

## 7. Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are also listed.

### 7.1 Environmental management plans (or system)

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

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

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Hunter 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 CEMP would be developed in accordance with the specifications set out in the: QA Specification G36 – *Environmental Protection (Management System)*, QA Specification G38 – *Soil and Water Management (Soil and Water Plan)*, QA Specification G40 – *Clearing and Grubbing*, QA Specification G10 – *Traffic Management*.

## 7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will 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 safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
GEN1	General - minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity. As a minimum, the CEMP will include the following:</p> <ul style="list-style-type: none"> <li>• A Surface Water Management Plan (SWMP)</li> <li>• Any requirements associated with statutory approvals</li> <li>• Details of how the proposal will implement the safeguards outlined in the REF</li> <li>• Issue-specific environmental management plans</li> <li>• Roles and responsibilities</li> <li>• Communication requirements</li> <li>• Induction and training requirements</li> <li>• Procedures for monitoring and evaluating environmental performance, and for corrective action</li> <li>• Reporting requirements and record-keeping</li> <li>• Procedures for emergency and incident management</li> <li>• Procedures for audit and review.</li> </ul>	Construction Contractor	Pre-construction/ construction
B1	Biodiversity	<p>A Flora and Fauna Management Plan will be prepared and implemented as part of the CEMP. It will address terrestrial and aquatic matters and will include, but not necessarily be limited to:</p> <p>(a) plans for the construction site and adjoining area showing native vegetation, flora and fauna habitat, threatened species and threatened ecological communities;</p>	Construction contractor	Pre-construction and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>(b) plans showing areas to be cleared and areas to be protected, including exclusion zones and protected habitat features (e.g. hollow-bearing trees), and areas for rehabilitation or re-establishment of native vegetation. The limits of clearing within the construction site and protected habitat features will be clearly delineated using appropriate signage, barriers, fencing or markings;</p> <p>(c) requirements set out in the Landscape Design Guideline (RMS 2018);</p> <p>(d) procedures addressing relevant matters specified in the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects (RTA 2011) including but not limited to:</p> <ul style="list-style-type: none"> <li>• pre-clearing, including the outcomes of final flora and fauna species checks, establishment of exclusion zones and on-ground identification of specific habitat features to be retained (such as hollow-bearing trees)</li> <li>• vegetation clearing and bushrock removal, including staged habitat removal and any specified seasonal limits on clearing activities</li> <li>• fauna handling and unexpected threatened species finds</li> <li>• rehabilitation, revegetation, re-use of soils, woody debris and bushrock, and other habitat management actions</li> <li>• weed, pathogen and pest management</li> </ul> <p>(e) procedures addressing relevant matters specified in the NSW DPI (Fisheries) Policy and guidelines for fish habitat conservation and management.</p> <p>(f) monitoring during construction and post-construction</p> <p>(g) adaptive management measures to be applied if monitoring indicates unexpected adverse impacts.</p>		
B2	Biodiversity	<p>Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be considered during the detailed design stage and implemented where practicable and feasible. Measures to avoid and minimise impacts should be prioritised in the following order:</p> <p>(a) critical habitat</p> <p>(b) threatened species, endangered ecological communities, groundwater dependent ecosystems or their habitat</p>	Construction contractor	Pre-construction and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		(c) native vegetation and habitat supporting flora and fauna connectivity and/or that supports other environmental objectives such as protecting water quality, hydrology or erosion and sediment controls (d) native vegetation of higher quality condition (e) other native vegetation.		
B3	Biodiversity	<p>Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects (RTA 2011), and any specific requirements of the approved Flora and Fauna Management Plan, management arrangements will be implemented to ensure unavoidable vegetation and bushrock removal minimises biodiversity impacts as far as practicable. As a minimum that will include:</p> <ul style="list-style-type: none"> <li>(a) no vegetation clearing or bushrock removal beyond limits identified in this</li> <li>(b) avoiding identified exclusion zones and protected habitat features.</li> <li>(c) avoiding mixing of topsoil with woody debris materials</li> <li>(d) separation of woody vegetation suitable for re-use during construction and rehabilitation or revegetation works</li> <li>(e) implementation of staged clearing</li> <li>(f) trimming and pruning to be undertaken in accordance with relevant Australian Standards</li> <li>(g) in riparian zones: avoiding clearing during likely flood periods; ensuring cleared vegetation does not enter the waterway; installation of suitable sedimentation and erosion control; retaining roots and stumps to maintain bank stability; applying the hierarchy for snag management set out in the Guidelines.</li> </ul>	Construction contractor	Pre-construction and construction
B4	Biodiversity	<p>Prior to the commencement of construction, carry out:</p> <ul style="list-style-type: none"> <li>• Targeted surveys to confirm the presence of the following along the Hunter River and unnamed tributary to the north of the Hunter River within the area to be impacted by the proposal <ul style="list-style-type: none"> <li>○ River red gum (<i>Eucalyptus camaldulensis</i>) (endangered population - BC Act)</li> <li>○ Hunter Floodplain Red Gum Woodland in the NSW North Coast and</li> </ul> </li> </ul>		

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>Sydney Basin Bioregions (EEC – BC Act)</p> <ul style="list-style-type: none"> <li>Threatened flora survey, fauna habitat assessments and ground-truthing of vegetation mapping, between the Hunter River and the southern extent of the area surveyed by Umwelt (2019), north of the New England Highway near Gowrie Gates, within the area to be impacted by the proposal</li> <li>Ground truthing surveys of the regional vegetation mapping within the McDougalls Hill ancillary facility to confirm presence of: <ul style="list-style-type: none"> <li>Central Hunter Ironbark – Spotted Gum – Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions EEC (BC Act)</li> <li>Central Hunter Valley Eucalypt Forest and Woodland CEEC (EPBC Act)</li> </ul> </li> </ul> <p>No clearing of threatened native vegetation is to be carried out within the McDougalls Hill ancillary facility. Subject to the outcomes of the above, a consistency review or environmental assessment may be required.</p>		
B5	Biodiversity	The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal site.	Construction contractor	Construction
B6	Biodiversity	<p>A nest box strategy would be developed and implemented during the detailed design stage in accordance with <i>Guide 5: Re-use of woody debris and bushrock</i> and <i>Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011). The strategy is to include:</p> <p>(a) a trial of artificial hollow creations.</p> <p>(b) reinstallation of suitable hollows removed by the proposal.</p> <p>(c) Installation of nest boxes in the event that there are not sufficient. trees for artificial hollow creation and hollows for reinstallation.</p>	Construction contractor	Detailed design
B7	Biodiversity	Prior to the commencement of construction, carry out monitoring to determine the presence of threatened microbats in the culverts that are part of the former Great Northern Railway.	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>If threatened microbats are identified, collect the following information:</p> <ul style="list-style-type: none"> <li>(a) Species present.</li> <li>(b) Total number of individuals and groups per occupied roost site.</li> <li>(c) Description of occupied roost sites.</li> <li>(d) Breeding status of the colony, including approximate adult to juvenile ratios.</li> </ul>		
B8	Biodiversity	<p>If roosting threatened microbats are found during pre-construction monitoring, a Bat Management Plan is to be developed and implemented. The Bat Management Plan is to be prepared by a microbat specialist and include the following:</p> <ul style="list-style-type: none"> <li>(a) A monitoring program for both during and outside of breeding periods.</li> <li>(b) Details of construction activities to be monitored that may affect microbat habitat, particularly light, noise, vibration, alteration of drainage into culverts.</li> <li>(c) Mitigation measures to be implemented during construction, including regular inspections of impacts from sedimentation and weed encroachment to culvert entrances, consider timing and nature of immediately adjacent works in relation to known breeding period of relevant threatened microbats.</li> <li>(d) Adaptive management measures to be implemented if monitoring indicates a decline in bat numbers or if bats are observed leaving the roost during construction activities.</li> <li>(e) A process for evaluating the effectiveness of management measures.</li> </ul>	Construction contractor	Pre-construction/ construction/ post construction
B9	Biodiversity	In accordance with Section 199 of the FM Act, Roads and Maritime would notify DPI Fisheries in writing of any proposed dredging or reclamation in the Hunter River and its tributary. Roads and Maritime would consider any matters raised by the Minister.	Roads and Maritime	Pre-construction
B10	Biodiversity	In accordance with Section 219 of the FM Act, Roads and Maritime would seek a permit from DPI Fisheries for any temporary blockage of fish passage. Roads and Maritime would consider any matters raised by the Minister.	Roads and Maritime	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B11	Biodiversity	Instream silt curtains would be implemented and maintained for construction in the Hunter River. Silt curtains would be installed such that they do not block fish passage.	Construction contractor	Construction
B12	Biodiversity	<p>Changes to existing surface water flows would be minimised through detailed design.</p> <p>Any rock platform required to be constructed within the Hunter River bridge would be designed and constructed to prevent blocking the main river channel. The platform would be designed to ensure that flow of the main river channel and fish passage is maintained even during low flow periods.</p> <p>The Department of Primary Industry (DPI) would be consulted on the final design.</p>	Construction contractor	Detailed design
B13	Biodiversity	<p>A wildlife connectivity strategy would be finalised and implemented during the detailed design stage in accordance with the draft Roads and Maritime Wildlife Connectivity Guidelines (RMS 2011). The strategy is to focus on maintaining connectivity in the northern extent of the proposal and is to include, but not be limited to:</p> <ul style="list-style-type: none"> <li>(a) provision for a rope crossing with an indicative location between chainages 8450 and 8725</li> <li>(b) identification of trees suitable for retention in the northern connection and tie in to facilitate glider crossings</li> <li>(c) consideration of additional gliding crossing structures where the width of disturbance is greater than 50 metres</li> <li>(d) type and extent of any associated landscaping or structures such as fencing or fauna infrastructure</li> </ul>	Construction contractor	Detailed design
W1	Surface water and flooding	A Soil and Water Management Plan will be prepared in accordance with QA Specification G38 and implemented as part of the CEMP. The Plan will identify all reasonably foreseeable risks relating to soil erosion and water pollution associated with undertaking the activity, and describe how these risks will be managed and minimised during construction. That will include arrangements for managing pollution risks associated with spillage or contamination on the site and adjoining areas, and monitoring during and post-construction.	Construction Contractor	Pre-construction/ construction

No.	Impact	Environmental safeguards	Responsibility	Timing
W2	Surface water and flooding	<p>A flood response management plan will be prepared as part of the CEMP. The Flood Risk Management Plan will address, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>Processes for monitoring and mitigation flood risk</li> <li>Steps to be taken in the event of a flood warning including removal or securing of loose material, equipment, fuels and chemicals.</li> </ul>	Construction contractor	Construction
W3	Surface water and flooding	<p>A site specific Erosion and Sediment Control Plan(s) will be prepared and implemented and included in the Soil and Water Management Plan. The Plan(s) will identify detailed measures and controls to be applied to minimise erosion and sediment control risks including, but not necessarily limited to: runoff, diversion and drainage points; sediment basins and sumps; scour protection; stabilising disturbed areas as soon as possible, check dams, fencing and swales; and staged implementation arrangements.</p> <p>The Plan will also include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.</p>	Construction Contractor	Construction
W4	Surface water and flooding	Stockpiles will be designed, established, operated and decommissioned in accordance with the RTA Stockpile Site Management Guideline 2011.	Construction Contractor	Construction
W5	Surface water and flooding	<p>The rehabilitation of disturbed areas will be undertaken progressively as construction stages are completed, and in accordance with:</p> <ul style="list-style-type: none"> <li>Landcom's Managing Urban Stormwater: Soils and Construction series</li> <li>RTA Landscape Guideline</li> <li>RMS Guideline for Batter Stabilisation using Vegetation (2015).</li> </ul>	Construction Contractor	Construction
W6	Surface water and flooding	<p>Consistent with any specific requirements of the approved Soil and Water Management, control measures will be implemented to minimise risks associated with erosion and sedimentation and entry of materials to drainage lines and waterways. That will include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>Sediment management devices, such as fencing, hay bales or sand bags</li> <li>Measures to divert or capture and filter water prior to discharge, such as drainage channels and first flush and sediment basins</li> <li>Scour protection and energy dissipaters at locations of high erosion risk</li> <li>Installation of measures at work entry and exit points to minimise movement of</li> </ul>	Construction Contractor	Construction



No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>material onto adjoining roads, such as rumble grids or wheel wash bays</p> <ul style="list-style-type: none"> <li>• Appropriate location and storage of construction materials, fuels and chemicals, including bunding where appropriate.</li> </ul>		
W7	Surface water and flooding	Batters will be designed and constructed to minimise risk of exposure, instability and erosion, and to support long-term, on-going best practice management, in accordance with Roads and Maritime 'Guideline for Batter Surface Stabilisation using vegetation' (2015).	Roads and Maritime / Construction Contractor	Detailed design/ construction
W8	Surface water and flooding	Two spill containment basins with a minimum volume of 25,000 Litres are to be provided on the north and south side of the Hunter River.	Roads and Maritime / Construction Contractor	Detailed design/ Pre-construction/construction
W9	Surface water and flooding	<p>A Spill Management Plan will be prepared and implemented as part of the CEMP to minimise the risk of pollution arising from spillage or contamination on the site and adjoining areas. The Spill Management Plan will address, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>• Management of chemicals and potentially polluting materials</li> <li>• Any bunding requirements</li> <li>• Maintenance of plant and equipment</li> <li>• Emergency management, including notification, response and clean-up procedures.</li> </ul>	Construction Contractor	Pre-construction/ construction
W10	Surface water and flooding	<p>A water quality monitoring program would be developed and implemented as part of the Soil and Water Management Plan in accordance with Roads and Maritime Guideline for Construction Water Quality Monitoring (Roads and Maritime, 2003). The monitoring program is to include</p> <ul style="list-style-type: none"> <li>• Visual monitoring of local water quality</li> <li>• Up and down stream water quality monitoring of the Hunter River prior to the start of construction</li> <li>• Monthly up and down stream water quality monitoring for the duration of working within and over the Hunter River.</li> </ul>	Construction Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
W11	Surface water and flooding	Any dewatering activities will be undertaken in accordance with the RTA Technical Guideline: Environmental management of construction site dewatering in a manner that prevents pollution of waters.	Construction Contractor	Detailed design/ Construction
E1	Contamination	The CEMP will include an unexpected finds protocol for potentially contaminated material encountered during construction work.	Construction contractor	Construction
E2	Contamination	<p>If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. This may include but not be limited to:</p> <ul style="list-style-type: none"> <li>• Diversion of surface runoff</li> <li>• Capture of any contaminated runoff</li> <li>• Temporary capping.</li> </ul> <p>All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or the EPA.</p>	Construction contractor	Construction
E3	Contamination	<p>An Asbestos Management Plan will be developed and implemented to manage asbestos and asbestos containing material if encountered during the construction. The plan will include:</p> <ul style="list-style-type: none"> <li>• Identification of potential asbestos on site</li> <li>• Procedures to manage and handle any asbestos</li> <li>• Mitigation measures if asbestos is encountered during construction</li> <li>• Procedures for disposal of asbestos in accordance with NSW EPA guidelines, Australian Standards and relevant industry codes of practice.</li> </ul>	Construction contractor	Construction
E4	Soils	An Acid Sulfate Materials Management Plan will be prepared and implemented as part of the CEMP. The Plan will be prepared in accordance with the RTA Guidelines for the Management of Acid Sulfate Materials.	Construction contractor	Construction
T1	Traffic and transport	Disruptions to property access and traffic will be notified to landowners at least five days prior in accordance with the relevant community consultation processes outlined in the TMP	Roads and Maritime	Detailed design
T2	Traffic and	Where any legal access to property is permanently affected, arrangements for	Construction	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
	transport	appropriate alternative access will be determined in consultation with the affected landowner and local road authority.	contractor and Roads and Maritime	
T3	Traffic and transport	Access to properties will be maintained during construction. Where that is not feasible or necessary, temporary alternative access arrangements will be provided following consultation with affected landowners and the relevant local road authority.	Construction contractor and Roads and Maritime	Construction
T4	Traffic and transport	<p>A detailed construction traffic management plan will be prepared in accordance with <i>Traffic Control at Work Sites Manual Version 4</i> (RTA, 2010) and <i>Specification G10 - Control of Traffic</i>. The plan will be approved by Roads and Maritime before implementation to provide a comprehensive and objective approach to minimise any potential impacts on road network operations during construction. The plan will include:</p> <ul style="list-style-type: none"> <li>• Access and haulage routes</li> <li>• Measures to maintain access to local roads and properties</li> <li>• Site specific traffic control measures (including signage) to manage and regulate traffic movement</li> <li>• Measures to maintain pedestrian and cyclist access</li> <li>• Requirements and methods to consult and inform the local community of impacts on the local road network</li> <li>• Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads.</li> <li>• A response plan for any construction traffic incident</li> <li>• Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic</li> <li>• Monitoring, review and amendment mechanisms.</li> </ul>	Construction contractor	Pre-construction
T5	Traffic and transport	Where practical, heavy vehicle movements would be outside the traffic peak hours to minimise impacts on the existing road network operation during construction.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
T6	Traffic and transport	Preparation of pre-construction and post construction road condition reports for local roads likely to be used during construction. Any damage resulting from construction (not normal wear and tear) will be repaired unless alternative arrangements are made with the relevant road authority. Copies of road condition reports will be provided to the local roads authority.	Construction contractor	Pre-construction/ post construction
T7	Traffic and transport	Pedestrian and cyclist access will be maintained throughout construction. Where that is not feasible or necessary, temporary alternative access arrangements will be provided following consultation with affected landowners and the local road authority.	Construction contractor	Construction
N1	Noise and vibration	<p>A Construction Noise and Vibration Management Plan (CNVMP) would be prepared as part of the Construction Environmental Management Plan. The CNVMP would identify:</p> <ul style="list-style-type: none"> <li>• all potential significant noise and vibration generating activities associated with the activity</li> <li>• noise and vibration sensitive receptors</li> <li>• measures to be implemented during construction to minimise noise and vibration impacts, such as restrictions on working hours, staging, placement and operation of work compounds, parking and storage areas, temporary noise barriers, haul road maintenance, and controlling the location and use of vibration generating equipment</li> <li>• feasible and reasonable mitigation measures to be implemented, taking into account the Roads and Maritime's Beyond the Pavement urban design policy, process and principles.</li> <li>• a monitoring program to assess performance against relevant noise and vibration criteria</li> <li>• arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures</li> <li>• an out of hours works procedure, including approval process and proposed mitigation measures.</li> </ul>	Contractor	Pre-construction/ post construction
N2	Noise and vibration	All sensitive receivers likely to be affected will be notified at least five days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will include details of:	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <li>the project</li> <li>construction period and construction hours</li> <li>contact information for project management staff</li> <li>complaint and incident reporting and how to obtain further information</li> </ul>		
N3	Noise and vibration	<p>All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include:</p> <ul style="list-style-type: none"> <li>All relevant project specific and standard noise and vibration mitigation measures</li> <li>Relevant licence and approval conditions</li> <li>Permissible hours of work</li> <li>any limitations on high noise generating activities</li> <li>Location of nearest sensitive receivers</li> <li>Construction employee parking areas</li> <li>Designated loading/unloading areas and procedures</li> <li>Site opening/closing times (including deliveries)</li> <li>Environmental incident procedures.</li> </ul>	Contractor	Construction
N4	Noise and vibration	<p>Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.</p> <p>Any variations to the standard construction hours will follow the approach RTA Environmental Facts Sheet - Noise Management and Night Works, including consultation with the affected local community</p>	Contractor	Construction
N5	Noise and vibration	<p>Where reasonable and feasible, high noise generating activities (75dB(A)<math>L_{eq}</math> at receiver) be used during standard construction hours and in continuance blocks of no more than three hours with at least one hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same receiver.</p>	Contractor	Construction
N6	Noise and vibration	<p>Where high noise generating activities (75 dB(A) <math>L_{eq}</math> at receiver) are required out of hours the following will be implemented:</p> <ul style="list-style-type: none"> <li>The equipment will be used prior to 10pm where reasonable and feasible</li> <li>Where the above cannot be achieved the equipment will be used prior to</li> </ul>	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>midnight where reasonable and feasible</p> <p>It is not proposed to apply a three hour on and a one hour off respite approach in an effort to ensure that the use of such equipment is completed as early in the night as possible.</p>		
N7	Noise and vibration	Where properties have been identified for architectural treatment and these properties would be impacted by noise from construction works, Roads and Maritime would consult with those property owners on the early installation of treatments to provide noise mitigation during the construction of the proposal.	Roads and Maritime	Pre-construction
N8	Noise and vibration	<p>The following will be implemented for deliveries the and from the proposal</p> <ul style="list-style-type: none"> <li>• Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.</li> <li>• Dedicated loading/unloading areas to be shielded if close to sensitive receivers.</li> <li>• Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.</li> </ul> <p>Construction sites would be arranged to limit the need for reversing associated with regular/repeatable movements</p>	Contractor	Construction
N9	Noise and vibration	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.	Contractor	Construction
N10	Noise and vibration	The noise associated with the operation of construction ancillary facilities would primarily result from the operation of fixed and mobile plant and truck movements. Consideration would be given to the layout of the site in order to maximise distance and shielding to nearby receivers.	Contractor	Pre-construction and Construction
N11	Noise and vibration	Where practicable, work should be scheduled to avoid major student examination periods such as before or during Higher School Certificate and at the end of higher education semesters.	Contractor	Construction
N12	Noise and vibration	At compound sites, consider positioning site sheds, earth bunds and hoarding to maximise shielding to residential receivers	Contractor	Construction
N13	Noise and	In circumstances where the noise levels are predicted to exceed construction	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
	vibration	<p>noise management levels after implementation of the general work practices, additional mitigation measures are required.</p> <p>These measures include the following:</p> <ul style="list-style-type: none"> <li>• Monitoring</li> <li>• Notification (letterbox drop or equivalent)</li> <li>• Specific notifications</li> <li>• Phone calls</li> <li>• Individual briefings</li> <li>• Respite Offers</li> <li>• Respite Periods</li> <li>• Duration Respite.</li> <li>• Alternative Accommodation</li> </ul>		
N14	Noise and vibration	Vibration intensive equipment size would be selected to avoid working within the structural damage minimum working distances The use of less vibration intensive methods of construction or equipment would be considered where feasible and reasonable.	Contractor	Construction
N15	Noise and vibration	Where the use of vibration intensive equipment within the relevant minimum working distances cannot be avoided, prior to the commencement of vibration intensive work, a detailed inspection will be carried out and a written and photographic report prepared to document the condition of buildings and structures within the minimum working distances. A copy of the report will be provided to the relevant land owner or land manager.	Contractor	Pre-Construction
N16	Noise and vibration	To confirm that the noise level targets are achieved, a post-construction noise monitoring program be carried out in accordance with the Noise Mitigation Guideline (Roads and Maritime 2014d).	Roads and Maritime	Operation
B1	Aboriginal heritage	A total of 16 Aboriginal archaeological sites, detailed in Table 6-37 will be impacted by the proposal. Roads and Maritime should apply for an 'all of area' AHIP for land to be impacted by the proposal (the 'AHIP area' shown on Figure 38 of Appendix E). This AHIP will allow impacts to these sites.	Roads and Maritime	Detailed design / pre-construction
B2	Aboriginal heritage	Impacted open artefact site Singleton Bypass OAS19 (37-6-3903, 37-6-1466 and 37-6-1468) has been assessed as being of moderate scientific significance and	Roads and Maritime	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		will be partially impacted by the proposal. To mitigate the impact of the proposal on this site, an archaeological salvage program incorporating surface collection and excavation is recommended for the impacted portion of this site. Salvage activities within OAS19 can only occur after an AHIP has been obtained and should be completed in accordance with the research design and methodology provided in Appendix F of AECOM's AAR.		
B3	Aboriginal heritage	Impacted open artefact sites Singleton Bypass OAS2 (37-6-3895), OAS7 (37-6-3889), OAS9 (37-6-3887), OAS10 (37-6-3886), OAS11 (37-6-3892), OAS12 (37-6-3891), OAS13 (37-6-3900), OAS15 (37-6-3898), OAS17 (37-6-3905), OAS18 (37-6-3904), McDougall Hill 2 (37-6-0789) and McDougall Hill 3 (37-6-0788) have been assessed as being of low scientific significance. Regardless, in recognition of their cultural significance, community collection is recommended for these sites, with collection to be limited to the impacted portion of each site. Community collection can only occur after an AHIP has been obtained from OEH and should be completed in accordance with research design and methodology provided in Appendix F of AECOM's AAR.	Roads and Maritime	Detailed design
B4	Aboriginal heritage	Impacted subsurface artefact scatter sites Singleton Bypass OAS21 and OAS22 have been assessed as being of low scientific significance. No further management or mitigation actions are recommended for these sites.	Roads and Maritime	Detailed design
B5	Aboriginal heritage	<p>Should the requirement for impacts to AHIMS registered potential Aboriginal scarred tree 37-6-0681 be confirmed during the detailed design or construction phases of the proposal, a qualified arborist should be engaged to undertake a removal/relocation feasibility assessment of the tree. Subsequent mitigation will depend on the results on this assessment, as follows:</p> <ul style="list-style-type: none"> <li>• Should the engaged arborist determine that 37-6-0681 is not suitable for relocation (i.e., due to the health of the tree and/or other factors), a detailed archival recording of the tree and its associated scars should be undertaken by a qualified archaeologist. A minimum of one RAP field representative will be invited to participate in the archival recording.</li> <li>• Should the engaged arborist determine that 37-6-0681 is suitable for removal/relocation, the relocation procedure outlined in section 10.1 of Appendix E should be employed.</li> </ul>	Contractor	Detailed design / pre-construction



No.	Impact	Environmental safeguards	Responsibility	Timing
		All RAPs should be given the opportunity to review and comment on the arborist's relocation assessment report and if required, the removal methodology (including equipment), keeping place and ongoing access arrangements.		
B6	Aboriginal heritage	Ten Aboriginal archaeological sites, listed in Table 6-37, will not be impacted by the proposal and should be conserved in situ. The protection of these sites to be retained and those sites identified for partial impact will occur in accordance with the measures outlined in the adopted Aboriginal Heritage Management Plan.	Contractor	Detailed design / pre-construction
B7	Aboriginal heritage	Cultural Site A: Gathering Place (Railway Bridge Camps) will be partially impacted by the proposal. Protective fencing should be erected between the zone of construction activity and the unimpacted area(s) of this site prior to any construction activities, with the unimpacted area(s) of the site to be clearly marked on all operational maps as 'no go zones' of environmental and heritage sensitivities. The location of the fencing at Cultural Site A: Gathering Place (Railway Bridge Camps) should be confirmed by a cultural heritage values consultant to ensure that it accurately reflects the mapped site. Fencing should be maintained throughout the duration of works	Contractor	Pre-construction
B8	Aboriginal heritage	An Aboriginal Heritage Management Plan (AHMP) will be prepared and implemented as part of the CEMP. The AHMP will provide specific guidance on measures and controls to be carried out to avoid and mitigate impacts on Aboriginal cultural heritage during construction. This will include protection measures to be applied during construction, as well as contractor training in general Aboriginal cultural heritage awareness and management of Aboriginal heritage values. Site locations will be identified in the proposal's CEMP and marked as environmentally sensitive areas or no-go zones.	Contractor	Detailed design / pre-construction
B9	Aboriginal heritage	All relevant staff and contractors working on site are to receive training to ensure awareness of the requirements of the AHMP and relevant statutory responsibilities. Site-specific training is to be given to personnel when working in the vicinity of identified Aboriginal heritage sites.	Contractor	Pre-construction
B10	Aboriginal heritage	In the event that construction works within the study area uncover any unexpected Aboriginal objects, the relevant provisions of Roads and Maritime's Standard Management Procedure for Unexpected Heritage Items (Roads and Maritime,	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		2015) should be followed		
B11	Aboriginal heritage	<p>A project specific Aboriginal cultural heritage interpretation plan will be developed to promote understanding and awareness of the cultural heritage values of the study area. The strategy should be prepared in accordance with Roads and Maritime's draft Heritage Interpretation Guideline (2016) in consultation with the RAPs and identified Aboriginal knowledge holders. The Aboriginal heritage interpretation project plan will include:</p> <ol style="list-style-type: none"> <li>Interpretative signage (or similar) relevant to Cultural Site A: Gathering Place (Railway Bridge Camps) and how it sits within the wider cultural landscape. The content of the signage is to be developed by a cultural heritage specialist in consultation with the identified Aboriginal knowledge holders.</li> <li>Opportunities for input into (aesthetic) design elements of the proposal such as noise walls, bridge piers or abutments to include the interpretation of the Aboriginal cultural values of the area.</li> <li>Provisions for rehabilitation and revegetation of the impacted portion of Cultural Site A: Gathering Place (Railway Bridge Camps) with local Indigenous plant species. The identification of the plant species should be undertaken in consultation with the identified Aboriginal knowledge holders. Opportunities should be provided to local Aboriginal organisations for involvement and potential engagement in the revegetation and landscaping process.</li> </ol>	Roads and Maritime	Detailed design / pre-construction
B12	Aboriginal heritage	<p>An educational booklet (or similar) would be developed by a cultural heritage specialist on the cultural values and historical records relating to the broader cultural landscape of which Cultural Site A: Gathering Place (Railway Bridge Camps) is one element. As part of this process the photographic recording of the cultural landscape should occur prior to any construction impacts. The final content of the booklet (or similar) to be developed in consultation with the RAPs and identified Aboriginal knowledge holders. To assist in the production of the recommended educational booklet, photographic recording of the cultural landscape by a cultural values specialist at Cultural Site A: Gathering Place (Railway Bridge Camps) should occur prior to any construction impacts.</p>	Roads and Maritime	Detailed design / Pre-construction
B13	Aboriginal	In accordance with Requirement 16B of the Code of Practice, all stone artefacts	AECOM / Roads	Detailed design / Pre-

No.	Impact	Environmental safeguards	Responsibility	Timing
	heritage	recovered from the proposal area as part of the test excavation program detailed in the AAR is to be stored temporarily at AECOM's head office (Level 8, 420 George Street, Sydney) while options for their long term management are being investigated, as determined through consultation with RAPs. Requirement 26 of the Code of Practice provides standard procedures for the deposition of stone artefacts dealt with under AHIPs and the Code of Practice. These procedures will be strictly adhered to.	and Maritime	construction
B14	Aboriginal heritage	Any Aboriginal objects removed from the study area as a result of test excavation and salvage activities authorised by the Code of Practice or an AHIP should be reburied upon completion of all post-excavation analyses, with the location of the reburial to be determined in consultation with RAPs	Roads and Maritime	Construction
H1	Non-Aboriginal Heritage	<p>A heritage management plan should be produced and included with in the Construction and Environment Management Plan measures to manage the identified heritage items in relation to the proposed works, including:</p> <ul style="list-style-type: none"> <li>• Heritage protection measures.</li> <li>• An induction program for construction personnel on the management of non-Aboriginal heritage values.</li> <li>• Procedures to be implemented if previously unidentified non-Aboriginal relics or heritage items are discovered during construction, in accordance with the Roads and Maritime's Standard Management Procedure - Unexpected Archaeological Finds.</li> </ul>	Contractor	Construction
H2	Non-Aboriginal Heritage	<p>If the use of vibration intensive plant cannot be avoided within the minimum working distance for cosmetic damage the following procedure would occur as a minimum:</p> <ul style="list-style-type: none"> <li>• Notification of the works to the affected residents and community</li> <li>• Works would not proceed until attended vibration measurements are undertaken. Vibration monitors are to provide real-time notification of exceedances of levels approaching cosmetic damage criteria.</li> </ul> <p>If ongoing works are required a temporary relocatable vibration monitoring system would be installed, to warn operators (via flashing light, audible alarm, short message service (SMS) etc) when vibration levels are approaching the cosmetic</p>	Contractor	Detailed design and Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		damage objective.		
H3	Non-Aboriginal Heritage	Singleton Council should be informed of the proposed impacts to heritage items and their records relating to the corresponding LEP listings should be updated accordingly.	Roads and Maritime	Construction
H4	Non-Aboriginal Heritage	Should any heritage items, archaeological remains or potential relics of Non-Aboriginal origin be encountered, then construction work that might affect or damage the material will cease and notification provided to Roads and Maritime's as per Roads and Maritime Standard Management Procedure - Unexpected Archaeological Finds. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction
H5	Non-Aboriginal Heritage	Roads and Maritime will investigate the need to salvage heritage fabric from listed items removed by the proposal for possible reuse in heritage reinterpretation in consultation with Singleton Council.	Roads and Maritime	Detailed design
H6	Non-Aboriginal Heritage	An archival recording of the Former Pumping Station (I21) will be prepared prior to the removal of the item. The recording will be prepared in accordance with guidelines published by the Heritage Division, Department of Premier & Cabinet.	Contractor	Construction
H8	Non-Aboriginal Heritage	Prior to ground disturbance impacts at the Former Pumping Station (I21), a permit under Section 140 of the <i>Heritage Act 1977</i> would be obtained given the potential for archaeological relics at this location.	Roads and Maritime / Contractor	Detailed design / Construction
A1	Air quality	<p>An Air Quality Management Plan will be prepared and implemented as part of the CEMP. The Plan will identify:</p> <ul style="list-style-type: none"> <li>• Potential sources of air pollution (such as dust, vehicles transporting waste, plant and equipment) during construction</li> <li>• Air quality management objectives consistent with any relevant published EPA and/or DPIE guidelines</li> <li>• Mitigation and suppression measures to be implemented, such as spraying or covering exposed surfaces, provision of vehicle clean down areas, covering of</li> </ul>	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>loads, street cleaning, use of dust screens, maintenance of plant in accordance with manufacturer's instructions</p> <ul style="list-style-type: none"> <li>• Methods to manage works during strong winds or other adverse weather conditions</li> <li>• A progressive rehabilitation strategy for exposed surfaces</li> <li>• When the air quality, suppression and management measures need to be applied, who is responsible, and how effectiveness will be assessed.</li> <li>• Community notification and complaint handling procedures</li> </ul>		
A2	Air quality	As part of the AQMP, a monitoring program would be developed for monitoring construction dust from the proposal. The monitoring plan would be implemented prior to construction and during the construction period to assess effective implementation of air quality safeguards, identify any unexpected or inadvertent impacts, and identify recommended revisions or improvements.	Construction contractor	Construction
LV1	Landscape and visual	All plant material to be locally sourced (seed collection preferred), with any seed collection to commence within three months of construction contract award, where possible.	Roads and Maritime	Detailed design
LV2	Landscape and visual	<p>An Urban Design Plan will be prepared as part of the CEMP. The Plan will include:</p> <ul style="list-style-type: none"> <li>• Location and identification of vegetation in the proposal area to be retained and proposed landscaped areas</li> <li>• Details of the staging of built elements including retaining walls, bridges and noise walls</li> <li>• Details of the staging of landscape works</li> <li>• Maintenance measures for landscaped or rehabilitated areas, including timings</li> <li>• A landscape monitoring program including an inspection program with frequency.</li> </ul>	Construction contractor	Pre-construction
P1	Property acquisition	Property acquisition will be carried out in accordance with the <i>Land Acquisition Information Guide (Roads and Maritime, 2014)</i> and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Roads and Maritime	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
P2	Property acquisition	Roads and Maritime will complete property adjustments including fencing, driveways/access and other property infrastructure impacted by the proposal in consultation with affected property owners.	Roads and Maritime	Detailed design
P3	Property acquisition	Roads and Maritime will investigate the possibility of licencing land beneath the bridge to impacted landholders to enable continued access for fragmented properties.	Roads and Maritime	Detailed design
SE1	Social and economic	Landowner surveys will be carried out to: <ul style="list-style-type: none"> <li>• Gather information about the current use and activities carried out on their property</li> <li>• Identify how the proposal would affect ongoing land use and activities on their property</li> <li>• Inform the development of appropriate mitigation measures.</li> </ul>	Roads and Maritime	Detailed design
SE2	Social and economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to ensure provision of timely and accurate information to the community during construction. The CP will include (as a minimum): <ul style="list-style-type: none"> <li>• Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions</li> <li>• Contact name and number for complaints</li> <li>• How the project webpage will be maintained for the duration of the proposal.</li> <li>• Minimum consultation activities to be carried out</li> <li>• A complaints handling procedure.</li> </ul>	Roads and Maritime / construction contractor	Detailed design and construction
SE3	Social and economic	Roads and Maritime will develop a signage strategy for the entrances to Singleton, in consultation with Singleton Council to encourage motorists to visit Singleton. This will include signage showing: <ul style="list-style-type: none"> <li>• The travel distances and estimated times for travelling routes via the bypass compared to travelling via the Singleton town centre</li> <li>• Services and facilities available within the Singleton township</li> <li>• Any visitor attractions within the Singleton township</li> </ul>	Roads and Maritime	Detailed design
SE4	Social and	Roads and Maritime will engage with Singleton Council and local businesses	Roads and	Detailed design and

No.	Impact	Environmental safeguards	Responsibility	Timing
	economic	regarding the progress of the proposal to allow businesses time to prepare for changed traffic conditions through the town.	Maritime	construction
M1	Resource use	Use of recycled-content materials would be considered during the detailed design.	Roads and Maritime	Detailed Design
M2	Construction waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will provide specific guidance on measures and controls to be implemented to support minimising the amount of waste produced and appropriately handle and dispose of unavoidable waste.</p> <p>The WMP will include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>• Measures to avoid and minimise waste associated with the project.</li> <li>• Classification of wastes generated by the project and management options (re-use, recycle, stockpile, disposal).</li> <li>• Classification of wastes received from off-site for use in the project and management options.</li> <li>• Identifying any statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions.</li> <li>• Procedures for storage, transport and disposal.</li> <li>• Monitoring, record keeping and reporting, including any documentation management obligations arising from resource recovery exemptions.</li> </ul> <p>The WMP would be prepared taking into account the <i>Roads and Maritime Environmental Procedure – Management of Wastes on Roads and Maritime Services Land</i> and relevant Roads and Maritime Waste Fact Sheets.</p>	Construction contractor	Pre-construction and construction
M3	Construction waste	<p>The following resource management hierarchy principles will be followed:</p> <ul style="list-style-type: none"> <li>• Avoid unnecessary resource consumption as a priority.</li> <li>• Avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery).</li> <li>• Disposal will be a last resort (in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>).</li> </ul>	Construction contractor	Pre-construction and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
CC1	Climate change	Construction equipment, plant and vehicles will be appropriately sized for the task, serviced frequently and will not be left idling when not in use.	Construction	Construction
R1	Hazard and risk	Emergency response plans will be incorporated into the construction environmental management plan.	Construction contractor	Pre-construction and construction
R2	Hazard and risk	<p>A Hazard and Risk Management Plan will be prepared and implemented as part of the CEMP. The Plan will identify:</p> <ul style="list-style-type: none"> <li>• Details of hazards and risks associated with the activity</li> <li>• Measures to be implemented during construction to minimise these risks</li> <li>• Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials</li> <li>• A monitoring program to assess performance in managing the identified risks, including "equipment checking and maintenance requirements contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations."</li> </ul>	Construction contractor	Pre-construction and construction



## 7.3 Licensing and approvals

A summary of notification, licences and approvals required for the proposal, prior to construction or the start of certain activities, are outlined below in Table 7-2.

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Protection of the Environment Operations Act 1997 (s43)</i>	Environment protection licence (EPL) for scheduled activities from the EPA.	Prior to start of the activity.
<i>Fisheries Management Act 1994 (s199)</i>	Notification to the Minister for Primary Industries prior to any dredging or reclamation works.	A minimum of 28 days prior to the start of work.
<i>Fisheries Management Act 1994 (s219)</i>	Permit to obstruct the free passage of fish (temporary or permanent) from the Minister for Primary Industries.	Prior to start of the activity.
<i>National Parks and Wildlife Act 1974 (s90)</i>	Aboriginal heritage impact permit from the Chief Executive of Heritage Division, Department of Premier & Cabinet.	Prior to start of the activity.
<i>Crown Lands Act 1989 (s6)</i>	Licence to occupy areas of Crown land.	Prior to start of the activity
<i>Heritage Act 1977</i>	Section 140 excavation permit for ground disturbance impacts at the Former Pumping Station (I21).	Prior to start of the activity.