the project.*	▪ Ongoing including community engagement
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Highway screening (p.202)	*Issues regarding visual mitigation, landscape integration at particular locations along the proposed project corridor.*	*Suggestions generally to be adopted if not already indicated in plans.*	▪ Noted
Cut				
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Toolijooa Ridge (p.190) Scale and visual impact of the Cut at Toolijooa Ridge	*"Visual impacts for train commuters travelling to Berry and road users on the coast road from Gerringong to Gerroa* *All disturbed land should be appropriately revegetated with the planting of endemic species, including the Toolijooa Ridge cutting which should be vegetated to the same standard as the North Kiama bypass cuttings".*	*"…strategies to minimise the visual impacts of the cutting at Toolijooa Ridge including:* ▪ *Close to vertical cuttings in the suitable rock.* ▪ *Keep the cutting benches at a consistent profile that matches the elevation of the roadway.* ▪ *Enclose the view at the end of the cutting to frame views.* ▪ *Establish vegetation to the top of the cutting to ensure integration with the adjacent landscape".*	▪ Noted
Broughton Village				
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Severance of rural communities (p. 265)	*"The proposed upgrade would have significant social impacts on an elderly land owner at a specific property in Broughton Village".*	*"As outlined in Section 7.9.2 of the environmental assessment, property underpasses, access under the Broughton Creek bridges and an extension to the existing cattle underpass would be provided for properties near Toolijooa Ridge. Consultation with the affected property owners would continue during the detailed design phase of the project".*	▪ Noted. However not part of the scope.

Table 3.1: Summary of relevant issues raised by the community (cont.)

Source	Key Issue	Description	Response by Roads and Maritime Services	Relevance for Detailed Design
Austral Park Road				
Foxground and Berry Bypass Community Discussion Commitments - Austral Park Road interchange and heavy vehicle rest area working group Working group meeting 05/03/13	Residual land at Austral Park Road	*"Roads and Maritime Services to resolve what will happen to the pieces of residual land from the highway upgrade".*	*"Roads and Maritime Services noted that residual land is to not be left untreated".*	▪ Noted
Foxground and Berry Bypass Community Discussion Commitments - Austral Park Road interchange and heavy vehicle rest area working group Working group meeting 05/03/13	Light spill at Austral Park Road interchange	*"Roads and Maritime Services to review impacts of light spill from the Austral Park Road interchange and vehicles using the highway".*	*"Light spill from both street lighting and headlights in the Austral Park Road interchange area needs to be addressed".*	▪ A headlight screen will not be required at this location based on investigations. Detailed design to confirm. ▪ Street lighting is limited to intersections only.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Norfolk Island pines (p. 221)	*Issues regarding the potential heritage value of a pair of Norfolk Island Pines close to the highway* *Response*	Reasonable efforts would be made to conserve the trees alive and in situ.	▪ To be confirmed in detailed design.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Landscape character units / Illawarra Gully Wet Forest (p. 198)	*Issue regarding categorisation of landscape units and the recognition of the value and importance of the mapped Illawarra Gully Wet Forest.*	During the detailed design of the project, Roads and Maritime Services would undertake targeted consultation with the relevant local community groups to determine a program for the supply of locally sourced seed and propagated plant stock to supplement the plant materials required for the project.	▪ Ongoing including community engagement
Berry Bridge and Northern Interchange				
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Impact on historical significance of the Alexander and David Berry Memorial (p. 234) Alexander and David Berry Memorial	*"Roads and Maritime Services should have ongoing discussions with Shoalhaven City Council on the design of the location for the relocated Alexander and David Berry sculptures, including the provision of appropriate landscaping and features"*	*"A new location for the sculpture has not been finalised apart from flagging potential locations within the general area of the northern Berry interchange or the proposed roundabout at the intersection of Woodhill Mountain Road and the current highway.* *Roads and Maritime Services is committed to conducting consultation with all relevant stakeholders as part of the process for determining a new location for the memorial sculpture".*	▪ Continue community consultation regarding an appropriate location for the Memorial ▪ Incorporate the Memorial into the detail design and overall design response
Foxground and Berry Bypass Community Discussion Commitments - Berry northern interchange and Berry bridge working group Working group meeting 05/03/13	Berry bridge over Woodhill Mountain Road	*"Roads and Maritime Services to optimise the design of the Berry bridge over Woodhill Mountain Road to minimise the number of expansion joints and utilise low noise pavement".*	*"Roads and Maritime Services to develop a 'reference design' which requires finger type expansion joints be used and the number of bridge joints minimised (3 or 4 maximum) to reduce the potential noise impacts. Roads and Maritime Services committed to using low noise pavement".*	▪ Bridge design in accordance with the SWTC.

Table 3.1: Summary of relevant issues raised by the community (cont.)

Source	Key Issue	Description	Response by Roads and Maritime Services	Relevance for Detailed Design
Appendix A – Berry Bypass Urban Design Strategy (October 2012)	The design of Berry bridge	*The community are interested in ensuring that the design of Berry Bridge is appropriate to its context and minimises visual impact.*	Roads and Maritime Services has presented several design options to the community to obtain feedback.	▪ Further discussed in Chapter 6.
Foxground and Berry Bypass Community Discussion Commitments - Berry northern interchange and Berry bridge working group Working group meeting 07/03/2012	Woodhill Mountain Road power lines	*"Preference for the existing power lines at Woodhill Mountain Road to be relocated underground to enable the poplar trees to grow unrestricted and shield the town from the bridge structure".*	*"Roads and Maritime Services to undertake discussions with the electricity supplier as part of the detailed design phase".*	▪ Noted
Foxground and Berry Bypass Community Discussion Commitments - Berry northern interchange and Berry bridge working group Working group meeting 07/03/2012	Woodhill Mountain Road heritage listed trees	*"Removal of 6-8 poplar trees, limited the amount of heritage listed trees that need to be removed is important".*	*"This was noted and Roads and Maritime Services needs to pass on for de-tailed design".*	▪ Noted
North Street Precinct				
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Berry Equestrian Centre (p. 190) The relocation and possible impacts on the Berry Equestrian Centre	*"The visibility of cars and trucks on the highway would cause safety concerns for horses and riders competing at the site".*	*"The Berry Equestrian Centre is currently the subject of a master plan, the development of which is being coordinated by Shoalhaven City Council in consultation with the Equestrian Centre. This master plan would provide recommendations to minimise impacts of the project on the site of the Equestrian Centre. The recommendations would be carried forward into the detailed design phase of the project to ensure that an integrated and satisfactory outcome is achieved for the Berry Equestrian Centre. It is expected that the recommendations of the master plan would include strategies to ensure safety for horses and riders competing at the Berry Equestrian Centre site by minimising and/or removing the visibility of vehicles on the highway".*	▪ The Berry Equestrian Centre concept plan is to be integrated by Roads and Maritime Services outside of this Project.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Berry Equestrian Centre (p. 189)	*Negative impacts of the proposed highway on rider and horse safety and the viability and function of the riding* *site*	*The Berry Equestrian Centre is currently the subject of a master plan, the development of which is being coordinated by Shoalhaven City Council in consultation with the Equestrian Centre. These are to be carried forward in the detailed design*	▪ The Berry Equestrian Centre is to be relocated by Roads and Maritime Services.
Appendix A – Berry Bypass Urban Design Strategy (October 2012)	The design of North Street noise barrier	*The community are interested in ensuring that the design of the noise barrier is appropriate to its context and minimises visual impact.*	*Roads and Maritime Services has presented several design options to the community to obtain feedback.*	▪ Further discussed in Chapter 6
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Berry Equestrian Centre (p. 131) Noise impacts on the Berry Equestrian Centre	*"The environmental assessment report does not consider the impact of or the mitigation measures for noise on horses in competition or training".* *"Increase in noise due to the close proximity of the highway, the skateway, the shared path and North Street would cause safety concerns for horses, riders and the general public".*	*"Roads and Maritime Services would provide mitigation measures to reduce noise levels at the Berry Equestrian Centre in the form of a low noise pavement and a noise barrier in the area adjacent to the centre as described in the environmental assessment".*	▪ Noted

Table 3.1: Summary of relevant issues raised by the community (cont.)

Source	Key Issue	Description	Response by Roads and Maritime Services	Relevance for Detailed Design
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	2.17.9 Operation community facilities and recreation Berry Equestrian Centre (p. 258) The relocation and possible impacts on the Berry Equestrian Centre	*"An options paper should be prepared, with input from the Berry Equestrian Centre, to examine modifications to the current site and assess other, more suitable sites for the Berry Equestrian Centre within close proximity to Berry".* *"Following project approval the Berry Equestrian Centre, needs to remain in close proximity to the Berry township, Berry Sporting Complex, public toilets and other amenities and Berry Showground for overnight yarding of horses; have easy access from outside Berry; secure storage on site; suitable parking and manoeuvrability for horse floats and vehicles. The competition arena should be located away from distractions such as the skate park, roads and other public facilities".*	*"Discussions would be undertaken between Roads and Maritime Services, Shoalhaven City Council as the land owner and the Berry Equestrian Centre to establish a new configuration for the centre. Roads and Maritime Services has agreed with Shoalhaven City Council that the club would be provided with an equivalent facility on a larger parcel of land than was suggested within the environmental assessment, to be consistent with the current size of the facility. Shoalhaven City Council has engaged an architect to prepare a concept plan in consultation with Roads and Maritime Services and the Berry Equestrian Centre* *These indicative plans will form a basis for any future discussion about the site".*	▪ Noted ▪ The Berry Equestrian Centre is to be relocated by Roads and Maritime Services.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Highway and interchange visual impacts (p. 193) Loss of visual connection between Berry and its surrounding	*"The location of the alignment would result in the loss of visual connection between Berry and the escarpment".*	*"The concept design for the project supports the retention of the visual connection between Berry and the escarpment".*	▪ Minimise impact on visual connections between Berry and the escarpment through the design.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Noise barrier impacts and treatments (p. 196) Loss of visual connection between Berry and its surrounding	*"The high noise barrier would obscure the view to the escarpment".*	*"The concept design for the project supports the retention of the visual connection between Berry and the escarpment".*	▪ Minimise the impact on escarpment views
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Noise barrier impacts and treatments (p. 196) Impacts of the noise barrier and accompanying design elements	*"Landscaping on North Street is important for screening however it would impact natural light, therefore the mitigation measures proposed are a 'trade off' which is not acceptable".*	*"Whilst it is unlikely, the proposed landscaping could have the potential to impact on the 'natural light' of the residences on the south side of North Street. Consultation with residents during the detailed design phase of the project would be undertaken and a shadow study of the proposed design would be developed in order to minimise potential impacts".*	▪ Undertake consultation with residents with regard to proposed landscape design
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Operational noise attenuation (p. 206) Impacts of the noise barrier and accompanying design elements	*"The proposed noise barrier on North Street would take away natural light and remove the view of the open paddocks and escarpment".*	*"It is recognised that, whilst it is unlikely, the proposed landscaping could have the potential to impact on the 'natural light' of the residences on the south side of North Street. Consultation during the detailed design phase of the project would be undertaken and a shadow study of the design would be prepared.* *The impacts on the foreground views of the open paddocks would be impacted, however from North Street the views of the escarpment would not be further impacted on".*	▪ Undertake consultation with residents with regard to proposed landscape design
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Noise barrier impacts and treatments (p. 196) Impacts of the noise barrier and accompanying design elements	*"Landscaping treatments to mitigate visual impact, structures and noise barriers need to be effective and adjusted as construction is completed. Roads and Maritime Services should continue to liaise with Council regarding landscape design improvements and treatments to mitigate the visual impact of structures (including shared footpaths and street furniture) and noise barriers at the Kangaroo Valley Road interchange and the interface along North Street".*	*"The concept plan illustrates 'supplementary street tree planting on the northern side of North Street'. The intention of this planting is not to screen views of the bypass, but rather to enhance the streetscape of North Street and subtly reinforce the grid nature of the town layout. The design would be developed further during the detailed design phase of the project with input from the community and relevant stakeholders".*	▪ Noted ▪ Continue consultation process with relevant stakeholders during detailed design

Table 3.1: Summary of relevant issues raised by the community (cont.)

Source	Key Issue	Description	Response by Roads and Maritime Services	Relevance for Detailed Design
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Noise barrier impacts and treatments (p. 196) Impacts of the noise barrier and accompanying design elements	*"Supporting structures of the southern and northern interchanges and noise barriers should reflect the character of the area".*	*"This approach for North Street would be consistent with approach for the southern interchange for Berry. The design framework puts in place the key requirements to retain a local scale character response. This includes the recommendation for use of locally sourced materials and culturally relevant planting".*	▪ Noted
Foxground and Berry Bypass Community Discussion Commitments - North Street precinct working group Working group meeting 29/02/2012	Impacts of the noise barrier and accompanying design elements	*"Roads and Maritime Services to present designs to improve the area between North Street and the alignment to minimise the impact of the noise protection structures on Berry and maximise the potential for good quality urban design".*	*"Roads and Maritime Services presented three alternative designs for the noise walls along North Street. Roads and Maritime Services to move forward with all three options as potential solutions".*	▪ Noted
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	North Street (p. 201) Pedestrian and cycle path along North Street	*Pedestrian / cyclists could use the road instead of a dedicated path*	*"Roads and Maritime Services would liaise with Council and local residents regarding the development of the land between North Street and the proposed highway, aiming for a consolidated framework that considers the Berry Equestrian Centre, the Berry Sports grounds, the pedestrian and movement plan and future asset management and maintenance requirements".*	▪ Noted
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	North Street (p. 201) Pedestrian and cycle path along North Street	*The shared pedestrian / cycle way would encourage littering and would take away resident privacy.*	*"Should a shared pedestrian path / cycleway be determined as appropriate for North Street, appropriate associated facilities, including bins to discourage littering, would be included in the final design. Resident privacy would only be impacted by a potential increase in pedestrian and cyclists numbers, which is likely to be offset by a reduction in the number of vehicles on North Street".*	▪ Noted
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	North Street (p. 201) Landscaping along North Street	*Landscaping should be planted now.*	*"While it is presently too early to define areas to be planted now, the early phases of detailed design may define possible locations for planting that could be undertaken in advance of the major civil earthworks".*	▪ Noted and will be designed according to the requirements of the SWTC.
Foxground and Berry Bypass Community Discussion Commitments - North Street precinct working group Working group meeting 29/02/2012	Relative height of the vertical alignment of the highway	*"Roads and Maritime Services to conduct further investigations into lowering the vertical alignment of the highway adjacent to North Street between Alexandra and Edward streets".*	*"Roads and Maritime Services to include a review of lowering the vertical alignment of the highway further as part of the conditions of contract for the detailed design".*	▪ Noted and will be designed according to the requirements of the SWTC.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Operation North Street buffer – uses (p. 205)	*"issues regarding the appropriate and integrated development of the proposed land between North Street and the proposed highway".*	*Roads and Maritime Services would liaise with Council and local residents to ensure that the development of the land between North Street and the proposed highway has a consolidated framework that considers Camp Quality, the Berry Sports grounds, the Berry Equestrian Centre, the pedestrian and access movement plan and future asset management and maintenance requirements for the area".*	▪ Ongoing community engagement during detailed design in finalising the design.

Table 3.1: Summary of relevant issues raised by the community (cont.)

Source	Key Issue	Description	Response by Roads and Maritime Services	Relevance for Detailed Design
Submissions report May 2013	Town Creek (p. 166)	*"A naturalistic creek profile should be achieved".*	*"Roads and Maritime Services propose to construct the realignment in a in a way that would allow for appropriate safe ongoing maintenance in line with standard agricultural practices, while maintaining or improving the existing water quality in this part of Town Creek".*	▪ Develop a scheme that addresses environmental and property owner concerns
Kangaroo Valley Road Interchange and Victoria Street Precinct				
Appendix A – Berry Bypass Urban Design Strategy (October 2012)	The design of Kangaroo Valley Road Bridge	*The community are interested in ensuring that the design of Kangaroo Valley Road Bridge is appropriate to its context and minimises visual impact.*	*Roads and Maritime Services has presented a concept design to the community to obtain feedback.*	▪ Further discussed in Chapter 6.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Operation pedestrian/cyclist Access routes (p. 80) Pedestrian connectivity	*"Maintaining the pedestrian connectivity between Kangaroo Valley Road and Berry and the provision of a suitable and safe pedestrian and cyclist facility from Kangaroo Valley Road to Berry.*	*"The project includes the provision of shared pedestrian and cyclist facilities on both sides of the Kangaroo Valley Road overbridge where there is currently no footpath provided along Kangaroo Valley Road. These facilities would be separated from traffic and provide a new safe pedestrian link between Berry town centre and residential development to the north-west along Kangaroo Valley Road and beyond. Provision for pedestrians and cyclists in and around Berry would support and complement any Berry pedestrian access and mobility plans and would be developed further during the detailed design phase of the project in consultation with Shoalhaven City Council".*	▪ Noted
Foxground and Berry Bypass Community Discussion Commitments – Southern bypass review Issues Actions and Outcomes register	Pedestrian connectivity	*"Kangaroo Valley Road Pedestrian Access: Single access point across the highway at Kangaroo Valley Road interchange is insufficient; costings should include additional pedestrian connection points".*	*"Roads and Maritime Services will continue to examine possible improvements to pedestrian connectivity during the environmental assessment process and the subsequent detailed design process should this route be chosen.* *Roads and Maritime Services will provide a cross-section of the Kangaroo Valley Road bridge showing pedestrian connectivity in the environmental assessment".*	▪ Improve pedestrian connectivity ▪ Provide images of the proposed design in ongoing consultation.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Noise attenuation along the bypass of Berry (p. 133) Noise impact of the bridge at Kangaroo Valley Road	*Include noise barriers and low noise treatment expansion joints / road drainage points on the bridge at Kangaroo Valley Road. Also use Toughened glass similar to the Minnamurra bridge should be used for the noise barriers.*	*"Two noise protection barriers would be built, both 4 metres in height, one near North Street and the other in front of Huntingdale Park Road. The construction materials selected would be subject to urban design review.* *Roads and Maritime Services is not clearly responding to the request of noise walls on the bridge".*	▪ Noted
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Noise barrier impacts and treatments (p. 196) Noise barrier at Huntingdale Park Road	*"The noise barrier would impose on the view of properties facing the barrier given the relative close proximity.* *The noise barrier would attract graffiti artists. Increased planting on both sides of the noise barrier to deter potential graffiti artists and ease visual impact should be considered".*	*"Other measures to further screen noise barriers, discourage graffiti and control access would be investigated during the detailed design phase of the project. Crime Prevention through Environmental Design principles would be applied to develop the optimum outcome. A potential art strategy and use of different (rough textured and/or vegetated) surfaces could be implemented and this would be discussed as part of the community engagement process during the detailed design phase of the project".*	▪ Apply Crime Prevention Through Environmental Design principles in detailed design ▪ Consider potential strategies to discourage graffiti ▪ On-going consultation during detailed design

Table 3.1: Summary of relevant issues raised by the community (cont.)

Source/Date	Key Issue	Description	Response by Roads and Maritime Services	Relevance for Detail Design
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Architectural treatments and noise mitigation measures for rural / individual properties (p. 131) Noise levels at Mark Radium Park	*Exceedance of predicted noise levels for Mark Radium Park, however no mitigation measures are proposed*	*"It is not considered reasonable to provide mitigation in the form of a noise barrier. Alternate forms of mitigation need to be considered in these circumstances. For example, Roads and Maritime Services would investigate the option of including a noise berm on the western side of Mark Radium Park during the detailed design stage of the project. Considerations for the berm would include the noise and visual screening benefits".*	▪ Design has changed this area and confirmed no wall is required.
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Noise barrier impacts and treatments (p. 196) Noise barrier at Huntingdale Park Road	*"The noise barrier would impose on the view of properties facing the barrier given the relative close proximity.* *The noise barrier would attract graffiti artists. Increased planting on both sides of the noise barrier to deter potential graffiti artists and ease visual impact should be considered".*	*"Other measures to further screen noise barriers, discourage graffiti and control access would be investigated during the detailed design phase of the project. Crime Prevention through Environmental Design principles would be applied to develop the optimum outcome. A potential art strategy and use of different (rough textured and/or vegetated) surfaces could be implemented and this would be discussed as part of the community engagement process during the detailed design phase of the project".*	▪ Apply Crime Prevention Through Environmental Design principles in detailed design ▪ Consider potential strategies to discourage graffiti ▪ On-going consultation during detailed design
Princes Highway Upgrade – Foxground and Berry bypass Roads and Maritime Services Submissions report, May 2013	Architectural treatments and noise mitigation measures for rural / individual properties (p. 131) Noise levels at Mark Radium Park	*Exceedance of predicted noise levels for Mark Radium Park, however no mitigation measures are proposed*	*"It is not considered reasonable to provide mitigation in the form of a noise barrier. Alternate forms of mitigation need to be considered in these circumstances. For example, Roads and Maritime Services would investigate the option of including a noise berm on the western side of Mark Radium Park during the detailed design stage of the project. Considerations for the berm would include the noise and visual screening benefits".*	▪ Design has changed this area and confirmed no wall is required.

Table 3.1: Summary of relevant issues raised by the community (cont.)

3.2 CONSULTATION DURING DETAILED DESIGN

The Project's Community Communications Strategy presents a detailed consultation program for the Foxground and Berry bypass Project to build on the significant effort, commitment and contribution made by RMS and the community since 2006. Over this period stakeholders have clearly demonstrated they have a genuine interest in this project and a need to be involved. The consultation program is designed to ensure that all stakeholder categories – local businesses, local residents and project neighbours- have an opportunity to understand the current status of the project, potential construction impacts and how they are to be managed and the ultimate project benefits on delivery.

The program will consist of:

- Two community displays to be held in July and October 2014 to show the concept and then final design, and aspects of construction for the Foxground and Berry bypass, prior to construction commencing in early 2015.
- One topic specific information and consultation session to be undertaken in August 2014. This session will be designed to provide topic specific technical information to the community on flooding, hydrology, signage, lighting, traffic staging, environmental management and the Construction Management Plan; and to seek community feedback on of the possible options related to the project's urban design and landscaping.
- Ongoing meetings with key stakeholders that commenced In April, to be held through to December 2014. These meetings will be designed to provide an overview of the project, construction program and the progress of design, and seek feedback on elements of project design.
- Stalls at the Gerringong and Berry Markets to be held from June to October, to raise community awareness of the project, to promote attendance at the community displays and seek participation in the topic specific information session and consultation.
- Open days at the Berry Project Office during the week of the community displays to provide an update on the project and project information and to answer any queries the community may have related to the project.
- Establishment of the Berry Business Focus Group as outlined in the Business Focus Group Terms of Reference document.

Refer to Appendix 2 for a detailed description of consultation undertaken to date.

4. ISSUES, OPPORTUNITIES AND CONSTRAINTS

This Chapter outlines the issues, opportunities and constraints as identified for the Project.

4.1 ISSUES

General for the Project

- Visual impacts as a result of scale of the road infrastructure in relation to the adjoining development and setting.
- Vegetation loss and habitat fragmentation.
- Impacts on the scenic quality of the region.
- Impacts on the operability of farm holdings as a result of fragmentation or loss of land.
- Noise impacts on rural residences and edge of town.

Berry Bypass

- Severance of the community at the Berry South (Kangaroo Valley Road) Interchange.
- Impacts on the scenic quality of the region.
- Impacts on adjacent land uses such as The Equestrian Centre, Mark Radium Park, Berry Oval and the Recreation area.
- Legibility of the town from the highway in terms of loss of passing trade and the need to establish a clear identity once it is bypassed.

4.2 OPPORTUNITIES

While there are issues which affect the community a number of these present opportunities which provide the potential for enhancement and improvement.

General for the Project

- Maintain key views.
- Minimise the visual impact of structures through the integration of landform and landscape.
- Highlight interchanges providing connectivity to the local road network through landscape and alignment design.
- Protect existing trees where possible.
- Respond to the underlying geological context in terms of cut form and profiles.

Berry Bypass

- Provide a gateway town entry statement to Berry township at its northern and southern entrances. The existing Alexander and David Berry Memorial will be relocated to the Berry North Interchange as the northern entry statement and part of the arrival sequence to the town.
- Provide a high level of pedestrian and cycle connectivity from Berry town in the east to the expanding Berry residential area to the west.

4.3 CONSTRAINTS

The design is constrained by the following:

General for the Project

- Need to minimise the road footprint and, thereby, minimise the impact on the surrounding landscape.
- Limited space available for landscape screening of structures.
- Flooding, drainage and water table.
- Constructability of the road and its engineering elements.
- The geology of the region, characterised by hard rock which defines a number of cuttings. The presence of hard rock influences the form and the ability to revegetate the cutting.

Berry Bypass

- Impact of the road design level on existing escarpment views.
- Noise attenuation requirements (from traffic noise levels) to the existing community.

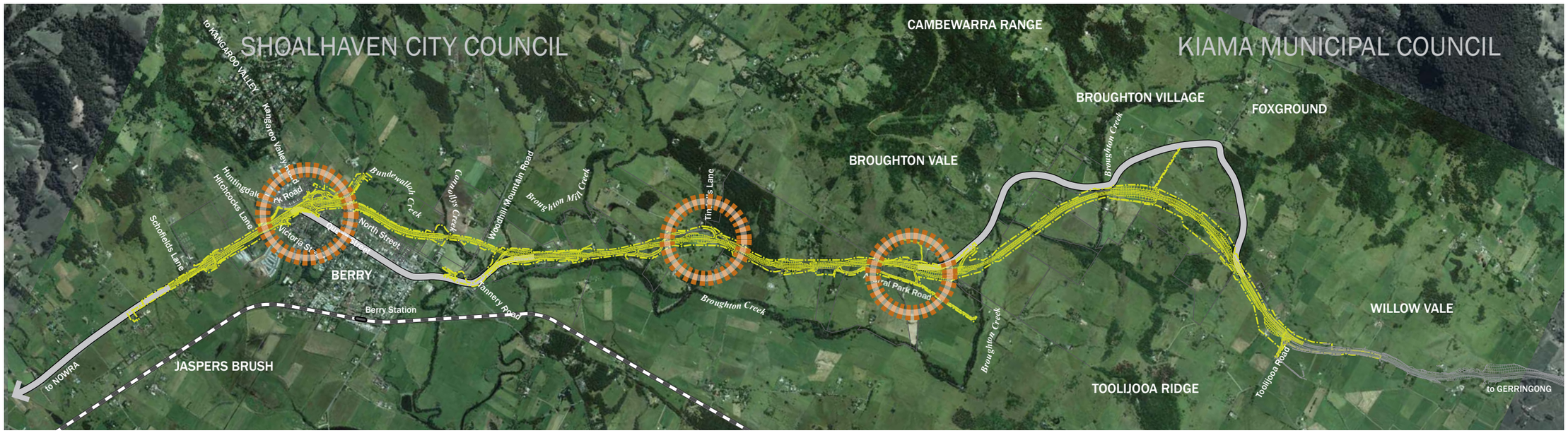


Fig. 4.1: Issues, opportunities and constraints along the Project

KEY

- Main interchanges
- Views to the escarpment from the town grid
- Existing highway
- Local road
- Proposed road alignment
- Proposed road reserve boundary
- South Coast Railway
- Waterways

Scale 1:10000 @ A3

0 100 200 500m

Fig. 4.2: Issues, opportunities and constraints in Berry

5. URBAN AND LANDSCAPE DESIGN OBJECTIVES

5.1 DESIGN OBJECTIVES AS STATED IN THE EA

5.1.1 DESIGN OBJECTIVES FOR THE PROJECT

The following urban design objectives are stated in the *EA Technical Paper: Urban Design including Landscape and Visual Amenity* (November 2012).

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

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

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

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

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

- *Avoid, where possible areas of identified historic and Aboriginal heritage and cultural value.*
- *Acknowledge and response to the heritage and cultural values of the rural landscape.*
- *Acknowledge and response to Aboriginal values places on the broader landscape.*
- *Reduce the visual and noise impacts of the Project.*
- *Consider the important value of productive landscape.*

Objective Four: Respect the communities and towns along the highway

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

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

- Acknowledge the role of this section of the *Princes Highway as an important part of a longer scenic drive along the New South Wales South Coast.*
- *Maximise the opportunities for high quality and varied views of the coast, the rural landscape and adjacent mountain ranges.*
- *Provide visual connection (wayfinding and directional signage) marking access to the towns/communities along the route.*

Fig. 5.1: View of Project area

- *Use landscape treatments to soften the appearance of the road for its users without compromising opportunities for key views.*
- *Consider the heritage aspects of the route to enable road users, where practicable to experience them.*

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

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

Fig. 5.2: View of Berry township

5.1.2 DESIGN OBJECTIVES FOR BERRY BYPASS

Appendix A – Berry Bypass Urban Design Strategy (October 2012) states the following regarding the urban design and landscape objectives for the Berry Bypass Section of the project:

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

The following overall urban design objectives have guided the Urban Design Strategy:

- *A bridge at Berry and Northern Interchange Precinct*
- *To integrate the bridge at Berry and Northern Interchange structures and earthworks within the picturesque rural landscape of northeast Berry.*
- *Northern Precinct*
- *To integrate the Berry Bypass within the northern township periphery and the picturesque rural landscape to the north of Berry.*
- *Kangaroo Valley Road Interchange and Victoria Street Precinct*
- *To integrate the Berry Bypass within the western edge of the township, including the Kangaroo Valley Road and Huntingdale Park communities, and within the picturesque rural landscape of Berry."*

5.2 OVERALL DESIGN OBJECTIVES ADOPTED FOR THE PROJECT

As stated above, the *EA Technical Paper: Urban Design including Landscape and Visual Amenity* (November 2012), outlines the urban design objectives for the Project and the *Appendix A – Berry Bypass Urban Design Strategy* (October 2012) outlines the design objectives for the Berry Bypass section of works. These objectives are adopted in the Design.

In addition, the Concept Design has been guided by the Roads and Maritime Services design guideline documents including:

- Beyond the Pavement - RTA Urban Design Policy, Procedures and Design Principles, August 2009
- Landscape Guideline: Landscape design and Maintenance Guidelines to Improve the Quality, Safety and Cost Effectiveness of Road Corridor Planting and Seeding, April 2008
- Bridge Aesthetics, July 2012
- Noise Wall Design Guideline, February 2007
- Shotcrete Design Guidelines, June 2005
- Road Design Guide
- Designing to Minimise Vandalism (Final Draft), November 2008

6. URBAN AND LANDSCAPE DESIGN CONCEPTS AND PRINCIPLES

6.1 INTRODUCTION

This Chapter outlines the design concepts, principles and strategies that have been adopted based on the consideration of the design principles presented in the EA, the Scope of Work requirements set out in the various Appendices, Roads and Maritime Services design guideline documents and an analysis of the existing context of the highway. It also describes the family of elements that are developed in consideration of these principles and includes landscape, bridges, noise walls, headlight screens, retaining walls and road furniture.

The specific application of these concepts and the design of the elements within the alignment and context are described in detail in Chapter 7. The design principles and strategies adopted and how they relate to the corridor through which it passes are defined here.

The proposed road corridor traverses through four distinctly different environments that influence the character of the Project and the experience of it. The approach to the design of the highway and of its various built elements responds to these four different characters. These are:

Character Zone 1: Toolijooa

Character Zone 2: Broughton Creek

Character Zone 3: Broughton Mill Creek

Character Zone 4: Berry

Community consultation will be undertaken during design development in the detailed design stage. This is considered particularly important with regard to design areas and elements that have been key points of discussions to date with the community.

6.2 APPROACH TO DESIGN

The urban design approach adopted for the Project is one that considers several factors including,

- The continuity of design approach and language adopted for the highway in the design of the Gerringong Upgrade.
- Design responses to the rural farmland context of the Foxground to Berry Bypass section of the works.
- Design response to the Berry township and its surrounds in the Berry Bypass section of the works.

The general approach adopted in the design of the road and its engineering elements in the Foxground to Berry section of the works, is to achieve a simple and elegant design outcome that is responsive to the highly scenic and semi-rural context of the Project linking it with the Gerringong Upgrade project.

Within the Berry Bypass section of the works, a more detailed and place-specific approach is adopted responding to the Berry township and the requirements of its community. These requirements have been understood as documented primarily in *Appendix A – Berry Bypass Urban Design Strategy* (October 2012), *EA Technical Paper: Urban Design including Landscape and Visual Amenity* (November 2012), EA Submissions Report (2013); and the Foxground and Berry Bypass Community Discussion Commitments (Roads and Maritime Services undated). The design of engineering elements and related landscape response enhance the sense of place and provide legibility to the entrances and exits to Berry township.

In general, the design minimises the visibility of structures and engineering elements within the existing landscape through its design and landscape treatments. The design provides a clear response to the needs of the context and community in the area and meets the requirements identified in the scope of works documents.

6.3 DESIGN CONCEPTS AND PRINCIPLES

Several strategies have been adopted to achieve the above (See Fig. 6.1):

- The impact of built elements has been reduced by:
  - a reduction in the number of structures to be incorporated within the landscape by using soft landscape solutions to minimise the need for these
  - the simple and elegant design with neat finishes to the engineering elements on the Project including bridges, retaining walls, noise walls and headlight screens.
- A sense of arrival and departure to the town is created by the use of the design to forewarn the motorists of the town's proximity. This has included changing vegetation patterns, the incorporation of sculpture and the formation of the road itself.
- Key visual corridors to the escarpment are retained where possible to ensure that the connections with the ridges to the west are maintained, particularly from the town.
- The pastoral landscape of the valleys and foot slopes is maintained and reinforced. Plantings have been used strategically in order to enhance this character and existing vegetation communities. Existing views across the valleys and towards the escarpment are retained.
- Creeklines are emphasised with vegetation communities restored to enhance connectivity and habitat and retain or improve water quality.
- Landform is worked so that cuts and fills are blended into the surrounding landscape, reducing the visual scarring that may occur.

Maintenance of Views

Views form an important component of the journey through this section of Southern NSW. The most striking views experienced from the corridor are views across long flat valleys from elevated ridges or to the escarpment.

The design acknowledges this, maintaining, where possible, views to the escarpment.

Critical views include:

- Views of Toolijooa Ridge and the maintenance of the ridge line when viewed from afar.
- Views from Toolijooa Ridge as you move into the Broughton Creek Valley.
- Views of the escarpment to the west particularly as you head north out of Berry.
- Views from Berry of the Escarpment and the rural context.

The views identified above are ones that may be potentially affected in terms of both the motorists' experience and that of the adjoining residents. It is important to ensure that the views of the adjoining properties are addressed and the impact of changes moderated where possible. The following are considered important considerations in regard to views from adjoining properties:

- Retain district views for residents of Berry particularly to the escarpment to the west.
- Reduce the visual impacts of the Project from adjacent properties through planting and earth mounding and the creation of a perceived sunken alignment when viewed from town.

Design of Structural Elements

- The design of structural elements aims to achieve the following outcomes:
- Achieve a consistent design language while responding to their different roles and functions.
- Relate and integrate with the surrounding landscape context both visually and physically.
- Integrate with the proposed landscape design to soften the visual impact of structures.
- Be simple, cognisant of maintenance issues and compliant with Roads and Maritime Services standards.

KEY

- Character zone boundary
- Interchange
- Creek bridges
- Overbridges
- Underpass
- Noise barrier (wall)
- Noise barrier (mound)
- Headlight screen
- Planted headlight screen
- Landscape zone
- Interchange formal tree planting
- Forest / screen planting
- Creek line planting
- Retained views
- Sculpture
- Major cutting
- Existing highway
- Local road
- South Coast Railway
- Waterways

Character Zones

- Character zone 1 - Toolijooa
- Character zone 2 - Broughton Creek
- Character zone 3: North Berry
- Character zone 4: Berry

Scale 1:20000 @ A3

0 0.2 0.5 1 kilometre

N

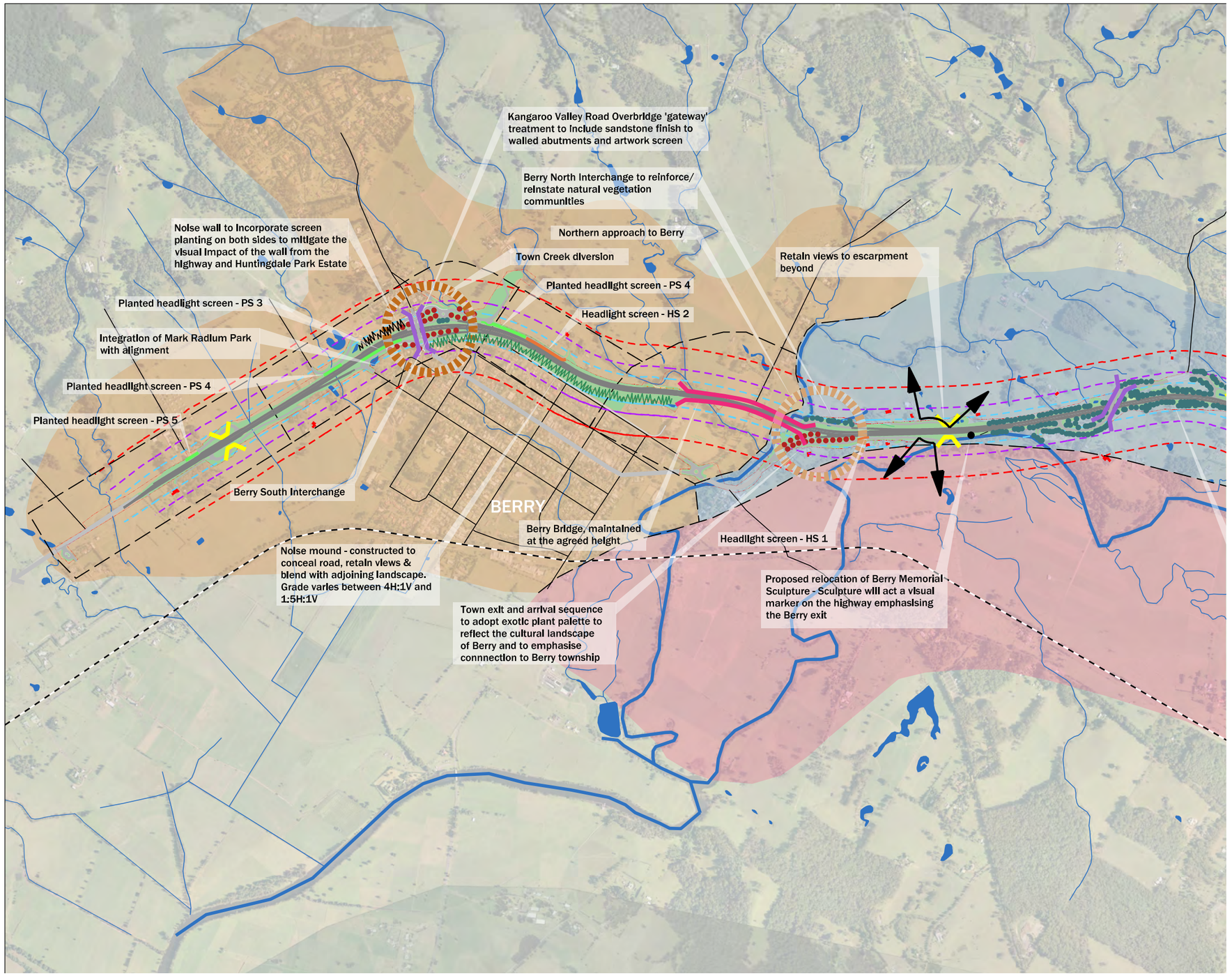
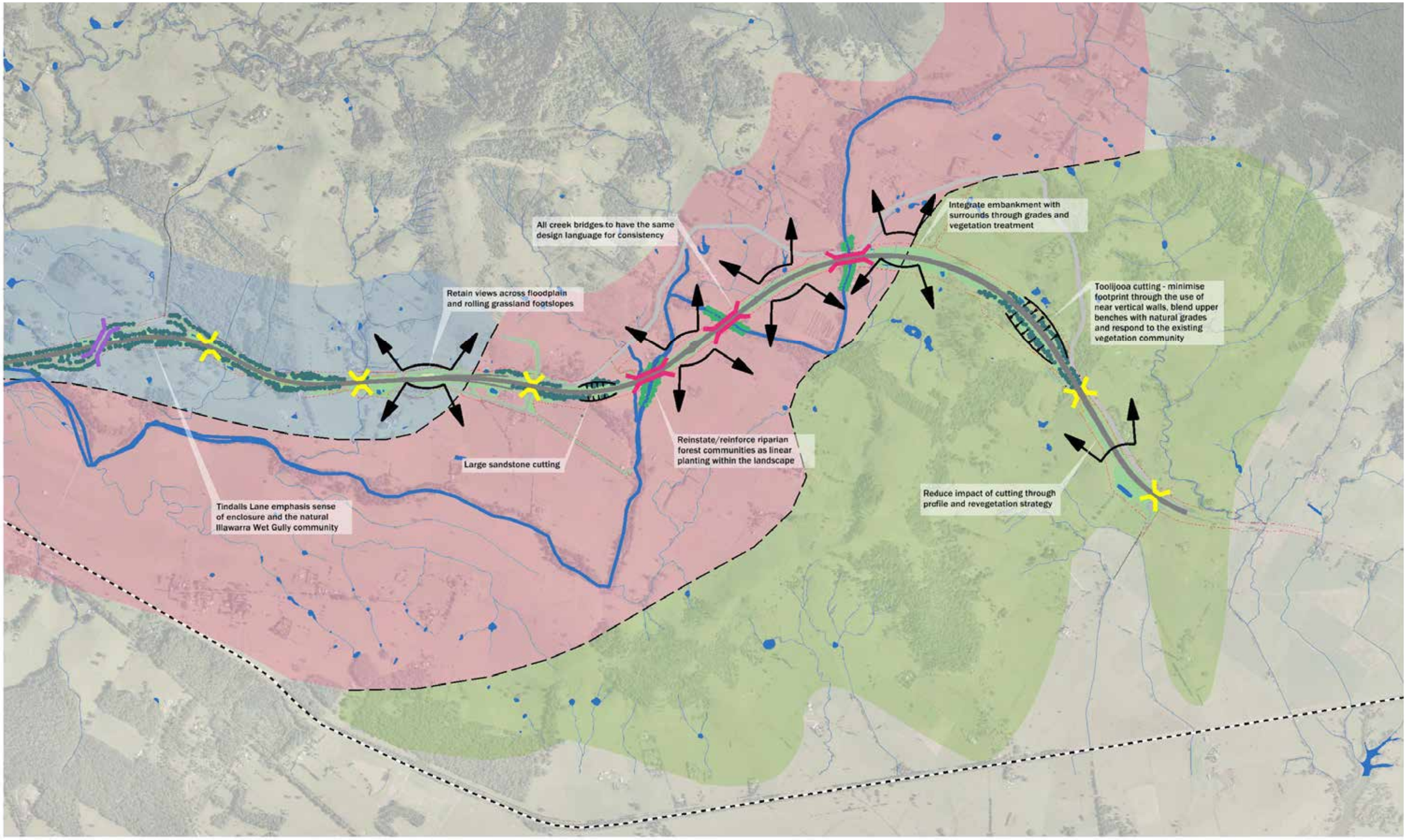


Fig. 6.1: Urban and landscape design Strategy Plan


All creek bridges to have the same design language for consistency
Integrate embankment with surrounds through grades and vegetation treatment
Retain views across floodplain and rolling grassland footslopes
Toolijooa cutting - minimise footprint through the use of near vertical walls, blend upper benches with natural grades and respond to the existing vegetation community
Large sandstone cutting
Reinstate/reinforce riparian forest communities as linear planting within the landscape
Tindalls Lane emphasis sense of enclosure and the natural Illawarra Wet Gully community
Reduce impact of cutting through profile and revegetation strategy

KEY

- Interchange
- Bridge structures
- Noise wall / Noise mound
- Headlight screen
- Retaining wall
- Bridge I.D.
- Noise barrier I.D.
- Headlight screen I.D.
- Proposed road alignment
- Proposed road reserve boundary
- Gerringong upgrade
- Existing highway
- Local road
- Character zone boundary
- South Coast Railway
- Waterways

Bridges
SB01. Toolijooa Road Underpass
SB02. Broughton Creek Bridge No.1
SB03. Broughton Creek Bridge No. 2
SB04. Broughton Creek Bridge No. 3
SB05. Austral Park Road Underpass
SB06. Tindalls Lane Overbridge
SB07. Berry Bridge
SB08. Kangaroo Valley Road Overbridge
SB09. Service Road E Underpass

Scale 1:20000 @ A3

0 0.2 0.5 1 kilometre

N

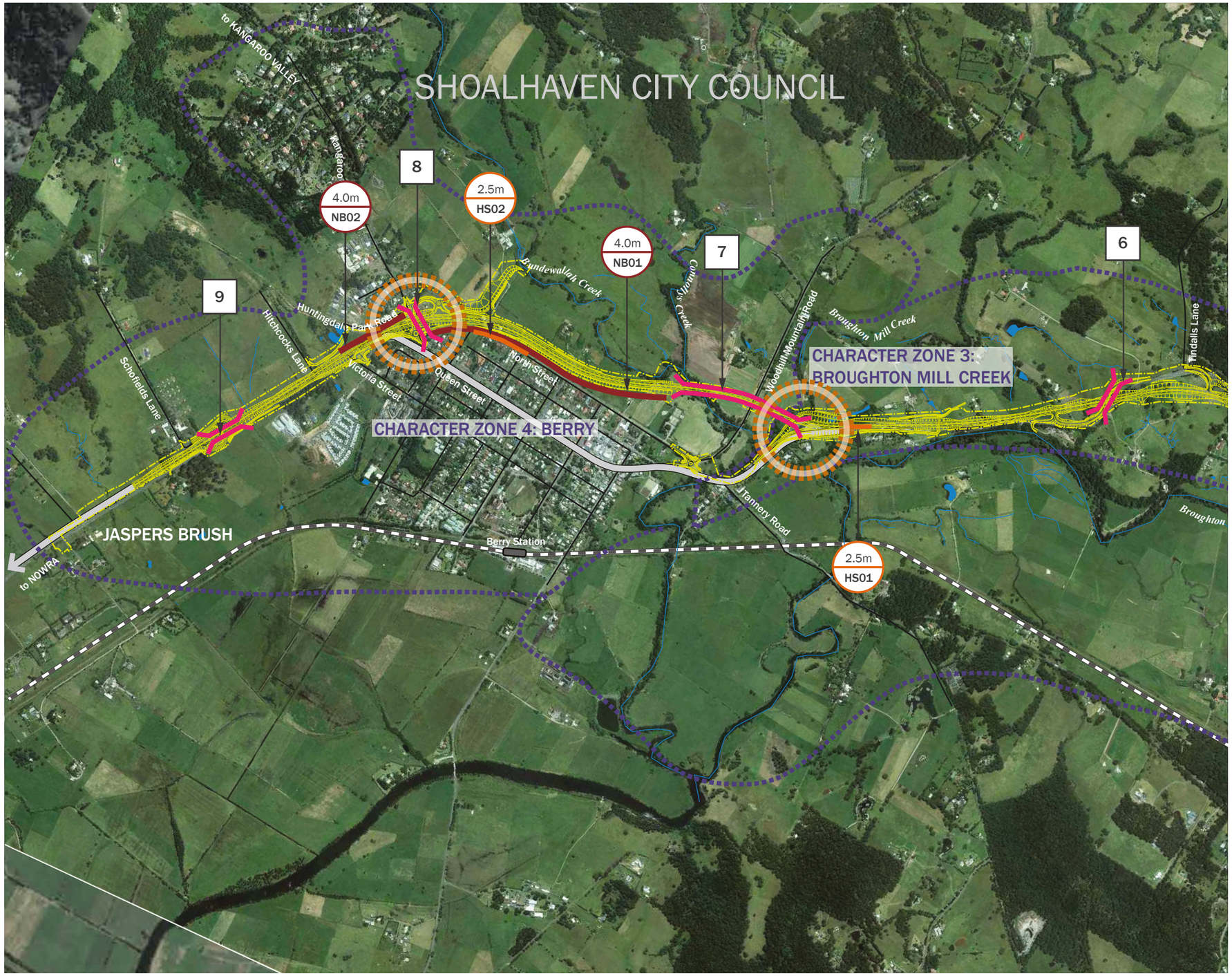
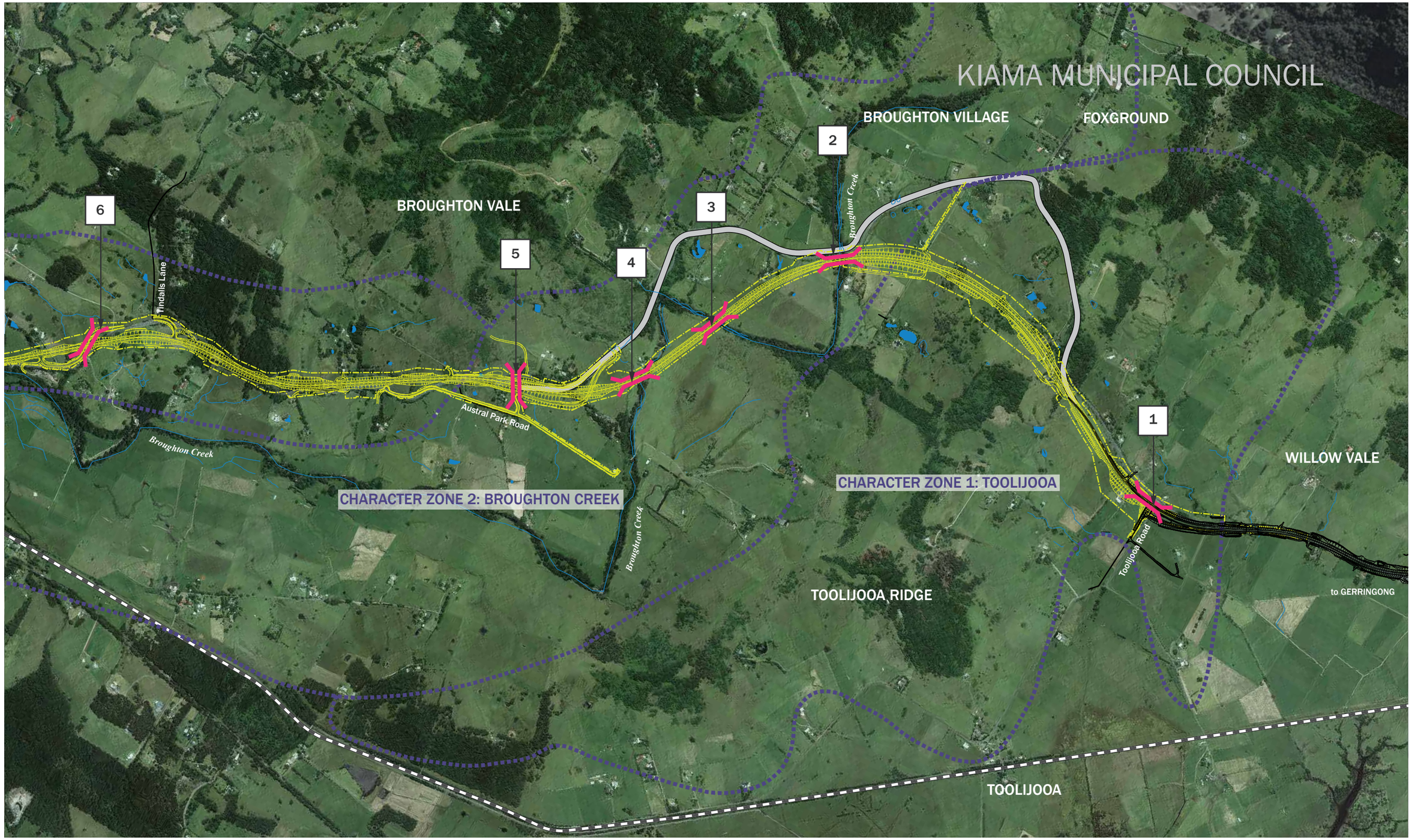


Fig. 6.2: Key plan – Bridges, Noise Barriers, Headlight Screens and Retaining Walls


KIAMA MUNICIPAL COUNCIL
BROUGHTON VILLAGE
FOXGROUND
BROUGHTON VALE
WILLOW VALE
TOOLIJOOA RIDGE
TOOLIJOOA
to GERRINGONG
CHARACTER ZONE 1: TOOLIJOOA
CHARACTER ZONE 2: BROUGHTON CREEK
1
2
3
4
5
6
Broughton Creek
Broughton Creek
Broughton Creek
Broughton Creek
Tindalls Lane
Austral Park Road
Toolijooa Road

6.3.1 BRIDGES

The design of the bridges follows the guidelines described in the Bridge Aesthetics (RTA, 2003) document and SWTC Appendix 15 (Urban Design Performance and Design Requirements).

The following key principles have been adopted in the design of the bridges:

- Bridges are designed as a consistent family, with consideration given to the context of the bridge and the design of bridges on adjoining sections of the Princes Highway.
- The main bridge elements have a smooth finish, clean lines and a minimum structural depth consistent with their spans and method of construction. All bridge elements including piers, parapets, headstocks, sill beams, abutments, transition panels, road traffic barriers and leading edges are fully integrated in the design. Where headstocks are required they are integrated with the pier design.
- The landform associated with bridges blends with the surrounding landscape topography through the easing of batter slopes and adopts a grading solution that considers the slope geometry as part of the bridge design.

The Project is comprised of two local road Overbridges, and seven underpasses of which four are creek bridges, including Berry Bridge. They are:

Highway Overbridges:

- Tindalls Lane Overbridge, providing southbound and northbound access to and from the highway.
- Southern Interchange for Berry at Kangaroo Valley Road, providing connectivity over the highway for Kangaroo Valley Road along its existing alignment.

Local / service road underpasses:

- Toolijooa Road Underpass
- Austral Park Road Underpass
- Service Road E Underpass

Underpasses over creeks and floodplain:

- Broughton Creek Bridge No. 1
- Broughton Creek Bridge No. 2
- Broughton Creek Bridge No. 3
- Bridge at Berry which crosses Bundewallah and Broughton Mill Creek and their floodplains and Woodhill Mountain Road.

EA Concept Design

The concept urban design (*Appendix A – Berry Bypass Urban Design Strategy* -October 2012) focused on two key bridge structures that have been points of discussion with the community. These are:

- Berry Bridge
- Kangaroo Valley Road Bridge

Berry Bridge: With regard to Berry Bridge, six sketch design options were presented to the community of which three have been chosen as preferred by the community. The three preferred options are illustrated below:

- Option 1: Circular columns with integrated headstock (Fig. 6.3)
- Option 2: Portal Frame with integrated headstock (Fig. 6.4 and 6.5)
- Option 4: Circular columns and expressed headstock (Fig. 6.6)

Kangaroo Valley Road Bridge: The Concept Design indicates this bridge to be a special bridge featuring pedestrian and cycle paths on either side of the bridge, planter boxes separating the shared path from the carriageways and a purpose designed safety screen (See Fig. 6.7 and 6.8).

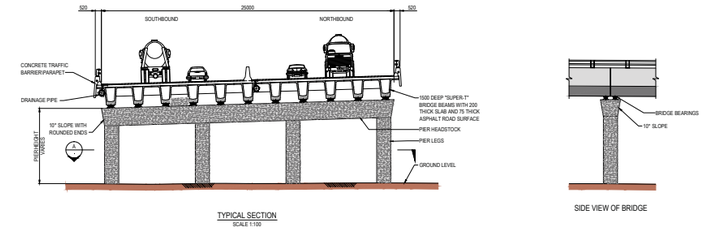
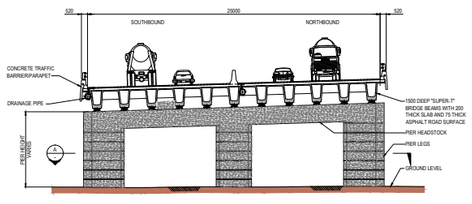


Fig. 6.3: Berry bridge EA Concept Design Option 1: Circular columns with integrated headstock



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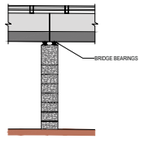
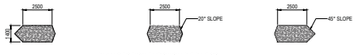
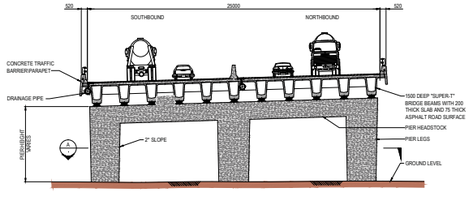
SCALE 1:100



SIDE VIEW OF BRIDGE



PLAN SECTION THROUGH PIER LEGS



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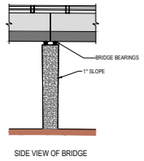
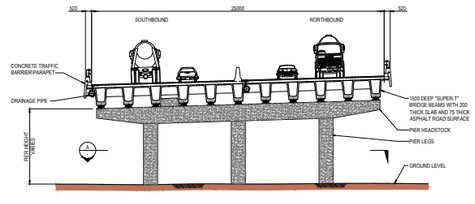


SIDE VIEW OF BRIDGE

PLAN SECTION THROUGH PIER LEGS



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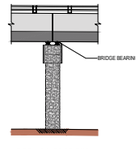
SCALE 1:100



SIDE VIEW OF BRIDGE

PLAN SECTION THROUGH PIER LEGS

Fig. 6.4: Berry bridge EA Concept Design Option 2: Portal frame with integrated headstock - Design 1

Fig. 6.5: Berry bridge EA Concept Design Option 2: Portal frame with integrated headstock - Design 2

Fig. 6.6: Berry bridge EA Concept Design Option 3: Circular columns with expressed headstock

Fig. 6.7: Kangaroo Valley Road Overbridge EA Concept Design - views from footpath on bridge (looking north and south)

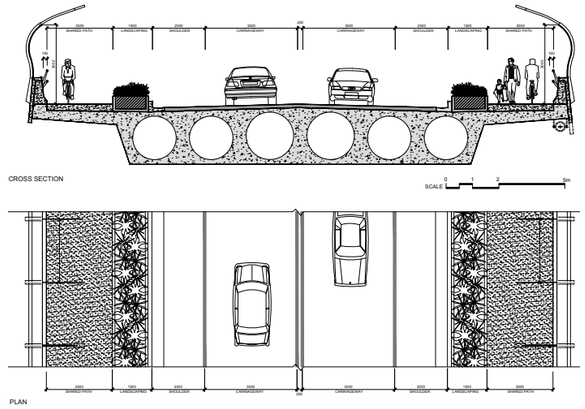


Fig. 6.8: Kangaroo Valley Road Overbridge EA Concept Design - views from the highway (looking northbound and southbound)

Fulton Hogan Design

The Design takes the Roads and Maritime Services Concept Design and its design intent discussions with the community and Roads and Maritime Services requirements as outlined in the SWTC; and subsequent advice received during the positive guidance sessions as a starting point for the design of the bridges and their various related elements.

The following general principles have been applied to the design of the bridges:

Bridge Piers

- Headstocks are integrated with the pier. They are shaped at the ends to ensure an elegant profile.

Bridge Parapets

- Twin steel rail and post system traffic barriers are used to allow through views to the surrounding landscape and to reduce the height of concrete portion of the structure in elevation (Fig. 6.10).
- Bridge parapets will be precast units.
- All bridge parapets incorporate a skirt to provide a drip edge and conceal drainage/ service pipes.

Abutment Finish

- Kangaroo Valley Road Overbridge abutments will feature a natural sandstone finish (Fig. 6.13).
- Retaining wall abutments will feature ribbed concrete panels as deemed necessary to deter graffiti.
- All spill through bridge abutments are finished as rock pitched/ or rock armoured depending on the location. The rock will be sourced from site or local quarries.

Safety Screens

- Tindalls Lane Overbridge will be provided with a safety screen design that is similar to those on the Gerringong Upgrade.
- Kangaroo Valley Road Overbridge will feature a special ‘artwork’ throw screen in keeping with its interchange role and will provide a gateway statement to the Berry township that can be seen from the highway as well as the local road. This artwork will complement the existing Alexander and David Berry Memorial.
- The design of the safety screens is integral with the bridge parapet design and barrier transition panel (Fig. 6.9).

Lighting on Bridges

- In general, no road lighting is to be located on the bridge decks in keeping with the strategy to have lighting located at either end of the bridge where required. Refer to Section 6.3.10.2 below on Lighting.

The specific character of each of the bridges is illustrated in Chapter 7. Refer to Chapter 8 -Urban Design Schedule of Finishes, for details on finishes.

The following design priorities have been identified in terms of the visibility, context and visual impact of the respective bridge:

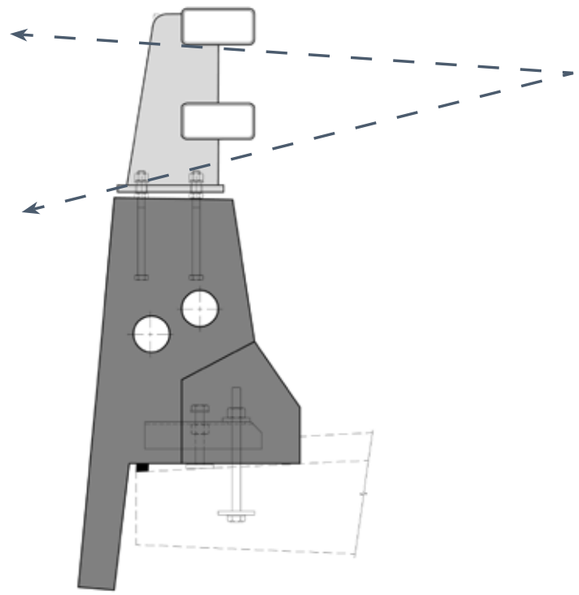


Fig. 6.10: Typical section - Bridge parapet

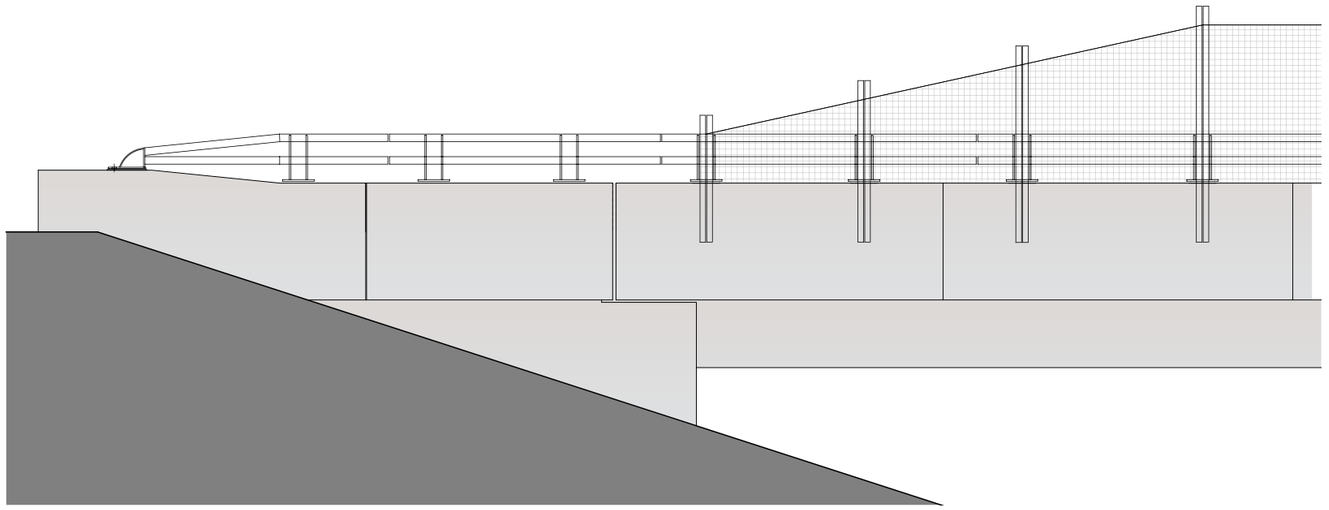


Fig. 6.9: Typical bridge to road barrier transition detail

Fig. 6.11: Perspective view of typical Overbridge - Tindalls Lane Overbridge

Fig. 6.12: Perspective view of typical creek bridge - Broughton Creek Bridge No. 3

Bridge Structure	Priority	Comment
Tindalls Lane Overbridge	1	These three bridges have a high level of visibility from the highway and/or its surroundings, and therefore have a greater visual impact on the surrounding community and motorists. These bridges are elegantly designed to fit well within the natural and built landscape. Whilst the first two are Overbridges of the highway, Berry Bridge is an approx. 600 m long bridge that spans across the floodplain in proximity to the Berry township.
Kangaroo Valley Road Overbridge	1	
Berry Bridge	1	
Austral Park Road Underpass	2	These bridges can be seen from local roads. Whilst they may not have as high a visual impact as the priority 1 bridges, they will be well detailed and finished.
Toolijooa Road Underpass	2	
Broughton Creek Bridge No. 3	2	
Service Road E Underpass	2	
Broughton Creek Bridge No. 2	3	These bridges are not visible from the highway or local roads. Therefore a lesser degree of emphasis can be placed on their design. However, for consistency through the Project these bridges have been designed to be consistent with the design for Berry Bridge.
Broughton Creek Bridge No. 1	3	

Table 6.1: Bridge design priorities

Bridge	Design	Comment
SB01. Toolijooa Road Underpass	Single span underpass with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: N/A	▪ Priority 2 bridge. ▪ 3.0m wide shoulders on highway for cyclists.
SB02. Broughton Creek Bridge No. 1	Multiple span bridge with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: Two rectangular columns with an integrated headstock.	▪ Priority 3 bridge. ▪ 3.0m wide shoulders for cyclists.
SB03. Broughton Creek Bridge No. 2	Multiple span bridge with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: Two rectangular columns with an integrated headstock.	▪ Priority 3 bridge. ▪ 3.0m wide shoulders for cyclists.
SB04. Broughton Creek Bridge No. 3	Multiple span bridge with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: Two rectangular columns with an integrated headstock.	▪ Priority 2 bridge. ▪ 3.0m wide shoulders for cyclists.
SB05. Austral Park Road Underpass	Single span underpass with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: N/A	▪ Priority 2 bridge.
	Options considered: *Single span Overbridge with spill through abutments with a rock pitched finish.* *Girder type: Box Girder* *Pier type: N/A*	▪ *Priority 1 bridge.* ▪ *Safety screen as per Gerringong Upgrade.* ▪ *2.5 and 3.0m wide shoulder for cyclists.*
SB06. Tindalls Lane Overbridge	Single span Overbridge with spill through abutments with a rock pitched finish. Girder type: Box Girder Pier type: N/A	▪ Priority 1 bridge. ▪ Safety screen as per Gerringong Upgrade.
SB07. Berry Bridge	Multiple span bridge with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: Two rectangular columns with an integrated headstock.	▪ Priority 1 bridge. ▪ 3.0m wide shoulders for cyclists.
	Options considered: *Multiple span bridge with spill through abutments with a rock pitched finish.* *Girder type: Super-T* *Pier type: Three rectangular columns with an integrated headstock.*	▪ *Priority 1 bridge.* ▪ *3.0m wide shoulders for cyclists.*
	Multiple span bridge with spill through abutments with a rock pitched finish. *Girder type: Super-T* *Pier type: Three rectangular columns (portal type) with an integrated headstock.*	▪ *Priority 1 bridge.* ▪ *3.0m wide shoulders for cyclists.*
SB08. Kangaroo Valley Road Bridge (see Entrance Strategies Section 6.3.4)	Single span Overbridge with sandstone clad reinforced soil retaining wall abutments. Girder type: Voided slab Pier type: N/A	▪ Priority 1 bridge. ▪ Is proposed to be a gateway town entry statement (see Entrance Strategies below). ▪ Retaining wall abutments be finished in natural sandstone. ▪ Safety screen is to be an 'artwork' screen. ▪ 2.5m shared path on either side. ▪ Illumination level calculations indicate that street lighting at either end of the bridge adequately illuminates the bridge for pedestrians. Therefore the design doesn't propose additional pedestrian lighting.
SB09. Service Road E Underpass	Single span underpass with reinforced soil retaining wall abutments. Girder type: Plank Pier type: N/A	▪ Priority 2 bridge. ▪ Ribbed R.E. Panels to discourage graffiti ▪ 3.0m wide shoulders for cyclists.

Table 6.2: List of bridges on the Project

BERRY BRIDGE - DESIGN DEVELOPMENT

EA CONCEPT DESIGN - BRIDGE PIER DESIGN

PIER DESIGN
OPTIONS CONSIDERED

Rectangular columns with integrated headstock

Circular columns with expressed headstock

Circular columns with integrated headstock

PIER DESIGN
OPTIONS CONSIDERED

Rectangular columns with integrated headstock - three column pier

Rectangular columns with integrated headstock - two column pier

Proposed Bridge Design

Proposed Bridge Design

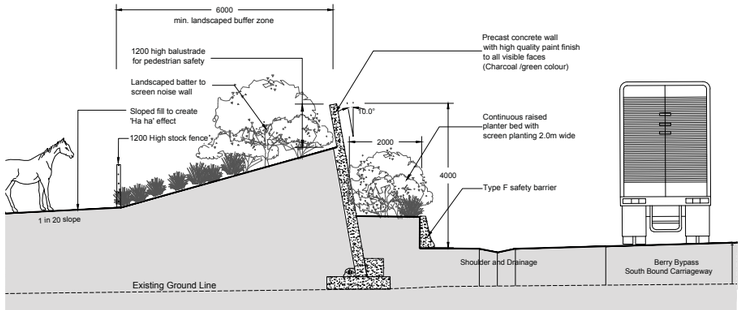
KANGAROO VALLEY ROAD OVERBRIDGE - DESIGN DEVELOPMENT

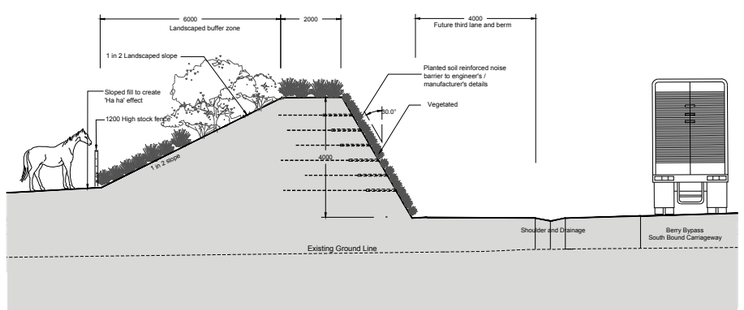
Fig. 6.13: Perspective view of Kangaroo Valley Road Overbridge from the highway

Artwork screen as a gateway statement celebrating Berry from Kangaroo Valley Road (to be further developed in consultation with the community and Council)

Low shrub and ground cover planting at roundabout to reinforce the arrival experience to Berry

Fig. 6.14: Perspective view of Kangaroo Valley Road Overbridge from the pedestrian path on the bridge





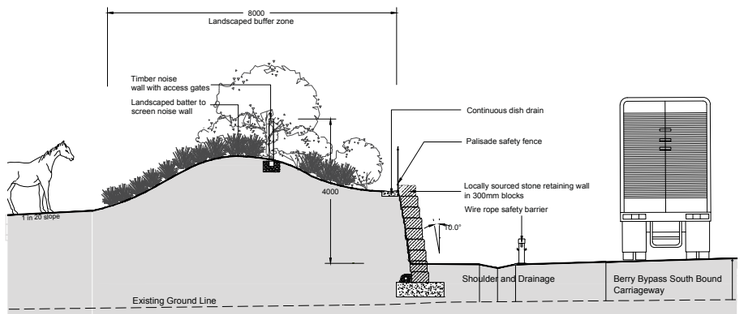


Fig. 6.15: North Street noise barrier EA Concept Design option 1 – precast concrete wall (Source: EA Appendix I, Roads and Maritime Services, 2012)

Fig. 6.16: North Street noise barrier EA Concept Design option 2 – planted soil reinforced mound

Fig. 6.17: North Street noise barrier EA Concept Design option 3 – combined stone wall and timber fence

6.3.2 NOISE BARRIERS AND HEADLIGHT SCREENS

The design of noise barriers and headlight screens on the Project is based on the principle that walls are to be avoided where possible. Preference has been given to the provision of landscaped mounds where possible or half wall/ half mound and the provision of walls where neither of these are feasible due to the availability of space.

There are two noise barriers on the Project. They are at:

- NB01: North Street
- NB02: Huntingdale Park Road

There are two headlight screens on the Project. They are at:

- HS01: Chainage 15430 to 15485
- HS02: Chainage. 16930 to 17280

Landscape headlight screens are proposed in a number of locations. These occur where there is sufficient space to enable vegetation to be used to provide screening. This is typically 5m wide and is to consist of a mix of plant sizes but with a core of advanced plants to ensure that the screen is effective at the time of opening. In some instances a Type F barrier is used in association with planting to provide both a barrier but also to assist in the interruption of headlight glare.

Locations are:

- PS01: Chainage 16935 to 17320
- PS02: Chainage 17720 to 17880
- PS03: Chainage 18030 to 18130
- PS04: Chainage 18515 to 18570
- PS05: Chainage 18810 to 18880

EA Concept Design

The concept urban design (Appendix A – Berry Bypass Urban Design Strategy -October 2012) presents three options for the noise barrier at North Street. These are:

- Option 1: Precast concrete wall (Fig. 6.16)
- Option 2: Planted soil reinforced mound (Fig. 6.17)
- Option 3: Combined stone wall and timber fence (Fig. 6.18)

It is understood that these three options have been presented to the North Street Working Group and exhibited community wide. Appendix 15 of the SWTC requires the consideration of these three options in the design development stage.

Fulton Hogan Design

The Design takes the EA Concept Design and its design intent, Roads and Maritime Services discussions with the community to date, Roads and Maritime Services requirements in the SWTC, and subsequent advice received during the positive guidance sessions as a starting point for the design of the noise barriers and headlight glare screens.

The design of the noise barriers and headlight screens complies with the requirements in the SWTC Appendix 15 (Urban Design Performance and Design Requirements). The design of the noise wall also follows the guidelines described in RTA D&C R271. They are designed as a part of a family of structures including bridges and retaining walls, and their finishes are determined by their proximity to the visual receptors and the availability of landscape screening. They present a coherent visual experience along the route.

In general the design of walls is guided by the following principles and strategies:

- Minimise the provision of walls as barriers through the use of landscaped mounds, a combination of mounds and half walls, landscape screens or Type F barriers (where the latter is required for road safety).
- Where walls are required, they will have a minimum 2m zone of landscape on either side of the wall to reduce the visual impact of the walls on the highway and adjoining properties. The landscape zone will also act to discourage graffiti (Fig. 6.21).
- Headlight screens only have planting to the highway side of the barrier as their construction is in association with a Type F barrier which addresses the local road.
- The tops of walls have a smooth flowing profile and avoid stepping.
- Long-term maintenance has been considered in the design and specification of finishes.
- The painted finish to the noise wall enables the easy maintenance of graffiti and the proposed dark colour aids the visual reduction of the scale of the wall enabling it to recede behind the vegetation screening. Both sides of the wall are finished to an equivalent quality. The headlight screens will also be finished to an equivalent quality on both sides.
- Wall end transitions are provided so that the walls appear to emerge from the ground in the case of noise walls (Fig. 6.25). In the case of headlight screens the wall end transitions ensure an elegant and gradual termination to the wall.

The specific character of the design of the noise wall and headlight screen is illustrated further in Chapter 7. Refer to Chapter 8 - Urban Design Schedule of Finishes, for further details on finishes.

Noise Barriers	Design	Comment
NB01 - North Street	Landscaped mound	The 4.0 m high mound will be sloped on the resident's side at 4h:1v – 2h:1v (varies) and the highway side at 2h:1v enabling landscape to be established on the mound. It will also have a 20:1 slope on the North Street side from the existing road reserve boundary. The landscape on the mound will be low level to ensure that views to the escarpment are not obstructed and the mound is integrated with the existing context. Treatment to the resident's side is primarily grasses to integrate with the context.
NB02 - Huntingdale Park Road	Mound solution	Minimise the extent of the 4.0 metre high barrier by providing a mound option in negotiation with Council. Whilst the mound will be on the Roads and Maritime Services road reserve, the mound would impact on an existing retaining wall and a proposed sewer line. The wall will be fronted by a 3.0 - 3.5 m wide landscape zone to the highway side and a min. 2 m wide landscape zone to the resident's side.
	Options considered: Noise wall	The approach to the design of this 4.0 m high wall is to provide a simple design with a recessive colour and dense landscape screening on either side of wall (3.0- 3.5 m wide zone on the highway side and a zone of varying width on the residents side to minimise its visual impact on the motorist as well as the adjacent residential properties.
Note: Mark Radium Park	N/A	The requirement for noise attenuation at Mark Radium Park was investigated. The noise modelling indicated that there was minimal exceedence to its current noise level and, therefore, noise attenuation was not required. The landscape design maintains passive surveillance from the local roads while screening the park from the highway. Refer Volume III (viii).

Headlight Screens	Design	Comment
HS01	Expanded metal louvre mesh on Type F barrier.	The expanded metal louvre mesh matches that used for headlight glare screens in the Gerringong Upgrade. The louvres allow through views in one direction (opposite traffic) and blocks views (and headlight glare) in the other direction (Fig. 6.32).
HS02	Type F barrier at 820 mm high on top of batter.	The total height of 2.5 m is achieved by the height of the landscaped batter and the 820 mm high Type F barrier.

Table 6.3: Schedule of noise wall types and finishes

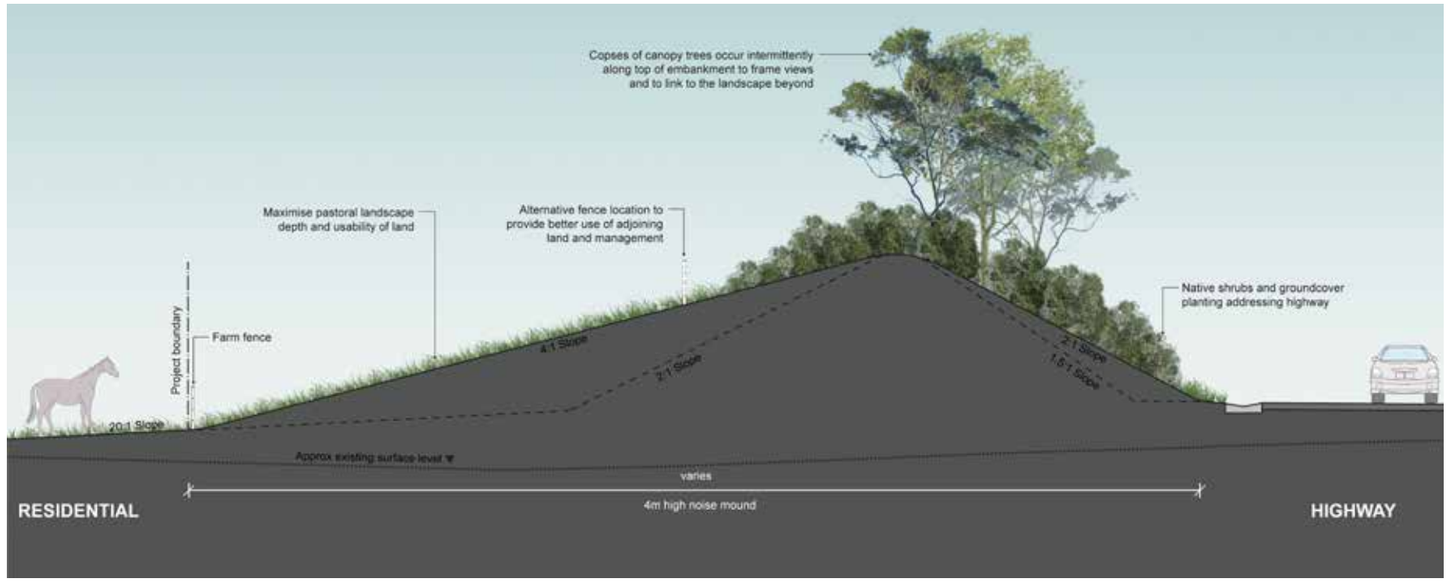


Fig. 6.18: North Street noise barrier NB01 - Design: proposed typical cross section

Fig. 6.19: North Street noise barrier NB01 - Design: proposed view from highway

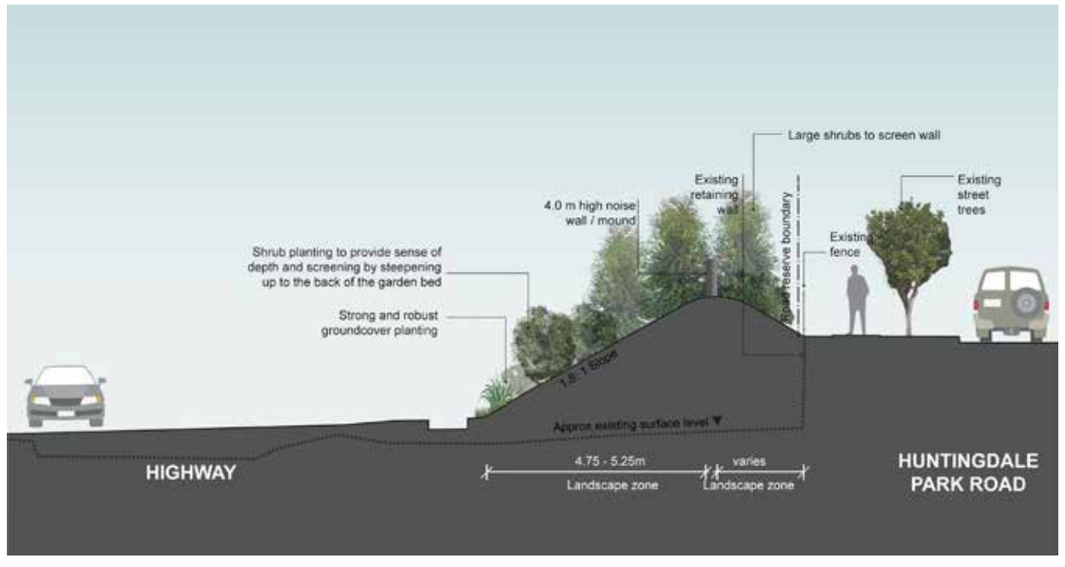


Fig. 6.20: Huntingdale Park Road noise barrier NB02- typical cross section of the proposed wall/ mound

Fig. 6.21: Huntingdale Park Road noise barrier NB02- typical cross section of the proposed wall/ mound

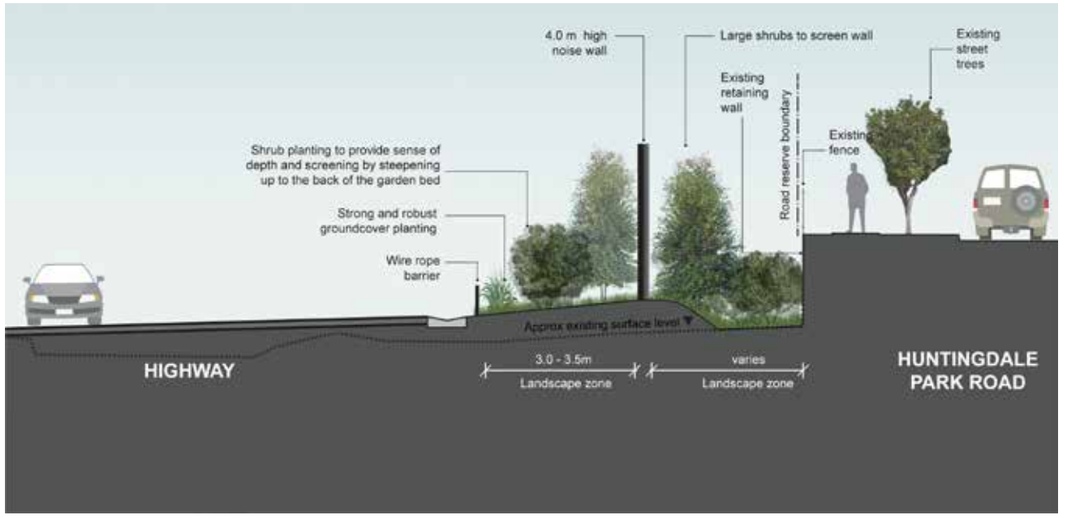


Fig. 6.22: Huntingdale Park Road noise barrier NB02 - Option considered. Typical cross section

Fig. 6.23: Huntingdale Park Road noise barrier NB02 - Option considered. View from highway

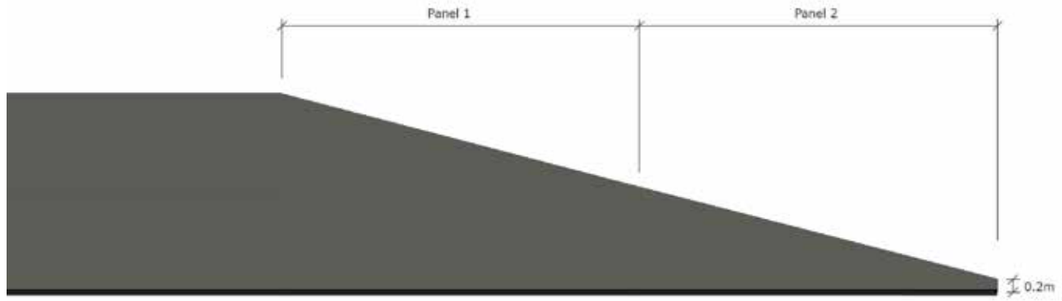


Fig. 6.24: Elevation - Noise Wall termination detail

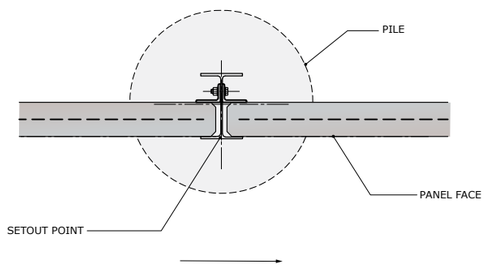


Fig. 6.25 Typical fixing detail for the web-fixed panel arrangement (NTS)

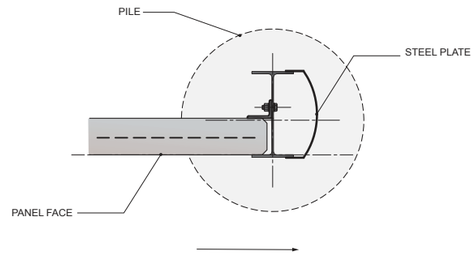


Fig. 6.26: Plan - wall termination detail (NTS)

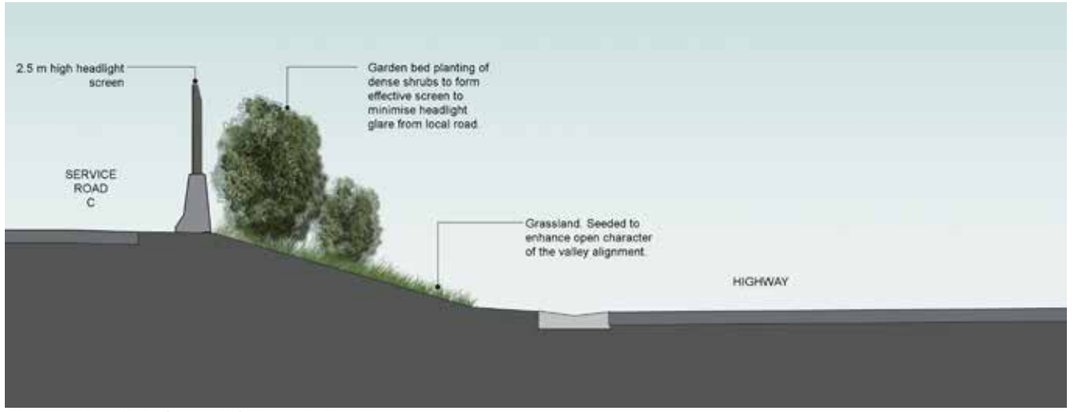


Fig. 6.27: Headlight Screen HS01 - typical section

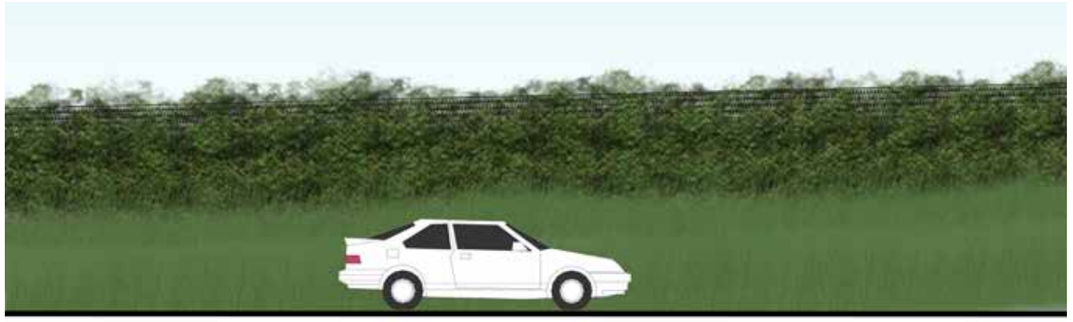


Fig. 6.28: Headlight Screen HS01 - elevation from highway

Fig. 6.29: Example of a louvre mesh headlight screen

6.3.3 ENTRANCE STRATEGIES

The town entrance statements will comprise a combination of landscape treatments, road design, and strategically placed artworks including the relocation of the existing Alexander and David Berry Memorial. The final location of the Memorial will be confirmed in consultation with the Shoalhaven City Council, the artist and the community.The existing Kiama Municipal Council area and Shoalhaven City Council area entry statements will also be relocated in consultation with the two councils, where they are affected by the Project.

Northern Berry town entry statement: The northern entry to Berry when travelling southbound is visually separated from the township. Therefore it is proposed that the Alexander and David Berry Memorial is relocated slightly to the north of Berry Interchange, prior to the turn off to Berry town (See Chapter 7). At present this memorial is a key visual marker for Berry town and is currently located to the west of the alignment at the Berry Rest Area. It is made of corten weathering steel resulting in a warm rust coloured coating. Its setting midway up the ridge provides views to the escarpment, but views of the town and its valley are restricted by vegetation cover and topography.

The Berry Memorial will be located within a landscaped open setting adjacent the southbound carriageway in a section of the alignment which is located on the eastern edge of the ridge and defined by existing vegetation. The location is level with the proposed alignment and contains clear sightlines from a distance – both northbound and southbound. The setting for the sculptures is to reflect some of the qualities of the existing site in terms of materials but is not to provide for the stopping of vehicles.

Southern Berry town entry statement: The bridge at Kangaroo Valley Road will be a visual marker for Berry, viewed by motorists using the highway as well as pedestrians and local traffic using Kangaroo Valley Road. It will also be the southern Berry town entry statement (Fig. 6.34).

Kangaroo Valley Road Overbridge is designed to complement the unique character of Berry town and stand out as a key visual marker. It is designed to have the following features:

- Sandstone finish to abutments giving it a distinctive character from the highway and connecting with the local character of Berry (Fig. 6.34).
- Artwork safety screen which will be viewed by both vehicular traffic and pedestrians from the highway as well as Kangaroo Valley Road. The colour of the artwork will be rust coloured to complement the Alexander and David Berry Memorial at the northern entry in to town (Fig. 6.33).
- Pedestrian and cycle paths on both side of the bridge connecting to the local footpaths on either side of the bridge – east and west (Fig. 6.34).

Fig. 6.30: Alexander and David Berry Memorial town entry sculptures - to be relocated

Fig. 6.31: Kangaroo Valley Road Overbridge to be design detailed as a town entry statement

6.3.4 EARTHWORKS, LANDFORM AND SLOPE STABILISATION

The landscape and topography of the alignment have a strong influence on its character. The undulating rolling grasslands are synonymous with the South Coast. The construction of the road formation could interrupt this flow. This has been identified both in the community responses but also the design responses described in the Environmental Assessment.

In light of this considerable effort will be devoted to ensuring the integration of the earth form. This will be achieved through the undertaking of contour modelling of key slopes and ensuring that the maximum grade of 2H:1V is not adopted as a standard with variable grades and flatter slopes used where appropriate.

Cuts

A cutting is an excavation into the natural ground profile. Its form and treatment are influenced by the differing layers through which it passes. Harder materials enable the adoption of steeper batter profiles and reduced footprint but limits the potential for revegetation, whereas softer less stable material requires a broader footprint due to a shallower profile but is more readily revegetated. The geology through which the road passes has a distinct interface between hard and soft materials with minimum transition through the profile.

The design response for cuttings reflects the need to both integrate with the surrounds and the need for these strategies to be refined based on the changing ground conditions.

Cuttings will generally be shaped to integrate with the local landform. This will involve the use of a number of strategies to achieve this objective. These include:

- The feathering of the edges of the cuts so that they transition and move gradually into the steeper form of the cutting. The length and nature of the feather will be responsive to the adjoining natural slopes.

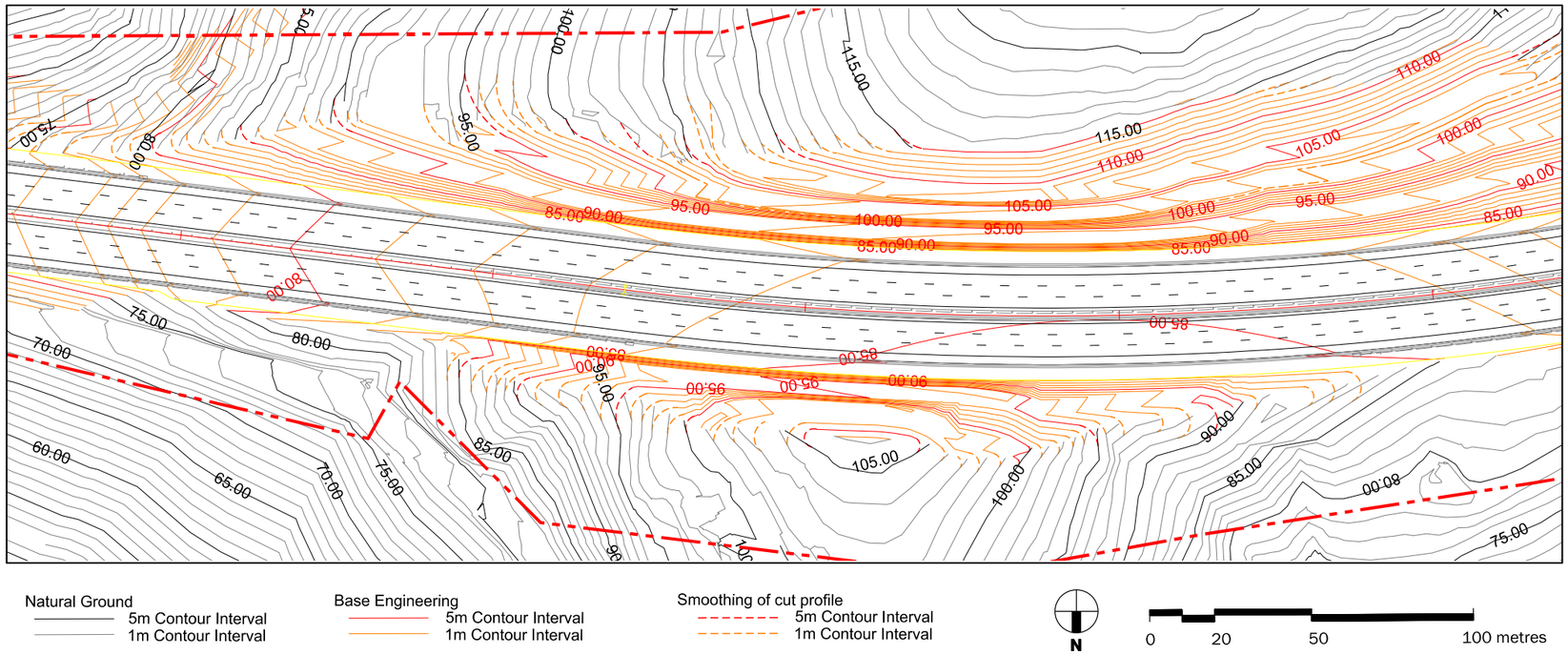


Fig. 6.32: Toolijooa cutting - grading response

- The laying back of the cut as it reaches the leading edges of the existing ground/cut face interface will be provided with a transitional slope which smoothly rounds the batter into the adjoining surface.
- The revegetating of batter slopes and benches must occur unless within hard stable rock. This will involve the respreading of topsoil on to the batter slope. Topsoil will only be respread on slopes equal to or flatter than 1.5h:1v.

Toolijooa cut is the most significant of the cuttings both in terms of its scale (around 900 metres long and up to 26 metres deep), but also its visual impact within the landscape. Its integration within the surroundings is a vital component of the Project. The strategies adopted here are:

- ensuring close to vertical cuttings and steepened rock batters determined by the strength of the rock, are used to minimise the overall footprint of the cutting. This has been developed with consideration for the potential need for shotcrete should the material not meet expectations.
- maintaining the cutting benches at a consistent profile and in parallel with the vertical geometry of the highway.
- providing a smooth, rounded edge at the top of the cutting and re-establishing the natural vegetation community. In doing so, a balance has been sought in the design between the maintenance of the Seven Mile Beach NP-Barren Ground Nature Reserve Wildlife, the blending with the existing vegetation cover to either side of the corridor and the establishment of a cover which is both stable and robust in the long term.
- benches will be located where the rock material moves from soft to hard in order to achieve the vertical cut faces and a clear cut line.
- establishing vegetation at the top and to the edge of the cutting to provide visual integration with the adjacent landscape and to satisfy environmental requirements for fauna connectivity.
- enclosing the view at the end of the cutting to frame views.
- the grading response for the design is depicted in Figure 6.35 (response for Toolijooa cut). This illustrates the adoption of these key strategies for integration with the surroundings, including feathering and rounding of the leading edge of the cut.

Embankments

Embankments play a significant role within the landscape, particularly in the valley floors where the road needs to be nestled in the landscape with slopes transitioned and manipulated so that the eye flows over the formation rather than being stopped by it. Key to addressing the integration of embankments will be:

- The revegetation of embankment batter slopes so that they present a consistent vegetation cover to the landscape to which they adjoin.
- Addressing the existing ground/batter interface so as to avoid obvious junctions between the embankment and the existing ground.
- Slopes will be responsive to the slopes of the adjoining natural terrain - flatter where the slope is shallowest and steeper where the land is steepest. Surplus or unsuitable material will provide the opportunity for slopes to be eased and where embankments are used will widen the footprint but lessen the grade, enhancing access and maintenance and blending the formation within the landscape.

6.3.5 USE OF SHOTCRETE

The introduction to the RTA *Shotcrete Design Guidelines* (June 2005) states the following with regard to untreated shotcrete: “Although it is cost effective and useful, when used in its natural, untreated state, it is intrusive particularly in highly sensitive urban or rural areas” (Page 5). Architecturally treated shotcrete is appropriate for localised “patching” to stabilise unstable areas on rock surfaces. The finish to the shotcrete, if required, will be guided by requirements set out in Appendix 15. The exposed areas of sprayed concrete will be coloured and textured to match the colour and striation of surrounding rock (Fig. 6.35) as recommended in the RTA guidelines on the use of shotcrete.

No areas of exposed shotcrete have been proposed as part of the new visual elements immediately adjacent to the main carriageway. Its use has been avoided through alternative treatments or appropriate design and grading.

Fig. 6.33: Shotcrete finish to match adjacent rock (shotcrete section at centre of photo)

Some small areas of patching may be required in the exposed rock cuts to stabilise specific areas. Exposed shotcrete will not be used around the curtilage of bridges. Refer to Chapter 8 - Urban Design Schedule of Finishes, for further details.

6.3.6 BUS FACILITIES

With regard to the provision of bus interchange facilities, the Design proposes,

- The current bus interchange facility at Tindalls Lane is retained.
- A new bus interchange facility will be provided at Toolijooa Road and Mullers Lane.

This will enable existing bus routes to continue to function.

6.3.7 CYCLIST AND PEDESTRIAN PROVISIONS

Pedestrian and/ or cyclist facilities will be provided at the following locations:

- On road cyclists provision is provided on the highway shoulders throughout the upgrade.
- A shared pedestrian path/cycleway along the southern side of the upgraded highway from the playing fields connecting North Street to Queen Street. This is to connect to the existing shared path at Berry Sports Ground.
- A shared pedestrian path/cycleway on either side of Kangaroo Valley Road linking Berry township via Queen Street and the residential development to the west via Kangaroo Valley Road.
- A shared pedestrian path/cycleway connecting Queen Street to Mark Radium Park.
- A link to Rawlings Lane from Kangaroo Valley Road.
- The alignment of paths has sought to consider the retention of existing trees and the provision of additional trees for the provision of shade and the creation of a sense of separation from the adjoining roadways. This will be further developed at detailed design stage.

6.3.8 INTERCHANGES

Grade-separated interchanges will be provided at:

- Toolijooa Road.
- Austral Park Road.
- Tindalls Lane.
- East of Berry at the existing Princes Highway, referred to as the Berry Northern Interchange.
- West of Berry at Kangaroo Valley Road referred to as the Berry Southern Interchange.
- Service Road E (Shoefields Lane).

With the exception of the Berry North and South Interchanges the majority of these are local road interchanges, the strategy for which is generally to keep these as simple unassuming interchanges integrated to the context.

In addition to these, a number of small local road connections are provided.

6.3.9 ROAD FURNITURE

Fences

Fencing is required to the road corridor as a means of defining the boundary, restricting fauna movements, and securing detention basins. The typical fence for the corridor is a five strand stock fence. Posts will generally be concrete with a design life as required. In the developed area around Berry, where required to restrict unauthorised access to the main alignment, the fence type will adopt the use of a chainmesh fence to secure the road from pedestrian access.

Fauna fences are to be used in identified fauna movement corridors to encourage the use of underpass and to reduce the potential for conflicts with motorists. Fauna fences will be set back from the road edge to minimise impact of these fences on the visual environment of the road corridor.

For basins the need for fencing will be risk assessed and if required this will be a galvanised chainmesh fence, set as far as possible from the road with vegetation used to strategically reduce its impact.

All steel handrails and fencing posts are black or galvanised depending on their location and proximity to the highway.

Lighting

The Project is generally an unlit highway. However, lighting will be provided as required by the SWTC at interchanges and local road intersections (refer Lighting drawings for further detail). No provision has been made for street lighting on footpaths or shared pathways. Highway lighting will be limited to grade-separated interchanges. Lighting has been designed in accordance with AS 4282-1997.

Road lighting is directed onto the road to provide the required lighting levels. The design of lighting ensures that light spillage into residential properties and other sensitive areas is minimised. The management of light on entry into the Berry township from interchanges is a critical concern in both establishing legibility of the town from the highway while minimising impacts on the adjoining community.

Signage

Signage plays an important role in the functioning of the highway, providing early warning for exits to town centres and advice regarding services offered in the towns. Signage will be minimised and considered in a holistic manner in relation to views, structures and landscape. Signs will not be located freestanding above the horizon line and planting will generally be used as a means of providing a backdrop to signage.

Existing tourism and other Council signage will be relocated or retained in their current location in consultation with Kiama Municipal Council and Shoalhaven City Council.

6.3.10 FAUNA CROSSINGS

Fauna crossings will be provided to address the needs of the road corridor and the safety of roads users and fauna alike. Crossings will consist of underpasses and rope bridges to provide for the key local fauna identified as part of the EA process. The Fauna Crossing Report will be developed by suitably qualified experienced ecologist. Fauna fencing will also be provided to ensure maximum efficiency of the structures.

Dedicated fauna underpasses will be provided at Chainages 8450, 12770, 13320 and 13680. At chainage 13320 fana underpass is combined with drainage. Bridge underpasses will provide additional crossing opportunities at Chainages 9950, 10700, 11200, 12785 and 16000.

Bridges and culverts across creek lines will provide further opportunities for fauna to cross and addresses the requirements of fish-friendly passage as determined as part of the Ministers Conditions of Approval and the requirements of the Department of Fisheries.

Refer to Fauna Crossings Report for Fauna management and details of individual crossings. The Fauna Crossing Report has been developed in consultation with OEH and DPI.

In addition to these requirements the landscape design will be responsive to the wildlife corridors identified as part of the context review and reinforce where possible these connections through the provision of appropriate planting.

6.3.11 DRAINAGE

Drainage can potentially have a significant influence on the character and appearance of the road corridor and its landscape treatments. Care will be taken to ensure that the drainage is considered and integrated with both the formation and structures associated with the road. As part of the drainage response the use of concrete lined drainage channels and rock mattresses will be minimised where possible in favour of vegetated drains or rock armoured channels.

Fig. 6.34: Naturalistic treatment to creek realignment

The alignment of channels will be informal and not rigid, responding to the topography and interfacing with the road formation.

Vegetated Channels

Vegetated channels will be provided wherever water velocities allow the use of them. The design has maximised the use of vegetated channels (Fig. 6.37), which assist in both the cleaning of water but also assist in the integration of the drainage with its landscape context. The vegetated nature of these drains ensures that velocities are reduced and the potential for sediment to be removed from the water column is maximised.

Fig. 6.35: Example of a concrete lined channel

The realignment of a number of creeks, including Bundewallah Creek where it passes under the Berry Bridge, will require an approach which maintains the creek character while providing a channel alignment which is compatible with the overall bridge structure in the short to long term. To this end a combination of rock armouring and vegetated treatments are to be used so that the overall feel of the creekline remains a vegetated creek corridor. This will ensure both visual continuity and the maintenance of the creekline as a wildlife corridor. Refer Volume III (ii) – Drainage Design.

Concrete Lined Channels and Gutters

Where the use of concrete lined channels (Fig. 6.38) is unavoidable due to steep gradients, the location and finish of the channel will be considered. Concrete channels will only be used where velocities of flow cannot be contained by rock or vegetation. Concrete channels will not be used in swamplands or floodplains where water naturally ponds. Channels that are located in highly visible areas will be coloured, using dark unobtrusive colours consistent with the natural rock colour and recede into the landscape. Less visible channels will remain uncoloured. Landscape is used to assist in reducing the visual prominence of drains where possible by providing screening or visual foil to the drain.

Town Creek diversion channel will have a concrete invert to prevent erosion as prescribed in the SWTC.

Basins

Basins form a significant component of the water treatment chain. The final form of a basin will be determined by its context and grading so that the visual impact of the basin is minimised. Basin shapes will be refined as part of the detailed design. In principle the shape of basins will be natural in appearance and not geometric or rectangular in form.

The topography of the site requires basins located on side slopes. The placement on these slopes is to be carefully considered with the basins being designed to sit along the contour rather than across it. This will limit the scale of cut and fill required to construct the basin and ensure that revegetation particularly of the cut slope is effective.

The impact of the basins will be moderated by landscape treatments, which have adopted a strategy that either screens the leading edge of the basin or expresses the basin as part of the landscape setting.

Where a filtration system has been identified this is to consist of a bio filtration channel, or bed consisting of a specialised soil medium and planting. This system will ensure the compliance of the drainage system with output targets.

The impact of the basins will be moderated by landscape treatments adopting a strategy which either screens the leading edge of the basin, or expresses the basin as part of the landscape setting.

The Design of the basins has meant that a full bio filtration system is generally not required to achieve performance targets. Where a filtration system has been identified this will consist of a bio filtration channel consisting of specialised soil medium and planting.

7. URBAN AND LANDSCAPE DESIGN CONCEPT PLAN

7.1 THE FULTON HOGAN DESIGN

The following chapter presents the landscape and urban design response which has been designed to ensure the best fit of the alignment within its context. The Design presented is responsive to the design illustrated in the environmental documents, community submissions and input provided to various design elements. Particular attention has been paid to the areas of key community concerns.

The overall driving principles of the Design have been led by the natural land form and communities, and the social and cultural influences specific to the area that occur along the alignment and to develop these in a manner which informs the drivers response and enables a sense of progress and connection to the landscape through which the alignment passes.

The landscape design has been developed in consideration of the heritage assessment and in particular the heritage values of the TRACL, SICPH CL and the Berry District Landscape Conservation Area.

The Fulton Hogan response is presented within the four Character Zones identified as part of the context analysis.

7.2 COMMUNITY CONSULTATION DURING DETAILED DESIGN PHASE

Community consultation will be undertaken during design development in the detailed design phase. This is considered particularly important with regard to design areas and elements that have been key points of discussions to date with the community.

7.3 CHARACTER ZONE 1 - TOOLIJOOA

7.3.1 INTRODUCTION

Character Zone 1 runs from the intersection of the alignment with the Gerringong Upgrade works at Toolijooa Road to the southern side of the Toolijooa Ridge at the cut/fill interface. Within this landscape the critical issue is the crossing of Toolijooa Ridge. Toolijooa Ridge is a landmark within the alignment, being the highest point and part of a ridge, which runs from the escarpment to the coast. It has significance to the Aboriginal community as both an historic route of travel, but also their relationship with the land. The ridge has a broader cultural significance encapsulating the scenic qualities of the South Coast and its rolling hills at the base of the escarpment.

The landscape response has been to respond to the issue of connection and integration. Toolijooa Ridge forms the largest cutting of the route. The cutting occurs in hard rock and so has enabled the sides of the cut to stand near vertical (0.25h:1v) in order to minimise land take. As the cutting moves into weaker material the batter slope is reduced and the batter will be laid back. Only the upper bench and above are suitable for vegetating due to the underlying rock strength. Revegetation of this upper slope will adopt a plant mix which reinforces the Warm Temperate Layered Forest.

Fig. 7.1: Aerial view of Character Zone 1

7.3.2 PLANS

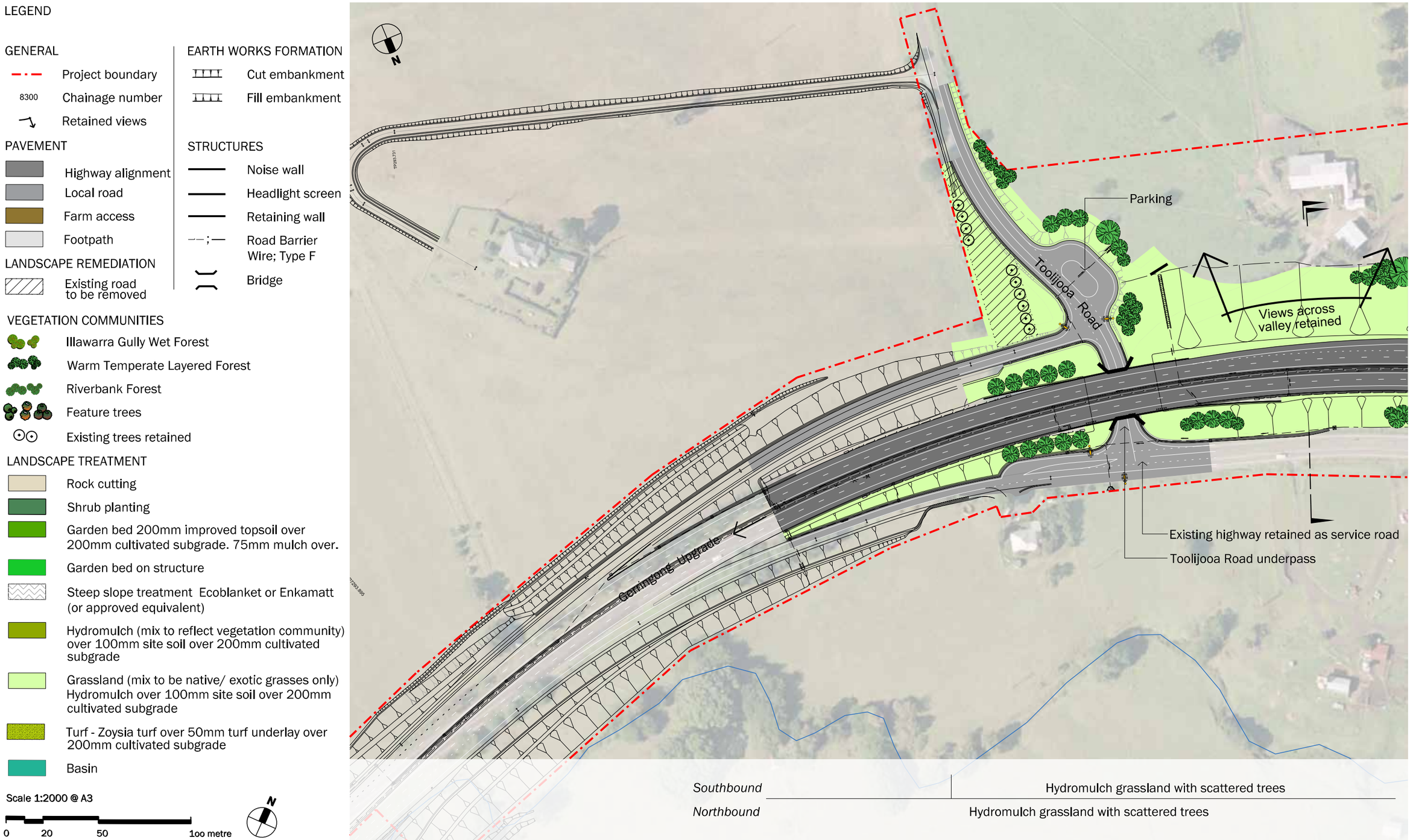
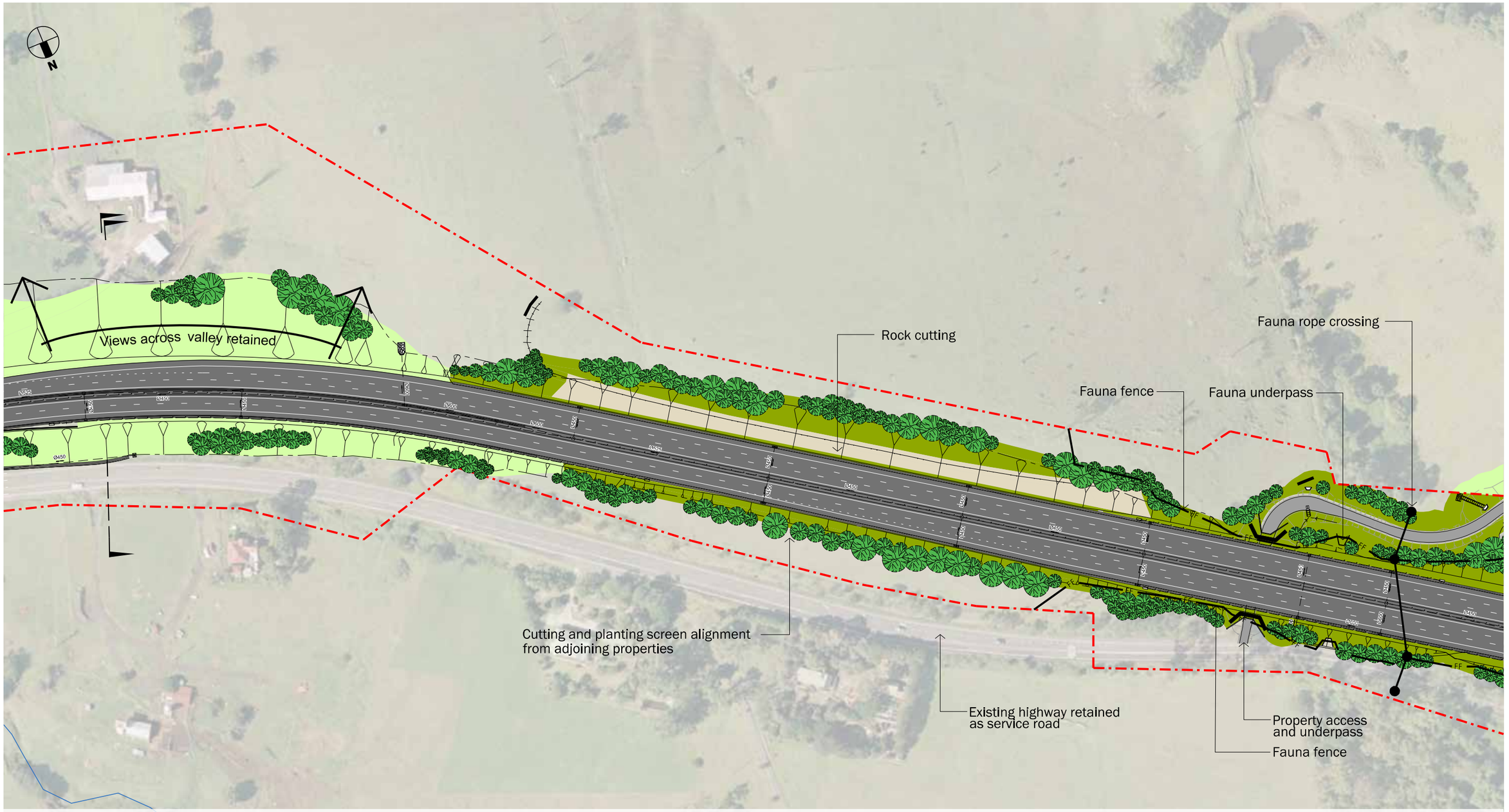
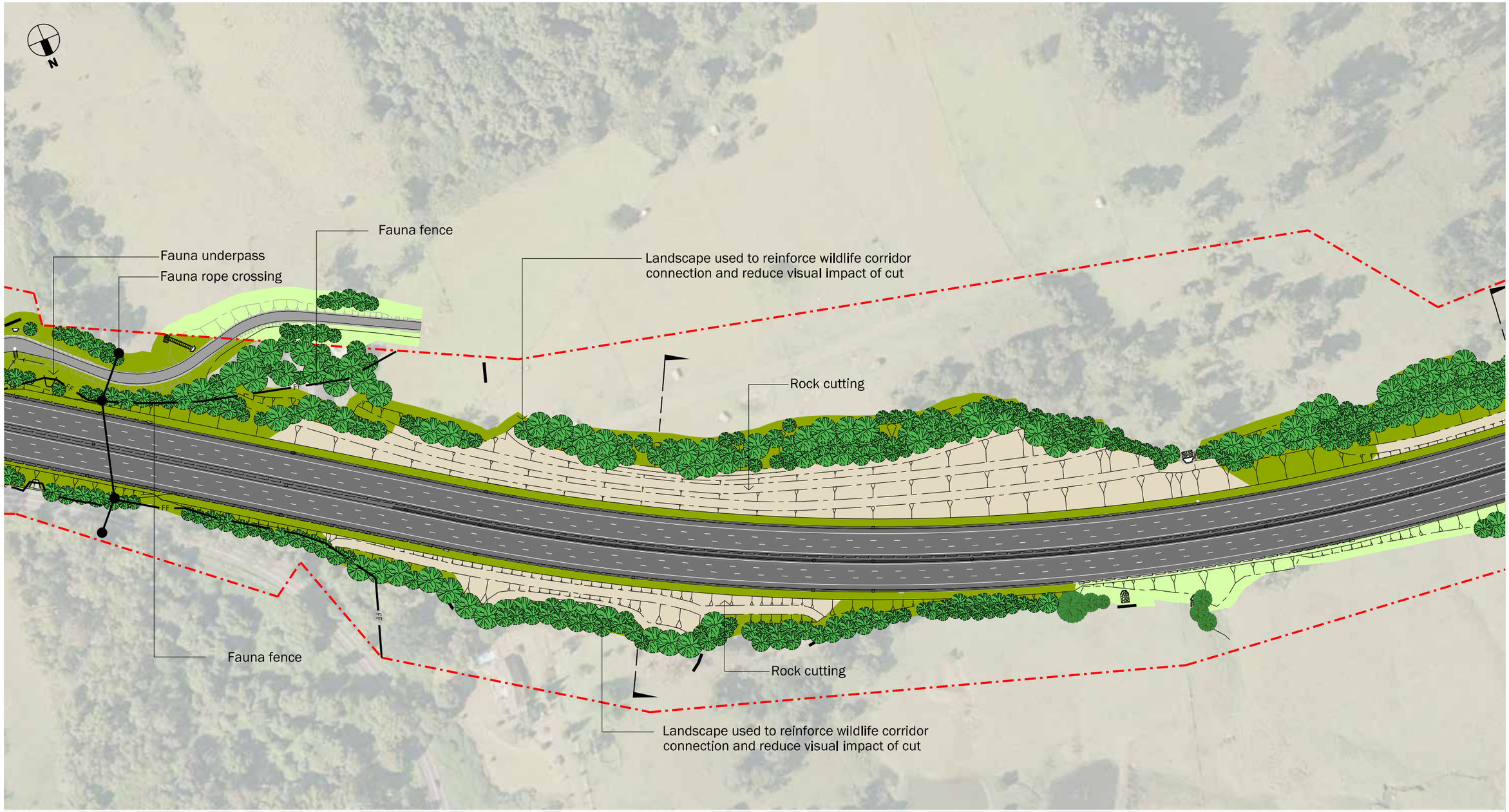


Fig. 7.2: Urban and landscape design plan (Sheet 1) - Toolijooa Character Zone



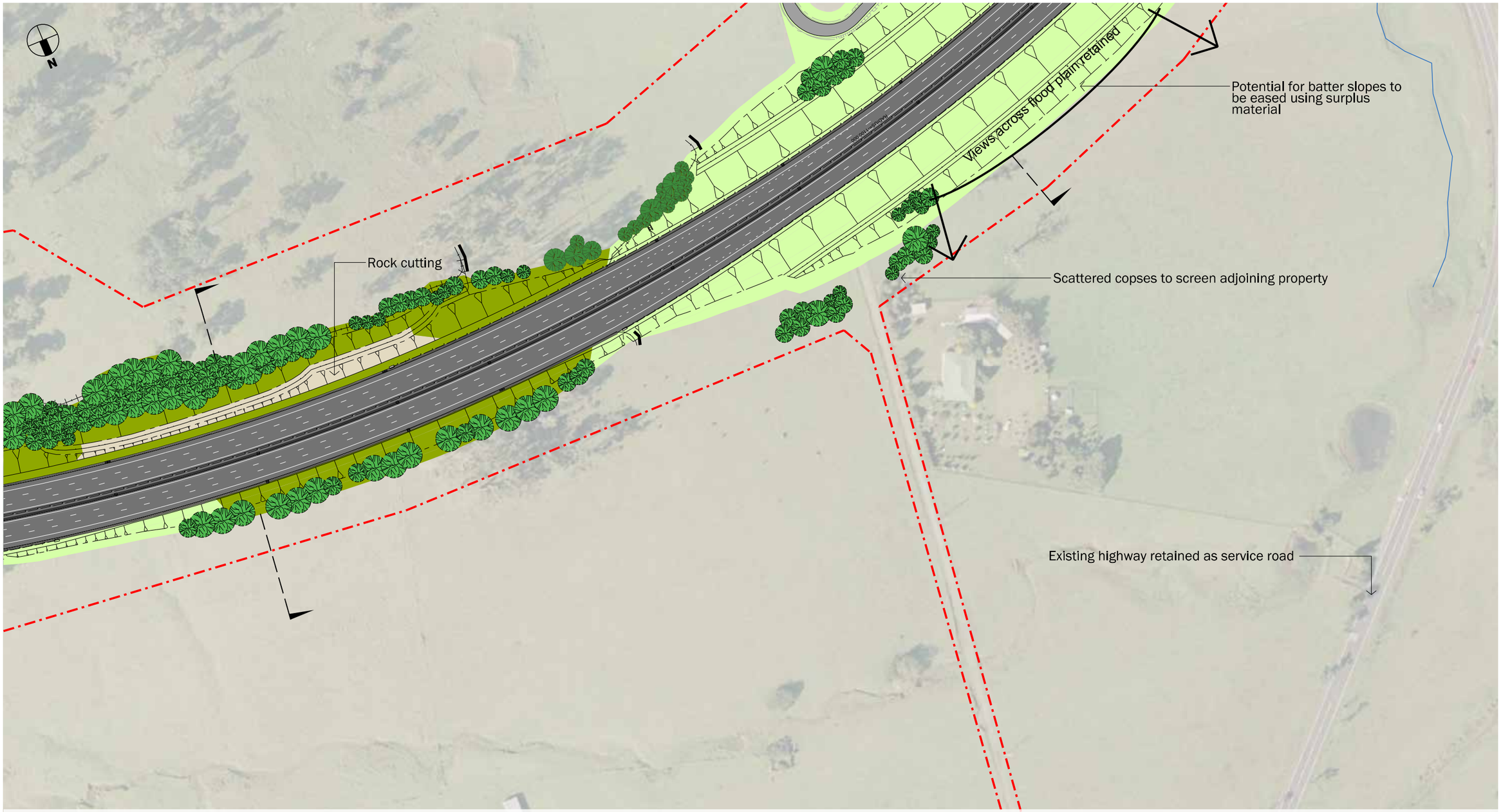
Southbound	Hydromulch grassland with scattered trees	Warm Temperate Layered Forest community established by hydromulch and planting
Northbound	Hydromulch grassland with scattered trees	Warm Temperate Layered Forest community established by hydromulch and planting

Fig. 7.3: Urban and landscape design plan (Sheet 2) - Toolijooa Character Zone



Southbound	Warm Temperate Layered Forest community established by hydromulch and planting	
Northbound	Warm Temperate Layered Forest community established by hydromulch and planting	Hydromulch grassland with planting of scattered trees Views retained

Fig. 7.4: Urban and landscape design plan (Sheet 3) - Toolijooa Character Zone



Southbound	Warm Temperate Layered Forest community established by hydromulch and planting		Hydromulch grassland with planting of scattered trees
Northbound	Hydromulch grassland with planting of scattered trees	Warm Temperate Layered Forest community established by hydromulch and planting	Hydromulch grassland with planting of scattered trees

Fig. 7.5: Urban and landscape design plan (Sheet 4) - Toolijooa Character Zone

7.3.3 CROSS SECTIONS

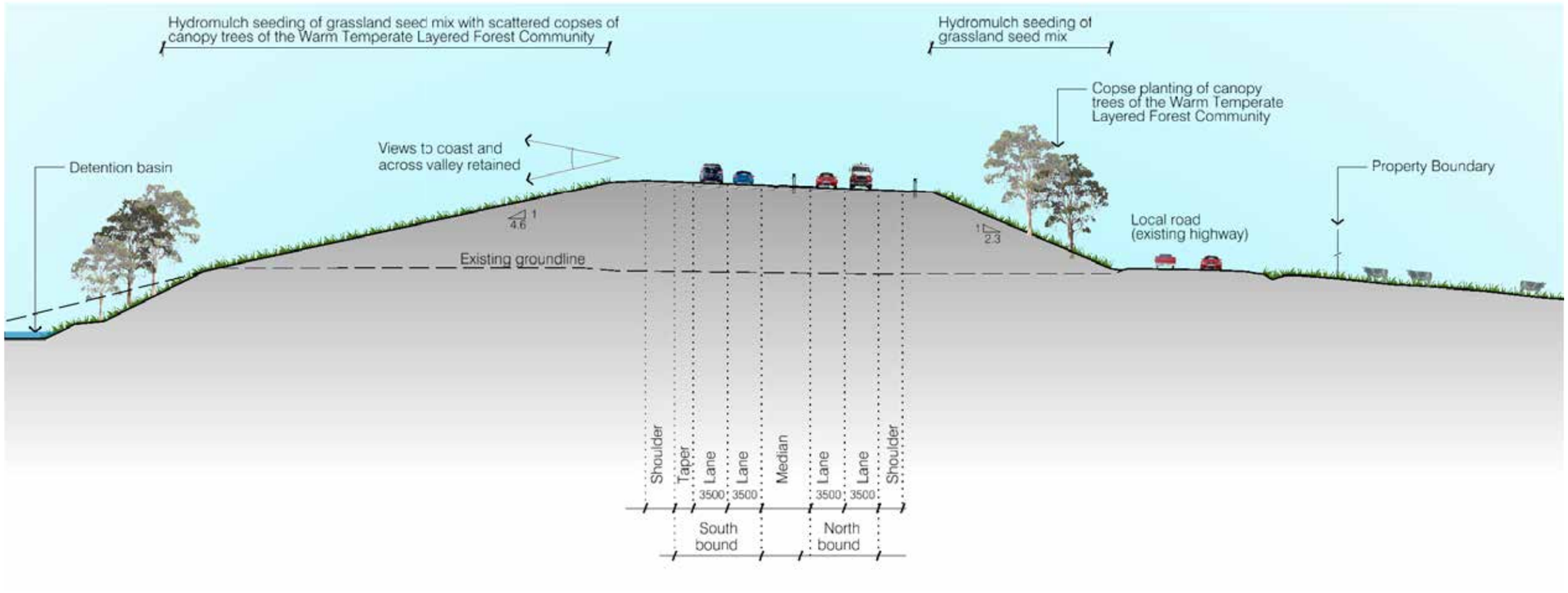


Fig. 7.6: Road cross section at Ch. 7800 (Scale 1:500 @ A3)

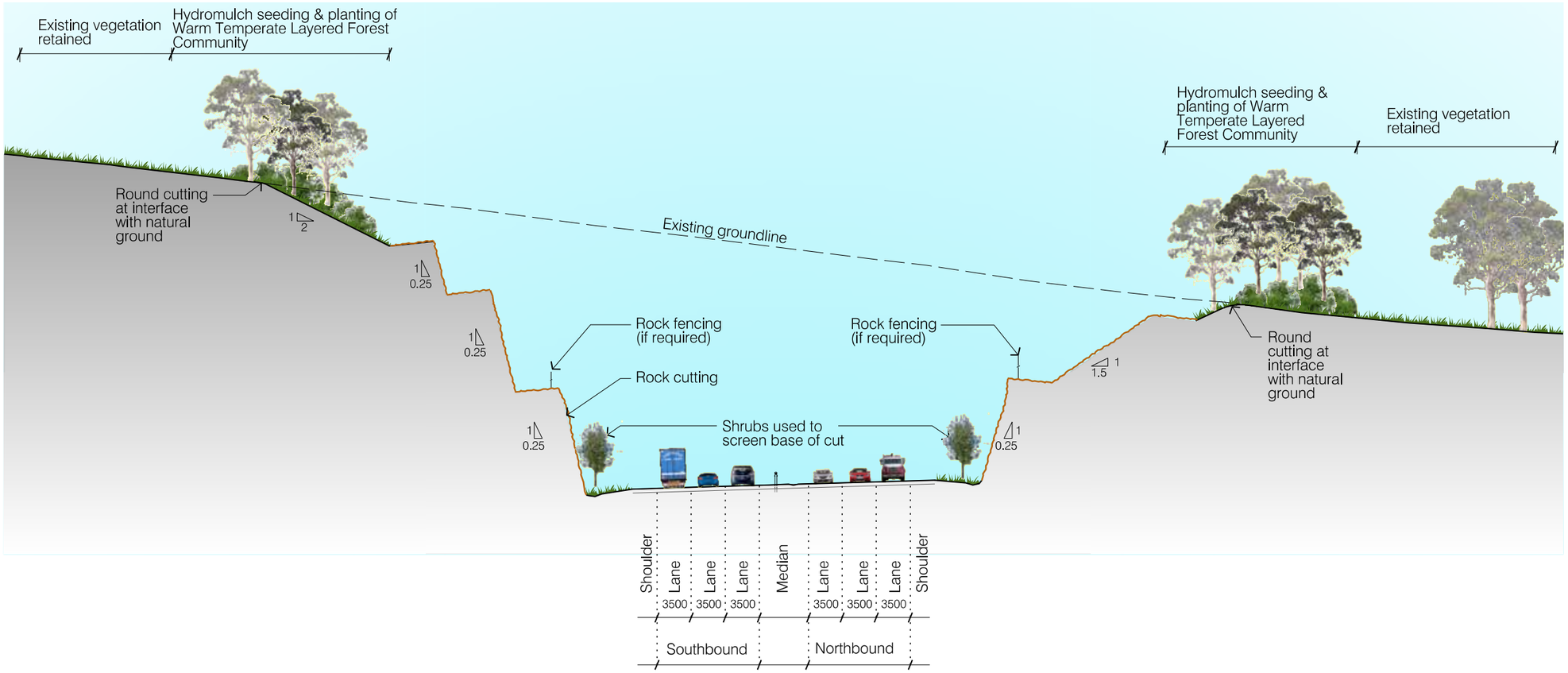


Fig. 7.7: Road cross section at Ch. 8750 (Scale 1:500 @ A3)

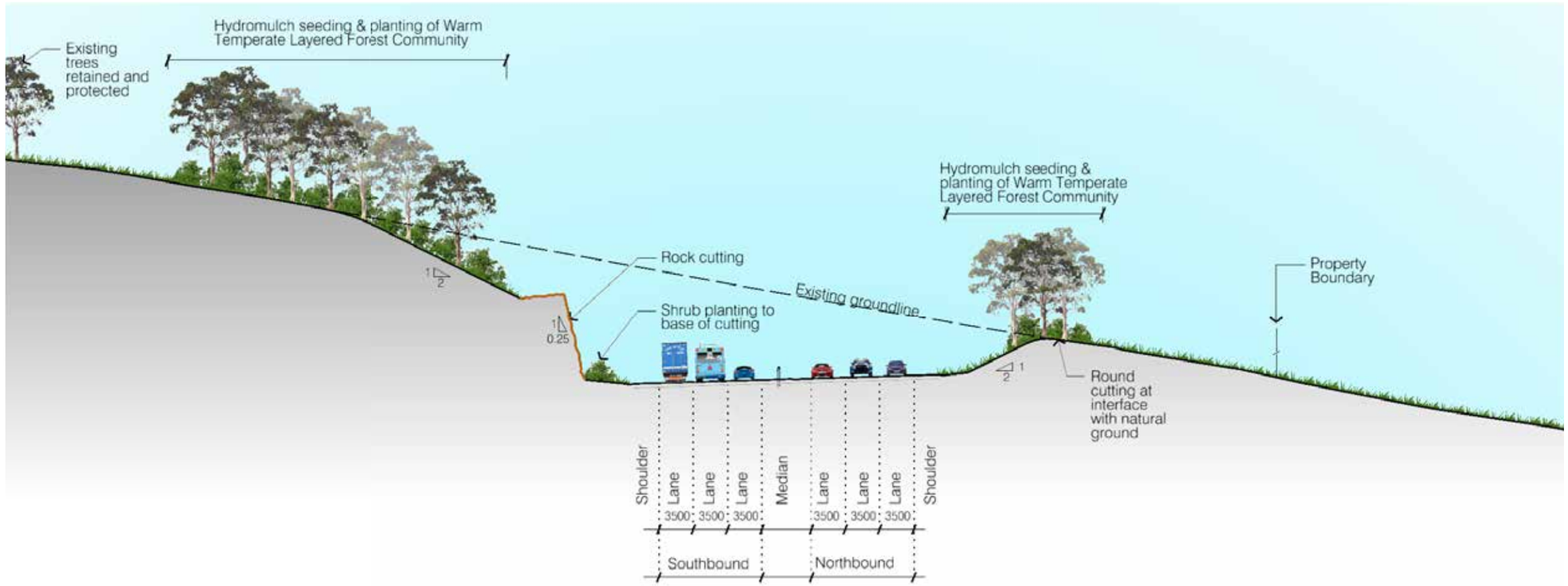


Fig. 7.8: Road cross section at Ch. 9200 (Scale 1:500 @ A3)

7.3.4 BRIDGES

The approach to the design of bridges for the Project and the principles governing the design of bridges are described in detail in Chapter 6. The bridges in this character zone are listed below in Table 7.1 and are illustrated in the following pages.

Bridge	Design	Comment
SB01. Toolijooa Road Underpass	Single span underpass with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: N/A	▪ Priority 2 bridge. ▪ 3.0 m wide shoulders on highway for cyclists.

Table 7.1: List of bridge structures in Character Zone 1

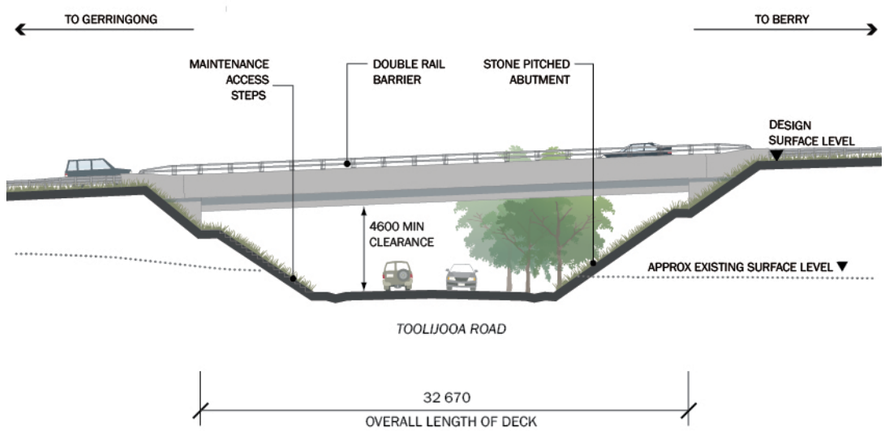


Fig. 7.9: Elevation – Bridge SB01: Toolijooa Road Underpass (Scale: 1:400@A3)

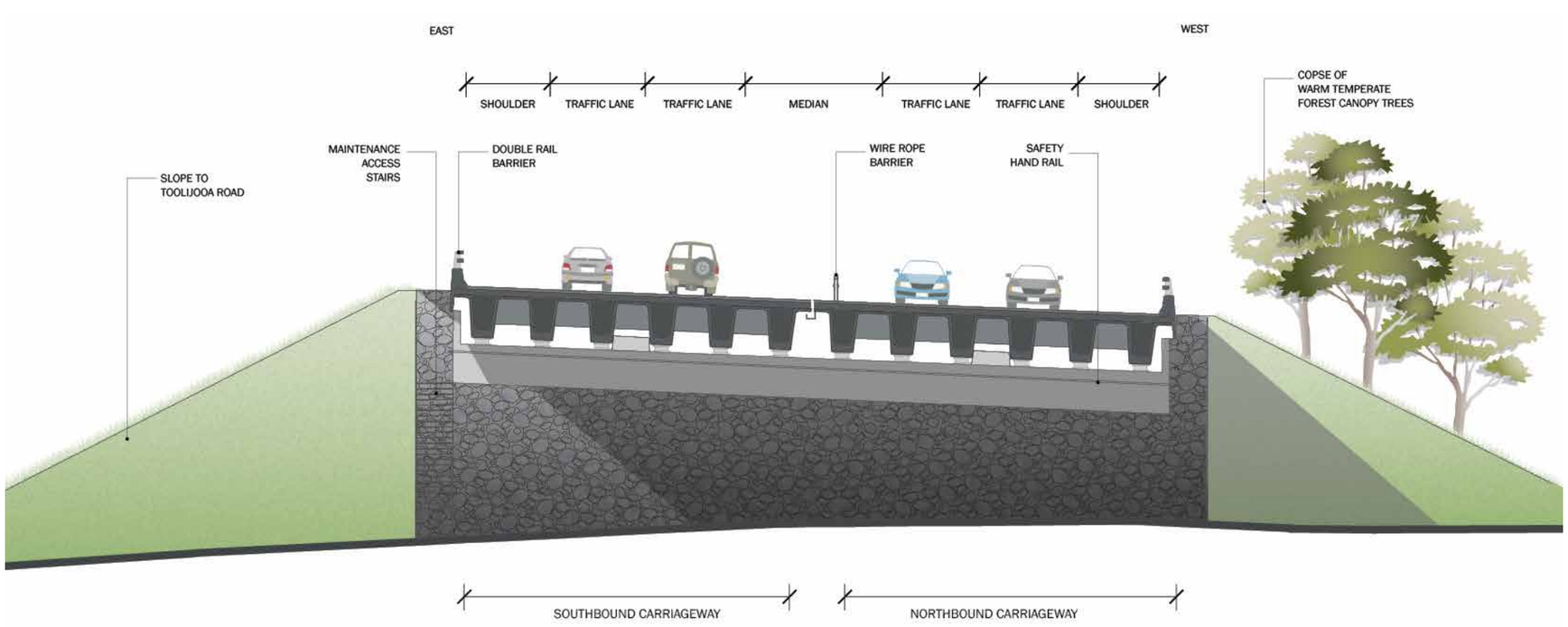


Fig. 7.10: Section – Bridge SB01: Toolijooa Road Underpass (Scale: 1:200@A3)

Fig. 7.11: Perspective view of the main cutting

7.4 CHARACTER ZONE 2 – BROUGHTON CREEK

7.4.1 INTRODUCTION

The alignment transitions from Toolijooa Ridge to the floodplain of Broughton Creek. The transition from cut to fill marks the change to Character Zone 2. The alignment crosses the floodplain of Broughton Creek, which is characterised by expansive views over the grassland paddocks, which in turn are defined by vegetation to the side of the valley floor. Generally the valley floor is largely cleared, except for the steeper, higher land, which retains remnants of the natural vegetation communities. These communities form the back drop to views from the alignment.

Much of the alignment throughout this zone will be on embankment. The batters of these embankments are generally to be reinstated with grassland to aid the integration of the formation with its context. To enhance the integration of the formation, the use of surplus material may be used to flatten slopes where space permits, without impeding flood flows. A localised section of 1:1 rock fill embankment is proposed north of Broughton Creek Bridge No.1.

Within the Broughton Creek valley the dominant vegetation community, other than that of the grassland, is that of the Riverbank Forest community. This forms a strong and distinct lineal element within the landscape.

The landscape community is crossed at three locations by the alignment where bridges will be constructed across the creek. The landscape response to these crossings has been to protect these communities during construction by minimising disturbance to the existing vegetation community and where necessary reinforcing the vegetation cover once construction is complete. In particular, the lineal nature of the creekline vegetation will be retained and emphasised with additional planting indicative of the community to be reinstated to both stabilise and enhance the diversity of the vegetation within the corridor.

This response will also aid the protection of wildlife movement within the main Seven Mile Beach Wildlife corridor.

The design approach to the three Broughton Creek Bridges has been to provide structures that are simple and elegant with a two column blade pier and integrated headstock. The two column pier enables maximum views through underneath the bridge minimising the extent of built elements as far as practicable.

These three bridges feature the same pier design as Berry Bridge for consistency through the Project.

Works associated with Broughton Creek include the stabilisation of the channel where erosion risks have been identified which in the course of time could pose a risk to the alignment. These works will seek to achieve a stable river bank profile through the use of embankment geometry and revegetation techniques, with a focus on endemic plantings to be used.

At the southern end of the zone the alignment begins to move off the floodplain and towards the foothills. This movement coincides with the Austral Park Road Underpass. The bridge occurs where the alignment is within fill. Service roads flank the main alignment and so need to be screened to both provide a sense of separation, but also to reduce the scale of the proposed road works.

Fig. 7.12: Fly-over view of Character Zone 2

7.4.2 PLANS

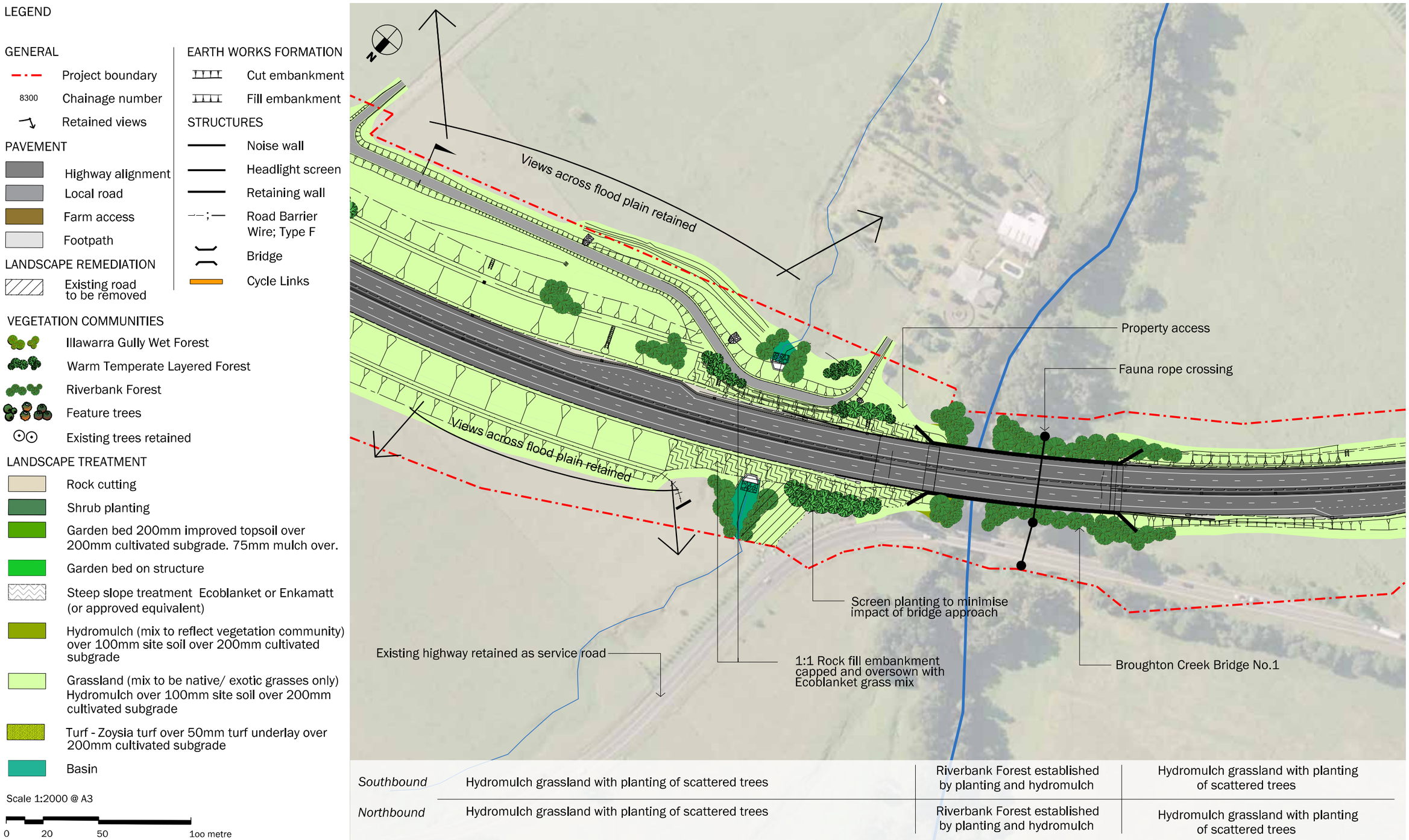
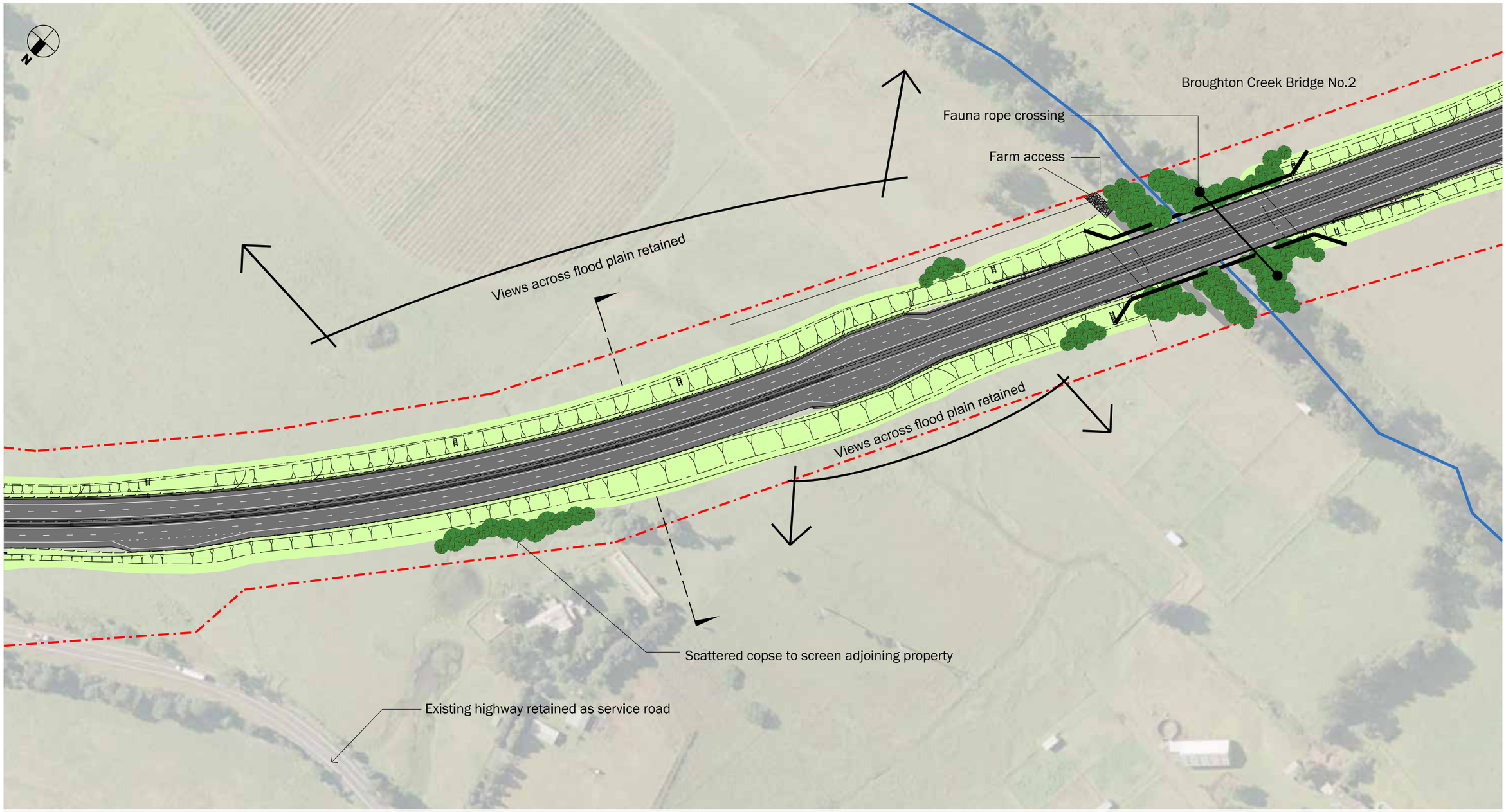
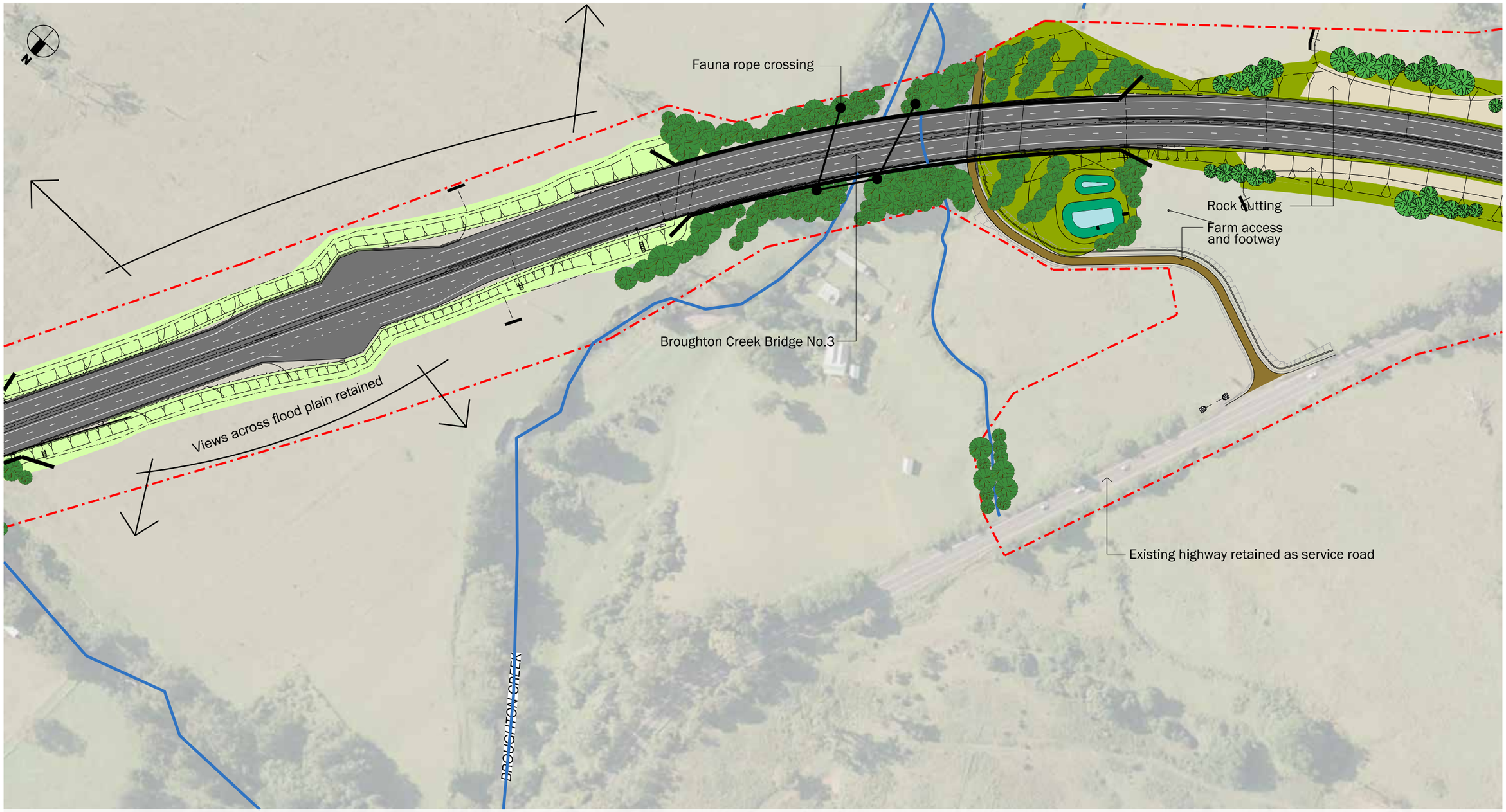


Fig. 7.13: Urban and landscape design plan (Sheet 5) - Broughton Creek Character Zone



Southbound	Hydromulch grassland with planting of scattered trees	Riverbank Forest established by planting and hydromulch	Hydromulch grassland with planting of scattered trees
Northbound	Hydromulch grassland with planting of scattered trees	Riverbank Forest established by planting and hydromulch	Hydromulch grassland with planting of scattered trees

Fig. 7.14: Urban and landscape design plan (Sheet 6) - Broughton Creek Character Zone



Southbound	Hydromulch grassland with planting of scattered trees	Riverbank Forest established by planting and hydromulch	Warm Temperate Layered Forest communities established by hydromulch and planting
Northbound	Hydromulch grassland with planting of scattered trees	Riverbank Forest established by planting and hydromulch	Warm Temperate Layered Forest communities established by hydromulch and planting

Fig. 7.15: Urban and landscape design plan (Sheet 7) - Broughton Creek Character Zone

Southbound	Warm Temperate Layered Forest community established by hydromulch and planting	Hydromulch grassland with scattered trees
Northbound	Warm Temperate Layered Forest community established by hydromulch and planting	

Fig. 7.16: Urban and landscape design plan (Sheet 8) - Broughton Creek Character Zone

7.4.3 CROSS SECTIONS

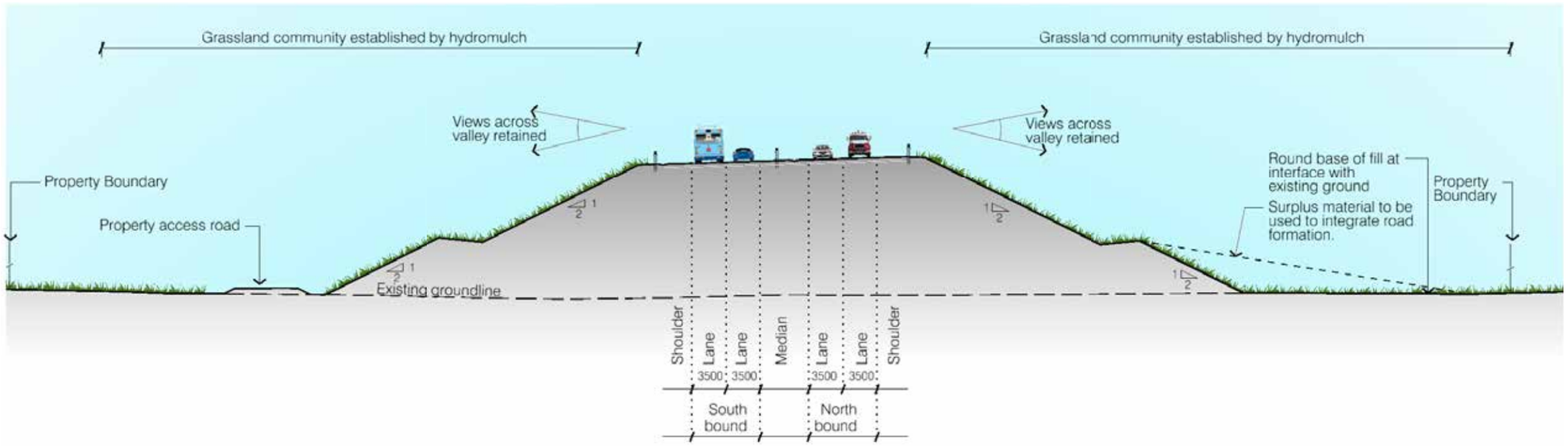


Fig. 7.17: Road cross section at Ch. 9600 (Scale 1:500 @ A3)

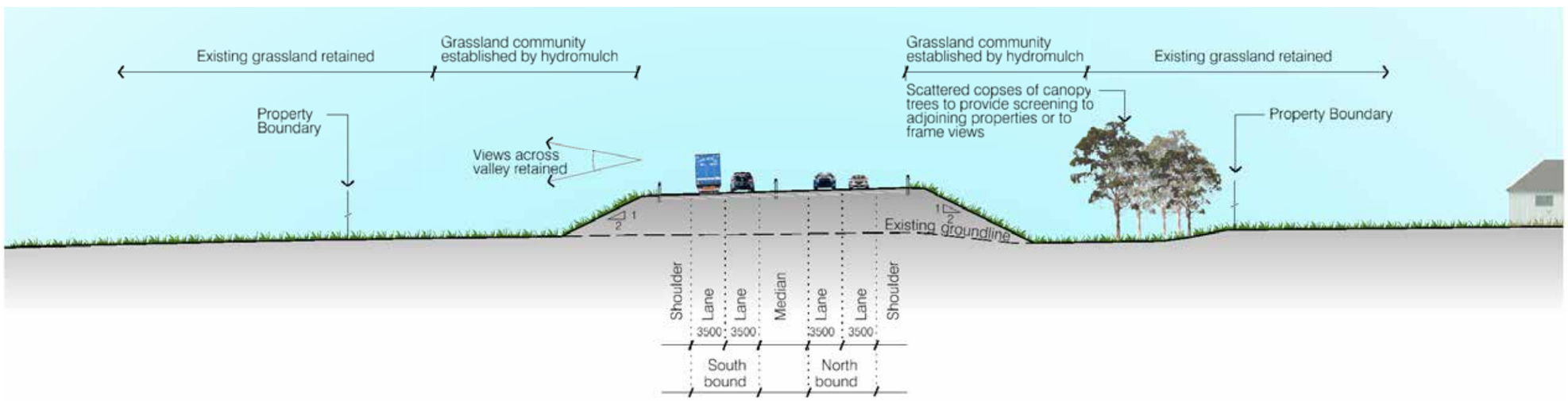


Fig. 7.18: Road cross section at Ch. 10400 (Scale 1:500 @ A3)

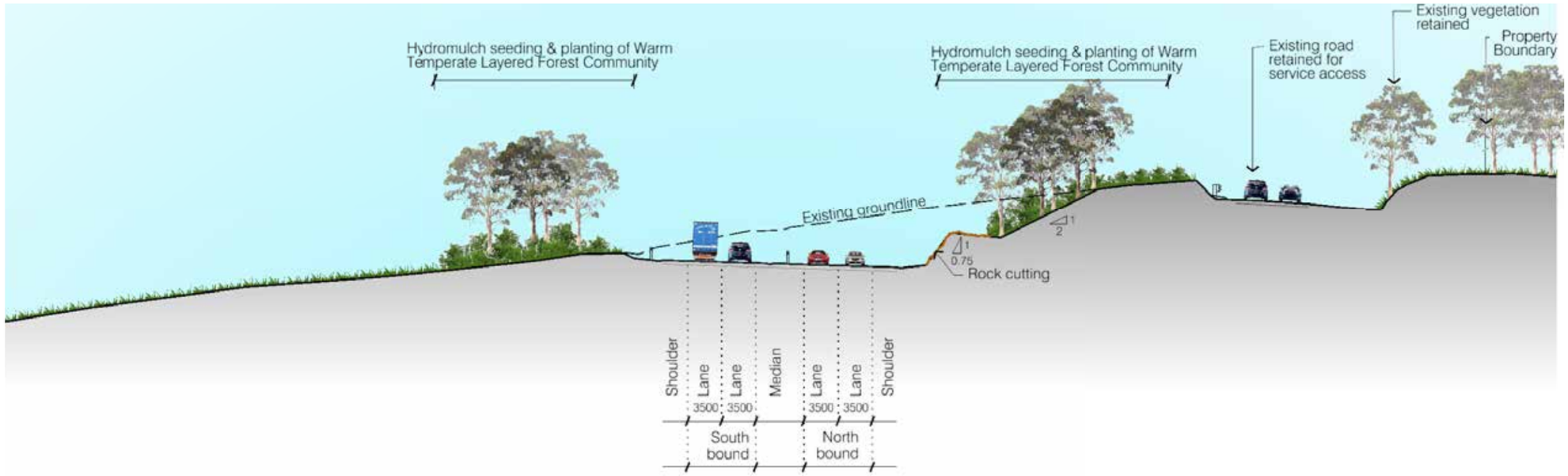


Fig. 7.19: Road cross section at Ch.11600 (Scale 1:500 @ A3)

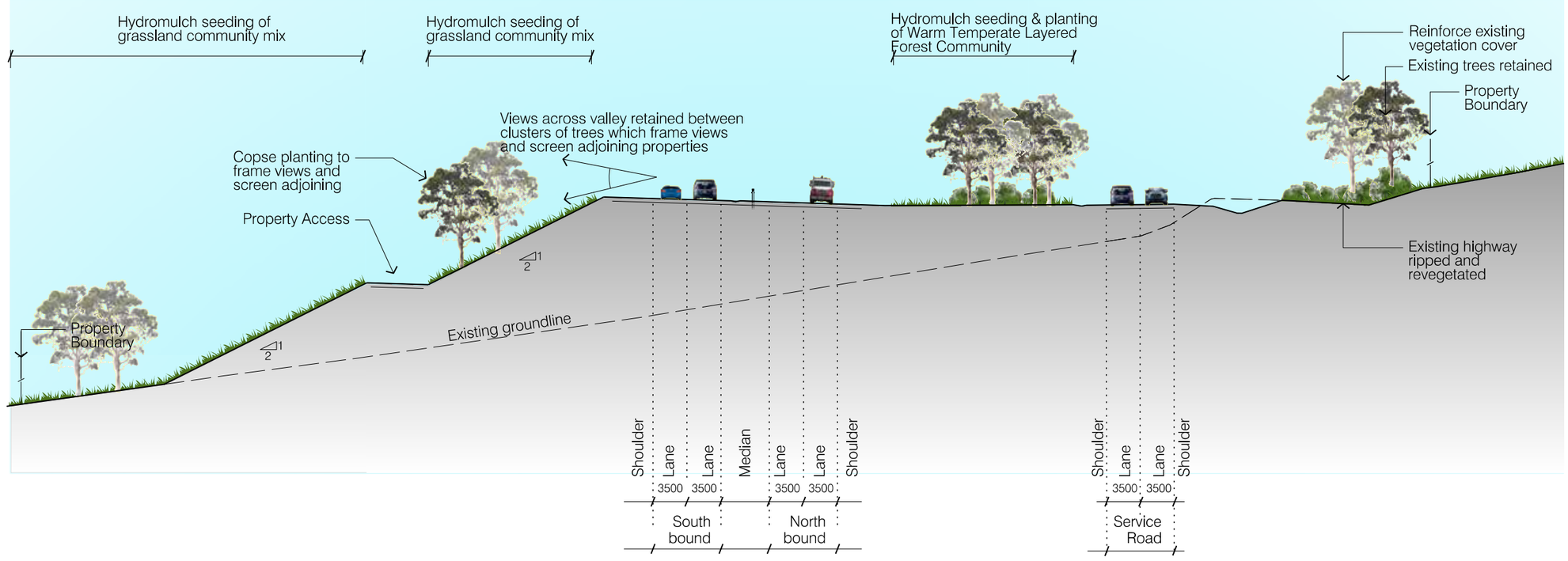


Fig. 7.20: Road cross section at Ch. 11750 (Scale 1:500 @ A3)

7.4.4 BRIDGES

The approach to the design of bridges for the Project and the principles governing the design of bridges are described in detail in Chapter 6. The bridges in this Character Zone are listed below in Table 7.2 and are illustrated in the following pages.

Bridge	Design	Comment
SB02. Broughton Creek Bridge No. 1	Multiple span bridge with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: Two rectangular columns with an integrated headstock.	▪ Priority 3 bridge. ▪ 3.0 m wide shoulders for cyclists.
SB03. Broughton Creek Bridge No. 2	Multiple span bridge with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: Two rectangular columns with an integrated headstock.	▪ Priority 3 bridge. ▪ 3.0 m wide shoulders for cyclists.
SB04. Broughton Creek Bridge No. 3	Multiple span bridge with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: Two rectangular columns with an integrated headstock.	▪ Priority 2 bridge. ▪ 3.0 m wide shoulders for cyclists. The bridge at Broughton Creek crossing No. 3 has been designed to minimise its visual impacts on RMB 353 Princes Highway, Broughton Village. Based on three-dimensional pier design studies, a two rectangular columned pier with an integrated headstock was selected as the preferred design. This design features a well-crafted elegant pier with slender lines. This is an improvement on the EA pier design which featured a wide columned pier. The slender columned pier ensure greater views through to the surrounding landscape. The bridge is viewed from approximately 100m away from the property. In addition, the riparian corridor planting will screen sections of the bridge in elevation, resulting in partial views only.
SB05. Austral Park Road Underpass	Single span underpass with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: N/A	▪ Priority 2 bridge.

Table 7.2: List of bridge structures in Character Zone 2

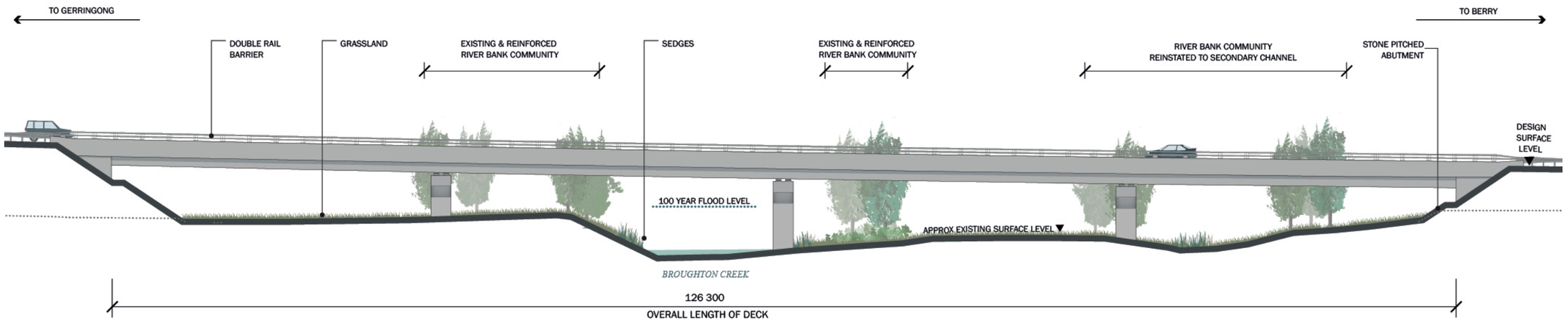


Fig. 7.21: Elevation – Bridge SB02: Broughton Creek Bridge No. 1
(Scale: 1:400@A3)

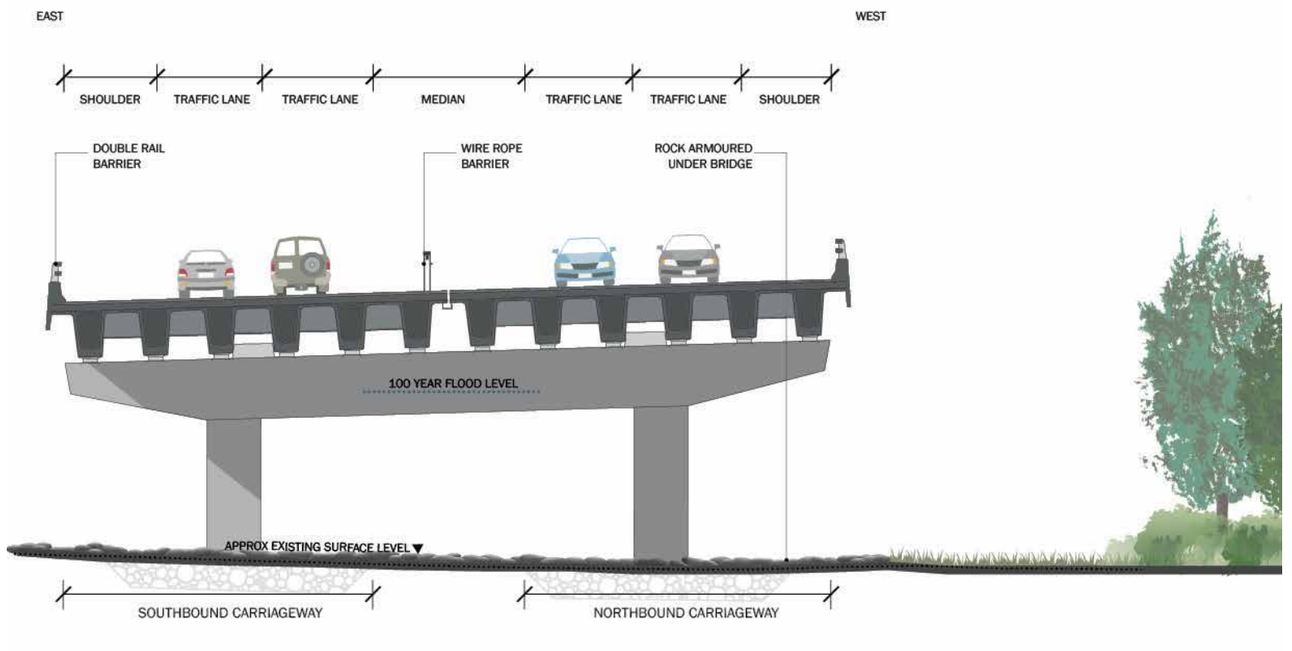


Fig. 7.22: Section – Bridge SB02: Broughton Creek Bridge No.1
(Scale: 1:200@A3)

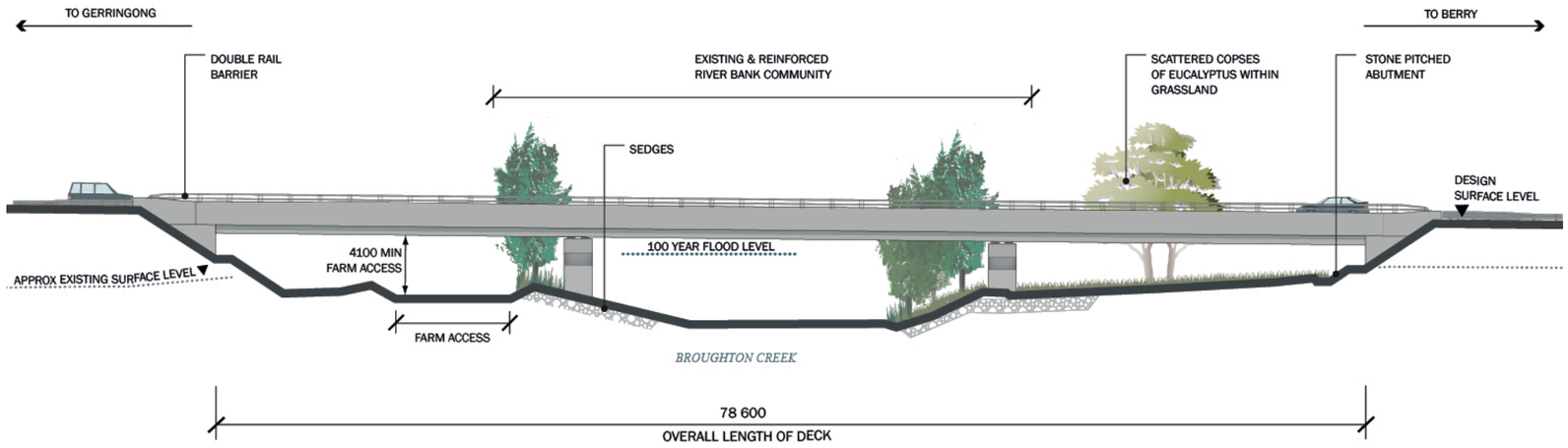


Fig. 7.23: Elevation – Bridge SB03: Broughton Creek Bridge No. 2
(Scale: 1:400@A3)

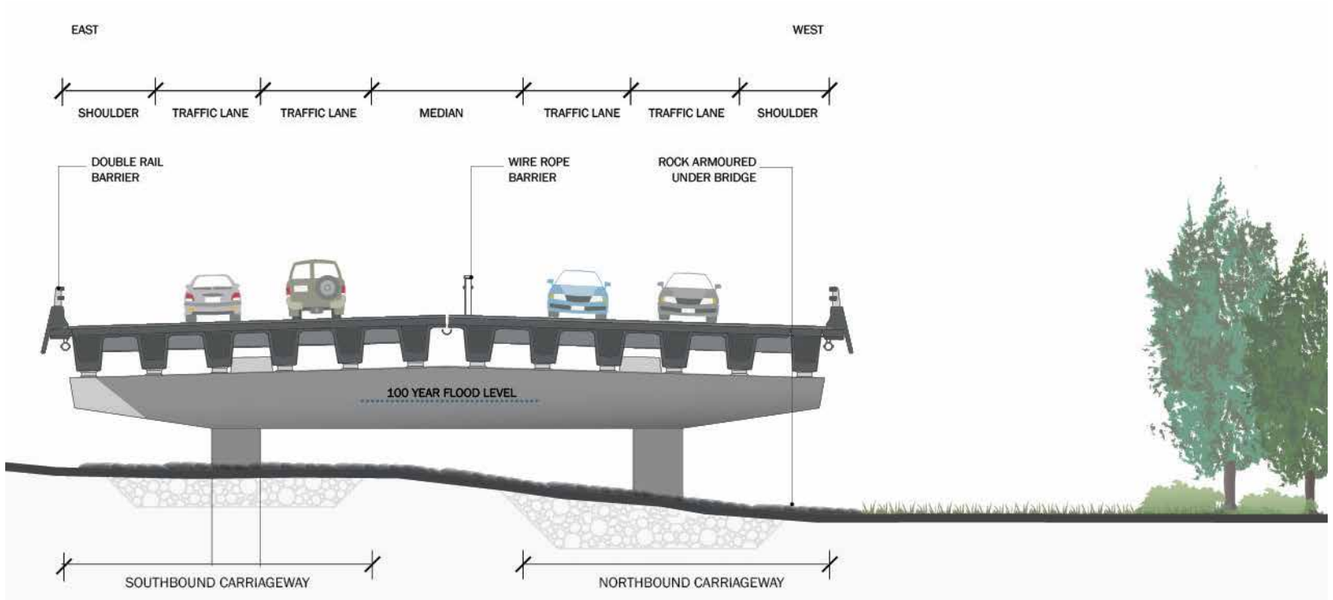


Fig. 7.24: Section – Bridge SB03: Broughton Creek Bridge No. 2
(Scale: 1:200@A3)

Fig. 7.25: Perspective view of a typical creek bridge – Broughton Creek Bridge No. 3

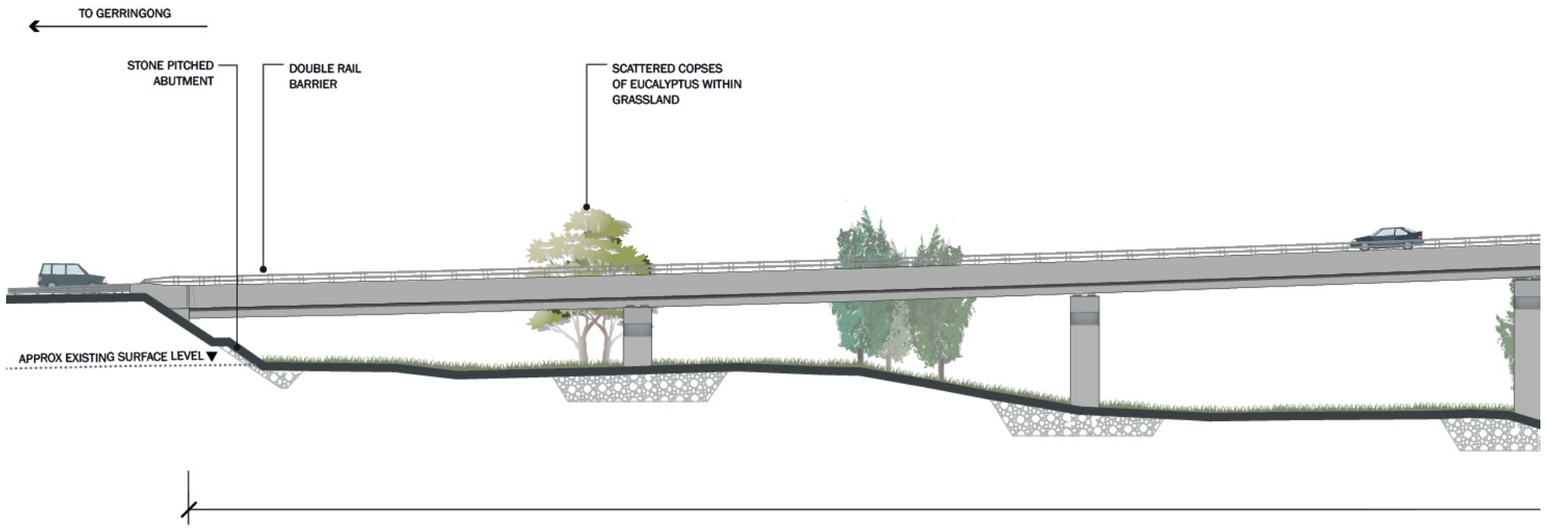


Fig. 7.26: Elevation – Bridge SB04: Broughton Creek Bridge No. 3
(Scale: 1:400@A3)

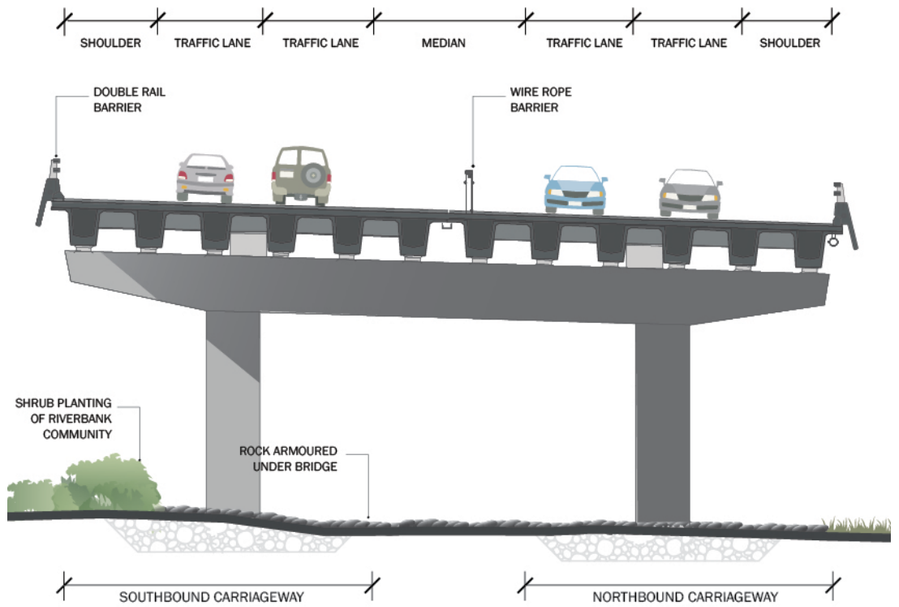
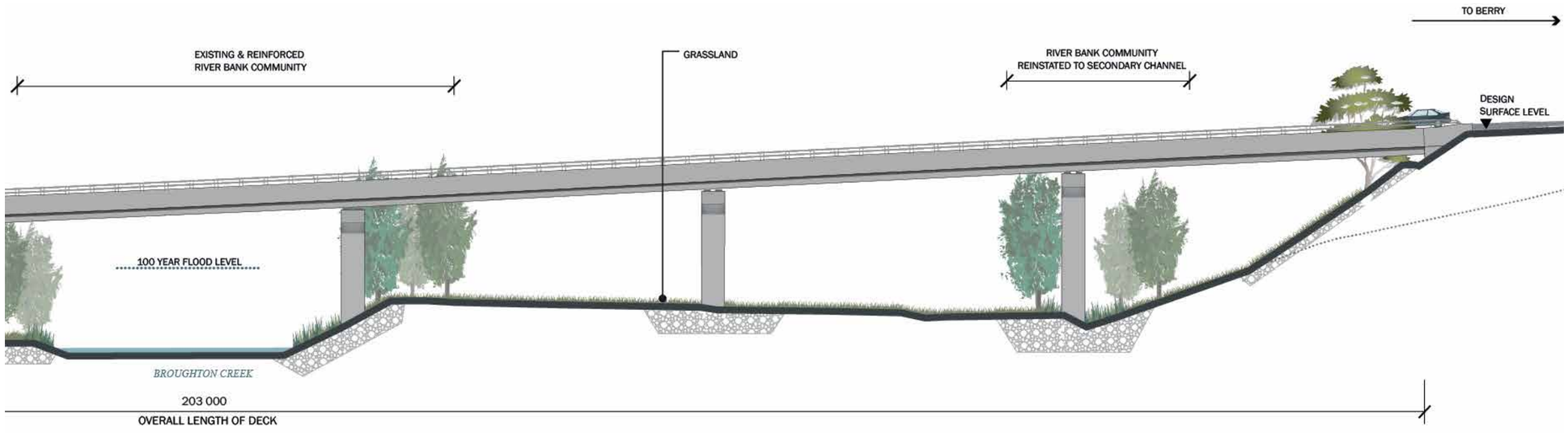


Fig. 7.27: Section – Bridge SB04: Broughton Creek Bridge No. 3
(Scale: 1:200@A3)


TO BERRY
EXISTING & REINFORCED
RIVER BANK COMMUNITY
GRASSLAND
RIVER BANK COMMUNITY
REINSTATED TO SECONDARY CHANNEL
DESIGN
SURFACE LEVEL
100 YEAR FLOOD LEVEL
BROUGHTON CREEK
203 000
OVERALL LENGTH OF DECK

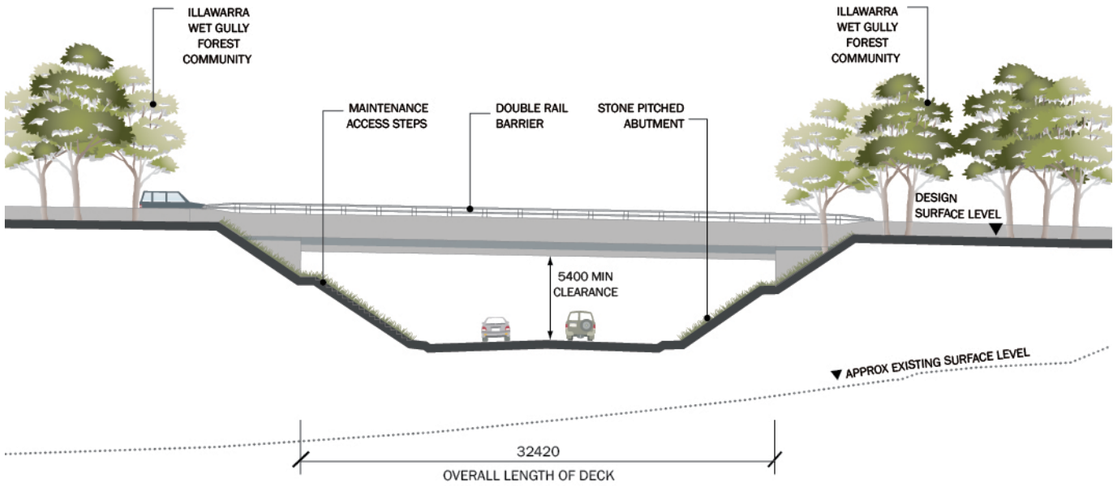


Fig. 7.28: Elevation – Bridge SB05: Austral Park Road Underpass
(Scale: 1:400@A3)

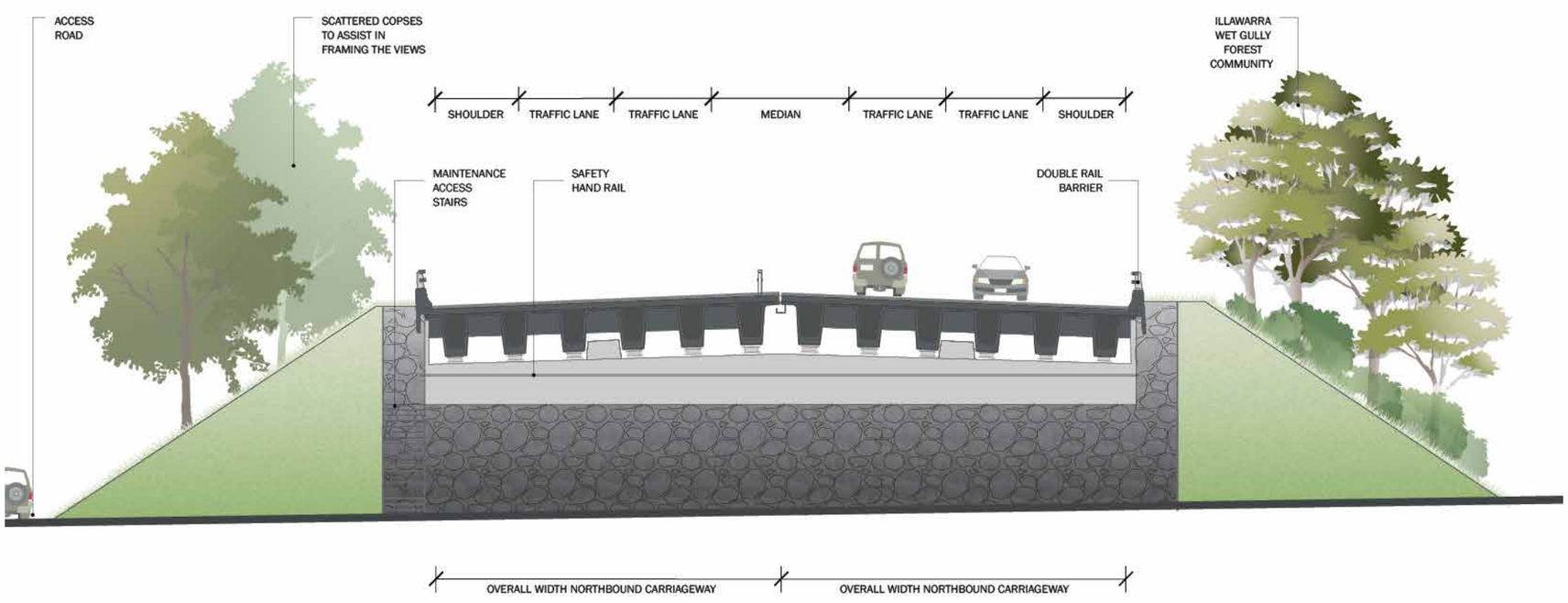


Fig. 7.29: Section – Bridge SB05: Austral Park Road Underpass
(Scale: 1:200@A3)

7.5 CHARACTER ZONE 3- BROUGHTON MILL CREEK

7.5.1 INTRODUCTION

Broughton Mill Creek Character Zone falls within an undulating landscape in which the present alignment is strongly defined by vegetation at a number of points. The design response has been to continue and strengthen this. The dominant community throughout this zone is the Illawarra Gully Wet Forest. This is the dominant community in the area of Tindalls Lane and provides a strong influence on the character of the road. It also forms an important part of the local wildlife corridor linked to the Seven Mile Beach Wildlife Corridor.

Vegetation on the ridge thins out along this undulating section and has the potential to provide panoramic views of the escarpment and valley. These views are responded to as part of the design response and revegetation strategy, with care taken to identify and retain key views which enables the corridor to be linked to its surrounds.

The Berry North Interchange forms the southerly extent of this zone of the corridor and a key arrival point for the Berry community. The sequence of arrival and the landscape cues that it provides are important in providing a presence on the highway for the township of Berry. The sequence includes:

- The Alexander and David Berry Memorial sculpture – relocated to north of the exit ramp into a position of visual prominence.
- The interchange landscape – developed to provide juxtaposition between the natural and cultural landscapes of the area. The landscape design has used an avenue of exotic deciduous trees to delineate the exit and entry ramps. Within this, a natural landscape is contained which provides a sense of enclosure prior to the moving onto the bridge, which will provide panoramic views across the valley and to the ridge.

Fig. 7.30: Aerial view of Character Zone 3

7.5.2 PLANS

LEGEND

GENERAL
- Project boundary
- 8300 Chainage number
- Retained views

PAVEMENT
- Highway alignment
- Local road
- Farm access
- Footpath

LANDSCAPE REMEDIATION
- Existing road to be removed

EARTH WORKS FORMATION
- Cut embankment
- Fill embankment

STRUCTURES
- Noise wall
- Headlight screen
- Retaining wall
- Road Barrier Wire; Type F
- Bridge

VEGETATION COMMUNITIES
- Illawarra Gully Wet Forest
- Warm Temperate Layered Forest
- Riverbank Forest
- Feature trees
- Existing trees retained

LANDSCAPE TREATMENT
- Rock cutting
- Shrub planting
- Garden bed 200mm improved topsoil over 200mm cultivated subgrade. 75mm mulch over.
- Garden bed on structure
- Steep slope treatment Ecoblanket or Enkamatt (or approved equivalent)
- Hydromulch (mix to reflect vegetation community) over 100mm site soil over 200mm cultivated subgrade
- Grassland (mix to be native/ exotic grasses only) Hydromulch over 100mm site soil over 200mm cultivated subgrade
- Turf - Zoysia turf over 50mm turf underlay over 200mm cultivated subgrade
- Basin

Scale 1:2000 @ A3

0 20 50 1oo metre

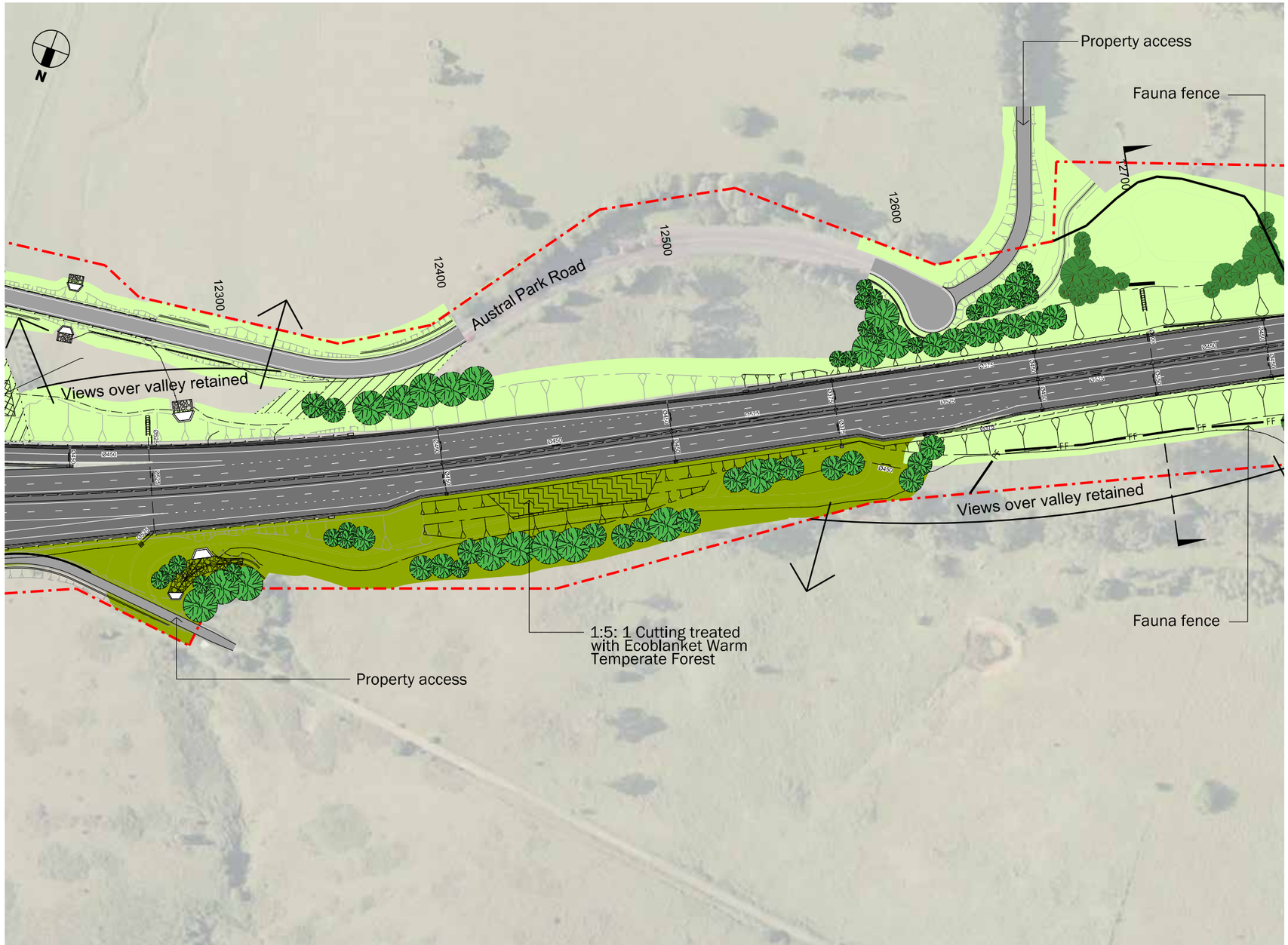


Fig. 7.31: Urban and landscape design plan (Sheet 10) - Broughton Mill Creek Character Zone

Southbound	Hydromulch grassland with planting of scattered trees	Illawarra Gully Wet Forest established by hydromulch and planting
Northbound	Hydromulch grassland with planting of scattered trees	Illawarra Gully Wet Forest established by hydromulch and planting

Fig. 7.32: Urban and landscape design plan (Sheet 11) - Broughton Mill Creek Character Zone

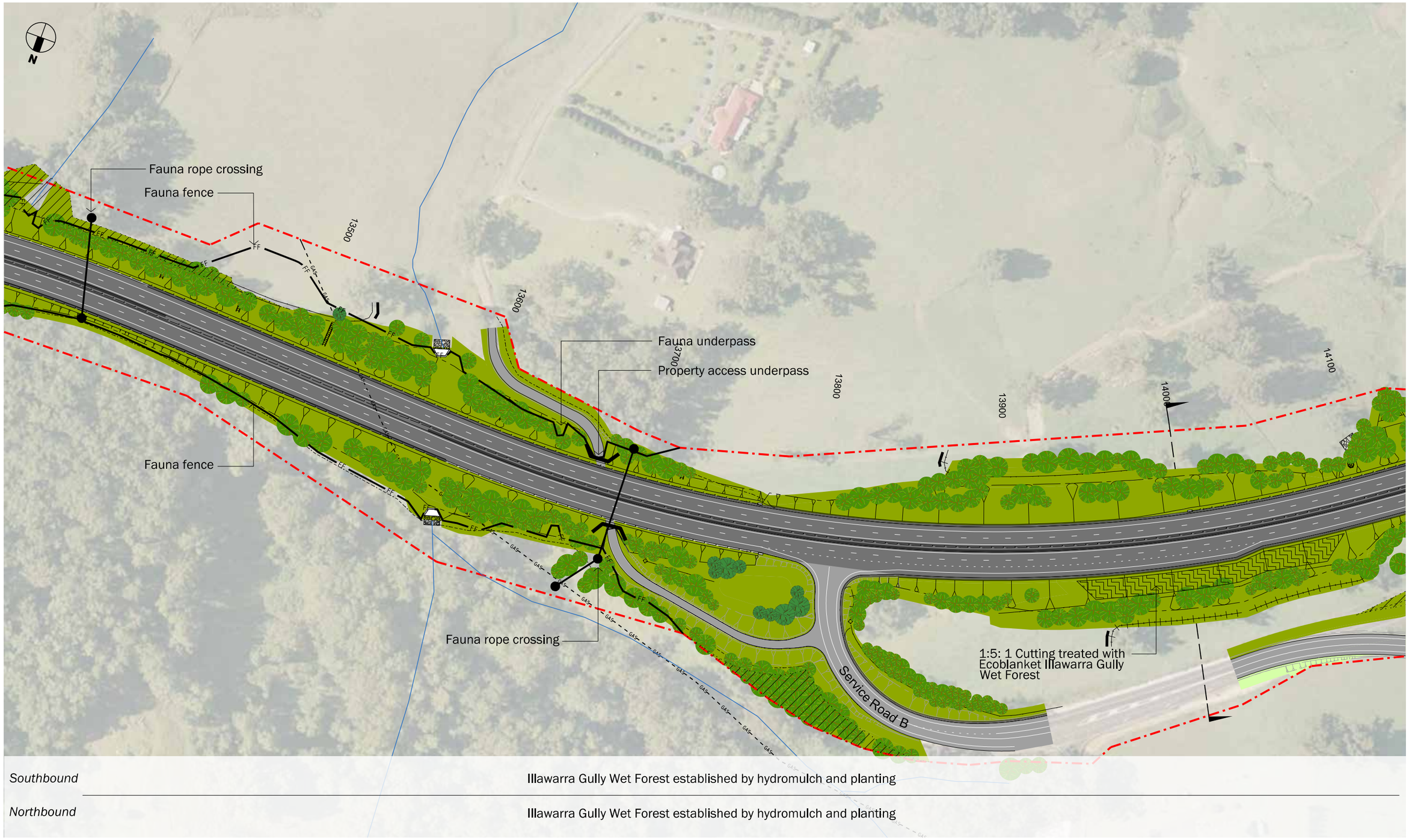
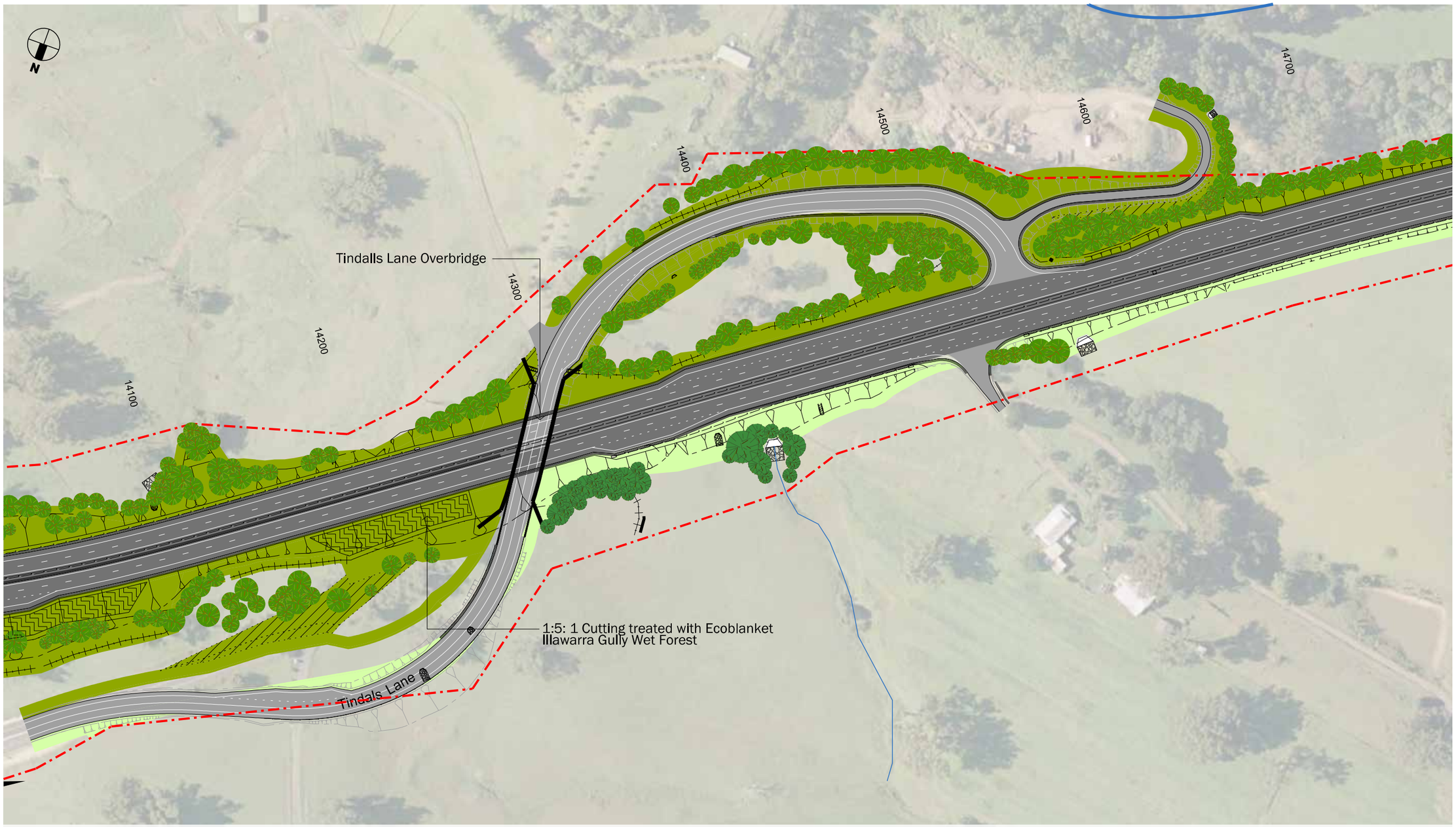


Fig. 7.33: Urban and landscape design plan (Sheet 12) - Broughton Mill Creek Character Zone



Southbound		Illawarra Gully Wet Forest established by hydromulch and planting
Northbound	Illawarra Gully Wet Forest established by hydromulch and planting	Hydromulch grassland with planting of scattered trees
Tindalls Lane	Local road hydromulch grassland	

Fig. 7.34: Urban and landscape design plan (Sheet 13) - Broughton Mill Creek Character Zone

Service Road C		Hydromulch grassland	
Southbound	Hydromulch grassland with planting of scattered trees	Illawarra Gully Wet Forest established by hydromulch and planting	
Northbound	Illawarra Gully Wet Forest established by hydromulch and planting	Hydromulch grassland with planting of scattered trees	Illawarra Gully Wet Forest established by hydromulch and planting
Service Road C		Hydromulch grassland	

Fig. 7.35: Urban and landscape design plan (Sheet 14) - Broughton Mill Creek Character Zone

Service Road C Southbound	Hydromulch grassland		
	Berry North Interchange shrub and grassland mix established by hydromulch and planting		Hydromulch grassland
Northbound	Berry North Interchange shrub and grassland mix established by hydromulch and planting		Hydromulch grassland
	Illawarra Gully Wet Forest established by hydromulch and planting	Riverbank Forest established by hydromulch and planting	

Fig. 7.36: Urban and landscape design plan (Sheet 15) - Broughton Mill Creek Character Zone

7.5.3 CROSS SECTIONS

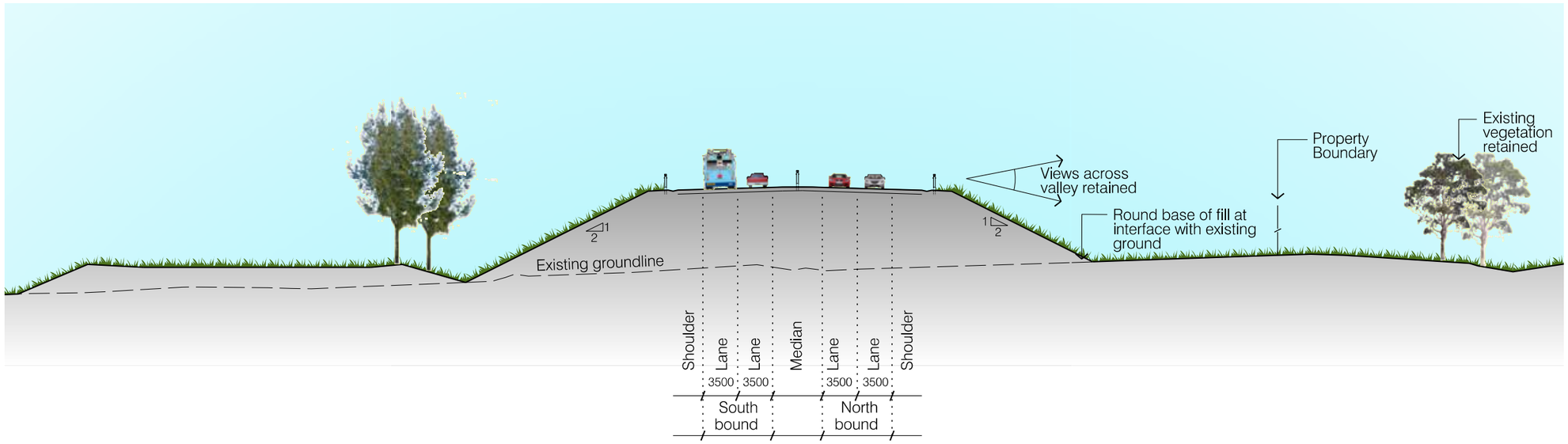


Fig. 7.37: Road cross section at Ch. 12700 (Scale 1:500 @ A3)

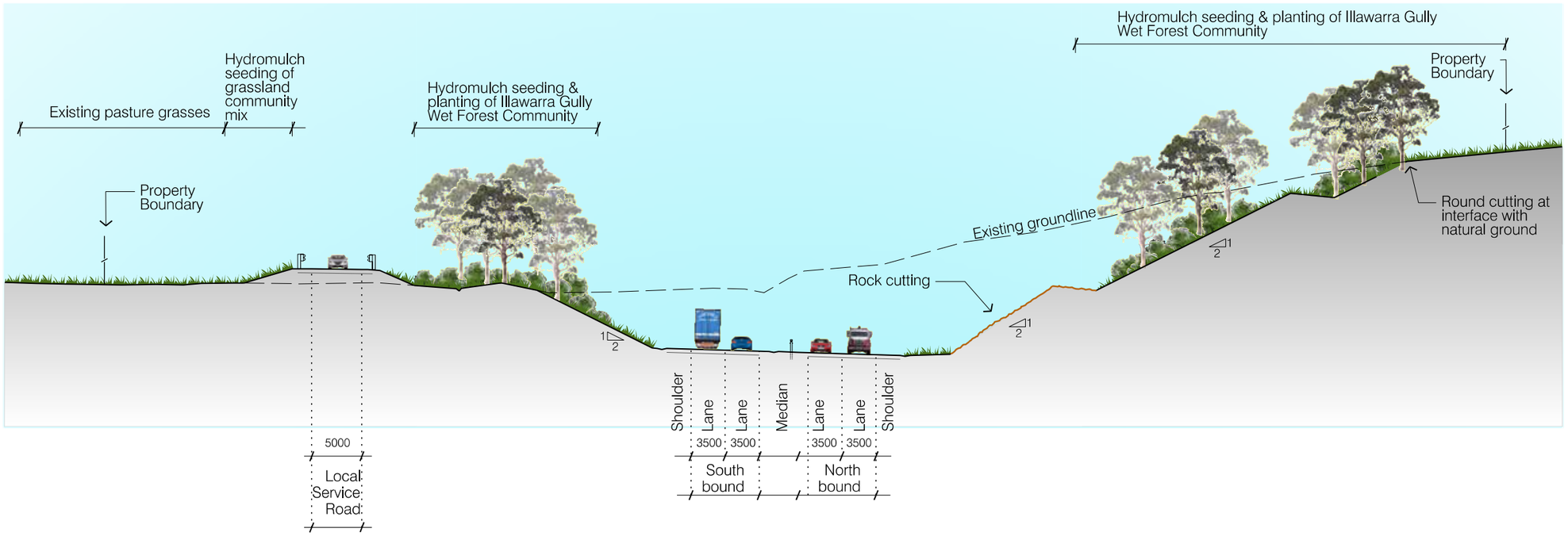


Fig. 7.38: Road cross section at Ch. 13100 (Scale 1:500 @ A3)

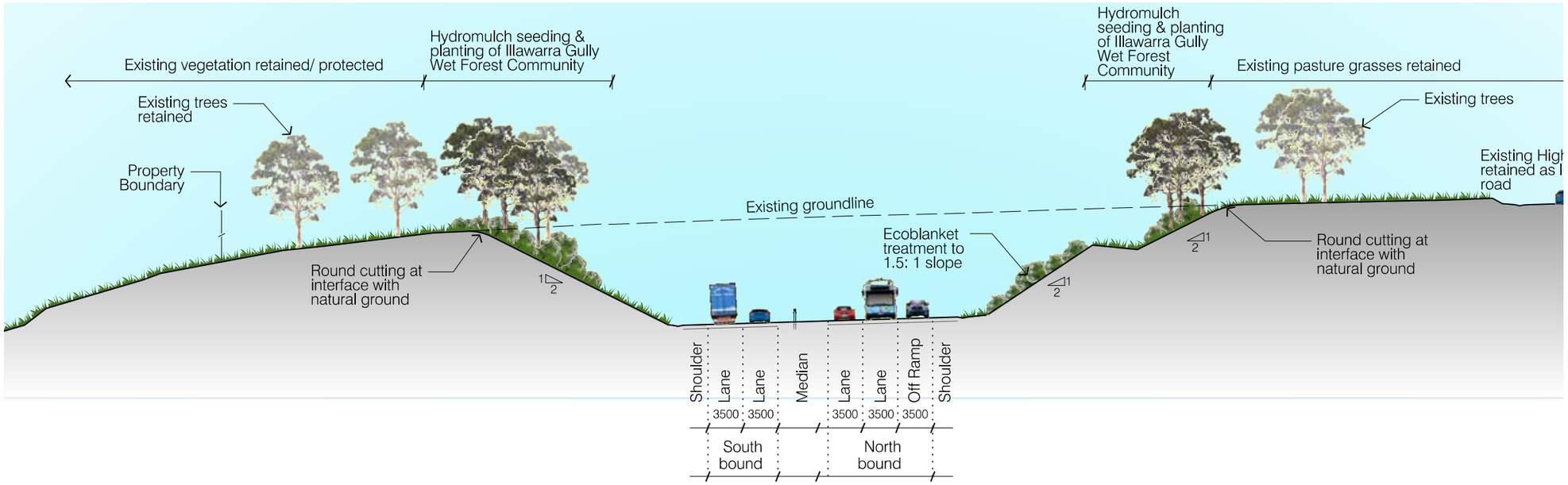


Fig. 7.39: Road cross section at Ch. 14000 (Scale 1:500 @ A3)

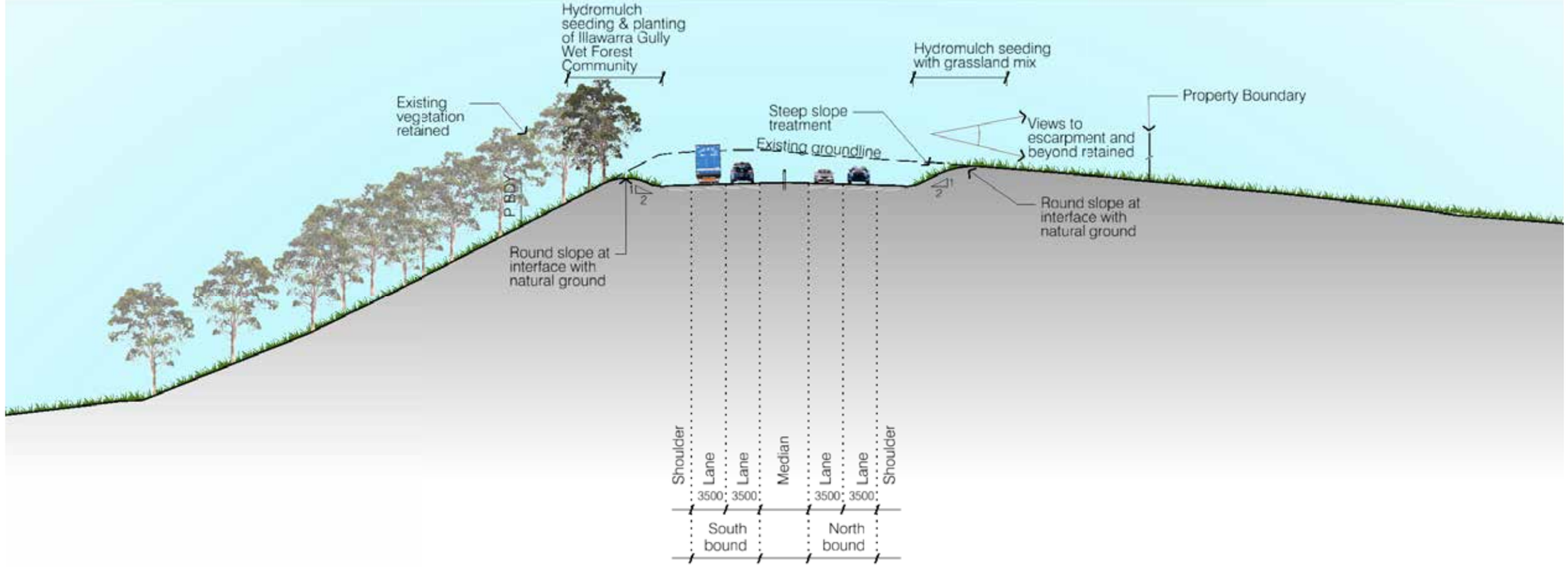


Fig. 7.40: Road cross section at Ch. 14800 (Scale 1:500 @ A3)

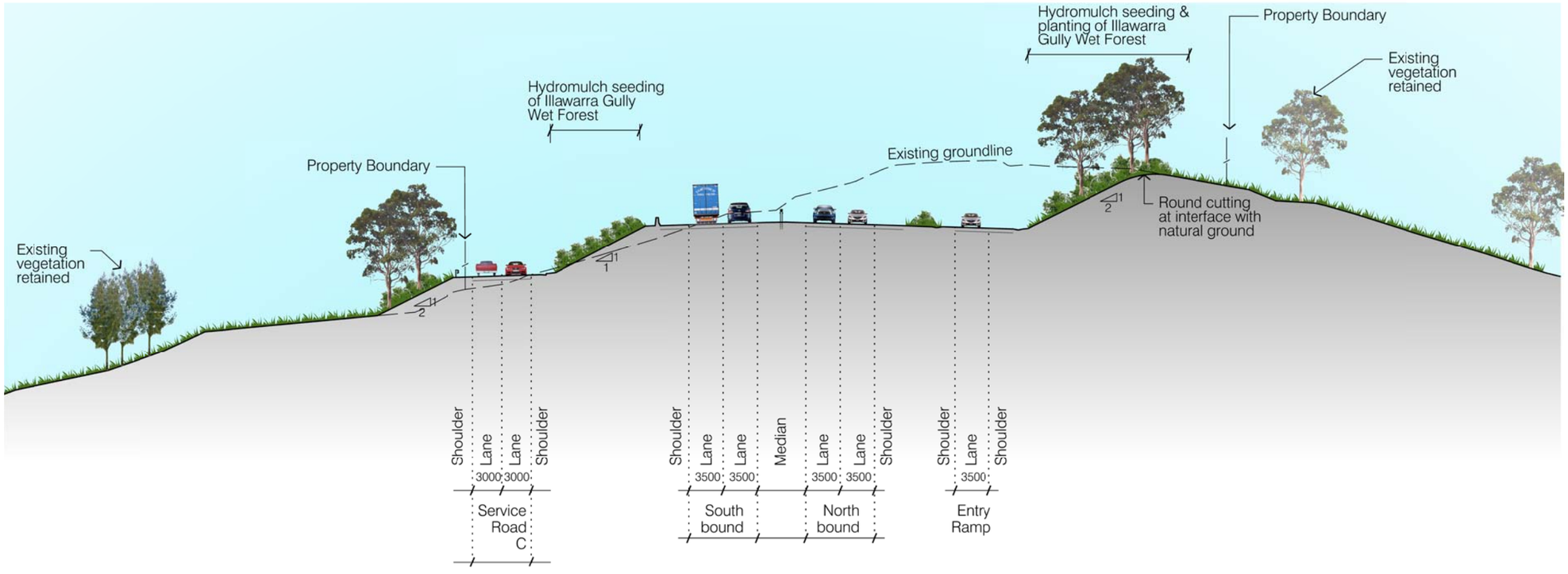


Fig. 7.41: Road cross section at Ch. 15400 (Scale 1:500 @ A3)

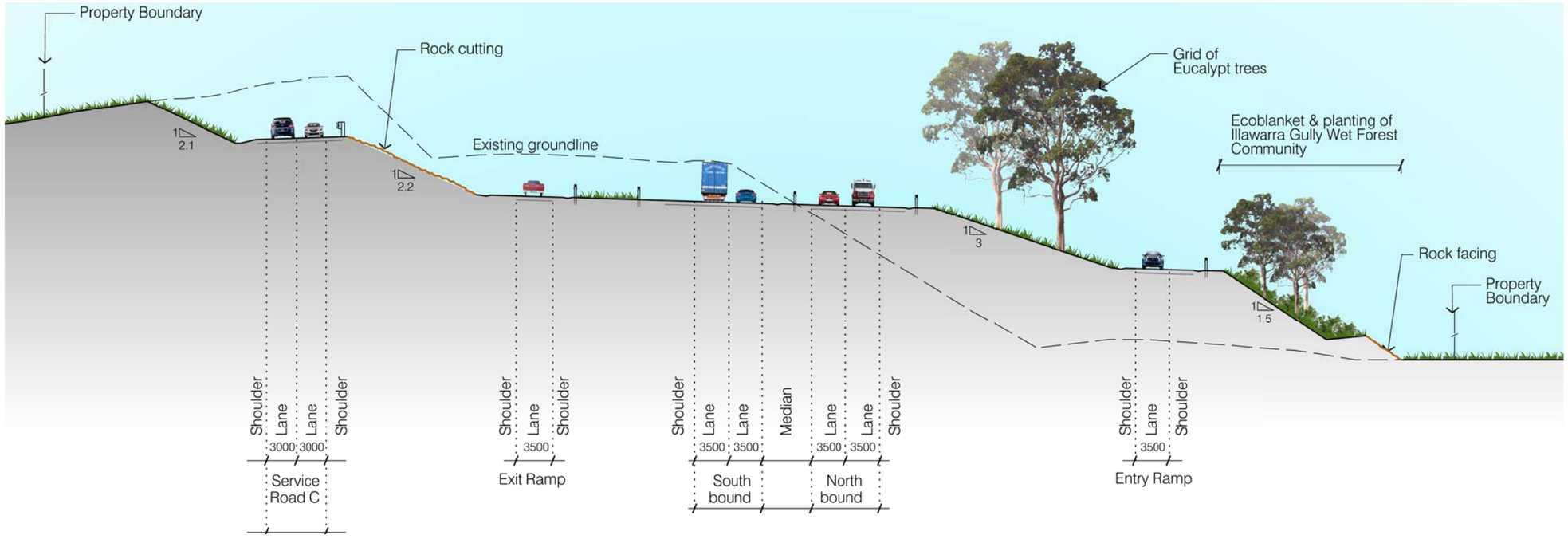


Fig. 7.42: Road cross section at Ch. 15650 (Scale 1:500 @ A3)

7.5.4 BRIDGES

The approach to the design of bridges for the Project and the principles governing the design of bridges are described in detail in Chapter 6. The bridges in this character zone are listed below in Table 7.3 and are illustrated in the following pages.

Bridge	Design	Comment
SB06. Tindalls Lane Overbridge	Single span Overbridge with spill through abutments with a rock pitched finish. Girder type: Box Girder Pier type: N/A	▪ Priority 1 bridge. ▪ Safety screen as per Gerringong Upgrade.

Table 7.3: List of bridge structures in Character Zone 3

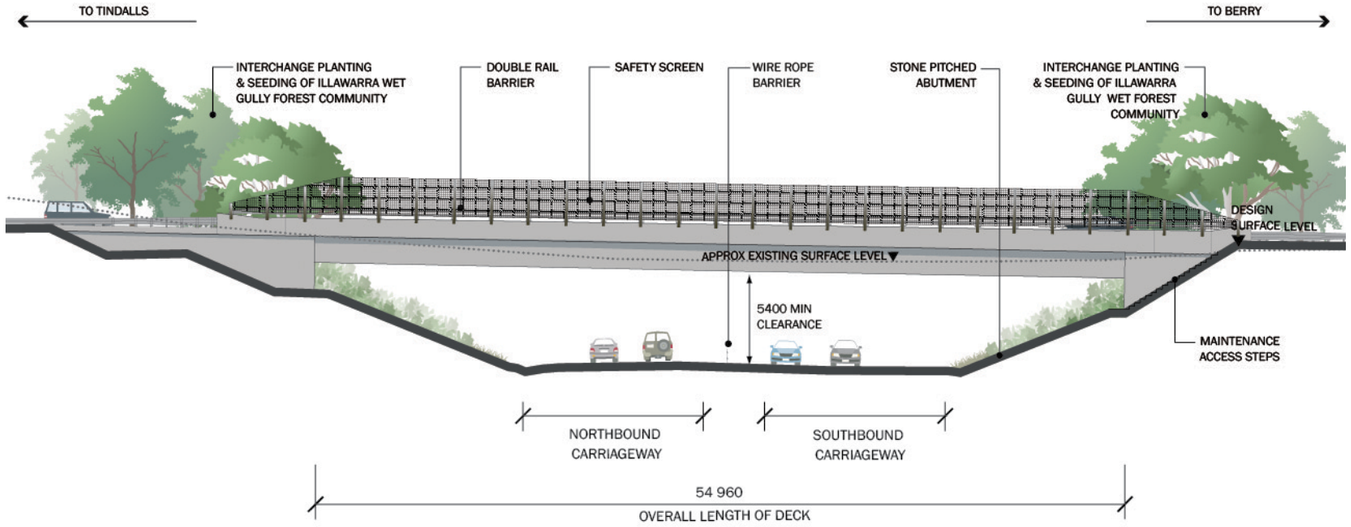


Fig. 7.43: Elevation – Bridge SB06: Tindalls Lane Overbridge (Scale: 1:400@A3)

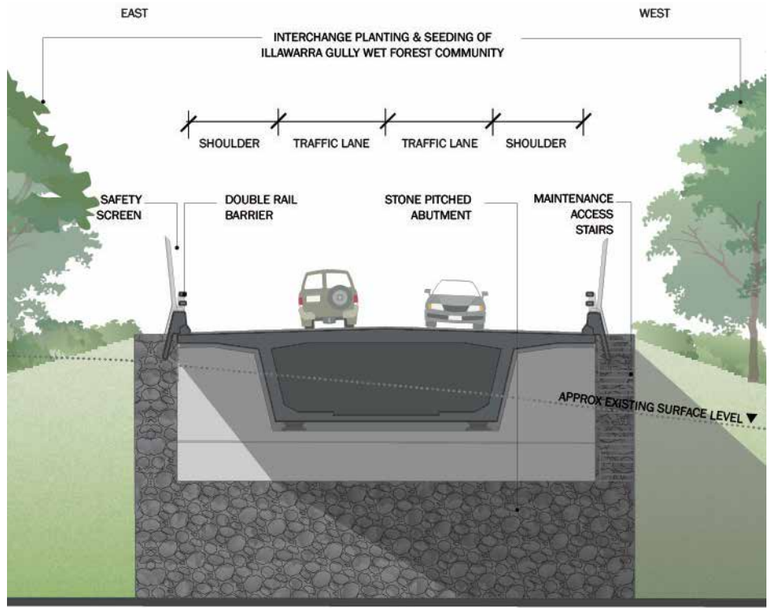


Fig. 7.44: Section – Bridge SB06: Tindalls Lane Overbridge (Scale: 1:200@A3)

Fig. 7.45: Perspective view of Tindalls Lane Overbridge

7.5.5 NOISE BARRIERS AND HEADLIGHT SCREENS

The overall design approach and principles governing the design of noise barriers and headlight screens are described in detail in Chapter 6. The barriers/ screens in this Character Zone are listed below in Table 7.4 and illustrated in the following pages.

Headlight Screens	Design	Comment
HS01	Expanded metal louvre mesh on Type F barrier	▪ The expanded metal louvre mesh matches that used for headlight glare screens in the Gerringong Upgrade. ▪ The louvres allow through views in one direction (opposite traffic) and blocks views (and headlight glare) in the other direction (Fig. 7.51).

Table 7.4: Schedule of retaining wall and headlight screens in this character zone

Fig. 7.46: HS01 - Cross section
(NTS)

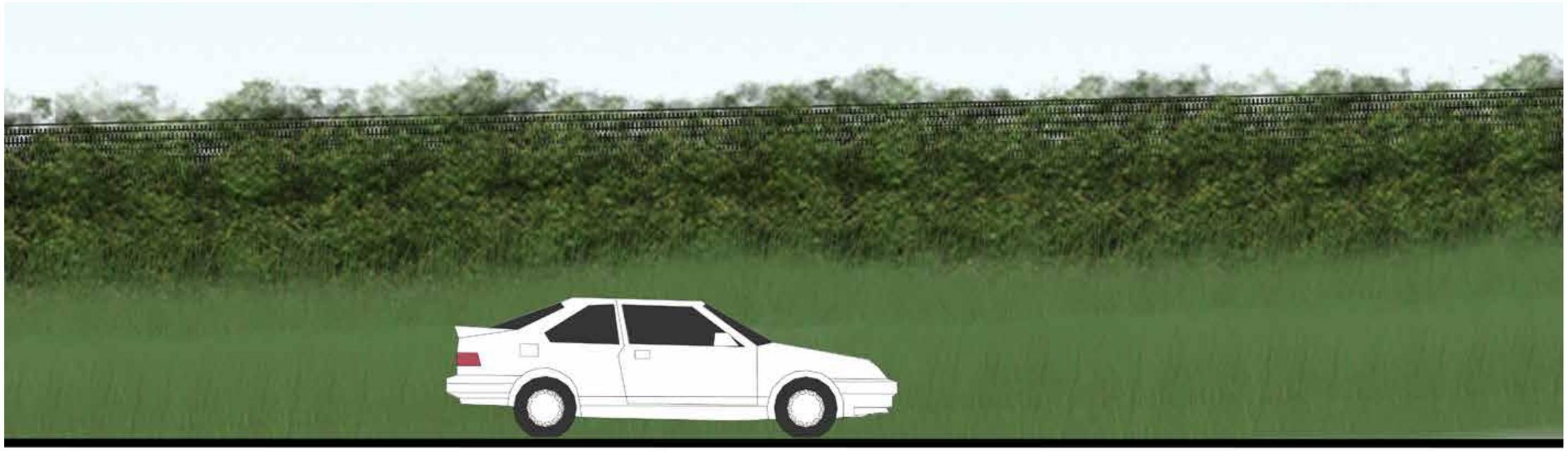


Fig. 7.47: HS01 - Elevation from the highway
(Scale: 1:50@A3)

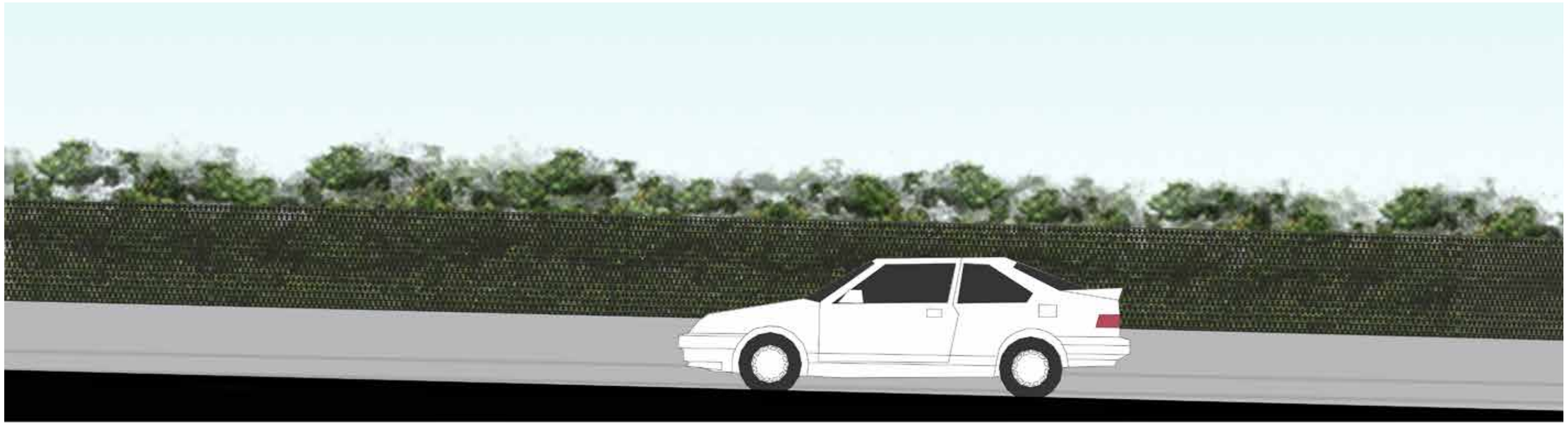


Fig. 7.48: HS01 - Elevation from Service Road C
(Scale: 1:50@A3)

7.6 CHARACTER ZONE 4 - BERRY

7.6.1 INTRODUCTION

The Berry Character Zone is the key interface with the population centre of Berry and so has a wider diversity of issues and characters which are explored. This zone has consequently been broken in to four sub zones to better reflect the interfaces and issues of this section.

Zone A – Sport and Recreation Precinct

The first character zone is characterised by the Berry Bridge and its interface with Bundewallah Creek, Broughton Mill Creek and Connollys Creek. This zone is dominated by recreational uses (Berry Oval, Camp Quality, and Equestrian Centre) and agricultural uses, including a turf farm. The landscape response has been to:

- strengthen the Riverbank forest where it is impacted by the works
- provide appropriate screening where possible to the bridge (although this sits largely to the west of Berry and the Riverbank forest along Bundewallah Creek
- to reinforce the existing poplar avenue in Woodhill Mountain Road. Under the bridge will largely be grassed with reinforcement provided where the rain and light shadow dictates.

Berry Bridge and its structural elements are designed to be simple and elegant with a two column (rectangular) pier and integrated headstock. The two column pier enables maximum views through underneath the bridge minimising the extent of built structure as far as practicable. The height of the bridge has been kept consistent with the EA concept design as negotiated with the community. The three Broughton Creek Bridges feature the same pier design for consistency through the Project.

Zone B – North Street Corridor

The second character zone covers the area where the alignment comes into visual prominence of the town and parallels North Street. The design has set the alignment down in the landscape concealed by a noise mound, which provides a visual and noise barrier to the alignment. The use of the mound enables the landscape character to be largely continued by adopting the principles of a 'ha ha' which enables the eye to continue without interruption to the landscape beyond.

The landscape response to the mound has focused on presenting predominantly a grassland landscape to the town with the road side treated with shrubs. The scale of the roadside plantings is such that they do not impose significantly onto the skyline enabling the viewing of the Riverbank forest and the escarpment beyond. The scale of the mound has been reduced by gently sloping the land beyond the Project boundary, but within Roads and Maritime Services ownership, up at 20h: 1v before transitioning to a maximum slope of 2h:1v within the Project boundary. The interface between the slopes will be rounded to reduce the definition of these elements within the view.

A shared path will be incorporated within the North Street road corridor with appropriate planting of street trees. The spacing and location of this will be undertaken to optimise view corridors.

As part of the North Street corridor redevelopment the development of Town Park is to be considered. This is subject to further resolution and design development in negotiation with RMS and council.

Zone C – Kangaroo Valley Road Precinct

The Kangaroo Valley Road Precinct is dominated by the southern interchange. This occurs at the interface between the old township of Berry dominated by its strong rectangular grid and the new development of Berry located on the higher ground free of flood influences.

The alignment passes between these two development zones. The acquisition of a number of properties has been required to facilitate this. The character established for the North Street corridor and in particular the noise mound is continued around into the intersection. Like the northern interchange the use of exotic/deciduous trees has been adopted to reinforce the cultural interface and its connection to town.

The Kangaroo Valley Road Overbridge is designed as part of the interchange 'gateway statement' treatments. The bridge abutments will be finished in natural sandstone and the safety screen is proposed to be an artwork screen creating a visual marker for Berry town to passing motorists on the highway as well as people using Kangaroo Valley Road for movement within the local area.

The connection between the new and old development is reinforced by the use of vegetation across the bridge providing an enhanced pedestrian experience and the sense that the town continues across the bridge. The bridge itself is book ended by roundabouts; to the east it marks the edge of town, to the west it marks the entrance to the Huntingdale Park Estate. These two elements in combination help to re-establish and reinforce the linkage which is broken by the highway alignment. The pedestrian linkages tie both into Queen Street, the main street of town, and also link to the North Street shared path.

Noise is an issue due to the proximity of developments and this has been integrated into the design response. To the east of the alignment the noise mound has been designed to minimise the number of built structures required to address this. To the west a small section of noise wall is required, which has been set back from the alignment to maximise the visual screening and minimise its presence within the landscape. The potential for mounding has also been explored and will be reviewed further in design development to further minimise the need for structures and to integrate the earthworks formation with its surrounds.

East of the alignment the link road passes the western edge of Mark Radium Park. A key element of this park is the duck pond which will be retained as part of the design response.

West of the alignment and north of the Kangaroo Valley Road bridge the realignment of Town Creek is required. The principals of the design have been agreed with RMS, the property owner and environmental agencies as to a strategy to move forward with: - a combination of engineered and naturalistic channel. This is to be developed further in consultation with all parties.

Zone D – Jaspers Bush Rural Interface

The Jaspers Bush marks the movement of the alignment beyond the urban development of the township of Berry and into the adjoining rural hinterland. The landscape is dominated by grasslands with scattered groupings of trees and the occasional homestead or farm yard. The alignment relates to this, continuing the grassland through the corridor and retaining views. A substantial stand of Eucalypts occurs near Schofields Lane at the end of the alignment and the landscape response reinforces this with a transitional zone from grassland to Illawarra Gully Wet Forest.

Fig. 7.49: Aerial view of Character Zone 4

7.6.2 PLANS

LEGEND

GENERAL
- Project boundary
- 8300 Chainage number
- Retained views

PAVEMENT
- Highway alignment
- Local road
- Farm access
- Footpath

LANDSCAPE REMEDIATION
- Existing road to be removed

EARTH WORKS FORMATION
- Cut embankment
- Fill embankment

STRUCTURES
- Noise wall
- Headlight screen
- Retaining wall
- Road Barrier Wire; Type F
- Bridge
- Cycle Links

VEGETATION COMMUNITIES
- Illawarra Gully Wet Forest
- Warm Temperate Layered Forest
- Riverbank Forest
- Feature trees
- Existing trees retained

LANDSCAPE TREATMENT
- Rock cutting
- Shrub planting
- Garden bed 200mm improved topsoil over 200mm cultivated subgrade. 75mm mulch over.
- Garden bed on structure
- Steep slope treatment Ecoblanket or Enkamatt (or approved equivalent)
- Hydromulch (mix to reflect vegetation community) over 100mm site soil over 200mm cultivated subgrade
- Grassland (mix to be native/ exotic grasses only) Hydromulch over 100mm site soil over 200mm cultivated subgrade
- Turf - Zoysia turf over 50mm turf underlay over 200mm cultivated subgrade
- Basin

Scale 1:2000 @ A3

0 20 50 1oo metre

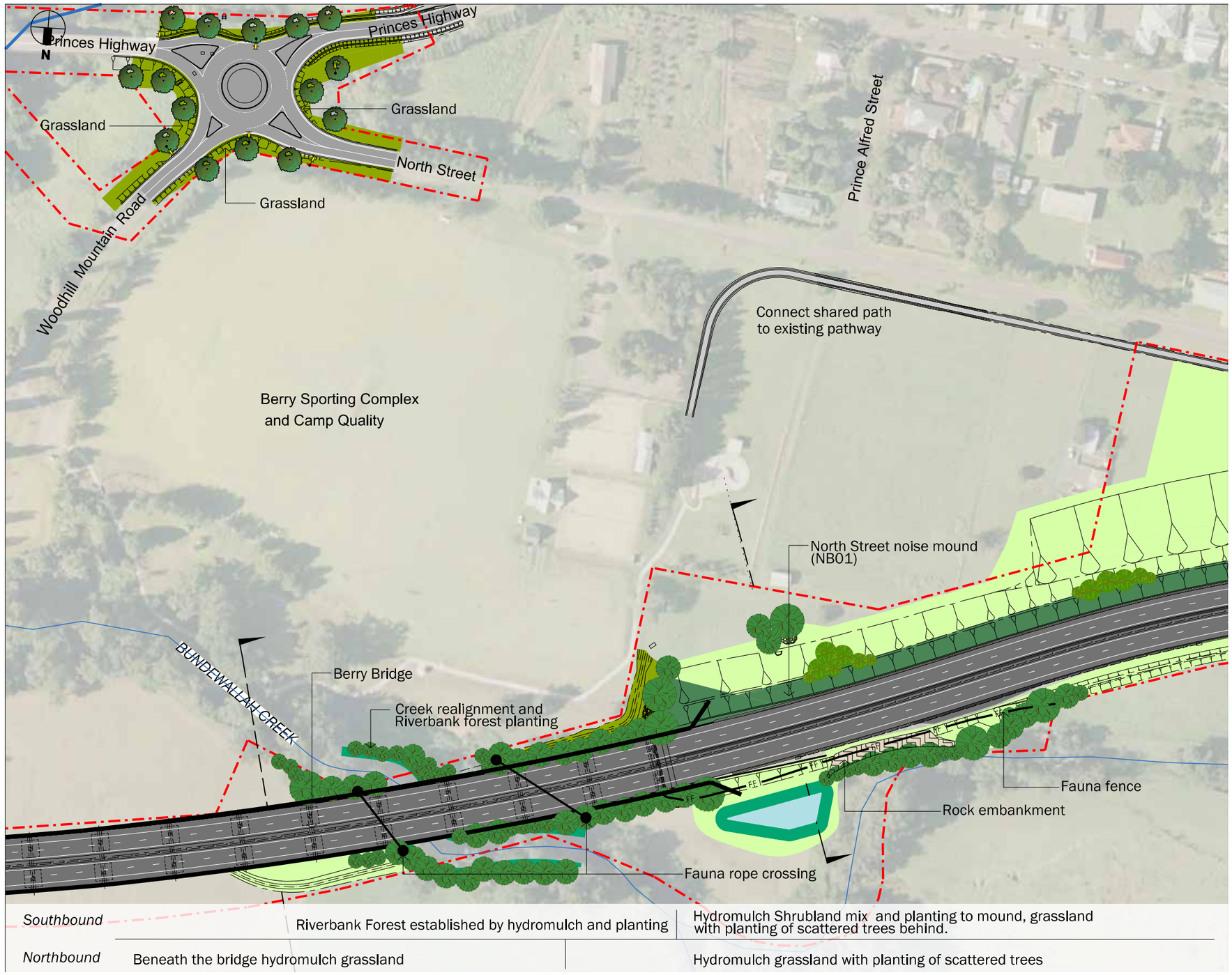


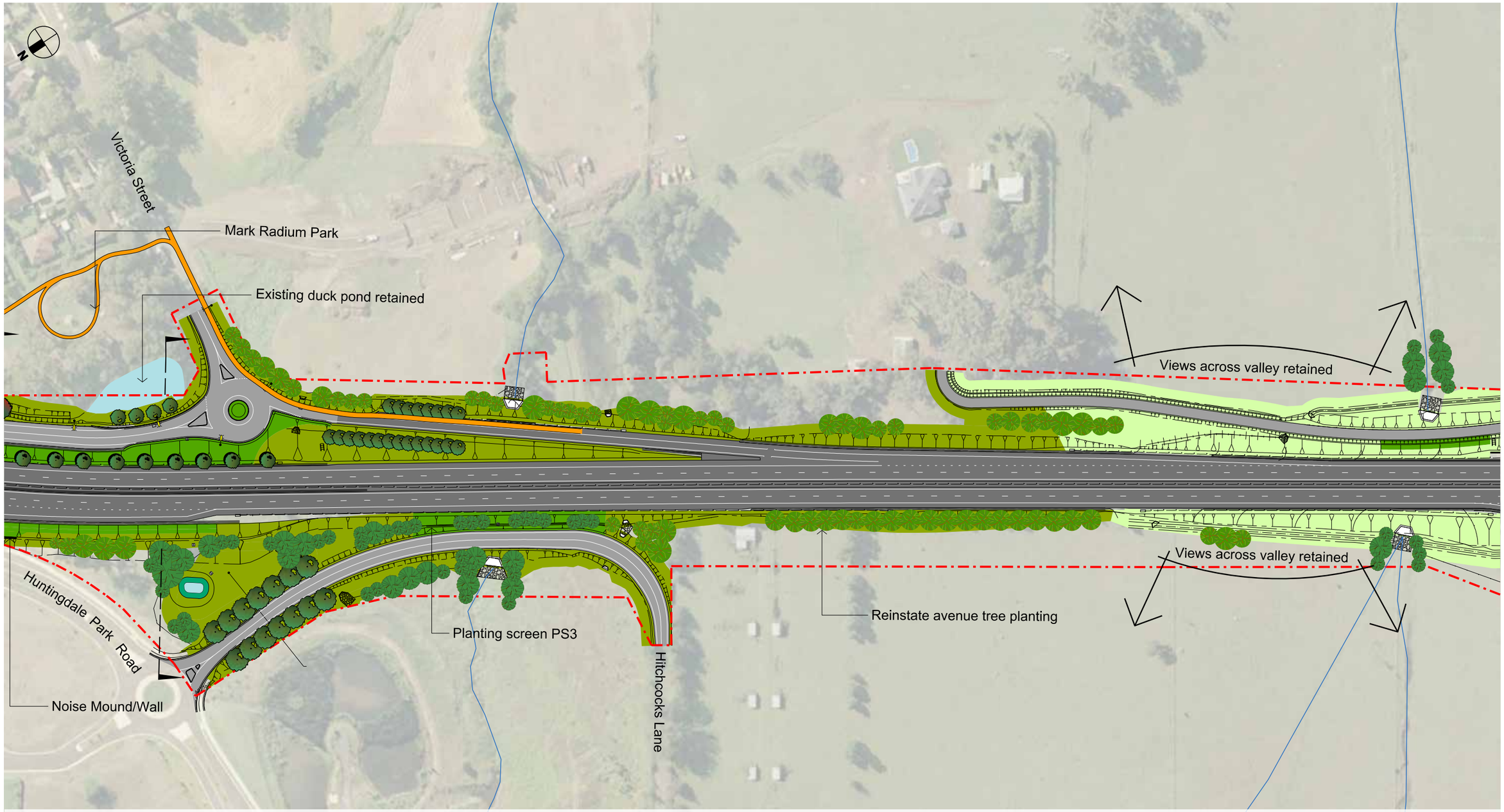
Fig. 7.50: Urban and landscape design plan (Sheet 16) - Berry Character Zone

Southbound	Hydromulch Shrubland mix and planting to mound, grassland with planting of scattered trees behind.
Northbound	Hydromulch grassland with planting of scattered trees

Fig. 7.51: Urban and landscape design plan (Sheet 17) - Berry Character Zone

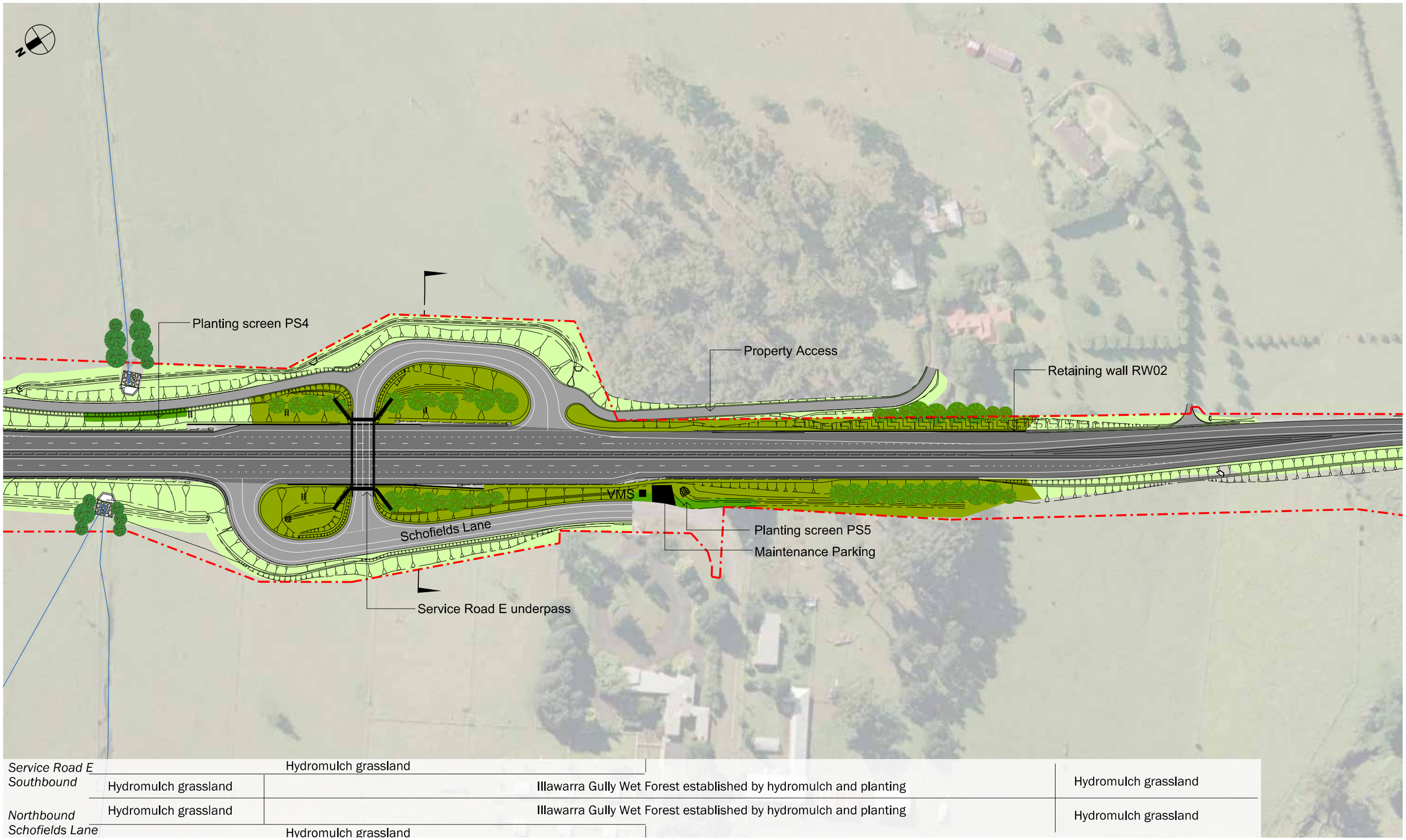
Southbound	Hydromulch Shrubland mix and planting to mound, grassland with planting of scattered trees behind.	Berry South Interchange mix established by hydromulch and planting
Northbound	Hydromulch grassland mix with planting for headlight glare control behind.	Berry South Interchange mix established by hydromulch and planting
Service Road	Hydromulch grassland with scattered trees	

Fig. 7.52: Urban and landscape design plan (Sheet 18) - Berry Character Zone



Southbound	Illawarra Wet Gully Forest established by hydromulch and planting	Hydromulch grassland
Northbound	Illawara Wet Gully Forest established by hydromulch and planting	Hydromulch grassland with planting of scattered trees

Fig. 7.53: Urban and landscape design plan (Sheet 19) - Berry Character Zone



Service Road E Southbound	Hydromulch grassland	Hydromulch grassland	Illawarra Gully Wet Forest established by hydromulch and planting	Hydromulch grassland
Northbound Schofields Lane	Hydromulch grassland	Hydromulch grassland	Illawarra Gully Wet Forest established by hydromulch and planting	Hydromulch grassland

Fig. 7.54: Urban and landscape design plan (Sheet 20) - Berry Character Zone

Fig. 7.55: Urban and landscape design plan (Sheet 20) - Berry Character Zone

7.6.3 CROSS SECTIONS

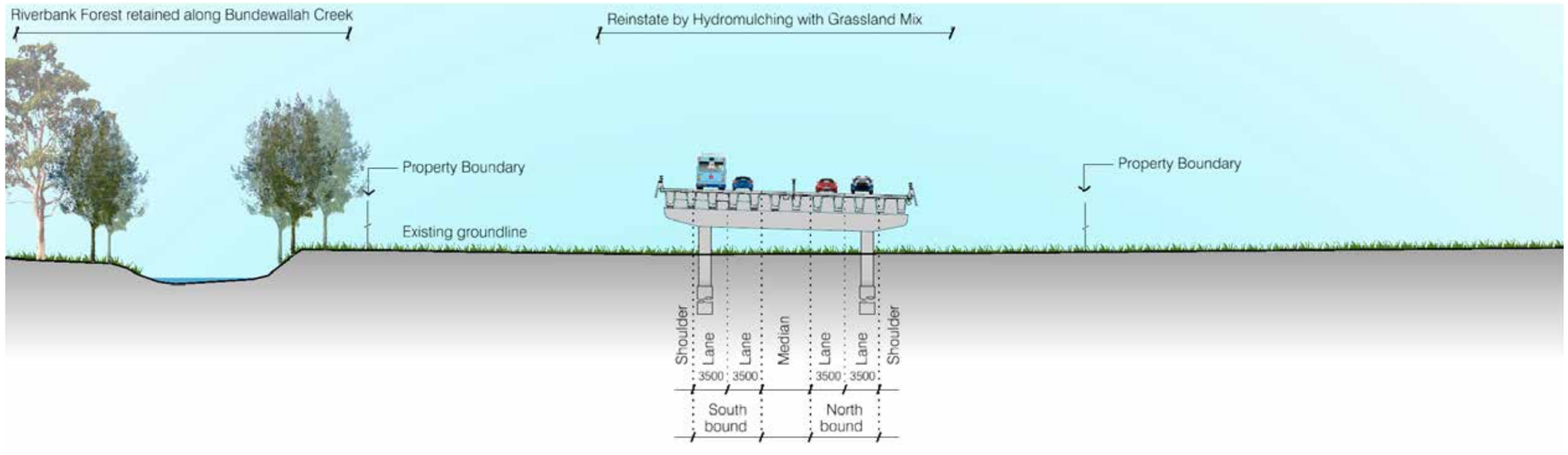


Fig. 7.56: Road cross section at Ch. 16150 (Scale 1:500 @ A3)

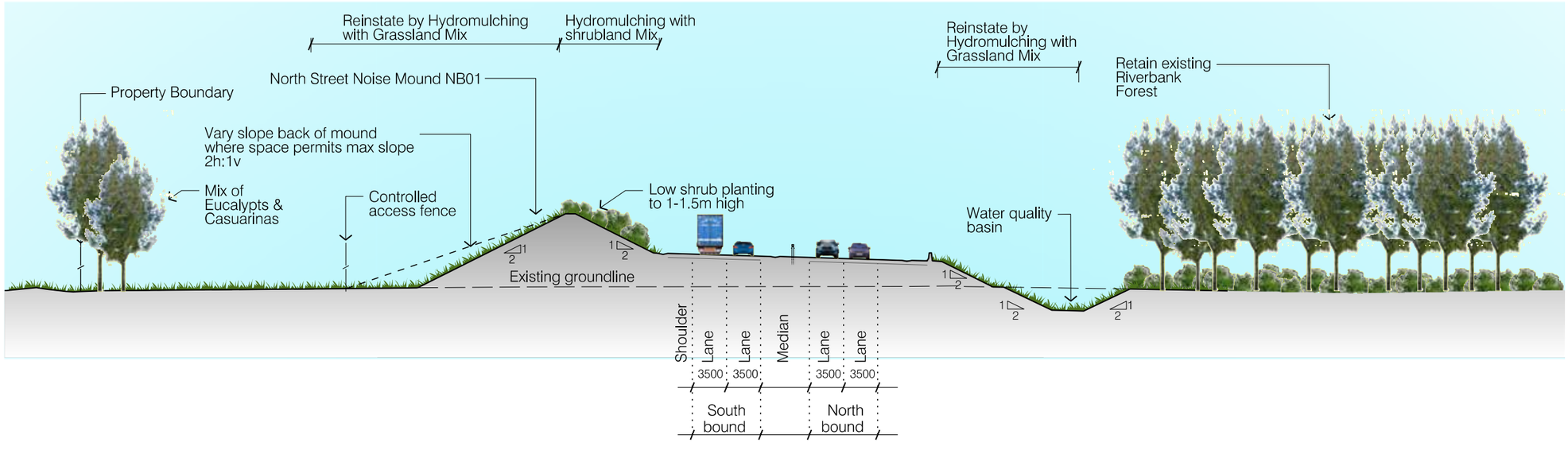


Fig. 7.57: Road cross section at Ch. 16400 (Scale 1:500 @ A3)

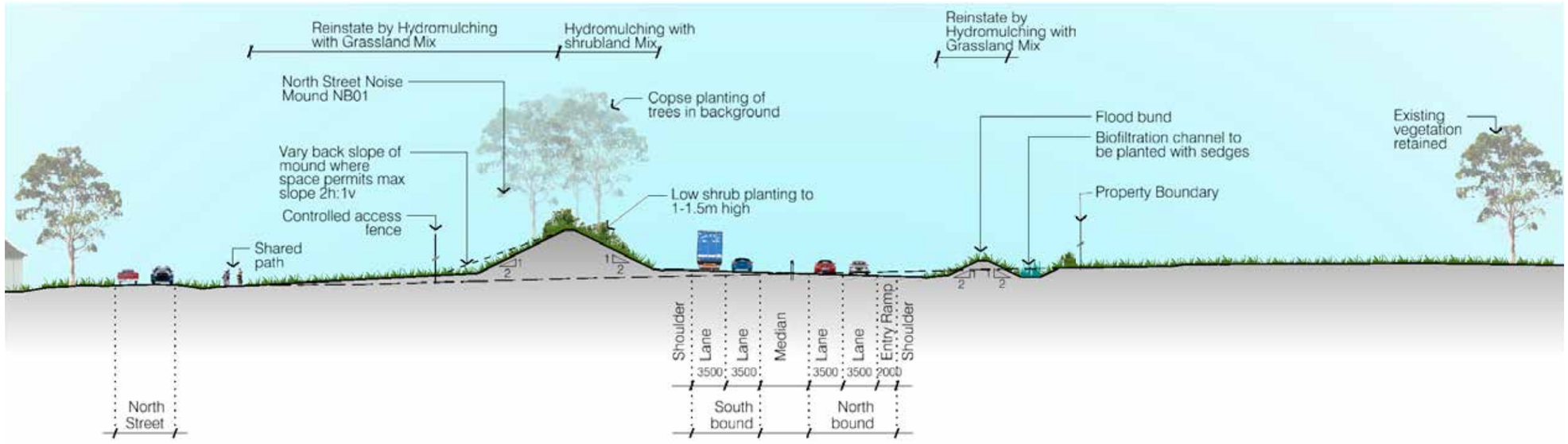


Fig. 7.58: Road cross section at Ch. 16900 (Scale 1:500 @ A3)

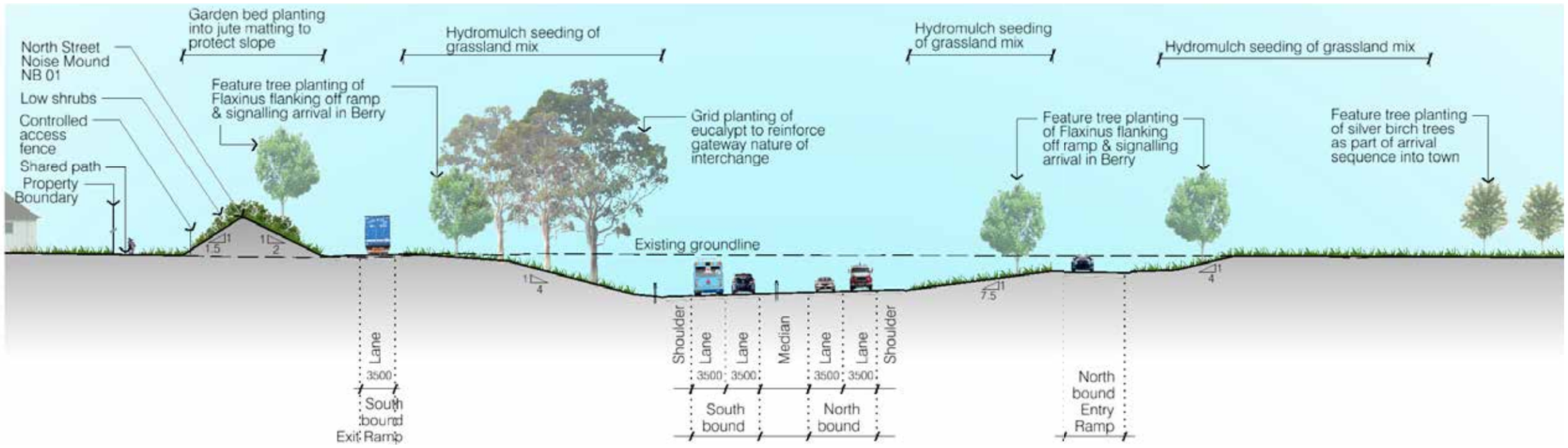


Fig. 7.59: Road cross section at Ch. 17550 (Scale 1:500 @ A3)

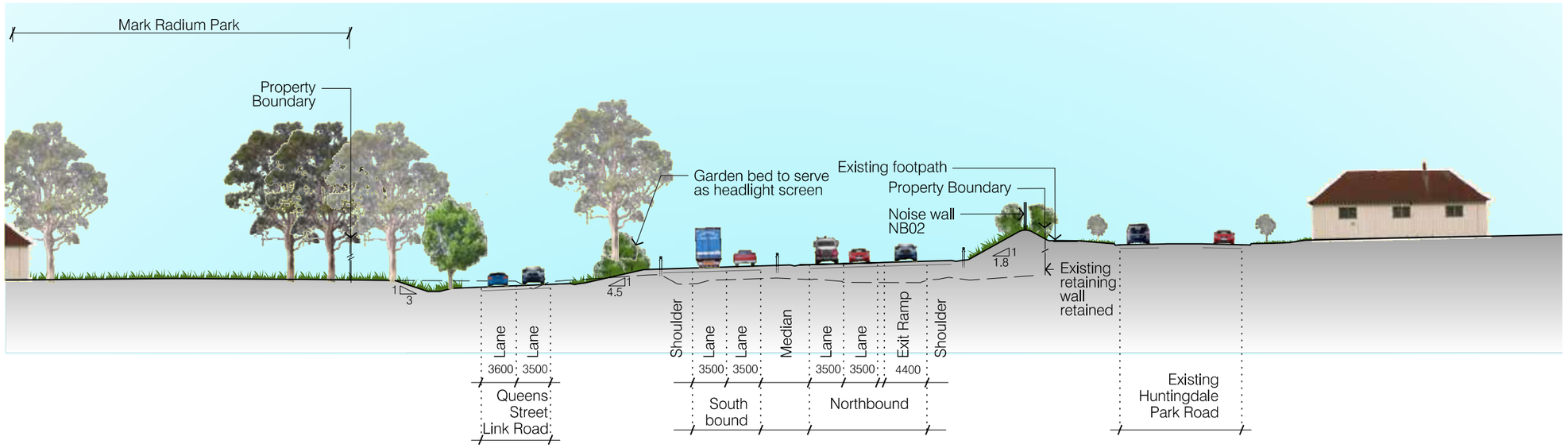


Fig. 7.60: Road cross section at Ch. 17800 (Scale 1:500 @ A3)

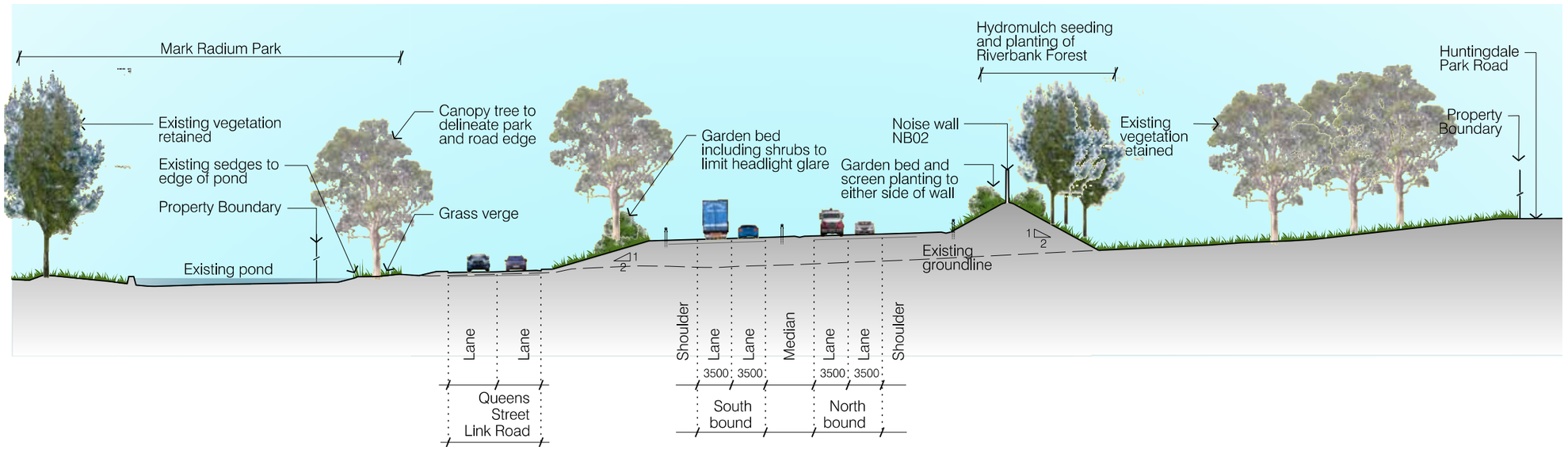


Fig. 7.61: Road cross section at Ch. 17900 (Scale 1:500 @ A3)

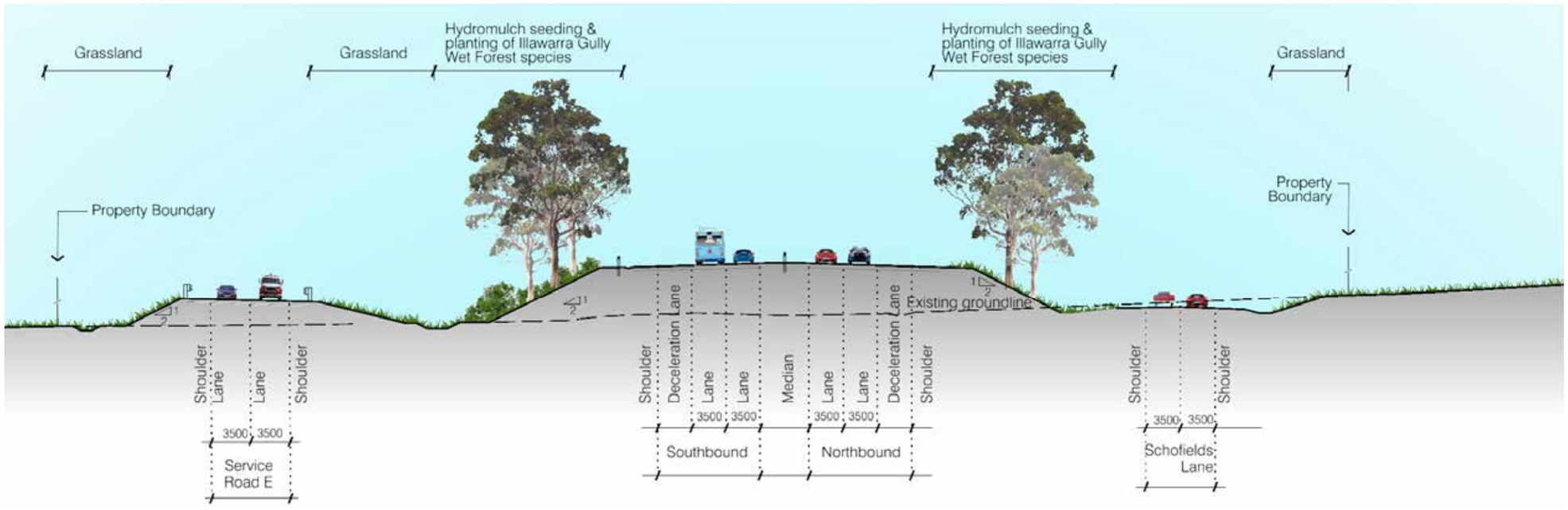


Fig. 7.62: Road cross section at Ch. 18700 (Scale 1:500 @ A3)

7.6.4 BRIDGES

The approach to the design of bridges for the Project and the principles governing the design of bridges are described in detail in Chapter 6. The bridges in this character zone are listed below in Table 7.6 and are illustrated in the following pages.

Bridge	Design	Comment
SB07. Berry Bridge	Multiple span bridge with spill through abutments with a rock pitched finish. Girder type: Super-T Pier type: Two rectangular columns with an integrated headstock.	▪ Priority 1 bridge. ▪ 3.0 m wide shoulders for cyclists and future expansion. The bridge at Connollys Creek / Bundewallah Creek / Broughton Mill Creek crossings has been designed to minimise its visual impacts on the Berry Township. During the design phase, more than ten design options were explored utilising three dimensional studies to arrive at the least impact option (five of these studies illustrated on pages 52-53). Based on these studies a pier form of two rectangular columns with an integrated headstock was selected as the preferred design. This design includes the following design features that contribute to minimising the visual impact of the piers on Berry: ▪ The number of pier columns at each pier location have been minimised. The EA concept design featured options with three or four columned piers. The current design has a two columned pier, vastly improving the aesthetics and reducing the visual impact. ▪ The current design features a well-crafted elegant pier design with slender lines. This is an improvement on the EA pier design options, the majority which were wide and bulky. The slender columns ensure better views through to the surrounding landscape minimising the visual intrusion caused by the piers. ▪ The current design has a bridge parapet with a 1600mm overhang. This provides a generous overhang of 635mm beyond the soffit of the Super-T flanges on the Berry town side. On the opposite side the parapet skirt is 200mm below the soffit of the service pipe. These overhangs improve the aesthetics of the bridge in elevation by creating generous shadow lines and minimising the visual exposure to services and other bridge elements.
SB08. Kangaroo Valley Road Overbridge	Single span Overbridge with sandstone clad reinforced soil retaining wall abutments. Girder type: Voided slab Pier type: N/A	▪ Priority 1 bridge. ▪ Is proposed to be a gateway town entry statement (see Entrance Strategies below). ▪ Retaining wall abutments are to be finished in natural sandstone. ▪ Safety screen is to be an ‘artwork’ screen. ▪ 2.5 m shared path on either side. ▪ Planter boxes provided separating shared paths on either side from roadway. ▪ Illumination level calculations indicate that street lighting at either end of the bridge adequately illuminates the bridge for pedestrians. Therefore the design doesn’t propose additional pedestrian lighting.
SB09. Service Road E Underpass	Single span Underpass with reinforced soil retaining ewall abutments. Girder type: Plank Pier type: N/A	▪ Priority 2 bridge. ▪ Ribbed R.E Panels to discourage graffiti. ▪ 3.0 m wide shoulders for cyclists and future expansion.

Table 7.5: List of bridge structures in Character Zone 4

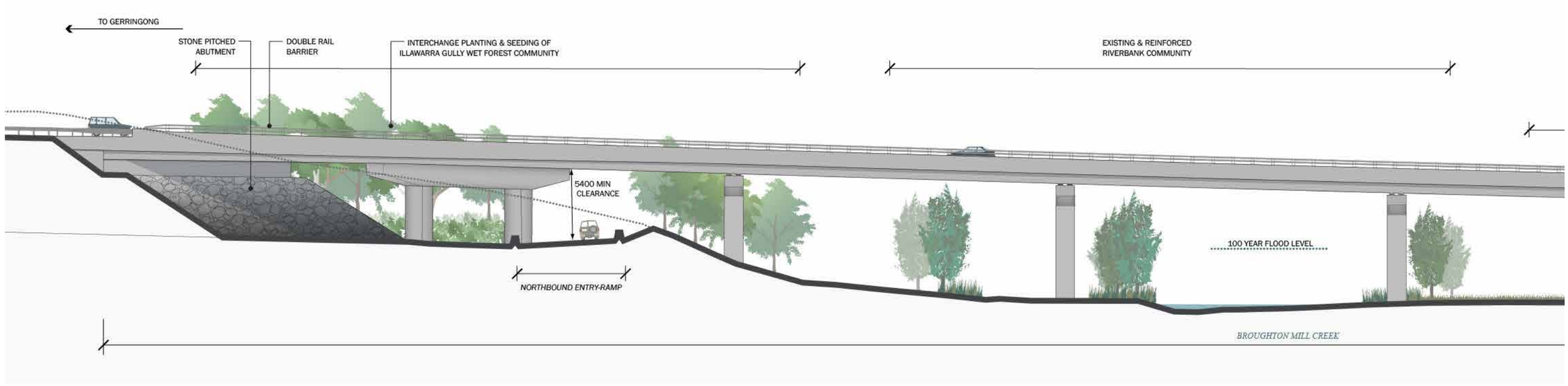


Fig. 7.63: Elevation – Bridge SB07: Berry Bridge
(Scale: 1:400@A3)

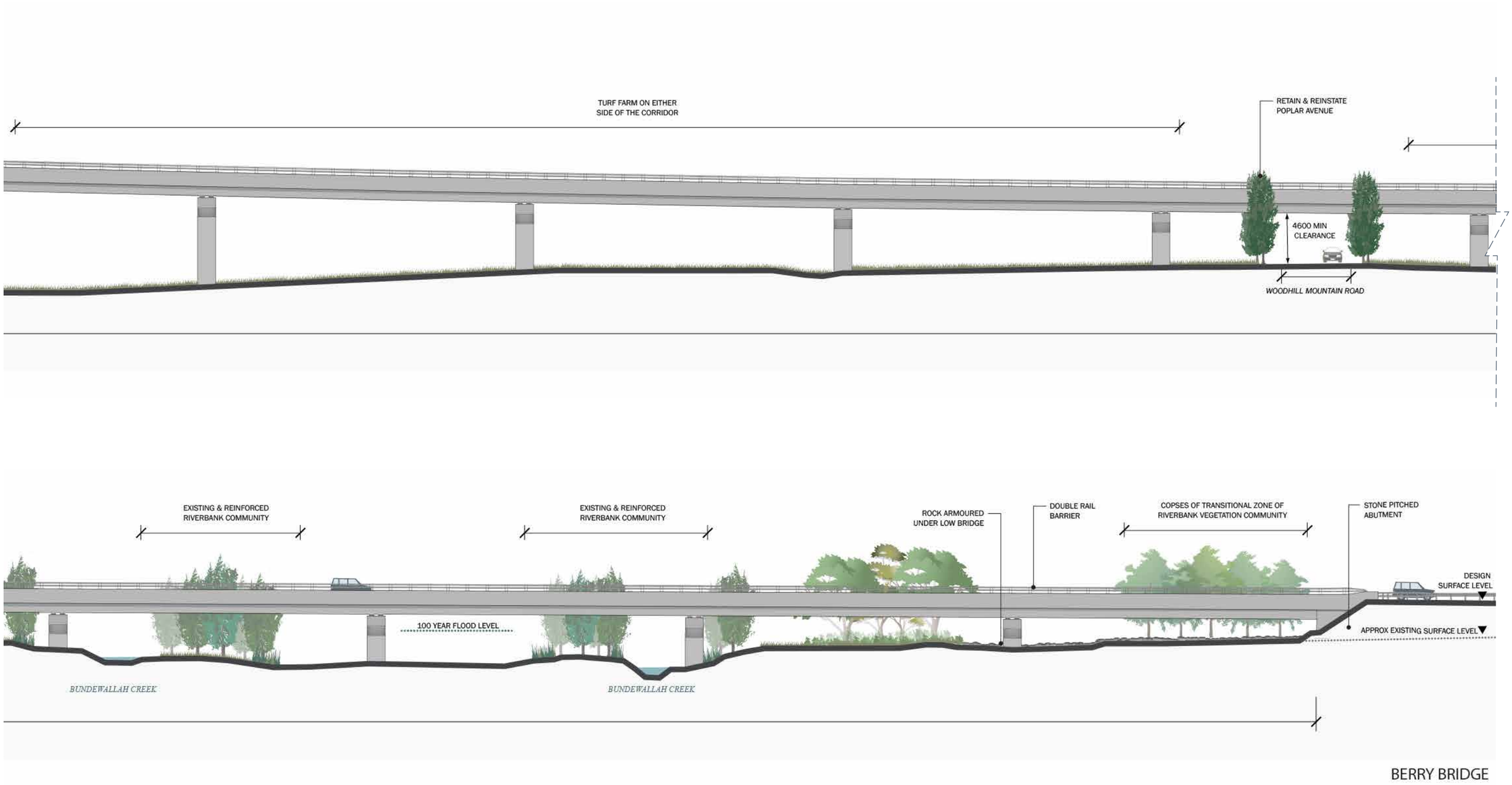


Fig. 7.64: Elevation – Bridge SB07: Berry Bridge (cont.)
(Scale: 1:400@A3)

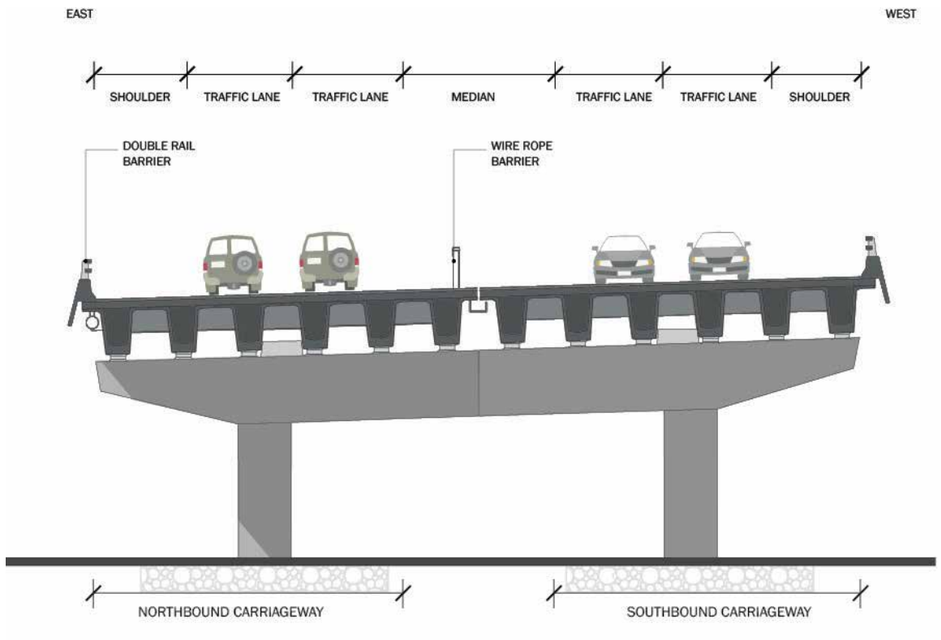


Fig. 7.65: Section – Bridge SB07: Berry Bridge
(Scale: 1:200@A3)

Fig. 7.66: Perspective of Berry Bridge - View from Woodhill Mountain Road
(Two rectangular columns with an integrated headstock)

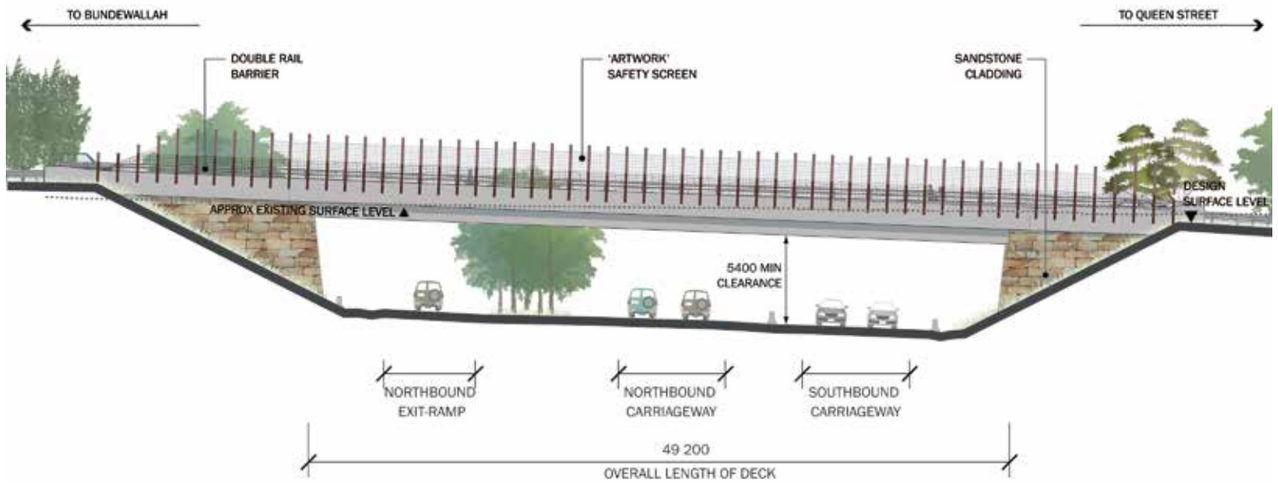


Fig. 7.67: Elevation – Bridge SB08: Kangaroo Valley Road Overbridge
(Scale: 1:400@A3)

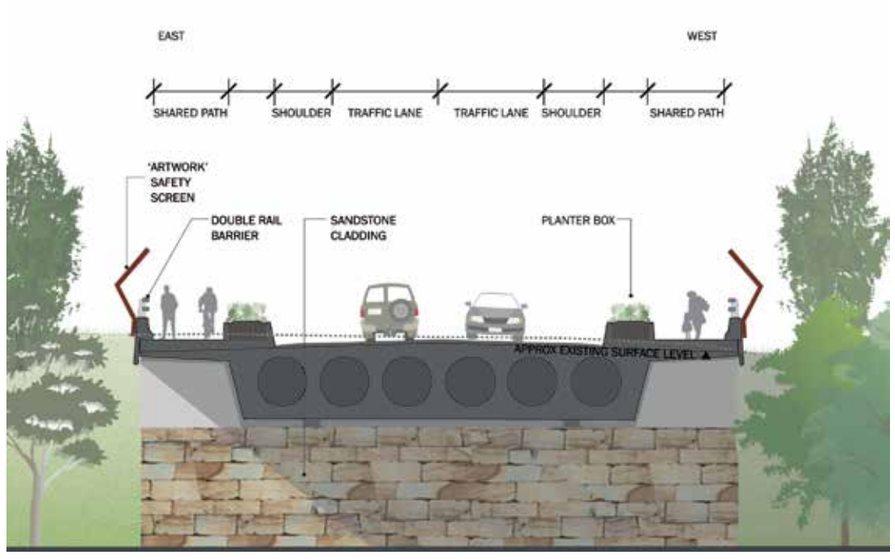


Fig. 7.68: Section – Bridge SB08: Kangaroo Valley Road Overbridge
(Scale: 1:200@A3)

Fig. 7.69: Perspective view of Kangaroo Valley Road Overbridge – View from the highway

Fig. 7.70: Perspective view of Kangaroo Valley Road Overbridge – View from the bridge

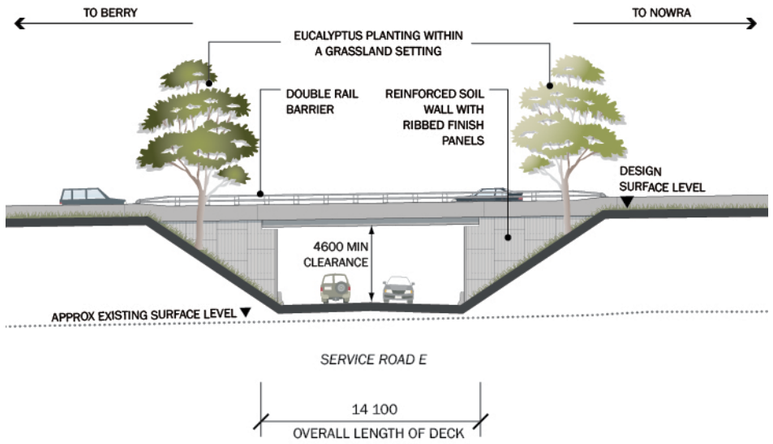


Fig. 7.71: Elevation – Bridge SB09: Service Road E Underpass
(Scale: 1:400@A3)

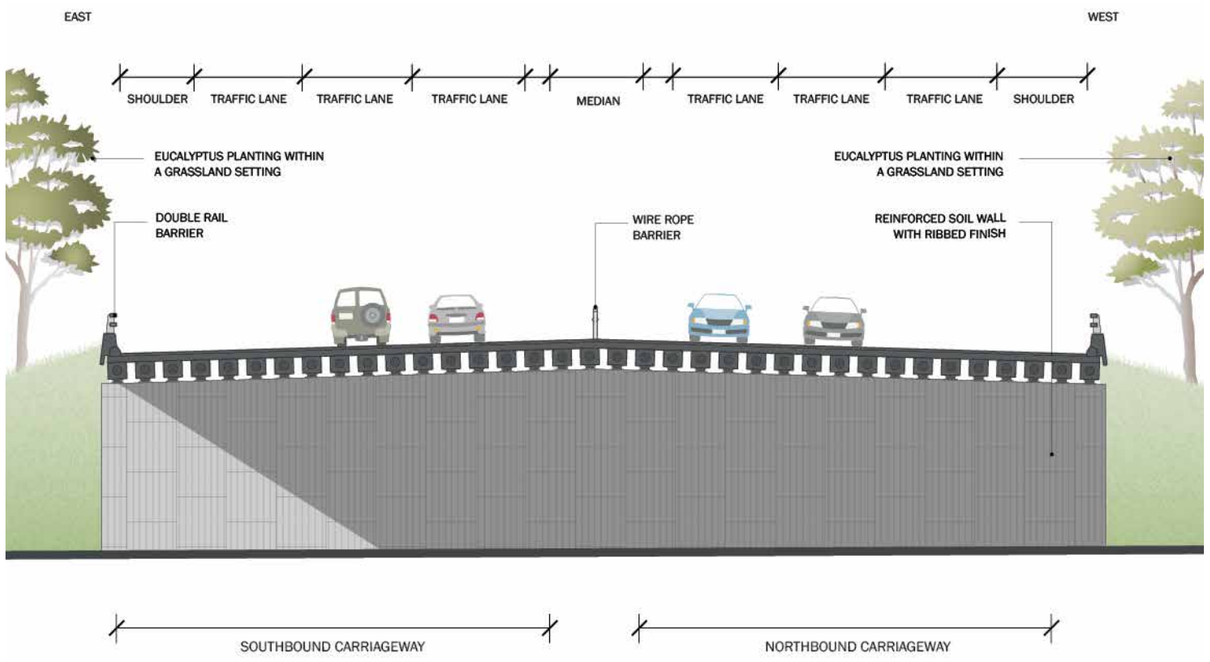


Fig. 7.72: Section – Bridge SB08: Service Road E Underpass
(Scale: 1:200@A3)

7.6.5 NOISE BARRIERS AND HEADLIGHT SCREENS

The overall design approach and principles governing the design of noise barriers and headlight screens are described in detail in Chapter 6. The barriers/ screens in this Character Zone are listed below in Table 7.7 and illustrated in the following pages.

Noise Barriers	Design	Comment
NB01 - North Street	Landscaped mound	▪ The 4.0 m high mound will be sloped on the resident's side at 4h:1v – 2h:1v (varies) and the highway side at 2h:1v enabling landscape to be established on the mound. It will also have a 20:1 slope on the North Street side from the existing road reserve boundary. ▪ The landscape on the mound will be low level to ensure that views to the escarpment are not obstructed and the mound is integrated with the existing context. Treatment to the resident's side is primarily grasses to integrate with the context.

Noise Barriers	Design	Comment
NB02 - Huntingdale Park Road	Mound / wall	▪ Minimise the extent of the 4.0 metre high barrier by providing a mound/wall in negotiation with Council. Whilst the mound will be on the Roads and Maritime Services road reserve, the mound will impact on an existing retaining wall and a proposed sewer line. ▪ The wall will be fronted by a 3.0 - 3.5 m wide landscape zone to the highway side and a min. 2 m wide landscape zone to the resident's side.
Note: Mark Radium Park	N/A	▪ The requirement for noise attenuation at Mark Radium Park was investigated. The noise modelling indicated that there was minimal exceedence to its current noise level and, therefore, noise attenuation was not required. The landscape design maintains passive surveillance from the local roads while screening the park from the highway. Refer Volume III (viii)

Headlight Screens	Design	Comment
HS02	Type F barrier at 820 mm high on top of batter.	▪ The total height of 2.5 m is achieved by the height of the landscaped batter and the 820 mm high Type F barrier.

Table 7.6: Schedule of noise barriers and headlight screens in this Character Zone

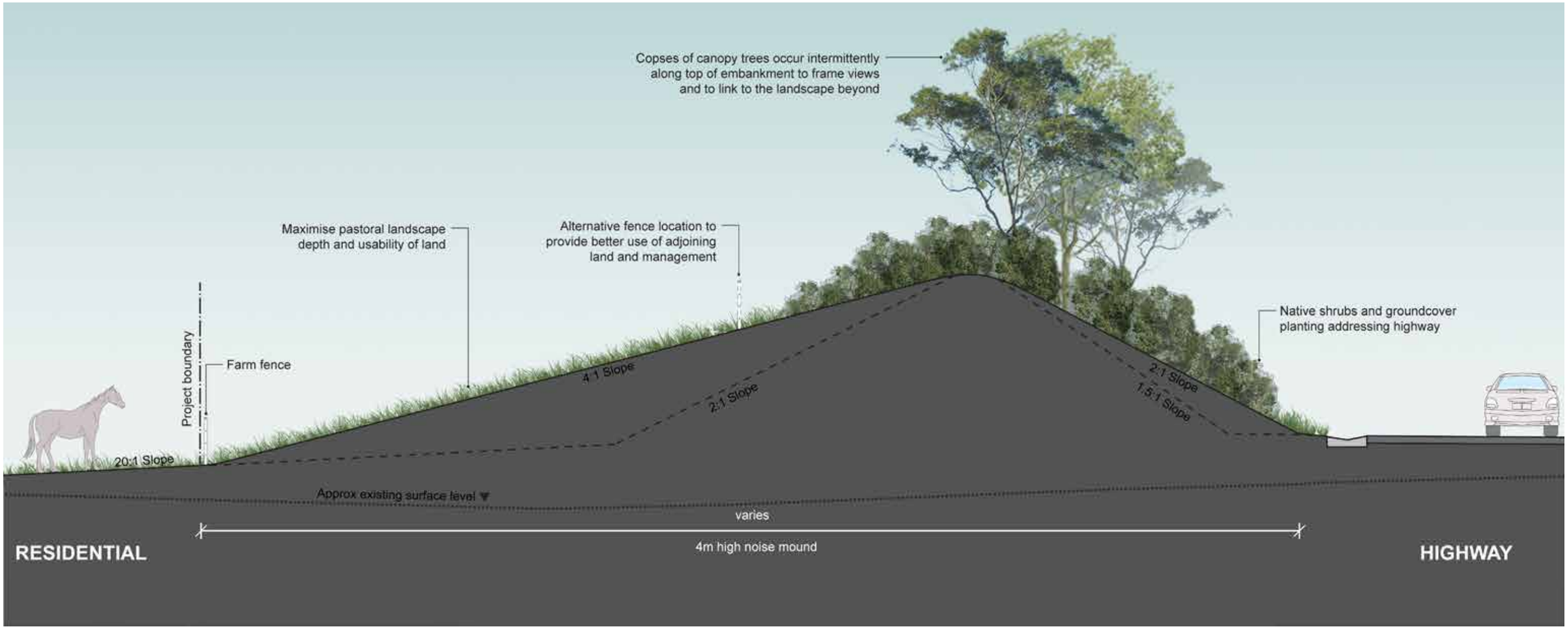


Fig. 7.73: North Street noise mound NB01 - Cross section (Scale: 1:50@A3)

Fig. 7.74: North Street noise mound NB01- View from the highway

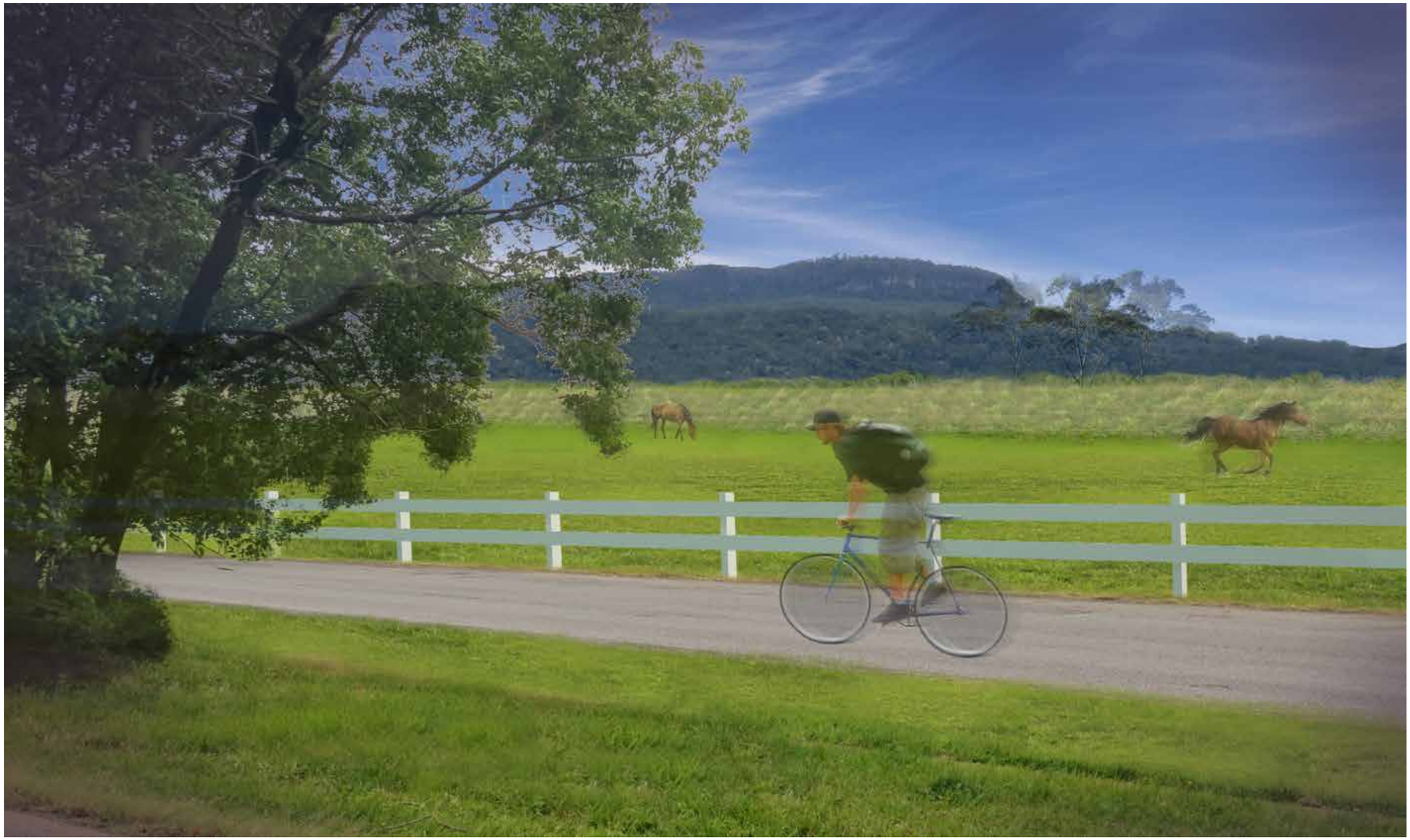


Fig. 7.75: North Street noise mound NB01 - View from North Street

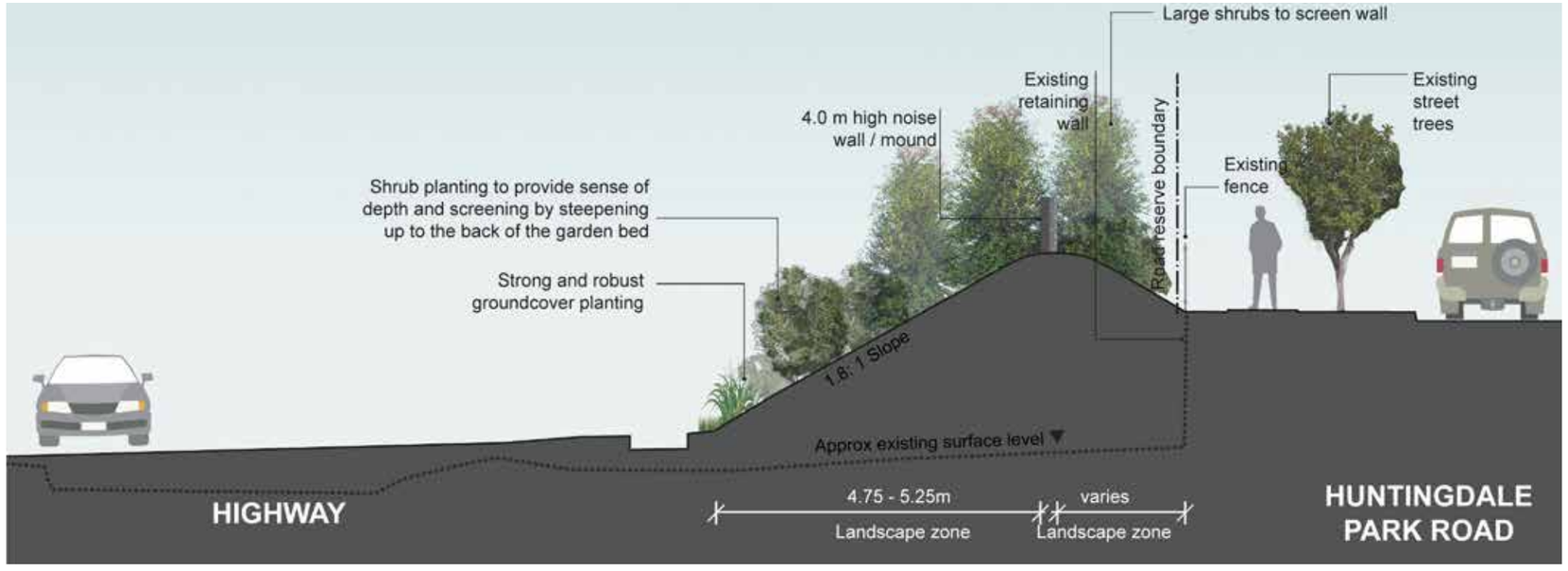


Fig. 7.76: Huntingdale Park Road noise wall NB02 - Cross section of the mound/wall (Scale: 1:50@A3)

Fig. 7.77: Huntingdale Park Road noise wall NB02 - Perspective view from the highway of the mound/wall

8. URBAN DESIGN FINISHES

8.1 PROJECT COLOUR PALETTE

A colour palette is proposed for the Project based on the design requirements, distance to visual receptors (highway, local roads or residential properties) and the context in which the element is placed (Table 8.1).

See Urban Design Schedule of Finishes below for further details.

Location	Description	Finish
Bridge Structures:	Plain concrete	
Bridge Abutments:	Rock pitched at spill through bridge abutments	
	Sandstone at Kangaroo Valley Road Overbridge walled abutment	
	Ribbed concrete panels at underpasses with a walled abutment	
Gateway Artwork:	Painted finish to match Corten weathered steel	
Concrete Drainage invert (where visible):	Coloured concrete	
Pedestrian Paths/ Cycleway:	Coloured concrete	
Noise Wall:	Painted finish to concrete (provides backdrop to screen planting).	Colour choice 01 Colour choice 02
Headlight Screen:	Painted finish to expanded metal screen	Colour choice 01 Colour choice 02

Table 8.1: Colour Palette

8.2 URBAN DESIGN SCHEDULE OF FINISHES

See finishes table in the following pages.

SCHEDULE OF URBAN DESIGN FINISHES								December 2013
PROJECT NO./NAME:	PRINCES HIGHWAY UPGRADE – FOXGROUND AND BERRY BYPASS					CONCEPT DESIGN		
CODE	STRUCTURE	FINISH	PROPRIETARY ITEM OR APPROVED EQUIVALENT	CODE/COLOUR OR APPROVED EQUIVALENT	PROPRIETARY SUPPLIER OR APPROVED EQUIVALENT	COMMENTS		REV
BRIDGES								
Abutments								
F1	SPILL THROUGH ABUTMENTS							
	▪ Overbridges and Underpasses	▪ Rock pitched finish.	▪ N/A	▪ N/A	▪ N/A	▪ Rock to be sourced locally where possible. ▪ Ensure rock is from a single source for both abutments.		
F2	SPILL THROUGH ABUTMENTS							
	▪ Floodplain / Creek bridges	▪ Rock armouring to engineer's specification.	▪ N/A	▪ N/A	▪ N/A	▪ N/A		
F3	WALLED ABUTMENTS							
	▪ Kangaroo Valley Road Overbridge	▪ Sandstone blocks or cladding	▪ N/A	▪ N/A	▪ To be sourced.	▪ Sample to be approved by urban designer.		
Bridge furniture								
F4	▪ Bridges in general - Bridge rail, safety screens and tubular fences.	▪ Galvanised	▪ N/A	▪ N/A	▪ N/A	▪ N/A		
F5	▪ Kangaroo Valley Road Overbridge – Safety Screen	▪ High performance paint on galvanised finish posts.	▪ Primer: Galvanised Iron primer- Quit Rust Range. ▪ Paint: Low sheen; Water-based.	▪ Rust	▪ Dulux Australia or equivalent.	▪ Paint system to be obtained by paint supplier. Follow paint supplier instructions in application.		
Anti-graffiti measures								
F6	▪ As per Roads and Maritime Services requirements - Wing walls and abutment walls accessible to the public and visible from the highway/local roads/residences/ public places.	▪ Anti-graffiti coating as per Roads and Maritime Services requirements. ▪ To be applied to the full height of panels where required.	▪ HZ 2004 in matt finish or equivalent.	▪ Neutral ▪ Should not change colour of concrete when painted.	▪ Dupont or equivalent.	▪ Sample to be sprayed on concrete panel of minimum size 3.0m x 2.0m to be approved by urban designer.		

Table 8.2: Urban Design Finishes Schedule

SCHEDULE OF URBAN DESIGN FINISHES								December 2013
PROJECT NO./NAME:	PRINCES HIGHWAY UPGRADE – FOXGROUND AND BERRY BYPASS					CONCEPT DESIGN		
CODE	STRUCTURE	FINISH	PROPRIETARY ITEM OR APPROVED EQUIVALENT	CODE/COLOUR OR APPROVED EQUIVALENT	PROPRIETARY SUPPLIER OR APPROVED EQUIVALENT	COMMENTS	REV	
NOISE WALLS AND HEADLIGHT SCREENS								
F7	▪ Noise Wall panels. ▪ Wall termination panels (at the start and finish of all walls).	▪ Precast concrete panels. ▪ All panels are textured (stucco finish) and painted on both sides. ▪ Posts are galvanised and painted to match panel colour.	<u>Concrete Panels</u> ▪ Primer and paint: Low Sheen; Water-based. <u>Posts</u> ▪ Primer: Galvanised Iron primer- Quit Rust Range. ▪ Paint: Low sheen; Water-based.	Colour choice 01 ▪ BOGLE PG2.D7 Colour choice 02 TICKING ▪ BOGLE PG1.A7	▪ Dulux Australia or equivalent.	▪ Sample panels to be prepared for approval of quality of finish. Wall panels to be equivalent to sample panels done for approval. ▪ Final colour subject to review by urban designer based on an on-site sample of three entire panels to be arranged by contractor. ▪ Paint system to be confirmed by paint supplier, particularly on galvanised posts.		
F8	▪ Headlight Screens	▪ Galvanised expanded metal panels painted to specified colour. ▪ Galvanised and painted finish to posts. ▪ Panels fixed on top of concrete barrier. ▪ Concrete barrier to have an anti-graffiti coating as per Roads and Maritime Services requirements. ▪ Louvre aperture needs to be vertically installed and facing the opposite direction to traffic.	<u>Expanded Metal Panels</u> ▪ Sankey Louvamesh L2063 galvanised expanded metal with edge trimmers. ▪ Primer: Galvanised Iron primer- Quit Rust Range. ▪ Powder coated finish desirable. <u>Posts</u> ▪ Primer: Galvanised Iron primer- Quit Rust Range. ▪ Paint: Low sheen; Water-based. <u>Type F Barrier</u> ▪ HZ 2004 in matt finish.	<u>Expanded Metal Mesh Colour choice 01</u> ▪ BOGLE PG2.D7 <u>Colour choice 02</u> TICKING ▪ BOGLE PG1.A7 <u>Post Colour choice 01</u> ▪ BOGLE PG2.D7 <u>Colour choice 02</u> TICKING ▪ BOGLE PG1.A7 <u>Type F Barrier</u> ▪ Neutral. ▪ Should not change colour of concrete when painted.	<u>Expanded Metal Panels</u> ▪ Sankey Australia or equivalent. <u>Paint for Mesh and Posts</u> ▪ Dulux Australia or equivalent. <u>Type F Barrier</u> ▪ Dupont or equivalent.	▪ Colour and finish of expanded metal panel to be reviewed by the Urban Designer based on sample. ▪ Sample of anti-graffiti coating to be reviewed by the Urban Designer. ▪ Paint system for galvanised posts to be confirmed with paint supplier. ▪ Painted surfaces of the expanded metal panels and posts do not require a proprietary anti-graffiti coating.		

Table 8.2: Urban Design Finishes Schedule (cont.)

SCHEDULE OF URBAN DESIGN FINISHES							December 2013
PROJECT NO./NAME:	PRINCES HIGHWAY UPGRADE – FOXGROUND AND BERRY BYPASS					CONCEPT DESIGN	
CODE	**STRUCTURE**	**FINISH**	**PROPRIETARY ITEM OR APPROVED EQUIVALENT**	**CODE/COLOUR OR APPROVED EQUIVALENT**	**PROPRIETARY SUPPLIER OR APPROVED EQUIVALENT**	**COMMENTS**	**REV**
DRAINAGE CHANNELS							
Rock lined drains							
F11	▪ Rock lined drains.	▪ Size and colour of rocks to be agreed with Landscape designer.	▪ N/A	▪ N/A	▪ N/A	▪ See Landscape drawings for specifications.	
F12	▪ Other types.	▪ N/A	▪ N/A	▪ N/A	▪ N/A	▪ See Drainage drawings for specifications.	
Exposed concrete drains							
F13	▪ Concrete drains visible from the highway.	▪ Slopes greater than 5% requiring concrete V drains and channels that are visible from the highway will contain an oxide additive.	▪ Oxide in concrete.	▪ CCS ONYX 21 @4.15% (min) or greater as per CCS specification in grey cement.	▪ Concrete Colour Systems or equivalent.	▪ There should be no smooth margins produced. ▪ Consistency of colour on the entire drain surface to be ensured. No plain concrete margins. ▪ Finish to be as rough as possible (similar to a broom finish).	
F14	▪ Concrete drains not visible from the highway.	▪ Plain concrete finish for slopes requiring concrete V drains and channels that are not visible from the highway.	▪ N/A	▪ N/A	▪ N/A	▪ Finish to be as rough as possible (similar to a broom finish).	
HANDRAILS							
General							
F15	▪ Handrails.	▪ Off the shelf products. ▪ Galvanised or painted at all other locations.	▪ As specified by and agreed with supplier.	▪ Black/ Charcoal grey as available; or ▪ Galvanised.	▪ N/A	▪ Off the shelf products to be approved by the Urban Designer.	
FOOTPATHS, SHARED PATHS AND CYCLE PATHS							
General							
F16	▪ Footpaths, shared paths and cycle paths.	▪ Brushed finish concrete. ▪ Oxide colour pigmentation.	▪ Oxide in concrete.	▪ CCS ONYX 21 @4.15% (min) or greater as per CCS specification in grey cement.	▪ Concrete Colour Systems or equivalent.	▪ N/A	

Table 8.2: Urban Design Finishes Schedule (cont.)

9. URBAN DESIGN IMPLEMENTATION STRATEGY

9.1 TEAM INTEGRATION

9.1.1 DETAILED DESIGN

All disciplines will work together as a multidisciplinary team. This will entail:

- The review of each disciplines package, at key milestones, by the team leader of all disciplines to ensure both an understanding of the issues but also co-ordination and the identification of opportunities beyond the respective silos is achieved.
- The undertaking of formal and informal meetings to ensure that developments are communicated to the entire team.
- All earthworks will be developed as a 3D contour model, to illustrate its integrated form and to be incorporated into construction documentation. In the construction process the modelling of surplus fill sites will also be undertaken to ensure that this material is used to best benefit of the Project including flattening of batters on floodplains etc.
- Construction phase minor design changes will be referred to the design team as a whole so that changes do not have unidentified consequences.

9.1.2 CONSTRUCTION

The urban designer and landscape designer will continue to be involved in the Project and provide review and comment throughout the construction period. Request for Information and Design Change requests will form the formal means of communicating areas of uncertainty or where the design cannot be built as intended from site. There will be a rigorous and structured process in place to ensure that these methods are adopted and followed to ensure that design objectives are met. The urban design and landscape team will be involved in the resolution of any of these issues, which may involve the following:

Earthworks

- Changes to the profile and form to that documented.
- Handling of surplus or unsuitable material.
- Topsoiling and suitability of material.

Structures

- Review of shop drawings and samples
- Review of revised construction methodologies which impact on the physical appearance of the structure.

Finishes

- Any changes to agreed finishes
- Approval of samples
- New design elements that require finishes

Landscape

Clear checkpoints will be identified as part of the specification to ensure quality of landscape materials. These include:

- Survey and Testing of soil.
- Inspection of soil preparation including amelioration, treatment of subgrade and placement of topsoil.
- Inspection of set-out for planting.

Community Feedback

Any changes to proposed design based on community feedback / involvement with regard to design or finishes.

Site Inspections

Site inspections will be undertaken at a minimum frequency of six visits per annum and at key milestone points as per SWTC Appendix 15. These inspections will form part of a quality review process. As part of the process, reports will be prepared identifying positive and negative aspects of the construction implementations and what needs to be undertaken to ensure compliance and improved outcomes.

10. LANDSCAPE IMPLEMENTATION STRATEGY

The approach to re-vegetation is holistic and will incorporate both the substrate and vegetation as a system to create a sustainable solution. The processes described in this document elaborate on the requirements of the Landscape and Vegetation Management Plans which are depicted in the appended Landscape Package.

The Landscape package depicts the finishing works required to implement the revegetation process but is based on the requirements of the various environmental sub-plans and technical specifications which define the implementation process from beginning to end. This chapter provides an overview of the entire implementation process for the revegetation works and the following chapter its management.

10.1 STRATEGIES AND PRINCIPLES FOR SITE CLEARING

Site clearance is an integral part of the implementation of the Landscape and Vegetation Management Plan and impacts on the areas of remnant vegetation, weed and soil management, both of which are strongly interrelated. Despite the interrelationships the two processes have been separated to allow the issues to be understood in terms of the two separate works contracts, i.e. site clearance and topsoil stripping.

The following section provides a range of vegetation management strategies associated with site clearing to ensure that:

- The extents of clearance are minimised.
- Environmentally significant vegetation is protected.
- Weed management is undertaken to ensure that landscape outcomes are optimised.
- Local provenance material is collected.

10.1.1 CLEARING AND CONSTRUCTION PROTOCOL

The clearing and construction protocols adopted have been developed as part of the Construction Flora and Fauna Management Plan. In terms of vegetation management there are a number of issues that have been considered:

What vegetation is present? Is it habitat? If habitat has it been cleared of all wildlife? Is it a protected species or community? Is it a plantation? Is it weed and therefore an issue for on-going vegetation establishment and management?

To answer these questions a series of protocols have been generated, these are defined below.

Assessment

1) A pre-clearing assessment will be undertaken identifying the following: hollow bearing and /or habitat trees; threatened species or endangered ecological communities; areas identified where weeds are present and the nature of these weeds; plantation sites identified; and relationship to creeklines.

Threatened Species or Communities

1) Where threatened species or communities are identified, fencing around all threatened species or ecological protected communities will be undertaken to ensure construction activities do not encroach into threatened habitats or habitats containing threatened species where disturbance has not been approved.

2) Where threatened species are impacted, seed or cuttings from all threatened plants required to be removed will be collected once construction approval is obtained to enable potential propagation and re-establishment of threatened species in the area.

Creekline and Riparian Vegetation Management

The management of native vegetation along the banks of Broughton Creek, Broughton Mill Creek, Bundewallah Creek and Town Creek, and their tributaries is described below:

- Existing trees, grasses and other ground cover will be retained as far as possible within 15m of rivers, creeks, and watercourses immediately before construction commences in an area.
- The project ecologist will supervise the clearing of any vegetation within close proximity to riparian and wetland areas. Any trees within 15m of watercourses that need to be felled will be done manually, leaving grasses and small understorey species wherever possible.
- Generally the use of heavy machinery will not permitted within 10m of the tree line or moist areas. Where this is unavoidable measures will be reviewed by an arborist on site. This may include a reduction in the clear zone offset or the use of porous fill and geofabric over the root zone of the affected tree.
- Trees within 10 metres of the centerline of any bridges to be constructed and 15m of the bank of any stream or other waterway, will be cleanly cut off between 300 and 600mm above the adjacent ground level and poisoned. This will ensure that weakened regrowth of the removed tree doesn't reshoot and ensures stable vegetation cover and bank profile is retained on the banks.

This careful management process combined with the regeneration activities to be undertaken by the RMS, as part of the biodiversity offsets beyond the corridor work zone, and our own revegetation works will all contribute to the enhancement of the creekline system and successful reinforcement of the habitat corridor network depicted in the environmental documents.

Weed Management

Weed management will also form a significant component of the clearing operations. It is proposed that a number of strategies are adopted in order to achieve the most effective means of weed reduction depending on the situation and context. The overruling principle of this process will be proactive, not reactive management.

Weed free topsoil strategies will include:

1) Undertake a weed audit identifying areas of common annual weeds and those infested with environmental or noxious weeds.

2) Isolate identified noxious weed areas. These areas will be quarantined and soil stripped and buried so as to avoid further infestations. The handling of this will be covered in the Earthworks Management Plan.

3) Spot spray areas identified with significant weed, other than noxious weeds, two or three times prior to final treatment and clearing. The definition of weed material will change according to the revegetation strategy. If soil is to be reused for pasture grass revegetation grass species will be deemed as acceptable planting. If however, soil is to be used for native regeneration then pasture grasses will be considered a weed.

4) Two weeks prior to stripping, blanket spray the route to achieve 100% knockdown of existing weed and vegetation cover. This will remove the possibility of vegetative growth and limit the potential transmission of weeds to what is in the soil seed bank or what blows in during construction. Once knockdown is complete, mow the grass with mulching blades and then add any recommended ameliorant (lime / gypsum) before stripping.

5) Once stripped, soil is to be stockpiled. Stockpiles will be shaped and finished to a high standard and then seeded with a cover crop.

6) Every 3-4 months spot spray the topsoil stockpiles and then mow / cut / trim the grass. Woody weeds will require removal by hand.

7) Four weeks prior to spreading topsoil, spray the vegetation on the stockpile with glyphosate.

8) After respreading topsoil apply the hydroseed within three working days of applying topsoil. Any delay here will give windborne weed seed the upper hand.

9) Every 3-4 months, spot spray the soiled batters and then mow / cut / trim the grass. Do not mow, or slash where shrub mixes are used. Remove woody weeds by hand.

Alternate Strategies

1) Strip 100mm topsoil as unsuitable and use the next 100mm as topsoil. This will provide a significantly reduced seed bank. Additional amelioration could be required and would be determined as part of the soil assessment process.
2) Planted areas, such as garden beds, can be treated differently to broad scale areas in that planting could be delayed and the area subject to numerous glyphosate treatments until the weed seed bank is depleted. Alternatively the soil bed could be treated with a pre-emergent which affects only emergent seeds and not the planted material. Such a strategy in association with on-going landscape maintenance should enable the achievement of a weed free environment.
3) Adopt a management strategy that addresses weeds within the corridor based on their influence on plant growth and legal obligations. Broad scale areas would need to acknowledge the presence of weeds in their on-going management, adopting a strategy whereby plants are encouraged to grow to minimise the influence of weeds on the establishment of desirable plantings and ultimately out-compete them. Weed management would focus on woody and structurally damaging weeds rather than annual weeds or grasses which if managed would result in removal of any revegetation growth.

Seed or Tissue Collection

The cultural nature of the landscape largely restricts the potential for seed collection. As a result, extra importance needs to be placed on what can be salvaged from the site as part of the clearance operations. Consequently the following strategy will be adopted:

- Review potential for seed collection within the alignment and implemented prior to clearing. Generally only tree species occur in any density that is suited to economical collection of seed from within the corridor and even this is limited. The potential exists for the seed for tubestock to be collected prior to clearing, for the growing on of canopy trees from the corridor. A contract would be put in place for collection prior to clearing.

On-going management of existing vegetation within the corridor:

- The on-going protection of existing vegetation stands, habitat trees will be undertaken throughout the project to ensure plant and equipment are kept clear of the critical root zone of the existing vegetation stands to maximise the on-going viability of these trees.

10.2 SOIL MANAGEMENT PLAN

Like vegetation, soil management also raises a number of issues:

What is the quality and depth of the topsoil? What is the vegetation cover and how does this affect the stripping process? What ameliorants are required to ensure topsoil quality is optimised and what can be done as part of the stripping process to improve this?

Stripping of Topsoil

Prior to stripping the soil, its condition and need for amelioration all need to be understood.

A site-wide soil assessment will be undertaken after award of contract. This assessment will confirm the amelioration requirements and suitability of soil. This assessment will identify:

- Soil pedology within each soil landscape and vegetation community type so that it may be stripped and stockpiled in the appropriate location for reuse.
- Chemistry of the soil including pH, salinity, cation exchange capacity, plant available phosphorous, total organic matter, total nitrogen and carbon / nitrogen

Once these activities have occurred exotic vegetation cover will be poisoned (as discussed in Weed Management) prior to stripping, to ensure the knockdown of weeds and vegetation. This will provide a level of weed control by reducing the seed bank and reducing the potential for vegetative reproduction. In addition to poisoning prior to stripping, it is intended that additives (gypsum and lime at rates determined by the assessment) will be applied to the soil. These additives will assist in ameliorating the stockpiles and achieving a balanced medium requiring less input at the time of respreading. This strategy will be developed further with the input of the soil scientist so that the soil quality and vegetation types are optimised as part of the revegetation works.

Soils for respreading will be screened or sorted, removing material 50mm diameter or greater and ensuring a friable medium is available.

Cultivation of Subgrade

After the ripping of the subgrade to a depth of 100 to 200mm, depending on location and proposed landscape treatment a uniform treatment of 4000kg/ha of lime and 2000kg/ha gypsum will be incorporated to subgrades, where confirmed by soil testing. Ripping will occur along the contours using a chain drag with spikes to break up the surface of non-traversable batter slopes. On flatter slopes a harrow plough or similar will be used. The combination of the ripping and ameliorants will reduce erosion risk.

Topsoiling

Topsoil will comprise ameliorated site soils, generally spread at the following depths:

- Hydro seeding of 1v:2h slopes - 100mm where an ameliorated soil is used
- Direct Seeding to slopes flatter than 1v:4h - 100mm
- Garden Bed planting - 200mm
- Turfing - 100mm
- Wetlands and Creekline edges - 50mm

Imported topsoil may be required to make up any shortfall in site soils and will be spread at the same rates. Generally, it is preferable to ameliorate the site soils rather than to import, in order to reduce environmental impacts and enhance the retention of a native seed bank. Any surplus unsuitable material will be reviewed for suitability and amelioration. Testing of soil stockpiles and soils on embankments will be undertaken prior to re-vegetation to ensure soil condition is optimised for plant growth.

Surplus Material Management

As an integrated part of the design development, potential opportunities and strategies will be developed to address the use of surplus or unsuitable material. Among the strategies to be adopted will be:

- The formation of mounds which are integrated with the formation in such a way as to appear deliberate and considered, to consequently blend with their surrounds. This includes the use of surplus as noise mounding. Opportunities for such treatments include Huntingdale Park Road. The flattening of slopes either as a landscape mound against the existing formation or as an integral element of the formation. This will be a focus of the plans to ensure that the landscape blends with the surrounds. Such a strategy would suit the Broughton Creek embankments if identified as not impacting flood flows or North Street noise mound if spilling beyond boundary is permitted.

10.2.1 LANDSCAPE REVEGETATION PLANS

The Landscape and Revegetation Plans appended to this document I form a related component of the Soil Management Plan. The two plans are intertwined and form a biologically engineered solution to soil stabilisation and erosion management to achieve a long lasting and stable system.

Stabilisation Methods

The methods of seeding adopted will be by:

- Hydromulching

Hydromulch will be the dominant revegetation technique used for the Project where slopes are not traversable by machines ie slopes steeper than 4H:1V. This technique provides a means of seed application that can work with the dominant slopes of the Project. It is an efficient means of distributing seed, ameliorating topsoil and provides a degree of initial soil protection prior to the establishment of a cover crop. Depending on availability and compatibility of machines either sugar cane or wood pulp would be used as the main mulch material.

- Ecoblanket

Ecoblanket may be used on steeper embankments or where access for respreading of site topsoil is not feasible. This integral seed and soil mix has performed well on a number of projects and provides a more rapid and uniform cover than that provided by hydromulch. It is also guaranteed by its installer for both response and stability on slopes up to 1.5H:1V.

- Enkamat and hydromulch

Enkamat and hydromulch provides a hybrid system of revegetation. Enkamat is an erosion control matting that is designed to provide a level of erosion resistance and acts as a friction joint between the subgrade and topsoil enabling the retention and stabilisation of soil on steep slopes. It can also be used as an erosion matting in channels to resist concentrated flows. In both instances vegetation cover is achieved by the application of seed by hydromulching.

The use of Enkmat within the Project will consequently be as:

1) An erosion control within vegetated channels where flow rates dictate.
2) as an alternative to Ecoblanket on steeper slopes.

- Direct Seeding

Direct seeding may form a component of the revegetation and stabilisation strategy. This is the traditional method of ploughing and seeding of the prepared bed, as used in agricultural production. It is suited to the flatter slopes of the plains where slopes have been eased out to enhance the integration of the formation. This method provides the benefit of having appropriate contact of the seed within the soil bed. Its use will be dictated on availability of large continuous areas which meet the access requirements for this method.

Organic Fertiliser and Amelioration of Topsoil

Application of fertiliser and soil amelioration will be undertaken to all areas and included as part of the hydromulching. Lime and gypsum included, in the ameliorants, are to be of super fine powdered form. Liquid lime will not to be used unless recommended as part of the soil assessment.

For site salvaged topsoil, lime and gypsum will be applied at 4,000kg/ha and 2,000kg/ha respectively, subject to confirmation by soil testing. If applied at the time of stripping these rates can probably be reduced or dropped entirely from the hydromulch mix. This will be confirmed as part of the testing of soil stockpiles.

Fertiliser will consist of:

- Nitrogen: 5.0% to 9.0%
- Phosphorous: 1.0% to 4.0%
- Potassium: 2.0% to 4.0%

Mulching

- Hydromulch Mixes

Hydromulching will be used as the dominant means of revegetation. This will provide safe access to steep slopes and provides a level of protection to the topsoil profile prior to the development of cover crop and permanent vegetation cover.. The ripping and cultivation of soil layers will be a critical component of this process.

Hydromulching will be undertaken in accordance with Roads and Maritime Services Landscape guidelines and specifications for the South Coast. The mixes composition is shown in Table 10.1.

The Cover Crop will be:

The detailed make up of the native tree, shrub and groundcover mixes is still being developed however an indicative mix is provided, refer to 10.2.

- Site Mulch

Maximum use will be made of mulch salvaged from site. No mulch will be removed from site.

Cover Crop		
Japanese Millet (Sep-Mar)		20kgs/ha
Rye Corn	(Apr-Aug)	20kgs/ha
Eclipse/Crusader Rye		20kgs/ha
Red Clover		9kgs/ha
Native grasses		4kgs/ha
Native trees, shrubs & ground covers		4kgs/ha
Organic Fertilizer		250kg/ha

Table 10.1: Hydromulch mixes

Mulch may be used as sediment control through its use as mulch bunds or temporary groundcover or habitat. Where used for sediment control the opportunity of integrating the mulch bund with final landscape works will be considered as it is unlikely that removal of this material will occur so maximum benefit should be made of this material within the landscape works. The potential of incorporating ripline treatments with sediment bunds and subsequent planting will form the basis of a potential strategy.

Mulch will be provided for all garden beds and planted areas, sourced from grubbing and clearing operations and spread at 50-75mm. Imported forest blend woodchip mulch will be used for all mass plantings, medians and individual plantings where site mulch is not available.

Organic Fibre Matting

Organic fibre matting will be used as part of the environmental controls of the site where erosion is likely to be a problem. Preference has been given to the use of turf for vegetated drainage lines, but where this is unviable the potential to use organic fibre will be investigated.

Temporary Vegetation Cover

A cover crop will be sown on all disturbed areas, soils stockpiles and interim works at a rate of 40kg per hectare. For longer-term stockpiles a perennial crop will be used. Stockpiles will be sown with seed within seven days of being formed. This strategy will ensure that weed growth is minimised.

Planting

Preparation is the critical concern in terms of landscape outcome. The requirements for this have been discussed earlier under topsoil and subgrades. It is a deed requirement and essential that hold and witness points are observed for these activities. Without strong quality controls planting will fail. The Verifation process for the project reflects the importance of monitoring and ensures compliance with these implementation processes.

- Planting Rates and Sizes

Plant material will be planted at a range of sizes to create a balance in terms of initial impact and cost. The following sizes are to be used:

- Tubestock
- Semi Advanced – 150mm container Advanced - 5 litre
- Semi Mature - 25 litre
- Semi mature and super advanced sizes will be used for the interchanges.

Median Treatments

The treatment of medians is primarily paved, the finish of which is distinct from the pavement of the road. The use of paved narrow median avoids the issue of maintenance access to this zone.

Noise Walls and Headlight Screens

The treatment in front of noise walls and headlights screens will consist of a minimum 2 metre wide garden bed. This will be planted with shrubs and groundcovers to create an appropriate setting for the wall and to minimise its impacts on the adjoining property and road users alike. Planting rates for these garden beds will be at a rate of:

Grasses: 4 per m2 (tubestock)

Shrubs: 3 per m2 (tubestock)

Noise Mounds are a key element in the integration of a noise attenuation structures within the landscape. A number of locations have used this approach to avoid the presence of a built structure within the field of view. The treatment of mounds will include seeding and planting. Planting will involve the use of tubestocks at the rate of 1 plant per m2.

Interchanges

Interchange garden beds will be designed for ease of maintenance and maximum impact. Interchanges will be designed so that they provide a focus and a visual marker for the road user.

Where trees are used these will be a minimum 25 litre container and planted at the rate of 1 plant per 9 m2.

Roundabouts at interchanges have specific planting requirements to address the need for fast establishment to minimise on-going maintenance. Planting rates for these garden beds is to be at a rate of:

Grasses: 4 per m2 (150mm container size)

Shrubs: 3 per m2 (150mm container size)

Tree Spacing

Tree spacing reflects the context and character of the landscape through which the alignment passes. This has been divided into the following planting types:

- Natural planting consists of random informal planting with a typical spacing of 1 tree every 10m2
- Where a visual buffer is required planting is to be at the rate of 3 to 5 m centres either along or within the property boundary affected.
- Local Road and Highway alignment planting will consists of lineal planting to define the edges of the local roads where disturbed by the works and the existing highway verge where the new road significantly impacts the highway outlook.

Table 10.2 provides a list of plant species and the area of use. This list reflects the plans and the classification types of revegetation.

10.2.2 SEED COLLECTION STRATEGY

Seed collection will be carried out by experienced seed collectors in a manner that preserves the parent plant and that removes only a small percentage of reproductive material from the overall population in a particular area. Seed will be sourced from local vegetation sources where possible. Where time of year does not permit or if the season is poor, seed may need to be reinforced by the use of regionally sourced seed procured from stocks not collected specifically as part of the road Project.

Given the disturbed nature of the site and the fact that the highway cuts through a mix of rural township and agricultural lands, a revegetation strategy, which acknowledges these contexts, has been adopted. A number of vegetation communities / mixes will be developed to reflect this. A list of native species occurring within the project area is appended.

Seed collected will consist of the following:

- Native seed mix will consist of shrub and groundcover seed for use in the hydro seed mix.
- Tree species used as part of the plant procurement phase of the Project will be collected as part of the seed collection strategy or site clearance strategy as defined earlier.

The final make up of these mixes will be determined once a clearer understanding of seed availability is gained.).

A contract for seed collection will be let at the start of the Project. The seed collection contractor will be provided with a program for when works are anticipated to ensure that they are able to procure stocks of the required seed in a timely fashion that reflects the quantities required at the time. It is not anticipated that all seed will be provided as one complete batch, but rather as a series of packages that reflects the overall staging of the Project. This will ensure that the seed is fresh and ensure that a number of seed batches are used throughout the Project providing greater assurity of a good seed take.

Plant type and Tree species	Location
Feature Trees	
Liquidamber styraciflua	Entry roads into Berry
Fraxinus oxycarpa aurea	
Betula pendula	
Ficus obliqua	
Eucalyptus pilularis	Kangaroo Valley Road Interchange
Local Road Trees	
Populus italica	Mountain Hill Road
Illawarra Moist Gully Forest Plants	***Character Zones 1 to 4***
Eucalyptus pilularis	
Eucalyptus paniculata	
Eucalyptus saligna x botryoides	
Syncarpia glomulifer	
Breynia oblongifolia,	
Persoonia linearis	
Diploglottis australis	
Eleacarpus reticulatus	
Elaecarpis kirtonii	
Warm Temperate Forest	
Eucalyptus saligna x botryoides	
Eucalyptus quadrangulata	
Acmena smithii	
Cryptocara glaucescens	
Pittosporum undulatum	
Livistonia australius	
River Forest	***Creek edges***
Casuarina cunninghamiana	

Plant type and Tree species	Location
Copses	***Character Zones 1 to 4***
Eucalyptus botryoides	
Eucalyptus eugenoides	
Eucalyptus pilularis	
Eucalyptus teriticornis	
Eucalyptus robusta	
Garden Beds	***Interchange, noise wall, headlight screen.***
Shrubs	
Callistemon citrinus 'endeavour'	
Callistemon citrinus 'white anzac'	
Lomandra longifolia	
Syzigium australe	
Syzigium allyn magic	
Syzigium elite	
Syzigium oleosum	
Groundcovers	
Lomandra longifolia	
Dianella caerulea	
Basin/ Riparian planting	***Biofiltration basins/ Creeklines***
Baumea juncea	
Gahnia clarkei	
Juncus usitatus	
Groundcovers	
Lomandra longifolia	
Carex appressa	
Isolepsis prolifera	

Table 10.2: Plant Species list

11. LANDSCAPE MANAGEMENT

11.1 MAINTENANCE

Maintenance is a critical consideration in terms of design treatments and the need for ongoing management. Decisions made at the design phase and construction phase will have ongoing impacts in relation to maintenance and will affect the viability of the landscape scheme. The following outlines some of the key strategies to address the ongoing management concerns:

Weed Control

A Weed Management Plan will be prepared which covers issues such as the management of weed outbreaks during both the construction and maintenance phases of the Project.

Weed control will be carried out in all areas of the corridor including revegetated and planted areas for a period of 36 months (3 years) commencing on the date of final construction completion.

Weed control will be an integral part of the construction process, with weed management prior to construction defined in the documentation (refer to Chapter 10.1.1). The focus of this management process will be on the identification and control of environmental and noxious weeds. The ongoing management plan will be implemented during and post construction to minimise regeneration or infestation of weeds. This systematic approach will reduce the weed potential into the future.

Proper construction implementation and maintenance practices will control the level of weed invasion including:

- Restriction of the area of native vegetation disturbed during construction works.
- Restriction of stockpiling to areas already cleared of vegetation.
- Use of weed-free topsoil in landscaping, and revegetate disturbed sites with locally indigenous species (local provenance).
- Revegetation using stockpiled soil will also include planting local native species to stabilise the soil as well as ongoing weed control.
- Comprehensive implementation and enforcement of the landscape design during construction phase to ensure batter slopes are constructed as designed are maintenance accessible and able to establish vegetation cover.
- Appropriate construction techniques for subsoil and topsoil preparation and placement will be implemented to encourage plant establishment.
- Appropriate densities of ground, shrub and tree covers and mulch will be installed to ensure maximum coverage and weed suppression.
- Maintenance phase works will be consistent with requirements of RMS Specification R179. Works will not only include weed removal but also the replacement of failed stock and re-hydromulching, to ensure proper establishment of vegetation cover with the topping up of mulch layers to ensure maximum weed suppression.
- Weed invasions will be monitored and controlled by personnel experienced in weed management.
- A Weed Management Plan will be incorporated into the Flora and Fauna Management Plan, detailing necessary weed control works, particularly in areas where the weeds may impact on threatened species and/or their habitats.

Fencing

To ensure the establishment of proposed planting, pests such as rabbits and hares which are attracted to fresh shoots will also be addressed. This may involve temporary rabbit proof fencing or the use of guards which allow the establishment of the plantings until they are no longer impacted by these pests.

At this stage no fencing is proposed as the intensity of rabbit or other populations appears low. Native animals can also cause problems, but access to the corridor is to be managed by the use of fauna fences.

Fencing will be maintained in order to exclude cattle and other stock from entering the road corridor. Fauna fencing will be maintained with a clear zone between fence and bushland.

Supplementary Watering and Mulching

Planting will be watered and maintained until plants have become established. This will consist of 20 litres of water per plant per week for the first 12 weeks before tapering off to 10 litres of water per plant per week until the 26th week depending on the extent of rainfall. Plant health will be assessed at this time and any further watering requirements determined. If extended periods without rain are experienced during the establishment period, then watering over and above normal construction practice will be undertaken to supplement natural rainfall.

Follow-up Fertiliser

Fertilising post-planting may be required where specific nutrient deficiencies are identified. The need for additional fertiliser will be minimised by the use of slow release fertiliser. Any additional fertiliser will be reviewed as part of the maintenance plan for the Project.

Pruning and Thinning

Pruning and thinning is likely to form a minor component of maintenance. Pruning may be required to ensure retention of sightlines where seeded shrubs have grown obscuring signage or views around bends.

Pests and Diseases

Generally pest and disease management is not viable over large areas. Planting will rely on developing an environmental balance through the establishment of improved habitat conditions. Should an outbreak be identified which will impact on the establishment of landscape outcomes an appropriate action plan will be determined. This is covered in the Flora and Fauna Management Plan.

Plant Replacements

Dead, diseased or dying plants will be replaced to ensure 90% of planting is established after 12 months.

11.2 MONITORING AND EVALUATION

Ongoing surveillance of the road corridor for weed management and landscape establishment will be undertaken throughout the establishment period of three years. A detailed management plan will be prepared when the final design development is complete for the project.

11.3 OCCUPATIONAL HEALTH AND SAFETY

The design of the highway considers the safety of workers during construction and the ongoing maintenance of the road. Both periods provide distinct, as well as overlapping risks. As part of the Project development the undertaking of safety in design workshops and the management of risk registers will ensure that the development of the design has safety as a key input.

Slopes are a key risk:

- Slopes equal to or steeper than 2H:1V are not easily traversed by vehicle or on foot resulting in construction and maintenance access issues. Good cover will reduce the need for these works.
- Bridge abutments and culverts where slopes increase and drop may pose risks in terms of public and maintenance access. These will be addressed in the detailed design.

Maintenance risks included the conflict of workers adjacent to traffic. The implementation of maintenance needs to consider issues such as sightlines, the need for lane closures and other activities adjacent to the road when workers are completing:

- Maintenance of garden beds in medians/ interchanges
- Mowing of verges and turf areas
- Weed management.

Although it is not possible to completely eliminate all maintenance risks, they can be minimised by reducing the frequency of the occurrence, which can be addressed through appropriate plant selection and density.

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APPENDIX 1

PLANT LIST

Native Plants adjacent to and within the corridor

Scientific Name	**Common Name**
Abrophyllum ornans	Native Hydrangea
Abutilon oxycarpum	Flannel Weed
Acacia binervata	Two-veined Hickory
Acacia decurrens	Black Wattle
Acacia falcata	Acacia
Acacia irrorata ssp. Irrorata	Green Wattle
Acacia longifolia	Coast/Sallow Wattle
Acacia maidenii	Maiden's Wattle
Acacia mearnsii	Black Wattle
Acacia melanoxylon	Blackwood
Acacia myrtifolia	Red-stemmed Wattle
Acacia parramattensis	Parramatta Wattle
Acacia spp.	Acacia
Acacia suaveolens	Sweet Wattle
Acacia terminalis	Sunshine Wattle
Acacia terminalis ssp. Angustifolia	Acacia
Acacia ulicifolia	Prickly Moses
Acmena smithii	lilly Pilly
Acronychia oblongifolia	Common Acronychia
Adiantum aethiopicum	Common Maidenhair
Adiantum formosum	Giant Maidenhair
Adiantum hispidulum var. hispidulum	Rough Maidenhair
Alectryon subcinereus	Wild Quince
Allocasuarina littoralis	Black She oak
Alocasia brisbanensis	Cunjevoi
Alphitonia excelsa	Red Ash
Alpinia caerulea	Native Ginger
Amyema gaudichaudii	Amyema
Amyema spp.	Amyema
Amylotheca dictyophleba	Amylotheca
Aneilema acuminatum	Aneilema
Angophora floribunda	Rough-barked Apple
Anisopogon avenaceus	Oat Speargrass
Aphanopetalum resinosum	Gum Vine
Araucaria spp.	Araucaria

Scientific Name	**Common Name**
Araucaria heterophylla	Norfolk Island Pine
Aristida ramosa var. ramosa	Aristida
Aristida vagans	Threeawn Speargrass
Arthropodium milleflorum	Vanilla Lily
Arthropteris tenella	Arthropteris
Asperula conferta	Common Woodruff
Asplenium australasicum	Asplenium
Asplenium flabeffifolium	Necklace Fern
Atriplex cinerea	Grey Saltbush
Atriplex spp.	Atriplex
Austrodanthonia spp.	Austrodanthonia
Austrodanthonia tenuior	Purplish Wallabygrass
Austrostipa pubescens	Austrostipa
Austrostipa ramosissima	Stout Bamboo Grass
Austrostipa spp.	Austrostipa
Austrostipa verticillata	Austrostipa
Backhousia myrtifolia	Grey Myrtle
Baloghia inophylla	Brush Bloodwood
Banksia spinulosa var. coffina	Banksia
Banksia spinulosa var. spinulosa	Hairpin Banksia
Baumea spp.	Baumea
Billardiera scandens var. scandens	Common Apple-berry
Blechnum cartilagineum	Gristle Fern
Blechnum patersonii ssp. patersonii	Strap Water-fern
Blechnum spp.	Blechnum
Bossiaea heterophylla	Variable Bossiaea
Botrychium australe	Parsley Fern
Brachychiton acerifolius	Illawarra Flame Tree
Brassica spp.	Brassica
Breynia oblongifolia	Coffee Bush
Brunonielfa pumilio	Dwarf Blue Trumpet
Bursaria spinosa ssp spinosa	Sweet Bursaria
Callistemon rigidus	Stiff Bottlebrush
Callistemon salignus	Willow Bottlebrush
Callistemon viminalis	Weeping Bottlebrush
Calochlaena dubia	Common Ground Fern
Calystegia sepium	Large Bindweed

Scientific Name	**Common Name**
Carex appressa	Tall Sedge
Carex fascicularis	Tassel Sedge
Carex longebrachiata	Bergalia Tussock
Carex spp.	Carex
Carronia multisepalea	Carronia
Cassine australis var. australis	Red Olive-berry
Cassinia spp.	Cassinia
Cassytha glabelfa forma glabella	Slender Dodder-laurel
Casuarina cunninghamiana ssp. cunninghamiana	River Oak
Casuarina glauca	Swamp Oak
Cayratia clematidea	Slender Grape
Celastrus australis	Staff Vine
Celastrus spp.	Celastrus
Celastrus subspicata	Celastrus
Centella asiatica	Pennywort
Cephalaralia cephalobotrys	Climbing Panax
Cheilanthes sieberi ssp. sieberi	Narrow Rock-fern
Christella dentata	Binung
Chrysocephalum apiculatum	Common Everlasting
Cissus antarctica	Water Vine
Cissus hypoglauca	Giant Water Vine
Claoxylon australe	Brittlewood
Clematis aristata	Mountain Clematis
Clerodendrum tomentosum	Hairy Clerodendrum
Commelina cyanea	Commelina
Commersonia fraseri	Brush Kurrajong
Convolvulus erubescens	Convolvulus
Correa reflexa var. reflexa	Native Fuschia
Corymbia gummifera	Red Bloodwood
Corymbia maculata	Spotted Gum
Croton acronychioides	Thick-leaved Croton
Croton verreauxii	Native Cascarilla
Cryptocarya glaucescens	Jackwood
Cryptocarya microneura	Murrogun
Cryptocarya spp.	Cryptocarya
Cryptostylis erecta	Tartan Tongue Orchid
Cryptostylis spp.	Cryptostylis

Scientific Name	**Common Name**
Cryptostylis subulata	Large Tongue Orchid
Cyathea australis	Rough Treefern
Cyathochaeta diandra	Sheath Sedge
Cymbidium suave	Snake Orchid
Cymbopogon refractus	Barbed Wire Grass
Cynodon dactylon	Common Couch
Cyperus brevifolius	Mullumbimby Couch
Cyperus imbecillis	Cyperus
Cyperus spp.	Cyperus
Daphnandra sp. 'Illawarra' (Schodde)	Daphnandra
Daviesia ulicifolia ssp. aridicola	Daviesia
Daviesia ulicifolia ssp. stenophylla	Daviesia
Daviesia ulicifolia ssp. ulicifolia	Gorse Bitter-pea
Deeringia amaranthoides	Deeringia
Dendrobium speciosum	Rock Lily
Dendrocnide excelsa	Giant Stinging Tree
Desmodium rhytidophyllum	Desmodium
Desmodium varians	Slender Tick-trefoil
Dianella caerulea var. caerulea	Paroo Lily
Dianella caerulea var. producta	Blue Flax-lily
Dianella longifolia var. longifolia	Pale Flax-lily
Dichelachne micrantha	Shorthair Plumegrass
Dichondra repens	Kidney Weed
Dicksonia antarctica	Soft Treefern
Dillwynia retorta (J .C. Wendl.) Druce species complex	Dillwynia
Dillwynia spp.	Dillwynia
Dioscorea transversa	Native Yam
Diospyros australis	Black Plum
Diploglottis australis	Native Tamarind
Dipodium punctatum	Hyacinth Orchid
Dodonaea triquetra	Large-leaf Hop-bush
Doodia aspera	Prickly Rasp Fern
Doryphora sassafras	Sassafras
Duboisia myoporoides	Corkwood
Echinopogon ovatus	Forest Hedgehog Grass
Ehretia acuminata var. acuminata	Koda
Einadia hastata	Berry Saltbush

Scientific Name	Common Name
Elaeocarpus kirlonii	Silver Quandong
Elaeocarpus reticulatus	Blueberry Ash
Endiandra sieberi	Hard Corkwood
Entolasia marginata	Bordered Panic
Entolasia stricta	Wiry Panic
Epacris microphylla var. microphylla	Coast Coral Heath
Epacris pulchella	Epacris
Eragrostis brownii	Brown's Lovegrass
Eragrostis spp.	Eragrostis
Eucalyptus amplifolia ssp. amplifolia	Cabbage Gum
Eucalyptus botryoides	Bangalay
Eucalyptus eugenioides	Thin-leaved Stringybark
Eucalyptus globoidea	White Stringybark
Eucalyptus microcorys	Tallowwood
Eucalyptus paniculata ssp. paniculata	Grey Ironbark
Eucalyptus pilularis	Blackbutt
Eucalyptus piperita	Sydney Peppermint
Eucalyptus quadrangulata	White-topped
Eucalyptus racemosa	Narrow-leaved Scribbly Gum
Eucalyptus robusta	Swamp Mahogany
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus scias ssp. scias	Large-fruited Red Mahogany
Eucalyptus sclerophylla	Hard-leaved Scribbly Gum
Eucalyptus spp. -	
Eucalyptus tereticornis	Forest Red Gum
Eupomatia laurina	Bolwarra
Eustrephus latifolius	Wombat Berry
Exocarpos cupressiformis	Native Cherry
Ficus coronata	Creek Sandpaper Fig
Ficus macrophylla ssp. macrophylla	Moreton Bay Fig
Ficus ob/iqua var obliqua	Ficus
Ficus rubiginosa	Ficus
Ficus spp .	Ficus
Ficus watkinsiana	Strangling Fig
Gahnia aspera	Gahnia
Gahnia clarkei	Tall Saw-sedge
Gahnia melanocarpa	Black-fruit Saw-sedge

Scientific Name	Common Name
Galium ciliare	Hairy Bedstraw
Galium propinquum	Maori Bedstraw
Galium spp.	Galium
Geitonoplesium cymosum	Scrambling Lily
Geranium homeanum	Northern Cranesbill
Geranium spp.	Geranium
Glochidion ferdinandi var. ferdinandi	Cheese Tree
Glycine clandestina	Twining Glycine
Glycine tabacina	Variable Glycine
Gnaphalium spp.	Gnaphalium
Gompholobium grandiflorum	Large Wedge Pea
Gompholobium minus	Dwarf Wedge Pea
Gompholobium pinnatum	Pinnate Wedge Pea
Gonocarpus tetragynus	Common Raspwort
Gonocarpus teucrioides	Germander Raspwort
Goodenia hederacea ssp. hederacea	Ivy Goodenia
Goodenia heterophylla ssp. eglandulosa	Goodenia
Goodenia spp.	Goodenia
Grevillea linearifolia	Small-flower Grevillea
Grevillea robusta	Silky Oak
Guioa semiglauca	Guioa
Gymnostachys anceps	Settler's Flax
Hakea dactyloides	Finger Hakea
Hakea salicifolia ssp. salicifolia	Hakea
Hakea sericea	Bushy Needlewood
Hardenbergia violacea	False Sarsaparilla
Hedycarya angustifolia	Native Mulberry
Helichrysum elatum	Tall Everlasting
Hibbertia aspera ssp. aspera	Hibbertia
Hibbertia dentata	Twining Guinea Flower
Hibbertia diffusa	Wedge Guinea-flower
Hibbertia scandens	Climbing Guinea Flower
Hovea linearis	Hovea
Hydrocotyle laxiflora	Stinking Pennywort
Hydrocotyle peduncularis	Pennywort
Hydrocotyle spp.	Hydrocotyle
Hymenanthera dentata	Tree Violet

Scientific Name	**Common Name**
Hymenophyllum cupressiforme	Common Filmy Fern
Hypericum gramineum	Small St John's
Hypolepis muelleri	Harsh Ground Fern
Imperata cylindrica var. major	Blady Grass
Indigofera australis	Austral Indigo
Juncus kraussii ssp australiensis.	Sea Rush
Juncus spp.	Juncus
Juncus usitatus	Billabong Rush
Kennedia rubicunda	Red Kennedy Pea
Kunzea ambigua	Tick Bush
Lagenifera stipitata	Blue Bottle-daisy
Lambertia formosa	Mountain Devil
Lastreopsis acuminata	Shiny Shield Fern
Lastreopsis decomposita	Trim Shield Fern
Lastreopsis microsora ssp. microsora	Creeping Shield-fern
Lastreopsis spp.	Lastreopsis
Laxmannia gracilis	Slender Wire-lily
Legn ephora moorei	Round-leaf Vine
Lepidosperma laterale	Variable Sword-sedge
Leptinella longipes	Coast Cotula
Leptomeria acida	Sour Currant Bush
Leptospermum continentale	Prickly Teatree
Leptospermum polygalifolium ssp polygalifolium	Tantoon
Leptospermum spp.	Leptospermum
Leptospermum trinervium	Paperbark Tea-tree
Leucopogon juniperinus	Long-flower Beard heath
Leucopogon lanceolatus var. lanceolatus	Lance Beard-heath
Libertia paniculata	Branching Grass-flag
Lindsaea linearis	Screw Fern
Litsea reticulata	Belly Gum
Livistona australis	Cabbage Palm
Lomandra filiformis ssp. filiformis	Wattle Mat-rush
Lomandra glauca	Pale Mat-rush
Lomandra longifolia	Spiny-headed Mat- rush
Lomandra multiflora ssp. multiflora	Many-flowered Mat- rush
Lomandra obliqua	Lomandra
Lomatia ilicifolia	Holly Lomatia

Scientific Name	**Common Name**
Ludwigia peploides ssp montevidensis	Water Primrose
Maclura cochinchinensis	Cockspur Thorn
Macrozamia spp.	Macrozamia
Marsdenia flavescens	Hairy Milk Vine
Marsdenia rostrata	Common Milk Vine
Maytenus silvestris	Narrow-leaved Orangebark
Melaleuca decora	
Melaleuca linariifolia	Budjur
Melaleuca quinquenervia	Broad-leaved Paperbark
Melaleuca styphelioides	Prickly-leaved Tea Tree
Melia azedarach	White Cedar
Melicope micrococca	Hairy-leaved + Doughwood
Micrantheum ericoides	Micrantheum
Microlaena stipoides var. stipoides	Weeping Grass
Microsorum scandens	Fragrant Fern
Mirbelia rubiifolia	Heathy Mirbelia
Morinda jasminoides	Jasmine Morinda
Myoporum acuminatum	Myoporum
Nephrolepis cordifolia	Fishbone Fern
Notelaea longifolia	Large Mock-olive
Notelaea spp.	Notelaea
Notelaea venosa	Veined Mock-olive
Olearia viscidula	Wallaby Weed
Omalanthus populifolius	Omalanthus
Opercularia diphylla	Stinkweed
Oplismenus aemulus	Basket Grass
Oplismenus imbecillis	Oplismenus
Oxalis perennans	Grassland Wood- sorrel
Oxalis spp.	Oxalis
Ozothamnus diosmifolius	White Dogwood
Palmeria scandens	Anchor Vine
Pandorea pandorana ssp. pandorana	Wonga Vine
Panicum simile	Two-colour Panic
Panicum spp.	Panicum
Pararchidendron pruinosum var. pruinosum	Snow Wood
Parsonsia straminea	Common Silkpod
Passiflora herbertiana ssp. herbertiana	Native Passionfruit

Scientific Name	**Common Name**
Patersonia glabrata	Leafy Purple-flag
Patersonia sericea	Silky Purple-flag
Pellaea falcata	Sickle Fern
Pennantia cunninghamii	Brown Beech
Persicaria decipiens	Slender Knotweed
Persicaria praetermissa	Spotted Knotweed
Persicaria spp.	Persicaria
Persicaria strigosa -	
Persoonia levis	Broad-leaved Geebung
Persoonia linearis	Narrow-leaved Geebung
Persoonia mol/is ssp. leptophylla	Persoonia
Petrophile pulchella	Petrophile
Petrophile sessi/is	Petrophile
Phragmites australis	Common Reed
Pimelea linifolia ssp. linifolia	Slender Rice-flower
Piper novae-hollandiae	Giant Pepper Vine
Pittosporum multiflorum	Orange Thorn
Pittosporum revo/utum	Rough Fruit Pittosporum
Pittosporum undulatum	Sweet Pittosporum
Planchonella australis	Black Apple
Platylobium formosum ssp. formosum	Handsome Flat-pea
Platysace linearifolia	Platysace
Plectranthus parviflorus	Cockspur Flower
Poa labillardierei var. labillardierei	Tussock
Poa spp.	Poa
Podocarpus elatus	Plum Pine
Polyosma cunninghamii	Featherwood
Po/yscias elegans	Celery Wood
Polyscias murrayi	Pencil Cedar
Pomaderris ferruginea	Rusty Pomaderris
Pomax umbellata	Pomax
Pratia purpurascens	Whiteroot
Prunus spp.	Prunus
Pseuderanthemum variabile	Pastel Flower
Psychotria loniceroides	Hairy Psychotria
Pteridium esculentum	Bracken

Scientific Name	**Common Name**
Pteris umbrosa	Jungle Brake
Pultenaea retusa	Blunt Bush-pea
Pyrrosia rupestris	Rock Felt Fern
Ranunculus inundatus	River Buttercup
Ranunculus plebeius	Forest/Hairy Buttercup
Ranunculus spp.	Ranunculus
Rapanea howittiana	Brush Muttonwood
Rapanea variabilis	Muttonwood
Rhodamnia rubescens	Scrub Turpentine
Ripogonum album	White Supplejack
Rorippa spp.	Rorippa
Rubus moluccanus var. trilobus	Molucca Bramble
Rubus parvifolius	Native Raspberry
Rubus rosifolius var. rosifolius	Rose-leaf Bramble
Rubus spp.	Rubus
Rumex brownii	Swamp Dock
Sambucus australasica	Native Elderberry
Samolus repens	Creeping Brookweed
Santalum obtusifolium	Sandalwood
Sarcocomia quinqueflora ssp. Quinqueflora	Beaded Glasswort
Sarcomelicope simplicifolia ssp. simplicifolia	Big Yellow Wood
Sarcopetalum harveyanum	Pearl Vine
Schefhammera undufata	Lilac Lily
Scolopia braunii	Flintwood
Sedum spp.	Sedum
Selliera radicans	Shiny Swamp-mat
Senecio spp.	Senecio
Sigesbeckia orientafis ssp. orientalis	Indian Weed
Smilax australis	Sarsaparilla
Smilax gfyciphylla	Sweet Sarsparilla
Solanum aviculare	Kangaroo Apple
Solanum pungetium	Eastern Nightshade
Solanum spp.	Solanum
Solanum vescum	Gunyang
Spiranthes sinensis ssp. australis	Ladies Tresses
Spirodela spp.	Spirodela

Scientific Name	**Common Name**
Sporobolus spp.	Sporobolus
Stellaria flaccida	Forest Starwort
Stenocarpus salignus	Scrub Beefwood
Stephania japonica var. discolor	Snake Vine
Streblus brunonianus	Whalebone Tree
Stylidium productum	Stylidium
Suaeda australis	Austral Seablite
Symplocos thwaitesii	Buff Hazelwood
Syncarpia glomulifera ssp. glomulifera	Turpentine
Synoum glandulosum ssp. glandulosum	Bastard Rosewood
Syzygium australe	Brush Cherry
Syzygium spp.	Syzygium
Tetragonia tetragonioides	New Zealand Spinach
Thelionema caespitosum	Tufted Lily
Themeda australis	Kangaroo Grass
Thysanotus tuberosus ssp. tuberosus	Common Fringe-lily
Todea barbara	King Fern
Toona ciliata	Red Cedar
Trema tomentosa var. viridis	Native Peach
Triglochin striatum	Streaked Arrowgrass
Tristaniopsis laurina	Kanuka
Trophis scandens ssp. scandens	Trophis
Tylophora barbata	Bearded Tylophora
Typha orientalis	Broadleaf Cumbungi
Typha spp.	Typha
Urtica incisa	Stinging Nettle
Vernonia cinerea var. cinerea	Vernonia
Veronica plebeia	Trailing Speedwell
Viola hederacea	Ivy-leaved Violet
Viola spp.	Viola
Wahlenbergia gracilis	Sprawling or Australian Bluebell
Wahlenbergia spp.	Wahlenbergia
Wilkiea huegeliana	Veiny Wilkiea
Xanthorrhoea spp.	Grass Tree
Zieria granulata	Zieria
Zieria smithii	Sandfly Zieria

Weed or Exotic species within or adjacent to, the corridor

Scientific Name	**Common Name**
Acetosella vulgaris	Sheep Sorrel
Agapanthus praecox	Agapanthus
Ageratina adenophora	Crofton Weed
Ageratina riparia	Mistflower
Aira spp.	Aira
Anagallis arvensis	Scarlet/Blue Pimpernel
Andropogon virginicus	Whisky Grass
Anredera cordifolia	Madeira Vine
Apium prostratum ssp. prostratum	Sea Celery
Araujia hortorum	Araujia
Asparagus densiflorus	Sprengeri Fern
Atriplex prostrata	Hastate Orache
Avena fatua	Wild Oats
Axonopus affinis	Narrow-leaved Carpet Grass
Bidens pilosa	Cobbler's Pegs
Brassica rapa	White Turnip
Briza maxima	Quaking Grass
Bromus catharticus	Prairie Grass
Calystegia silvatica	Greater Bindweed
Canna indica	Tous-les-mois Arrowroot
Centaurium tenuiflorum	Slender Centaury
Cestrum elegans	Elegant Poison-berry
Chlorophytum comosum	Spider Plant
Cinnamomum camphora	Camphor Laurel
Cirsium vulgare	Spear Thistle
Citrus limonia	Rough Lemon
Colocasia esculenta	Taro
Conyza albida	Tall Fleabane
Conyza spp.	Conyza
Coreopsis lanceolata	Coreopsis
Cotula coronopifolia	Water Buttons
Cyperus eragrostis	Umbrella Sedge
Delairea odorata	Cape Ivy
Echium plantagineum	Patterson's Curse
Ehrharla erecta	Panic Veldtgrass
Ehrharla longiflora	Annual Veldtgrass
Scientific Name	**Common Name**
Eleusine indica	Crowsfoot Grass
Eriobotrya japonica	Loquat
Erythrina crista-galli	Cockspur Coral Tree
Erythrina X sykesii	Coral tree
Euphorbia peplus	Petty Spurge
Euphorbia oblongata	Egg-leaf Spurge
Foeniculum vulgare	Fennel
Fumaria spp.	Fumaria
Galium aparine	Goosegrass
Hedychium gardnerianum	Ginger Lily
Holcus lanatus	Yorkshire Fog
Hypochaeris radicata	Catsear
Isolepis prolifera	Proliferous Club sedge
Jacaranda mimosifolia	Jacaranda
Juncus tenuis	Slender Rush
Lantana camara	Lantana
Ligustrum lucidum	Large-leaved Privet
Ligustrum sinense	Small-leaved Privet
Lolium perenne	Perennial Ryegrass
Lonicera japonica	Japanese Honeysuckle
Lycium ferocissimum	African Boxthorn
Malus spp.	Malus
Myriophyllum sp	
Modiola caroliniana	Red-flowered Mallow
Ochna serrulata	Mickey Mouse Plant
Olea europaea	Common Olive
Olea europaea ssp. cuspidata	Olea
Paspalum dilatatum	Paspalum
Paspalum urvillei	Vasey Grass
Passiflora edulis	Common Passionfruit
Passiflora subpeltata	White Passionflower
Pennisetum clandestinum	Kikuyu Grass
Phytolacca octandra	Inkweed
Pinus radiata	Radiata Pine
Pinus spp.	Pine
Plantago lanceolata	Lamb's Tongues
Protasparagus aethiopicus	Sprengeri Fern
Scientific Name	**Common Name**
Protasparagus plumosus	Climbing Asparagus Fern
Prunella vulgaris	Self-heal

Ranunculus repens	Creeping Buttercup
Ranunculus sceleratus	Celery Buttercup
Ricinus communis	Castor Oil Plant
Rorippa microphylla	One-rowed Watercress
Rorippa nasturtium- aquaticum	Watercress
Rubus fruiticosus	Blackberry complex
Rumex crispus	Curled Dock
Sagittaria graminea	Sagittaria
Salix babylonica	Weeping Willow
Salix spp.	Willow
Schinus areira	Pepper Tree
Senecio madagascariensis	Fireweed
Senna pendula var. glabrata	Cassia
Setaria gracilis	Slender Pigeon Grass
Setaria italica	Foxtail Millet
Sherardia arvensis	Field Madder
Sida rhombifolia	Paddy's Lucerne
Solanum jasminoides	Potato Climber
Solanum mauritianum	Wild Tobacco Bush
Solanum nigrum	Black-berry Nightshade
Solanum pseudocapsicum	Madeira Winter Cherry
Sonchus oleraceus	Common Sowthistle
Sporobolus indicus var. capensis	Parramatta Grass
Sporobolus indicus	Parramatta Grass*
Stenotaphrum secundatum	Buffalo Grass
Tagetes minuta	Stinking Roger
Tecoma capensis	Cape Honeysuckle .
Taraxacum officinale	Dandelion
Thunbergia alata	Black-eyed Susan
Tradescantia fluminensis	
Tradescantia albiflora	
Trifolium repens	White Clover
Verbascum virgatum	Twiggy Mullein
Verbena rigida	Veined Verbena
Verbena bonariensis	Purpletop
Scientific Name	**Common Name**
Watsonia bulbillitera	Watsonia
Zantedeschia aethiopica	Arum Lily

APPENDIX 2

CONSULTATION REGISTER

UDLP Consultation Register			
Stakeholder	Contact details	Date Document issued for comment	Emails/ Meetings/Corrspondence (see attached)
RMS (Roads and Martime Services)	Ron De Rooy T 02 4221 2585 Level 6 90 Crown St Wollongong NSW 2500	08/07/2014 - TX#0153: Urban Design & Landscape Plan	Minutes - '140721 - Urban Design Review Meeting - Meeting Minutes' Email -' TX#0177 Urban Design Review - Meeting Minutes - 21 07 14 K3 1 1#F53B5 FFDE376B ' Email - 'FW TX#0153 Urban Design Landscape Plan - Draft K3.1.1#EC4F7.FFDDB96B'
Kiama Municipal Council	Darren Brady Manager Design and Development (02) 4232 0444 Administration Centre 11 Manning Street Kiama NSW 2533 darrenb@kiama.nsw.gov.au	08/07/2014 - TX#0153: Urban Design & Landscape Plan	Email ' TX#0153 Urban Design & Landscape Plan - Draft K3 1 1#EC4F7 FFE128AF '
Shoalhaven City Council	Martin Upitis Assets Manager (02) 4429 3111 36 Bridge Rd Nowra PO Box 42 Nowra NSW 2541 Australia upitis@shoalhaven.nsw.gov.au	08/07/2014 - TX#0153: Urban Design & Landscape Plan	Email - 'FW TX#0125 FBB-LD-01 - Landscape Design - 15% Concept Design K3 1 1#E5C88 FFDE88A1 ' Email 'TX#0153 Urban Design & Landscape Plan - Draft' Minutes - 'FBB - Shoalhaven Council Meeting Minutes 22 07 14'
Department of Primary Industries (DPI) NSW Office of Water (NOW)	David Zerafa Senior Water Regulation Officer NSW Government Offices 5 O'Keefe Street PO Box 309 Nowra 2541 David.Zerafa@water.nsw.gov.au.	08/07/2014 - TX#0153: Urban Design & Landscape Plan	No comments
Department of Primary Industries (DPI) Fishing and Aquaculture	Dr Trevor Daly Fisheries Conservation Manager – South Coast Aquatic Habitat Protection (02) 44789103 0408 487 083 PO Box 17 Batemans Bay NSW 2536 trevor.daly@dpi.nsw.gov.au	08/07/2014 - TX#0153: Urban Design & Landscape Plan	Email 'FW TX#0153 Urban Design Landscape Plan - Draft K3.1.1#EC4F7.FFDDB96B'
Shoalhaven City Council	Martin Upitis Assets Manager (02) 4429 3111 36 Bridge Rd Nowra PO Box 42 Nowra NSW 2541 Australia upitis@shoalhaven.nsw.gov.au	Meeting 29/08/2014	FBB- Shoalhaven Council Design Review Meeting – No.03
Community	N/A	Saturday 26 July 2014	Report on Community Information Display

140721 - URBAN DESIGN REVIEW MEETING MINUTES

FBB- Urban Design Review Meeting

Meeting Date: 21/07/2014	**Meeting Time:** 11:00am
Location: Miller Street L13.02 Video Conference Room	

Attendance:

Mike Dickens (PB) - MD	Michael Marix-Evans (FH) - MME
Ron de Rooy (RMS) - RD	David Bender (FH) - DB
Ryan Whiddon (RMS) - RW	Michael Sheridan (RMS) - MS
Nadira Yapa (JT) – NY	Luke Brodie (RMS) - LB

Apologies:

Colin Clarke (SMEC) - CC	Andrew Pau (PB) - AP

Agenda No.	Comment	Action	Due Date
1. Bridge Parapets	• FH have rationalised bridge parapets and skirting depths to allow for 2 standard precast barrier shapes.	Note	Note
	• For Kangaroo Valley and Tindalls Lane overbridges, FH will adopt a 1.6m deep parapet.	Note	Note
	• For underbridges; 1.6m parapets will be adopted where there is suspended drainage and 1.1m parapets where there is no drainage with the exception of Berry Bridge which will have 1.6m parapets on both sides.	Note	Note
	• RMS accepts a non-conformance for the proposed 1.1m parapet design. The 1.1m parapets will only extend 80mm below soffit of the girder flanges. The SWTC (app 15) clause 15.2.1 (viii). Requires parapets to extend 200mm below the soffit of girder flanges. It was acknowledged that with the exception of Berry Bridge, underbridges on the project are not highly visible and the non-conformance is not expected to have any visual impact.	Note	Note
2. General	• RMS to consultant government architect to discuss the urban design strategy adopted for the project.	MS	TBC
3. Bridge Headstocks	• Bridge pier headstocks at Broughton Creek Bridge 1,2,3 have been standardised to simplify construction and improve quality outcomes.	Note	Note

Princes Highway Upgrade – Foxground and Berry Bypass
Meeting Minutes

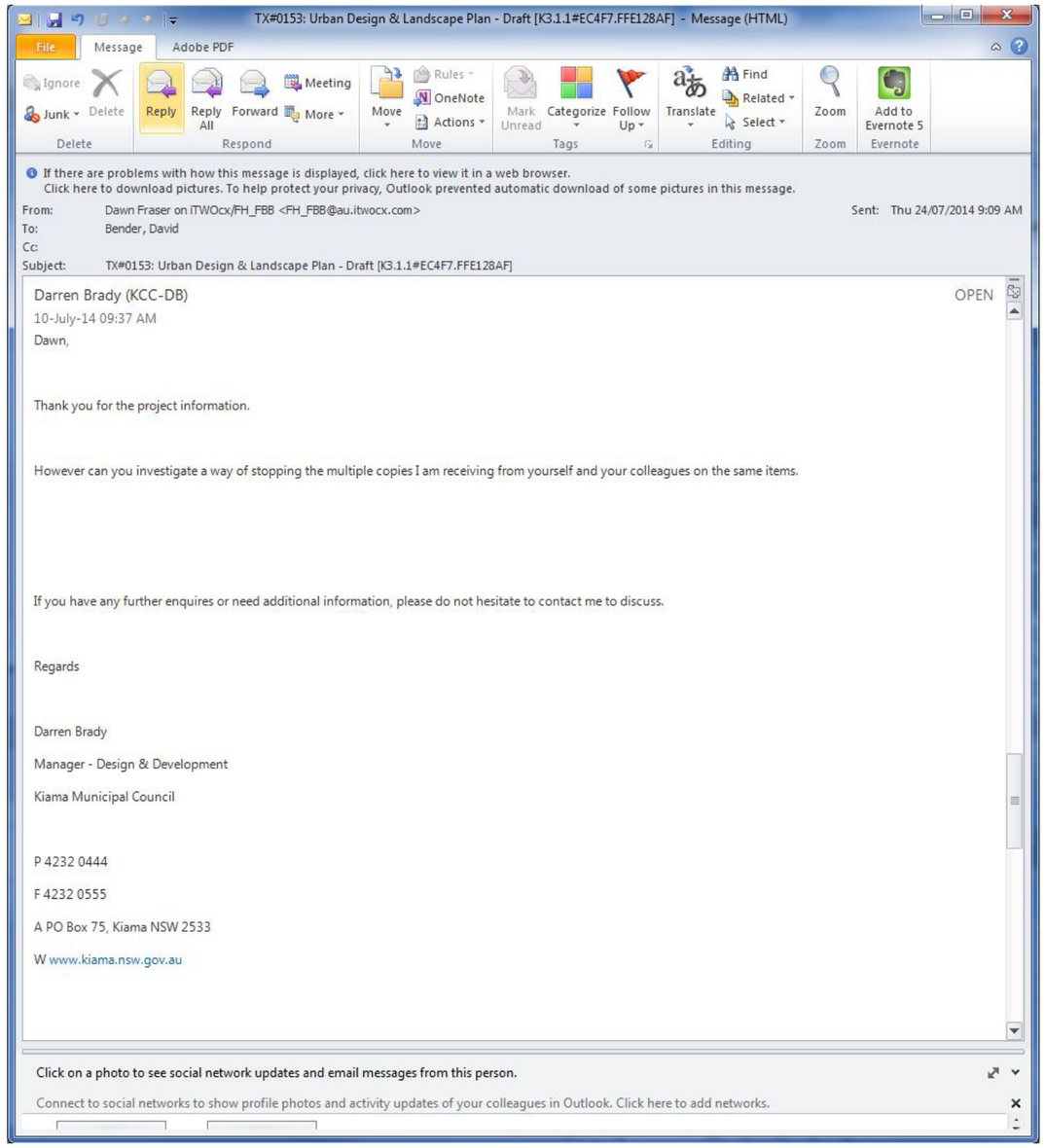
	• Headstocks for the Broughton Creeks Bridges 1,2 and 3 do not have tapered ends to match the alignment of parapets. As the visual exposure is low in these locations RMS did not see an issue with this approach.	Note	Note
	• RMS has requested additional headstock details for the Broughton Creek 3 bridge before agreeing to the head stock design. FH to send through details.	MD	25.07.14
	• The Pier 1 headstock at Berry Bridge will have tapering ends to match the alignment of the parapets as the pier is highly skewed. The other piers at Berry Bridge will have square headstocks as the pier alignment closely matches the bridge (skew < 5degrees). RMS confirmed there are no issues with the proposed approach.	Note	Note
4. KVR Plater Boxes	• RMS has requested that the planter box options for the Kangaroo Valley Road Bridge be presented at the community open day (to be held on 26/07/2014). Fulton Hogan will also present alternative options at open day for the community to consider.	MME	26.07.14
	• RMS to assess the community desire for the planter box design option after the community open day before confirming the design in liaison with Council and FH.	RD	tbc
5. Throw screens/ head light screens	• The throw screen at Kangaroo Valley Bridge was noted to be a bold design and has the potential to be too dominating. RMS would like to assess the community reaction to before the design is locked in.	RD	30.07.14
	• RMS has no particular comments regarding the throw screen at Tindalls Overbridge	Note	Note
	• RMS has no particular comments regarding the headlight screen design	Note	Note
6. Kangaroo Valley Bridge RSW Facing	• From the KVR Bridge RSW panel facing, RMS have stated that they would prefer a 'light ' colour for the sandstone design similar to that shown on the UDLP.	Note	Note
	• RMS have requested Fulton Hogan put together a detailed proposal of the chosen design clearly showing the chosen facing material (concrete/ sandstone), texture/pattern of facing, fixture method (if required) and integration of facing and the RSW jointing layout. Once this is provided RMS will confirm if they are happy with the proposed approach. FH to continue to look at sandstone options.	ND	30.07.14
7. North Street/ Open Space Strategy	• RMS have requested FH present the North Street Open Space strategy on the community open day to assess community feedback. FH to discuss with Council prior to presenting material.	DB	26.07.14
	• RMS do not have any objections with the noise mound design along North Street however would also like to assess the community response.	Note	Note
8. Retaining Wall	• Retaining wall 1 at Service Road has been removed from the	Note	Note

140721 - URBAN DESIGN REVIEW MEETING MINUTES (CONT.)

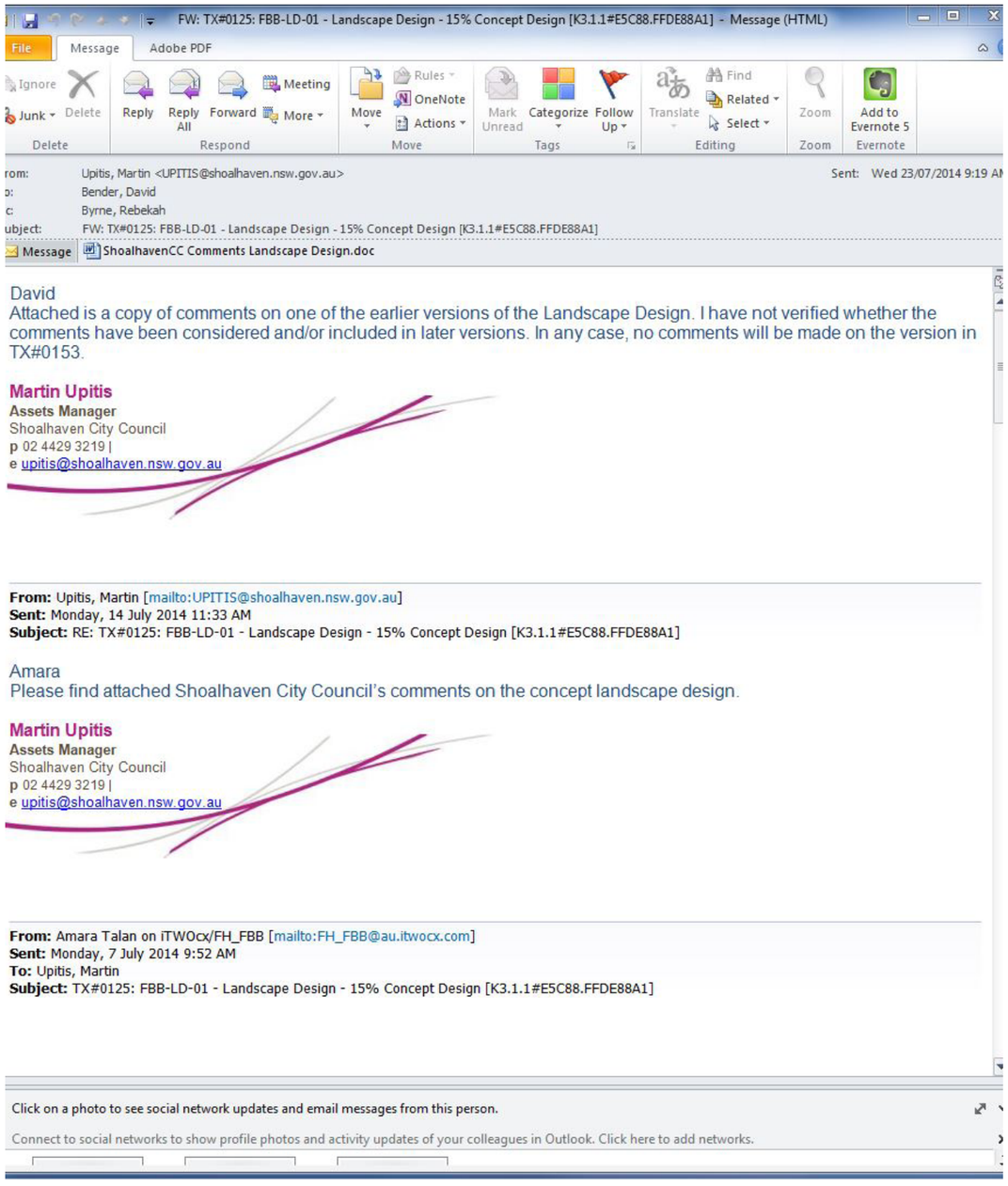
1	design		
9. Berry Memorial	• Shoalhaven Council have confirmed the location of Berry Memorial (Ch14950). The monuments will be squared to the road as per Councils request.	Note	Note
10. Mark Radian Park	• FH have requested to remove fencing along the Queen Street Link Road to limit visual impact. RMS to assess proposal. FH to discuss proposal with Shoalhaven Council.	RW DB	30.07.14 22.07.14
11. Cyclists Provisions	• FH presented TN – 006 Cycle and Footpath Strategy which outlines pedestrian and cyclists movements around the Kangaroo Valley interchange. RMS accepts the current proposal.	Note	
12. Earthworks	• The batter geometry at Cut 2 has been integrated with the geology to provide both a constructible and aesthetic design. RMS has acknowledged the design provides a good urban design outcome.	Note	Note
	• FH have 'laid back' all other cuttings to 2h:1v which minimises visual impact and allows for landscaping.	Note	Note
	• FH have designed Fill 4 (Broughton Creek 1 bridge approach) with 2h:1v rock fill batters (300mm minus material). FH will vegetate the batters to ensure there is no additional impact from the tender design (details tbc). The fill has also been reduced by approximately 1.5m in height which is expected to minimise visual impact.	MME	06.08.14
	• Batters at fills 5 & 6 have been flatted to 4h:1v to allow for removal of wire rope barriers and SO kerbs in some locations. This will provide a more open feeling when driving the alignment and will maximise visuals exposure to the adjacent flood plains.	Note	Note

Recorded by; DB

EMAIL ' TX#0153 Urban Design & Landscape Plan - Draft K3 1 1#EC4F7 FFE128AF '



MINUTES - 'FBB - Shoalhaven Council Meeting Minutes 22 07 14'



Register Of Comments

Princes Highway Upgrade – Foxground and Berry Bypass

Design Lot No: FBB-LD-01 **Revision No:** **Design Lot Title:** Landscape Design **Discipline:**

Review Type: ☒ PV ☐ RTA ☐ IV ☒ Stakeholders ☐ Other **Review Stage** ☒ Concept ☐ Detail ☐ Substantial ☐ Final

Reviewer Name: Roslyn Holmes – Shoalhaven City Council **Review Date:** 01/07/2014 **Other Type/Stage:**

ITEM	REFERENCE	REVIEWER COMMENTS	DESIGNER RESPONSE	Reviewer Close Out	
				STATUS	DATE
0202	Landscape Plans Sheets 1-58	See Comments below:			
		Intersection / Node Trees 1. All pot sizes to be ≥75ltr			
		Tree Planting 1. Delete following species from plant list: Betulapendula, Liquidamba stryraciflua, Calistemon 'Endeav our', Calistemon 'Anzac White'. 2. Preferred species: Pyrus chanticleer, Fraxinus oxycarpa 'Raywoodii', Fraxinus oxycarpa aurea, Liriodendron tulipiferum.			
		Warm Temperate Forest 1. Delete following species from plant list: Pittosporum undulatum			

Register Of Comments

Princes Highway Upgrade – Foxground and Berry Bypass

ITEM	REFERENCE	REVIEWER COMMENTS	DESIGNER RESPONSE	Reviewer Close Out	
				STATUS	DATE
		Tubestock Planting The following plant species to be planted in ≥ 25L pot size: - Acamena smithii - Glochidian fernandii - Eucalyptus microcorys, Eucalyptus paniculata, Eucalyptus pilularis, Eucalyptus robustus, Eucalyptus saligna x botryoides, Eucalyptus quadrangulata - Lophostemon confertus, Lophostemon souvalens - Melaleuca quinquinervia - Syncorpia golulifera - Syzygium oleosum			
		End of Comments			

EMAIL 'TX#0153 Urban Design & Landscape Plan - Draft'

FW: TX#0153: Urban Design & Landscape Plan - Draft [K3.1.1#EC4F7.FFDDB96B] -

File | Message | Adobe PDF

Ignore | Junk | Delete | Reply | Reply All | Forward | Meeting | More | Move | Rules | OneNote | Actions | Mark Unread | Categorize | Follow Up | Translat

Delete | Respond | Move | Tags

From: Toby Hobbs <thobbs@venv.com.au>
To: Byrne, Rebekah
Cc: Kliger, Irina; Michelle.TOMS@rms.nsw.gov.au; ROCHE Graham A
Subject: FW: TX#0153: Urban Design & Landscape Plan - Draft [K3.1.1#EC4F7.FFDDB96B]

Rebekah,

Many thanks for the opportunity to comment on the draft UDLMP. The technical content is generally b
however I note that the majority of relevant Project Approval requirements appear to be addressed wi
at the start of the document).

Having said that it will be important to include a summary of key consultation outcomes within the finali
consultation undertaken with Kiama and Shoalhaven local government representatives.

Regards,

Toby

TOBY HOBBS
Principal

Vantage Environmental Management Pty Ltd
4/539-541 Kiewa Street (PO Box 378) Albury NSW 2640
T (02) 6021 8655 **F** (02) 6021 8666 **M** 0420 922 955
www.venv.com.au

This email is intended for the addressee named and may contain confidential information. If you are not the inten
sender.
Please consider the environment before printing this e-mail

From: Dawn Fraser on iTWOcx/FH_FBB [mailto:FH_FBB@au.itwocx.com]
Sent: Thursday, 10 July 2014 3:26 PM
To: thobbs@venv.com.au
Subject: TX#0153: Urban Design & Landscape Plan - Draft [K3.1.1#EC4F7.FFDDB96B]

EMAIL 'FW TX#0153 URBAN DESIGN LANDSCAPE PLAN - DRAFT K3.1.1#EC4F7.FFDDB96B'

Response from Trevor Daly -

Hi Rebekah

Overall this looks OK to us however obviously the Landscape Plan (and some Figures) wil need to be revised in light of our previous comments on the Drainage 15% Plans.
In particular, I think the following Figures for bridges will need to be revised in this Plan once the drainage aspects are confirmed:

Figures 7.13, 7.14, 7.15, 7.36, 7.50, 7.63 amd 7.64

Thanks

Trevor

FBB- Shoalhaven Council Design Review Meeting – No.02

Meeting Date: 22/07/2014	**Meeting Time:** 10am
Location: Nowra Administration Centre	

Attendance:

Martin Upitis (MU) - Shoalhaven Council	David Bender (DB) - Fulton Hogan

Apologies:

Michael Marix-Evans (MME) - Fulton Hogan	Ron De Rooy - RMS

Agenda No.	Comment	Action	Due Date
1. Temporary Through Road	• Council has confirmed that a temporary through road between Lincoln Ct and Ford st is acceptable. FH complete a letter drop to inform residence of the likely duration it will be operational.	DB	TBC
2. Mark Radium Park	• Council has a preference to remove the fence along Mark Radium Park. FH to discuss with RMS. • Swale running along Queen Street Link Road to be accessible for maintenance (including tie in area with existing basin.)	DB Note	06.08.14
3. Kangaroo Valley Road Bridge	• Council has no comments on Urban Design of Kangaroo Valley Road Bridge. • Planter Box Option not the desired option for Council. Council prefer the textured/coloured pavement option presented by FH. FH and RMS to assess community feedback on open day.	Note Note	
4. North Street	• Council have no objection to noise mound option proposed along the North Street Boundary. • Council has stated there is not a high likelihood that they will follow up works in the North Street open space area within the timeframe of the project. Council's preference would be to construct a carpark which does not align with RMS's proposal. Council is ok with FH presenting the North Street open space concept at the community open day.	Note DB	06.08.14

5. Bundewallah and Town Creek Concept	• Council agree with the DPI's (Fishing and Aquaculture) approach to the Bundewallah Creek concept and is in favour of the concept presented in the meeting. FH to issue Bundewallah Creek concept after meeting with DPI. • Council has commented that the Town Creek diversion does not appear natural due to the concrete invert and would like to be informed of the design once agreed with DPI.	DB DB	06.08.14 06.08.14
6. Lighting	• FH has stated that currently all lights are located within Council road area. Council has stated that Endeavour Energy will own and operate these lights however Council will need to pay a tariff. Council has asked if it possible to rationalise these lights where possible. FH to investigate.	DB	06.08.14
7. Signage	• FH to relocate Berry Sign adjacent to service road C intersection. • FH to submit TN 0008 - Rest Area and Service Signage to Council for review.	Note DB	 01.08.14
8. Pavements	• FH has proposed to use Stabilco pavement base on local roads. FH to submit Council detailed design for review. Council have raised some resivations using this product. • Council open alternative pavement/earthwork options. FH to propose options after detailed design submission.	DB DB	08.08.14 TBC
9. Pedestrian Cyclist Strategy	• Council has no significant comments on the proposed cyclist strategy however would like to review the detailed design.	DB	TBC
10. MCOA	• Council have asked how the MCOA requirement to consider a future off-ramp to Woodhill Mountain Road will be closed out. FH and Council to follow up with RMS to close out issue.	DB/MU	TBC

TRANSMITAL - TX#0153 Urban Design Landscape Plan - Draft K3.1.1#EC4F7.FFDC916B.msg

Hi David,
Dawn Fraser has issued you this Transmittal.
Reply to this email to post a comment on the document or click the respond button for more options.
Show me how

Respond

PROJECT NO	FH_FBB	PHONE	02 8346 9400
PROJECT	Foxground and Berry Bypass	FAX	02 8346 9444
COMPANY	Fulton Hogan Construction	REF	TX#0153

Transmittal

STATUS CLOSED

ISSUED 8-July-14 05:15 PM DUE

	AUTHOR	COMPANY	PHONE	MOBILE
	Dawn Fraser	Fulton Hogan Construction	02 8346 9400	02 8349 9454
COLLABORATORS	ACTION			
	Amara Talan	**Hyder/App**	**02 8907 9211**	**0410 428 663**
	Chay Utatao	**Roads and Maritime Services of NSW**	**02 4221 2429**	
	Darren Brady	**Kiama City Council**		
	David Zerafa	**NSW Office of Water**		
	Hyder-PMB	**Hyder/App**	**02-8907-9211**	
	Kanex Kanagalingam	**Roads and Maritime Services of NSW**	**02 4221 2400**	
	Luke Brodie	**Roads and Maritime Services of NSW**	**02 4221 2400**	
	Martin Upitis	**Shoalhaven City Council**		
	Ron de Rooy	**Roads and Maritime Services of NSW**	**02 4221 2585**	**0411 409 185**
	Ryan Whiddon	**Roads and Maritime Services of NSW**	**02 4221 2403**	**0407 271 454**
	Saman Liyannaarachchi	**Roads and Maritime Services of NSW**	**02 4221 2400**	
	Themis Prodromakis	**Hyder/App**	**02 8907 9000**	
	Trevor Daly	**DPI Fisheries**		
	INFO			
	Andrew Loader	**Fulton Hogan Construction**	**02 8346 9400**	**0450 640 575**
	Andrew McRae	**Fulton Hogan Construction**	**02 8346 9400**	
	Cameron McConVille	**Fulton Hogan Construction**	**02 8346 9400**	
	Chris Peat	**Fulton Hogan Construction**	**02 8346 9400**	
	Coral Reynolds	**Fulton Hogan Construction**	**02 8346 9400**	**0417 917 979**
	David Bender	**Fulton Hogan Construction**	**02 8346 9400**	**0431 961 747**
	Erwin Amores	**Fulton Hogan Construction**	**02 8346 9400**	**0415 070 513**
	Michael Marix-Evans	**Fulton Hogan Construction**	**02 8346 9400**	**0401 454 213**
	Michael Phillips-Ryder	**Fulton Hogan Construction**	**02 8346 9400**	**0427 928 295**
	Paul Travers	**Fulton Hogan Construction**	**02 8346 9400**	
	Rebekah Byrne	**Fulton Hogan Construction**	**02 8346 9400**	
	Roger Santos	**Fulton Hogan Construction**	**02 8346 9400**	**0419 514 567**

Urban Design & Landscape Plan - Draft

SENT FOR REV:Review

Good Afternoon,

Please find attached the draft Urban Design & Planscape Plan for review.

Kind Regards

Dawn

Document Controller | **Fulton Hogan** | Suite 3.04, L3, 61 Dunning Avenue, Rosebery, NSW, 2018 | P.O. Box 6099, Alexandria, NSW, 2015, Australia | Phone +61 2 8346 9454 | Web www.fultonhogan.com

FILE	NAME	REV	DATE	DESCRIPTION	FMT	STATUS
1	FBB_UD&L_PLAN - DRAFT	-	8-July-14	No title provided. File: FBB_UD&L_Plan - Draft.pdf	PDF 50.5Mb	REV

COMMENTS

Dawn Fraser (FH-DF) CLOSED

8-July-14 05:15 PM

Transmittal Issued

FBB- Shoalhaven Council Design Review Meeting – No.03

Meeting Date: 29/08/2014	**Meeting Time:** 11am
Location: Nowra Administration Centre	

Attendance:

Martin Upitis (MU) - Shoalhaven Council	David Bender (DB) - Fulton Hogan
Michael Marix-Evans (MME) - Fulton Hogan	Ron De Rooy (RDR) - RMS
Ryan Whiddon (RW) - RMS	Matt Easton (ME) - Tract

Apologies:

Coral Reynolds – Fulton Hogan	

Agenda Item	Comment	Action	Due Date
1. Road Ownership Plans	• Council stated that it is their expectations that RMS would have ownership over the highway on and off ramps. RMS will review if this is in line with their greater road ownership strategy.	RDR	04/09/2014
2. Tech Note 008 (Rest Area/Direction Signage) + Visual impact along North Street	• The signage strategy along North Street/ Kangaroo Valley interchange was reviewed by Council. The following points were agreed: o Council agreed to with the rest area signage strategy. o Reference to 'Kangaroo Valley' can be removed from directional signs. o Service road D to remain unnamed. Remove Huntingdale Park from off-ramp directional signs. o Tourist Drive Sign ch 16,780 (FBB_097) to move onto Berry Exit sign ch 17,100 (FBB_059) and be reduced in size. o New tourist sign to be located prior to South Bound Off Ramp ch 15,300 approx. • Lines and signs packaged to be issued to Council for review.	Note DB	
3. Street Lighting Review	• Council outlined a preference to reduce the extent of lighting across the project due to higher costs. FH have reviewed and rationalised lighting where possible. Ownerships of lights will be confirmed once the road ownership plans are finalised.	Note	
4. Fencing and North Street and Mark Radian Park	• Shoalhaven council have no objections to the black chainlink fence which will be located adjacent to the North Street noise mound. • It was agreed that no fencing to be provided at Mark Radian	Note	

	Park.	Note	
5. Kangaroo Valley Bridge (Revised UD)	• Planter boxes have been deleted from Kangaroo Valley Bridge. FH and RMS propose to install bollards in the location of the planter boxes. FH to develop and send revised design to Council for review.	DB	12/09/2014
6. Landscape Comments	• Strategy of exotic flanking trees as 75 litre with body planting at 25 litre was agreed by Council. • Species outlined in Councils comments based on maintenance of performance. • Council regards pittosporum undulatum as a weed and would preferred dropped despite RMS and Landcares position. • Councils comment relates to visibility and success. Noted contractual constraints and accepted that there was a period of maintenance which could address these concerns. Accepted tubestock	Note	
7. Construction access	• FH proposed to have a construction access gate on North Street (ch16,500 approx) and a laydown area set back from North Street. Council have no objections to this proposal. Council stated that the condition of North Street would need to be monitored during construction.	Note	
8. CoA B36(a)	• DP&E raised the comment that there wasn't any specific mitigation measures implemented during construction to address potential impacts on the 'Sandtrack' such as reducing speed limits. Council stated they do not believe benefit the speed limit will have a positive community impact. FH stated that for the FBB project the Princes Highway will operate at 80km/hr, major intersections will be designed with right and left turns and the Gerringong project will finish soon and open to 100km/hr. The combination of these items should make the Princes Highway a more desirable route than previously under the Gerringong Upgrade Project. It was noted by all parties that this should be an appropriate response to DP&E.	Note	
9. Woodhill Mountain Road Off-ramp considerations	• RMS stated that they do not believe that providing a concept design for an off-ramp to Woodhill Mountain Road is appropriate. RMS have stated that the distance required for a deceleration lane and the distance for required for the vertical grade transition would not fit in practically with the current bridge arrangement and would require an additional lane the break off before the beginning of the bridge. In addition the areas adjacent to Woodhill Mountain Road are flood prone and are not conducive of residential development and therefore the need for such a ramp is unlikely. Council will review this comment and close out this requirement.	MU	tbc
10. Woodhill Mountain Road Roundabout	• FH to look at constructing roundabout early. Potential to push roundabout into Council land to increase roundabout deflection.		
11. Other	• Urban Design and Landscaping open day scheduled for the 21/10/2014. Shoalhaven Council invited to attend. • Cottage relocation to be approved by Council. • Pavements package to be re-issued to Council.	Note MU DB	 tbc 12/09/2014

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Community Information Display

Foxground and Berry bypass

Saturday 26 July 2014

Agricultural Pavilion – Berry Showground

1. Overview

A community display was held on Saturday 26 July 2014 in the Pavilion at Berry Showground providing the community an opportunity to view the changes made to the July 2013 Approved Concept Design. It was also an opportunity for the community to discuss and register their interest in future workshops on urban design and landscaping as part of the new bypass.

Over 200 people attended the display with positive feedback received from the community about the project.

The project team were at the display to discuss with the community the changes to the July 2013 Approved Concept Design.

Key areas of interest discussed at the display were the design of interchanges and bridges, urban design and landscaping and noise management.

Key changes made to the July 2013 Approved Concept Design include:

- A new 33 metre long underpass at Austral Park Road replacing the previously planned overbridge.
- Changes to the noise barrier at Huntingdale Park Road that will now be a noise barrier made up of a 0.8 metre high noise wall resting on a vegetated noise mound. This replaces the previously planned four metre high noise wall.
- The previously proposed retaining wall on the northbound entry ramp on the eastern side of the bridge at Berry will be replaced with a vegetated embankment to improve safety and visual impacts.
- Additional footpath and cycleway connectivity at Kangaroo Valley Road / Berry south interchange.
- Reducing the length of Broughton Creek bridges 1 and 3.

The display provided an overview of key features of the developed 15% concept design and was the first in a series of community displays to be undertaken during the detailed design period, prior to major construction commencing on the bypass. Updated information on display included:

- The Journey So Far – project flow chart
- Bridges
- Interchanges
- Noise mound/walls
- Pedestrian and cycle paths
- Urban design
- Environment

Attendees were also given the opportunity to provide feedback on the design; register their interest in specific areas of the project (urban design and landscaping, flooding, hydrology, signage, lighting and traffic staging); register their interest in participating or attending community workshops and presentations about the bypass; and to provide feedback on how they would like to be kept informed about the project during construction.

2. Attendees

Over 200 people attended from the community with the majority attending providing positive feedback regarding the project.

Roads and Maritime Services was represented by: Ron de Rooy, Bruce Walters, Ryan Whiddon, Leigh Madden, Lauren Gray and Michael Sheridan.

Fulton Hogan (incorporating Fulton Hogan, SMEC, Parsons Brinckerhoff, Tract and Jackson Teece personnel) was represented by: Andrew McRae, Michael Marix-Evans, Roger Santos, Rebekah Byrne, James Diamond, Andrew Loader, David Bender, Erwin Amores, Chris Peat, Coral Reynolds, Karen Williams, Mike Dickens, Andrew Baxter, Steve Hodgson, and Nadira Yapa.

3. Interest and feedback

Key areas of interest were the interchanges and bridges, urban design and landscaping, and noise management.

24 written responses were received from the community at the display via the 'Register your interest' and 'Have your say' forms. This has been captured in the following table:

Issue	Feedback/Comments
1. Bridge at Berry.	Viewed as an eyesore. Request for tree plantings to improve visual impact.
2. Flooding.	Request for information about Broughton Creek data from Flooding Report.
3. Community consultation.	Would like to be involved/attend urban design and landscaping meetings/workshops.
4. Private driveway.	Request for repositioning the driveway at 13 Kangaroo Valley Road.
5. Community display. Community consultation.	Compliment on a well organised community display. Would like to be involved/attend flooding and traffic staging meetings/workshops.
6. Design of Austral Park Road Interchange.	The design of Austral Park Road Interchange viewed as positive.
Landscaping and new bypass route.	Request for landscaping along the embankment between Broughton Creekb 2 and 3 and a new route for the bypass.
Noise management.	Concern expressed over noise abatement in general.
7. Community consultation.	Would like to be involved/attend urban design and landscaping meetings/workshops.
8. Botanical garden.	Would like a botanical garden to be constructed as part of the urban design and landscaping in Berry.
9. Community consultation.	Would like to be involved/attend urban design and landscaping meetings/workshops.
10. Community consultation.	Would like to be involved/attend urban design and landscaping meetings/workshops.
11. Community consultation.	Would like to be involved/attend urban design and landscaping meetings/workshops.
12. Bridge at Berry.	Request for tree plantings or painting it green to improve visual impact.
13. Community consultation.	Would like to be involved/attend urban design and landscaping, signage and lighting meetings/workshops.
14. Community consultation.	Would like to be involved/attend urban design and landscaping, signage, lighting and traffic staging meetings/workshops.
15. Community consultation.	Would like to be involved/attend urban design and landscaping meetings/workshops.
16. Community consultation.	Would like to be involved/attend urban design and landscaping, and lighting meetings/workshops.
Car parking.	Construction of a car park at North Street with shade trees, amenities and signage.
17. Design of Austral Park Road Interchange.	The design of Austral Park Road Interchange viewed as positive.
Naming of new link road at Austral Park Interchange.	Request to name the new link road at Austral Park Interchange Seaton Park Road.
Naming of Broughton Creek Bridges 2 and 3.	Request to name Broughton Creek Bridges 2 and 3 after the Chittick family.
Community consultation.	Compliment on Ron De Rooy and Fulton Hogan's community consultation.
18. Design of Austral Park Road Interchange.	The design of Austral Park Road Interchange viewed as positive.
Naming of Broughton Creek Bridges 2 and 3.	Request to name Broughton Creek Bridges 2 and 3 after the Chittick family.
Naming of new link road at Austral Park Interchange.	Request to name the new link road at Austral Park Interchange Seaton Park Road.
Community consultation.	Compliment on Ron De Rooy and Fulton Hogan's community consultation. Would like to be involved/attend urban design and landscaping, flooding, lighting and traffic staging meetings/workshops.
19. Mark Radium Park.	Interest in the work being done adjacent to, and at, Mark Radium Park.
20. Pedestrian paths.	Interest in continuity of pedestrian access to Queen Street from Kangaroo Valley Road during construction.
21. Plan of Schofields Lane and access to The Arbour.	Interest in the cost of construction per m^2.
22. North Street open space.	Interest in the future plan of North Street open space.
23. 3D visualisation.	Would like to be notified when the new 3D visualisation is available on the project website.
24. Signage.	Request for signage to be installed to advertise events in Berry.

4. Discussions

Discussions held with community members recorded as notes by Roads and Maritime Services and Fulton Hogan personnel, have been categorised as follows:

Noise

- Construction noise.
- Noise modelling results be made available before and after the project, and reassessment of mitigation treatments proposed.
- Location of noise mounds.
- Additional noise walls be installed adjacent to Mark Radium Park.
- Operational noise on North Street and Huntingdale Park Road, and from bridge joints.

Construction

- A separate access road be constructed to BUPA connecting with Schofields Lane from Service Road C.
- Obtaining bitumen during construction.

Safety

- A low level picket fence be installed at Mark Radium Park to ensure safety of children.

Design

- Location of the alignment in relation to a resident's property.
- The design of Austral Park Road interchange.
- The alignment design.
- Height of the bridge at Berry.
- Creation of cul de sacs at North Street.

Property access

- The access from Austral Park Road would no longer be adjacent to a resident's property.
- The length of the route to access properties from Austral Park Interchange.
- Access to the church and last house on North Street.

Environment

- To be kept informed about the Ecological Monitoring Program, and the effectiveness of the fauna crossing structures once they have been installed e.g. what fauna use them and how frequently.
- Investigating potential of using cattle proof fencing without the use of barbed wire be installed to reduce the risk of wildlife injuries.
- Flooding downstream of Broughton Creek bridge 3.
- A low level picket fence be installed at Mark Radium Park to prevent wildlife from wandering onto the new bypass.

Urban design and landscaping

- Landscaping between the new bypass and existing Princes Highway.

- Requests of copies of pages from the Urban Design and Landscape Plan.

Communications

- Copies of the 3D visualisation be available in the Roads and Maritime Services office in Berry.
- Copies of the display material on the Project website.
- Questions on distribution of the invitation and a number of residents/businesses not receiving the Householder invitation letter.

5. Actions

The Fulton Hogan community relations team will respond to stakeholder queries that have been obtained via the 'Register for more information' and 'Have your say' forms and notes from the project team requiring a response within one week of the display. The display materials and 3D visualisation will be uploaded to the project website and be available at the Berry project office within one week of the display [as per SWTC 8.4.2 (e)].

6. Next steps

The information gathered from the community display and presented in this report will be considered by the project team in refining the detailed concept design, and to assist in the remaining community engagement activities to be undertaken during the detailed design period.