CHAPTER

27

Environmental Management Plan

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

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27.1 Environmental Management Plan

27.1.1 Purpose of the Environmental Management Plan

The Environmental Management Plan (EMP):

- Provides an outline environmental management framework to ensure that reasonable environmental outcomes are achieved for construction and commissioning of the North Star to NSW/Queensland border (NS2B) project (the proposal).

The EMP is a controlled document. It may be updated as a result of:

- Progression of the proposal
- Continuous improvements and corrective actions
- Changes to legislation, regulations or proposal approvals.

27.1.2 Structure of the Environmental Management Plan

The EMP:

- Introduces and outlines key elements of the proposal
- Describes the proposal and proponent respectively
- Discusses the EMP's relationship with the regulatory environment, Inland Rail EMPs and principles, and other management plans specific to the proposal
- Sets out how the EMP will be implemented
- Lists outcomes the proposal will achieve and the environmental mitigation measures to be applied during specific phases of the proposal.

27.2 Introduction

This EMP supports the Australian Rail Track Corporation's (ARTC) proposal to develop the North Star to NSW/Queensland border section of Inland Rail. The proposal is one of the three 'missing link' projects in NSW associated with the Inland Rail.

This EMP summarises the potential environmental impacts identified during the assessments conducted for the EIS. It also establishes the frameworks, and proposes measures to avoid, mitigate and manage adverse impacts during the construction, operation and decommissioning phases of the proposal.

27.3 The proponent

ARTC was created in 1997 after the Australian and state governments agreed to the formation of a 'one stop shop' for all operators seeking to access the national interstate rail network.

Since their formation, ARTC has focused on infrastructure investment and the modernisation of the interstate rail network. This has extended to building and upgrade of existing track to allow for the capacity that the interstate market and Hunter Valley coal chain require.

Today, ARTC plays a critical role in the transport supply chain and in the overall economic development of Australia. The ARTC network supports industries and businesses that are vital to the nation's economy by facilitating the movement of a range of commodities, including general freight, coal, iron ore, other bulk minerals and agricultural products. Across the network, ARTC is responsible for:

- Selling access to train operators
- Developing new business
- Capital investment in the network
- Managing the network
- Infrastructure maintenance.

As the operator and manager of Australia's national rail freight network, ARTC has successfully delivered more than $5 billion in capital upgrades to the national rail freight network. Having emerged from this period of significant investment and network growth, ARTC has now been tasked with developing a program to deliver Inland Rail under the guidance of the Department of Infrastructure, Regional Development and Cities.

Further information on ARTC can be found at: artc.com.au.

27.4 Proposal overview

The proponent is seeking approval to construct and operate the proposal. The proposal follows the existing, non-operational Boggabilla rail corridor from a point approximately 900 m north of North Star, for approximately 25 km towards Whalan Creek. The proposal then continues along a 5 km section of greenfield rail corridor between Whalan Creek and the Macintyre River. The NSW/QLD border is defined by the centre point of the Macintyre River.

The proposal will pass through agricultural land and rural properties of northern NSW and presents the opportunity to reduce the level of interaction between the rail line and existing road crossings to improve safety and operational outcomes. The proposal consists of the key features listed in Table 27.1.

TABLE 27.1 KEY FEATURES OF THE PROPOSAL

Aspect	Description
New track	▸ Approximately 25 km of new track within the existing non-operational Boggabilla rail corridor ▸ Approximately 5 km of new track within a greenfield rail corridor.
Crossing loop, maintenance siding and turnouts	▸ One crossing loop, designed to accommodate trains up to 1,800 m long ▸ Turnouts will be provided on either end of the crossing loop to allow trains to be guided from one track to another ▸ A one-ended siding (approximately 250 m long) will be incorporated into the crossing loop for maintenance purposes. It will be connected to the southern end of the crossing loop via a low-speed turn out.
Bridges	▸ Eleven new bridges ▸ This includes an approximately 1.8 km-long viaduct over the Macintyre River and Whalan Creek, which are major watercourses. The viaduct is located in both NSW and Queensland; therefore, potential impacts will be assessed under the *Environmental Planning and Assessment Act 1979* (NSW) by this EIS, and under the *State Development and Public Works Organisation Act 1971* (Qld) by the Inland Rail Border to Gowrie project EIS.
Drainage	▸ Reinforced concrete pipe culverts and reinforced concrete box culverts ▸ Scour protection measures will generally be installed around culverts to prevent erosion ▸ Embankment and catch drains adjacent to the proposed alignment to divert surface runoff to the nearest bridge or culvert location.
Road–rail interfaces	▸ Work on new and existing non-operational level crossings (within the existing non-operational Boggabilla rail corridor) ▸ Signalling and communications infrastructure.
Road realignments	▸ Minor realignment of Bruxner Way near where the proposal transitions from the existing non-operational Boggabilla rail corridor to the greenfield rail corridor.
Earthworks	▸ To achieve flood immunity, the majority of the proposal is elevated on a fill embankment. The embankment height is typically less than 2 m; however, in the lead up to the Macintyre River Viaduct, the height increases to approximately 7.5 m ▸ No significant cuttings (> 10 m) are proposed.
Ancillary works	▸ Ancillary infrastructure including utilities, signalling and communications infrastructure, fencing and signage.

Train services are not expected to commence until all 13 sections of Inland Rail are complete, which is planned to be after 2025.

The proposal will be trafficked by an estimated 14 trains per day in 2025, increasing to an estimated 21 trains per day in 2040. Annual freight tonnages will increase in parallel, from approximately 12 million tonnes per year in 2025 to 20 million tonnes per year in 2040.

The new track is designed to support double-stacked, 21 to 25 tonne axle load intermodal (i.e. container) trains up to 1,800 m long and 6.5 m high. Tonne axle load refers to the total weight felt by the track due to passing trains. Depending on the tonne axle load, train speeds will vary between 80 kilometres per hour (km/hr) and 115 km/hr. In addition, the new track is future-proofed to accommodate 30 tonne axle load intermodal trains up to 6.5 m high travelling at 80 km/hr.

27.4.1 Pre-construction and construction

The construction of the proposal will include several stages and activities and will consist of key features listed in Table 27.2.

Subject to approval of the proposal, construction of the proposal is planned to occur between 2021 and 2025.

TABLE 27.2 KEY FEATURES OF CONSTRUCTION OF THE PROPOSAL

Aspect	Description
Construction works	▸ The main construction works will primarily consist of earthworks, track works, drainage works, bridge works and road works ▸ Utility diversions and adjustments.
Land	▸ The temporary construction footprint encompasses land needed to construct the proposal, including borrow pits ▸ Temporary laydown areas will be established at regular intervals along the alignment ▸ Temporary access tracks will be used to access construction sites. Where possible they will be retained to serve as rail maintenance access roads during the operation phase of the proposal.
Materials	▸ Significant material requirements for the proposal include general and structural fill, steel rails, ballast, water, precast concrete sleepers and precast bridge and culvert elements ▸ Eleven borrow pits with the potential to provide general fill, structural fill, ballast and/or capping have been identified ▸ Subject to availability, capping and ballast could be sourced from local, licenced quarries.
Schedule	▸ Construction is expected to occur between 2021 and 2025.
Hours of construction	▸ The primary hours of construction will be 6.30 am to 6.00 pm on Monday–Sunday; however, extended working hours would be considered permissible if there are no nearby sensitive receptors, or if negotiated agreements have been reached with sensitive receptors ▸ Blasting may be required, blasting would generally only be permitted between the hours of 9:00 am to 5:00 pm, Monday to Saturday. Blasting would not occur on Sundays or public holidays and would generally only be permitted once per day.
Workforce	▸ The construction workforce is expected to peak at approximately 350 workers in Q3 2022 ▸ A construction facility is proposed in North Star to house the construction workforce.

27.4.2 Reinstatement and rehabilitation

A Reinstatement and Rehabilitation Plan will be developed prior to the completion of construction activities for the management of land that is not required for the operations phase.

Rehabilitation will be undertaken as construction areas become available and will include the following activities:

- Demobilise site compounds and facilities
- Remove all materials, waste and redundant structures from the works sites
- Forming and stabilising of spoil mounds, where required
- Decommission all temporary worksite signs
- Remove temporary fencing
- Establish permanent fencing, where needed
- Decommission site access roads that are no longer required
- Restoration of disturbed areas as required, including revegetation where required.

On removal of offices, laydowns and stockpiles, topsoil and available mulch will be spread over the area and seeding will be undertaken in accordance with the Reinstatement and Rehabilitation Plan.

Access roads and tracks that will no longer be used will be rehabilitated by restoring natural contours, hydrology, and vegetation through mechanical and/or natural means.

Some sediment and erosion control measures will be left in place until areas are stabilised.

27.4.3 Commissioning

Testing and commissioning (checking) of the rail line and communication/signalling systems will be undertaken to ensure that all systems and infrastructure are designed, installed and operating according to ARTC's operational requirement.

27.5 Corporate governance and policies

27.5.1 ARTC corporate policies and values

ARTC's system of corporate governance comprises corporate policies and core values. This governance system applies to all works associated with Inland Rail. All works associated with Inland Rail will be completed in accordance with the following ARTC corporate policies:

- *Inland Rail Environment and Sustainability Policy* (inlandrail.artc.com.au/13269/documents/85996)
- *ARTC Environmental Policy* (artc.com.au/library/Environmental%20Policy.pdf)
- *ARTC Safety Policy* (artc.com.au/work/contractors/safety-policy).

ARTC's core values are as follows:

- No Harm
  In our world, safety is everything. We care about our people, environment and communities. It does not matter how big or small, doing things safely means doing things right.
- Future Thinking
  Future thinking is in our DNA. It is how we innovate, change the game and break through challenges and barriers. We are leaders who think differently; curious and skilful, we challenge the status quo.
- Active Engagement
  We care about what matters and we're committed to the success of our customers, stakeholders and employees. We ask questions, listen and respond to needs. We're always on the front foot and actively engaged.
- Results
  We deliver results. We're driven by results because they lead to progress. Determined to make rail the mode of choice for freight, we work together to achieve personal, organisational and industry-wide results.

27.5.2 **ARTC's Environmental Management** System

The proposal will be operated in accordance with ARTC's environmental management system. The ARTC environmental management system (EMS) is a structured framework for the consideration, evaluation, management and regulatory compliance with, and reporting of, environmental issues associated with ARTC's business activities.

27.5.3 Inland Rail Environmental Management System

As Inland Rail covers multiple jurisdictions, consistent management of potential impacts to environmental, heritage, social and economic values is critical to the proposal's success. ARTC's Inland Rail EMS consists of strategies, programs, frameworks, policies, procedures and management plans that have been developed to manage ARTC's environmental programs in a comprehensive, systematic, planned and documented manner. It also includes the organisational structure, planning and resources for developing, implementing and maintaining policy for environmental protection.

The Inland Rail EMS adopts relevant elements of ARTC's corporate EMS, which has been supplemented by specific components and tools to manage the planning, construction and operation of the Inland Rail project. The EMS also covers environmental incident reporting and investigation requirements. The EMS philosophy for Inland Rail is illustrated in Figure 27.1.

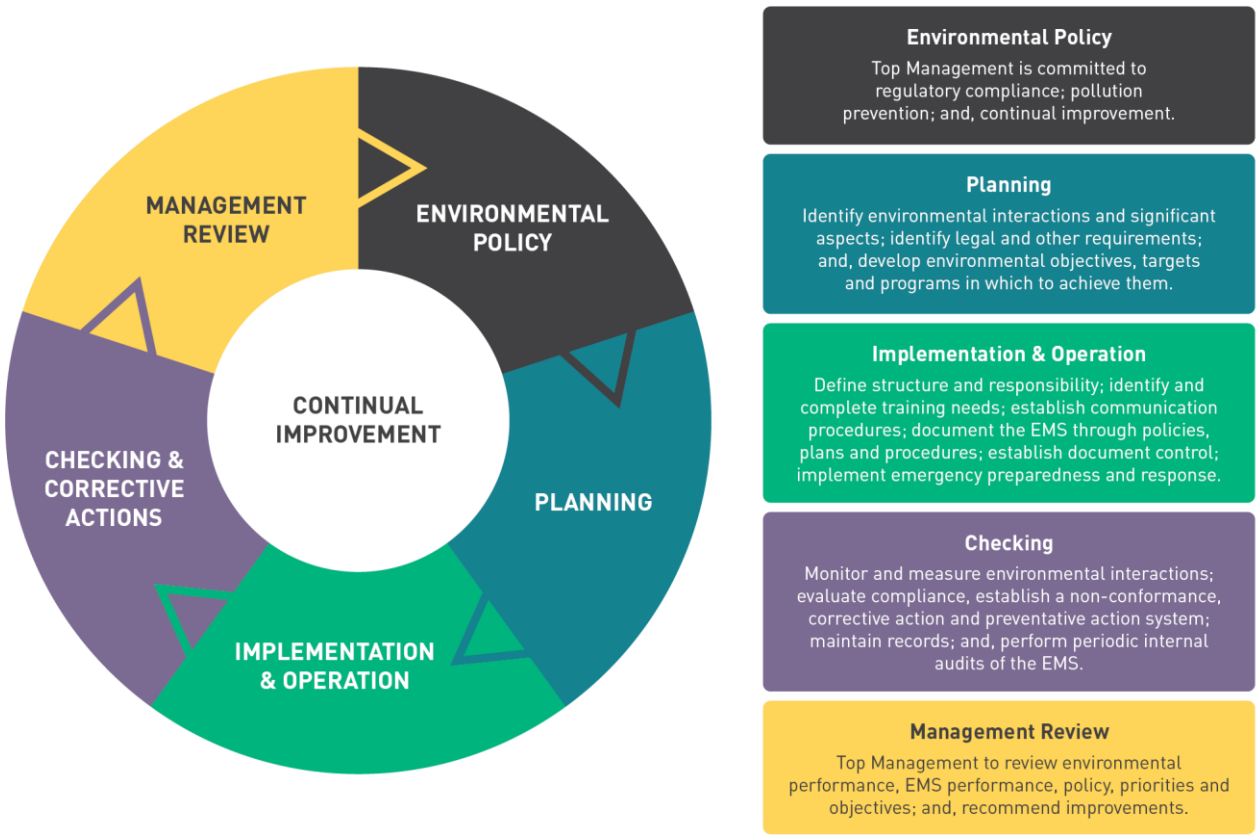

FIGURE 27.1 ENVIRONMENTAL MANAGEMENT SYSTEM PHILOSOPHY FOR INLAND RAIL ENVIRONMENT AND SUSTAINABILITY POLICY

The *Inland Rail Environment and Sustainability Policy* (ARTC, 2018a) outlines sustainability objectives, targets and commitments for the proposal. This includes the implementation of a Sustainability Management Plan and the pursuit of an 'excellent' rating against version 1.2 of the Infrastructure Sustainability Council of Australia's rating scheme.

The proposal is not currently registered for a design rating; however, during the feasibility design phase, the proposal has demonstrated progress toward achieving a minimum design rating of 60, which is an 'excellent' rating under version 1.2 of the IS rating scheme (ISCA,2017).

The sustainability commitments embedded into the *Inland Rail Environment and Sustainability Policy*, supported by identified targets for Inland Rail Program as part of the sustainability strategy, have guided the proposal's approach to sustainability and are summarised in Table 27.3.

TABLE 27.3 INLAND RAIL SUSTAINABILITY COMMITMENTS AND THE APPLICATION OF THESE ON THE PROPOSAL

Sustainability commitments	Application to the proposal
No Harm: ▸ Our goal is that no-one is harmed at work or on our network.	▸ Health and Community Wellbeing—within the Social Impact Management Plan (SIMP), a Health and Community Wellbeing Action Plan will be developed, creating a safe environment, developing programs and initiatives to improve safety outcomes to local communities and ensuring ongoing engagement. ▸ Crime Prevention through Environmental Design—incorporating measures in design, construction and operation that reduce the likelihood of damage and injury to people and property and the impact these have on local communities and investigating the opportunity for designing temporary construction diversions and lighting to meet Crime Prevention through Environmental Design guidance.

Sustainability commitments	Application to the proposal
Engage early and meaningfully with stakeholders, including Indigenous organisations, communities, industry and government: ▸ Build effective working relationships and a shared understanding of the program and solutions.	▸ Community and Stakeholder Engagement—encouraging, planning, implementing and monitoring stakeholder and community engagement in accordance with the SIMP—Community and Stakeholder Engagement Action Plan. ▸ Heritage—recognising the role that engagement with the Indigenous and non-Indigenous community has in the identification of heritage items and values.
Promote long-term economic benefits within regional communities: ▸ Create lasting opportunities for development of skilled local and Indigenous workers ▸ Support local and Indigenous businesses to ensure they are prepared for and provided with opportunities to participate ▸ Enable Inland Rail to be a catalyst for complementary private sector investment.	▸ Procurement—encouraging sustainability throughout the value chain for goods and services used to build and operate Inland Rail ▸ Community and Stakeholder Engagement—encouraging, planning, implementing and monitoring stakeholder and community engagement ▸ Heritage—recognising the role that engagement with the Indigenous and non-Indigenous community has in the identification of heritage items and values and investigating the opportunity to interpret heritage to promote local heritage values. ▸ Community Health and Wellbeing—identification of opportunities to support local economic benefits to local, regional and Indigenous communities ▸ Implement the SIMP and supporting action plans specifically relating to workforce management, housing and accommodation and local business and industry content.
Protect the environment by minimising the environmental footprint: ▸ Apply the principles of avoid, minimise, offset, to manage impacts to receiving environments and ecological values ▸ Reduce greenhouse gas (GHG) emissions and minimise waste ▸ Minimise water use ▸ Continually investigate opportunities to improve environmental values and prevent pollution ▸ Obtain and comply with all relevant environmental approvals and compliance obligations.	▸ Environment—seeking opportunities to reduce the environmental footprint of the proposal ▸ Waste—seeking opportunities to minimise waste generation and to reuse or recycle materials ▸ Energy and carbon—seeking opportunities to reduce the carbon footprint of the proposal through considering construction and operational greenhouse emissions ▸ Water—seeking opportunities to reduce the total amount of water used on the proposal and to identify sources of water that reduce the demand on potable water supplies ▸ Resources and embodied energy—seeking opportunities to reduce the environmental impacts of materials used during construction and operation of the proposal through encouraging dematerialisation of the design and improving the service life of the materials.
Future-proof Inland Rail so it is efficient and effective in the long term: ▸ Design for climate change resilience ▸ Incorporate the future demand requirements and corridor uses in current design.	▸ Climate change—considering climate change impacts and opportunities to reduce the risks to Inland Rail associated with a future climate ▸ Future proofing—considering the future demand requirements to reduce the potential for impacts to the natural and social environment associated with future upgrades to meet increased demand for freight rail.
Base decisions on a balanced consideration of technical, economic, environmental and social issues: ▸ Adopt a consistent approach across the program.	▸ Decision making—consistently considering the environmental, social, local economic and technical impacts during decision making and ensure such considerations are built into the decision-making process.
Regularly review and audit processes and performance: ▸ Challenge the way we have always done things ▸ Ensure we are doing what we said we would do.	▸ Leadership—demonstrating sustainability leadership across the delivery of the Inland Rail Program and at the proposal levels ▸ Management and governance—recognising the importance of monitoring, and review of progress to identify opportunities for continuous improvement ▸ Benefits identification—early identification of the benefits the proposal will bring, so that the promised benefits can be assessed and reviewed during operation.
Drive a culture of continuous improvement: ▸ Seek to improve, collaborate and value add throughout delivery ▸ Continually improve our EMS to enhance environmental performance.	▸ Management and governance—encouraging improvement in the delivery of the proposal and on the promises made to stakeholders and the community ▸ Innovation—reviewing the outcomes from the way things are done to find new and better ways of achieving the desired outcomes.

27.6 Planning and assessment process

The proposal is permitted without consent in accordance with the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) and is subject to assessment under Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

The capital investment value of the proposal is estimated to be over $50 million and, as a result, the proposal is state-significant infrastructure under the Department of Planning. (2011). *State Environmental Planning Policy (State and Regional Development)* (State and Regional Development SEPP). The proposal is therefore subject to approval under Division 5.1 of the EP&A Act.

Other approvals and permits are also required, including approval as a controlled action under the EPBC Act. The requirements under other legislation provided in Chapter 5: Planning and Assessment Process.

If the EIS is considered to meet the SEARs, the Department of Planning, Infrastructure and Environment (NSW) (NSW DPIE) would place the EIS on public exhibition for at least 30 days and invite submissions. The department would provide ARTC with a copy of the submissions and ask ARTC to respond to the issues raised. Following its review of the submissions, ARTC may modify the proposal to minimise impacts on the environment if required and practicable. If the proposal is modified in response to the issues raised, a preferred infrastructure report would be prepared to describe the scope of the revised proposal; otherwise, a submissions report would be prepared. The department would then make the report public.

Following the exhibition period, the NSW DPIE will, on behalf of the Minister for Planning, review the EIS and the submissions/preferred infrastructure report. The department will prepare an assessment report, which is submitted to the Minister for Planning for determination. The Minister may refuse the proposal or approve it with any conditions considered appropriate. The Minister's approval and the assessment report will be published on the NSW DPIE's Major Projects website following determination. Approval under the EPBC Act from the Australian Minister for the Environment and Energy will be advised separately.

Once the proposal receives approval, the approval conditions will be incorporated in the environmental documentation for the construction and operational phases.

27.6.1 Additional approvals

Following approval, the proposal is likely to require additional post-EIS approvals under state environmental and planning legislation. The exact triggers, impacts and permitting requirements for these approvals will not be confirmed until later design stages and the majority of the approvals will be required prior to construction or any ground-disturbing activities.

A summary of the potential post-EIS approvals is provided in Chapter 5: Planning and Assessment Process.

Approval and permit requirements may vary depending on the final design and construction methodology, and future changes in statutory requirements prior to project implementation.

27.7 Roles and responsibilities

There are a number of general responsibilities for all entities involved in the proposal, with respect to the environment. Staff members will be required to comply with the following items at all times:

- Relevant legislation, with particular attention to environmental legislation under this EMP
- EMP requirements including relevant criteria for design, construction and operation
- Planning approval and associated conditions.

27.7.1 ARTC and contractors

At this preliminary stage, an outline of the proposed responsibilities and accountabilities of various parties who would have active roles in implementing the requirements of the EMP are provided in Table 27.4. These preliminary arrangements are subject to further review and negotiation, as these roles and responsibilities will be further refined as contractual arrangements and the delivery model is finalised.

TABLE 27.4 ROLES AND RESPONSIBILITIES—ARTC AND CONTRACTORS

Role	Responsibilities
ARTC	▸ Maintains Inland Rail's EMS and associated environmental procedures ▸ Provides environmental expertise and assistance as required ▸ Monitors the environmental performance and provide regular reports to managers and relevant administering authorities, where required ▸ Identifies, investigates and reports on actual and potential environmental incidents and non-conformances ▸ Ensure relevant agencies are notified of any environmental incidents and maintain a record of events relating to the environmental incidents, including any remedial action taken ▸ Develop and implements corrective and preventive actions to prevent recurrence of incidents and non-conformances ▸ Facilitates and manage the regular review of the Construction Environmental Management Plan (CEMP) and associated documents ▸ Provides environmental and sustainability training to proposals staff and maintains a record of all training undertaken by all construction staff, detailing the type and purpose of the training ▸ Maintains a master copy of the completion of planned actions, monitoring records and reports that are made available during the audits ▸ At this stage, it is expected that ARTC will be responsible for the operational phase of the proposal, subject to the roles and responsibilities of the Construction Contractor and other relevant parties.

Detailed Design Consultant	▸ Implement the requirements of this EMP, as appropriate, during the development of the detailed design
	▸ Liaise with the ARTC about:
	  ▸ Proposal design issues as they affect or potentially affect land use and tenure
	  ▸ Traffic management and pedestrian management during the construction phase, particularly in relation to worksites
	  ▸ The relocation of public utilities.
	▸ Document the environmental design considerations that are incorporated into the detailed design.

Contractor	▸ Prepares, maintains and implements the CEMP ▸ Obtains all necessary statutory approvals and licences and ensures that conditions of licences/ approvals/permits are met and updated into the CEMP ▸ Is responsible for the environmental performance during the construction phase, including responsibility for the effective implementation of this CEMP ▸ Ensures that all construction personnel and subcontractors understand their roles and responsibilities relating to this EMP and that works are conducted in accordance with the contract, design requirements and relevant legislation ▸ Ensures that enough personnel, material and financial resources, including technical resources and support, are provided for the effective implementation of the CEMP and management of environmental aspects of the proposal ▸ Ensures all project staff are competent to undertake their duties including fulfilment of the general environmental duty, by providing for appropriate education, training and experience ▸ Provides relevant and timely information to communities, local businesses and other relevant stakeholders about construction activities, potential impacts and mitigation measures and, as required, consult with residents, businesses, organisations or other individuals that may be impacted directly by construction activities to ensure direct project impacts are being appropriately managed ▸ Ensures that all equipment used is properly serviced and that all precautions are in place to prevent the likelihood of an environmental incident occurring ▸ Take control and manage any environmental incidents and implement any corrective actions that are identified during the incident investigation ▸ Coordinate during environmental emergency situations and allocates required resources, when required

Role	Responsibilities
Contractor	▸ Ensures corrective actions arising from internal and external audits are completed as soon as practical and in accordance with this CEMP ▸ Ensures there is adequate, accurate identification and reporting of any non-conformances and any other environmental issues that may arise during construction ▸ Participates and provide guidance in the regular review of the CEMP and associated documents.
All construction personnel	▸ Have a duty to carry out their work in a manner that does not present a risk to themselves, to others or to the environment ▸ Ensure that they attend the environmental training provided relevant to their role and responsibilities ▸ Carry out all work in accordance with the processes outlined in the CEMP ▸ Comply with the requirements of applicable environmental legislation, including the specific requirements of the proposal approvals and supporting documentation ▸ Report any non-conformances with environmental management, legislative or approval requirements.

27.8 Training and awareness

All proposal personnel will be required to attend an induction session to inform them of their responsibilities under the Construction EMP. Depending on their role, certain proposal personnel may also be required to have or obtain specific qualifications and competencies. Proposal-specific environmental training and refreshers may also be required to ensure proposal personnel have the necessary competency levels to meet their responsibilities.

A training register will be developed that identifies the qualifications, competency levels, proposal specific environmental training courses, refreshers and induction requirements required for different activities/groups of personnel/locations. This register will be used to track the relevant qualifications held by proposal personnel and subsequent completion of induction/training/refreshers sessions.

Short-term visitors to site for purposes such as deliveries will be required to undertake a visitors' induction and be accompanied by inducted personnel at all times.

All employees, contractors and subcontractors will receive an environmental induction, which will include, but not be limited to, the following:

- Relevant conditions of licences/approvals/determinations
- Their duty to notify of environmental harm
- Relevant details of the CEMP including purpose and objectives
- Key environmental issues
- Location of nearest sensitive receivers
- Environmental sensitive areas within and in close proximity to the proposal footprint
- Specific environmental management requirements and responsibilities
- Permissible hours of work
- Construction traffic routes
- Key environmental contacts
- Environmental incident notification procedures
- Dealing with complaints
- Community relations.

The Construction and ARTC Operation Managers will be responsible for ensuring that personnel involved in the proposal, including subcontractors and visitors, have received the environmental training required to ensure they are aware and understand their responsibilities under the CEMP and environmental approvals. The Construction and ARTC Operation Managers will also be responsible for ensuring all supervisory and management staff are aware of and understand their responsibilities under this CEMP.

27.9 Overview of EMP approval process

This EMP has been prepared on the understanding that detailed EMPs for construction and operation as well as relevant sub management plans will be prepared by the Contractor and approved by relevant state agencies. The detailed CEMP and Operational EMP (OEMP) will need to include, but not be limited to, the mitigation measures in this EMP and any conditions of approval.

This EMP outlines the strategies to be adopted to address the identified impacts and recommendations in the EIS.

The purpose of this EMP is to set out the proposal commitments to environmental management, including the identification of environmental aspects to be managed and how environmental values would be protected and enhanced, and identifies mitigation measures relevant to the reference design for the proposal.

Once in place, the CEMP and the OEMP would be dynamic documents. Each would be revised to incorporate further information and public concerns, approval conditions, changes in environmental management procedures, new techniques, and relevant legislative requirements.

The CEMP must be endorsed by ARTC and then submitted to the Secretary of Department of Planning, Industry and Environment for approval no later than one month prior to the commencement of any works, including early works and demolition. The OEMP will be finalised 10 days prior to the commencement of operations and will be communicated to relevant site personnel.

27.10 Monitoring, auditing and reporting

Monitoring, auditing and reporting will be completed to demonstrate compliance with the proposal's environmental approvals and this EMP. This will also include, where required, compliance monitoring of proposal commitments associated with Inland Rail.

27.10.1 Environmental monitoring

Environmental monitoring programs will be developed for the construction and operational phases of the proposal. These monitoring programs will be designed to assess the environmental management, legislative and approvals requirements of the proposal. The monitoring programs will set out the monitoring objectives: parameters, criteria, location, frequency, procedure, recording, reporting and corrective action.

Monitoring will be undertaken during the pre-construction phase to establish baseline conditions, where necessary, during construction and operation. Monitoring activities will be conducted by a person who is suitably trained and qualified. Monitoring will be carried out in accordance with relevant guidelines. All monitoring equipment will be maintained and calibrated in accordance with manufacturers' instructions, which will ensure reliability of equipment and data.

The results of the monitoring programs will be interpreted and reviewed regularly. Where required, monitoring results will be reported to the relevant authorities within agreed timeframes as determined in approval conditions.

27.10.2 Environmental audits

During construction, audits will be completed to verify compliance with all applicable environmental requirements, including the imposed conditions of approval and the CEMP. Auditing will include audits completed by third-party independent consultants and internal audits completed by the construction team. Audits will be conducted by suitably qualified and competent auditors.

Third-party independent audits will be completed annually during the construction period. The internal environmental audits will be conducted periodically and where current site activities are deemed to have a higher risk, audit intervals may be increased (e.g. fortnightly or weekly).

The audits will verify compliance with the following requirements:

- Applicable approval and legislative requirements
- This EMP and any additional and relevant environmental management plans for construction or operation
- Other applicable environmental requirements (e.g. site-specific or operation procedures).

The audit reports will be made available to the relevant regulator as required by conditions of approval or other permits and licences in place.

27.10.3 Environmental reporting

27.10.3.1 Internal reporting

Audit reports will be prepared and will summarise the findings of the audits and include any corrective actions. The audit results, conclusions and corrective actions required will be communicated to those responsible for implementing the corrective actions.

During construction, a report will be prepared on a monthly basis for the construction management team. This report will include the site audit records; monitoring results; training undertaken; initiatives; incident records; details of any corrective and preventive actions taken where non-conformances had been identified; and all non-conformances that have not been closed out.

All staff and contractors will be required to report any environmental incidents (including complaints) or breaches of the approval conditions to their supervisors immediately, who will then involve the Environmental Team who will implement further actions.

27.10.3.2 External reporting

The Construction Contractor will be required to report any environmental incidents or breaches of the approval conditions immediately to an ARTC key representative. Where there is an obligation to report to relevant authorities, this must also occur within the required timeframes.

Where required, external reporting aims to provide timely, relevant and appropriately presented information to government authorities, the local community and the general public on the environmental performance of the proposal.

27.10.4 Non-compliance and corrective actions

A non-conformance and corrective action procedure will be developed for managing non-conformances with this EMP, proposal approvals or legislative requirements. The procedure will be implemented after the identification of non-conformances during site inspections, environmental audits and through other mechanisms, such as the complaints register. The procedures will include:

- Classification of what constitutes non-conformance
- Investigation requirements
- Identification and implementation of corrective and preventative actions
- Assigning adequate resources and timelines for completion of corrective and preventative actions
- Reporting requirements (internally and externally)
- Process for closing out non-conformances
- Requirements for and the maintenance of a non-conformance register
- Processes for the regular review and status of non-conformances.

The non-conformances and corrective actions may trigger the requirement for a review and modification of practices onsite. These changes in onsite work practices should be reflected in amendments to the EMS and EMPs.

27.11 Document control

An adequate document control system will be in place during construction and operations to ensure that only current documentation is in use. The document control and records management system for the construction and operation of North Star to Border will meet the requirements of ARTC's document control procedures.

Records that are applicable to environmental management will be retained for the legally required period of time. Environmental records include but may not be limited to:

- Site inspection checklists
- Environmental audit reports
- Training records
- Monitoring data
- Complaints and associated records of communication
- Meeting minutes.

27.12 Communications

During the construction and operation of the proposal, there will be adequate communication to all construction and operational personnel in relation to environmental management. The Construction Contractor and ARTC will ensure that the general intent, scope and relevance of this EMP are understood by site personnel. To achieve clear and concise environmental management, internal communications extending ARTC to the workforce 'on the ground' is needed. Environmental education and issues for the proposal will be communicated by the following methods:

- Environmental induction programs and training
- Daily toolbox meetings
- Risk workshops
- Management meetings
- Noticeboards
- Environmental incident reports.

The above lines of communication will be subjected to periodic review to ensure that the communication structure is performing adequately.

To ensure clear communication, only proposal staff nominated and approved by ARTC should be involved in consultation with external bodies on environmental issues.

Site personnel are to direct all media and public enquires to the nominated and approved site representative.

27.12.1 Community and stakeholder engagement

Various communication channels are being used to support the different phases of engagement. These channels have been, and will continue to be, instrumental to ensuring information and updates about the proposal are disseminated regularly and feedback from the community and stakeholders is received, recorded in a secure stakeholder management database (Consultation Manager) and escalated internally to assist with the development of the proposal. Stakeholders will also receive a prompt reply to their feedback.

ARTC Inland Rail maintains Consultation Manager to record all consultation undertaken as a part of the EIS consultation process. The database was established in 2015 and will be maintained throughout the remainder of EIS process and into project construction and operations. This central database is used to record stakeholder consultation and monitor and report on enquiries, issues and team responses across all Inland Rail projects.

27.12.1.1 Community engagement

Consultation with the community and key stakeholders will be ongoing in the lead up to, and during, construction building on previous consultation relationships with stakeholders and the community. The consultation activities would ensure that:

- The community and stakeholders have a high level of awareness of all processes and advanced notice of activities associated with the proposal
- Accurate and accessible information is made available
- A timely response is given to issues and concerns raised by the community
- Feedback from the community is encouraged
- Opportunities for input are provided.

The 1800 phone number and proposal email address would continue to be available during construction, along with a 24-hour construction response line.

Targeted consultation methods, such as letters, notifications, signage and face-to-face communications, would continue to occur. The Inland Rail website and social media platforms would also include updates on the progress of the proposal.

The communication tools and activities used for the construction phase would include:

- Development of a communication management plan detailing the complaints-handling process
- Proposal email address
- 1800 phone number
- Updates to the inland Rail website
- Targeted consultation and notifications such as letters, notifications, and face-to-face communication
- Construction signage.

27.12.1.2 Complaints and responses

The Construction Contractor engaged to construct the proposal would be required to implement a complaints management procedure during construction of the proposal. This procedure would be defined within the CEMP, which the contractor would be required to prepare and have approved by ARTC prior to construction commencing.

The complaints management procedure would include, at a minimum:

- Contact details for a 24-hour program response line and email address for ongoing stakeholder contact throughout the proposal
- Provision of accurate public information signs while work is in progress
- Staging of works, developed in consultation with relevant stakeholder groups, to minimise disruptions and impacts to community activities and functions
- Management of complaints in accordance with ARTC's emergency management procedure, specifically:
  - Details of all complaints received will be recorded
  - Verbal and written responses describing what action will be taken will be provided to the complainant within time limits (or as otherwise agreed by the complainant).
- Enquiry management and response times are detailed in Table 27.5.

TABLE 27.5 ENQUIRY MANAGEMENT

Nature of enquiry	Response time
All enquiries	Initial acknowledgement within 24 hours
General or information enquiries	48 hours
Technical enquiries	Up to five working days

27.13 Aspect management mitigation measures

27.13.1 Biodiversity

27.13.1.1 Mitigation measures

Potential impacts and proposed mitigation and management measures for each of the proposal delivery phases are included in Table 27.6.

TABLE 27.6 ENVIRONMENTAL MANAGEMENT MEASURES—BIODIVERSITY

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Flora and fauna/ biodiversity	▸ Undertake detailed design and/or construction planning to minimise the construction footprint and avoid impacts to vegetation as far as practicable. Clearing of vegetation will be limited as far as practicable and disturbance is to only occur within the approved footprint. ▸ A Biodiversity Management Sub-plan will be developed as part of the CEMP. This plan should include appropriate criteria, directives and procedures in relation to: ▸ Methods and sequencing of threatened plant surveys, in accordance with the requirements of *Guide to Surveying Threatened Plants* (OEH, 2016) ▸ Methods and sequencing of pre-clearance fauna surveys, including terrestrial, aquatic and breeding habitats (including burrows and hollow bearing trees/logs, existing culverts and structures) ▸ Staging works to avoid animal breeding periods where possible. ▸ Develop a Soil Management Sub-plan that includes procedures and protocols relevant to potential impacts to the receiving environment: ▸ Soil/land conservation objectives for the proposal ▸ Management of problem soils (refer Chapter 15: Land Resources and Contamination), such as: – Cracking clays (vertosols) that are expected to be encountered directly south of the Macintyre River – Saline soils, particularly in potential expression areas such as soil salt stores, artificial restrictions and roads. ▸ Specification of the type and location of erosion and sediment controls. The erosion and sediment control measures, developed in accordance with the *Managing Urban Stormwater* series (Bluebook) (Landcom, 2004; DECC, 2008) to be implemented during construction of the proposal include: – Minimise disturbance of areas identified as susceptible to erosion – Use existing tracks, where possible. Design new access tracks (permanent and temporary) with the aim of minimising disturbance of substrates and vegetation – Water quality and erosion-control measures that consider site-specific soil types – Prescribed erosion and sediment controls relevant to the site risk.
	Riparian vegetation and aquatic habitats	▸ The design will continue to be developed to minimise the extent of impacts to waterways, riparian vegetation and in-stream flora and habitats, in accordance with relevant policies and guidelines, including: ▸ *Policy and Guidelines for Fish Habitat Conservation and Management Update 2013* (Fairfull and Department of Primary Industries (DPI), 2013) ▸ *Guidelines for controlled activities on waterfront land* (DPI, 2012).

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Water quality	▸ A Surface Water Management Sub-plan will be developed as a component of the CEMP. The sub-plan will provide a surface water monitoring framework for the proposal that establishes: ▸ Frequency, testing requirements and location of surface water sampling during construction of the proposal, with consideration for: – Construction activities with potential to impact water quality – Seasonality – Sensitivity of receiving watercourse. ▸ A risk-management framework for evaluation of the risks to surface water quality and ecosystems in the receiving environment, including definition of instances (including accidental discharge of contaminants and sediments) that trigger contingency and ameliorative measures ▸ Responses to impact threshold exceedances.
	Fauna passage	▸ Fauna movement opportunities identified during the reference design process will be developed and refined during detailed design. Development of these opportunities will involve: ▸ Assessment of the compatibility of each approach with the general design principles at each location ▸ Assessment of adjacent habitat and connectivity (including existing adjacent land use) ▸ Consideration of safety requirements for the rail corridor and adjoining properties. ▸ Elevated fauna crossing structures may be required to provide clearance over double-stacked trains (e.g. glider poles). To be determined in detailed design, taking into account safety requirements (e.g. for higher bridges or viaducts, rope bridges may be more practical) ▸ For higher bridges or viaducts, rope-bridge underpasses may be more practical ▸ Fauna crossing structures that may be suitable include glider poles, rope-bridge underpasses and fauna furniture within culverts ▸ Fauna exclusion fencing will be used to channel fauna towards crossing structures.
	Fauna fencing	▸ Fauna fencing opportunities will be further developed during detailed design. Development of these opportunities will involve: ▸ Assessment of the compatibility of each approach with the general fencing principles at each location and existing land use ▸ Consideration of safety requirements for the rail corridor and adjoining properties. e.g. rail corridor fencing has not been proposed across the Macintyre River floodplain to prevent the possibility of debris accumulation in fencing during flood events ▸ Consideration of maintenance constraints that a fauna connectivity or fencing opportunity may introduce. ▸ Priority will be given to fauna fencing in areas identified as state, regional or local fauna movement corridors to channel fauna toward safe movement options (i.e. culverts) to limit vehicle strikes and associated incidents.
Detailed design	Aquatic fauna	▸ The design will continue to be developed to minimise the extent of impacts to waterways, riparian vegetation and in-stream flora and habitats, in accordance with the current applicable policies/legislation ▸ The detailed design will be developed to minimise the potential for watercourse diversion, as defined under the *Fisheries Management Act 2000* ▸ Detailed design and construction will be undertaken to ensure fish passage is maintained. Any watercourse crossing structures will be designed in accordance with, *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (DPI, 2003).
	Flora	▸ Construction areas including compounds, stockpiles, fuel storage areas, laydown areas and staff parking will be located and established outside the tree protection zone as defined in AS4970-2009 *Protection of trees on development sites* (Standards Australia, 2009).

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Weeds and pests	▸ A Biosecurity Management Sub-plan will be developed as a component of the CEMP in accordance with the *Biosecurity Act 2015* ▸ Property-specific biosecurity requirements will be agreed with the relevant landowner/operator prior to pre-construction/construction activities occurring on that property. Agreed protocols will be documented in individual property management agreements, to be signed by ARTC and the landowner/operator.
	Rehabilitation	▸ A Rehabilitation and Landscaping Management Sub-plan will be developed for the proposal, as a component of the CEMP. This sub-plan will be based on the Inland Rail Landscape and Rehabilitation Strategy, the Inland Rail Landscape and Rehabilitation Framework and property-specific reinstatement commitments. As a minimum it will establish the following: ▸ Location-specific objectives for rehabilitation of borrow pit sites, reinstatement and/or stabilisation. Objectives will differ for within the rail corridor and outside of the rail corridor. Outside of the rail corridor, property-specific and township-specific (e.g. North Star) rehabilitation and landscaping requirements may apply ▸ Timeframes for rehabilitation and/or reinstatement/stabilisation works to be achieved ▸ Details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the agreed objectives ▸ Include rehabilitation requirements such as: – Milling and removal of bitumen pavement – Removal of any decommissioned culverts – Tyning and ripping of base and sub-base material – Application of soil ameliorants – Topsoiling and/or compost blanket – Stabilisation and rehabilitation (e.g. planting and or seeding). ▸ Consideration for maintenance or performance issues of rehabilitation e.g. vegetation that does not grow and obscure signals or impact the longevity of rail infrastructure ▸ Procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas ▸ Where temporary construction facilities/borrow pits are required, land will be returned to a stable condition that complies with the conditions of applicable landowner agreements and regulatory approvals.
	Offsets	▸ Restriction of the proposal footprint as far as practical, to that required to safely and efficiently construct and operate the proposal. In doing so, avoid areas of matters of national environmental significance (MNES), *Biodiversity Conservation Act 2016* (NSW) (BC Act) listed receptors and their associated habitat, where possible, thereby minimising significant adverse residual impacts to these matters ▸ A biodiversity offset strategy will be developed in consultation with the Department of Agriculture, Water and the Environment (DAWE) (Australian Government) and the Department of Planning, Industry and Environment (NSW).

Delivery phase	Aspect	Proposed mitigation measures
Pre-construction/ construction	Flora and fauna/ biodiversity	▸ Scheduling of construction activities to minimise time of works in or adjacent to drainage lines, waterways or watercourses, particularly during periods of flow ▸ Clearly mark designated 'no-go' areas and clearing extents/site boundary/limit of works prior to any vegetation clearing ▸ Where possible, minimise loss of canopy vegetation and works that will lead to the proliferation of weed species ▸ A qualified ecologist with relevant NSW licences will undertake pre-clearance surveys of remnant and regrowth vegetation ▸ The ecologist will supervise the subsequent clearing of where damage to any trees 3 metres (m) or greater in height, where arboreal fauna has been identified in, or adjacent to, the clearing front, known and potential habitat trees, log piles, burrows, stags and nests may occur and areas identified as containing threatened fauna species, habitat and mapped Plant Community Type (PCT)/threatened ecological communities (TECs) ▸ Scheduling of clearing activities will be done to avoid breeding seasons as far as reasonably practical. Where this is not practical, and where breeding sites are identified within the corridor during pre-clearance surveys, a suitably qualified person will provide mitigation measures for exclusion zones/ relocation requirements relevant to the specific species identified ▸ Clearing extents will be limited to the area of the permanent and temporary works, avoiding impacts to native vegetation and habitats as far as practicable.

	Riparian vegetation and aquatic habitats	▸ Plant maintenance activities and refuelling must be carried out a minimum of 50 m from riparian vegetation and waterways, where practical, with appropriate interception measures in place to avoid impacts to waterways, aquatic habitats, and groundwater. Where this cannot be achieved, a risk-management approach will be applied with additional management controls applied appropriate to the level of environmental risk
		▸ The Surface Water Management Sub-plan, as a component of the CEMP, will be implemented (refer above)
		▸ Works within or adjacent to watercourses will be conducted in accordance with the intent of:
		  ▸ *Policy and Guidelines for Fish Habitat Conservation and Management Update 2013* (DPI, 2013)
		  ▸ *Guidelines for controlled activities on waterfront land* (DPI, 2012)
		  ▸ The salvage and relocation of fish within isolated aquatic environments will be managed in accordance with the *Policy and Guidelines for Fish Habitat Conservation and Management Update 2013*
		  ▸ *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (DPI, 2003).
		▸ In the event of a spill incident during construction, any impacted aquatic environments will be assessed for the presence of fauna. If necessary, salvage and recovery efforts will be undertaken.

Pre-construction/ Construction	Flora	▸ Minimise clearance of remnant vegetation to that necessary for construction. Ensure all necessary permits and approvals are in place prior to the commencement of construction ▸ Clearly mark designated revegetation/rehabilitation zones and other no-go areas (including large significant trees) before to any vegetation clearing. High-visibility tape, barricade webbing or similar should be used. All contractors are to be briefed on clearing requirements and restrictions (including fines) to prevent over-clearing of these areas. ▸ Where possible, minimise loss of canopy vegetation and works that will lead to the proliferation of weed species ▸ Topsoil stockpiles will be a maximum of 2.5 m in height to avoid heat sterilisation of the seed bank ▸ Topsoil stockpiles will be managed to maintain the viability of soil seed banks for threatened flora species such as Slender Darling-pea, Silky Swainson-pea and Winged peppercress.

Delivery phase	Aspect	Proposed mitigation measures
Pre-construction/ Construction	Fauna fencing	▸ Any required fauna fencing will be installed in accordance with the fencing strategy, which will be finalised and documented in the detailed design.
	Weeds and pests	▸ The Biosecurity Management Sub-plan, as a component of the CEMP, will be implemented (refer above) ▸ The effectiveness of weed hygiene measures will be monitored as a component of the environmental monitoring procedure for the proposal ▸ Vegetation material will be managed with a general biosecurity duty to prevent, eliminate or minimise any cross contamination due to the spreading of known weeds ▸ ARTC's Enviroline will be advertised for the proposal to enable members of the public to notify ARTC of issues, including concerns regarding weeds and pests.
	Erosion and sediment control	▸ Implement the Soil Management Sub-plan including erosion and sediment controls as a component of the CEMP.
	Rehabilitation and landscaping	▸ The Rehabilitation and Landscaping Management Sub-plan, as a component of the CEMP, will be implemented (refer above) ▸ Rehabilitation of disturbed areas will be undertaken progressively and in accordance with the Rehabilitation Management Sub-plan.
Operation	Riparian vegetation and aquatic habitats	▸ Maintenance activities within or adjacent to watercourses will be conducted in accordance with relevant NSW policies and guidelines.

	Weeds and pests	▸ Weed management protocols for the operational rail corridor and other ARTC facilities will be in accordance with the requirements of the *Biosecurity Act 2015* (Cth) and incorporated into the OEMP. These protocols will include:
		  ▸ Site hygiene and waste-management procedures to deter pest animals
		  ▸ Weed surveillance and treatment during operation and maintenance activities
		  ▸ Requirements in relation to pesticide and herbicide use, including any limitations on use. Restrictions may apply in proximity to watercourses, known areas of MNES or BC Act listed receptors, habitat or land uses sensitive to spray-drift from the application of pesticides and herbicides
		  ▸ Erosion- and sediment-control risks associated with broad-scale weed removal or treatment.
		▸ ARTC's Enviroline will be advertised for the proposal to enable members of the public to notify ARTC of issues, including concerns regarding weeds and pests.

	Fauna fencing	▸ Fauna fencing, and adjacent vegetation clearance zones (3 m) will be inspected and maintained during operation to retain the fauna fencing integrity ▸ Vegetation maintenance on the habitat side of the fauna exclusion fencing associated with fauna passages would be required to ensure that species cannot use vegetation to climb onto the exclusion fencing.

27.13.2 Heritage

27.13.2.1 Mitigation measures

Mitigation and management measures for each of the proposal delivery phases are included in Table 27.7.

TABLE 27.7 ENVIRONMENTAL MANAGEMENT MEASURES—ABORIGINAL AND HISTORICAL HERITAGE

Delivery phase	Aspect	Proposed mitigation measures
Pre-construction/ construction	Heritage (General)	▸ Clearing extents/site boundary/limit of works are consistent with proposal extents defined in a condition of approval ▸ Clearing extents are limited to that required to undertake the works ▸ The clearing extents/site boundary/limit of works is clearly defined with flagging or marking tape, signage or other suitable means, to delineate no-go areas. This delineation and marking process will be incorporated and align with the flagging/marking tape process and specifications for the proposal, to ensure that it aligns with the greater Inland Rail program processes and does not conflict or contradict any of their demarcation. ▸ Disturbance is minimised, to avoid impacts to identified heritage as far as practicable ▸ A Heritage Management Sub-plan will be developed as part of the CEMP, which complies with the proposal conditions of approval, relevant regulatory requirements and state or Commonwealth guidelines. This plan should include appropriate criteria, directives and processes on: ▸ Site registry with approved management requirements ▸ Requirements and protocols for heritage clearances including engagement of Registered Aboriginal Parties (RAPs) for areas of Aboriginal heritage sensitivity ▸ Unexpected finds procedure, including the following steps: 1. All activity to cease within a 10 m buffer of the suspected find, and the area to be cordoned off using temporary fencing 2. Site supervisor is to be immediately notified, who will then engage a qualified heritage advisor to assess the find 3. If the find is determined to be Aboriginal cultural heritage, the Department of Premier and Cabinet and the RAPs are to be notified immediately of the find. The heritage advisor is to consult with the RAPs on the management of the object and prepare a site card for submission to the Aboriginal Heritage Information Management System (AHIMS) register. ▸ Consultation engagement protocols and dispute resolution process for Aboriginal heritage ▸ Relocation methodology of salvaged material (where applicable) ▸ Requirements for inspections and corrective actions during construction and other activities in vicinity of heritage items ▸ Heritage management actions to be undertaken by suitably qualified persons ▸ Requirements for training, inspections, corrective actions, notification and classification of incidents, record keeping, monitoring and performance objectives for handover on completion of construction ▸ Any other requirements necessary to comply with conditions of approval, subsequent approvals or regulatory requirements.

Delivery phase	Aspect	Proposed mitigation measures
Pre-construction/ construction	Isolated artefacts and low-density artefact scatters (<100 artefacts)	▸ Aboriginal artefacts are to be surface-collected as per the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW Department of Environment Climate Change & Water, 2010) ▸ Historical artefacts determined to be of high significance are to be surface collected as per the *Historical Archaeology Code of Practice* (Heritage Office, 2006a) ▸ Individual artefacts are mapped using tablet devices and/or handheld differential GPS ▸ An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required ▸ All historical heritage items are to be analysed by a historical heritage professional.
	Artefact scatters (>100 artefacts)	▸ Aboriginal artefacts are to be surface-collected as per the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW Department of Environment Climate Change & Water, 2010) ▸ Historical artefacts determined to be of high significance are to be surface-collected as per the *Historical Archaeology Code of Practice* (NSW Heritage Office, 2006a) ▸ Individual artefacts are mapped using tablet devices and/or handheld differential GPS ▸ A program of test excavation is to be undertaken as per the requirements of the relevant code and approved Heritage Management Plan ▸ An Aboriginal Site Impact Recording Form will be completed for Aboriginal stone artefacts, where required ▸ All historical heritage items are to be analysed by a historical heritage professional.
	Aboriginal culturally modified trees	▸ All culturally modified trees are to be avoided as far as practicable ▸ Where avoidance is not achievable and salvage is appropriate, a program of consultation must be undertaken with the relevant Aboriginal Parties to identify a suitable salvage methodology and agreement on keeping place.
	Historic heritage	▸ A program of archival recording is to be undertaken prior to construction. This program will seek to map the full extent of each site through surface finds and documented with photographs as per the NSW guidelines (Heritage Office, 2006b).

27.13.3 Surface water, hydrology and water quality

27.13.3.1 Mitigation measures

Mitigation and management measures for each of the proposal delivery phases are included in Table 27.8.

TABLE 27.8 ENVIRONMENTAL MANAGEMENT MEASURES—SURFACE WATER AND WATER QUALITY

Delivery phase	Aspect	Proposed mitigation measures
Construction	Increased water turbidity and sedimentation	▸ A stormwater and erosion and sediment control management sub-plan will be developed as part of the CEMP, which complies with the project conditions of approval, relevant regulatory requirements and industry guidelines (e.g. *Managing Urban Stormwater—Soils and Construction—NSW*, Landcom, 2004). This is expected to include: ▸ Water quality and soil/land conservation objectives for the proposal ▸ Temporary erosion- and sediment-control measures (including progressive erosion and sediment control plans that allow for staging of erosion and sediment controls as construction progresses) ▸ Rainfall monitoring requirements across the project area ▸ Workplace health and safety requirements relating to management of contamination and unexploded ordnance risk (UXO) ▸ Management of problem soils (e.g. acid sulfate soils and erosive, dispersive, reactive, acidic, sodic or alkaline soils) ▸ Stockpiling and management/segregation of topsoil where it contains native plants, seedbank or weed material ▸ Vehicle, machinery and imported fill hygiene protocols and documentation ▸ Measures to prevent/minimise mud and dirt being tracked onto public roadways by trucks and any equipment leaving the site ▸ Requirements for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction ▸ Any other requirements necessary to comply with conditions of approval, subsequent approvals or regulatory requirements. ▸ The construction of bridges, waterway crossings and waterway realignment/diversions is scheduled and/or staged to minimise impacts to bed, banks and environmental flows, in accordance with relevant regulatory requirements ▸ Design and construction of waterway realignments considers staging requirements/temporary works, in accordance with relevant regulatory requirements ▸ The siting of temporary construction facilities compounds, stockpiles, fuel storage, laydown areas, temporary access roads and staff parking will be in accordance with the project conditions of approval and sited to minimise the extent of disturbance ▸ Temporary waterway crossings are rehabilitated in accordance with conditions of approval and the Reinstatement and Rehabilitation Plan ▸ Riparian vegetation and aquatic habitats are identified and avoided, where possible ▸ The project must be designed, constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved within the locality of this proposal, unless an Environmental Protection Licence in force in respect to the proposal contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with. These outcomes will be identified within the CEMP.
Operations	Increased water turbidity and sedimentation	▸ The boundary requirements defined for the proposal allow sufficient room for provision of the required temporary and permanent erosion and sediment control measures/pollution control measures, where identified, as a mitigation measure for an identified environmental impact or risk.

Delivery phase	Aspect	Proposed mitigation measures
Construction	Changes to water chemistry	▸ The siting and scale of stockpiles, construction compounds, fuel storage and laydown areas and other construction areas will be informed by a flood risk assessment, relevant conditions of approval and relevant regulatory requirements ▸ Opportunities to re-use/recycle construction water are identified and implemented, where feasible, during construction ▸ Requirements for construction water (volumes, quality, demand curves, approvals requirements and lead times) will be defined during design, e.g. water used for dust suppression will not result in adverse environmental or health impacts ▸ A surface water monitoring framework will be developed as part of the Soil and Water Management Sub-plan in the CEMP. It will identify monitoring locations at discharge points and selected locations in watercourses where works are being undertaken ▸ Water quality should be monitored during construction in accordance with the Surface Water Monitoring Framework ▸ Demolition of bridges and waterway crossing structures does not introduce pollutants or waste materials into waterways.
Operations		▸ Maintenance activities and refuelling must be carried out at an appropriate distance from riparian vegetation and waterways, with appropriate measures in place to avoid impacts to waterways, aquatic habitats, and groundwater in accordance with relevant regulatory requirements. Specifically, relevant legislation and regulations that specify requirements about permissible works in/near watercourses and release of contaminants to waters should be referred to. Additionally, relevant Australian Standards should be considered and adhered to, where applicable and relevant. ▸ ARTC will implement its spill and contamination procedures during the operational phase of the proposal.

TABLE 27.9 ENVIRONMENTAL MANAGEMENT MEASURES—FLOODING AND HYDROLOGY

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Hydrology and flooding	▸ Consult with stakeholders including directly impacted landowners, local government authorities, state government departments and local flood specialists to inform and refine the proposal design ▸ Continue to refine project design in response to hydraulic modelling outcomes. This includes addressing flood impact objectives, which include consideration of peak water levels, flow distribution, velocities and duration of inundation. This will confirm bridge lengths, culvert sizing and numbers, localised scour and erosion protection measures for both rail, road and other permanent infrastructure related to the proposal. ▸ Undertake a flood risk assessment to inform the siting and scale of temporary construction areas (including stockpiles, construction compounds, access, laydown areas etc) to ensure they are located in areas that do not experience periodic inundation ▸ Construction planning reviews of the design to locate plant and equipment maintenance activities and chemical/hazardous goods storage facilities in accordance with the risk assessment and incorporate appropriate location-specific controls and procedures to minimise the risk and avoid impacts to waterways, aquatic habitats, and groundwater.
Pre-construction		▸ Impacts must be determined at all drainage structures and waterways affected by construction works. The change in flood levels and impacts on infrastructure and properties outside the rail corridor must be justified for a range of events up to and including the 1% annual exceedance probability (AEP) event.
Operation		▸ Inspections will be carried out in accordance with ARTC's *Structures Inspection Engineering Code of Practice* (ETE-09-01) to identify defects and conditions that may affect waterway and drainage system capacity or indicate increased risk of flooding.

27.13.4 Groundwater

27.13.4.1 Mitigation measures

Mitigation and management measures for each of the proposal delivery phases are included in Table 27.10.

TABLE 27.10 ENVIRONMENTAL MANAGEMENT MEASURES—GROUNDWATER

Delivery phase	Aspect	Proposed mitigation measures
Detail design	Water resources	▸ Further assessment of design concepts will be undertaken at watercourse crossings to minimise embankment loading or compaction of alluvial sediments and mounding of groundwater levels (i.e. use of pilings) ▸ Assessment of sizing for longitudinal drainage for permanent drainage features ▸ Define requirements for construction water (volumes, quality, demand curves, approvals requirements and lead times), storage locations along the construction footprint, e.g. water used for dust suppression will not result in adverse environmental or health impacts ▸ Moderate and high potential aquatic and terrestrial groundwater dependent ecosystems (GDEs) have been identified within the groundwater study area and can potentially be impacted by the proposal. Field truthing of these particular environments will be undertaken to confirm the location and status of potential GDEs within the predicted impact areas.
	Water quality	▸ Further assessment of potential borrow pit areas to confirm quality of material to ensure no contamination.
Pre-construction	Water resources	▸ Confirm (i.e. physical survey/'ground truth') the location of registered bores that may be lost due to construction or operation of the proposal and engage with licensed users to determine mitigation strategy (e.g. replacement of water supply, if required) ▸ Undertake bore survey/census to identify any potential unregistered bores (landowners) that may be impacted by the proposal ▸ Confirm sources for construction water requirements (surface water, groundwater, municipal supply, etc.) via consultation with relevant stakeholders (including landowners/occupants) prior to construction. Appropriate approvals and agreements will be sought for the extraction of water. Where private water sources are used for construction, monitoring will be undertaken during extraction to ensure volumes and conditions stipulated by licence requirements and/or private landowner agreements are met.
	Water quality	▸ Identification and/or reuse of contaminated, hazardous or potentially contaminated material onsite (i.e. soil, ballast) will be subject to a risk assessment and managed in accordance with any relevant applicable legislation and regulations.
Construction	Water resources	▸ Permanent drainage structures (precast concrete pipe products) will be installed in areas where there are significant sections of embankment fill that incorporate significant cross-drainage structures over floodplain areas ▸ Opportunities to re-use/ recycle construction water are identified and implemented where feasible during construction.

Delivery phase	Aspect	Proposed mitigation measures
Construction	Water quality	▸ Vehicle and plant maintenance activities will be undertaken in suitable areas, with hardstand to minimise risk of contaminants from incidental spills or leaks from entering aquifers via infiltration or surface runoff ▸ Refuelling will only occur at selected sites, located to minimise impacts to surface water bodies and other sensitive receptors. These refuelling locations will be equipped with onsite chemical and hydrocarbon-absorbent socks/booms and spill kits ▸ Laydown areas and storage areas will be located to minimise potential impacts on creeks, rivers, and/or sensitive receptors such as existing groundwater bores or known GDEs ▸ Drilling and excavation activities during construction will make use of drilling fluids and chemicals that are environmentally neutral and biodegradable, where practical. Mobile plant, drill rigs and equipment will be maintained in accordance with manufacturer requirements and inspected frequently to minimise breakdowns and decrease the risk of contamination. ▸ Any bores that are decommissioned will be undertaken in accordance with the *Minimum Construction Requirements for Water Bores in Australia—Edition 3* (National Water Commission, 2012).
Operation	Water quality	▸ Operator will notify their employees of the storage, handling, or transport of hazardous substances or dangerous goods, to raise awareness and reduce potential of associated incidents ▸ Operator will ensure appropriate controls are in place to prevent environmental incidents, including leaks/ spills from refuelling activities and locomotive operations and to protect the environment in the event of an incident ▸ In the event of a spill, all necessary actions will be taken to contain the spill ▸ The supervisor or person in charge of the work activity must be notified immediately. The matter will be recorded on the reportable environmental incident checklist and, in the case of a major spill or incident, the Emergency Management Procedure (RLS-PR-044) will be followed.

27.13.5 Land resources

27.13.5.1 Mitigation measures

Mitigation and management measures for each of the proposal delivery phases are included in Table 27.11.

TABLE 27.11 ENVIRONMENTAL MANAGEMENT MEASURES—LAND RESOURCES

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Erosion and sediment control	▸ Proposal clearing extents are limited to that required to construct and operate the works and clearing is scheduled to minimise the exposure time of unprotected earth ▸ An Erosion and Sediment Control Plan will be created. The Erosion and Sediment Control Plan will include temporary and permanent measures implemented across phases of the proposal that are appropriate to the site conditions, contain an erosion risk assessment, relevant environmental receptors, climatic zone and seasonal factors. It will also establish and specify the monitoring and performance objectives for handover on completion of construction. Furthermore, the plan will detail the following procedures and protocols relevant to potential impacts of land resources and contamination: ▸ Soil/ land conservation objectives for the proposal ▸ Temporary/permanent erosion and sediment control measures ▸ Workplace health and safety requirements relating to management of contamination and unexploded ordnance (UXO) risk ▸ Management of problem soils (e.g. acid sulfate soils (ASS), and erosive, dispersive, reactive, acidic, sodic, or alkaline soils) ▸ Stockpiling and management/segregation of topsoil where it contains native plants, seedbank or weed material ▸ Vehicle, machinery and imported fill hygiene protocols and documentation.
	Materials handling and storage	▸ A hazardous substances and dangerous goods risk management strategy will be developed to manage the potential for risks.
	Rehabilitation	▸ Prepare a Rehabilitation and Reinstatement Plan to guide the approach to rehabilitation following the completion of construction. The plan should include and clearly specify: ▸ Location of areas subject to rehabilitation and/or reinstatement/stabilisation ▸ Details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the agreed objectives.
	Land and soil	▸ Minimise risks through appropriate geotechnical design where reactive or problem soils are present or suspected ▸ Cut-and-fill balance and minimisation of transport requirements for import/disposal of spoil are considered as part of the design process ▸ Soil conditions across the study area are appropriately characterised at a suitable scale in accordance with the EMP prior to construction, to inform design and environmental management measures. This includes identification of potential/actual ASS, reactive soils, erosive soils, dispersive soils, saline soils, acidic soils, alkaline soils and contaminated soils. ▸ A contaminated land investigation of the NS2B rail corridor will be undertaken by a suitably qualified person in accordance with requirements of National Environment Protection Measures (NEPM) (2013) and the methodology captured within the CEMP.

Delivery phase	Aspect	Proposed mitigation measures
Pre-construction/ Construction	Materials handling and storage, hazardous waste	A CEMP will be developed as part of the project. The CEMP will detail the following procedures and protocols relevant to potential impacts of land resources and contamination: ▸ A response plan to deal with accidental spills and leaks. The supervisor or person in charge of the work activity must be notified immediately. The matter will be recorded on the reportable environmental incident checklist or the emergency management procedure. ▸ All bunding, hydrocarbon and chemical storage areas are routinely checked and their integrity and functionality maintained in a good condition, so they continue to function in an effective manner ▸ Operator must ensure appropriate controls are in place to prevent environmental Incidents, including leaks/spills from refuelling activities and locomotive operations, and to protect the environment in the event that incidents occur ▸ Spill kits will be available at all work fronts and laydown areas in the event of a spill or leak ▸ Chemical and dangerous goods storage areas will be stored and located in accordance with relevant Australian Standards ▸ Identification of contaminated, hazardous or potentially contaminated material onsite (i.e. soil, ballast) will be subject to a risk assessment ▸ Appropriate register and records of chemicals, hydrocarbons and hazardous substances and materials onsite will be kept up-to-date as required by the CEMP. Where appropriate, this should include a relevant risk assessment prior to the substance coming to, and being used on, site, plus a Safety Data Sheet Register. ▸ Operators must not transport hazardous substances or dangerous goods if they know, or ought reasonably to know, that a special provision applies to the transport of the goods and the transport of the goods does not comply with the special provision. Operators must notify their employee of the storage, handling or transport of hazardous substances or dangerous goods. ▸ Refuelling to occur 50m from a defined watercourse, overland flow path or other sensitive environment receivers where practical.
Pre-construction/ Construction	Contamination	▸ Personnel involved in ground-disturbing works must be familiar with the unexpected finds protocol/procedure and be trained in the identification of potential contaminated soil/material and relevant controls ▸ The reuse or retention of contaminated or potentially contaminated material onsite (i.e. soil, ballast) will be subject to a risk assessment and/or occur as per the relevant components of the CEMP.
	Erosion and sediment control, rehabilitation	▸ Appropriate erosion and sediment control measures are to be implemented for each phase or elements of the construction works, in accordance with the Construction Erosion and Sediment Control Plan ▸ Reinstatement, stabilisation and rehabilitation of temporarily disturbed areas (such as laydown, site offices and temporary access tracks) will be undertaken progressively, consistent with a Reinstatement and Rehabilitation Plan.
	Hazardous waste	A contaminated and hazardous material survey will be undertaken prior to demolition of structures. If asbestos or other hazardous materials are identified, removal will be undertaken in accordance with relevant state guidelines and the CEMP.
	Unexploded ordnances	Identification of UXO will be subject to a risk assessment. Where a risk of encountering known or possible UXO is identified, assessment and identification of management options will be carried out by a suitably qualified person.
Operation	Land and soil contamination	Ongoing management and maintenance of the corridor to be in accordance with existing environmental management system and corridor management procedures.

27.13.6 Noise and vibration

27.13.6.1 Mitigation measures

Mitigation and management measures for each of the proposal delivery phases are included in Table 27.12.

TABLE 27.12 ENVIRONMENTAL MANAGEMENT MEASURES—CONSTRUCTION NOISE AND VIBRATION

Delivery phase	Aspect	Proposed mitigation measures

Detailed design	Construction noise and vibration impacts on sensitive receptors	▸ A Noise and Vibration Management Sub-plan will be developed as a component of the CEMP. This sub-plan will include:
		  ▸ Construction noise and vibration criteria for the proposal
		  ▸ Location of sensitive receivers in proximity to the construction area
		  ▸ Specific management measures for activities that could exceed the construction noise and vibration criteria
		▸ Notification process within the community engagement plan (including who to contact in the event of a complaint) to advise of significant works with potential for noise nuisance or vibration at sensitive receivers and surrounding residences/premises
		▸ Noise management measures including controlling noise and vibration at the source, controlling noise and vibration on the source to receiver transmission path and controlling noise and vibration at the receiver, as reasonably practical
		▸ Requirements for training, inspections, corrective actions, monitoring, notification and classification of environmental incidents/complaints, record keeping
		▸ Confirm the proximity of sensitive receivers to finalised locations for construction activities, laydown areas and other construction-phase facilities. Continued consultation with potentially affected landowners and stakeholders to communicate the anticipated scheduling of construction works and the activities that may occur in proximity to each receiver.

Pre-construction	Pre-condition surveys	▸ Building condition/dilapidation surveys should be undertaken at receiver identified as being particularly sensitive to vibration, including heritage buildings. Building surveys should also be undertaken at vibration-sensitive receivers that are expected to exceed the structural damage vibration limits given by DIN 4150.3.
Construction	Consultation	▸ A complaint hotline will be established to enable members of the public to notify ARTC of issues, including the generation of excessive noise and/or vibration.
	Monitoring	▸ Noise and vibration monitoring will be undertaken to verify compliance with construction-phase criteria at locations and at times nominated in the Noise and Vibration Management Sub-plan ▸ Noise and/or vibration monitoring may be undertaken in response to legitimate noise or vibration complaints to assess compliance of construction activities against adopted criteria.
	Construction work hours	▸ Works in the vicinity of sensitive receivers and/or outside of the proposed construction hours should be completed in accordance with the requirements of the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009) ▸ Extended working hours outside of the nominated work hours for the proposal should be considered permissible where there are no nearby sensitive receivers or impacts to receivers can be appropriately managed ▸ Time differences between NSW and Queensland from October to April must be considered when conducting works near the NSW/QLD border. Works should be considered to be occurring outside standard hours if the time at nearby sensitive receivers is outside standard hours.

Delivery phase	Aspect	Proposed mitigation measures
Construction	Equipment selection	▸ Equipment selections will be reviewed with a preference for adopting quieter and non-vibratory plant items near sensitive receivers, where feasible and reasonable ▸ Appropriately sized equipment will be selected for the task, such as vibratory compactors and rock excavation equipment.

	Blasting	▸ Vibration impacts from blasting will be assessed by the contractor once the locations and depths of blasting and the charges to be used are confirmed. This assessment will confirm which receivers at which blasting impacts are expected to exceed the nominated blasting vibration criteria.
		▸ Where blasting impacts are expected to exceed the vibration limits, the following measures are recommended, where practicable:
		  ▸ Reducing the charge size by use of delays and reduced charge masses
		  ▸ Ensuring adequate blast confinement to minimise the amount of overpressure
		  ▸ Avoiding secondary blasting where possible. The use of rock breakers or drop hammers may be an acceptable alternative.
		  ▸ Avoiding blasting during heavy cloud cover or during strong winds blowing towards sensitive receivers
		  ▸ Establishing a blasting timetable through community consultation, e.g. blasts times negotiated with surrounding sensitive receivers
		  ▸ Residents, occupants and other stakeholders within a 2-km radius of a blast location will be notified a minimum of three calendar days in advance of a blast occurring.

	Use and siting of plant	▸ Where possible, the duration of simultaneous operation of noise or vibration-intensive plant will be minimised. Plant and equipment used intermittently or no longer in use will be throttled or shut down. ▸ Noise-emitting plant and equipment will be orientated away from sensitive receivers where practical and feasible ▸ Construction plant, vehicles and machinery will be maintained and operated in accordance with manufacturer's instructions to minimise noise and vibration emissions.
	Construction traffic	▸ Where reasonable, unsealed areas should be graded regularly, and potholes sealed access roads and hardstand areas filled in to reduce noise from construction vehicles ▸ Where reasonable, construction traffic should be kept to a minimum ▸ The speed of construction traffic should be minimised near noise-sensitive receivers.

TABLE 27.13 ENVIRONMENTAL MANAGEMENT MEASURES—OPERATIONAL NOISE AND VIBRATION

Delivery Phase	Aspect	Proposed mitigation measures
Operation	Rail noise and vibration	▸ Where reasonable, architectural acoustic treatments to the building to control rail noise within the internal environment of the building will be considered ▸ Where reasonable, upgrades will be considered to any existing property boundary fencing to improve screening of rail noise levels.
	Monitoring	▸ Provide a monitoring strategy consistent with the requirements of the conditions of approval, and relevant acoustic standards and guidelines for monitoring environmental and transport noise and vibration.

27.13.7 Air quality

27.13.7.1 Proposed mitigation measures

Potential impacts and proposed mitigation and management measures for each of the proposal delivery phases are included in Table 27.14.

TABLE 27.14 ENVIRONMENTAL MANAGEMENT MEASURES—AIR QUALITY

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Dust generation (windborne erosion) from construction or operation	▸ Incorporate treatments in earthworks and landscape design of railway batters and other exposed surfaces ▸ Define and design temporary access tracks to minimise dust generation, e.g. appropriate surface treatments for the predicted construction traffic movements, installation of rumble grids, concrete pads or other physical measures to reduce trackout ▸ Define proposed stockpiles locations with consideration of proximity to sensitive receptors.
	Emissions from refuelling activities during construction	▸ Review and refine the location of proposed fuel tank storage locations, particularly where the separation distance to a sensitive receptor is less than 50 m.
Construction	Dust generation from earthworks, clearing and grubbing, construction activities and exposed areas within the construction disturbance footprint	▸ Limit clearing to that required to construct and operate the proposal ▸ Where practical, stage clearing and grubbing and construction activities to limit the size of exposed areas ▸ Implement controls to prevent or minimise dust generation during activities involving excavation or disturbance of soils or vegetation, or handling ballast (e.g. use water sprays or water carts for dust suppression as required) ▸ Stabilise disturbed areas and exposed surfaces as soon as practical ▸ Long-term stockpiles should be avoided wherever possible; however, where necessary, long-term stockpiles should be established in locations with suitable separation from sensitive receptors and not in the path of prevailing winds (which would transport dust towards sensitive receptors). Stabilise and protect long-term stockpiles from erosive processes while not in use.
		▸ Provide timely, meaningful responses to air quality or dust complaints. This may include investigations, corrective actions, monitoring or notification to relevant authorities. ▸ Establish and communicate the protocol for notifying relevant stakeholders when potentially dust-generating activities are planned to be carried out, with contact details for queries or complaints ▸ Visually monitor dust generation (visible plumes) throughout construction and undertake visual inspection at the boundary of the disturbance footprint in areas in proximity to sensitive receptors, to inform when corrective actions are required.
	Dust generation and deposition as a result of adverse weather conditions	▸ Avoid ground-disturbing activities during windy conditions. When this is not practical, implement additional management measures, such as enhanced watering of access roads and works areas to minimise the potential increase in dust generation. ▸ Implement additional dust suppression controls prior to the onset of adverse weather, including covering of stockpiles and additional watering of access roads.

Delivery phase	Aspect	Proposed mitigation measures
	Emissions from refuelling activities	▸ Refuelling activities to be located and operated in accordance with a risk assessment, to minimise odour and air quality issues at a sensitive place.
	Emissions from combustion engines (construction vehicles and generators)	▸ Maintain and operate construction plant, vehicles and machinery in accordance with manufacturer's recommendations ▸ Turn off idling plant, equipment and vehicles when not in use.
	Use of non-potable water for dust suppression	▸ Water used in dust suppression must be of suitable quality and not result in environmental or human health risks, or impact rehabilitation outcomes. Water additives used to improve dust suppression effectiveness (e.g. the addition of soil binders to water for dust suppression on roads or handstand areas) are to be risk assessed prior to adoption.
	Dust generated by traffic on access tracks	▸ Where sensitive receptors are located within 350 m of construction works, or visible dust is generated from vehicles using unsealed access roads, road watering or other appropriate controls are to be implemented ▸ Adjust access road watering or treatments, as required, to prevent visible dust generation or impacts to sensitive receptors.
	Dust emissions from vehicles transporting materials to and from site	▸ Cover vehicles transporting potentially dust- and/or spillage-generating material to and from the construction site immediately after loading (prior to traversing public roads) ▸ Visually inspect vehicles entering/exiting the site and implement additional controls if corrective actions are required.

27.13.8 Sustainability

27.13.8.1 Proposed mitigation measures

Potential impacts and proposed mitigation and management measures for each of the proposal delivery phases are included in Table 27.15.

TABLE 27.15 ENVIRONMENTAL MANAGEMENT MEASURES—SUSTAINABILITY

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Infrastructure Sustainability (IS) Rating Tool	▸ A Sustainability Strategy will be developed to guide the design, construction and operation of the proposal. The plan will address, as a minimum, safety, employment, materials and waste, procurement, ecological connectivity, greenhouse gas emissions, and climate change risk, and establish the basis for these to be considered across the delivery phases of the proposal, using the IS rating tool process.
	Sustainability	▸ The Sustainability Strategy will incorporate the updated sustainability initiatives and the review and reporting requirements necessary to demonstrate how sustainability has been incorporated into the proposal during design, construction and operation.
Construction	Procurement	▸ Procurement will be undertaken in accordance with the *Sustainable Procurement Guide* (Department of Environment and Energy, 2018) and the *NSW Government Resource Efficiency Policy* (OEH, 2014) or other applicable state-based policy and guidance.
	Reporting	▸ Sustainability reporting (and corrective action where required) will be undertaken during construction in accordance with the Sustainability Strategy.
Operation	Procurement	▸ Procurement will be undertaken in accordance with the *Sustainable Procurement Guide* (Department of Environment and Energy, 2018) and the *NSW Government Resource Efficiency Policy* (OEH, 2014) or other applicable state-based policy and guidance.
	Sustainability	▸ Prior to operation commencing, the Sustainability Strategy will be reviewed and updated and relevant initiatives will be implemented during operation.

27.13.9 Climate change

27.13.9.1 Proposed mitigation measures

Potential impacts and proposed mitigation and management measures for each of the proposal delivery phases are included in Table 27.16.

TABLE 27.16 ENVIRONMENTAL MANAGEMENT MEASURES—CLIMATE CHANGE RISK AND ADAPTATION

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Adaptation measures	▸ Ensure that design and procurement of trackside equipment (e.g. signals, communication relay points) account for an increase in ambient temperatures and extreme heat days ▸ Consider the use of elastic fasteners and/or heavier sleepers to account for potential track buckle ▸ Consider the use of lighter-coloured ballast or painted rails to reduce trackside temperature ▸ Locate electrical equipment and supporting infrastructure outside of bushfire-prone areas, where reasonable and feasible, to reduce risk of damage from bushfire ▸ Include allowance for climate change in the design criteria for flooding based on a 10% increase in rainfall events, particularly around track-side storage detention basins/stormwater infrastructure, in accordance with the NSW Office of Water guidance, *Practical Consideration of Climate Change* (Office of Water, 2007) ▸ Undertake sensitivity testing in line with climate change scenario planning for RCP 8.5 by reviewing implications of 20% and 30% increases in rainfall (in accordance with the *Australian Rainfall and Runoff Guidelines 2019* (OEH, 2019) ▸ Implement flood-mitigation measures along the rail corridor, including the locating of critical electrical systems (signalling, communications huts, etc.) above potential flood zones and increasing the design height of bunds ▸ Design site grading to direct flooding into onsite detention and other stormwater channels/drainage infrastructure ▸ Design culverts and drainage to be concrete lined to reduce potential for damage ▸ Incorporate additional drainage network features and flood protection measures (e.g. larger drainage network, additional pits, larger pipe diameters, larger sumps, etc.) to mitigate a potential increase in flood risks ▸ Investigate the inclusion and development of an early flood warning system (e.g. flood gauges, trackside monitors) to alert ARTC to impending flooding ▸ Backup power supply and/or built-in system redundancy (in case of substation failure) provided as standard to ensure continuous operation of electrical systems, including signalling and communications equipment along the corridor ▸ Incorporate solar photovoltaic (PV) and battery storage as a built-in redundancy to ensure ongoing operation of signalling and communications equipment in the event of power failure.

Delivery phase	Aspect	Proposed mitigation measures
Pre-construction and construction	Adaptation measures	▸ Provide shade for trackside equipment (double ventilated signal boxes and/or double skinned enclosures) and/or specify material and colour selection to reduce heat load ▸ Establish vegetation clearance zones across the corridor to minimise vegetation (debris and bushfire risk).
	General	▸ Implement high temperature stop work threshold if not already considered within existing ARTC operational framework ▸ Develop or update emergency response procedures to respond to extreme weather events ▸ Engage with local emergency services to discuss and coordinate emergency response procedures.
Operation	Adaptation measures	▸ Reduce train speeds during days where trackside temperature exceeds 35°C.
	General	▸ Maintenance program to be developed/operational policy updated to avoid outdoor works during hotter times (where practicable) ▸ Develop or update emergency response procedures to respond to extreme weather events ▸ Engage with local emergency services to discuss and coordinate emergency response procedures.

27.13.10 Traffic and transport

27.13.10.1 Mitigation measures

Potential impacts and proposed mitigation and management measures for each of the proposal delivery phases are included in Table 27.17.

TABLE 27.17 ENVIRONMENTAL MANAGEMENT MEASURES—TRAFFIC AND TRANSPORT

Delivery phase	Aspect	Proposed mitigation measures

Design/ pre-construction	Road safety	▸ Road safety audits will be undertaken pre-construction at level crossings in accordance with the Austroads Guidelines (Austroads, 2019) to confirm:
		  ▸ The level of protection is appropriate
		  ▸ The infrastructure is appropriate for the traffic conditions
		  ▸ The crossing is designed to provide suitable stacking and sight distance.
		▸ Ongoing consultation with local government/Roads and Maritime Services (RMS) and asset owners will be undertaken to ensure safety concerns and issues are assessed
		▸ Relevant emergency services should be notified of changes to the road network and of construction activities, prior to construction commencing.

	Road network	▸ Traffic management plan prepared in consultation with the Construction Contractor, Transport for NSW (TfNSW), local governments and an accredited road safety auditor. This plan will identify the impacts that construction traffic is likely to have on the transport infrastructure and detail ameliorative measures required to mitigate all identified impacts of the proposal.
	Road–rail Interface	▸ Consult with stakeholders (level crossings) for public roads and private landowners before detailed design phase.

Delivery phase	Aspect	Proposed mitigation measures
Design/ pre-construction	Intersection	▸ Traffic management plans, traffic control plans and temporary road works, including diversion and signage, should be prepared prior to construction in accordance with the latest edition of the *Traffic control at work sites: Technical Manual 2018* (Roads and Maritime Services, 2018) and Australian Standard 1742.3, *Manual of uniform traffic control devices—Traffic control* (Standards Australia, 2019) for works on roads. Traffic management plans should consider construction activity delivery timeframes that avoid peak-hour travel conditions.
	Access	▸ Ongoing consultation with RMS/local governments and asset owners will be undertaken to ensure proposed access arrangements are suitable.
Construction	Road safety	▸ Road safety measures to be implemented, taking into consideration: speed restrictions; construction worker driver fatigue; in-vehicle communications; signage; demarcations; maintenance; safety checks; interaction with public transport; transport of hazardous and dangerous goods; and emergency response and disaster management ▸ Relevant emergency services should be notified in advance prior to the movement of all hazardous/dangerous or oversize construction material and equipment ▸ Consideration should be given to limiting construction traffic on school bus routes during pick-up and set-down times on school days. Alternatively, appropriate school bus infrastructure could be installed. ▸ Traffic-calming devices to be installed along road segments with surrounding land uses containing vulnerable road users (e.g. schools) where deemed necessary in consultation with local road authorities and relevant stakeholders.
	Road network	▸ Construction traffic management plan to be implemented and reviewed periodically for effectiveness by stakeholders ▸ Ongoing consultation with relevant local governments, police, emergency services and affected property owners/occupiers to inform of proposal status and likely traffic disruptions and temporary road closures ▸ Relevant emergency services should be notified in advance, prior to the movement of all hazardous/dangerous or oversize construction material and equipment ▸ Secondary alternative construction route activities should be determined as part of the traffic management plans, in the event that the primary route is blocked off by an emergency/accident.

	Road/rail interface	▸ Road safety audits will be undertaken at the level crossings post construction in accordance with the Austroads guidelines (Austroads, 2019). Level crossings will be reviewed to confirm:
		  ▸ The level of protection continues to be appropriate
		  ▸ The infrastructure is appropriate for the traffic conditions.

	Intersection	▸ Traffic management plans, traffic control plans and temporary road works to be implemented and reviewed to ensure effectiveness ▸ Construction Traffic Management Plan to be implemented and reviewed periodically by stakeholders to ensure intersection operations are effective.
Construction	Biosecurity	▸ A CEMP will be prepared prior to construction commencing. As part of the CEMP, a project biosecurity plan will be developed to identify operating requirements of machinery during construction.
	Access	▸ The Rail Maintenance Access Road strategy to be reviewed and updated to ensure it remains effective.

Delivery phase	Aspect	Proposed mitigation measures
Operation	Road network	▸ Develop a protocol between ARTC and emergency service providers, defining appropriate and co-ordinated responses and communication in the event of emergencies during operations, (e.g. access to real time information about crossing times and access to alternate crossing points).
	Road/rail interface	▸ Road safety audits will be undertaken at the level crossings post opening in accordance with the relevant legislation and guidelines. Level crossings will be reviewed to confirm: ▸ The level of protection continues to be appropriate ▸ The infrastructure is appropriate for future traffic conditions.

27.13.11 Landscape character and amenity

27.13.11.1 Mitigation measures

Mitigation and management measures for each of the proposal delivery phases are included in Table 27.18.

TABLE 27.18 ENVIRONMENTAL MANAGEMENT MEASURES—LANDSCAPE CHARACTER AND VISUAL AMENITY

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Landscape and visual values	Landscape and visual impacts due to vegetation removal ▸ Prepare a Rehabilitation and Reinstatement Plan to guide the approach to rehabilitation following the completion of construction. The plan should include and clearly specify: ▸ Location of areas subject to rehabilitation and/or reinstatement/stabilisation details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the agreed objectives. ▸ Clearing of visually significant vegetation is further limited during the detailed design phase to that required to enable the works. Locations include: ▸ Between North Star Road and Scotts Road (approx. Ch 8.2 km to Ch. 9.2 km) ▸ Between North Star Road and the alignment (generally) ▸ Adjacent Wilby Street in North Star ▸ Associated with watercourses as described below
		Landscape and visual impacts on watercourses ▸ Develop the detailed design to further minimise impacts to waterways, riparian vegetation and in-stream flora and habitats. Particular locations include, Back Creek, Forest Creek, Whalan Creek and the Macintyre River and their tributaries. ▸ Adopt a crossing structure hierarchy: bridges preferred to culverts; however, local conditions and constructability impacts must be considered when determining the preferred environmental solution: aim to avoid, then minimise, the extent of waterway diversions or realignments.

Delivery phase	Aspect	Proposed mitigation measures

Detailed design	Landscape and visual values	Visual impact of rail infrastructure
		▸ Infrastructure (such as structures, embankments/cuttings and bridges) should be designed following an integrated design process with regard to landscape character and views as identified in the landscape and visual impact assessment, seeking to:
		  ▸ Legacy: create a consistent legacy of treatments along the Inland Rail Program alignment to enhance the overall recognition and legacy of the proposal
		  ▸ Bridges: through detailed design, ensure that bridges contribute to an overall coherent sense of design, respect their surroundings and consider connectivity, Crime Prevention through Environmental Design, and graffiti issues. In particular, consider urban design input to:
		  – Macintyre river/Whalan Creek bridge crossing and viaduct (around Ch. 30.6 km): Potential urban design input to the Macintyre Bridge during detailed design phase could enhance its visual amenity and potential to create a legacy of elegant waterway crossings
		  – Bruxner Way overbridge (around Ch. 25.6 km): Additional urban design input to the Macintyre Bridge during the detailed design phase could enhance its visual amenity and potential to create a legacy of elegant bridge structures.
		  ▸ Embankments: minimise the extent to which landform (embankments) restricts views or affects views from nearby residences, to the greatest extent possible, including through sensitive stabilisation, revegetation or, where appropriate, screen planting
		  ▸ Cuttings: minimise the extent of cut batters, noting that this has already been addressed to the greatest extent possible
		▸ Develop a Landscape and Rehabilitation Plan and associated detailed landscape design with landscaping treatments in accordance with the conditions of approval. The plan should reference the key landscape characteristics and elements identified in this landscape and visual impact assessment, and place particular emphasis on sensitive design appropriate to the setting as described below.

Detailed design	Landscape and visual values	▸ Rural and natural landscapes: the landscape design shall respect and enhance the rural landscapes. Considerations include:
		  ▸ Design of the landscape earthworks and planting to, screen and integrate the railway and associated structures and features, wherever practicable and appropriate to the character and maintenance of desired views. This includes further opportunity for design of targeted planting of buffer/shelterbelts adjacent to major earthworks within the rail corridor to the extent consistent with safety. For example, planting strips could be introduced adjacent to significant embankments and structures (such as those associated with bridge crossings) to reduce visual impact and assist in integrating the landform and structures into the existing landscape setting (which, it is noted, already incudes similar shelterbelts beside roads and riparian vegetation along watercourses).
		  ▸ The landscape design shall seek to enhance the features and qualities that give the landscape its particular characteristic, ensuring the design responds to the natural patterns of the rural or natural landscape.
		▸ Where appropriate consult with local stakeholders and landowners during design (and construction) in order to understand the landscape context and the particular qualities of landscapes.
		▸ Ecologically sensitive areas: design to provide opportunities for ecological gain to benefit biodiversity where practical within the operational rail corridor. This includes:
		  ▸ Development of diverse planting and seed mixes to maximise and connect habitat types for ecological gain
		  ▸ Enhancement of landscape corridors and ecological links across the landscape by, where possible, joining or re-joining fragmented areas of habitat
		  ▸ Landscape design and planting to incorporate ecological requirements to benefit the characteristic and visual amenity of local landscapes, including through revegetation with locally indigenous species.

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Landscape and visual values	Heritage Landscapes ▸ Heritage landscapes: through detailed design: ▸ Seek to further limit direct impacts or impacts to the setting of identified items of Aboriginal, historic or natural heritage significance, to the greatest extent possible. ▸ Consider the development of interpretation strategy and wayfinding to assist in the interpretation of visual elements of heritage significance, such as old rail lines, bridges, buildings or other items of visual value.
		Light impacts ▸ Opportunity for vegetation screening or 'at receptor' mitigation, as negotiated with the landowner, such as light blocking curtains, to minimise impacts on affected properties including the rural property 'Ohmi' (around Ch. 7.1 km). Selection of at-property mitigation measures and treatments will be undertaken in consultation with affected landowners.
Construction	Landscape and visual values	Landscape and visual impacts due to damage to vegetation ▸ Minimise disturbance to avoid impacts to native vegetation and habitats as far as practicable ▸ Consider selective retention of existing mature trees within laydown areas, where practical, in particular in North Star (adjacent to Wilby Street and within the construction facility footprint) where views towards the proposed construction facility will be clearly evident, to provide some screening of construction activities and provide a framework for restoration planting following completion of works (in consultation with the affected landowners). ▸ Construction areas, including compounds, stockpiles, fuel storage, laydown areas and staff parking to be located outside the tree protection zone as defined in AS4970-2009: *Protection of trees on development sites* (Standards Australia, 2009).
		Visual impacts of construction activities ▸ Minimise construction compounds close to sensitive receptors to the greatest extent possible ▸ Minimise height of all stockpiles to the greatest extent possible to reduce their visual impact ▸ Temporary treatments: Temporary treatments (such as hoardings and screens) to site compounds should be considered, to assist in reducing visual impacts. These include: ▸ Site compounds—opportunities to use features on temporary fencing/hoarding. This may include art-based treatments to assist with screening the works from the public and using information boards (or similar) to educate the public about the construction works.
		Landscape and visual impacts due to borrow pits ▸ Borrow pits to be rehabilitated at the conclusion of the construction of the proposal. Rehabilitation should occur to minimise long-term landscape and visual impacts, respond to the intended land use, be in accordance with the relevant strategic framework and best practice, and in consultation with the affected landowners.

27.13.12 Land use and property

27.13.12.1 Mitigation measures

Mitigation and management measures for each of the proposal delivery phases are included in Table 27.19.

TABLE 27.19 ENVIRONMENTAL MANAGEMENT MEASURES—LAND USE AND PROPERTY

Delivery phase	Aspect	Proposed mitigation measures

Detailed design	Property	▸ The overall disturbance of construction areas is to be limited where possible
		▸ Where land is not purchased on the open market, land will be acquired for the proposal in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW). Acquisitions of Crown land will also be undertaken in accordance with the *Crown Land Management Act 2016* (NSW)
		▸ If it is determined that land parcels fragmented by the proposal have a historical or current dwelling entitlement that is no longer applicable under the Gwydir Shire Local Environmental Plan (LEP) or Moree Plains LEP as a result of fragmentation, ARTC will consult with affected landowners where appropriate
		▸ Detailed management measures to reduce land-use impacts on individual properties and land users will be developed in consultation with the individual landowners concerned, during the detailed design and property acquisition negotiations
		▸ Individual property management agreements will be developed in consultation with landowners/occupants, with respect to the management of construction on, or immediately adjacent to, private properties. These will detail any required adjustments to fencing, access, farm infrastructure, and relocation of any impacted structures, as required:
		  ▸ Any impacts on operational farm requirements will be managed and reinstated as soon as possible
		  ▸ ARTC will work with individual landowners to develop suitable solutions based on individual farm-management practices. Solutions may include the provision of crossing points or underpasses for access to fragmented or isolated properties or, where disruption to water supply occurs, crossing points will be provided or the relocation of dams or irrigated systems will be undertaken
		▸ During the detailed design process, consideration will be given to the movement of stock across the rail line. In the event that private stock routes are identified through consultation with landowners, appropriate mitigation measures will be agreed upon with affected landowners. Mitigation measures may include the provision of alternative access arrangements developed in consultation with affected landowners.
		▸ Stock fencing must be in accordance with the Inland Rail fencing standards and be constructed prior to the removal of existing fencing or any works being carried out on the subject land, unless otherwise agreed with the landowner.

	Access	▸ Where any legal access to a property is permanently affected and a property has no other legal means of access, alternative access to and from a public road will be provided to an equivalent standard, where feasible and practicable. Where an alternative access is not feasible or practicable and a property is left with no access to a public road, negotiations will be undertaken with the relevant property owner for acquisition of the property in accordance with the provisions of the applicable land acquisition legislation and regulatory requirements. ▸ Detailed design aims to minimise the potential for impacts to the surrounding road and transport network, and property access ▸ For public crossings, ARTC will continue to undertake necessary consultation with Gwydir Shire and Moree Plains Shire councils and the local community in relation to the preferred road–rail interface treatments for each location ▸ Appropriate road–rail interface will continue to be assessed on a case-by-case basis for design purposes, with consideration given to current and future usage of the existing asset, its location relative to other crossings of the rail corridor, and the road and rail geometry at the crossing location

Delivery phase	Aspect	Proposed mitigation measures
Detailed design	Access	▸ The proposal will seek to maintain connectivity of travelling stock reserves (TSRs) through appropriate mitigation and management measures that include consultation with the relevant managing authority and proposing certain treatments, where practicable. ARTC will continue to liaise with Local Land Services during detailed design.
	Utilities	▸ Utility providers will continue to be consulted during detailed design to identify possible interactions and develop procedures to minimise the potential for service interruptions and impacts on existing land uses ▸ The location of utilities and other infrastructure will be identified prior to construction, to determine requirements for access to, diversion, protection and/or support.
Construction	Stakeholder engagement	▸ Property owners and occupants will be consulted in accordance with the communication plan for the proposal, to ensure that owners/occupants are informed about the timing and scope of activities in their area and any potential property impacts/changes, particularly in relation to potential impacts to access, utilities, or farm operational arrangements ▸ The rehabilitation strategy will include measures to reinstate and restore disturbed sites as close as possible to the pre-construction condition or better, or in consultation with the landowner.

27.13.13 Socio-economic

27.13.13.1 Mitigation measures

Mitigation and management measures for each of the proposal delivery phases are included in Table 27.20.

TABLE 27.20 ENVIRONMENTAL MANAGEMENT MEASURES—SOCIO-ECONOMIC

Delivery phase	Aspect	Proposed mitigation measures
Pre-construction and construction	Severance and amenity impacts	▸ Existing rail corridor used for 25 km to avoid direct impacts on private properties ▸ Macintyre River Viaduct designed to address risks to community safety through changes to flooding patterns or people accessing the rail corridor ▸ Working with property owners to ensure that a satisfactory level of access between adjoining properties is maintained and to identify actions that will minimise or offset changes to connectivity or changes to water flows that affect their properties ▸ Consulting with landowners to identify specific measures that will reduce impacts on farm connectivity or amenity.
	Proposal alignment	▸ ARTC's consideration of proposal alignment options is detailed in Chapter 3: Alternatives and proposal options. Chapter 8: Consultation describes the consultation process which occurred in relation to the proposal's alignment.
	Potential flooding impacts	▸ ARTC will continue working with stakeholders including directly impacted landowners, concerned landowners, local councils state departments and local flood specialists to inform and refine assessments and design, construction and operational phases of the proposal.
	Local business opportunities	▸ Development of a Local Content Policy and strategy to ensure proposal supply opportunities are available to local businesses (within 125 km of the proposal) ▸ Identification of businesses within 125 km with potential capacity to supply the proposal.

Delivery phase	Aspect	Proposed mitigation measures
Pre-construction and construction	Employment opportunities	▸ Engagement with the Toomelah and Boggabilla communities, representative organisations and service providers to develop new local businesses ▸ Providing a clear and efficient process for people to seek information about employment opportunities and register their interest in Inland Rail.
	Toomelah community safety and wellbeing	▸ Providing a grade-separated crossing of Tucka Tucka Road ▸ Working with the Toomelah community and government stakeholders to identify education and training pathways, and employment opportunities for Toomelah residents during and post-construction ▸ Supporting Toomelah residents to develop businesses that will service the proposal and/or support long-term employment outcomes.
	North Star community impacts and benefits	▸ Ongoing consultation with North Star residents regarding the proposed accommodation site and construction hours ▸ Inclusion of an access road within the proposal design to reduce traffic impacts past North Star Public School and in the village.
	Community wellbeing	▸ Consultation with landowners whose properties would be transected or bordered by the proposal to identify mitigation measures addressing impacts on farm management, access and residential amenity ▸ Engagement with North Star stakeholders and Gwydir Shire Council regarding plans for an accommodation construction facility in North Star ▸ Establishing and maintaining a Community Reference Group throughout construction, to include, as a minimum, landowners and residents from nearby communities, with future need for the Community Reference Group to be agreed with Community Consultative Committee members and DPIE following the conclusion of construction.

27.13.14 Hazard and risk

27.13.14.1 Mitigation measures

Mitigation and management measures for each of the proposal delivery phases are included in Table 27.21.

TABLE 27.21 ENVIRONMENTAL MANAGEMENT MEASURES—HAZARD AND RISK

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Detailed design	Natural	Bushfire	▸ Design to maintain appropriate access during construction and operation, ensuring local roads allow emergency access, first-response firefighting, access to water supply for firefighting purposes, and safe evacuation routes ▸ A landscaping design to include a wide strip of land on either side of the tracks to be clear from vegetation to provide a suitable fire break.
	Natural	Flooding and flash flooding	▸ Work with stakeholders including directly impacted landowners, relevant community stakeholders, local governments, state departments and local flood specialists to inform and refine assessments and design ▸ Continue to refine project design in response to hydraulic modelling. This includes consideration of peak water levels, flow distribution, velocities and duration of inundation. This will inform bridge lengths, culvert sizing and numbers, scour and erosion protection measures for both rail, road and other permanent project infrastructure. ▸ Review flood risk assessment to inform the siting and scale of temporary construction areas (including stockpiles, construction compounds, access roads, laydown areas etc) ▸ Locate plant and equipment maintenance activities and refuelling facilities in accordance with a risk assessment at an appropriate distance from riparian vegetation and waterways, with appropriate measures in place to avoid impacts to waterways and aquatic habitats as per water quality management plans.
	Natural	Landslide, sudden, subsidence, movement of soil or rocks	▸ Incorporate batter slopes and scour protection into design.
	Natural	Climatic conditions	▸ Continue to refine the cut/fill balance for earthworks to minimise material transport requirements ▸ The proposal will implement safety measures for the potential damage of tracks and asset as a result of extreme hot weather events, such as considering the use of elastic fasteners or heavier sleepers to reduce the risk of track buckling, selection of materials and colour to reduce heat load on trackside equipment ▸ The reference design has been developed to achieve a design life of 100 years. In doing so, designs for formation, track and structures have been developed in accordance with the ARTC *Codes of Practice*. The management of temperature fluctuation would be assured by sourcing components that have the assurance from manufacturers that the components maintain integrity at the required or envisaged temperatures. ▸ Factor for the potential increase in flood risk arising from any increase in extreme rainfall as a result of climatic conditions. Adaption strategies such as installing an early flood warning system to alert ARTC to impending flood risks, locating critical electrical systems (signalling, communications huts, etc.) above potential flood zones and considering the use of solar and battery devices to ensure uninterrupted operation of signalling and network communication in the event of power failure will be incorporated into the detailed design.

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Detailed design	Natural	Climatic conditions	▸ Design for future climate, including consideration of existing ARTC protocols for operating in extreme temperatures ▸ Sustainability initiatives, particularly in relation to energy consumption and savings throughout the project lifecycle, must be incorporated in detailed design.
	Proposal	Private access and travelling stock reserve	▸ ARTC would consult with Gwydir Shire Council, Moree Plains Shire Council and Crown Lands—DPIE to identify potential solutions for the treatment of rail and TSR interfaces ▸ Impacts to TSR and fully or partially acquisition of affected owners' land will be managed through the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) ▸ Where the proposal impacts on land designated as a TSR, the proposal will seek to maintain the connectivity of TSRs by either: ▸ Creating an Interface Agreement with Crown Lands—DPIE ▸ Implementing rail-over-road bridges where practicable ▸ Acquiring land and implement TSR route deviations ▸ Co-using level crossings (incorporating features of fencing, barrier or stock crossing, such as cattle grid).
	Proposal	Rail incidents	▸ Advanced Train Management System (ATMS) will be the adopted signalling technology once operational. ATMS improves network capacity, operational flexibility, train service availability, transit times, rail safety, and reliability. ▸ Track detail design will be investigated and implemented where relevant.
	Proposal	Road–rail interfaces Pedestrian interfaces at level crossings	▸ Any physical controls, such as boom gates and warning lights, that have been determined necessary from ALCAM will be detailed in the proposal design ▸ Detailed design of site location appropriate fencing is required near roads or where trespass is likely to occur.
Detail design	Proposal	Emergency access	▸ Emergency access will be addressed by the development of an access strategy. Consideration of the use of the maintenance access road by emergency vehicles will be made when evaluating the position of corridor access points. To facilitate emergency egress, multiple access points into and out of the rail corridor will be provided. ▸ Safe corridor access and vehicle turnaround points will be provided for maintenance work to ensure sufficient setback while working adjacent to live railway. Maintenance and emergency access roads will be designed such that it will allow separation, to prevent interaction between trains and vehicles without impeding escape or rescue activities.
Pre-construction	Proposal	Underground and overhead services	▸ The proposal will identify known services that require relocation prior to construction ▸ Overhead transmission lines and buried telecommunication cables will be identified before construction to ensure that construction and operation do not interfere or damage the utilities, as per the requirements of *Gas and Electricity (Consumer Safety) Regulation 2018* and *Safe Work Australia Model Code of Practice—Managing Electrical Risk in the Workplace* (Safe Work Australia, 2018b) The proposal has considered alignment to minimise the potential interference with these overhead utilities. ▸ The proposal will lodge a Dial Before You Dig enquiry prior to excavation or drilling work, which provides information about underground services on the worksite. Procedural control for the proposal will ensure that excavation work will comply with the *Safe Work Australia Model Code of Practice—Excavation Work* (Safe Work Australia, 2015).

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Pre-construction	Proposal	Contaminated land	▸ A Contaminated Site Management Sub-plan will be prepared to document management controls for works on land known or suspected of being contaminated and outline the process to identify, document and manage contaminated sites. This will include notification to the regulator as required, undertaking an impacted site review, reporting site contamination to authorities as required, recording the site contamination on ARTC Contaminated Site Register, and developing and implementing an action plan.
	Proposal	Asbestos	▸ Older infrastructure and previously disturbed land within the disturbance footprint may contain asbestos. The proposal will adhere to *Safe Work Australia Model Code of Practice—How to Manage and Control Asbestos in the Workplace 2016* (Safe Work Australia, 2020) and *Safe Work Australia Model Code of Practice – How to Safely Remove Asbestos 2018* (Safe Work Australia, 2018a). ▸ Survey of infrastructure that will be removed or disturbed by the proposal will be conducted to potentially identify asbestos-containing materials ▸ Construction activities likely to disturb asbestos will review the presence and requirement for specific controls ▸ The proposal will engage with competent contractors who are appropriately licensed for asbestos disturbance work.
	Proposal	Bridges	▸ Further ground surveys will be carried out as determined by a geotechnical engineer during construction early works to mitigate against bridge collapse.
	Proposal	Road–rail interfaces	▸ Crossing consolidation, relocation, diversion or realignment—existing road–rail interfaces may be closed, consolidated into fewer crossing points, relocated or diverted. Roads will only be closed where the impact of diversions or consolidations is considered acceptable, or the existing location is not considered safe and cannot reasonably be made safe. Approval for closures, where required, will be progressed in accordance with the requirements of the relevant legislation and road closure permits.
Construction and commissioning	Natural	Bushfire	▸ High fire-risk activities, such as hot works including flash-butt welding, will be carried out in accordance with ARTC's *Fire Prevention Management Procedure* (ARTC, 2007) and *Total Fire Bans Procedure* (ARTC, 2019). These procedures establish processes to manage hot work/high fire-risk activities, including observation of relevant Queensland Fire and Emergency Service directives, check extent of worksite vegetation prior to hot work, and ensure appropriate firefighting equipment and trained personnel are available.
	Natural	Flooding and flash flooding	▸ Construction staging to include construction of drainage structures before embankment sections, to mitigate flooding potential during construction.
	Natural	Landslide, sudden subsidence, movement of soil or rocks	▸ Implement a Soil Management Plan to manage the topsoil onsite such that it can be reused in rehabilitation and landscaping activities. Soil stockpiles are to be managed in accordance with erosion and sediment control plans. ▸ Regular earthworks inspections will be implemented to identify defects and conditions that may affect or indicate problems with the stability of earthworks ▸ The period that soil is exposed will be minimised through progressive ground cover revegetation to minimise erosion ▸ Temporary construction facilities will be sited to avoid flood areas, overland flow paths and clearance of established vegetation, where possible.

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Construction and commissioning	Natural	Climatic conditions	▸ Considering opportunities for the reduction of GHG generation during construction as per the Sustainability Management Plan developed during the detailed design/pre-construction phases ▸ Laydown areas will be included along the length of the proposal and at strategic locations, such as near structures. These will act as a centralised point for material storage, with some storing hazardous materials such as fuel. The locations of laydown areas have been chosen to avoid areas that are within the 1% AEP floodplains, where possible; however, by virtue of the requirement of laydown areas for constructing bridges, some laydown areas must be within flood plains and near water sources. ▸ ARTC will work towards minimising future risk in emergencies and engage with local governments and the Local Disaster Management Groups ▸ Construction water will be obtained from sustainable sources, with the necessary water entitlement, water allocation, water licence or water permit. Overall, an allowance of 190 L water per cubic metres of earthworks has been made for estimated construction water demand. Current water demand can be met through the use of existing water sources; however, further options may need to be investigated depending on engagement with water resource owners and water availability.
	Natural	Wildlife	▸ Construction works will be undertaken in accordance with a Flora and Fauna Sub-plan.
	Natural	Biosecurity	▸ Develop and implement a Biosecurity Management Plan as part of the CEMP in accordance with the *Biosecurity Act 2015* (NSW)
	Proposal	Fatigue and heat stress management	▸ Ensure construction management plans, systems, workplace conditions and facilities align with requirements of the *Work Health Safety Act 2011* (NSW) ▸ Follow Safe Work Australia, *Guide for managing the risks of working in heat* (Safe Work Australia, 2017).
Construction and commissioning	Proposal	Dust, respirable silica and other airborne contaminants	▸ Direct construction exposure to respirable silica and other airborne contaminants will be controlled through the use of appropriate personal protective equipment ▸ Where sensitive receptors, agricultural land uses or protected vegetation are located within 350 m of construction works, or visible dust is generated from vehicles using unsealed access roads, road watering or other appropriate controls are to be implemented ▸ Cover vehicles transporting potentially dust and/or spillage-generating material to and from the construction site immediately after loading (prior to traversing public roads) ▸ Visually inspect vehicles entering/exiting the site and implement additional controls such as wheel wash ▸ Limit clearing to that required to construct and operate the works, in accordance with the areas defined during detailed design ▸ Where practical, stage clearing and grubbing and construction activities to minimise exposure to erosive processes ▸ Implement controls to prevent and/or minimise dust generation during activities involving excavation or disturbance of soils or vegetation, or handling ballast (i.e. use water sprays or water carts for dust suppression as required) ▸ Avoid ground-disturbing activities during windy conditions or when prevailing winds are likely to result in dust impacts to sensitive receptors ▸ Implement additional dust-suppression controls prior to the onset of adverse weather. This may include covering of stockpiles and additional watering of access roads.

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Construction and commissioning	Proposal	Noise and vibration	▸ The proposal will develop and implement a Noise and Vibration Management Sub-Plan as part of the CEMP ▸ Noise and vibration sources from construction involving heavy machinery will incorporate appropriate noise mitigation equipment and devices, including mufflers and acoustic barriers. The proposal will reduce and manage noise as much as possible through a range of noise-management measures. Noise disruption from night works are kept to a minimum and work will be completed as quickly and efficiently as possible.
	Proposal	Road incidents	▸ A Traffic Management Sub-plan will be implemented to identify the impacts that construction traffic is likely to have on the transport infrastructure, and detail ameliorative measures required to mitigate all identified impacts of the development ▸ Specific hazard-control measures will be applied, including clearly defined access for vehicles and pedestrians along the rail corridor and the provision of fencing and gating for all corridor access points to prevent unauthorised entry ▸ Access roads and laydown areas established for construction that will have no permanent use will be decommissioned following construction, unless otherwise agreed with relevant landowners. ARTC will manage critical pedestrian, road and rail safety risks during operation, in accordance with the ARTC's Fatal and Severe Risk Program. ▸ Preferred options for public road–rail interface treatments currently applied over the length of the proposal include grade separation and level crossings.
	Proposal	Private access and travelling stock reserve	▸ ARTC will continue to consult with the affected landowner and alternative access arrangements will be provided to ensure safe access to residential property.
	Proposal	Underground and overhead services	▸ Procedural control for the proposal will ensure that excavation work will comply with *Safe Work Australia Model Code of Practice—Excavation Work* (Safe Work Australia, 2015) ▸ The ARTC *Engineering Standard for Requirements—Electric Aerials Crossing ARTC Infrastructure* (ARTC, 2005) requires that all structures supporting a span of electric aerials over ARTC railway track or sidings be located so that, in the event of failure, no part will fall within 1.8 m outside rail of any railway track.
	Proposal	Contaminated land (including unexploded ordnances)	▸ Construction personnel involved in ground-disturbing works will be trained in the identification of potential contaminated soil/material and the relevant controls that will be put in place in the event of its discovery ▸ Waste generation from construction activities can potentially contaminate the surrounding land and will be managed in accordance with the Waste Management Sub-plan and ARTC *Environmental Policy* (ARTC, 2014). A Hazardous Materials Management Sub-plan will be developed and implemented as part of the Waste Management Sub-plan. ▸ Identification of UXO will be subject to a risk assessment. Where there is a risk of encountering known or possible UXO, a suitably qualified person will assess and identify management options. ▸ Implementation of the Contaminated Site Management Sub-plan if contaminated land is suspected.

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Construction and commissioning	Proposal	Emergency access	▸ The maintenance of emergency access will be managed through the development and implementation of a Proposal Access Strategy. Access for emergency vehicles during construction of the proposal will be discussed with service providers during development of the strategy. In instances where construction-phase emergency access is affected, use of the rail maintenance access road (RMAR) by emergency vehicles may be appropriate. Multiple access points into and out of the rail corridor will be provided. ▸ A proposal Traffic Management Plan under the CEMP will be implemented to minimise impacts to surrounding land users.
	Dangerous goods and hazardous chemicals	Chemicals spillage and loss of containment	▸ Construction facilities where hazardous materials may be used or stored have been located outside of floodplains and away from areas of social and environmental receptors in accordance with the NSW SEPP 33. Additionally, the locations of construction facilities where vehicle maintenance and refuelling activities are expected will be selected to achieve appropriate separation to riparian vegetation and waterways. ▸ During the construction phase of the proposal, dangerous goods will be required at construction sites and facilities. Licensed transporters operating in compliance with *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2020) will be used for dangerous goods deliveries. ▸ Construction chemicals stored and handled will be managed in accordance with the *Work Health Safety Act 2011* (NSW) and Regulation, the relevant Australian Standards and the requirements of chemical safety data sheets. Safety data sheet information will be obtained from the supplier of these chemicals and stored in an easily accessible location.

	Dangerous goods and hazardous chemicals	Explosives	▸ Where explosives are used for significant cuttings during construction, the works will be undertaken by licensed shotfirers in accordance with the *Explosives Act 2003* (NSW) and *AS 2187—Explosive—Storage, Transport and Use* (Standards Australia, 1998)
			▸ Develop and implement a Blast Management Plan as part of the Noise and Vibration Management Sub-plan within the CEMP
			▸ At all times, the handling and use of explosives will follow procedures to:
			  ▸ Prevent misfire
			  ▸ Minimise the risk associated with material projected by a blast
			  ▸ Minimise adverse effects of ground vibration and shock waves caused by a blast
			  ▸ Ensure explosives are not used after either the manufacturer's recommended shelf life or the approved, extended shelf-life
			  ▸ Ensure public safety, vehicular access and security
			  ▸ Identify other activities within proximity of explosive use
			  ▸ Identify the environment of explosive use, including flood, bushfire, landslide zones.
			▸ Workplace Health and Safety (WH&S) Management Plans to include appropriate measures to manage risk associated with blasting such as consultation with service providers, comply with separation requirements and access controls, exclusion zones, trails, and buffers. Additionally, WH&S Management Plans will seek to minimise interruption to mine explosive transport routes, by communicating with mine management in regard to the schedule and activities of the proposal.

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Operation	Natural	Bushfire	▸ Existing ARTC management plans and strategies, including *Engineering (Track and Civil) Code of Practice—Section 17 Right of Way* (ARTC, 2013) and fire prevention management and total fire ban engineering procedures will be applied throughout the proposal lifecycle to minimise damage to property and maximise the safety of people ▸ The *ARTC Engineering (Track and Civil) Code of Practice—Section 17 Right of Way: Vegetation Management* (ARTC, 2013) will be implemented to minimise fire risk within the rail corridor, which includes specifications for vegetation management/ fire hazard reduction within the corridor ▸ Local fire authorities and local emergency services will be consulted to ensure appropriate operational actions are taken, such as providing feedback on the firefighting vehicles accessibility, fire prevention plans and cooperation on burning-off activities.
	Natural	Flooding and flash flooding	▸ Established site safety protocol (procedures, warnings, depth, indicators, etc.) ▸ Inspections and assessments will be carried out regularly to identify drainage defects that impact the operation of the proposal.
	Natural	Landslide, sudden subsidence, movement of soil or rocks	▸ Regular earthworks inspections will be implemented to determine defects and conditions that may affect or indicate problems with the stability of earthworks.
	Natural	Climatic conditions	▸ Operations on the corridor will comply with the *ARTC Route Access Standard General Information Route Standards: Speed Restrictions During Hot Weather* (ARTC, 2018b) ▸ ARTC Standard *ETM-06-08 Managing Track Stability* will be employed to ensure integrity of the track during increased extreme heat events. The *Track Stability Handbook* (ARTC, 2017) will be used as guide for track buckling mitigation plans through managing track stability. These will ensure regular rail inspection, maintenance, and de-stressing of the rail to maintain track stability during both seasonal and annual temperature fluctuations. The track structure design has allowed for temperature-based adjustment in operation.
	Natural	Wildlife	▸ Stock fencing, fauna fencing and wildlife permeability structures will be inspected and maintained as per *ARTC Engineering (Track and Civil) Code of Practice—Section 17 Right of Way: Inspection and Assessment* (ARTC, 2013).
	Natural	Biosecurity	▸ Pest and weed management will be carried out within the rail corridor in accordance with the *ARTC Engineering (Track and Civil) Code of Practice – Section 17 Right of Way: Vegetation Management* ▸ Adhere to quarantine rules and regulations.
	Proposal	Noise and vibration	▸ During the operational phase, environmental management will be managed in accordance with ARTC's EMS, which will incorporate the requirements of the Outline EMP, as appropriate, in line with the Noise and Vibration Management Sub-Plan ▸ Adhere to the noise and vibration management requirements as per ARTC standards ▸ Noise and vibration sources from maintenance work involving heavy machinery will incorporate appropriate noise-mitigation equipment in compliance with relevant state policy and guidelines.
	Proposal	Asbestos	▸ Adhere to ARTC's *Work Health and Safety Work Instruction for Asbestos* (Safe Work Australia, 2018a), along with Safe Work *Australia Model Code of Practice—How to Manage and Control Asbestos in the Workplace* (Safe Work Australia, 2020) and *Safe Work Australia Model Code of Practice—How to Safely Remove Asbestos 2018* (Safe Work Australia, 2018).

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Operation	Proposal	Dust, respirable silica and other airborne contaminants	▸ Trains to minimise idling time near sensitive receivers (where possible) ▸ Operators must ensure that significant dust-generating activities on the proposal are managed in a proper and efficient manner to minimise dust emissions, and comply with any relevant conditions of approval ▸ Conduct proactive community consultation where undertaking operational works with potential for adverse air-quality impacts.
	Proposal	Road–rail interface Pedestrian interface at level crossings	▸ ARTC will conduct routine inspections of crossing infrastructure, in accordance with ARTC *Engineering (Track and Civil) Code of Practice—Section 17 Right of Way: Inspection and Assessmen*t (ARTC, 2013) and will regularly review crossing performance and incident information to identify and remedy potential hazards ▸ ARTC is committed to continued delivery of railway safety messages to the community, in line with the Social Impact Management Plan (SIMP), through the awareness activities, community engagement activities and campaigns to increase public awareness.
	Proposal	Bridges	▸ Safety elements for double-stack freight trains such as loading requirements, centre of gravity and inspections for rolling stock are required to meet the organisational rolling stock and loading requirements, to ensure stability and prevent excessive movements of loads and containers during train movements or severe weather events.
	Proposal	Emergency access	▸ Local fire authorities and local emergency services will be consulted to ensure appropriate operational actions are taken.

	Proposal	Overhead and underground services	▸ Operation upholds the following ARTC and Australian Standards:
			  ▸ *ARTC Underground/Overhead Services Work Method Statement* (ARTC, 2016)
			  ▸ *AS 4799—Installation of underground utility services and pipelines within railway boundaries* (Standards Australia, 2020)
			▸ The proposal will also comply with the clearance distance as specified in the ARTC *Engineering Standard for Requirements—Electric Aerials Crossing ARTC Infrastructure* (ARTC, 2005) to ensure sufficient clearance and prevent contact with live electricity.

	Proposal	Contaminated land	▸ Hazardous (regulated) waste, such as hydrocarbons and hydrocarbon-contaminated products (e.g. oily waste or oil filters), which could potentially be generated during operation (either from maintenance operations or from freight spillages) will be collected and disposed of by a licensed waste transporter ▸ Implementation of the Contaminated Site Management Sub-plan if contaminated land is suspected.
	Dangerous goods and hazardous chemicals	Freight dangerous goods	▸ Emergency information holders must be readily available containing the *Initial Emergency Response Guide* (Standards Australia/Standards New Zealand, 2010), dangerous goods transport and consignment documents ▸ The freight transportation of dangerous goods on the proposal will be in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (National Transport Commission, 2020). Freight carts will be required to display appropriate Hazchem signage, including placards, and carry appropriate spill-containment equipment to be used by emergency services personnel in the event of an emergency. ▸ ARTC will develop a Spill Response Plan as part of a Hazardous Materials Management Sub-plan to outline the appropriate actions to be taken to minimise the effects of a spill ▸ Train operators will comply with the ARTC *Inspecting Trains Policy* (ARTC, 2015), such that inspections of dangerous-goods loading (e.g. restraining of packages, segregation of dangerous goods), brake conditions and train integrity are compliant with the ARTC *Train Operating Conditions Manual* (ARTC, various), before and during travel on the ARTC network. Details of the train's consist (a sequence of train carriages or cars) and content will also be provided to the ARTC network control.

27.13.15 Waste and resource management

27.13.15.1 Proposed mitigation measures

Potential impacts and proposed mitigation and management measures for each of the proposal delivery phases are included in Table 27.22.

TABLE 27.22 ENVIRONMENTAL MANAGEMENT MEASURES—WASTE AND RESOURCE MANAGEMENT

Delivery phase	Aspect	Proposed design objectives and mitigation measures
Detailed design	Generation of waste	▸ Cut-and-fill balance and minimisation of transport requirements for import/disposal of earthworks material considered further during detailed design by implementing the waste hierarchy in the *Waste Avoidance and Resource Recovery Act 2007* (WA) ▸ Establish waste-reduction targets for design and construction ▸ A waste-reduction review will be undertaken to identify opportunities to meaningfully achieve the waste-reduction targets through detailed design, construction and operation of the proposal ▸ Consideration of alternative approaches to materials used, construction and operational techniques and maintenance of a process to achieve a less resource-intensive and more efficient process, in accordance with relevant design standards. For example, material specifications should consider aspects such as use of prefabricated materials, percentage of recycled content and percentage of material rejection to reduce waste generation from the proposal. ▸ Investigate and develop a wastewater solution for the management of effluent from the construction accommodation facility, including an assessment of irrigation to fields and opportunity for beneficial reuse as non-potable water for agricultural purposes.

Pre-construction	Generation of waste	▸ The CEMP must comply with the conditions of approval and relevant regulatory requirements, detailing waste-management information, including:
		  ▸ General protocols and performance objectives for keeping the worksite clean and tidy
		  ▸ Processes for documenting waste volumes, types and how these will be compared to waste targets
		  ▸ Contingency measures for managing unexpected volumes of waste or other exceptional circumstances
		  ▸ Requirements for secure temporary storage, collection frequency and disposal/recycling requirements
		  ▸ Procedures and reporting/documentation requirements for ensuring waste transporters and receivers are appropriately licenced according to the type of waste
		  ▸ Requirements for training, inspections, audits, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction.

	Hazardous waste	▸ A contaminated and hazardous material survey will be undertaken prior to demolition of structures. In the event that asbestos or other hazardous materials are identified in these structures, a Contaminated and Hazardous Materials Management Plan will be developed and implemented as part of the CEMP.

Delivery phase	Aspect	Proposed design objectives and mitigation measures
Construction	Generation of waste	▸ Identify opportunities to achieve waste-reduction targets appropriate to the scope of the construction works ▸ Avoid disposal of excavated material to landfill by implementing the waste-management hierarchy and measures in the CEMP relating to waste management ▸ All cut material of appropriate suitability (as per organisational specifications) should be stockpiled separately and reused onsite where possible ▸ Purchase construction materials in bulk, where practical, to minimise packaging waste ▸ Plant and equipment used in the proposal is appropriately maintained ▸ Maintenance activities, refuelling and concrete washout will be carried out at an appropriate distance (relative to task risk) from riparian vegetation and waterways, with appropriate measures in place to reduce the potential for impacts to waterways, aquatic habitats and groundwater ▸ Effluent disposal from the construction site facilities to be managed in accordance with EPA environmental criteria and effluent quality requirements ▸ Contractors to adhere to the practices of the waste hierarchy in the *Waste Avoidance and Resource Recovery Act 2007* (WA), which sets out options for managing waste, from avoiding, to reusing, recovering, treating and disposing of waste ▸ Appropriate waste bins, facilitating segregation of waste, should be located at key site compounds to facilitate segregation and prevent cross contamination.
	Hazardous waste	▸ Contaminated waste must be classified and disposed in accordance with the CEMP ▸ Hazardous waste to be correctly stored, managed and disposed of by a licenced contractor or facility and in accordance with the relevant occupational health and safety legislative and regulatory obligations, including wastes generated as a result of demolition.
Operation	Generation of waste	▸ Plant and equipment used in the proposal is appropriately maintained ▸ Operators to adhere to the practices of the waste hierarchy in the *Waste Avoidance and Resource Recovery Act 2007* (WA), which sets out options for managing waste from avoiding, to reusing, recovering, treating and disposing of waste.
	Hazardous waste	▸ Contaminated waste must be classified and disposed in accordance with relevant legislative requirements.