Berry to Bomaderry
Princes Highway upgrade
Technical paper: Urban design, landscape character and visual amenity
NOVEMBER 2013
Berry to Bomaderry upgrade
Princes Highway upgrade
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Executive summary

The purpose of this report is to:

- Describe the urban design context of the Berry to Bomaderry upgrade (the proposal), identifying key built, natural, landscape and visual features, characteristics and qualities of the route and its setting.
- Describe the proposal, including the proposed urban design and landscape features and aspects.
- Assess the urban and landscape design of the proposal (including landscape character and visual impacts).
- Identify and describe integrated mitigation measures.

While a specific ‘Urban Design Framework’ does not yet exist for the whole Princes Highway, the design objectives outlined in this report (Section 2.0) are derived from RMS urban design policies as published in Beyond the Pavement, RTA Urban Design Policy, Procedures and Design Principles (RTA July 2009), Bridge Aesthetics, Design Guidelines to Improve the Appearance of Bridges in NSW (RMS July 2012) and are also consistent with the Gerringong to Bomaderry Princes Highway upgrade Preliminary Urban and Regional Design Strategy (AECOM November 2007).

Evaluation of the proposal

The proposal has been assessed with regard to:

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

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

- Potential visual landscape character impacts on the widely acknowledged and recorded Berry Bolong Pastoral Landscape.
- Provision of a safe transition from highway speed conditions into lower speed local conditions on the southbound entry into Bomaderry.
- The visual impact of proposed highway infrastructure including:
  - Grade-separated facilities at Jaspers Brush Road and Strongs Road.
  - Grade-separated facilities at Morschels Lane and Devitts Lane.
  - A grade-separated half-interchange at Pestells Lane and Mercoo Road.
  - A large cutting at Strongs Road, Jaspers Brush up to 300 metres long and up to 10 metres deep.
  - A northbound heavy vehicle inspection bay at Jaspers Brush.
- Integration of cut and fill embankments into the existing landscape context and character.
- Major drainage and flood mitigation structures.
- Eight bridges over waterways.
- Physical modifications to about 16 existing property accesses.

The integrated urban design concept plan included in this report presents recommended mitigation strategies to minimise these impacts on landscape character.

Three landscape character units have been identified and assessed. The landscape character and visual impacts are considered moderate for two of the landscape character units while the third is considered to have high to moderate impacts.

Two ground level and four aerial viewpoints have been identified along the route to illustrate potential landscape character and visual impacts. Existing views and artist’s impressions illustrating the proposal are presented for each viewpoint. The artist’s impressions incorporate the recommended mitigation strategies derived from the urban design strategy and illustrate possible outcomes.

These artist’s impressions and the urban and landscape design concept plan combine to illustrate the key urban design initiatives as follows:

- The development of an alignment and road formation for the proposed highway, that has been designed to best fit with the landform and existing landscape along the route and to minimise the visual and landscape character impacts while meeting modern road design standards.
- The strategic use of culturally relevant tree species for revegetation along the corridor.
- The integration of cut and fill embankments and recommended variation in slope angle and treatment to fit with undulating landscape form.
- The selective and prudent screening of some of the new infrastructure and blending to the edge of the infrastructure as far as practicable.
- The holistic and considered integration of bridge and retaining elements within the urban design framework.

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

- Embankment slopes associated with the raised highway would not exceed 2:1 where feasible and reasonable and would be sympathetic with the adjacent landscape, using techniques such as varied embankment slopes and blending to the edge of the infrastructure as far as practicable.
- The further redevelopment of the Bomaderry arrival / departure strategy during detailed design to integrate with the varying characteristics of the existing rural and town landscape context, providing a safe and legible transition from highway conditions to local roads. Development of the strategy would occur in consultation with Shoalhaven City Council.
- Engagement with the local community to gather feedback as the design develops, foster broader community support and ownership for the design outcome.
Introduction
1 Introduction

1.1 The proposal

Roads and Maritime Services (RMS) is proposing to upgrade about 11.5 kilometres of the Princes Highway between Schofields Lane (the southern extent of Foxground and Berry bypass) and the intersection with Cambewarra Road, Bomaderry. The proposal is part of RMS’ program to upgrade the Princes Highway between Gerringong and Bomaderry, providing increased road safety and traffic efficiency in the South Coast region.

The horizontal and vertical alignments of the existing largely two-lane highway between Schofields Lane and Cambewarra Road require upgrading to meet current design safety and traffic efficiency requirements. The highway has limited overtaking opportunities, many junctions with rural roads and private, uncontrolled accesses.

The preferred option for the proposal has been selected as that which best meets the objectives applied across the program of proposals for the Princes Highway upgrade between Schofields Lane and Cambewarra Road. The preferred option performs well across a combination of the technical input gathered through investigations carried out to date (including a review of studies from previous investigations into the proposal), community feedback and the findings of the value management process.

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

- Gerringong upgrade.
- Foxground and Berry bypass.

1.1.1 The study area

The proposal study area extends from just south of Schofields Lane close to Berry (the southern extent of the proposed Foxground and Berry bypass) to the intersection with Cambewarra and Moss Vale roads, in Bomaderry (Figure 1.1). The study area varies in width from approximately one to three kilometres and is strongly influenced by the underlying natural landform, past and present cultural settlement and pastoral practices. The proposed alignment runs in a general north-east to south-west direction. To the north and west the study area is bordered by the southern end of the Illawarra Escarpment. To the east and south the study area is bordered by the Broughton Creek floodplain and the South Coast Railway line.

Almost the entire area falls into the listed and recognised Berry Bolong Pastoral Landscape (Refer Section 5.3). The southern extent of the cultural landscape occurs just north of Bomaderry.

From north-east to south-west the study area passes through Jaspers Brush, with undulating terrain and a number of small tributaries of Broughton Creek crossing the existing highway. The most prominent and well treed crossing being at Jaspers Brush Creek.

South-west of Jaspers Brush Creek the terrain transitions from undulating to gently undulating as the existing highway passes through Meroo Meadow. To the east and south the landscape is dominated by open flat pastureland. The South Coast Railway runs in close proximity, parallel to the highway at this point. To the north and west the gentle lower slopes of the escarpment begin to rise up to the forested hills.

South of Meroo Meadow the landscape transitions with the open pastoral backdrop being dominated by the tall line of remnant Eucalyptus forest separating the open pastoral landscape to the north from the Bomaderry urban area to the south.

The undulating landscape, pastureland and rural settlement patterns of the study area are defining features. The rural landscape that exists today is a mix of past agricultural and pastoral activities that have been occurring since the first half of the nineteenth century, combined with smaller scale rural allotments with varied practices.

The largest agricultural influence has come from dairying activities. That have defined the general pattern of vegetation clearance, rural boundaries (by linear cultural plantings) and the distribution of rural houses and farm buildings.

Within the pastoral landscape the major source of variation is the topography of the study area. The character of the rural backdrop is markedly different between the undulating higher elevations associated with the forested foothills of the Illawarra Escarpment to the west and the open areas of the Broughton Creek floodplain to the east. The intimate interplay between areas of roadside vegetation, open agricultural plots and undulating open pastoral landscape are both attractive and engaging.

The rural backdrop is slowly changing and the partial decline in the dairy industry has created a more complex landscape pattern. A wider variety of agricultural activities is resulting in more areas under cultivation. Potential urban expansion of Bomaderry to the north of Cambewarra and Moss Vale roads may further change the landscape character of the study area in the future.
Figure 1.1 The overall Princes Highway upgrade between Gerringong and Bomaderry
1.1.2 Design constraints
Constraints which influence the location and design of the proposal include:
• The existing highway corridor.
• Sub-standard road geometry of the existing highway.
• Floodplains and soft soil conditions.
• Numerous existing creek crossings.
• Existing land uses and settlement patterns.
• The South Coast Railway line.
• Bomaderry urban area.
• Agricultural industry.
• The Eastern Gas Pipeline.
• Indigenous and non-Indigenous cultural heritage.
• Residences and communities.

1.1.3 Major design elements
The proposal is approximately 11.5 kilometres in length. Figure 1.1 highlights the proposal in the context of the Princes Highway upgrade between Gerringong and Bomaderry. Figure 1.2 illustrates the proposed route and the key elements of the proposal as they relate to the urban and landscape design. The overarching objectives of the Princes Highway upgrade are to improve road safety and reduce travel times. A detailed description of the proposal elements is outlined in Section 3.2.

The proposal would include the following key design elements:
• Upgrade of the existing highway, including widening from two lanes to a four lane divided highway (two lanes in each direction) with median separation (wire rope barriers generally, or concrete barriers where space is constrained, such as at bridge locations).
• Provision for widening of the highway (if required in the future) to six lanes within the road corridor between Schofields Lane and around Pestells Lane.
• Tie-in to the Berry bypass to the north of the proposal.
• Grade-separated facilities at:
  - Jaspers Brush Road and Strongs Road.
  - Morschels Lane and Devitts Lane.
• A grade-separated half-interchange at Pestells Lane and Meroo Road.
• Controlled right turn bays and u-turn facilities at:
  - Croziers Road (northbound).
  - Between Strong Road and Turners Lane (southbound).

Figure 1.2 The proposal and the key elements associated with the route
The landscape character units are defined and discussed in Section 5.5.

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

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

1.2 Study methodology

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

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

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

- Urban and landscape design objectives and principles (refer Section 2.0) were developed for the strategic concept design (alignment) of the whole of the Princes Highway upgrade between Gerringong and Bomaderry. These objectives and principles were then used to develop and assess the proposal.
- A contextual analysis of the Princes Highway was documented to assist in understanding the environment around the proposal. This analysis was undertaken through field surveys and desktop studies to determine character units, identify key local and regional characteristics and qualities; and identify site opportunities and constraints.
- A landscape character assessment and visual analysis was undertaken in accordance with RMS’ Environmental Impact Assessment Guidance Note E1A-N04 for Landscape Character and Visual Impact Assessment to identify key viewpoints and to review the character of the study area. The visual analysis was used to identify potential impacts and to make recommendations for design refinement and mitigation measures.

Collaboration between design disciplines will continue through the detailed design phase of the proposal so that the whole-of-corridor landscape and urban design objectives are met.

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

1.2.1 Concept design development approach and process

Consistent with the overall philosophy and goals for urban design, as described within Beyond the Pavement, (RTA, 2009) the urban and landscape design team has been continually engaged throughout the concept design phase of the proposal.

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

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

1.2.2 Landscape character units

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

The landscape character units are defined and discussed in Section 5.5.
Urban design objectives and principles
2 Urban design objectives and principles

2.1 Purpose of proposal urban design objectives and principles

While a specific ‘Urban Design Framework’ does not exist for the whole Princes Highway, the design objectives outlined in this report (Section 2.0) are derived from RMS’ policies regarding urban design as published in Beyond the Pavement. Urban design policy, procedures and design principles (RTA, July 2009). This is explained in further detail below in Section 2.2 and Section 4.0 - Urban and landscape design strategy.

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

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

2.2 Objectives and principles of the proposal

The objectives that form the urban and regional design framework for the proposal are supported by specific guiding design objectives and principles which include:

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 should 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.
- Preserve existing cultural patterns within the landscape.
- Avoid where possible, impact to relevant local landscape features through which the proposal passes.
- Vary the gradient of earthworks to provide visual interest and reflect the characteristics of the surrounding landform and landscape.

- Grade out cuttings and embankments, where possible to best fit the characteristics of the local landform, returning the land to its former use or replacing vegetation lost to the proposal.

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.
- Integrate the landscape qualities and characteristics of the proposal landscape with the locality through which it passes.
- Integrate water quality basins within the landscape form and character.

Protect and enhance the heritage and cultural values of the corridor

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

Respect the communities and towns along the highway

- Minimise the proposal impacts to local residents.
- Provide safe and efficient access to towns.
- Provide safe and efficient access from the highway into Bomaderry, 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.

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

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

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 proposal. Urban design principles to be consistent with those outlined in Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW (RMS, 2012).
- Develop an integrated strategy for the avoidance, minimisation and improved appearance of shotcrete as outlined in Shotcrete Design Guidelines: Design guidelines to avoid, minimise and improve the appearance of shotcrete (RTA, 2005).
- Develop a consistent approach to the design of soft landscaping along the route. Planting design principles to be consistent with those outlined in Landscape Guideline: Landscape Design and maintenance guidelines to improve the quality, safety and cost effectiveness of road corridor planting and seeding (RTA, 2008).

The unifying philosophy behind these objectives (and associated design principles) is the goal to develop a proposal that not only meets functional and engineering criteria, but one that respects the environment in which it is located. The urban and regional design framework is intended to be a fundamental component of all stages of highway planning and design. Conceptually, these principles are illustrated in Figure 2.1.
Figure 2.1 Design principles

Preservation of and response to the natural landform

Preservation of cultural patterns in the landscape

Avoidance of wetlands, unique habitats and remnant plant communities

Respect for rivers, streams and natural drainage ways

Preservation of historical archaeological sites

Preservation of historical cultural landscapes

Preservation of context of communities

Consideration of adjacent land uses and access to and from highway

Highway location to engage with terrain

Recognition of special view sheds and scenic character
3

Concept design description
3 Concept design description

3.1 The concept plan

The proposal concept design is illustrated and described in Figure 3.1. The urban design and landscape concept plans supported with sections, typical treatment illustrations and enlargement plans, are illustrated in Figure 3.2 through to Figure 3.5.

3.2 The design elements

The general features of the proposal are:

- Upgrade of the existing highway, including widening from two lanes to a four-lane divided highway (two lanes in each direction) with median separation (wire rope barriers generally, or concrete barriers where space is constrained, such as at bridge locations).
- Provision for widening of the highway (if required in the future) to six lanes within the road corridor between Schofields Lane and Pestells Lane.
- Tie-in to the Berry bypass to the north of the proposal.
- A large cutting at Strongs Road, Jaspers Brush of around 300 metres long and up to 10 metres deep in addition to various smaller cuttings along the proposal.
- Eight bridges over waterways:
  - Creek crossing No. 1 – Unnamed drainage line at chainage 19350, a three span concrete structure around 44 metres long and three metres high.
  - Creek crossing No. 2 – Unnamed drainage line at chainage 19800, a single span concrete structure around 33 metres long and four metres high.
  - Creek crossing No. 3 – Flying Fox Creek, a single span concrete structure around 18 metres long and seven metres high.
  - Creek crossing No. 4 – Jaspers Brush Creek, a three span concrete structure around 44 metres long and six metres high.
  - Creek crossing No. 5 – Wileys Creek, a three span concrete structure around 44 metres long and five metres high.
  - Creek crossing No. 6 – Tandingullia Creek, a five span concrete structure around 76 metres long and five metres high.
  - Creek crossing No. 7 – Tullian Creek, a three span concrete structure around 44 metres long and three metres high.
  - Creek crossing No. 8 – Abernethys Creek, a three span concrete structure around 76 metres long and two metres high.
- Major drainage and flood mitigation structures:
  - Flood mitigation bridge - located just south of O’Keefe Lane at chainage 21200, a three span concrete structure around 45 metres long and 3.5 metres high.
  - Pestells Lane culverts - eight cell box culvert, with each cell around 2.5 metres wide, 1.5 metres high and 130 metres long.
  - Overflow channel – 300 metre long channel located upstream of the alignment to allow flood waters to follow the existing drainage path (between chainage 22320 and 22650).
- A northbound heavy vehicle inspection bay at Jaspers Brush, staffed as needed and locked when not in use.
- Modifications to local roads, including Strongs Road, Jaspers Brush Road, Morschels Lane, Devitts Lane, Pestells Lane, Meroo Road and Abernethys Lane.
  - South of Abernethys Lane at about chainage 28590 (to travel southbound).
  - A large cutting at Strongs Road, Jaspers Brush of around 300 metres long and up to 10 metres deep in addition to various smaller cuttings along the proposal.
- Ancillary operational facilities, including permanent detention basins and stormwater treatment facilities.
  - Tie-in with the existing highway at the Cambewarra Road / Moss Vale Road roundabout.
  - Temporary ancillary facilities, including construction compounds, stockpile sites, haulage roads and sediment basins would be established and operated for construction.
- Relocation and formalisation of existing southbound bus stops at Mullers Lane, Jaspers Brush Road, Morschels Lane and Lamonds Lane and existing northbound bus stops at Boxsells Lane, Croziers Road and Strongs Road. Bus stops would be relocated to sites where there is provision for safe vehicular access, set down and pick up.
- Removal of the current southbound bus stop adjacent to Croziers Road.
  - Ancillary operational facilities, including permanent detention basins and stormwater treatment facilities.
- Tie-in with the existing highway at the Cambewarra Road / Moss Vale Road roundabout.
  - Temporary ancillary facilities, including construction compounds, stockpile sites, haulage roads and sediment basins would be established and operated for construction.
- Relocation and formalisation of existing southbound bus stops at Mullers Lane, Jaspers Brush Road, Morschels Lane and Lamonds Lane and existing northbound bus stops at Boxsells Lane, Croziers Road and Strongs Road. Bus stops would be relocated to sites where there is provision for safe vehicular access, set down and pick up.
  - Ancillary operational facilities, including permanent detention basins and stormwater treatment facilities.
- Tie-in with the existing highway at the Cambewarra Road / Moss Vale Road roundabout.
  - Temporary ancillary facilities, including construction compounds, stockpile sites, haulage roads and sediment basins would be established and operated for construction.
- Relocation and formalisation of existing southbound bus stops at Mullers Lane, Jaspers Brush Road, Morschels Lane and Lamonds Lane and existing northbound bus stops at Boxsells Lane, Croziers Road and Strongs Road. Bus stops would be relocated to sites where there is provision for safe vehicular access, set down and pick up.
  - Ancillary operational facilities, including permanent detention basins and stormwater treatment facilities.
- Tie-in with the existing highway at the Cambewarra Road / Moss Vale Road roundabout.
  - Temporary ancillary facilities, including construction compounds, stockpile sites, haulage roads and sediment basins would be established and operated for construction.
- Relocation and formalisation of existing southbound bus stops at Mullers Lane, Jaspers Brush Road, Morschels Lane and Lamonds Lane and existing northbound bus stops at Boxsells Lane, Croziers Road and Strongs Road. Bus stops would be relocated to sites where there is provision for safe vehicular access, set down and pick up.
  - Ancillary operational facilities, including permanent detention basins and stormwater treatment facilities.
- Tie-in with the existing highway at the Cambewarra Road / Moss Vale Road roundabout.
  - Temporary ancillary facilities, including construction compounds, stockpile sites, haulage roads and sediment basins would be established and operated for construction.
3.3 Application of the urban and landscape design principles

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

- Minimising slopes to cuts, embankments and reducing size and scale of the structural elements in the landscape.
- Establishing culturally relevant plantings such as Figs, Pines and Cabbage Tree palms to create identifiable landmarks.
- Reinforcing the cultural landscape by planting trees perpendicular to the carriage way at the interface of the creeks, fence lines and existing vegetation lines.
- Extending the pastoral landscape to the edges of the road, engaging the motorists with the contextual landscape.
- Responding to the open nature of the broader landscape setting.
- Integrating the design to minimise impacts to landscape character.
- Utilising landscape and road furniture (kerbs, medians etc) to assist in the creation of safe speed transition zones.

3.4 Urban design and landscape concept plan

The urban design and landscape concept plans are illustrated in Figure 3.2 through to Figure 3.15. The concept design responds to the Urban and Landscape Design Strategy (Section 5.0), which was informed by the visual assessment and contextual analysis as documented in Section 5.0 and Section 6.0.

The visual assessment and contextual analysis identify impacts associated with the proposal and the Urban and Landscape Design Strategy proposes relevant design treatments that have been integrated into the concept design to minimise its impacts.
Figure 3.1 The proposal engineering concept drawing
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Figure 3.2 Urban design and landscape concept plan for northern section of the proposal including Jaspers Brush

Legend
- South Coast Railway
- Road corridor boundary
- The proposal
- Existing adjoining roads
- Lot boundaries
- Existing 2m contours
- Existing tree vegetation

- Existing roadside tree vegetation to be retained (indicative)
- Eucalyptus tree planting
- Riparian / Casuarina tree planting
- Bomaderry street tree planting
- Bridge
- Water course

- Pasture grass planting on buffer slopes
- Pasture grass planting to swales
- Ridgelines

* Refer to Appendix J: Non-Aboriginal (Historic) Heritage of the Review of Environmental Factors (REF) for the proposal, for heritage significance, impact management, and mitigation.
Figure 3.3 Section - heavy vehicle inspection bay - Chainage 21100

Figure 3.4 Section - Flying Fox Creek - Chainage 21450

NOTE: Section illustrations represent likely landscape at ten plus years growth.

Figure 3.5 Section - Jaspers Brush / Strongs Road grade-separated facility - Chainage 21800
Figure 3.6 Urban design and landscape concept plan for middle section of the proposal- Meroo Meadow
Figure 3.7 Typical Section Fill - Chainage 23100

Figure 3.8 Typical Section Cut - Chainage 24850

NOTE: Section illustrations represent likely landscape at ten plus years growth.
Figure 3.9 Urban design and landscape concept plan for southern section of Meroo Meadow

Legend
- Road corridor boundary
- The proposal
- Existing adjoining roads
- Lot boundaries
- Existing 2m contours
- Existing tree vegetation
- Existing roadside tree vegetation to be retained (indicative)
- Eucalyptus tree planting
- Riparian / Casuarina tree planting
- Bridge
- Water course
- Pasture grass planting on batter slopes
- Pasture grass planting to swales
- Ridgelines

* Refer to Appendix J: Non-Aboriginal (Historic) Heritage of the REF for the proposal, for heritage significance, impact management, and mitigation.
Figure 3.10 Section - Morschels Lane grade-separated facility - Chainage 25100

Figure 3.11 Section - Morschels Lane grade-separated facility - Chainage 25100

NOTE: Section illustrations represent likely landscape at ten plus years growth.
Figure 3.12 Urban design and landscape concept plan for southern section of the proposal into Bomaderry

Legend:
- Road corridor boundary
- The proposal
- Existing adjoining roads
- Lot boundaries
- Existing 2m contours
- Existing tree vegetation
- Existing roadside tree vegetation to be retained (indicative)

- Eucalyptus tree planting
- Riparian / Casuarina tree planting
- Feature cultural tree planting - Ficus
- Cultural tree planting - Livistona
- Bomaderry street tree planting
- Bridge
- Water course

- Pasture grass planting on batter slopes
- Pasture grass planting to swales
- Feature shrub / groundcover planting to median

* Refer to Appendix J: Non-Aboriginal (Historic) Heritage of the REF for the proposal, for heritage significance, impact management, and mitigation.
Figure 3.13 Section Pestells Lane and Meroo Road grade-separated half-interchange - Chainage 28150

Figure 3.14 Section Bomaderry gateway - Chainage 29500

Figure 3.15 Section Cambewarra Road - Chainage 3000

NOTE: Development of Bomaderry arrival / departure strategy subject to ongoing consultation.
Typical treatment - Fills

The proposed fill treatment (refer Figure 3.16 and Figure 3.17) will:
• Maintain consistency with the existing landscape character and patterns.
• Engage road users with the landscape.
• Integrate the ultimate road corridor by utilising a larger construction footprint during construction and construct broader flatter batters. Re-establish the adjacent pasture and return to prior use as much as practicable. This would ultimately minimise the apparent road corridor width.
• Reduce total area of maintenance.
• Balance cut and fill where possible.

Typical treatment - Cuts

The cut batters (refer Figure 3.18) will be designed so that:
• Shotcrete is not required for stabilisation.
• A sufficient depth of soil is maintained in order to support vegetation where feasible.
• Ease of ongoing maintenance.

Where unstable rock exists consider:
• Slopes of 3:1 or flatter that can potentially be returned to existing use and/or better integrated within the surrounding landscape character (refer Figures 3.18 and Figure 3.19).

Where stable rock exists consider:
• Close to vertical cuttings (refer Figure 3.20).
• Leaving room (a minimum of two metres) at the base of the cutting for vegetation (refer Figure 3.20).

Where cuttings are designed to include the ultimate widening of the corridor to six lanes, the opportunity arises to include additional vegetation at the base of the cutting up until the widening occurs.
Figure 3.18 Typical corridor approach (cuts)

Figure 3.19 Section - Typical corridor approach (cuts)

Figure 3.20 Section - rock cut batter 2:1-1:1 - in suitable rock formation

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