



TOOLIJOOA ROAD FILL WORKS STAGE OF THE  
FOXGROUND AND BERRY BYPASS PROJECT

**URBAN DESIGN AND LANDSCAPE SUB PLAN**  
(LANDSCAPE AND REVEGETATION MANAGEMENT SUB PLAN)

PREPARED BY ELEMENT ENVIRONMENT FOR FULTON HOGAN

**JANUARY 2014**





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## Toolijooa Road Fill Works

Stage 1 of the Foxground and Berry Bypass Project  
Landscape and Vegetation Management Sub Plan

Prepared for Fulton Hogan Pty Limited

22 January 2014

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## Toolijooa Road Fill Works

### Landscape and Revegetation Management Sub Plan

DRAFT

Report # 4 | Prepared for Fulton Hogan Pty Limited | 22 January 2014

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### Document Control

Revision	Date	Description	Prepared by	Reviewed By
0	23/10/2013	For internal review	Neville Hattingh	Irina Kliger
1	23/10/2013	For RMS review	Neville Hattingh	Irina Kliger
2	30/10/2013	For ER review	Neville Hattingh	Irina Kliger
3	11/11/2013	For DP&I review	Neville Hattingh	Irina Kliger
4	22/01/2014	2 <sup>nd</sup> Draft for RMS review (DP&I comments addressed)	Neville Hattingh	Irina Kliger

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# 1 INTRODUCTION

## 1.1 CONTEXT

*The Princes Highway upgrade - Foxground and Berry bypass Environmental Assessment* (AECOM, 2012) assessed the impacts of construction of the Foxground and Berry Bypass Project on landscape and visual amenity.

As part of the Environmental Assessment (EA) development, a detailed urban design, landscape character and visual amenity assessment was prepared to address the Director General's Requirements issued by the then Department of Planning. The assessment was included in the EA as *Volume 2 - Appendix 1 Technical paper: Urban design including landscape character and visual amenity*.

On 22 July 2013 the Foxground and Berry Bypass Project (the Project) was granted approval by the Minister for Planning and Infrastructure. The Minister's Conditions of Approval (CoA) requires the preparation and implementation of an Urban Design and Landscape Plan.

This Landscape and Revegetation Management Sub Plan (LRMP or Plan) has been prepared to address the requirements of the CoA and forms part of the Construction Environmental Management Plan (CEMP) for the Toolijooa Road Fill Works stage of the Project.

## 1.2 BACKGROUND

Fulton Hogan is currently constructing the Gerringong Upgrade Project on behalf of the RMS, which involves the upgrade of the Princes Highway between Mount Pleasant and Toolijooa Road (the start of the Foxground and Berry Bypass Project).

Fulton Hogan have identified that surplus spoil (Virgin Excavated Natural Material - VENM) will be generated from Cut 7 in particular, with smaller volumes originating from various locations along the Gerringong Upgrade Project.

The planning for the Foxground and Berry Bypass has progressed and further design work has been undertaken to take advantage of approximately 151,000m<sup>3</sup> of surplus spoil generated by the Gerringong upgrade project. It is intended for the surplus spoil to be used to widen and enhance the appearance of the proposed road embankment that will be constructed as an engineered fill on the property (known as the "Bologna Property") on the western side of Toolijooa Road, at its intersection with the Princes Highway, to support the realignment of the Princes Highway to the south (refer Area 1 in Figure 1). It is also intended that approximately 29,000m<sup>3</sup> of additional surplus spoil (VENM) will be used as non-engineered fill, immediately south of the Foxground and Berry Bypass project boundary (outside the road footprint) and adjoining the engineered fill (refer Area 2 in Figure 1).

The Foxground and Berry Bypass concept design originally showed this proposed road embankment as a terraced embankment. This has been amended to use the available additional spoil to reshape this south facing embankment slope to a continuous grade.

Extending the width of the embankment will make future provision for widening the Princes Highway to three lanes in the southbound direction, at this location. In addition, the fill will be placed on some of the property outside the road footprint to blend the embankment into the natural landform and reduce its apparent height by following the existing gradient.



The Toolijooa Road Fill Works, the first stage of the Foxground and Berry Bypass, is proposed to commence in late November 2013 and be completed in March 2014 weather permitting. The Toolijooa Road Fill Works will be constructed as a separate package of works from the rest of the Foxground and Berry Bypass Project.

As the Toolijooa Road Fill Works only involves the first stage of an engineered earthworks fill to support the future southern realignment of the Princes Highway, consideration of urban design elements are not relevant to the Toolijooa Road Fill Works stage. A Landscape and Revegetation Management Sub-plan (this Plan) has therefore been prepared for the Toolijooa Road Fill Works stage.

An Urban Design and Landscape Plan, which also focuses on urban design elements, will be developed for subsequent stage(s) of the Foxground and Berry Bypass Project, which involve other features such as bridges, intersections, retaining walls and noise barriers.

This Landscape and Revegetation Plan has therefore been prepared to meet those requirements of the Foxground and Berry Bypass Project approval that are relevant to the construction of the Toolijooa Road Fill Works stage, as discussed in section 2.

### 1.3 PURPOSE

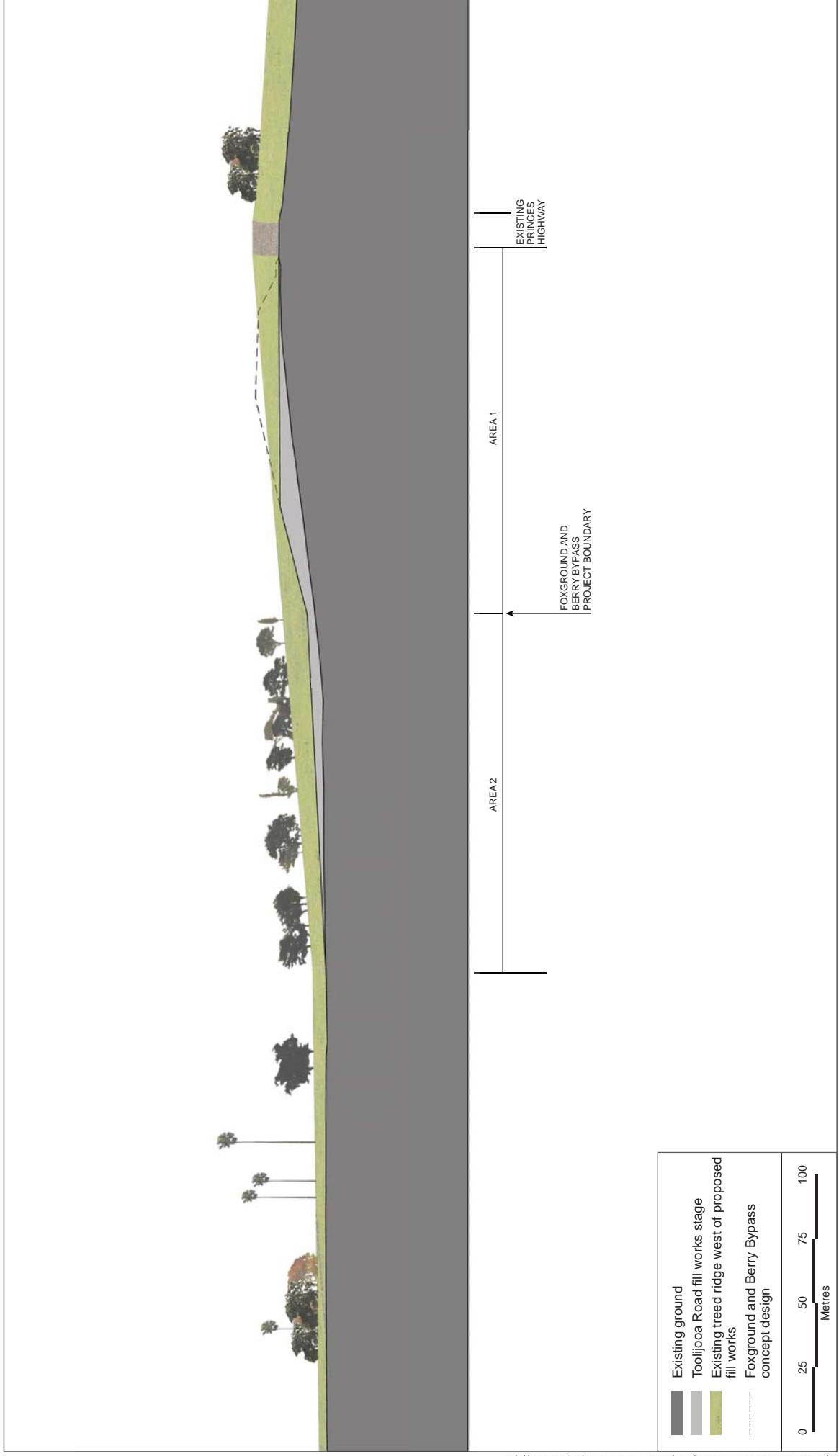
The purpose of this Landscape and Revegetation Plan is to demonstrate that the proposed Toolijooa Road Fill Works stage of the Project, although only the first stage of an earthworks fill, will not conflict with the Project's overarching design principles and objectives, as presented in the *EA Volume 2 - Appendix 1 Technical paper: Urban design including landscape character and visual amenity (AECOM, 2012)*. A summary of those principles and objectives that are relevant to the Toolijooa Road Fill Works stage of the Project and how they are upheld, are included in section 3.



# EXISTING AND PROPOSED LANDFORM

Toolijooa Road Fill Works Stage  
 Foxground and Berry Bypass Project

**FIGURE 001**



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## 2 MINISTER'S CONDITIONS OF APPROVAL

The CoA relevant to this LRMP are listed in Table 1 below. A cross reference is also included to indicate where the condition is addressed in this LRMP or other project / environmental management documents.

Table 1: Conditions of Approval relevant to the LRMP

CoA No.	Condition Requirements	Document Reference
B23	The Proponent shall prepare and implement an <b>Urban Design and Landscape Plan</b> 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:	This LRMP
	(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 A 1 (b);	Chapter 3
	(b) location of existing vegetation and proposed landscaping (including use of indigenous and endemic species where possible) and design features;	Pre-Construction Survey (Appendix H – FFMP) Chapter 4 Figure 5
	(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);	Figures 1, 3, 4 and 5
	(d) a description of locations along the project corridor directly or indirectly impacted by the construction of the project (e.g. 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;	Chapters 3 and 4
	(e) an assessment of the visual screening effects 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;	An assessment of visual screening effects is not considered relevant as there are no existing substantial trees or vegetation located along the southern boundary of the site that visually screen the site from residential receivers as evident from Figure 4, and the proposed landscaping/revegetation approach is to replace

		the predominant vegetation type that exists on the property i.e. grass, which has no visual screening effect.
	(f) take into account appropriate roadside plantings and landscaping in the vicinity of heritage items and ensure no additional heritage impacts;	Chapters 3 and 4 Figure 5
	(g) specific details on the landscape treatments for the North Street corridor, Town Creek diversion and Town Park.	Not relevant to the Toolijooa Road Fill Works stage.
	(h) strategies for progressive landscaping of other environmental controls such as erosion and sedimentation controls, drainage and noise mitigation;	Erosion and Sediment Control Plan (Appendix B – SWQMP) Chapter 4
	(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;	Not relevant to the Toolijooa Road Fill Works stage.
	(j) evidence of consultation with the relevant council and community on the proposed urban design and landscape measures prior to its finalisation; and	Not relevant to the Toolijooa Road Fill Works stage. Consultation will be undertaken during the preparation of the Urban Design and Landscape Plan for subsequent stages of the Project.
	(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.	Chapter 4 FFMP
	The Plan shall be submitted for the approval of the Director General prior to the commencement of construction, unless otherwise agreed by the Director General. The Plan may be submitted in stages to suit the staged construction program of the project	Noted

### 3 URBAN DESIGN OBJECTIVES AND PRINCIPLES

While a specific ‘Urban Design Framework’ does not yet exist for the whole of the Princes Highway, the design objectives outlined in Table 2 are derived from the RMS’s policies regarding urban design as published in ‘Beyond the Pavement: RTA Urban Design Policy, Procedures and Design Principles’ (RTA, 2009).

The objectives that form the urban and regional design framework for the Project are supported by specific design principles which guide their achievement. These objectives as presented in the EA Volume 2 - Appendix 1 Technical paper: Urban design including landscape character and visual amenity (AECOM, 2012) and how these principles were upheld in the design of the Toolijooa Road Fill Works stage, are summarised in Table 2.

Table 2: Urban design objectives and principles relevant to the Toolijooa Road Fill Works stage

<b>Objective One: Provide a flowing highway alignment that is responsive and integrated with the natural landscape</b>	
<b>Design Principles</b>	<b>Toolijooa Road Fill Works Response</b>
Integrate cut and fill embankments with surrounding terrain by grading out and varying slopes.	The proposed fill embankment was originally designed as a terraced embankment. This has been amended to use the surplus spoil to reshape the south facing embankment slope to a continuous, more gradual grade.
Vary the gradient of earthworks to provide visual interest and reflect the characteristics of the surrounding landform and landscape.	The proposed fill embankment has been re-designed with a 1V:4H batter in the upper (northern) part of the fill, which aligns with the steeper existing slopes immediately south of the Princes Highway, and a 1V:20H batter in the lower (southern) part of fill, which aligns with the more gradual existing slopes associated with the valley (refer Figure 1)
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.	The revised fill embankment design will grade out and won’t conflict with the characteristics of the surrounding landform. The embankment will be revegetated to grasses after construction, which was the dominant vegetation type on the property and compliments the surrounding landscape (refer Figure 5).
<b>Objective Two: Protect the natural systems and ecology of the corridor</b>	
<b>Design Principles</b>	<b>Toolijooa Road Fill Works Response</b>
Minimise disruption to natural drainage patterns both through route selection and road design.	The proposed fill embankment has been designed with batters that are similar to the existing slopes in both orientation (southward draining) and grade. The toe of the fill embankment grades out some distance from the valley bottom which is characterised by agricultural drains and unnamed, altered creeks, none of which are impacted by the proposed fill embankment.
Integrate the landscape qualities and characteristics of the project landscape with the locality through which it passes.	The landscape surrounding the proposed fill embankment is characterised by undulating terrain and open pastures. The revised fill embankment design will grade out and won’t conflict with the characteristics of the surrounding landform. The embankment will be revegetated to grasses after

	<p>construction, which was the dominant vegetation type on the property and compliments the surrounding landscape (refer Figure 5).</p>
<p><b>Objective Three: Protect and enhance the heritage and cultural values of the corridor</b></p>	
<p><b>Design Principles</b></p>	<p><b>Toolijooa Road Fill Works Response</b></p>
<p>Avoid, where possible areas of identified historic and Aboriginal heritage and cultural value and acknowledge and respond to Aboriginal values placed on the broader landscape.</p>	<p>The proposed fill embankment has been designed to totally avoid and to allow for an exclusion zone around the Aboriginal heritage site G2B A38 (isolated artefact), which is located to the south-west. The re-designed fill embankment also seeks to reduce any impacts on the landscape form and character of the area and therefore any potential impact on the Toolijooa Road Aboriginal Cultural Landscape, which is located to the west. The proposed fill embankment also avoids the heritage item G2B H30 (remnant 19<sup>th</sup> century road) which is located on the adjacent property to the west. This road remnant will however be entirely impacted during following stages of the Project. Reference can be made to the Heritage Management Sub Plan for the location of these heritage items.</p>
<p>Acknowledge and respond to the heritage and cultural values of the rural landscape.</p>	<p>The landscape surrounding the proposed fill embankment is characterised by undulating terrain and open pastures. The revised fill embankment design will grade out and won't conflict with the characteristics of the surrounding landform. The embankment will be revegetated to grasses after construction, which was the dominant vegetation type on the property and compliments the surrounding landscape (refer Figure 5).</p>
<p>Reduce the visual impacts of the project.</p>	<p>Although at a distance, the proposed fill works is visible to a handful of rural residential receivers, located predominantly to the south as presented in the Visual Catchment Plan - Figure 3. The proposed approach to reducing batters, grading out the embankment and revegetating with grasses, will significantly reduce the visual impacts of the proposed fill embankment. Figure 5 provides a visual representation of proposed fill embankment after the establishment of grass.</p>
<p>Consider the important value of productive landscapes.</p>	<p>An option has been provided in section 4 of this Plan to revegetate the completed fill embankments to pasture grasses, which would allow for the grazing of part of the "Bologna" property that was acquired to construct the Toolijooa Road Fill Works, post construction. This depends on RMS landholding use restrictions.</p> <p>This Plan also provides the relevant management controls which will limit impacts on surrounding productive farms, by reducing windblown dust and sedimentation as well as weed establishment and spread.</p>

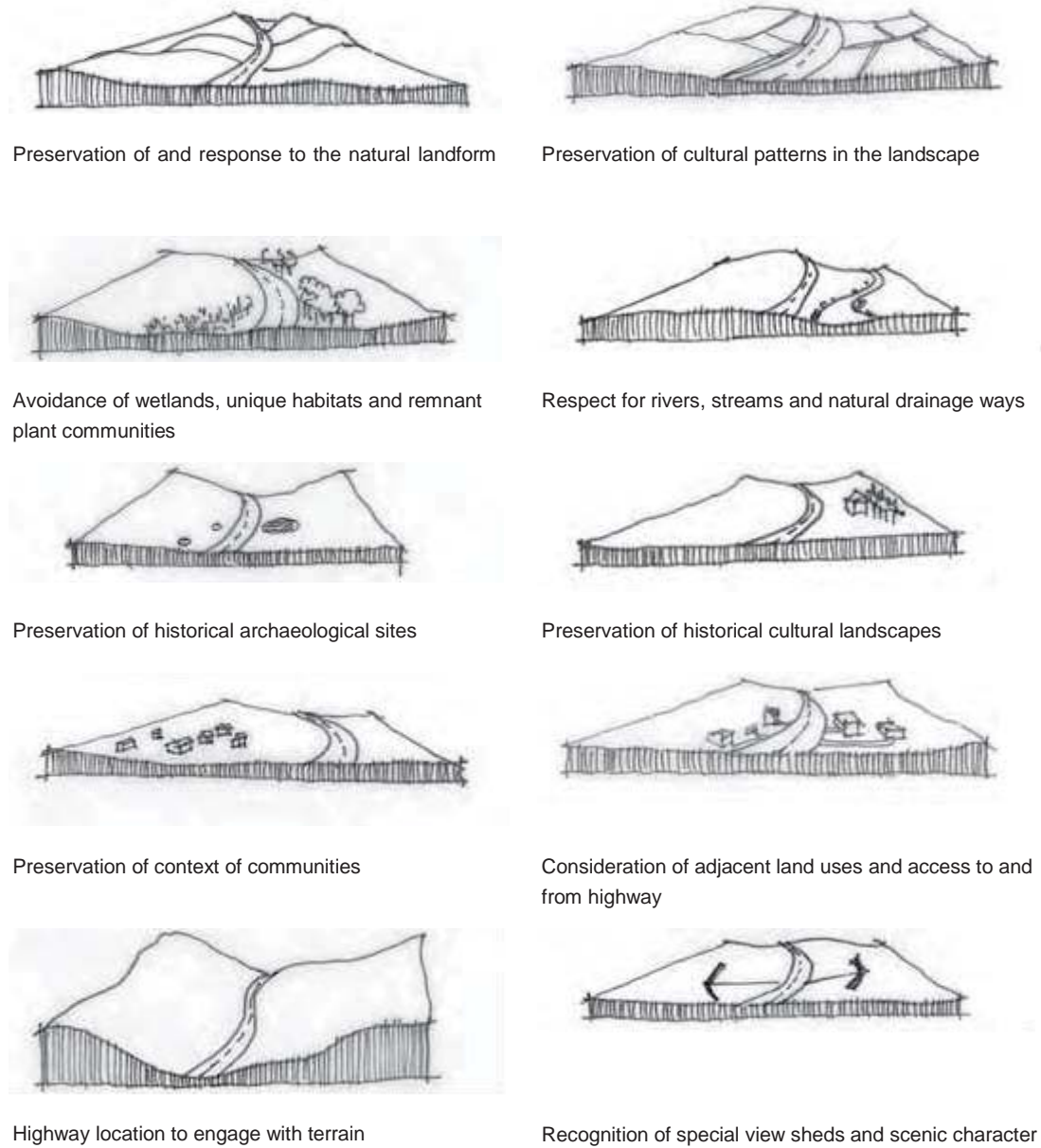
<b>Objective Four: Respect the communities and towns along the highway</b>	
<b>Design Principles</b>	<b>Toolijooa Road Fill Works Response</b>
Minimise the disruption and loss of amenity to rural residents within the study area.	Although at a distance, the proposed fill works is visible to approximately nine rural residential receivers, located predominantly to the south (refer Figure 3). The proposed approach to reducing batters, grading out the embankment and revegetating to grasses, will significantly reduce the visual impacts of the proposed fill embankment on all rural residential receivers. Figure 5 provides a visual representation of proposed fill embankment after the establishment of pasture.
<b>Objective Five: Provide a safe, enjoyable and interesting highway with strong visual connections to the Pacific Ocean, immediate hinterland, and mountains to the west</b>	
<b>Design Principles</b>	<b>Toolijooa Road Fill Works Response</b>
Use landscape treatments to soften the appearance of the road for its users without compromising opportunities for key views.	Although the proposed fill embankment won't be particularly visible to users of the realigned Princes Highway and won't impact on the valley and sea views to the east, it will be visible for northbound commuters travelling along Toolijooa Road (refer Figure 4). The proposed approach to reducing batters, grading out the embankment and revegetating to grasses, will significantly reduce the visual impacts of the proposed fill embankment on users of Toolijooa Road (refer Figure 5).
<b>Objective Six: Develop a simple and unified palette of elements and details that are easily maintained</b>	
<b>Design Principles</b>	<b>Toolijooa Road Fill Works Response</b>
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 revegetation of the proposed fill embankment to grasses is in accordance with the urban design and landscape concept plans as illustrated in Figure 3.2 of the EA <i>Volume 2 - Appendix I Technical paper: Urban design including landscape character and visual amenity</i> (AECOM, 2012). As the Toolijooa Road Fill Works stage will be followed by future construction works on the site and therefore disturbance, the <i>RMS QA Specification R178 – Vegetation</i> was considered to be the relevant RMS specification for this specific stage of works.

The unifying philosophy behind these objectives (and associated design principles) is the goal to develop a project that not only meets functional and engineering criteria, but one that respects the environment in which it is located.

Conceptually these principles are illustrated in the following figures.



Figure 2: Design principles (AECOM, 2012)



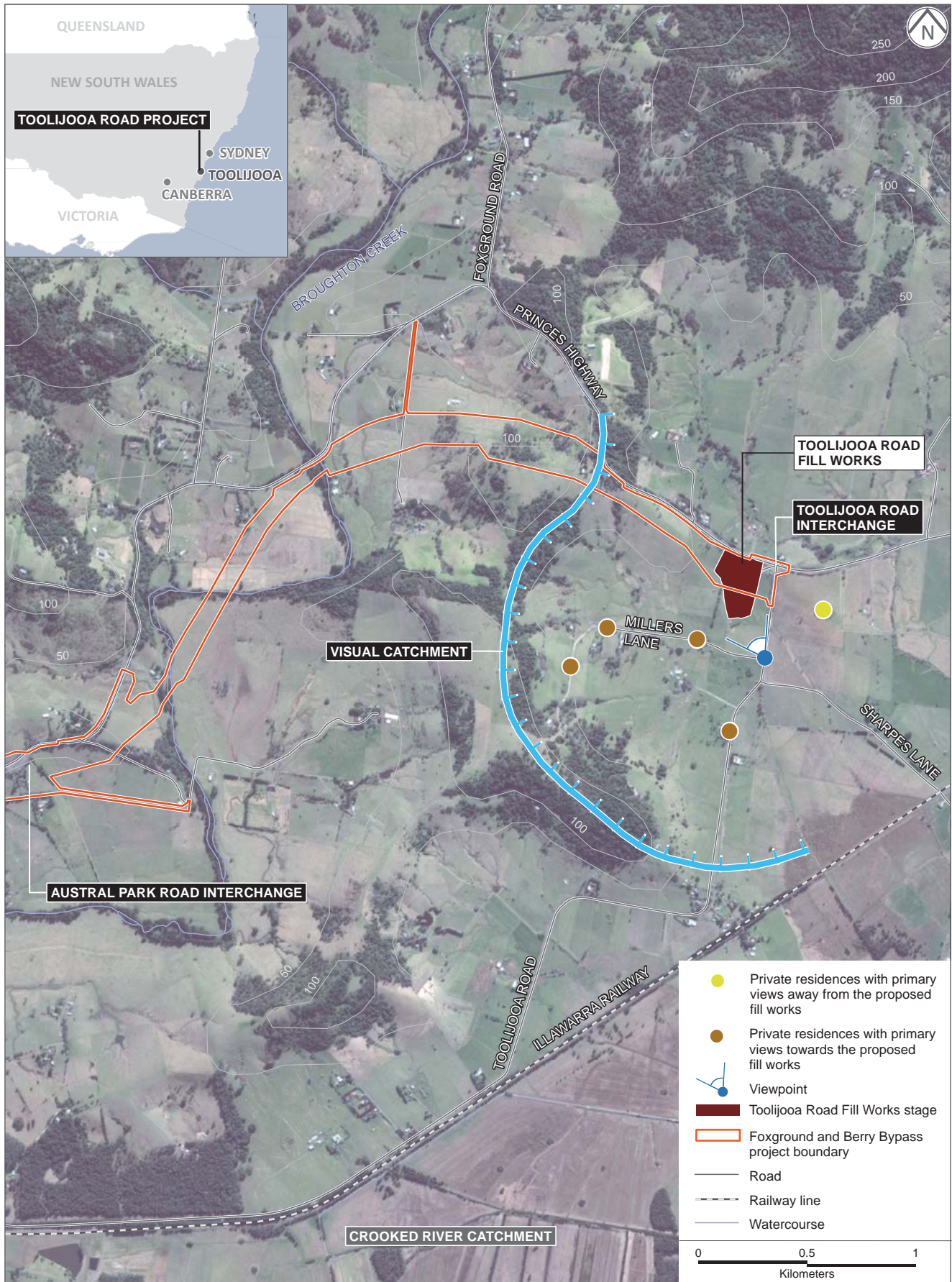
This LRMP has recognised the Project’s urban and landscape design objectives, principles, and strategy and presents how these values will be upheld in the design and construction of the proposed Toolijooa Road Fill Works stage of the project.



# VISUAL CATCHMENT PLAN

Toolijooa Road Fill Works Stage  
 Foxground and Berry Bypass Project

FIGURE 003



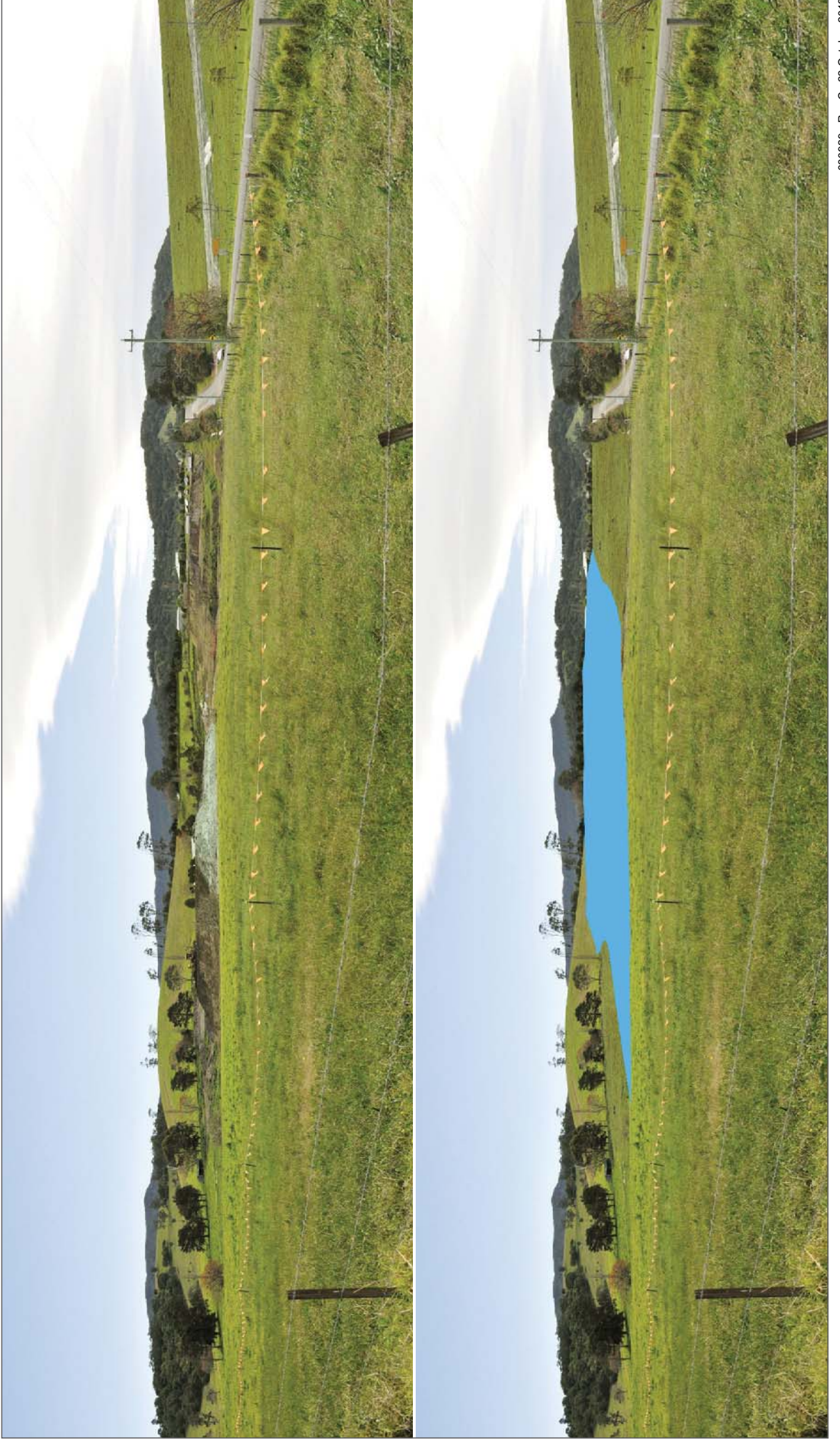
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**EXISTING LANDFORM AND IMPACT FOOTPRINT**

Toolijooa Road Fill Works Stage  
Foxground and Berry Bypass Project

**FIGURE 004**



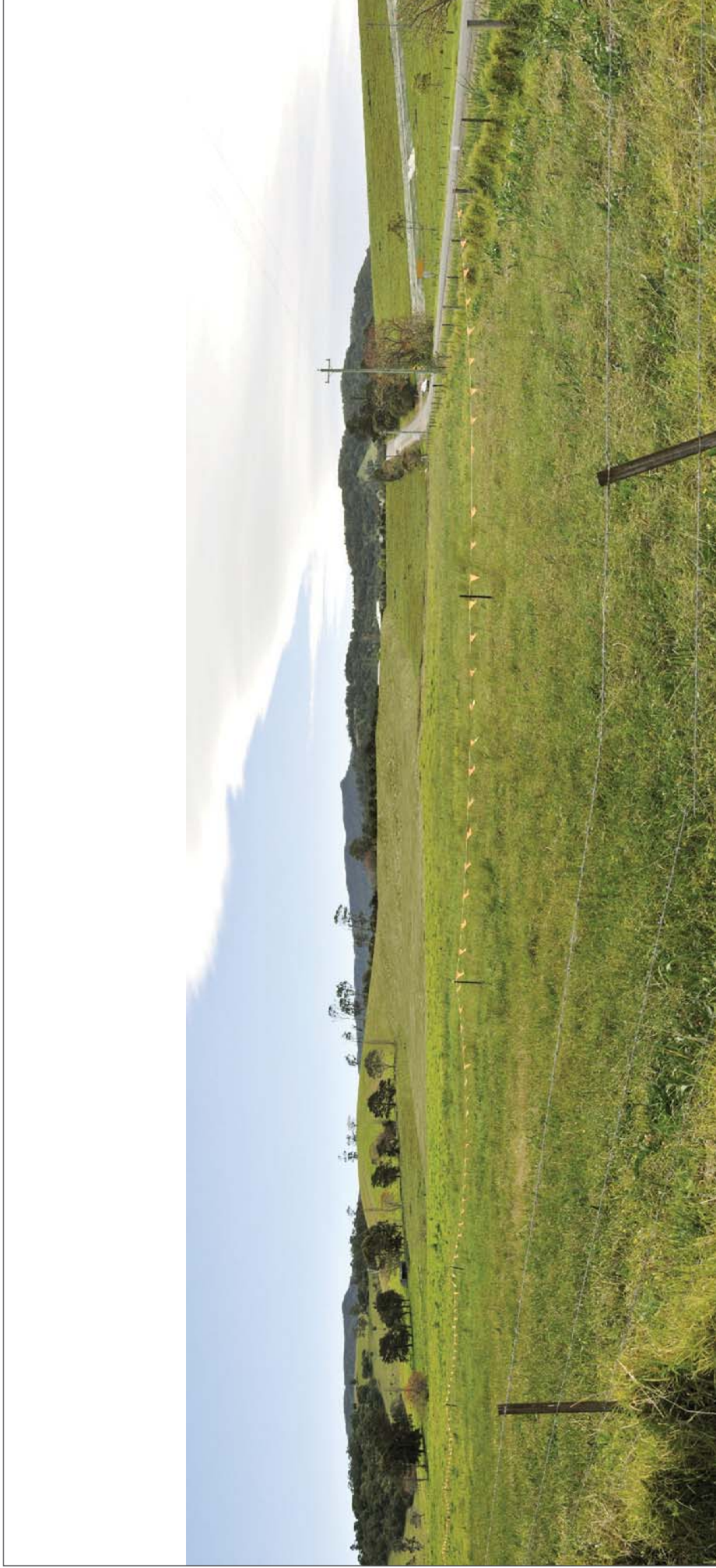
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**PROPOSED LANDFORM**

Toolijooa Road Fill Works Stage  
Foxground and Berry Bypass Project

**FIGURE 005**



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## 4 LANDSCAPE IMPLEMENTATION

The approach to re-vegetation is holistic and needs to incorporate both the substrate and vegetation as a system to create a sustainable solution. The following sections have been prepared making use of relevant information from the Gerringong Upgrade Landscape and Revegetation Management Sub Plan (Tract Consultants, 2012) as well as the *RMS QA Specification R178 - Vegetation*, while considering site specific requirements.

It is important to note that the proposed Toolijooa Road Fill Works involves the construction of the first stage of an engineered fill embankment, which forms the base for the placement of additional engineered fill during subsequent stages of the Foxground and Berry Bypass Project. The Toolijooa Road Fill Works site, will therefore be subjected to further disturbance during the following construction stages, with further development of the engineered fill embankment as well as during the use of the area as an ancillary site. The objective of this Plan is therefore not to prescribe the ultimate landscaping and revegetation requirements for the site, but to provide guidance around appropriate revegetation of the Toolijooa Road Fill Works stage, to prevent erosion, minimise the visual impact of the works and limit the establishment of weeds.

### 4.1 STRATEGIES AND PRINCIPLES FOR SITE CLEARING

Site clearance impacts upon the areas of vegetation 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 i.e. site clearance and soil management.

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

- The extents of clearance are minimised;
- The potential to relocate existing native trees for landscape plantings within either the Gerringong Upgrade or the Foxground and Berry Bypass projects has been investigated;
- Weed management is undertaken to ensure that landscape outcomes are optimised.

#### 4.1.1 CLEARING AND GRUBBING PROTOCOL

Clearing and grubbing will be undertaken in accordance with *RMS QA Specification G40 Clearing and Grubbing*.

#### 4.1.2 PRE-CONSTRUCTION SURVEYS

A pre-construction survey was undertaken by LesryK Environmental Consultants in September 2013 (refer Appendix H of the Flora and Fauna Management Sub Plan).

No threatened flora or fauna or EECs listed under the EPBC Act or TSC Act were recorded during the pre-construction survey, or are considered to occur, within or in proximity to the Toolijooa Road Fill Works site.

No potential fauna habitat including tree hollows were identified on site for threatened fauna and/or migratory species identified in the Terrestrial Fauna and Flora Assessment for the Foxground and Berry Bypass Project (Biosis, 2012).

### 4.1.3 EXISTING VEGETATION MANAGEMENT

#### Native Vegetation

A total of 24 individual native plants were recorded during the pre-construction survey.

The location and species of native trees and shrubs that will be cleared during the construction of the Toolijooa Road Fill Works stage are included in Attachment 1 to this LRMP, while further discussion is provided in the Pre-Construction Survey Report (Appendix H of the Flora and Fauna Management Sub Plan).

All native plants recorded on the site, with the exception of two figs, are considered to have been planted. The two figs, likely to be endemic, are relatively small and therefore are potentially suitable for local relocation and incorporation into either the Foxground and Berry Bypass and/or the Gerringong upgrade project landscape works.

Fulton Hogan will consider, prior to the clearing of vegetation, whether any of the 24 native trees and shrubs that require removal, are suitable for local relocation and incorporation into either the Foxground and Berry Bypass or Gerringong upgrade project landscape works. Particular consideration must be given to the two figs that are likely to be endemic.

#### Weed Management

Weed management would also form a significant component of the clearing operations and will be undertaken in accordance with the Weed Management Strategy (Appendix G of the Flora and Fauna Management Sub Plan). 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 is proactive not reactive management.

Weed free topsoil strategies 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 should be quarantined and soil stripped and buried so as to avoid further infestations;
3. Spot spray areas identified with significant weeds, other than noxious weeds, two or three times prior to final treatment and clearing;
4. Two weeks prior to stripping, blanket spray the area to be cleared 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 are to be shaped and finished to a high standard and then seeded with a cover crop. Stockpiles are to be managed in accordance with the Stockpile Management Protocol (Appendix F of the Soil and Water Quality Management Sub Plan);
6. Every 3-4 months spot spray the topsoil stockpiles and then mow / cut / trim the grass. Woody weeds would require removal by hand;
7. Four weeks prior to spreading topsoil, spray the stockpile with a herbicide such as glyphosate;
8. After respreading topsoil apply the hydromulch mix (refer section 4.3.3) within three working days of applying topsoil. Any delay will provide windborne weed seed the opportunity to establish;

9. Every 3-4 months spot spray the soiled batters and then mow / cut / trim the grass. Remove woody weeds by hand.

### Alternate strategy

Adopt a management strategy that addresses weeds within the site based on their influence on plant growth and legal obligations. The strategy encourages the establishment and rapid growth of vegetation on the newly completed embankments, to minimise the establishment of weeds and their influence on the establishment of a vigorous grass cover and ultimately out-compete them. Weed management would focus on noxious weeds as well as woody and structurally damaging weeds rather than annual weeds or grasses.

## 4.2 SOIL MANAGEMENT

### 4.2.1 STRIPPING OF TOPSOIL

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

A soil assessment of the site will be undertaken prior to the commencement of topsoil stripping. This assessment would identify:

- Areas where an infestation of noxious weeds exists so that this soil is quarantined from use as topsoil and would be either buried in accordance with the earthworks specification or disposed of offsite;
- Soil type and suitability of the soil for use in landscaping and revegetation, including any amelioration requirements, so that it may be stripped and stockpiled in the appropriate location for reuse.

Stockpiled topsoil would be tested using a NATA accredited laboratory in accordance with clause 2.1.1 of *RMS QA Specification R178 - Vegetation*.

Once these activities have occurred undesirable grass/weed growth would be sprayed with a herbicide (as discussed in the Weed Management Strategy) prior to stripping, to ensure the knockdown of weeds and vegetation. This would 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, if the soil test certificate indicates any topsoil to be unsuitable for use in revegetation works, the measures recommended in the soil test certificate to improve the topsoil are to be carried out prior to use. These recommendations may include the application of additives to the soil including (gypsum and lime). These additives will assist in ameliorating the stockpiles and achieving a balanced medium requiring less input at the time of respreading.

### 4.2.2 PREPARATION OF SURFACE

Slopes with gradients of 1V:5H or flatter (such as the proposed 1V:20H batter on the lower embankment of the Toolijooa Road Fill Works) would be cultivated parallel to the surface contours using a diamond harrow plough or similar, to a depth of 50 mm to produce a roughened, loose surface, with soil lumps not exceeding 50 mm dimension. Stones larger than 100 mm in size would be removed, as well as other materials that may hinder germination.

Slopes with gradients steeper than 1V:5H (such as the proposed 1V:4H batter on the upper embankment of the Toolijooa Road Fill Works) would be prepared no earlier than seven days before seeding, by three passes of a steel chain (minimum weight 25 kg/m) or by another method that produces a similar result.



Subsoils would also be treated with ameliorants such as lime and gypsum in accordance with the measures recommended in the soil test certificate, where confirmed to be required following soil testing. Treatment with ameliorants would take place after ripping of the subsoil to a depth of 100 mm to 300 mm depending on the location and level of subsoil compaction and at intervals of no greater than 1 m.

### 4.2.3 TOPSOILING

Topsoil is to be spread on all finished embankments and other disturbed areas prior to revegetation.

Any undesirable grass/weed growth that has established on topsoil stockpiles would be sprayed with a herbicide (refer to the Weed Management Strategy - Appendix G of the Flora and Fauna Management Sub Plan), before spreading the topsoil. Herbicide is to be re-applied as required to eradicate weed and grass growth. The last application of herbicide is to be applied not less than 2 weeks prior to topsoil spreading.

Topsoil would be spread uniformly at a rate of 1 cubic metre per 20 square metres of surface to all areas which are to be topsoiled.

The Toolijooa Road Fill Works finished embankment batters will range from 1V:4H to 1V:20H and therefore specialised techniques would not be required where batter slopes are steeper than 1V:2H. Imported topsoil may be required to make up any shortfall in site soils and is to be spread at the above 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 would 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.

## 4.3 REVEGETATION PLAN

This Plan should be considered in parallel with the Soil and Water Quality Management Sub Plan. The two plans are intertwined and form a biologically engineered solution to soil stabilisation and erosion management which seek to achieve a long lasting and stable system.

### 4.3.1 STABILISATION METHODS

Hydromulch would be the dominant revegetation technique used to stabilise the Toolijooa Road Fill Works embankments. 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 and permanent vegetation cover. Depending on availability and compatibility of machines either sugar cane or wood pulp would be used as the main mulch material.

### 4.3.2 ORGANIC FERTILISER AND AMELIORATION OF TOPSOIL

Fertiliser and soil amelioration would be applied to all embankments and will be included as part of the hydromulch.

As discussed previously, topsoil and subsoil would also be treated with ameliorants such as lime and gypsum in accordance with the measures recommended in the soil test certificate, where confirmed to be required following soil testing. Lime and gypsum included in the ameliorants are to be of super fine powdered form. Liquid lime is not to be used.



Fertiliser is to consist of:

N: 5.0% to 9.0%

P: 1.0% to 4.0%

K: 2.0% to 4.0%

### 4.3.3 MULCHING

#### Hydromulch Mixes

Hydromulching will be used as the dominant means of revegetation. Its success is linked directly to the level of preparation. The ripping and cultivation of soil layers is a critical component of this process. It is also important to apply hydromulch during appropriate weather conditions as specified in section 3 of the *RMS QA Specification R178 – Vegetation*. Hydromulching would be carried out within 2 days of completion of soil preparation.

A hydromulch mix composition (in accordance with *RMS QA Specification R178 - Vegetation*) including Type 1 Grassland Mix (in accordance with RMS design documentation and specifications for the South Coast) is shown in Table 3.

Table 3: Hydromulch mix composition

Material	Rate per Hectare
Japanese Millet (Sep-Mar)	20 kg
Eclipse/Crusader Rye	20 kg
Red Clover	9 kg
Native grasses: - <i>Imperata cylindrica</i> - <i>Themeda australis</i> - <i>Chloris truncata</i> - <i>Cymbapogon refractus</i>	4 kg
Water	35,000 litres
Organic fertiliser: pelletised poultry manure	250 kg
Cellulose fibre mulch: - Sugar cane mulch, mixed with 20% (by weight) of shredded paper; or - Wood fibre mulch	3,500 kg 2,500 kg
Binder: granulated 'Guar gum'	60 kg
Biodegradable green dye*	As recommended

\*Dye used in herbicide spraying, hydroseeding and hydromulching applications must be a biodegradable, red or green coloured vegetable dye, as applicable.

A Type 1 Grassland Mix will be used to revegetate those parts of the Toolijooa Road Fill Works site, which will be disturbed during subsequent stages of the Project and those areas of the site from which livestock will be excluded after completion of the Project.

If it is determined that the southern part of the Toolijooa Road Fill Works site will not be subjected to further disturbance during construction of future stages of the Project and will be accessible to livestock after completion of the Project, it is recommended that these

areas are revegetated with a Summer South Coast/Parkland Seed Mix rather than a Type 1 Grassland Mix.

A Summer South Coast/Parkland Seed Mix includes the following species composition and is applied at a rate of 55 kgs/ha.

60% Tall Fescue

20% Perennial Ryegrass

16% Creeping Red Fescue

4% Unhulled Couch

Seed would be pre-treated (in accordance with section 3.3 of *RMS QA Specification R178 – Vegetation*) before it is incorporated into the hydromulch mix, to assist rapid germination after application.

### Site Mulch

Maximum use would be made of mulch salvaged from site. Although most of the site is covered by pasture grasses and old farm buildings, mulch that is generated from the clearing of trees that are not relocated, will be retained on site.

Any mulch generated during site clearing is likely to be used for sediment control. Where used for sediment control the opportunity of integrating the mulch bund with final landscape works will be considered as it is unlikely that this material will be removed.

## 4.3.4 VEGETATION OF OPEN DRAINS AND SEDIMENT BASINS

Although construction sediment basins and surface water management structures e.g. clean water divergence drains, will be a temporary feature on the Toolijooa Road Fill Works site, these features will be in place for over four months and would require appropriate revegetation to prevent erosion and weed establishment. The proposed construction erosion and sediment controls and their location, are described in detail in the Soil and Water Quality Management Sub Plan. The embankments of the sediment basins as well as other surface water management structures would be revegetated as described in section 4.3.3. Organic fibre matting would be required to line some of the surface water management structures (in accordance with section 4 of *RMS QA Specification R178 - Vegetation*). Revegetation of all sediment basins and surface water management structures would be undertaken in consultation with Fulton Hogan's appointed soil conservation specialists.

## 4.3.5 TEMPORARY VEGETATION COVER

As the construction of the Toolijooa Road Fill Works stage will take place between November 2013 and March 2014, Japanese Millet is the cover crop that is to be sown on all disturbed areas, soils stockpiles and interim works at a rate of 35kg per hectare. For longer-term stockpiles a perennial crop will be used. Stockpiles are to be sown with seed within seven days of being formed. This strategy will ensure that weed growth is minimised.

## 5 LANDSCAPE MANAGEMENT

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 have ongoing impacts in relation to maintenance and can affect the viability of the landscape scheme. The following outlines some of the key concerns.

### 5.1 WEED CONTROL

A Weed Management Strategy has been prepared (Appendix G of the Flora and Fauna Management Sub Plan), which covers issues such as the management of weed outbreaks during both the construction and maintenance phases of the Toolijooa Road Fill Works stage of the Project.

Weed control is to be carried out within the Toolijooa Road Fill Works site, until the site is handed over to the contractor that is awarded the construction contract for the following stages of the Project.

The focus of weed management would be on the identification and control of noxious and environmental weeds. Ongoing weed management to control the level of weed invasion, would involve the following:

- Restrict the area of native vegetation disturbed during construction works;
- Restrict stockpiling to areas already cleared of vegetation;
- Use weed-free topsoil in landscaping, and revegetate disturbed sites as soon as practically possible;
- Implementing proper techniques for subsoil and topsoil preparation and placement to encourage plant establishment;
- Application of appropriate mulching mix that contains the specified seed mix and associated materials to ensure rapid vegetation germination, maximum vegetation coverage and weed suppression;
- Maintenance phase works should not only include weed removal but also ensure the replacement of failed stock and re-hydromulching as required to ensure proper establishment of vegetation cover with the refreshing of mulch layers to ensure maximum weed suppression;
- Weed invasions should be monitored and controlled by personnel experienced in weed management.

### 5.2 FENCING

Fencing should be maintained in order to exclude cattle and other stock from entering the Toolijooa Road Fill Works site, therefore preventing trampling of the embankments and grazing of newly germinated grasses.

### 5.3 SUPPLEMENTARY WATERING AND MULCHING

Embankments that have been hydromulched will be watered and maintained until plants have become established. Water would be applied to hydromulched embankments and other disturbed areas by means of a fine spray, which causes minimal soil disturbance and associated erosion. If extended periods without rain are experienced during the establishment period, then watering over and above normal construction practice would be required to supplement natural rainfall.

## 5.4 FOLLOW-UP FERTILISER

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

# ATTACHMENT 1

Location of native species recorded (both planted and endemic)

# LOCATION OF NATIVE SPECIES (BOTH PLANTED AND ENDEMIC) RECORDED

Toolijooa Road Fill Works Project

## ATTACHMENT 1



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