

7 Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts throughout the detailed design, construction and operation. A framework for managing the potential impacts is provided with reference to environmental management plans and relevant Roads and Maritime QA specifications. A summary of site-specific environmental safeguards and management measures is provided as detailed in **Chapter 6** of this review of environmental factors and the licence and/or approval requirements required prior to the commencement of construction are also listed.

7.1 Environmental management plans (or systems)

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts which could potentially arise as a result of the proposal. These management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Project Environmental Management Plan (PEMP) and CEMP will be prepared to describe safeguards and management measures identified. These plans will provide a framework for establishing how these measures will be implemented and who would be responsible for the implementation.

The plans will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environmental Officer, Southern Region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The PEMP and CEMP would be developed in accordance with the specifications set out in the:

- Roads and Maritime QA Specification G36 – Environment Protection (Management System).
- Roads and Maritime QA Specification G38 – Soil and Water Management (Soil and Water Plan).
- Roads and Maritime QA Specification G40 – Clearing and Grubbing.
- Roads and Maritime QA R178 – Vegetation.

7.2 Summary of safeguards and management measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards would minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in **Table 7-1**.

Table 7-1 Summary of site-specific environmental safeguards

Ref #	Impact	Environmental safeguards	Responsibility	Timing
General environmental management				
G-1	General	<p>All environmental safeguards must be incorporated within the following documents:</p> <ul style="list-style-type: none"> • PEMP. • Detailed design. • Contract specifications for the proposal. • CEMP. 	Roads and Maritime project manager	Pre-construction
G-2	General	<p>A risk assessment must be carried out on the proposal in accordance with the Roads and Maritime Services Audit Pack and OSD risk assessment procedures to determine an audit and inspection program for the works. The recommendations of the risk assessment are to be implemented.</p>	Roads and Maritime project manager and regional environmental staff	Pre-construction
		<p>A review of the risk assessment must be undertaken after the initial audit or inspection to evaluate if the level of risk chosen for the proposal is appropriate.</p>	Roads and Maritime project manager and regional environmental staff	After first audit
		<p>Any works resulting from the proposal and as covered by the review of environmental factors may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.</p>	Roads and Maritime project manager and regional environmental staff	Construction and operation
		<p>The environmental contract specification must be forwarded to the Roads and Maritime Services Senior Environmental Officer for review at least 10 working days prior to the tender stage.</p> <p>A contractual hold point must be maintained until the CEMP is reviewed by the Roads and Maritime Services Senior Environmental Officer.</p>	Roads and Maritime project manager	Pre-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
G-3	General	The Roads and Maritime Project Manager must notify the Roads and Maritime Environmental Officer Southern Region at least five days prior to work commencing.	Roads and Maritime project manager	Pre-construction
G-4	General	All businesses and residences likely to be affected by the proposed works must be notified prior to the commencement of the proposed activities in accordance with the Community Involvement Plan for the proposal.	Roads and Maritime project manager	Pre-construction
G-5	General	Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.	Construction Contractor	Pre-construction and during construction as required.
Traffic and transport				
TR-1	Delays and disruptions due to construction traffic and works	<p>Prepare and implement a TMP in accordance with Roads and Maritime's 'Specification D&C G10 Traffic Management' (Roads and Maritime 2011) and Roads and Maritime's 'Traffic Control at Worksites Manual Version 4' (Roads and Maritime 2011) as part of the CEMP. The TMP will be submitted in stages to reflect the progress of work and at a minimum will include:</p> <ul style="list-style-type: none"> • Signage requirements. • Lane possession approval process during periods of online construction. • Traffic control devices such as temporary traffic signals. • A local and regional communication strategy. • Strategies to respond to any changes in road safety (including on the 'Sandtrack'). 	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Where feasible and reasonable, schedule construction work that will substantially reduce the performance of the road network during periods of typically lower traffic volumes.	Roads and Maritime project manager and construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Clearly communicate and signpost traffic controls in use, such as road closures, detours, temporary speed limits and passing constraints.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Choose suitable locations for access and egress to and from worksites and provide adequate traffic control at these locations.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Consult with local emergency services during the development of the TMP to provide procedures to maintain an unrestricted and safe environment for emergency service vehicles to pass through construction zones. Provide updates to the local emergency services on the staging and progress of construction.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Consult with local bus companies operating the school and other bus services to ensure appropriate location and access to bus stops during construction of the proposal.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		<p>Overall the TMP will aim to:</p> <ul style="list-style-type: none"> • Adopt construction methods and staging that are designed to minimise road closures and disruptions to existing traffic; subject to other proposal constraints. • Implement an 80 kilometre per hour construction speed zone for highway traffic where feasible and reasonable. • Maintain continuous access to local roads and properties. • Ensure road occupancy licences are obtained for all work that impacts traffic on the existing highway. • Maintain suitable road network safety and performance during construction of the proposal. 	Roads and Maritime project manager and construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
TR-2	Operational performance	Monitor traffic levels and operational performance on the Princes Highway between Berry and Bomaderry and at selected local roads once the proposal is operational, particularly during peak periods. Compare the actual versus modelled performance of the road network to identify differences at an early stage.	Roads and Maritime project manager	Six months and 12 months after completion of construction
TR-3	Safety of cyclists	Provide cyclist access at all grade-separated facilities and half-interchanges in compliance with Roads and Maritime's 'NSW Bicycle Guidelines' (RTA, 2003).	Roads and Maritime project manager	Detailed design
Noise and vibration				
NV-1	Construction noise impacts on sensitive receivers	Revise the noise and vibration assessment based on the final detailed design.	Roads and Maritime project manager and Qualified noise specialist	Detailed design
		Prepare and implement a CNVMP in accordance with Practice Note VI of the RTA ENMM (RTA, 2001) prior to the commencement of construction that: <ul style="list-style-type: none"> Identifies feasible and reasonable approaches to reduce noise and vibration impacts during construction of the proposal, including ancillary facilities. Identifies the extent that noise sensitive receivers are affected. Provides an assessment of the construction noise impact of the proposal on the community. Considers potential cumulative impacts associated with the concurrent construction of the proposal with other major construction projects following the receipt of detailed construction schedule when available. Includes a sleep disturbance assessment. 	Construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Considers appropriate height and location of temporary noise barriers and mounds for noise attenuation within ancillary facilities. • Identifies details of the out of hours works. • Complies with the requirements of the project EPL (once obtained). 		
		Provide detail regarding proposed consultation with the community on noise and vibration in the community involvement plan for the proposal.	Construction contractor	Pre-construction and construction
		Inform the community about any out of hours works in accordance with Practice Note VII of the ENMM.	Construction contractor	Pre-construction and construction
		Implement a 24-hour hotline and complaints management procedure for noise and other construction related complaints.	Construction contractor	Pre-construction and construction
		<p>Include specific noise management measures within the CNVMP such as:</p> <ul style="list-style-type: none"> • Carry out noise intensive construction works during standard construction hours where feasible and reasonable. • Schedule noisy activities that cannot be undertaken during standard construction hours as early as possible during the evening and/or night-time periods. • Select appropriate plant for each task, to minimise the noise impact. • Plan the delivery of material to, and removal of spoil and waste from the proposal so there is a consistent and minimal number of trucks arriving at the site at any one time. Carry out these activities during standard construction hours where reasonably practicable and safe to do so. • Minimise reversing. 	Construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Fit non-tonal reversing alarms on all construction equipment where possible, reasonable and where acceptable from a work health safety perspective. • Maximise the distance between noisy plant items and nearby residential receivers. • Orientate noisy equipment away from residential receivers where feasible and reasonable. • Locate site access points and roads as far as reasonably practicable away from residential receivers. • Use structures or enclosures to shield residential receivers from noise sources where reasonably practicable. • Require trucks to travel via internal haul routes and major roads and routes where reasonably practicable. • Minimise truck queuing or idling near residential dwellings. • Provide respite periods during times of noise intensive works where sensitive receivers will be adversely impacted for extended periods. These could include late start and/or early finishes. • Plan noise intensive works in the following order of priority to minimise the potential impacts on sensitive receivers: <ul style="list-style-type: none"> - Standard working hours. - Evening working hours. - Night-time working hours. • Use bored piling in place of impact piling wherever possible. Additionally, only undertake impact piling during standard construction hours and only where ground conditions require it. 		

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Stage traffic movements to restrict movement which pass by noise sensitive receivers. Minimise noise from plant and equipment using treatments which could include mufflers, enclosed working areas and screening. 		
NV-2	Construction noise impacts from ancillary facilities	Where necessary to minimise noise impacts, and where feasible and reasonable, use noise barriers and mounds at the temporary construction ancillary facility sites.	Construction contractor	Pre-construction and construction
		Include any additional mitigation measures in the CNVMP in relation to the operation of the ancillary facilities.	Construction contractor	Pre-construction and construction
NV-3	Construction vibration impacts on sensitive receivers	Minimise the size of vibration intensive equipment, taking into account the safe working distances and the distance between the area of construction and the nearest sensitive receiver. If vibration intensive works are required outside of the safe working distances, use alternative equipment to ensure distances are not exceeded.	Construction contractor	Construction
		<p>Undertake construction works in accordance with the following procedure when the use of vibration intensive equipment within safe working distances for cosmetic damage cannot be avoided:</p> <ul style="list-style-type: none"> Notify the affected residents and community of the proposed works. Undertake attended vibration measurements prior to the commencement of vibration intensive works. Install a permanent vibration monitoring system if ongoing vibration intensive works are required. The system will warn operators when vibration levels are approaching cosmetic damage levels. Carry out dilapidation surveys on potentially affected properties. 	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
NV-4	Noise levels from road traffic exceed criteria at sensitive receivers.	Develop and implement all feasible and reasonable safeguards and management measures to meet the applicable noise criteria in consultation with sensitive receivers.	Roads and Maritime project manager	Detailed design and construction
		Specific noise mitigation for this proposal includes building architectural treatments. Consideration of architectural treatment has been recommended for 42 residential properties and one child care centre to achieve the applicable noise criteria where feasible and reasonable. Treatments for properties with exceedences of up to 8 dB (A) could include modifications to buildings such as the provision of fresh air ventilation, sealing of wall vents and upgrading window and door seals. The type of architectural mitigation to be implemented at receivers specified for consideration of architectural treatment will be confirmed during detailed design.	Roads and Maritime project manager	Detailed design and construction
		Undertake post construction noise monitoring in accordance with the ENMM to determine whether the noise mitigation measures are adequate. Take appropriate action if further mitigation is required and is feasible and reasonable.	Roads and Maritime project manager	Detailed design and construction
NV-6	Operational noise impacts on sensitive land uses	<p>Undertake a site inspection of the child care centre at 281 Princes Highway (receiver 778) during the detailed design phase. Consult with the owner of the centre on feasible and reasonable noise safeguards and management measures available and implement the agreed measures.</p> <p>Examples may include:</p> <ul style="list-style-type: none"> • Upgraded fencing. • Upgraded seals, doors, glazing. • Upgrade to mechanical ventilation system. 	Roads and Maritime project manager and construction contractor	Pre-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
Biodiversity				
BI-1	General construction impacts	<p>Prepare a construction VMP to be integrated with the urban and landscape character plan for the proposal and included in the CEMP. The VMP will:</p> <ul style="list-style-type: none"> • Identify measures to manage vegetation within the road reserve. • Detail restoration, regeneration and rehabilitation of areas of native vegetation that will be removed to accommodate the proposal. This will be in accordance with Guide 3: Re-establishment of Native Vegetation of Roads and Maritime's Biodiversity Guidelines (RTA, 2011). • Detail appropriate management for the potential habitat of threatened flora and fauna species that will be indirectly impacted by the proposal. This may include fencing and signage. • Identify weed management strategies. 	Construction contractor	Pre-construction
		<p>As part of the site induction process, provide all site personnel with information on the biodiversity values of the study area, including threatened species, no-go areas and responsibilities under relevant environmental legislation, including but not limited to the EP&A Act, TSC Act and EPBC Act and associated management plans for individual species.</p>	Construction contractor	Pre- construction and construction
		<p>Should unexpected threatened fauna be located at any time during construction, cease work immediately in the area to prevent further harm to the individual. Contact the Senior Environment Officer Southern Region and a suitably qualified ecologist to determine if further assessment or management plans are required.</p>	Construction contractor	Construction
BI-2	Vegetation clearance	Restrict vegetation clearing to those areas where it is necessary.	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>Undertake vegetation clearance in accordance with Guide 1 Pre-clearing Process of Roads and Maritime's Biodiversity Guidelines (RTA 2011). Pre-clearing surveys should include:</p> <ul style="list-style-type: none"> Targeted surveys for the Green and Golden Bell Frog, microchiropteran bats and forest owls. Hollow-bearing tree/stag watching survey of habitat trees to be removed. Installation of nest boxes. 	Construction contractor	Construction
		Where clearing is required, establish exclusion zones in accordance with Guide 2 Exclusion zones of Roads and Maritime Biodiversity Guidelines (RTA, 2011) to ensure clearing does not extend beyond the area necessary.	Construction contractor	Construction
BI-3	Habitat fragmentation and loss of connectivity and Injury and mortality of individuals	Where reasonably practicable, minimise disturbance to stream banks through avoidance of the use of in-stream structures.	Construction contractor	Construction
		Where feasible and reasonable incorporate fauna-friendly features into bridge design at Wileys Creek, Jaspers Brush Creek and Flying Fox Creek to maintain or improve fauna passage under the Princes Highway, fauna movement corridors and vegetation connectivity.	Roads and Maritime project manager	Pre-construction
		Where fauna friendly' features are incorporated into bridge design, consider the use of appropriate fencing to funnel wildlife through under the 'fauna friendly' bridge and prevent wildlife from accessing the highway.	Roads and Maritime project manager	Pre-construction
BI-4	Loss of threatened species and their habitats	Minimise removal of native vegetation and fauna habitat.	Construction contractor	Construction
		Implement exclusion zones to protect threatened ecological communities and threatened species habitat.	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>Undertake targeted surveys for microchiropteran bats at any bridges and culverts scheduled for removal in accordance with detailed survey guidelines (refer to Section 3.5 of the <i>Technical Paper: Terrestrial Flora and Fauna</i> at Appendix E). If microchiropteran bats are recorded roosting within bridges or culverts prior to or during construction, develop and implement a Microbat Management Plan. As a minimum, the plan will:</p> <ul style="list-style-type: none"> • Determine the types of roost habitat and locations to install replacement roost habitat. • Provide information regarding staged habitat removal including removal of secondary or less preferential roosting habitat prior to removal of primary habitat. • Methodology for a pre-demolition inspection of roost habitat, and the implementation of exclusion measures to prevent the continuing use of existing roosts. • Outline monitoring requirements for the replacement habitat, such as outlining the predetermined number of occasions for which monitoring is required, and for the appropriate length of time that considers seasonal movements and habits of the subject species. 	Qualified ecologist	Pre-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>Undertake targeted surveys for the Green and Golden Bell Frog in areas identified as providing potential breeding habitat in accordance with detailed survey guidelines (refer to Section 3.5 of the <i>Technical Paper: Terrestrial Flora and Fauna</i> at Appendix E). If the Green and Golden Bell Frog is recorded within the study area, develop and implement a Green and Golden Bell Frog Management Plan. At a minimum, the plan will address:</p> <ul style="list-style-type: none"> • The type of and locations for temporary and permanent replacement habitat including consideration of staged habitat removal. • The most optimal alignments for frog exclusion fencing. • Diurnal and nocturnal pre-clearing surveys. • Environmental induction training for construction contractors. • Site hygiene management including prevention of chytrid fungus. • GGBF relocation procedures. • Construction works procedures (including timing of works). • Reporting procedures. 	Qualified ecologist	Pre-construction
		<p>Undertake targeted surveys for forest owls within suitable breeding, roosting and foraging habitat of the study area in accordance with detailed survey guidelines (refer to Section 3.5 of the <i>Technical Paper: Terrestrial Flora and Fauna</i> at Appendix E). The type and extent of habitat to be removed will inform the installation of nest boxes (ie for prey and/or owls) and subsequent pre-clearance survey methodology.</p>	Qualified ecologist	Pre-construction
		<p>Provide nest boxes to mitigate impacts of removing hollow-bearing trees.</p>	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Where reasonable and feasible, retain mature and hollow bearing habitat trees, including the dead stag (habitat tree 29) located within the temporary construction ancillary facility area shown in Figure 3.12 of the <i>Technical Paper: Terrestrial Flora and Fauna</i> at Appendix E .	Construction contractor	Construction
		Remove trees in accordance with Guide 4: Clearing of Vegetation and Removal Of Bushrock of Roads and Maritimes Biodiversity Guidelines (RTA, 2011) and in the presence of a qualified ecologist or wildlife expert experienced in the rescue of fauna.	Construction contractor and qualified ecologist / experienced wildlife expert	Construction
		Carry out a hollow bearing tree survey and stag-watching exercise, (targeting threatened parrots, cockatoos, forest owls, arboreal mammals and microbats) in order to identify the number and type of nest boxes required and the appropriate locations to install them.	Roads and Maritime project manager and qualified ecologist	Pre-construction
		Install roost and nest boxes in accordance with Table 8.1 of Guide 8 Nest Boxes of Roads and Maritime's Biodiversity Guidelines (RTA, 2011) at least one month prior to the commencement of construction.	Construction contractor	Pre-construction and construction
		Include locally indigenous species in post-construction revegetation works. These species will promote fauna habitat, for example, the planting of <i>Allocasuarina</i> species for the Glossy Black Cockatoo.	Construction contractor and qualified ecologist	Construction
		Salvage and relocate tree hollows and woody debris to appropriate locations for reuse in accordance with Guide 5: Re-use of Woody Debris and Bushrock Of Roads and Maritime's Biodiversity Guidelines (RTA, 2011).	Construction contractor and qualified ecologist	Pre-construction and construction
		Include native in-stream vegetation (macrophytes) and snags where appropriate where establishment or rehabilitation of a riparian zone is required.	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Manage riparian areas in accordance with Roads and Maritime's 'Biodiversity Guidelines Guidance Note 10: Aquatic Habitats And Riparian Zones' (RTA, 2011).	Construction contractor	Construction and operation
BI-5	Impacts to water quality	Measures to mitigate potential water quality impacts for example from spills during construction are outlined in Section 6.4.5 , Section 6.11.4 and Section 6.13.2 .	Construction contractor	Pre-construction
		Fence off areas within ancillary sites seven and nine that are located less than 50 metres from a waterway as environmentally sensitive areas.	Construction contractor	Construction
BI-6	Invasion of exotic species	Manage vegetation within the road reserve and adjacent to areas of vegetation clearing in accordance with Guide 6 Weed Management and Guide 10 Aquatic Habitats and Riparian Zones of Roads and Maritime's Biodiversity Guidelines (RTA, 2011) to reduce invasion of noxious weed species.	Construction contractor and Roads and Maritime's project manager	Construction and operation
		Use weed-free topsoil in landscaping and revegetate disturbed sites with locally indigenous species in accordance with the Urban and Landscape Character Plan outlined in Section 6.6.3 .	Construction contractor	Construction
		Undertake pre-construction weed management around all creek crossings to remove noxious vegetation from the work areas.	Construction contractor	Pre-construction and Construction
		Ensure that relevant construction staff are trained in the identification and appropriate disposal of noxious species. This should include Eastern Gambusia.	Construction contractor and qualified ecologist	Pre-construction and Construction
BI-7	Fish passage	Should alteration of fish passage occur during construction consult with NSW Department of Primary Industries to determine if a permit under Section 219 of the FM Act is required.	Roads and Maritime project Manager	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
Surface water and groundwater				
SW-1	General construction impacts	Prepare and implement a SWMP and site specific erosion and sediment control plans (ESCPs) as part of the CEMP. Based on the high risk rating of this proposal and in accordance with Roads and Maritime's erosion and sedimentation management procedure, the SWMP and ESCP would be prepared in consultation with a soil conservation consultant to be engaged from Roads and Maritime's panel of registered soil conservation consultants. The soil conservation consultant would assist the construction contractor in identifying the most appropriate approach to erosion and sediment control.	Construction contractor	Pre-construction and construction
		Prepare and implement SWMP and ESCPs in accordance with Managing Urban Stormwater-Soils and Construction, Volume 2D (Landcom 2004), and the conditions of the EPL for the proposal	Construction contractor	Pre-construction and construction
SW-2	Sedimentation and erosion	Construct temporary drainage structures in accordance with the 'Technical Guideline – Temporary Stormwater Drainage for Road Construction' (Roads and Maritime, 2011).	Construction Contractor	Construction
		Manage and use treated effluent in accordance with Roads and Maritime's Environmental Direction No. 19 – Use of Reclaimed Water (RTA, 2006) and Roads and Maritime's Tip Sheet – Use of reclaimed water (RTA, 2006).	Construction Contractor	Construction
		Minimise scour and creek instability through installation of structures such as rock revetments, where necessary. These would be designed to minimise impacts to aquatic ecology, surrounding land uses and the visual amenity of the area.	Roads and Maritime project manager and construction contractor	Detailed design and construction
SW-3	Impacts to water pollution (surface water and groundwater)	Store fuels, chemical and hazardous materials in secure, bunded areas within temporary construction ancillary facilities.	Construction contractor	Construction
		Capture and dispose of spill and contaminated materials from temporary construction ancillary facilities at a licensed facility.	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Undertake refuelling, washdown and the preparation of construction materials within bunded areas to mitigate risks in relation to spills or leaks of fuels/oils or other hazardous onsite construction material.	Construction contractor	Construction
		Apply good practice measures with regards to the storage and handling of dangerous and hazardous goods to minimise the risk of a spill occurring.	Construction contractor	Construction
		Provide spill kits around temporary construction ancillary facilities.	Construction contractor	Construction
		Manage and minimise the generation and discharge of tannins from vegetation mulch within temporary construction ancillary facility areas in accordance with Roads and Maritime's <i>Environmental Direction Number 25 – Management of Tannins from Vegetation Mulch</i> (Roads and Maritime, 2012).	Construction contractor	Construction
SW-4	Impacts to groundwater flow conditions	Minimise the depth of excavations in areas of alluvium.	Construction contractor	Construction
		Manage dewatering using a work method statement prepared in accordance with Roads and Maritime's Environmental Management of Construction Site Dewatering (RTA, 2011).	Construction contractor	Construction
		Should dewatering of the alluvial aquifer be required during the construction of the bridge footings, limit groundwater drawdown to the base of the footing.	Construction contractor	Construction
SW-5	Potential impacts of ASS	Refer to safeguards and management measures in Section 6.11	Construction contractor	Construction
SW-6	Impacts to surface water quality	Prepare and implement an operational water quality strategy that includes a combination of water quality basins and swales. Where feasible and reasonable, the strategy should aim to achieve the suggested water quality treatment targets for the proposal of an 80 per cent reduction in total suspended sediment load and a 60 per cent reduction in total phosphorous load.	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Six indicative operational water quality basins have been planned for the proposal as part of the concept design. The number and location of basins would be refined and finalised during detailed design.	Roads and Maritime project manager	Detailed design
		Direct runoff from bridges over watercourses and floodplains to water quality basins and swales.	Construction contractor	Construction
SW-7	Monitoring and maintenance of surface water quality, swales and water quality basins	<p>Inspect swales and basins every three months or following storm events until the system has become established. Inspections of swales would include:</p> <ul style="list-style-type: none"> • Checking vegetation is at a suitable height to allow design flow capacity. • Clearing of any obstructions or debris. • Checking for erosion, weeds, plant conditions, oil spill and the build-up of litter and sediment. • Mowing, as required. <p>Inspections of sediment basins would include:</p> <ul style="list-style-type: none"> • Checking pits, pipes, weirs and other structures are clear of obstructions and debris. • Checking for erosion, weeds, plant condition, oil spills and the build-up of litter and sediment. 	Roads and Maritime project manager	Operation
		<p>To minimise maintenance requirements:</p> <ul style="list-style-type: none"> • Use native species for the water treatment features of the landscape (as part of the design of swales and basins). • Plant using high and diverse planting densities to make aquatic features resistant to weed establishment. 	Roads and Maritime project manager and construction contractor	Detailed design and construction
SW-8	Impacts to groundwater quality	If the Strongs Road cutting intercepts groundwater, direct the groundwater to the road drainage network via a drainage system.	Roads and Maritime project manager	Construction and operation

Ref #	Impact	Environmental safeguards	Responsibility	Timing
SW-9	Impacts to farm dams	Undertake consultation with affected landowners where there would be permanent losses or gains in dam catchments. Determine and implement appropriate mitigation measures in consultation with landowners.	Roads and Maritime project manager	Detailed design
Flooding				
FL-1	Flooding and construction	The construction methodology will minimise flooding impacts to and from the proposal. Refine the assessment of construction phase flooding impacts when the construction methodology is progressed.	Roads and Maritime project manager	Pre-construction
		Construct the proposal in stages where practicable to: <ul style="list-style-type: none"> Allow flood waters to flow naturally and not be retarded or altered by construction activities. Reduce the risk of flood levels increasing upstream by a substantial amount. Limit the potential for the construction site to be flooded. 	Construction contractor	Construction
		Prepare a construction flood risk response plan for the proposal as part of the CEMP. This would formalise the planned flood risk management response and incorporate the safeguards and management measures.	Construction contractor	Pre-construction
		Use an AWS to gather accurate and timely weather data such as rainfall volumes and communicate weather warnings to Roads and Maritime staff and construction contractors.	Construction contractor	Pre-Construction
		Store chemicals and fuels above the one in 100 year ARI flood level where possible.	Construction contractor	Pre-Construction and construction
FL-2	Impacts to residential buildings and structures	In consultation with the landowner, design and construct a driveway and waterway opening at 4 O'Keefes Lane which is flood immune during a 100 year flood event.	Roads and Maritime project manager	Detailed design

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Undertake floor level surveys at potentially flood affected properties to quantify flooding impacts of the proposal at each building/structure. If the surveys determine the change in flood level would impact habitable areas consult with the affected landowners to agree on and implement appropriate local mitigation works.	Roads and Maritime project manager	Detailed design
		Carry out modifications to the farm dam downstream of catchment four in consultation with the landowner.	Roads and Maritime project manager	Detailed design and construction
FL-3	Impacts to pastureland	Following modification of the farm dam downstream of catchment four and in consultation with the landowner, design and implement measures to mitigate shallow ponding of water on pastureland between the dam and the South Coast Railway line. This may include constructing a higher embankment and spillway downstream of the dam.	Construction contractor	Construction
FL-4	Impacts of climate change	Undertake sensitivity testing for: <ul style="list-style-type: none"> • Blockage impacts of culverts and bridges. • A 10 per cent, 20 per cent and 30 per cent increase in rainfall due to climate change. • Tailwater levels for the northern and central catchments. 	Roads and Maritime project manager	Detailed design
Landscape character and visual amenity				
LV-1	Loss of visual amenity	Avoid excessive vegetation clearance by demarcating areas requiring removal.	Construction contractor	Pre-construction
		Progressively stabilise cut batters and exposed areas with appropriate seed mixes for cover crop and install landscape plantings as soon as reasonably practicable.	Construction contractor	Construction
		Engage with adjacent land owners to assess whether early works mitigation (eg landscape planting) can be implemented to help reduce or soften the visual impacts of the proposal. Implement these measures where appropriate.	Roads and Maritime project manager and construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
LV-2	General loss of landscape character and visual amenity along the length of the proposal	In addition to the area-specific measures outlined below, implement the urban design and landscape concept plan outlined in Section 3.0 of the <i>Technical Paper: Urban Design, Landscape Character and Visual Amenity</i> (AECOM, 2013), which is provided at Appendix H .	Roads and Maritime project manager and construction contractor	Construction
		Minimise lighting impacts of the proposal by designing lighting in accordance with 'Australian Standard 1158 Road Lighting'. Where lighting is proposed it will be designed for a non-intrusive angle to minimise light spill impacts on adjoining residential properties.	Roads and Maritime project manager and construction contractor	Detailed design
LV-3	Visual impacts at specific locations and precincts – Jaspers Brush and Meroo Meadow	Roll back the top of the cutting at Strongs Road to minimise the overall appearance of the cutting.	Roads and Maritime project manager	Detailed design
		Reinstate the vegetation as close to the top of cuttings as possible (whilst allowing for the provision of required drainage structures and maintenance access) in the spaces between the access ramps for Strongs Road and Jaspers Brush Road and along the tops of the embankments on the ridge line south of Jaspers Brush Creek.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Use cultural plantings to highlight property boundaries and waterways and along the top of embankments where appropriate.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Construct embankment slopes at a gradient less than 2:1 where feasible and reasonable. Vary the embankment slopes and blend the slopes to the edge of new proposal infrastructure where practicable.	Roads and Maritime project manager and construction contractor	Detailed design and construction
LV-4	Visual impacts at specific locations and precincts – Bomaderry gateway	Reinforce existing vegetation with additional plantings where appropriate at Abernethys Creek.	Roads and Maritime and construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Soften the grade of fill embankments so that the new slopes can be reinstated with turf grass.	Roads and Maritime project manager and construction contractor*	Pre-construction and construction
LV-5	Inappropriate design of the southern tie in of the proposal.	Further develop the Bomaderry arrival and departure strategy in consultation with Shoalhaven City Council during detailed design. Implement the agreed urban and landscape design treatments proposed in the Bomaderry arrival and departure strategy.	Roads and Maritime project manager and Construction Contractor.	Detailed design and construction.
Aboriginal heritage				
AH-1	Stakeholder consultation	Undertake ongoing consultation with Aboriginal stakeholders in accordance with the PACHCI protocol.	Roads and Maritime project manager	Ongoing
		Advise the AFG of the final locations of ancillary facilities and any proposed mitigation measures applicable to these areas.	Roads and Maritime project manager	Pre-construction
		Provide three copies of this report to OEH.	Roads and Maritime project manager	Pre-construction
AH-2	Impacts to items of Aboriginal archaeological significance within the study area	Undertake all subsurface testing and salvage in accordance with the methodology outlined in Appendix C of the <i>Aboriginal Cultural Heritage Assessment Report</i> (NOHC, 2013) at Appendix I .	Roads and Maritime project manager	Pre-construction
		Apply for and obtain an Aboriginal Heritage Impact Permit (AHIP) which would cover the entire construction footprint of the proposal, including impacted areas of site G2B A49 and G2B A53 (if construction impacts are expected to extend to the south of the current road reserve at this location) and temporary construction ancillary facilities, for both impact and salvage.	Roads and Maritime project manager	Pre-construction
		Carry out archaeological salvage excavation within impacted areas of sites G2B A42, G2B A44, G2B A45, G2B A46, G2B A47, G2B A51, G2B A53, G2B A54 and G2B A55.	Roads and Maritime project manager	Pre-construction
		Carry out surface artefact collection within impacted areas of G2B A1 and G2B A44.	Roads and Maritime project manager	Pre-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Follow Roads and Maritime's 'Standard Management Procedure: Unexpected Archaeological Finds' (RMS, 2011) in the event that construction related disturbance results in the discovery of Aboriginal objects or suspected human remains.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
AH-3	Impacts to items of Aboriginal archaeological cultural significance within ancillary facility areas	If ancillary area 8 is to be used, fence sites MTF25 and MTF26 to avoid any inadvertent impact to these sites.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		If ancillary area 12 is to be used, include the area of impact from the ancillary area in the recommended salvage excavation at site G2B A51.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Where an Aboriginal site, or portion thereof, is situated adjacent to, but outside of the construction footprint, erect temporary fencing or other means where temporary fencing is not reasonably practicable between the zone of construction activity and the adjacent site area and/or archaeological deposit, with the aim of defining a 'no-go' area for vehicles, material storage or other actions likely to result in ground disturbance. Signpost such sites as Environmentally Sensitive areas.	Roads and Maritime project manager and Construction contractor	Pre-construction
Non-Aboriginal heritage				
NH-1	General construction impacts	Follow the Standard Management Procedure – Unexpected Archaeological Finds (RMS, 2012), or a Roads and Maritime approved revised version, in the event that unexpected heritage/archaeological finds are encountered during construction of the proposal.	Roads and Maritime project manager and construction contractor	Construction
		Include heritage awareness, including requirements specific to the proposal, in the site induction training for proposal staff.	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Subject to stakeholder agreement, lodge any non-Aboriginal artefact materials recovered during archaeological or construction related excavations with either the Berry Museum (Berry and District Historical Society) or Nowra Museum (Shoalhaven Historical Society), depending on the location and the nature of the finds. The material will be appropriately inventoried and accompanied by supporting documentation.	Roads and Maritime project manager	Pre-construction and construction
		<p>Prepare and implement a HIP. The HIP would contain:</p> <ul style="list-style-type: none"> An archival recording strategy for items where direct impacts are unavoidable. The strategy would include creating a documentary and photographic record of items, which would act as a form of information recovery and can be used as a reference in the future. A site interpretation strategy for the management of sites where archaeological excavation may be required. Where appropriate the strategy may include options such as physical memorials, interpretive signage, printed, internet and/or electronic media, and supportive local museum displays. 	Roads and Maritime project manager	Pre-construction and construction
		Establish no-go zones between construction zones and sites G2B H1, G2B H3, G2B H4, G2B H5, G2B H7, G2B H44, G2B H46, G2B H66, G2B H68, G2B H75, G2B H78, G2B H80, G2B H86, G2B H88 and G2B H91. The no-go zones would prevent impacts to areas or items with heritage value which are situated close and adjacent to the proposal, or constitute remnants of partially impacted sites. If temporary fencing is not practical at some heritage sites, adopt an alternate strategy to demarcate the boundaries of the no-go areas.	Construction contractor	Construction
NH-2	Impacts to heritage items within potential temporary construction ancillary facility sites	Where the root zone of trees located on heritage sites (G2B H5, G2B H66 and G2B H71) extend into adjacent ancillary areas (ancillary areas 1, 10 and 11), demarcate the likely root zone of those trees as 'no-go' areas.	Construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
NH-3	Direct impacts to road infrastructure	Prior to construction, carry out archival recordings for heritage items G2B H2 and G2B H7.	Roads and Maritime project manager	Pre-construction
		Notify the Heritage Council of NSW at least 14 days prior to the removal of item G2B H2 (Abernethys Creek Bridge) from Roads and Maritime's Section 170 Heritage Register	Roads and Maritime project manager	Construction
NH-4	Direct impacts to buildings and structure	<p>In accordance with the HIP for the proposal, carry out test excavations to determine the presence and nature of archaeological deposits, and any further management strategies for the following heritage items:</p> <ul style="list-style-type: none"> • 'Pomona' Homestead, Meroo Meadow (G2B H46). • Site of former Jaspers Dairy Co. and Jaspers Brush Dairy Co. Factory, Jaspers Brush (G2B H68). • Approximate site of former Meroo Meadow Dairy Co. factory, Meroo Meadow (G2B H75). • Site of former Berry Estate tenant 'house', Jaspers Brush (G2B H80). • Site of former Meroo Station hut building, Meroo Meadow (G2B H88). <p>Site of former Berry Estate tenant farm buildings, Meroo Meadow (G2B H92).</p>	Roads and Maritime project manager and specialist heritage consultant	Pre-construction
		Further management strategies, if required, could include salvage excavation and/or the provision of site interpretation in accordance with the HIP.	Roads and Maritime project manager and specialist heritage consultant	Pre-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>'Pomona' Homestead (G2B H46).</p> <ul style="list-style-type: none"> • Conduct an archival recording of the entrance gateway prior to construction impact. • Disassemble and reconstruct the entrance gateway at a new location, to be determined in consultation with the owner. • The reconstructed gateway should be as close to the original as is feasible and reasonable. • If feasible and reasonable avoid impacts to the front garden and yard. 	Roads and Maritime project manager	Pre-construction
		<p>Former Meroo Meadow public hall (G2B H67) Commemorate and interpret this site in an appropriate form and method in accordance with the HIP for the proposal.</p>	Roads and Maritime project manager	Pre-construction
		<p>Depending on the results of further research and archaeological investigations, where reasonable and warranted, interpret the sites G2B H68, G2B H75, G2B H80, G2B H81, G2B H88 and G2B H91 in an appropriate form and method in accordance with the HIP for the proposal.</p>	Roads and Maritime project manager	Pre-construction
NH-5	Impacts to potential archaeological deposits	All subsurface archaeological investigations will be undertaken in accordance with a Section 140 excavation permit (under the <i>Heritage Act 1977</i>), which will be required for the proposal.	Roads and Maritime project manager	Pre-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>Site of former Jaspers Dairy Co. and Jaspers Brush Dairy Co. Factory, Jaspers Brush (G2B H68) and Site of former Meroo Station hut building, Meroo Meadow (G2B H88).</p> <ul style="list-style-type: none"> • Where feasible and reasonable avoid direct impact to the area of G2B H88 and to the land to the north of the current Jaspers Brush Reserve easement (Part of G2B H68). • If impact is not avoidable conduct an archaeological test excavation in the areas of anticipated impact within sites G2B H88 and G2B H68, prior to construction impact. • Based on the findings of the test excavation, any further necessary management actions such as salvage excavation should be conducted prior to construction impact. 	Roads and Maritime project manager	Pre-construction
		<p>Approximate site of former Meroo Meadow Dairy Co. factory, Meroo Meadow (G2B H75).</p> <ul style="list-style-type: none"> • Conduct a program of archaeological test excavation to determine the presence and nature of any archaeological deposits within the portion of the proposal area which occurs within site G2B H75. Test excavation is not required if any additional historical analysis undertaken prior to construction determines that the factory is located outside of the proposal area. • Based on the findings of the test excavation program, any further management actions such as salvage excavation and/or the provision of site interpretation would be conducted prior to the commencement of construction. 	Roads and Maritime project manager	Pre-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>Site of former Berry Estate tenant 'house', Jaspers Brush (G2B H80), agricultural earth dam and former associated pipeline, Jaspers Brush (H81) and site of former 'Little Meadow' Public (tent) School (G2B H91).</p> <ul style="list-style-type: none"> Conduct a program of archaeological test excavation within the potentially impacted portions of sites G2B H80, G2B H81 and G2B H91 to determine the presence and nature of any archaeological deposits, and any required management strategies. Based on the findings of the test excavation, any further management actions such as salvage excavation and/or site interpretation are to be conducted prior to construction impact. 	Roads and Maritime project manager	Pre-construction
NH-6	Indirect impacts to buildings and structures	Implement urban design initiatives to minimise the visual and contextual impacts of the proposal in relation to viewsheds, noise and artificial light to and from heritage items, including G2B H1, G2B H4, G2B H44, G2B H46, G2B H66, G2B H71, G2B H77 and G2B H87.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		<p>Meroo Meadow Public Schoolhouse and residence (G2B H4).</p> <p>Define and fence off a no-go area in front of the buildings. The downslope extent of the no-go area should be as large as reasonably practicable. Retain a portion of the road reserve adjacent to G2B H4 as an open space curtilage in front of the heritage buildings.</p>	Roads and Maritime project manager and construction contractor	Pre-construction
		<p>'Hotel Woodbyne (G2B H44) and 'Fairview' (G2B H71).</p> <p>Maintain or replace visual barrier between the proposal and the heritage items G2B H44 ('Hotel Woodbyne', Jaspers Brush) and G2B H71 ('Fairview', Meroo Meadow) with appropriate planting of vegetation along the proposal.</p>	Roads and Maritime project manager and construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>'Mount View' Meroo Meadow (G2B H1).</p> <p>Undertake all feasible and reasonable measures to minimise the loss of open space on the eastern side of the buildings. Maintain this space as an effective curtilage between the building and the construction footprint of the proposal.</p>	Roads and Maritime project manager and construction contractor	Pre-construction and construction
NH-7	Impacts to tree plantings	<p>Tree plantings, Meroo Meadow (G2B H5).</p> <ul style="list-style-type: none"> • Minimise direct impacts to old growth tree plantings on the southern side of the proposal. • Undertake archival recordings of the whole tree planting group prior to direct construction impact. • Replace felled trees with new plantings using the same or similar tree species in an appropriate and safe location and configuration. This would maintain or restore and support the landscape character and heritage values of the plantings. • Avoid direct impacts to the trees on Turners Lane. This area, including the root zones of the trees, is to be fenced off and designated as a no-go zone. • Conduct dendro-chronological analysis of trunk-section samples from select felled trees in each group of tree plantings impacted by the proposal. 	Roads and Maritime project manager and construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>Tree plantings, Meroo Meadow (G2B H78).</p> <ul style="list-style-type: none"> • Avoid direct impacts to the trees adjacent to the Meroo Union Church (part of G2B H78), and the single pine on the south side of Boxsells Lane (part of G2B H78). These areas, including the root zones of the trees, are to be fenced off and designated as no-go zones. • Undertake archival recordings of tree plantings prior to construction. • Define no-go areas around trees to be retained, particularly around Meroo Union Church and on the opposite side of Boxsells Lane, where possible. • Conduct dendro-chronological analysis of trunk-section samples from select felled trees in each group of tree plantings impacted by the proposal. 	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		<p>Tree plantings (G2B H86).</p> <p>Define and fence off no-go areas around tree plantings within G2B H86 to avoid direct impacts throughout construction.</p>	Construction contractor	Pre-construction and construction
		<p>'Westbury' (G2B H66).</p> <p>Where feasible and reasonable retain the Camphor Laurel trees on either side of the driveway.</p>	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		<p>Where feasible and reasonable, the construction and finishing of the proposal corridor, including embankments and cutting faces would be undertaken in such a way to minimise and ameliorate adverse visual impacts, and facilitate the re-establishment of vegetation. This would be undertaken in a manner consistent with the Urban Design and Landscape Concept Plan, which is detailed in the <i>Technical Paper: Urban Design, Landscape Character and Visual Impact Assessment</i> at Appendix H.</p>	Roads and Maritime project manager	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Establish new plantings in areas where existing heritage tree plantings would be directly impacted by the proposal. The new plantings would aim to maintain, restore and/or support the landscape character and heritage values of the existing tree plantings along the proposal and would be consistent with the Urban Design And Landscape Concept Plan, which is detailed in the <i>Technical Paper: Urban Design Landscape Character and Visual Impact Assessment</i> at Appendix H . The type and variety of plantings used should seek to replicate those felled and/or be locally prominent.	Roads and Maritime project manager	Pre-construction and construction
		Establish appropriate forms of vegetation along the proposal corridor and adjacent areas to assist in mitigating broad-scale landscape and visual impacts of the proposal corridor.	Roads and Maritime project manager	Pre-construction and construction
		Carry out vegetation plantings with an awareness of maintaining important vistas from the road corridor, and the use of vegetation boundaries and alignments which conform to the rectangular patchwork of the surrounding landscape. This would serve to break up or scatter the dominant curvilinear character of the proposal.	Roads and Maritime project manager	Pre-construction and construction
NH-8	Impacts to cultural landscape values, including the SICPH CL	Where appropriate incorporate artistic elements in structures adjacent to the carriageway. This could include the use of designs derived from local cultural heritage themes, particularly at locations in close association to places/items of significance.	Roads and Maritime project manager	Pre-construction and construction
NH-9	General construction impacts	Consider entering all heritage items which would remain in whole, or in part, within the easement of the proposal following the completion of construction, on Roads and Maritime's Section 170 Heritage and Conservation Register(s). This would likely include heritage items G2B H5, G2B H7, G2B H67, G2B H78, G2B H80, G2B H86 and G2B H88.	Roads and Maritime – Environment Branch	Operation

Ref #	Impact	Environmental safeguards	Responsibility	Timing
Property and land use				
PL-1	Loss of agricultural land for use as ancillary sites.	Strip and stockpile topsoil during the preparation of any ancillary sites.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Reinstate topsoil as part of the rehabilitation of these areas for ongoing agricultural use.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
PL-2	Traffic disruptions and changes to property access.	Undertake consultation and regularly communicate with affected landowners and residents where temporary property access changes would be required.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Provide property owners and residents with advanced notification of construction schedules and any changes to local roads and property access.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Provide community updates on changes to the local road network during construction, in accordance with the Traffic Management Plan detailed in Section 6.1 .	Roads and Maritime project manager and construction contractor	Pre-construction and construction
PL-3	Permanent acquisition of land.	Acquire land for the proposal in accordance with the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> and Roads and Maritime's 'Land Acquisition Information Guide' (RTA, 2011).	Roads and Maritime project manager	Pre-construction
		Continue consultation with all affected property owners regarding property acquisition during the detailed design of the proposal.	Roads and Maritime project manager	Detailed design and pre-construction
		Complete property adjustments for fencing, access tracks and other farm infrastructure in consultation with property owners.	Roads and Maritime project manager	Pre-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
PL-4	Changes to external property access.	Relocate property accesses that are lost as a result of the proposal in consultation with affected land owners.	Roads and Maritime project manager and construction contractor	Detailed design and pre-construction
PL-5	Land use impacts	Continue consultation with the property owner (property reference number 3) whose high ground would be partially impacted by strip acquisition. This consultation would determine the likely level of impact from the proposal and potential mitigation measures or acquisition would be negotiated with the property owner.	Roads and Maritime project manager	Detailed design and pre-construction
Socio-economic				
SE-1	Community impacts	Implement a Community Involvement Plan to provide timely, regular and transparent information about changes to access and traffic conditions, details of future work programs and general construction progress throughout the construction phase of the proposal. Provide information in a variety of ways including letter box drops, media releases, an internet site and variable message signs. Set up a 24 hour hotline and complaints management process.	Roads and Maritime and construction contractor	Pre-construction and construction
SE-2	Construction fatigue and noise impacts from construction works	Safeguards and management measures to address construction fatigue and noise impacts are described in Section 6.2 .		
SE-3	Dust impacts from construction works	Safeguards and management measures to address air quality impacts during construction are described in Section 6.12 .		
SE-4	Visual impacts of construction works	Safeguards and management measures to address visual impacts during construction are described in Section 6.6 .		
SE-5	Potential community cohesion and severance impacts	Continue consultation with the Friends of Meroo Union Church throughout the detailed design and construction phases of the proposal to develop and implement measures to minimise and mitigate amenity impacts on the church arising during construction.	Roads and Maritime project manager	Detailed design and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Continue consultation with bus commuters at Croziers Road and Mullers Lane bus stops, including parents/carers of school children, throughout the detailed design and construction phases of the proposal, to develop and implement measures to minimise impacts on access to public transport facilities during construction.	Roads and Maritime project manager	Detailed design and construction
SE-6	Potential impacts from traffic delays and changed access arrangements	Advise residents, businesses and road users in a timely manner of any changes to road and property access arrangements.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		In consultation with affected property owners, residents and businesses, provide temporary or alternative access arrangements to affected properties, where required to maintain uninterrupted access.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Prepare and implement Traffic Control Plans to manage peak tourist/holiday traffic on Friday and Sunday afternoons and days immediately prior and following public holidays.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
SE-7	Impacts on the viability of agricultural land	Carry out property acquisition in accordance with Roads and Maritime's 'Land Acquisition Information Guide' (RMS, 2012) and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Roads and Maritime project manager and construction contractor	Pre-construction and post-construction
		Continue consultation with all affected property owners and agricultural business operators during detailed design and construction phases of the proposal to develop and implement measures to minimise and mitigate impacts on land use viability, farm operations and infrastructure.	Roads and Maritime project manager and construction contractor	Pre-construction and post-construction
		Continue consultation with the owner of the residence to be demolished (property reference number 23) during the acquisition phase in accordance with Roads and Maritime's 'Land Acquisition Information Guide' (RMS, 2012).	Roads and Maritime project manager and construction contractor	Pre-construction and post-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Safeguards and management measures to address farm dam impacts are described in Section 6.4 .		
		Maintain both internal and external property access for agricultural businesses for the duration of construction. Should temporary or alternative access be required this would be agreed and provided in consultation with the affected property owner(s).	Roads and Maritime project manager and construction contractor	Pre-construction and post-construction
		Rehabilitate land as appropriate that has been acquired or leased for use as a temporary ancillary facility site for the construction, if it is not required during operations. Rehabilitate land for return to its previous use or for sale.	Roads and Maritime project manager and construction contractor	Pre-construction and post-construction
SE-8	Amenity impacts	Provide architectural treatments and other noise management measures as detailed in Section 6.2 .		
		Implement the urban and landscape design strategy as detailed in Section 6.6 .		
		Safeguards and measures to address visual amenity impacts during operation are provided in Section 6.6 .		
SE-9	Changed traffic and access arrangements	Safeguards and management measures to address changes to traffic and access arrangements are described in Section 6.1 .		
SE-10	Economic impacts to businesses and agriculture	Provide signposting to encourage highway traffic to visit tourist destinations and to indicate routes via u-turns to businesses on the other side of the carriageway. Signposting would be consistent with Roads and Maritime signposting guidelines.	Roads and Maritime project manager	Pre-construction and operation

Ref #	Impact	Environmental safeguards	Responsibility	Timing
Geology and soils				
GS-1	Short and long term stability of embankments and cuttings.	<p>Create cut and fill batters at a maximum of 2:1 slope unless otherwise agreed during detailed design.</p> <p>In areas of particular risk of erosion, investigate measures which may include:</p> <ul style="list-style-type: none"> Retaining structures or soil nailing at steep or vertical cuts in areas where soft soils and highly weathered rock, such as the Berry Siltstone and Nowra Sandstone are present. Retaining structures at bridge abutments. Erosion protection measures, such as drainage structures, hydroseeding, hydro mulching and the use of geotextile fabric. <p>Mitigation strategies designed to minimise the visual impact of these measures are discussed in Section 6.6.</p>	Roads and Maritime project manager and Construction contractor	Detailed design and Construction
GS-2	Instability of soft soils	Where required, undertake ground improvements within areas of soft soils to provide sufficiently stable areas for construction to commence, and to provide long-term durability of the proposal.	Roads and Maritime project manager and Construction contractor	Pre-construction and construction
GS-3	Erosion and sedimentation	Refer to mitigation measures in Section 6.4		
GS-4	Disturbance of acid sulfate soils	Develop an ASSMP in accordance with the 'Guidelines for the Management of Acid Sulfate materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulphidic Black Ooze' (RTA, 2005).	Roads and Maritime project manager and Construction contractor	Pre-construction
		Seek opportunities to avoid PASS and to avoid lowering of the water table in the vicinity of PASS. If it is not feasible and reasonable to avoid disturbance of PASS, limit areas of disturbance as much as possible and implement management measures documented in the ASSMP.	Roads and Maritime project manager	Detailed design, pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
GS-5	Contamination	<p>Further assessment of areas of potential contamination concern will be required in areas that will be disturbed. Assessments could include:</p> <ul style="list-style-type: none"> • Sampling of the fill mounds identified adjacent to the existing highway within the study area prior to the disturbance of these areas, if these fill mounds will be disturbed or utilised during construction of the proposal. • Conduct a hazardous materials audit on buildings requiring demolition, disturbance or alteration as part of the proposal. • Consult with the 10 landowners identified as having current or historical land use activities that store or may have previously stored petroleum hydrocarbons in order to evaluate whether potential contamination may have migrated into the construction footprint of the proposal. 	Roads and Maritime project manager	Pre-construction
		<p>Undertake further investigation in the area identified as the truck spill site that occurred on 15 December 2012 at Jaspers Brush to evaluate the presence of residual contamination prior to the commencement of construction. This will include a review of EPA records, inspection and sampling, as required. Subject to the findings of the additional investigation, recommendations will be made regarding the requirement for the management or remediation of contamination (if identified).</p>	Roads and Maritime project manager	Pre-construction
		<p>Prepare and implement a procedure for handling the unexpected discovery of contamination prior to the commencement of construction. The procedure will be incorporated into the CEMP for the proposal and will outline the process for the identification and assessment of potentially contaminated material in the event that previously unidentified contamination is discovered during construction of the proposal.</p>	Roads and Maritime project manager	Pre-construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
Air quality				
AQ-1	Air quality – dust generation	Develop an AQMP, which will form part of the CEMP. The AQMP will aim to minimise dust generation.	Construction contractor	Pre-construction and construction
		Undertake dust deposition monitoring at the nearest sensitive receivers to construction ancillary facilities that are in use to determine compliance with relevant EPA criteria.	Construction contractor	Pre-construction and construction
		Air quality impacts during operation of the proposal would be minimal and therefore no mitigation measures have been proposed.		
Hazard and risk				
HR-1	General	<p>Prepare site specific Hazard and Risk Management Plans as part of the CEMP, which may include items such as:</p> <ul style="list-style-type: none"> • Details of the hazards and risks associated with construction activities. • Risk management measures, including those identified in Chapter 6. • Procedures to comply with all legislative and industry standard requirements. • Contingency plans, as required. • Site-specific Occupational Health and Safety plans and safe work method statements. • Training for all personnel (including subcontractors) in site inductions, including the recognition and awareness of site hazards and the location of relevant equipment to protect themselves and manage any spills. 	Construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
HR-2	Contamination from accidental releases or improper transport, handling and storage of hazardous substances.	Transport all hazardous substances in accordance with relevant legislation and codes, including the <i>Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998</i> and the 'Australian Code for the Transport of Dangerous Goods by Road and Rail' (National Transport Commission, 2008).	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Manage specific risks associated with the transport of hazardous substances to and from work sites, including the risks associated with temporary changes in local traffic conditions during the construction period, through the implementation of measures detailed in the CEMP.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Undertake a preliminary hazard analysis if the quantities of hazardous substances during construction are found to exceed threshold levels provided in 'Applying SEPP 33: Hazardous and Offensive Development Application Guidelines' (DP&I, 2011).	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Store, handle and use hazardous construction materials in accordance with the <i>Occupational Health and Safety Act 2000</i> and the 'Storage and Handling of Dangerous Goods Code of Practice' (Workcover NSW, 2005).	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Provide secure, bunded areas around storage areas for oils, fuels and other hazardous liquids.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Locate chemical storage areas outside areas subject to the 1 in 100 year flood event. Where this is not feasible, provide sufficient freeboard to avoid inundation during events of this size.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		In the event of an incident leading to a spill of a hazardous substance during construction, use appropriate incident control measures in accordance with contingency plans for the worksite.	Roads and Maritime project manager and construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		Construct temporary drainage structures as detailed in Section 6.4 and in accordance with the 'Technical Guideline – Temporary Stormwater Drainage for Road Construction' (Roads and Maritime, 2011).	Roads and Maritime project manager and construction contractor	Pre-construction and construction
		Carry out regular maintenance and inspection of all environmental and safety protection controls.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
HR-3	Rupture or damage to underground utilities	Undertake utility checks (such as dial before you dig), consult with relevant service infrastructure providers and if required, relocate and/or protect utilities within the proposal area prior to the commencement of construction.	Roads and Maritime project manager and construction contractor	Pre-construction and construction
HR-4	Contamination from transportation of hazardous substances	Design water quality treatment measures to provide capacity to treat first flush from the pavement surface and reduce the risk of spills discharging onto adjacent land or into watercourses. Confirm locations and design capacity during the detailed design phase of the proposal.	Roads and Maritime project manager	Detailed design
Waste management				
WM-1	Inappropriate management of waste	Manage and dispose of all waste in accordance with applicable State legislation and government policies, including: <ul style="list-style-type: none"> • WARR Act. • Waste Avoidance and Resource Recovery Strategy 2007 (DECC, 2007). • WRAPP (RTA, 2009). • Compliance with relevant EPA resource recovery exemptions. 	Construction contractor	Pre-construction and construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>Prepare a Waste Management Plan as part of the CEMP, detailing appropriate procedures for waste management according to the waste management hierarchy:</p> <ul style="list-style-type: none"> • Avoidance of unnecessary resource consumption to reduce the quantity of waste being generated. • Recovery of resources for reuse onsite or offsite for the same or similar use without reprocessing. • Recovery of resources through recycling and reprocessing so that waste can be processed into a similar non-waste product and reused. • Disposal of residual waste material. 	Construction contractor	Pre-construction and construction
		<p>In the instance that there are no other feasible and reasonable options for waste avoidance, reuse or recycling, all residual waste material will be disposed to a suitably licensed landfill or waste management facility.</p> <p>Waste materials requiring removal from site would be classified, handled and stored onsite in accordance with the 'Waste Classification Guidelines: Part 1: Classifying Waste' (DECCW, 2009) until collection by a contractor for disposal.</p>	Construction contractor	Pre-construction and construction
WM-2	Unnecessary resource consumption	Avoid unnecessary resource consumption by making realistic and accurate predictions on the required quantities of resources, such as construction materials.	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
		<p>Apply resource recovery principles, including reuse, recycling and reprocessing, to the management of waste generated during construction, including:</p> <ul style="list-style-type: none"> • Recovery of resources for reuse. Reuse waste materials generated by the proposal onsite or off-site where possible, including the reuse of topsoil within the construction footprint of the proposal. Onsite reuse would include landscaping works and re-contouring activities. Where such material cannot be reused for the proposal, it may be stockpiled for use on other road projects, or removed from the proposal site for other uses (subject to the third party obtaining any relevant approvals). • Recovery of resources for recycling. Segregate resources such as paper, plastic, glass, aluminium cans and other recyclable materials for recycling during construction. These materials would subsequently be removed from the proposal site and disposed of at a local recycling facility for processing. • Recovery of resources for reprocessing. Mulch or chip green wastes onsite and use for landscaping in the absence of a more beneficial use being identified (such as harvestable timber or fence posts). Larger green waste such as logs can be used for sediment and erosion control and habitat replacement as part of the landscaping and revegetation. 	Construction contractor	Construction
		Use recycled products in construction to reduce the demand on resources, in instances where the use of such material is cost and performance competitive (for example, where quality control specifications allow). This may include the use of fly ash and slag within concrete mixes.	Construction contractor	Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
WM-3	Excess spoil	<p>Prepare a spoil management strategy to address excess spoil (refer to Section 3.4.4). The strategy would consider the following options:</p> <ul style="list-style-type: none"> • Reduction of spoil volume through detailed design refinement or during construction (should increased quantities of spoil be encountered) through reuse within the proposal. This could include flattening batters or incorporating fill into landscaping (including landscaped mounds, if appropriate). The reuse of excess spoil during construction will be undertaken in accordance with Roads and Maritime's resource recovery exemptions detailed in Section 6.14.1. • Further geotechnical investigation during detailed design which may lead to design refinements that reduce the predicted volume of excess spoil. • Utilisation of excess spoil to flatten fill batters to blend the proposal into the existing landscape. • Utilisation of excess spoil in the formation of noise or landscape mounds, where feasible. • Utilisation of excess spoil in the construction of other road projects. • Provision of excess spoil to adjoining landowners, Shoalhaven City Council or other parties requiring spoil¹. This may include the provision of excess spoil to Shoalhaven City Council to provide stock mounds in flood prone areas as part of its flood mitigation works in the region which are still under investigation by Council. 	Roads and Maritime project manager and construction contractor	Detailed design, pre-construction and construction

¹ Any provision of excess soil or similar materials to a third party would be dependent on the demonstration by the third party that it has obtained the necessary approvals for the use of the material (such as development consent from the relevant local council or a license under section 143 of the Protection of the Environment Operations Act 1997). Appropriate environmental controls would be installed at sites where excess materials are delivered.

Ref #	Impact	Environmental safeguards	Responsibility	Timing
WM-4	Roadside litter	Manage roadside litter in accordance with the existing Roads and Maritime road maintenance and litter collection program for the Princes Highway.	Roads and Maritime Asset Maintenance	Operation
Greenhouse gas and climate change				
GH-1	GHG emissions	Where feasible and reasonable select the most fuel efficient plant, equipment and vehicles available through consultation with subcontractors and suppliers.	Construction contractor	Construction
		Maintain all plant and vehicles regularly to maintain fuel efficiency.	Construction contractor	Construction
		Procure locally produced goods and services where feasible, reasonable and cost effective to reduce transport fuel emissions.	Construction contractor	Construction
		Specify construction materials with lower emissions intensity in the detailed design (eg recycled steel in place of virgin steel and asphalt in place of concrete) where engineering and other technical specifications can be met and the alternative is feasible and reasonable.	Roads and Maritime project manager	Detailed design
		Seek opportunities to reduce the quantity of construction materials used through innovative design and construction methodologies.	Construction contractor	Pre-construction and Construction
		Where feasible and reasonable, procure recycled content road construction and maintenance materials such as recycled aggregates in road pavement and surfacing (including crushed concrete, granulated blast furnace slag, glass, slate waste and fly ash). This measure forms part of Roads and Maritime's implementation of the NSW Government's WRAPP.	Construction contractor	Pre-construction and Construction
		Plan earthworks to minimise long haulage distances and reduce excess spoil.	Construction contractor	Pre-construction and Construction

Ref #	Impact	Environmental safeguards	Responsibility	Timing
Cumulative impacts				
CI-1	Cumulative impacts – other projects	Consult with proponents of the North Nowra Link Road project and Shoalhaven Starches factory site proposed gas pipeline project to obtain information about project timeframes and impacts. Identify and implement appropriate safeguards and management measures to minimise cumulative impacts of construction if either of these projects are constructed at the same time as the Berry to Bomaderry upgrade.	Roads and Maritime project manager and construction contractor	Pre- construction and construction.

7.3 Licensing and approvals

The proposal would require several licenses and approvals for its construction and operation. A summary of the licenses and approvals required for the proposal is provided in **Table 7-2**.

Table 7-2 Summary of licensing and approvals required

Requirement	Timing
An AHIP would be required for the proposal.	Prior to commencement of construction.
The proposal would require an excavation permit under Section 140 of the <i>Heritage Act 1977</i> to undertake subsurface archaeological investigations.	Prior to commencement of construction.
The proposal is classified as a scheduled activity under Schedule 1 of the POEO Act and therefore an EPL for road construction would be required.	Prior to commencement of construction.
Flood work is expected to be undertaken as part of the proposal given that work would be undertaken on a floodplain that is likely to affect the distribution of floodwater. Roads and Maritime would continue to consult with OEH and the NOW to ensure that flood impacts have been adequately assessed and appropriate approvals are sought.	Roads and Maritime would continue to consult with OEH and NOW prior to commencement of and during construction.
Road Occupancy Licences would be obtained for each type of construction work involving closures in accordance with the <i>Roads Act 1993</i> .	Prior to commencement of construction.