# CHAPTER 23

# Draft Outline Environmental Management Plan

**CALVERT TO KAGARU** 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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# 23. Draft Outline Environmental Management Plan

## 23.1 Introduction

The Australian Government has committed to delivering the Inland Rail Program, which is significant national transport infrastructure. The Calvert to Kagaru Project (the Project) is one of 13 projects that make up the Inland Rail Program and delivers a missing link in the existing rail network between Calvert and Kagaru.

This Draft Outline Environmental Management Plan (Draft Outline EMP) establishes the environmental management framework for delivery of the Project.

The Project has been declared a 'coordinated project for which an EIS is required' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). The Coordinator-General will prepare a report evaluating the EIS and may make recommendations for the Project, and impose conditions for undertaking the Project.

The Project is also a 'controlled action' for the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), with the controlling provisions being listed threatened species and communities (EPBC 2017/7944).

Following completion of the EIS process, and subject to approval conditions under the EPBC Act, subsequent approvals and permits under other State legislation will be required for the Project. These additional approvals and permits are discussed in Chapter 3: Project Approvals.

## 23.2 Purpose of the Draft Outline Environmental Management Plan

The Draft Outline EMP:

- Provides an environmental management framework to enable the identified environmental and social outcomes to be achieved for the detailed design, pre-construction, construction and commissioning of the Calvert to Kagaru Project
- Establishes the process for the preparation and implementation of the Outline Construction EMP (Outline CEMP), Construction Environmental Management Plan (CEMP) and sub-plans.

Once operational, the Project will become part of the existing ARTC national rail network, and will be subject to the laws, policies and procedures that already apply to that network. Internal ARTC policies and procedures will be reviewed to include any special operational requirements for the Project. Operational matters are included in Appendix E: Proponent Commitments.

Proposed mitigation measures relevant to the operation of the Project are described in Chapter 7 to Chapter 21 of the EIS.

### 23.2.1 Structure of the draft Outline Environmental Management Plan

The Draft Outline EMP:

- Describes the key elements and delivery phases of the Project
- Describes the environmental management framework for the design, construction and commissioning of the Project
- Describes the relationship between the Draft Outline EMP, the Outline CEMP, the CEMP, sub-plans and other environmental management documents
- Describes monitoring, reporting, auditing, review and documentation requirements
- Describes processes for dealing with a non-compliance, including corrective actions
- Includes requirements for training and awareness, community and stakeholder engagement
- Outlines the complaints management and response process.

The Draft Outline EMP includes the following sub-plans:

- Land use and tenure
- Land resources, including erosion and sediment control
- Landscape and visual amenity
- Flora and fauna
- Air quality
- Surface water
- Groundwater
- Noise and vibration
- Cultural heritage
- Traffic, transport and access
- Hazard and risk
- Waste and resource management.

### 23.2.2 Structure of draft Outline Environmental Management Plan sub-plans

Table 23.1 outlines the components of each sub-plan contained in this Draft Outline EMP.

It is proposed that any conditions that are imposed by the Coordinator-General in the EIS evaluation report will be incorporated into future versions of the Outline CEMP and corresponding sub-plans as well as the CEMP to ensure that all works are authorised and consistent with the imposed conditions.

It is expected that the CEMP will be developed in stages, in advance of relevant project works, and will be amended/updated as the Project proceeds.

**TABLE 23.1: SUB-PLAN COMPONENTS**

| Component | Description |
|---|---|
| Environmental element | Environmental aspect to be managed through the EMP sub-plan. |
| Environmental outcomes | Environmental outcomes are mandatory and must be achieved.<br>The environmental outcomes are derived from statutory requirements or other relevant criteria and are reflected in the criteria adopted in the draft EIS. |
| Performance criteria | Measurable goals or indicators of the environmental outcome.<br>Environmental outcomes are deemed to be achieved if the performance criteria are met.<br>If the performance criteria are not met, mitigation measures must be implemented to achieve the environmental outcomes. |
| Proposed mitigation measures | Measures directed at achieving the environmental outcomes.<br>The proposed mitigation measures have been identified through the EIS process, recognising that additional or different mitigation measures may be applied in order to achieve the environmental outcome.<br>Additional mitigation measures may be developed in consultation with directly affected persons, relevant stakeholders and with the advice of the Environmental Monitor and Community Relations Monitor. |
| Monitoring and reporting requirements | Monitoring and reporting requirements to demonstrate that the environmental outcomes have been achieved, or corrective actions implemented, where applicable. |

## 23.3 Background

### 23.3.1 Proponent

ARTC was created after the Australian Government and state governments agreed in 1997 to the formation of a 'one-stop shop' for all operators seeking to access the national interstate rail network. Today, ARTC plays a critical role in the transport supply chain and in the overall economic development of Australia.

ARTC manages and maintains 8,500 kilometres (km) of rail network across five States and has invested billions of dollars to build, extend and upgrade the rail network to get freight off the road and onto rail.

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. ARTC also manage the seamless, safe transit of hundreds of freight and passenger trains across the rail network every day.

### 23.3.2 The Project

The Project is a new single track, dual-gauge railway, approximately 53 km in length, connecting the existing Queensland Rail (QR) West Moreton System rail corridor with the existing Interstate Line at Kagaru. The Project starts within the existing QR West Moreton System rail corridor to the east of Calvert where it heads to the south-east, traversing through the localities of Lanefield, Rosewood, Lower Mount Walker, Ebenezer, Willowbank, Purga, Peak Crossing and Washpool.

The Project then deviates to the north of the Southern Freight Rail Corridor (SFRC) through the Teviot Range until it again realigns with the SFRC on the eastern side of the Teviot Range, and traverses through Undullah until it joins the existing Interstate Line at Kagaru.

Where feasible, the Project has been designed to be within the existing SFRC, which was protected in November 2010 as future railway corridor under Section 242(1) of the *Transport Infrastructure Act 1994* (Qld).

The Project is one of the 'missing links' within the Inland Rail Program. As part of the broader Inland Rail Program, this Project provides a more direct route between Melbourne and metropolitan Brisbane in comparison with the existing inland and coastal road and rail networks and meets the Australian Government's objective of providing a long-term rail solution for competitive freight movement.

The Project includes four crossing loops to accommodate double-stack freight trains up to 1,800 m long and a 1,015 m tunnel through the Teviot Range to facilitate the required gradient across the undulating topography.

The key components of the Project include:

- 53 km of single track, dual-gauge rail line with four crossing loops. It will initially be constructed for 1,800 m long, double-stacked trains, and designed so as not to preclude the future extension of some crossing loops to accommodate 3,600 m trains.
- An approximately 1,015 m long Teviot Range tunnel, and bridges to accommodate topography and Project crossings of waterways and other infrastructure

- Tie-ins to the existing West Moreton System at the Project boundary near Calvert
- Allowance for a future connection to the Ebenezer Industrial Area at Willowbank
- The construction of associated rail infrastructure including maintenance sidings and signalling infrastructure to support the Advanced Train Management Systems (ATMS)
- Rail crossings including level crossings, grade separations/road overbridges, occupational/private crossings, fauna crossing structures
- Tie-ins to the existing operational Sydney to Brisbane interstate railway line at Kagaru
- Significant embankments and cuttings will be required along the length of the alignment
- Ancillary works including road and public utility crossings and realignments, signage and fencing and provision of services within the corridor (excluding those undertaken as enabling works, refer Section 23.3.4)
- Construction worksites, laydown areas and access roads.

## 23.3.3 Proposed activities

### 23.3.3.1 Detailed design

Detailed design is the process of developing the Project design up to an 'Approved for Construction' stage.

Detailed design includes outputs such as 2-D and 3-D models, detailed engineering drawings, construction specifications, and detailed bill of quantities for estimates and procurement.

The Draft Outline EMP sub-plans identify proposed mitigation measures to be considered during detailed design.

### 23.3.3.2 Ongoing activities

Some ongoing activities may occur concurrently with detailed design. This includes, although is not limited to, corridor acquisition, obtaining environmental approvals, land surveys, geotechnical investigations, land acquisition, plans and documentation in support of secondary permits and approvals, environmental surveys and monitoring.

### 23.3.3.3 Project works

Project works include early works and pre-construction activities, construction and commissioning works. Project works exclude enabling works as described under Section 23.3.4.

**Early works and pre-construction activities**

Early works and pre-construction activities are required for construction mobilisation and to support the permanent infrastructure components. These activities must not commence until a CEMP for the relevant Project works has been endorsed by the Environmental Monitor as being consistent with the Outline CEMP and imposed conditions.

Early works and pre-construction activities may include but are not limited to:

- Establishment of access tracks for early works and pre-construction works
- Installation of erosion and sediment control measures associated with early works and pre-construction works
- Relocation or protection of QR assets (excluding those undertaken as enabling works)
- Installation of temporary fencing
- Utility and service relocations (excluding those undertaken as enabling works)
- Establishment of some site compounds, where identified as required in support of early works/ pre-construction activities
- Delivery of materials to site.

#### 23.3.3.4 Construction

Construction activities include, but are not limited to:

- Site set out and pegging, including establishing clearing limits
- Establishment of laydowns and compounds, including vehicle inspection/workshops, washdown facilities and temporary fencing as required
- Installation of erosion and sediment control measures
- Clearing using dozers, chainsaws, excavators, trucks and similar equipment
- Bulk earthworks—major cut-to-fill operations include the winning of suitable construction material from sections of cut along the railway alignment or from borrow areas external to the site
- Construction of drainage infrastructure—cut-off drains, table drains and culvert structures
- Construction and installation of concrete railway bridges and culverts
- Ballast—supply, delivery and installation
- Concrete sleepers—supply, delivery and installation
- Installation of rail track and other items of rail infrastructure using rail-mounted equipment
- Installation of railway signalling and communications equipment
- Construction of tunnel maintenance facilities, administration and amenities buildings, car and truck parking and bulk fuel provisioning and storage areas
- Other miscellaneous activities to complete the works such as reinstatement and rehabilitation of temporary works areas and landscaping in accordance with the Project landscape design.

Additionally, transportation of equipment, materials, spoil, construction waste and workforce will also take place across the Project.

Construction may commence once the CEMP for the relevant Project works has been endorsed by the Environmental Monitor. Construction activities must be undertaken in accordance with any relevant imposed conditions.

**Reinstatement, rehabilitation and landscape treatment**

A Reinstatement and Rehabilitation Management Plan will be implemented during the construction and commissioning phases of the Project to manage the rehabilitation of land that is not required for the operations phase.

A Landscape and Rehabilitation Management Plan will establish the requirements for:

- Progressive installation of the Project landscape design and implementation of the Reinstatement and Rehabilitation Plan
- Establishment, maintenance and monitoring
- Completion criteria for areas defined in the Project landscape design and/or identified in the Reinstatement and Rehabilitation Plan.

Erosion and sediment control measures will be left in place, monitored and maintained until the relevant erosion and sediment control plan catchment areas are stabilised.

**Commissioning**

All Project works will be subject to approved Testing and Commissioning Plans, as required, and appropriate Inspection and Test Plans.

Relevant aspects of the CEMP will remain in place until the commencement of the operation phase.

### 23.3.4 Works that are not part of Project works

Enabling works are those undertaken by or for third parties, primarily for the relocation or re-provision of public utilities, or existing QR rail assets. These works may be undertaken under a separate contract, or by the relevant asset owner, and are required to comply with the relevant environmental and regulatory framework applicable to the works or public utility.

## 23.4 Approach to environmental management

This Draft Outline EMP establishes the requirements for the development and implementation of the CEMP. This Draft Outline EMP exists within a suite of documents that will guide the delivery of the Project:

- ARTC corporate policies (refer Section 23.4.1.1)
- ARTC's Environmental Management System (EMS) (refer Section 23.4.1.2)
- Inland Rail Environment and Sustainability Policy and Project Sustainability Management Plan (refer Section 23.4.1.3)
- Social Impact Management Plan (SIMP) (refer Section 23.4.2)
- Approved Cultural Heritage Management Plans (CHMPs) (refer Section 23.4.3).

### 23.4.1 Corporate governance and policies

#### 23.4.1.1 ARTC Policies

ARTC's system of corporate governance comprises corporate policies and core values. This governance system applies across the whole of the ARTC network, including all works associated with the Inland Rail Program.

In addition to various legislative compliance requirements, all works associated with the Inland Rail Program will be completed in accordance with the following ARTC corporate policies:

- ARTC Environmental Policy (refer Appendix F: Corporate Policies)
- ARTC Safety Policy (refer Appendix F: Corporate Policies).

The ARTC Environmental Policy provides a framework for continual improvement of ARTC's Environmental Management System (EMS) and sets out commitments for managing potential environmental risks.

#### 23.4.1.2 ARTC Environmental Management System

ARTC's EMS supports effective management of environmental risk and legal obligations during the detailed design, construction and commissioning phases of development of the Project. On the commencement of operation of the Project, ARTC's EMS and operational and maintenance procedures will apply.

#### 23.4.1.3 Inland Rail Environment and Sustainability Policy

ARTC have developed the Inland Rail Environment and Sustainability Policy (refer Appendix F: Corporate Policies).

Sustainability initiatives and measures have been identified and captured in Project designs and proposed mitigation measures where relevant.

A Sustainability Management Plan will be developed for the delivery of the design and construction of the Project. Further details are provided in Chapter 7: Sustainability.

### 23.4.2 Social Impact Management Plan

A Social Impact Management Plan (SIMP) has been developed in accordance with the Coordinator-General's Social Impact Assessment Guideline. The SIMP outlines the objectives, outcomes and performance measures for mitigation of social impacts, and the actions that ARTC will undertake and/or require its contractor to undertake. The SIMP is described in Chapter 16: Social and provided in Appendix R: Social Impact Assessment Technical Report.

### 23.4.3 Cultural Heritage Management Plans

Two Cultural Heritage Management Plans (CHMPs) (CLH017009) for the Project were developed between ARTC and the relevant Aboriginal Parties in 2017 and 2018. These CHMPs have been approved under the *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act) and consequently meet all the requirements for the identification, assessment and management of Aboriginal heritage under the Project's Terms of Reference (ToR) and the ACH Act. Impacts and/or risks associated with Indigenous heritage will be managed in accordance with the CHMPs (CLH017009).

## 23.5 Roles and responsibilities

The roles and responsibilities of relevant entities for delivery of the project works are set out in Table 23.2. These roles may be refined as contractual arrangements are finalised and subject to changing agency responsibilities.

**TABLE 23.2: ROLES AND RESPONSIBILITIES**

| Role | Responsibilities |
|---|---|
| ARTC (Proponent) | ▸ Proponent for the Project<br>▸ Administers the Project agreement<br>▸ Oversees the contractor's detailed design process to achieve the environmental outcomes<br>▸ Participates in community engagement activities<br>▸ Engages the Environmental Monitor for the duration of construction<br>▸ Engages the Community Relations Monitor for the duration of construction |
| Contractor | ▸ Prepares, maintains and implements the CEMP<br>▸ Delivers the Project in accordance with all laws, including conditions of approvals<br>▸ Provides notifications and reports as required by law, including conditions of approvals<br>▸ Ensures the construction workforce are properly and regularly trained in environmental responsibilities, including cultural heritage responsibilities, in accordance with the CEMP<br>▸ Establishes and maintains a complaints management system, to receive and respond to complaints |
| Coordinator-General | ▸ Administers the SDPWO Act |
| State Regulator | ▸ Administers compliance with imposed conditions and the Coordinator-General's evaluation report<br>▸ Receives reporting and notification in accordance with commitments and any imposed conditions |
| Commonwealth Regulator | ▸ Administers compliance with EPBC Act conditions of approval |
| Environmental Monitor—an independent, suitably skilled and qualified entity engaged by ARTC | ▸ Reviews and endorse the contractor's CEMP (including sub-plans) and revisions against the Outline CEMP and any imposed conditions<br>▸ Monitors compliance with the CEMP (including sub-plans) and any imposed conditions<br>▸ Maintains a current copy of the CEMP (including sub-plans) including any progressive revisions and records of modifications to the Projects construction or commissioning procedures<br>▸ Maintains a register of sensitive receptors<br>▸ Reviews any audit and compliance reports prepared by the Contractor or the Proponent<br>▸ Has oversight of the implementation of the environmental monitoring requirements established in the CEMP. Review the results of the monitoring and verify these results if the Environmental Monitor considers it necessary |
| Community Relations Monitor—an independent, suitably skilled and qualified entity | ▸ Provides monthly reports on community issues emerging from the construction and commissioning activities in relation to any imposed conditions, the CEMP, complaints, monitoring and community relations.<br>▸ Communicates with ARTC and the Environmental Monitor with regard to any imposed conditions, the CEMP, the SIMP, community consultation strategies and community concerns<br>▸ Reviews complaints procedures and the resolution of complaints and corrective action reporting to assess performance of the construction contractor's implementation of the SIMP and CEMP<br>▸ Facilitates discussions between the ARTC and the contractor and affected entities about mitigation measures as required by either the ARTC or affected entity<br>▸ Provides advice to the Environmental Monitor in relation to complaints |
| Community Reference Group | ▸ Provides feedback to ARTC and the contractor in relation to construction planning, impacts and mitigation measures |

## 23.6 Training and awareness

All Project personnel will be required to attend an induction session to inform them of their responsibilities under the CEMP.

A training register will be developed and maintained throughout construction and commissioning that identifies requirements in relation to:

- Qualifications and competencies
- Project specific environmental training courses, refreshers and inductions relevant for different activities/groups of personnel/locations.

This register will also be used to track the relevant qualifications held by Project personnel and subsequent completion of induction, training, and refreshers sessions.

Short-term visitors to site, for purposes such as deliveries, will be required to undertake a visitor's induction and will 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:

- CEMP requirements
- Relevant imposed conditions
- Statutory duties in regard to notification of environmental harm
- Environmental incident notification procedures
- Complaints management procedures
- Key environmental risks and issues
- Location of sensitive receptors and environmentally sensitive areas
- Cultural heritage and cultural awareness training, in consultation with the Yuggera Ugarapul People and Jagera Daran People
- Permissible hours of work
- Construction traffic routes
- Key environmental contacts.

Communication to all construction personnel in relation to environmental management will occur. The contractor, ARTC and other relevant responsible entities will ensure that the general intent, scope and relevance of this Draft Outline EMP are understood by all site personnel.

Environmental education of environmental risks and issues such as: dust and air quality, erosion and sediment controls (during wet seasons or prior to forecast events), fauna awareness during clearing phases or breeding periods etc. for the Project will be communicated as relevant (such as seasonal, work activity etc) by the following methods:

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

Attendance records and any training associated with the environmental education program will be recorded and maintained by the environment team through project database recording with summaries of topics included within project environmental monthly reporting. The effectiveness of these communication methods will be subjected to periodic review.

## 23.7 Incidents, notifications and emergencies

Sections 320 to 320G of the *Environmental Protection Act 1994* (Qld) (EP Act) outline the requirements for the duty to notify of environmental harm. Pollution incidents and activities that cause or threaten to cause serious environmental harm or material environmental harm must be reported within 24 hours to the Department of Environment and Science (DES), and other stakeholders as required, so that appropriate action can be taken to prevent or limit possible environmental harm.

All staff and contractors will be required to report any environmental incidents (including complaints) or breaches of the approval conditions in accordance with the requirements and timeframes set out in the CEMP and any statutory requirements.

Project-specific Incident Management Procedures will also be developed to detail the process and resources required to respond to and manage incidents and emergencies during construction and commissioning.

## 23.8 Inspections, monitoring, auditing and reporting

Inspections, monitoring, auditing and reporting will be undertaken to document compliance with imposed conditions and the CEMP.

Where monitoring and auditing determines that the existing management measures are not effective, corrective and preventative measures will be developed and implemented as soon as practicable.

### 23.8.1 Environmental inspections

The CEMP will include requirements for inspections of construction sites to ensure compliance with imposed conditions and other Project-specific plans.

### 23.8.2 Environmental monitoring

Environmental monitoring programs will be developed for the pre-construction and construction phases of the Project. These monitoring programs will be designed to assess the compliance of the Project with the CEMP and determine the effectiveness of mitigation measures.

Monitoring activities will be conducted by a person who is suitably trained, qualified and experienced. 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.

Environmental samples will be sent to a National Association of Testing Authorities (NATA) accredited laboratory for analysis, unless otherwise stated in a sub-plan or as approved by the Environmental Monitor. The results of the monitoring programs will be interpreted and reviewed regularly through monthly project reporting with non-compliance investigated and resolved as per agreed timeframes.

If monitoring indicates construction or commissioning activities are not in compliance with the imposed conditions or the CEMP, necessary actions will be taken to rectify the identified issue.

### 23.8.3 Auditing

During construction and commissioning, environmental audits will be completed to assess compliance with all applicable environmental requirements, including the imposed conditions and the CEMP. This will include internal audits (an internal audit plan will be developed) and third-party independent audits by suitably qualified/experienced and competent auditors.

Third-party independent audits will be completed on an annual basis during the construction period.

The audits will assess compliance with the following requirements:

- Any imposed conditions determined by the Coordinator-General
- CEMP, including sub-plans.

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

### 23.8.4 Reporting

During construction, a monthly construction compliance report will be prepared that includes:

- Summary of monitoring data and interpretation of the results
- Details of any non-compliance event, including a description of the incident, resulting effects, corrective actions, revised practices to prevent a recurrence, responsibility and timing
- Reporting of complaints, including the number of complaints, description of issues, responses and corrective actions.

For the duration of construction, an Annual Construction Report will be prepared that includes:

- A compliance evaluation table detailing the relevant imposed condition, whether compliance with the imposed condition was achieved and how compliance was evaluated
- An evaluation of compliance with the CEMP
- A summary of any non-compliance events during the reporting period
- A summary of any non-compliance events during the previous reporting period, with details of corrective actions taken or to be taken and revised practices implemented or to be implemented (as relevant)
- Relevant trends and interpretation as related to environmental outcomes and performance criteria for each environmental element (all periods to date).

## 23.9 Document control

Records that are applicable to construction and commissioning environmental management will be retained for a minimum of five years post-construction. Environmental records will include but will not be limited to:

- Site inspection checklists
- Environmental audit reports
- Training records
- Monitoring data
- Environmental approval documentation and associated compliance reporting
- Complaints and associated records of communication
- Learnings and revised controls developed as a result of non-compliance events
- Environmental procedures and plans
- Meeting minutes
- Regular correspondence.

## 23.10 Community and stakeholder engagement principles

A Community and Stakeholder Engagement Plan will be developed to guide and monitor engagement activities during the construction phase. The Community and Stakeholder Engagement Plan will include measures to address:

- Communication with potentially impacted communities regarding the EIS findings
- Engagement with Scenic Rim Regional Council (SRRC) and Ipswich City Council (ICC) on the schedule, progress, potential impacts and mitigations for the Project, and development of partnerships to maximise social opportunities
- Working with the owners of properties that would be acquired, and those who may experience exceedances of the Project's construction noise criteria, to keep them updated and address property-specific impacts
- Consultation with the owners of homes and agricultural operations adjacent to the Project's work sites to discuss mitigation of property-specific impacts (such as changes to road access, surface water diversion, noise issues or dust) where necessary
- Provision of information to landholders and communities near Project works about the nature of construction, including the timing, duration and predicted impacts of the works, and the predicted effects of Project works on road, rail and pedestrian and cycle network operations, in advance of their commencement
- Establishment of a Community Reference Group (CRG) for the construction phase, to meet regularly with the purpose of providing timely, open advice, representation of community issues and concerns arising from the works
- Engagement with government agencies to develop protocols, confirm the detail of mitigations for impacts on social infrastructure and develop joint response arrangements with:
  - Department of Education e.g. school bus route safety measures
  - Queensland Health, e.g. forecasting the workforce ramp-up and agreeing the schedule for communication with the Project
  - Queensland Police Service (QPS), Queensland Ambulance Services (QAS) and Queensland Fire and Emergency Services (QFES), e.g. emergency access arrangements
  - Department of Communities, Disability Services and Seniors (DCDSS), e.g. monitoring of demands for community support services
  - Department of Housing and Public Works (DHPW) to ensure that they are aware of any support needed by Department of Transport and Main Roads (DTMR) tenants
- Cooperation with Traditional Owners and other Aboriginal parties and organisations
- Meetings and partnership discussions with local high schools and training providers, to develop training pathways for Project construction and operation
- Consultation with the Scenic Rim Tourism Association and Ipswich Tourism Operators Network regarding major event schedules and support for the promotion of local tourism
- Engagement with local businesses, local Chambers of Commerce and Department of Employment. Small Business and Training (DESBT) to identify existing skills, gaps in local capacity to work with major projects, and capacity building programs
- Updating the Project's webpage and other locally available communication materials to include:
  - The Project's CEMP and SIMP
  - Quarterly construction updates, including detailed explanations of upcoming activities, workforce ramp-up and stakeholder engagement mechanisms
  - Complaints and feedback mechanisms.

The Community and Stakeholder Engagement Plan will inform the development of the Community Engagement Sub-plan in the CEMP.

The Community and Stakeholder Engagement Plan will be reviewed annually in consultation with the CRG during the construction phase and updated as required. Further information is contained in Chapter 16: Social.

## 23.11 Complaints management

A project Complaint Management Handling Procedure will be developed to ensure that complaints are dealt with efficiently and effectively, and that stakeholders have confidence in the organisation's complaint system.

Complaints can be lodged by any member of the public, landholder or other stakeholder.

The Complaint Management Handling Procedure will include the following steps:

- Acknowledge: On receiving a complaint, staff will take reasonable steps to ensure that the complaint is properly understood and seek clarification or additional information from the complainant where required. The complaint will be reported and forwarded to the relevant technical area for appropriate action or information.
- Assessment: A preliminary assessment of the complaint is conducted to determine whether the complaint can be resolved, or if it needs to be referred to another appropriate agency or party (for example a local government or government agency).
- Planning: Complaints that are straightforward can often be resolved on first contact. If this is not the case and the complaint requires investigation, a planning process will be undertaken to identify what is to be investigated, the steps involved in investigation, the remedy the complainant is seeking and other possible remedies.
- Investigation: The complaint will be investigated, based on the principles of impartiality, confidentiality and transparency.
- Response: The progress of the complaint will be monitored and communicated to the complainant, until the outcome has been communicated to the complainant.
- Follow-up: Complainants will be offered the opportunity to seek review of how their complaint was handled and resolved. If a complainant is dissatisfied with an investigator's findings or decision, a review will be carried out by a representative who has not been involved in the matter.

ARTC Inland Rail will regularly monitor the quality and effectiveness of the complaints management system and revise relevant components where appropriate, based on feedback from internal and external sources.

ARTC's stakeholder management system will be used to record details of complaints and their resolution for issues analysis and reporting purposes. Further information is provided in Chapter 16: Social.

## 23.12 Construction hours

The proposed hours for various construction activities are set out in Table 23.3 and are reflected in the performance criteria in the Draft Outline EMP Noise and Vibration Sub-plan.

**TABLE 23.3: PROPOSED HOURS OF WORK FOR CONSTRUCTION ACTIVITIES**

| Description of works | Hours of work |
|---|---|
| Surface Works (other than works set out below) | Standard Hours<br>Monday–Friday<br>6.30 am–6.00 pm<br>Saturday<br>6.30 am–1.00 pm<br>No work on Sundays or public holidays<br>If the Project works comply with the Performance Criteria in Section 23.13.8.2:<br>Monday–Friday<br>6.00 pm–10.00 pm<br>Saturday<br>1.00 pm–5.00 pm |
| Tunnelling activities | 24 hours a day, 7 days a week[1] |
| Spoil haulage | 24 hours a day, 7 days a week[1] |
| Transport, assembly or decommissioning of oversized plant, equipment, components or structures | 24 hours a day, 7 days a week[1] |
| Delivery of 'in time' materials such as concrete, hazardous materials, large components and machinery | 24 hours a day, 7 days a week[1] |
| Works that require continuous construction support, such as continuous concrete pours, pipe-jacking or other forms of ground support necessary to avoid a failure or construction incident | 24 hours a day, 7 days a week[1] |
| Materials and equipment delivery | 24 hours a day, 7 days a week[1] |
| Works in a rail corridor (track possessions) | 24 hours a day, 7 days a week[1] and in accordance with the hours of work prescribed by the rail infrastructure manager. |
| Works in a road | In accordance with the hours of work prescribed by the road authority in any permit under a local law (for a local government) or a permission under the *Transport Infrastructure Act 1994*, or if no hours of work are prescribed, then works may be undertaken Monday–Saturday (not public holidays) 6.00 am–6.00 pm. |
| Works carried out in an emergency to avoid the loss of life, damage to property or to prevent environmental harm | At any time |
| Blasting | Monday–Friday<br>7.30 am–4.30 pm<br>Saturday<br>7.30 am–1.00 pm<br>No blasting on Sundays or public holidays |

1. Works outside of standard hours will only proceed where:
   - consultation with the local community has been undertaken
   - a site-specific noise risk assessment has been undertaken to identify the environmental risks associated with the works and action required to mitigate these risks
   - justification is provided as to why the works are required outside of the hours nominated for surface works above.

## 23.13 Draft Outline Environmental Management Plan sub-plans

This section provides discipline-specific Draft Outline EMP sub-plans, drawing on the outcomes of the environmental assessments documented in the Draft EIS. The Draft Outline EMP sub-plans establish a framework for sub-plans that will be prepared as components of the CEMP during the next phase of the Project.

Each Outline EMP Sub-plan includes:

- Environmental outcomes
- Performance criteria
- Mitigation measures
- Monitoring requirements.

### 23.13.1 Land use and tenure

#### 23.13.1.1 Environmental outcomes

Project works are designed and managed to minimise the potential adverse impacts and maximise the potential benefits to surrounding land uses.

#### 23.13.1.2 Performance criteria

- Access to private land is maintained for the duration of construction.
- The Project footprint is refined and limited to that required to safely construct, operate and maintain the Project.
- The sub-plans for noise and vibration, air quality and traffic, and the landscape design, Reinstatement and Rehabilitation Plan, and Landscape and Rehabilitation Management Plan are prepared and implemented in consideration of neighbouring land uses.

#### 23.13.1.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.4.

**TABLE 23.4: LAND USE AND TENURE**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design | Property | Detailed design to further refine the project disturbance footprint identified and assessed in the EIS, to that which is required to safely construct, operate and maintain the Project.<br>Minimise property acquisition requirements, property severance and disruption to land use and transport networks.<br>Project clearing extents are to be surveyed and clearly defined, physically and digitally, prior to Project works commencing.<br>Consultation is to occur with the resource tenement holders within the disturbance footprint prior to Project works. |
| | Access | Where feasible, detailed design and construction planning minimises alteration to the surrounding road and transport network and maintains legal property accesses.<br>Develop site-specific traffic management plans with key land uses and businesses adjoining, or within close proximity of, the Project disturbance footprint to minimise business operations disruptions during construction (e.g. businesses that rely on access to Undullah Road).<br>Road–rail interface detailed design to be undertaken in consultation with road/rail authority. |
| | Reinstatement and/or rehabilitation | A Reinstatement and Rehabilitation Plan will be developed for areas within the disturbance footprint that do not form part of the permanent works (e.g. construction compounds, laydown areas, temporary access and some temporary erosion and sediment controls).<br>The Plan will include and clearly specify:<br>▸ Location of areas subject to reinstatement and/or rehabilitation<br>▸ Rail safety operational requirements and constraints<br>▸ Details of the actions and responsibilities, performance criteria and monitoring frameworks to progressively rehabilitate, regenerate, and/or revegetate areas no longer active.<br>A Landscape and Rehabilitation Management Plan must be developed to define progressive and post construction installation of the Project landscape design, its establishment and ongoing maintenance and monitoring requirements in addition to construction contract completion criteria for areas defined in the landscape design and/or identified in the Reinstatement and Rehabilitation Plan. |
| | Utilities | The location of utilities, services and other infrastructure identified through design processes to date will be further documented during detailed design to confirm requirements for access to, diversion/relocation, protection and/or support.<br>Interface arrangements with impacted public utility providers will be finalised prior to relevant construction activities commencing. |
| Pre-construction/ construction | Fencing | Where practicable, permanent Project boundaries are to be fenced in accordance with Inland Rail fencing standards. |

#### 23.13.1.4 Monitoring

Monitoring compliance of the development and implementation of the land use- and tenure-related management processes and performance criteria identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

### 23.13.2 Land resources

#### 23.13.2.1 Environmental outcomes

Project works are designed and managed to avoid, and where this is not possible, minimise potential adverse impacts to soils within and adjacent to the Project works. Project works are managed to prevent contamination of soil as a result of construction and commissioning activities.

Project works are managed to minimise biosecurity risk within and on land adjacent to the disturbance footprint.

#### 23.13.2.2 Performance criteria

- Project works do not cause erosion or contamination beyond the disturbance footprint.
- Project works are undertaken in accordance with an Erosion and Sediment Control Plan (ESCP) prepared by a Certified Professional in Erosion and Sediment Control (CPESC).
- Acid sulfate soils and contaminated soils are avoided or intercepted and managed to avoid adverse impacts to environmental values.
- Obtain all necessary approvals and permits associated with the movement of contaminated, hazardous or biosecurity materials associated with the pre-construction, construction, maintenance and operational activities.
- The storage, transport and use of hazardous materials does not cause contamination of land or waters.
- Any imported fill is tested and classified to confirm it is not contaminated and suitable for use for the Project.
- All contamination incidents are rectified as soon as possible, and in accordance with legislative requirements.
- Minimise the import and disposal of fill material.
- Minimise and manage the environmental and health impacts arising from disturbance of pre-existing contaminated and/or hazardous soil and materials (including unexploded ordnances (UXO)).

#### 23.13.2.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.5.

**TABLE 23.5: PROPOSED MITIGATION MEASURES—LAND RESOURCES**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design | Erosion and sediment control | Project clearing extents are limited to the disturbance footprint, which must be minimised to that required to safely construct, operate and maintain the Project.<br>An ESCP will be prepared by a CPESC in accordance with the International Erosion Control Association's *Best Practice Erosion and Sediment Control* (IECA, 2008). The plan will detail the following procedures and protocols relevant to potential impacts identified within the Chapter 9: Land Resources:<br>▸ Soil/land conservation objectives for the Project<br>▸ Temporary/permanent drainage, erosion and sediment control measures<br>▸ Workplace health and safety requirements relating to management of contamination and unexploded ordnance risk<br>▸ Management of problem soils (e.g. acid sulfate soils, erosive, dispersive, reactive, acidic, sodic, alkaline soils)<br>▸ Stockpiling and management/segregation of topsoil where it contains native plants seedbank or weed material<br>▸ Vehicle, machinery and imported fill hygiene protocols and documentation<br>▸ Requirements for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction.<br>The ESCP will be reviewed prior to the commencement of preconstruction activities, once the construction methodology is finalised and to document location-specific controls. |
| | Hazardous materials handling and storage | A Contaminated and Hazardous Materials Management Plan will be included as a component of the CEMP to eliminate, minimise and manage spills.<br>Design of bunding containment is to be in accordance with *Australian Standard (AS) 1940:2017 The storage and handling of flammable and combustible liquids*. |
| | Reinstatement and/or rehabilitation | The ESCP will align with the Reinstatement and Rehabilitation Plan and will include progressive stabilisation of earth materials and soil consolidation to prevent erosion and sedimentation in areas within the disturbance footprint that do not form part of the permanent works (e.g. temporary construction compounds and laydown areas etc.). |
| | Land and soil | Soil conditions across the disturbance footprint will be appropriately characterised at a suitable scale through additional soils surveys during the detailed design phase of the Project to inform design and environmental management measures. This includes identification of potential/actual acid sulfate soils, acid rock, reactive soils, erosive soils, dispersive soils, salinity, acidic soils, alkaline soils, wetness, depth and contaminated land.<br>Minimise risks through implementation of appropriate detailed design processes where reactive or problem soils are present or suspected.<br>Cut and fill balance and minimisation of transport requirements for import/disposal of spoil will be considered as part of the design process<br>Detailed design to demonstrate assessment and viability of opportunities for:<br>▸ Re-use of local sources of aggregate and treatment of dispersive and reactive materials to improve mass haul<br>▸ Re-use of material excavated below the rail embankment for less critical parts of infrastructure<br>▸ Re-use of excavated material as a stabilised structural fill. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design (continued) | Land and soil (continued) | A Soil Management Plan will be developed to provide the framework for the stripping, storage, treatment and reuse of topsoil.<br>Develop and implement a Biosecurity Management Plan as part of the CEMP to include:<br>▸ Compliance requirements including relevant biosecurity surveillance or prevention program authorised under the *Biosecurity Act 2014* (Qld) and any requirements of the *Vegetation Management Act 1999* (Qld) (VM Act), the *Planning Act 2016* (Qld) and the *Agricultural Chemicals Distribution Control Act 1966* (Qld) (ACDC Act)<br>▸ Requirement for pre-clearing survey to determine the risk of weeds or pest animals being present<br>▸ Map of the existing severity and extent of weed infestations and weed management requirements, including land adjacent to the disturbance footprint and construction access tracks<br>▸ Pest animal management (including fire ants and fire ant biosecurity zones)<br>▸ Site hygiene and waste management procedures to deter pest animals<br>▸ Weed surveillance and treatment during construction and rehabilitation activities<br>▸ Requirements in relation to pesticide and herbicide use and documentation, including any limitations on use, such as restrictions on use in sensitive environmental areas, agricultural areas, drainage lines that flow to waterways and aquatic habitats, and ensuring that broad-scale use does not result in an increase erosion and sediment risk<br>▸ Vehicle, machinery and imported fill hygiene protocol and documentation<br>▸ Erosion and sediment control risk associated with broad-scale weed removal or treatment<br>▸ Mitigation or remediation measures contained in the Biosecurity Management Plan will be developed in accordance with relevant agencies and local government. |
| | Contamination, land and soil | As required, a Contaminated Land Management Strategy will be developed and implemented by a suitably qualified professional, incorporating consultation outcomes from landholders and other relevant stakeholders. This strategy will include a review of the environmental management and contaminated land registers to identify lots within the disturbance footprint, to assess the potential contamination risk, and to develop contaminated site management plan/s as outlined in Chapter 9: Land Resources, of the EIS. |
| Pre-construction | Materials handling and storage, hazardous waste | The CEMP must contain the following provisions relevant to potential impacts of land resources:<br>▸ A Pollution Incident Response Plan for accidental spills, leaks and other polluting incidents. 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<br>▸ All bunding, hydrocarbon and chemical storage areas must be routinely checked, and their integrity and functionality maintained as per design capacity<br>▸ Appropriate controls to prevent environmental incidents, including leaks/spills from refuelling activities and to protect the environment in the event that incidents occur<br>▸ Personnel involved in ground-disturbing works must be familiar with the unexpected finds protocol/procedure and trained in:<br>  ▸ The identification of potential contaminated soil/material and relevant controls such as how to recognise potential contaminated material (colour, texture, odour, presence of asbestos, metal, ash) from inert waste or materials<br>  ▸ Stop work and corrective/containment actions<br>  ▸ Classification and notification of incidents procedures. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction (continued) | Materials handling and storage, hazardous waste (continued) | Identification of contaminated, hazardous or potentially contaminated material onsite (i.e. soil/formation etc.) will be subject to a risk assessment.<br>Assessment of contaminated, hazardous or potentially contaminated material encountered during Project works will be undertaken and recorded.<br>Transportation of hazardous substances, wastes and/or dangerous goods are to be undertaken by appropriately licensed contractors and a register of waste transfer certificates to be maintained for the Project. |
| | Spoil management/ excavated material | A Construction Spoil Management Plan will be developed and implemented to document and manage the stockpiling and storage, onsite reuse, removal, transport and disposal of excavated material.<br>Any imported fill material will be clean, certified pest and contaminant free. |
| | Erosion and sediment control, land and water, water quality | The ESCP prepared during detailed design will be reviewed and updated by a CPESC, incorporating further construction methodology details, as required.<br>The ESCP will include water quality monitoring requirements as defined in the Surface Water Sub-plan to assess the effectiveness of erosion and sediment controls and reinstatement and rehabilitation programs. |
| | Land and soil | Closure or realignments of local roads will be undertaken in accordance with the Reinstatement and Rehabilitation Plan.<br>Wherever practical, topsoil will be transferred directly to placement as planting media.<br>Where stockpiling of topsoil is required, it will be carried out in accordance with the soil management plan, and in a manner that ensures that the properties of the topsoil are not permitted to degrade such that it becomes unsuitable as planting media. The Soil Management Plan will establish:<br>▸ Limitation for height of stockpiles<br>▸ Limits for the width of the base of stockpiles<br>▸ Requirements for adopting batter slopes, protective covers and drainage, which reduce potential for erosion and/or segregation<br>▸ Limits for the period of stockpiling to a minimum practical time<br>▸ Requirements for carrying out herbicide spraying or other treatment of the stockpile at intervals required to prevent weed growth and ensure the stockpile faces are weed-free prior to use. |
| | 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. The Contaminated and Hazardous Materials Management Plan will contain procedures to ensure that removal is undertaken in accordance with *How to Safely Remove Asbestos Code of Practice* (Safe Work Australia, 2018a). |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning | Erosion and sediment control, land and water, water quality | Appropriate erosion and sediment control measures are to be implemented and the ESCPs continuously reviewed and updated for effectiveness and to reflect changing site conditions as construction progresses. |
| | Contamination | For work activities undertaken within the 11 properties identified on the EMR, as documented in the EIS within the disturbance footprint, or any other sites identified as part of the actions under the Contaminated Land Strategy, a Contaminated Site Management Plan will be developed and implemented to reduce the risk of adverse impacts to the existing and surrounding environments.<br>If suspected contaminated land or material in drums, tanks, bags or plastic containers are encountered during excavation works, all work must stop in the affected area and measures to manage the contamination will be implemented, as per the Contaminated Site Management Plan.<br>The reuse or retention of contaminated or potentially contaminated material encountered onsite (i.e. soil, ballast) will be subject to a risk assessment. |
| | Materials handling and storage | Appropriate registers and records of chemicals, hydrocarbons and hazardous substances and materials onsite will be maintained up to date. Where appropriate this will include a relevant risk assessment prior to the substance coming to and being used onsite, plus a Safety Data Sheet (SDS) Register.<br>Where an incident occurs that threatens or causes unlawful environmental harm, the contractor must take all reasonable steps, including allocation of additional trained resources or specialists, to remediate and manage the incident. |
| | Rehabilitation | Reinstatement, stabilisation and rehabilitation of temporarily disturbed areas (such as laydown, site offices and temporary access tracks) will be undertaken progressively, consistent with the Project Reinstatement and Rehabilitation Plan and the Landscape and Rehabilitation Management Plan. |
| | Unexploded ordnance | Although unlikely, based on the UXO assessment for the Project, 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. |
| | Hazardous waste | Hazardous and/or dangerous waste (e.g. asbestos, chemicals, oils) must be correctly stored and managed onsite and/or correctly disposed of by a licensed contractor to a registered waste facility and in accordance with the CEMP. |

#### 23.13.2.4 Monitoring

Monitoring compliance of the development and implementation of the land resources-related management processes and performance criteria identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

### 23.13.3 Landscape and visual amenity

#### 23.13.3.1 Environmental outcomes

Project works are designed to minimise vegetation loss and mitigate impacts through appropriate rehabilitation.

Project works are designed to minimise impacts on the visual amenity of watercourses.

The design of rail infrastructure and associated landscape treatments (including slope and stabilisation measures) responds to the natural and rural landscape, topography and landform, to the greatest extent possible, while complying with engineering design standards, safety and legislative requirements.

Project design results in a minimal maintenance landscape.

#### 23.13.3.2 Performance criteria

- Construction compounds and ancillary facilities are located to minimise visual impacts.
- Vegetation screens and other barriers are provided or retained where practicable to minimise visual amenity impacts.
- Temporary construction areas are rehabilitated progressively and in accordance with the Reinstatement and Rehabilitation Plan.
- The Landscape and Rehabilitation Management Plan is implemented.
- Construction lighting nuisance to potentially affected landholders is avoided.

#### 23.13.3.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.6.

**TABLE 23.6: MITIGATION MEASURES—LANDSCAPE AND VISUAL AMENITY**

| Delivery Phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design | Landscape and visual impacts due to vegetation removal | Clearing extents of visually significant vegetation are further limited, where feasible, to that required to safely construct, operate and maintain the Project. Locations include:<br>▸ Between Mt Forbes Road and the Cunningham Highway (approximately Ch 9.7 km to Ch 16.5 km)<br>▸ Areas adjacent to and within the Teviot Range and the Flinders–Goolman Conservation Estate, particularly around Dwyers Road near the Flinders Peak Winery and near the proposed Teviot Range Tunnel between Ch 39.0 km and Ch 45.5 km.<br>Develop a Reinstatement and Rehabilitation Plan for areas within the disturbance footprint that do not form part of the permanent works (e.g. construction compounds, laydown areas, temporary access tracks etc.). The plan will include and clearly identify:<br>▸ Location of areas subject to rehabilitation and/or reinstatement/stabilisation, in accordance with the landscape and rehabilitation design developed during detailed design<br>▸ Objectives and timeframes for rehabilitation and/or reinstatement/stabilisation works (including biodiversity, vegetation establishment and erosion and sediment control outcomes to be achieved)<br>▸ Where appropriate, the plan describes how the objectives align with relevant recovery plans, threat abatement plans, conservation advices or policy guidance for target species in areas identified for rehabilitation<br>▸ Details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the objectives<br>▸ Native flora species endemic to the Scenic Rim and Ipswich regions or other suitable species appropriate to the landscape context and nursery/seed stock sources<br>▸ Procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas<br>▸ Corrective actions if the outcomes of rehabilitation and/or reinstatement/stabilisation are not achieved.<br>A Landscape and Rehabilitation Management Plan must be developed to define post-construction maintenance requirements, monitoring requirements and completion criteria for areas defined in the landscape design and/or identified in the Reinstatement and Rehabilitation Plan. |
| | Landscape and visual impacts on watercourses | Develop the detailed design to minimise impacts to waterways, riparian vegetation and in-stream flora and habitats (particular locations include Western Creek, Bremer River, Warrill Creek, Purga Creek, Sandy Creek, Dugandan Creek, Wild Pig Creek, Woollaman Creek and Teviot Brook and their tributaries).<br>Aim to avoid, then minimise the extent of temporary or permanent waterway diversions. |
| | Visual impact of rail infrastructure | Infrastructure (such as structures, embankments/cuttings, tunnel portals, tunnel control centre and bridges) should be designed following an integrated design process with regard to landscape character and views as identified in the EIS:<br>▸ *Legacy*: Create consistent design treatments along the Project alignment to enhance the overall recognition and legacy of the Project<br>▸ *Bridges*: Bridge design considers appropriate design principles at key viewpoints, including the Cunningham Highway, Ipswich–Boonah Road, Undullah Road and the Bremer River near Rosewood–Warrill View Road |

| Delivery Phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design (continued) | Visual impact of rail infrastructure (continued) | ▸ *Embankments*: At locations where embankments are near roads and/or adjoin bridge structures, minimise the extent to which landform (embankments) restricts views or affects views from nearby residences, to the greatest extent possible, via sensitive stabilisation, revegetation or, where appropriate, screen planting. These locations may include Rosewood–Warrill View Road (VP1); Ipswich–Boonah Road (VP5) and Mt Flinders Road, and in locations close to the future Greater Flagstone Priority Development Area (PDA), between Ch 49.3 km and Ch 54.5 km.<br>▸ *Tunnel approaches and cuttings*: Where practical, minimise the extent of cut batters and undertake sensitive design of these to blend them into their landscape setting (for example considering potential for revegetation, rock pitching, etc.). Locations to consider include the approach to the Teviot Range tunnel portal, cuts around Paynes Road, the Cunningham Highway and Undullah Road. |
| | Landscape design treatments | Develop a Project landscape design with landscaping treatments determined by reference to the key landscape characteristics and elements identified in the EIS, with particular emphasis on sensitive design that is appropriate to the setting as described below. The Project landscape design will also define appropriate treatments for areas subject to the Reinstatement and Rehabilitation Plan (or equivalent), and comply with the ARTC Engineering (Track & Civil) Code of Practice Section 17 Right of Way Requirements:<br>▸ *Rural and natural landscapes:* The landscape design will respect and enhance the rural landscapes. Considerations include:<br>▸ 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 to reduce visual impact and assist in integrating the landform into the existing landscape setting, which already includes similar shelterbelts beside roads and riparian vegetation along watercourses, as described above, and in the following locations:<br>– Adjacent to Dwyers Road, between Ch 31.2 km to Ch 32.4 km to screen views from Flinders Peak Winery and buffer adjacent properties to the west of Dwyers Road<br>– Selective planting adjacent to the Cunningham Highway Bridge to screen the alignment and bridge abutments while maintaining distant views to Flinders Peak and the Teviot Range<br>– The landscape design will 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<br>▸ Where appropriate consult with stakeholders and landholders during design (and construction) in order to understand the landscape context and the particular qualities of existing landscapes.<br>▸ *Ecologically sensitive areas:* Design to provide opportunities for ecological gain to benefit biodiversity. This includes:<br>▸ Development of diverse planting and seed mixes to maximise and connect habitat types for ecological gain<br>▸ Enhancement of landscape corridors and ecological links across the landscape by, where possible, joining or re-joining fragmented areas of habitat<br>▸ Landscape design and planting to incorporate ecological requirements to benefit the characteristic and visual amenity of local landscapes including revegetation with locally indigenous species. |
| | Visual impacts of lighting | During detailed design, review assessment of the potential for operational light impacts to residents and identify if/where attenuation measures are required. |

| Delivery Phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction | Landscape and visual values | Implement the relevant aspects of the Reinstatement and Rehabilitation Plan and progressively deliver to minimise disturbance to landscape and visual amenity values during and post the pre-construction period.<br>Where feasible and practicable, 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*. |
| Construction and commissioning | Landscape and visual values | Establish vegetation protection zones and project clearing extents prior to commencement of works to avoid impacts on adjoining vegetation and habitats as far as practicable. |
| | Visual impacts of construction activities | Avoid or minimise locating construction compounds within close proximity to sensitive receptors to provide as much separation as possible.<br>Minimise height of all stockpiles to the greatest extent possible to reduce their visual impact.<br>Cover stockpiles with temporary vegetative cover (such as mulch, grass seeding/hydro-mulch, soil binder etc).<br>Temporary treatments (such as hoardings and shade-cloth screens) to site compound fencing must be considered to assist in reducing visual impacts of temporary infrastructure and sun glare within close proximity of sensitive receptors (such as Peak Crossing township and road networks). |
| | Lighting impacts of construction activities | Implement attenuation measures in discussion with potentially affected landholders. |
| | Reinstatement/ rehabilitation | Implement the landscape design, the Reinstatement and Rehabilitation Plan and the relevant requirements of the Landscape and Rehabilitation Management Plan, until performance criteria are satisfactorily achieved. |

#### 23.13.3.4 Monitoring

Monitoring compliance of the development and implementation of the landscape and visual amenity-related management processes and performance criteria identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

### 23.13.4 Flora and fauna

#### 23.13.4.1 Environmental outcomes

Project works are designed and managed to minimise impacts to the existing ecological values of the adjoining habitats.

Environmental offsets are provided where Project works have a significant residual impact on matters of national and/ or state environmental significance.

#### 23.13.4.2 Performance criteria

- Environmental offsets are provided for significant, residual impacts on matters of national environmental significance and matters of state environmental significance, in accordance with the Environmental Offsets Delivery Strategy.
- Clearing for the Project does not occur outside of the Project disturbance limits.
- Appropriate fauna habitat connectivity measures including fencing and fauna movement structures are provided during construction in accordance with detailed design to ensure safe permeability for wildlife.
- Environmental weeds and pests including prohibited and restricted matters prescribed under the *Biosecurity Act 2014* (Qld) and Biosecurity Regulation 2016 within the Project area are appropriately managed.

#### 23.13.4.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.7.

**TABLE 23.7: MITIGATION MEASURES—FLORA AND FAUNA**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design | Flora and fauna | While the assessment assumes the entire Project disturbance footprint will be cleared, the disturbance footprint will be refined through detailed design, as far as practical, to that required to safely and efficiently construct and operate the Project and avoid unnecessary clearing. This will involve inputs from the design team, construction contractor and, where applicable, the constructing authority. |
| | | Flora and fauna surveys will be undertaken where they are required to verify previous surveys and assessments, confirm habitat, refine potential offsets, inform micro-siting of infrastructure, support secondary approvals and establish baseline conditions against which relevant outcomes of the Reinstatement and Rehabilitation Plan and monitoring activities can be compared.<br>Methods and sequencing of surveys, including seasonal timing, will be in accordance with the relevant published State Government and Australian Government survey guidelines and conservation advices for each target species, such as the *Protected Plants Survey Guidelines* (DES, 2020g) and *Survey guidelines for Australia's threatened birds* (DEWHA, 2010).<br>Flora species to be targeted through these surveys include, but are not limited to the following:<br>▸ MSES:<br>▸▸ Slender Milkvine (*Marsdenia coronata*)<br>▸▸ Bailey's Cypress Pine (*Callitris baileyi*)<br>▸▸ Swamp Tea-tree (*Melaleuca irbyana*)<br>▸ MNES:<br>▸▸ Hairy-joint Grass (*Arthraxon hispidus*)<br>▸▸ Miniature Moss-orchid (*Bulbophyllum globuliforme*)<br>▸▸ Boonah Tuckeroo (*Cupaniopsis tomentella*)<br>▸▸ An algae (*Lychnothamnus barbatus*)<br>▸▸ Lloyd's Olive (*Notelaea lloydii*)<br>▸▸ Shiny-leaved Condoo (*Planchonella eerwah*).<br>Fauna surveys, including terrestrial, aquatic habitats and breeding habitats (including burrows and hollow-bearing trees/logs, wetlands, existing culverts and structures) will target, but not be limited to include the following target species:<br>▸ MSES:<br>▸▸ Short-beaked Echidna (*Tachyglossus aculeatus*)<br>▸▸ Powerful Owl (*Ninox strenua*)<br>▸▸ Tusked Frog (*Adelotus brevis*)<br>▸▸ Glossy-black Cockatoo (*Calyptorhynchus lathami*)<br>▸ MNES:<br>▸▸ Regent Honeyeater (*Anthochaera phrygia*)<br>▸▸ Australasian Bittern (*Botaurus poiciloptilus*)<br>▸▸ Curlew Sandpiper (*Calidris ferruginea*)<br>▸▸ Large-eared Pied Bat (*Chalinolobus dwyeri*)<br>▸▸ Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)<br>▸▸ Collared Delma (*Delma torquata*)<br>▸▸ Red Goshawk (*Erythrotriorchis radiatus*)<br>▸▸ Painted Honeyeater (*Grantiella picta*)<br>▸▸ Swift Parrot (*Lathamus discolor*)<br>▸▸ Australian Lungfish (*Neoceratodus forsteri*)<br>▸▸ Greater Glider (*Petauroides volans volans*)<br>▸▸ Brush-tailed Rock-wallaby (*Petrogale penicillata*)<br>▸▸ Koala (*Phascolarctos cinereus*)<br>▸▸ Long-nosed Potoroo (*Potorous tridactylus tridactylus*)<br>▸▸ New Holland Mouse (*Pseudomys novaehollandiae*)<br>▸▸ Grey-headed Flying-fox (*Pteropus poliocephalus*)<br>▸▸ Australian Painted Snipe (*Rostratula australis*)<br>▸▸ Black-breasted Button-quail (*Turnix melanogaster*) |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design (continued) | Flora and fauna (continued) | Where a species is detected, it will be reported to the relevant agencies along with information on the species habitat, habitat in which the species was identified and, where possible, population size and local threatened processes. This information will be used to refine the predictive habitat mapping, significant residual impact assessment, disturbance limits, mitigation measures and offsets.<br>Surveys of representative MNES habitat, remnant and regrowth vegetation communities that will be impacted by the Project will be undertaken during the detailed design phase in accordance with the *Guide to determining terrestrial habitat quality: Methods for assessing habitat quality under the Queensland Environmental Offsets Policy, Version 1.3* (DES, 2020d) and the *EPBC Act environmental offsets policy* (DSEWPAC, 2012) as relevant, to enable a condition assessment of vegetation communities that require offset for the Project. |
| | | Based on the outcome of flora, fauna, vegetation communities and MNES habitat surveys:<br>▸ Work with the design team and construction team to implement measures to avoid and/or further minimise the extent of impacts (i.e. designate no-go zones, reduce the construction or operational footprint within or adjacent to communities or habitat for MNES, clearing limits)<br>▸ This information will inform staged and sequential clearing (i.e. clearing of non-habitat trees in area, then a wait period and then the clearing of the remaining habitat)<br>▸ Identify suitable locations for the release of fauna that may be encountered during pre-clearing or clearing or for the salvaging of microhabitats. |
| | | For any threatened flora species identified through surveys within the disturbance footprint, consult with relevant specialists to determine the feasibility of translocating or propagating specimens in accordance with relevant guidelines (e.g. *Guidelines for the Translocation of Threatened Plants in Australia* (Commander et al. 2018)), including the collection of seed. Feasibility will be assessed noting that not all species can be translocated or propagated and that for the majority of the species identified as potentially occurring with the Project disturbance footprint, there is limited evidence of these species being successfully translocated, although some are used in the horticultural industry. |
| | Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-East Queensland | The following TEC specific measures for Swamp Tea-tree (*Melaleuca irbyana*) Forest of South East Queensland TEC will also be implemented:<br>▸ Undertake a baseline assessment to determine the health and condition of the community to inform offsets and quantify impacts during construction and potentially operations<br>▸ Work with the design team to minimise the direct impact on Swamp Tea-tree (*Melaleuca irbyana*) Forest of South East Queensland TEC. This includes ensuring that communities (remnant and regrowth) identified within the construction disturbance footprint are avoided (e.g. Lots 3 and 4 on RP178669 contain approximately 7 ha of TEC, with these lots identified as a potential laydown area), siting access roads to avoid and minimise impacts in the Warrill Creek area and ensuring that changes to the predicted hydrology outcomes consider this TEC.<br>Continue to refine the Project design in response to hydraulic modelling outcomes to demonstrate continued compliance with the design objectives of the Project including maintaining inundation regimes within the Swamp Tea-tree (*Melaleuca irbyana*) Forest of South East Queensland TEC as close to natural conditions as possible. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design (continued) | MNES: Lloyd's Olive | The following species-specific measures for Lloyd's Olive (*Notelaea lloydii*) will also be implemented:<br>▸ Avoid works above the tunnel as this area is known to support an important population of Lloyd's Olive<br>▸ Undertake protected flora surveys as per *Protected Plants Survey Guidelines* (DES, 2020g) with a particular focus within the area of Teviot Range identified as habitat for the species (refer species habitat mapping in Appendix K: Matters of National Environmental Significance Technical Report). This includes assessing the condition and health of the population above the tunnel prior to construction to establish the baseline for monitoring during construction to determine if any changes to the population occur as a result of the Project or due to natural attrition. Potential criteria may include recruitment and presence of fertile material, plus signs of water stress.<br>▸ As part of the MNES monitoring plan, continue to monitor this population during construction. |
| | MNES: Australian Lungfish | The following species-specific measures for Australian Lungfish (*Neoceratodus forsteri*) will also be implemented:<br>▸ Avoid clearing within and along major watercourses, in particular Bremer River and Teviot Brook, through the use of bridge structures and the placement of pylons away from bed and banks<br>▸ Pre-construction surveys of waterways identified as potential habitat of species (e.g. Bremer River) to identify whether Australian Lungfish occurs. Surveys will follow the *Survey guidelines for Australia's threatened fish* (DSEWPaC, 2011c)<br>▸ Where a temporary impoundment or diversion is required for construction purposes and the species is found to be present, the Flora and Fauna Sub-plan will include requirements for an appropriately qualified person to be consulted to make an assessment on the method of recovery, transport and release of fish. The Flora and Fauna Sub-plan will include requirements for the application of relevant State (DAF) fish salvage guidelines during construction activities<br>▸ The Biosecurity Management Sub-plan will include measures to manage the risk of translocating non-endemic flora and fauna through dewatering and fish salvage activities<br>▸ The Surface Water Sub-plan will be developed to include measures to maintain low flows during drought conditions and avoid fluctuations to water levels downstream during spawning period (i.e. Bremer River).<br>The Reinstatement and Rehabilitation Plan will establish requirements for instream and riparian habitats impacted by Project works. These requirements include restoration of natural riparian vegetation and, where possible, reinstatement of instream habitat to pre-construction state (e.g. replacement of large woody debris and ensure no or limited change to instream flows and allow fish passage). |
| | MNES: Spotted-tailed Quoll and Brush-tailed Rock-wallaby | The following species-specific measures for Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) and Brush-tailed Rock-wallaby (*Petrogale penicillata*) will also be implemented:<br>▸ Avoid works above the tunnel as this area is a key corridor to maintain movement during construction and operation of the Project<br>▸ Targeted surveys for identified mammal species will follow the *Survey guidelines for Australia's threatened mammals* (DSEWPaC, 2011b) and include the identification of species-specific habitat (refer species habitat mapping in Appendix K: Matters of National Environmental Significance Technical Report) and habitat features considered suitable for species presence (e.g. cliff faces/boulder piles for Brush-tailed Rock-wallaby and Spotted-tailed Quoll)<br>▸ As part of the MNES monitoring plan, establish camera traps above the tunnel areas to monitor fauna movement across this area during construction |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | MNES: Spotted-tailed Quoll (continued) | ▸ The Flora and Fauna Sub-plan will include restricted works measures for implementation if Spotted-tailed Quoll or Brush-tailed Rock-wallaby are observed within or adjacent to disturbance footprint to allow safe movement away from works area. These measures may include, but are not limited to the following:<br>▸ Measures to remove carrion from the Project disturbance footprint (and the rail corridor), along with waste management measures<br>▸ Pest control measures in known or potential habitat for the Spotted-tail quoll consider risks to the species (e.g. use of baiting to control wild dogs)<br>▸ Salvage hollow logs and rocky outcrops removed from the Project disturbance footprint into adjoining habitat<br>▸ Establish buffer zones around known key habitat and den sites<br>▸ Where possible avoid clearing within the known habitat (e.g. Teviot Range) during the breeding season for the Spotted-tailed Quoll<br>▸ Implement measures to manage the clearing of hollow logs and hollow-bearing trees (e.g. tapping of tree prior to clearing, removal of hollows prior to clearing and grubbing activities). |
| | MNES: Swift Parrot | The following species-specific measures for the Swift Parrot (*Lathamus discolor*) will also be implemented:<br>▸ Where possible through design, reducing the disturbance footprint in winter foraging habitat, including avoiding clearing for ancillary works<br>▸ Incorporating winter foraging species into the landscape design and Reinstatement and Rehabilitation Plan. |
| | MNES: Australian Painted Snipe | The following species-specific measures for the Australian Painted Snipe (*Rostratula australis*) will also be implemented:<br>▸ Targeted surveys to be undertaken of potential habitat following the *Survey guidelines for Australia's threatened birds* (DEWHA, 2010).<br>▸ Should the Australian Painted Snipe or other target wetland species be found to occur, the CEMP Flora and Fauna Sub-plan will include:<br>▸ Clearing/construction works in potential habitat areas will be timed, where possible, to avoid wet conditions where habitat is likely to be most suitable<br>▸ Restricted works/avoidance measures will be put in place if nesting is detected<br>▸ The CEMP will include measures to minimise noise as much as feasible and Air Quality Sub-plan will include measures to minimise dust impacts including dust monitoring and suppression methods<br>▸ The Biosecurity Management Sub-plan will include site hygiene and waste management measures to ensure pest predator fauna are not attracted to works areas or utilizing the Project disturbance footprint. |
| | MNES: Collared Delma | The following species-specific measures for the Collared Delma (*Delma torquata*) will also be implemented:<br>▸ Targeted surveys to be undertaken as per *Survey guidelines for Australia's threatened reptiles* (DSEWPaC, 2011d) where suitable habitat is identified (refer species habitat mapping in Appendix K: Matters of National Environmental Significance Technical Report)<br>▸ The Flora and Fauna Sub-plan will include restricted works measures for implementation if the Collared Delma is observed within or adjacent to disturbance footprint to allow safe movement away from works area. Other measures may include, but are not limited to the following:<br>▸ Measures to ensure retrieval of potential habitat elements (e.g. loose surface rock, large fallen timber) during vegetation clearing and placement in adjacent unimpacted habitat<br>▸ Erosion and sediment control measures in steep slopes (and known important habitat for this species) to avoid/minimises slippages<br>▸ Measures to allow safe handling of fauna (where required) and repatriation in a suitable habitat away from site. |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | MNES: Red Goshawk | The following species-specific measures for Red Goshawk (*Erythrotriorchis radiatus*) will also be implemented:<br>▸ Pre-clearing surveys of woodlands identified as potential habitat for Red Goshawk (refer species habitat mapping in Appendix K: Matters of National Environmental Significance Technical Report) will be undertaken to identify whether individuals occur and potentially nest within the disturbance footprint. Surveys for nest sites within or near the disturbance footprint will be as per MNES guidelines where suitable nesting habitat (i.e. large emergent trees near water) is identified.<br>▸ Where Red Goshawk nesting is identified in pre-clearing surveys, the Flora and Fauna Sub-plan will include restricted works measures for construction to allow nesting to continue undisturbed (e.g. micro-siting of works to avoid nests or maximise separation distance, 100 m buffer and signage around nests, no disturbance to nests until after breeding season (being until fledglings/offspring no longer use the nest/roost for habitat). Some limited works may occur in the buffer zone during this period (e.g. cultural heritage surveys). |
| | MNES: Koala | The following species-specific measures for the Koala (*Phascolarctos cinereus*) will also be implemented:<br>▸ Avoid works above the tunnel as this area is a key corridor to maintain movement during construction and operation of the Project<br>▸ Pre-clearing surveys to be undertaken of woodlands (and other relevant habitats) identified as potential habitat of species (refer species habitat mapping in Appendix K: Matters of National Environmental Significance Technical Report) to identify whether individuals occur within disturbance footprint<br>▸ Project design to incorporate fauna crossing structures to allow fauna movement across alignment. The location and frequency of the passages will be based on an understanding of local Koala movements and in consultation with relevant stakeholders (e.g. DTMR and local councils)<br>▸ Fauna and fencing in accordance with ARTC guidelines and DTMR's *Fauna Sensitive Road Design Manual* (DTMR, 2000; DTMR, 2010). Fencing extent will be determined by the availability of suitable habitat adjacent to alignment<br>▸ Viaducts and the bridge structures will assist in the retention of corridor(s) of at least 100 m width. While the tunnel will ensure a corridor over 1 km wide is maintained through the Teviot Range<br>The Flora and Fauna Sub-plan will include restricted works measures for implementation within or adjacent Koala habitat to allow safe movement away from works area. These measures may include, but are not limited to the following:<br>▸ Staged and sequential clearing within Koala habitat<br>▸ In areas where koala have been identified as being present undertake pre-clearing Koala searches on the morning prior to clearing commencing<br>▸ Measures to allow safe handling of Koalas (where required) and repatriation in suitable habitat away from site<br>▸ Requirements for koalas subject to handling to be examined and if suspected of chlamydia infection will be taken to a predesignated veterinarian/wildlife care facility for treatment prior to release<br>▸ A procedure to guide koala interactions, including any translocations<br>▸ Appropriate construction traffic speed limits will be established and managed to minimise vehicle strike risk<br>▸ Incorporation of Koala trees in landscape design and rehabilitation works, especially along existing corridors, which are to be retained (e.g. riparian corridors). |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | MNES: Greater Glider | The following species-specific measures for the Greater Glider (*Petauroides volans volans*) will also be implemented:<br>▸ Avoid works above the tunnel as this area is a key corridor to maintain movement during construction and operation of the Project<br>▸ Pre-clearing surveys to be undertaken of woodlands (and other relevant habitats) identified as potential habitat for the species (refer species habitat mapping in Appendix K: Matters of National Environmental Significance Technical Report) to identify whether individuals occur within disturbance footprint, including potential movement pathways, nest sites (e.g. hollow-bearing trees) and feeder trees<br>▸ Project design to incorporate fauna-crossing structures to allow fauna movement across alignment. The location and frequency of the passages will be based on an understanding of local Greater Glider movements and in consultation with relevant stakeholders (e.g. DTMR and local councils)<br>▸ Fauna and fencing in accordance with ARTC guidelines and DTMR's *Fauna Sensitive Road Design Manual* (DTMR, 2000; DTMR, 2010). Fencing extent will be determined by the availability of suitable habitat adjacent to alignment. Also, where possible, avoid the use of barb wire particularly on the top strand, to prevent threatened species (particularly Greater Glider, flying-foxes and microbats) from becoming entangled. Fauna-friendly fencing must be used, while being in accordance with landowner and/or structural requirements.<br>▸ The Flora and Fauna Sub-plan will include:<br>  ▸ Requirements for pre-clearing surveys to identify and map out hollow-bearing trees, feed trees and potential movement pathways<br>  ▸ Determine whether key microhabitats can be avoided, in consultation with the Project team and construction team.<br>▸ Where key microhabitats cannot be avoided, develop protocols/procedures to manage these features, including relocating hollow-bearing trees into adjacent habitat and the use of nest boxes, tapping of hollows nearing trees or, where possible, by lowering slowly with a claw extension. |
| | MNES: Grey-headed Flying fox | The following species-specific measures for the Grey-headed Flying-fox (*Pteropus poliocephalus*) will also be implemented:<br>▸ Pre-clearing surveys to be undertaken of riparian habitat identified as potential roost sites of species to identify whether camps occur within or near the disturbance footprint. No roost sites have been previously identified within 5 km of the Project<br>▸ Where possible, reduce the disturbance footprint in winter foraging species, including avoiding clearing for ancillary works<br>▸ Incorporate winter foraging species into the landscape design and Reinstatement and Rehabilitation Plan<br>▸ Work with the design team and property team to incorporate fencing that minimises the risk of entanglement (e.g. avoid the use of barbed wire fencing with a high-tensile wire strand as the top wire).<br>The Flora and Fauna Sub-plan will include measures to be implemented if a roost site is found. These measures will incorporate the mitigation standards detailed in the Commonwealth's *Referral guideline for management actions in Grey-headed and Spectacled Flying-fox camps* (DotE, 2015b). |
| | MNES, MSES | For other species not listed above, review the outcome of the flora and fauna surveys and adopt species-specific measures as appropriate for pre-clearing surveys, landscape design, the Reinstatement and Rehabilitation Plan and the Flora and Fauna Sub-plan. |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | MNES | Develop a post-construction MNES monitoring plan, with reference to the survey results. The MNES monitoring plan will be developed in consultation with relevant stakeholders and imposed conditions. The MNES monitoring plan will define the TEC or other MNES habitat location, reference condition, assessment framework, infrastructure elements (e.g. erosion and sediment control devices, fauna crossing structures), corrective actions, completion criteria and monitoring timeframes. Criteria and monitoring targets to be considered include (but are not limited to):<br>▸ For Swamp Tea-tree: level of dieback and recruitment, dust deposition on leaves, changes to the local hydrology through observations of soil moisture with these criteria to be determined, in consultation with a relevant specialist<br>▸ For Lloyd's Olive: weed monitoring within identified Lloyd's olive population, with annual monitoring in accordance with completion criteria<br>▸ For Painted Snipe: ongoing annual weed monitoring within wetland habitat in accordance with completion criteria<br>▸ For Lloyd's Olive: monitor individual plants used in rehabilitation activities in accordance with the Rehabilitation and Reinstatement Plan, if included. |
| | Fauna | Project design to incorporate minimum lighting requirements feasible for Project safety. |
| | Flora and fauna | The potential for Project works to impact MNES and other ecological receptors through erosion, soil loss, land degradation, sedimentation or decreased surface water, or groundwater quality or availability will be managed through the following:<br>▸ Soil surveys to further characterise soil conditions across the disturbance footprint at a suitable scale to inform detailed design, including appropriate design responses where reactive or problem soils are present or suspected (e.g. sodosols near Ebenezer, vertosols near Purga and Willowbank, saline hazard areas, potential for acid sulfate soils near artificial waterbodies or impoundments<br>▸ Contaminated land surveys to inform detailed design and subsequent contaminated land strategy<br>▸ A Soil Management Plan will be developed to provide the framework for the stripping, storage, treatment and reuse of topsoil<br>▸ An ESCP will be developed by a CPESC as part of the CEMP, in accordance with the *International Erosion Control Association's Best Practice Erosion and Sediment Control* (IECA, 2008). The ESCP will include:<br>▸ Soil/land conservation objectives for the Project<br>▸ Management of problem soils<br>▸ Temporary/permanent drainage, erosion and sediment control measures<br>▸ Stockpiling and management/segregation of topsoil where it contains native plants seedbank or weed material<br>▸ Vehicle, machinery and imported fill hygiene protocols and documentation<br>▸ Requirements for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction<br>▸ Where practical and/or in accordance with specific flora and fauna management plans, vegetation clearing and ground disturbing works will be staged sequentially across the Project to minimise areas exposed to erosion and sediment risk of receiving waterways and drainage lines in accordance with the general environmental duty of the *Environmental Protection Act 1994* (Qld)<br>▸ Measures for minimising the exposure time of unprotected materials to prevent sedimentation of receiving waterways and subsequent impacts to ecological receptors |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | Flora and fauna (continued) | ▸ A process for site- and activity-specific preparation when forecast large or high-intensity wet weather events are predicted. This may include, but not be limited to, removing equipment out of riparian zones, stabilising/covering live work areas, additional application of soil binders/veneers and pre event treatment and dewatering of sediment basins<br>▸ Process for the continuous reviewed of effectiveness of erosion and sediment controls<br>▸ Water quality monitoring requirements as defined in the Surface Water Sub-plan to assess the effectiveness of erosion and sediment controls and reinstatement and rehabilitation programs<br>▸ The ESCP will align with the Reinstatement and Rehabilitation Plan and will include progressive stabilisation of earth materials and soil consolidation to prevent erosion and sedimentation in areas within the disturbance footprint that do not form part of the permanent works (e.g. temporary construction compounds, temporary waterway barrier works and laydown areas etc.)<br>▸ The ESCP will be reviewed prior to the commencement of pre-construction activities, once construction methodology is finalised and to document location specific controls<br>▸ A surface water monitoring framework will inform the development of the Surface Water Sub-plan and the construction water quality monitoring program. The framework will identify monitoring locations including upstream, downstream and at the intersection of the Project disturbance footprint and watercourse. It will include the relevant water quality objectives, parameters, criteria and specific monitoring locations, frequency, and duration, identified in consultation with relevant regulators to reduce impacts to surface water quality<br>▸ The Surface Water Sub-plan will establish the construction water quality monitoring program, which will include as a minimum:<br>▸ Analysis of the representative background monitoring dataset<br>▸ Identification of Project works and activities during construction and operation, including runoff, emergencies and spill events, that have the potential to impact on surface water quality of potentially affected waterways and riparian land (via discharge points)<br>▸ A risk management framework for evaluation of the risks to surface water quality and ecosystems in the receiving environment, including definition of impacts that trigger contingency and ameliorative measures<br>▸ Potential aquatic and terrestrial Groundwater Dependent Ecosystems will be field-truthed to confirm presence<br>▸ Further geotechnical investigations will be undertaken at deep cut sections to inform design and location-specific construction management of groundwater.<br>Risks associated with dewatering (i.e. water table lowering) and environmental management requirements during construction will be identified through appropriate baseline groundwater monitoring, modelling, and analysis and incorporated into the CEMP. |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | Riparian vegetation and aquatic habitats | Project design minimises impacts to waterways, riparian vegetation and in-stream flora and habitats by:<br>▸ Adopting a waterway crossing structure hierarchy: bridges preferred to culverts, to maintain infrastructure permeability for fauna at identified habitat connectivity points; however, local conditions and constructability impacts must be considered when determining the preferred environmental solution<br>▸ Avoiding, then minimising, the extent and duration of temporary waterway diversions. Where unavoidable, implement water quality, erosion and sediment control measures to minimise impacts to downstream environments and water users<br>▸ Avoiding, then minimising, the extent of permanent waterway diversions. Where unavoidable, waterway diversion design to include simulation of natural features e.g. meanders, pools, riffles, shaded and open sections, deep and shallow sections and different types of sub-strata, depending on the pre-disturbance environmental values, as per requirements of relevant and applicable conditions of approval, legislation, regulations and industry guidelines. Maintenance activity locations, construction compounds and storage areas will be defined as part of Project detailed design and positioned away from waterways<br>▸ Continuing to refine Project design in response to hydraulic modelling outcomes. This refinement includes addressing flood impact objectives, which include consideration of peak water levels, flow distribution, velocities, and duration of inundation, and implications for fish passage. This will confirm bridge lengths, culvert sizing and numbers, localised scour and erosion protection measures for both rail, road and other permanent Project infrastructure<br>▸ Stormwater controls, such as scour protection, are to be further developed and incorporated where necessary to achieve compliance with established water quality objectives. Temporary and permanent measures must be appropriate to the site conditions, responding to the erosion risk assessment, environmental receptors, climatic zone and seasonal factors. The ESCP will establish and specify the monitoring and performance objectives for handover to operational management on completion of construction<br>▸ Ensuring the disturbance footprint extents allow sufficient space for provision of the required temporary and permanent erosion and sediment control measures/pollution control measures defined during detailed design<br>▸ Undertaking rehabilitation of temporary waterway crossings in accordance with the Reinstatement and Rehabilitation Plan. |
| | Fauna passage | Refine fauna passage locations and associated rehabilitation areas in the design in accordance with the fauna crossing strategy to maintain infrastructure permeability, particularly at the six key locations identified as part of the EIS assessment process to maintain and/or re-establish habitat connectivity for the targeted local species, which includes but is not limited to:<br>▸ Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)<br>▸ Greater Glider (*Petauroides volans volans*)<br>▸ Brush-tailed Rock-wallaby (*Petrogale penicillata*)<br>▸ Koala (*Phascolarctos cinereus*)<br>▸ New Holland Mouse (*Pseudomys novaehollandiae*).<br>Design of fauna passage structures and associated rehabilitation areas will respond to local topographical and hydrological context, with consideration of safety requirements for the rail corridor and adjoining properties.<br>Design bridges and culverts to accommodate terrestrial fauna passage where assessed as appropriate, in addition to fish passage design requirements.<br>Fauna passage design will be consistent with the intent of DTMR's *Fauna-Sensitive Road Design Manual* (DTMR, 2000, DTMR, 2010) and where applicable, species-specific requirements. |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | Fauna fencing | Fauna fencing opportunities will be further assessed and, where appropriate, developed during detailed design to limit fauna strike and fauna mortality risk and/or maintain habitat connectivity. This will include:<br>▸ Assessment of the compatibility of each approach for the targeted local species with the general fencing principles at each proposed fencing location<br>▸ Consideration of safety requirements for the rail corridor and adjoining properties<br>▸ Consultation with adjoining landholders<br>▸ Requirements for maintaining an appropriate clearance buffer between adjacent vegetation and fauna fences<br>▸ Consideration for maintenance constraints and responsibilities that a fauna connectivity or fencing opportunity may introduce to operations.<br>Fauna fencing will be designed with reference to DTMR's *Fauna-Sensitive Road Design Manual* (DTMR, 2000). Additional expert guidance in relation to specific design features will be sought during the detailed design process.<br>The design will aim to maximise infrastructure permeability by connecting fauna fencing with safe crossing opportunities. |
| | Aquatic fauna | Design watercourse crossing structures (including culverts and bridges) to maintain fish passage, where applicable, in accordance with *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018) or conditions of development approval for operational work that is constructing or raising waterway barrier works.<br>The design will aim to minimise the need for ongoing maintenance and inspection to maintain fish passage. |
| | | Dewatering strategies will be required to comply with the *Biosecurity Act 2014* (Qld) to take reasonable measures to avoid the spread of pest species and in accordance with any required aquatic fauna species management plans and water quality objectives defined in the outline CEMP. |
| | Flora | Where feasible and practicable, locate construction areas including compounds, stockpiles, fuel storage, laydown areas and staff parking outside the tree protection zone as defined in *AS4970-2009 Protection of trees on development sites*.<br>Where practical, existing tracks will be used and the design for new access tracks (permanent and temporary) will be undertaken with the aim of minimising disturbance of substrate and vegetation. |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | Landscape, rehabilitation and stabilisation | Landscape design establishes the requirements for rehabilitation of disturbed areas for habitat re-creation, landscaping and stabilisation, including for riparian zones and informs the development of the Reinstatement and Rehabilitation Plan and the Landscape and Rehabilitation Management Plan. This should also include criteria for retrieval of potential habitat elements (loose surface rock, large fallen timber) during vegetation clearing for habitat recreation where appropriate.<br>Develop a Reinstatement and Rehabilitation Plan for areas within the disturbance footprint that do not form part of the permanent works (e.g. construction compounds, laydown areas, temporary access tracks etc). The Plan will include and clearly identify:<br>▸ Location of areas subject to rehabilitation and/or reinstatement/stabilisation, in accordance with the landscape and rehabilitation design developed during detailed design, including operational rail safety considerations<br>▸ Objectives and timeframes for rehabilitation and/or reinstatement/stabilisation works (including biodiversity, vegetation establishment and erosion and sediment control outcomes to be achieved)<br>▸ Where appropriate, the plan describes how the objectives align with relevant recovery plans, threat abatement plans, conservation advices or policy guidance for target species in areas identified for rehabilitation<br>▸ Details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the objectives<br>▸ Native flora species endemic to the Scenic Rim and Ipswich regions or other suitable species appropriate to the landscape context and nursery/seed stock sources. Where possible (i.e. propagated material is available) include MNES species (i.e. Lloyd's Olive) in rehabilitation activities<br>▸ Incorporate Koala trees in landscape design and rehabilitation works, especially along existing corridors that are to be retained (e.g. riparian corridors)<br>▸ Procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas<br>▸ Corrective actions if the outcomes of rehabilitation and/or reinstatement/stabilisation are not achieved.<br>Develop a Landscape and Rehabilitation Management Plan to define post-construction maintenance requirements, monitoring requirements and completion criteria for areas defined in the landscape design and/or identified in the Reinstatement and Rehabilitation Plan. |
| | Offsets | Restriction of the Project disturbance footprint through detailed design as far as practical, to that required to safely and efficiently construct and operate the Project.<br>Significant adverse residual impact to habitat for MNES and MSES will be re-calculated to confirm the Project's offset obligations under Australian Government and State Government requirements based on the outcomes of the flora, fauna and MNES habitat surveys.<br>Re-calculated impacts will be used to confirm the Project's offset obligations under Australian Government and State Government requirements.<br>A Project offset delivery plan and offset management plans will be developed to provide for the staged delivery of offsets, where appropriate, ahead of relevant clearing works being undertaken and finalised in consultation with Australian Government and State Government regulatory agencies as per Appendix K: Matters of National Environmental Significance Technical Report for the Environmental Offset Delivery Strategy—Qld. |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | Flora and fauna | Develop the CEMP Flora and Fauna Sub-plan to include appropriate criteria, directives and procedures in relation to:<br>- Requirements for pre-clearing surveys, including terrestrial, aquatic and wetland habitats, protected plants, breeding habitats (including burrows and hollow-bearing trees/logs, existing culverts and structures, riparian habitat identified as potential roost sites) for both threatened and non-threatened species by suitably qualified persons. This requirement includes:<br>  - Staged and sequential clearing protocols<br>  - Signage requirements for the delineation of no-go areas and clearing extents<br>- Animal handling protocols, including relocation and emergency care. For example:<br>  - Consideration of chytrid fungus for frogs<br>  - Koalas (*Phascolarctos cinereus*) subject to handling will be examined for chlamydia infection and will be taken to a predesignated veterinarian/wildlife care facility for treatment prior to release<br>- Restricted works/avoidance measures if nesting Australian Painted Snipe (*Rostratula australis*) or Australasian Bittern (*Botaurus poiciloptilus*) are detected<br>- Works protocols if an active Red Goshawk (*Erythrotriorchis radiatus*) nest site is identified to allow nesting to continue undisturbed<br>- Works protocols if a Grey-headed Flying-fox roost site (*Pteropus poliocephalus*) is found, in accordance with the *Referral guideline for management actions in Grey-headed and Spectacled Flying-fox camps* (DotE, 2015b)<br>- Works protocols to allow safe movement away from works area if other fauna is observed within or adjacent to the works area<br>- Works protocols to minimise construction noise as much as possible where fauna are observed, staying within or adjacent to the works area<br>- Relocation of plants and micro-habitats (such as hollow-bearing logs), where applicable<br>- Requirements for inspections and corrective actions during construction and rehabilitation activities<br>- Biodiversity/fauna and flora management actions, including those required under secondary approvals to be undertaken by suitably qualified persons<br>- Requirements for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction. |

| Delivery phase | Aspect | Proposed mitigation measures |
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| Detailed design (continued) | Weeds and pests | Develop the CEMP Biosecurity Management Plan to include:<br>▸ Pre-clearing surveys to determine the risk of environmental weeds and pests including prohibited and restricted matters prescribed under the *Biosecurity Act 2014* (Qld) and Biosecurity Regulation 2016 being present<br>▸ Consideration of relevant guidelines to control potential deleterious pathogens including *Phytophthora cinnamomi* and *Austropuccinia psidii* (Myrtle rust) (e.g. DotE, 2015c) associated with Project activities both of which may impact Melaleuca species<br>▸ Revegetation species to be obtained from source certified free of *Phytophthora cinnamomi*<br>▸ Mapping the existing extent and severity of any weed infestation and weed management requirements in the disturbance footprint or on adjacent land<br>▸ Pest animal management, including Red Imported Fire Ants management within the Fire Ants Biosecurity Zones 1 and 2 as per current DAF advice<br>▸ Weed surveillance and treatment during construction and rehabilitation activities<br>▸ Vehicle and plant washdown protocols when traversing properties via temporary access tracks or if any high-risk areas are identified during the Project construction<br>▸ Requirements in relation to pesticide and herbicide use and documentation, recognising ACDC Act requirements, including any limitations on use, such as restrictions on use in sensitive environmental areas, drainage lines that flow to waterways and aquatic habitats, and ensuring that broad-scale use does not result in an increased erosion and sediment risk<br>▸ Vehicle and plant equipment and imported fill hygiene protocols and documentation<br>▸ Erosion and sediment control risks associated with broad-scale weed removal or treatment<br>▸ Stockpiling and management/segregation of topsoil where it contains native plants seedbank or weed material<br>▸ Dewatering and fish salvage requirements to manage the risk of translocating non-endemic flora and fauna<br>▸ Consideration of local government Biosecurity Plans (City of Ipswich *Biosecurity Plan 2018–2023* and City of Logan *Biosecurity Plan 2017–2022*) (Ipswich City Council, n.d.; Logan City Council, n.d.). |
| | | Develop the Community Engagement Sub-plan in the CEMP to enable members of the public to assist with weed surveillance in the vicinity of Project works. |
| Pre-construction | Flora and fauna | Implement the CEMP Flora and Fauna Sub-plan.<br>Undertake pre-clearing surveys in any areas to be cleared to enable pre-construction activities and confirm the species-specific works protocols to be implemented.<br>Document the area and type of vegetation cleared in a post-clearance summary, including MNES and MSES for offsetting and compliance purposes. |
| | Landscape, rehabilitation and stabilisation | The Reinstatement and Rehabilitation Management Plan will guide the approach to rehabilitation and be implemented progressively during pre-construction and construction phase activities. |
| | Weeds and pests | Implement the Biosecurity Management Plan during pre-construction to reduce the potential for the spread of weeds and pests into the surrounding environments and land uses. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction (continued) | Erosion and sediment control | Review and update the ESCP developed during detailed design, incorporating further construction methodology details, as required.<br>Implement appropriate site stabilisation treatments, including seeding and planting requirements, in accordance with the ESCPs and Reinstatement and Rehabilitation Plan. |
| Construction and commissioning | Flora and fauna | Project clearing extents are limited to that required to safely construct, operate and maintain the Project, in accordance with the approved disturbance footprint.<br>Locate temporary construction facilities compounds, stockpiles, fuel storage, laydown areas, temporary access roads and staff parking to minimise the extent of disturbance on existing habitat and significant vegetation, i.e. undertake micro-siting of these temporary activities and facilities.<br>Appropriate construction traffic speed limits will be established and managed to minimise vehicle strike risk.<br>Clearly define clearing boundaries associated with the construction disturbance footprint with flagging or marking tape, signage or other suitable means to delineate no go areas. Undertake this delineation and marking process in a manner that is consistent with the Project flagging/marking tape process and specifications, to ensure that it is consistent with the wider Project control processes and does not conflict or contradict any other demarcation practices.<br>Staged and sequence clearing where feasible to minimise the extent of exposed areas. Where possible, minimise loss of canopy vegetation and works that will lead to the proliferation of weed species.<br>A qualified Fauna Spotter Catcher will undertake pre-clearance surveys of habitats and vegetation, including, where applicable, fauna reduction activities. The Fauna Spotter Catcher will supervise the subsequent clearing. The area and type of vegetation cleared will be documented where required for compliance with secondary approvals and offset purposes.<br>Implement the post-construction MNES Monitoring Plan. Continue monitoring each nominated MNES against initial assessment values, until completion criteria are achieved. Corrective actions to be implemented where Project-associated impacts are identified<br>Implement the Air Quality Sub-plan to minimise dust impacts including dust monitoring and suppression methods. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Riparian vegetation and aquatic habitats | Locate construction areas including compounds, stockpiles, fuel storage, laydown areas, temporary and permanent access roads within the Project disturbance footprint.<br>Undertake a flood/drainage assessment to inform the siting and scale of temporary construction areas (including stockpiles, construction compounds, fuel storage and laydown areas etc). Locate these areas on land that is not subject to flooding to the extent possible.<br>Siting of plant and equipment and refuelling facilities to be undertaken in accordance with *AS1940:2017 The storage and handling of flammable and combustible liquids.*<br>Implement the site-specific ESCPs.<br>Works within or adjacent to watercourses will be conducted in accordance with relevant secondary approvals including:<br>▸ *Riverine protection permit exemption requirements (WSS/2013/726) Version 2.01* (2019) or conditions of a riverine protection permit issued for the Project<br>▸ *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018) or conditions of development approval for operational work that is constructing or raising waterway barrier works.<br>Dewatering/extraction of water from artificial impoundments will be undertaken after consultation with relevant stakeholders.<br>Dewatering strategies will be required to comply with the *Biosecurity Act 2014* (Qld) to take reasonable measures to avoid the spread of pest species (with capacity to affect water quality) and in accordance with any required aquatic fauna species management plans.<br>The salvage and relocation of fish within isolated aquatic environments will be managed in accordance with DAF *Guidelines for Fish Salvage* (DAF, 2018b).<br>An appropriately qualified person will be consulted to make an assessment on the method of recovery, transport and release of fish and other aquatic fauna, as required. As a minimum, the following will be implemented:<br>▸ Relocation will be undertaken by a suitably qualified person<br>▸ Dewatering pumps will have an intake screen<br>▸ Records of all fish recovered, and the location of their release will be maintained.<br>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. |
| | Fauna passage | Prioritise bridge structures and culvert construction where practical and feasible, particularly in the six key locations identified as part of the EIS assessment process to maintain and/or re-establish habitat connectivity as soon as possible and minimise the disruption to waterways.<br>Stage the implementation of the Reinstatement and Rehabilitation Plan in locations associated with fauna passage structures. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Flora | Minimise clearance of remnant vegetation to that necessary for construction and safe operation, and in accordance with the Project disturbance footprint and secondary approvals.<br>Where practicable and feasible, locate construction areas including compounds, stockpiles, fuel storage, laydown areas, staff parking outside the tree protection zone as defined in *AS4970-2009 Protection of trees on development sites*.<br>Where possible, minimise loss of canopy vegetation and works that will lead to the proliferation of weed species.<br>Implement the Soil Management Plan as part of the CEMP, guiding the stripping, stockpiling and management of topsoil where it has the potential to contain seedbank or weed material.<br>Manage topsoil stockpiles to maintain the viability of soil seed banks for threatened flora species such as Hairy-joint Grass, Boonah Tuckeroo, Lloyd's Olive and Shiny-leaved Condoo.<br>Plan and implement revegetation and rehabilitation works so that they do not create safety, maintenance or performance issues e.g. vegetation does not grow and obscure signals or impact longevity of rail infrastructure. |
| | Aquatic fauna | Construct temporary and permanent watercourse crossing structures in accordance with the detailed design and *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018) or conditions of development approval for operational work that is constructing or raising waterway barrier work. This is required to minimise impacts to aquatic fauna (i.e. fish passage) and hydrology during construction and operation. |
| | Fauna fencing | Install fauna exclusion fencing in accordance with detailed design and fencing hierarchy especially in conjunction with the six identified fauna passages/creek crossing locations for the Project to maintain permeability in the alignment. |
| | Weeds and pests | Implement the Biosecurity Management Plan during construction to reduce the potential for the spread of weeds and pests into the surrounding environments and land uses.<br>Monitor the effectiveness of weed hygiene measures as a component of the environmental monitoring procedure for the Project.<br>Do not use any vegetated material containing, or with the potential to contain, weed seed material for onsite mulching or erosion protection.[1,2]<br>Implement the Community Engagement Sub-plan in the CEMP, to enable members of the public to assist with weed surveillance in the vicinity of Project works. |
| | Landscape, rehabilitation and stabilisation | Construct landscaping treatments in accordance with the landscape design.<br>Implement the Soil Management Plan.<br>Undertake progressive rehabilitation and reinstatement of disturbed areas in accordance with the Reinstatement and Rehabilitation Management Plan and the Landscape and Rehabilitation Management Plan. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Erosion and sediment control | Vegetation clearing and ground disturbing activities will be supplemented by the progressive installation of erosion and sediment controls including stabilisation works to minimise areas exposed to erosion and sediment risk.<br>Implement site stabilisation treatments in accordance with:<br>▸ ESCP<br>▸ Air Quality Sub-plan<br>▸ Reinstatement and Rehabilitation Plan.<br>Assess the suitability of cleared vegetation for mulching/erosion protection on a case-by-case basis. Any vegetated material containing or with the potential to contain weed seed material will not be used for onsite mulching or erosion protection without prior treatment. For any unsuitable material i.e. noxious weeds etc, the cleared and grubbed material will be removed from the site and disposed of in accordance with relevant statutory requirements and the Biosecurity Management Plan.<br>Re-use suitable mulch generated by construction of the Project within appropriate timeframes and manner as specified in the ESCP and the Reinstatement and Rehabilitation Management Plan. |

#### 23.13.4.4 Monitoring

Requirements for monitoring will be documented in the following plans that will support the CEMP:

- Flora and Fauna Sub-plan
- Biosecurity Management Plan
- Construction Noise and Vibration Management Plan
- Reinstatement and Rehabilitation Management Plan
- Post-construction MNES monitoring plan.

Monitoring and reporting on compliance with the mitigation measures identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

The proposed mitigation measures identified in Table 23.7 have been selected based on the best available information, including government guidelines (e.g. DTMR's *Fauna Sensitive Road Design Manual* (DTMR, 2000; DTMR, 2010)) and mitigation measures used on similar projects that have been subject to legislative approval. It is acknowledged the effectiveness of these measures may not have been subject to rigorous peer-reviewed analysis to date.

Ongoing monitoring of the effectiveness of the measures with contingency (under an adaptive management framework) will allow change/improvement of management strategies where deleterious impacts to the identified environmental values are observed, or are not minimised, as per the objectives of the proposed mitigation measures.

### 23.13.5 Air quality

#### 23.13.5.1 Environmental outcomes

Design and construction of the Project is undertaken in a manner that minimises air quality impacts, specifically impacts to the following environmental values that are relevant for the Project:

- The qualities of the air environment that are conducive to human health and wellbeing
- The qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property.

#### 23.13.5.2 Performance criteria

The air quality goals applicable to the construction phase of the Project are presented in Table 23.8.

**TABLE 23.8: PROJECT AIR QUALITY GOALS**

| Pollutant | Air quality goal | Averaging period | Environmental value |
|---|---|---|---|
| TSP | 90 µg/m$^3$ | Annual | Health and well being |
| $PM_{10}$ | 50 µg/m$^3$ | 24 hours | Health and well being |
| | 25 µg/m$^3$ | Annual | Health and well being |
| Dust deposition[1] | 120 mg/m$^2$/day | Monthly | Protecting aesthetic environment |

**Table notes:**

µg/m$^3$ —micrograms per cubic metre

mg/m$^2$/day —microgram per square metre per day

1. Dust deposition is assessed as the insoluble solids component of deposited dust.

#### 23.13.5.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are presented in Table 23.9.

For a number of emission sources there are multiple available mitigation measures. The exact method of mitigation implemented will be determined during construction phase planning and following confirmation of the availability and suitability of water supply sources.

**TABLE 23.9:MITIGATION MEASURES—AIR QUALITY**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design | Availability of water for dust suppression and stabilisation during construction | Prior to construction, quantities of water required for dust suppression, construction, landscaping and stabilisation activities will be confirmed. The availability and suitability of water supply sources will be determined and where water supply is deemed insufficient or in high demand for other uses, other dust suppression and stabilisation methods will be implemented. |
| | Emissions from refuelling activities during construction | Design of fuel storage areas will ensure that fuel tanks will be located at least 50 m from the nearest sensitive receptor, with separation distances maximised as far as practical within site restrictions. |
| | Fugitive dust emissions (windborne erosion) during construction and operation | Project clearing extents are limited to the disturbance footprint that must be minimised to that required to safely construct, operate and maintain the Project.<br>Laydown areas and other construction-phase facilities will be designed and arranged to minimise emissions and reduce the potential for air quality impacts to sensitive receptors. Design considerations will include the locations of stockpiles, activity areas, travel routes, rumble grids and truck washdown areas, etc.<br>Earthworks and landscape design of railway batters and other exposed surfaces will be designed to incorporate treatments and enable stabilisation to reduce wind erosion. |
| | Emissions reporting requirements | Emissions reporting requirements for the construction phase will be confirmed during detailed design and respond to National Greenhouse and Energy Report (NGERS) requirements and the Sustainability Management Plan. |
| Pre-construction and construction | Dust generation pre-construction activities | Vehicle travel on unsealed roads will be minimised as far as practical. Sealed roads will be used where possible, in accordance with the Construction Traffic Management Plan.<br>Disturbed areas will be rehabilitated and stabilised as soon as practical on completion of works. |
| Construction and commissioning | Dust generation from earthworks, clearing and grubbing, mobile plant activity and wind erosion of exposed areas within the construction disturbance footprint | Limit clearing to the disturbance footprint as identified during the detailed design constructability assessment and planning.<br>Limit clearing to that required to safely construct and operate the Project.<br>Where practical, stage clearing and grubbing and construction activities to limit the size of exposed areas.<br>Adequate precautions to effectively minimise the generation of dust, which may affect the safety and general comfort of the travelling public, the contractor's employees and/or occupants of adjacent buildings, during the construction of the work will be undertaken.<br>This will involve regular applications of water or other measures along the sections of the work traversed by the travelling public, as required, to minimise dust.<br>Implement water sprays or other measures to reduce dust emissions from excavation or disturbance of soils or vegetation, or handling ballast.<br>Implement water sprays or other measures to reduce dust emissions from trucks unloading material.<br>Implement water sprays or other measures to reduce dust emissions for mobile plant loading to or from material stockpiles. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Dust generation from earthworks, clearing and grubbing, mobile plant activity and wind erosion of exposed areas within the construction disturbance footprint (continued) | To reduce wind erosion from stockpiles, the following mitigation methods may be used subject to water availability and stockpile activity:<br>▸ Water sprays<br>▸ Wind breaks or earthworks profiling<br>▸ Application of rock armour/covering<br>▸ Covering of the stockpile with an impermeable covering (i.e. tarpaulin) or binding agent.<br>If water sprays are implemented for stockpiles, the application rate of water will be increased for stockpiles which will receive new material regularly, such as tunnel excavation stockpiles.<br>Disturbed areas and exposed surfaces will be stabilised as a soon as practical. The following mitigation methods may be used subject to final purpose of the exposed area:<br>▸ Initial establishment of vegetation<br>▸ Maintained revegetation<br>▸ Establishment of self-sustaining rehabilitation vegetation<br>▸ Sealing of exposed surface (i.e. concrete, asphalt, etc.).<br>Long-term stockpiles will be avoided where possible. However, where necessary (e.g. topsoil), long-term stockpiles will be established in locations with suitable separation from sensitive receptors. During periods of inactivity, stockpiles will be stabilised appropriately.<br>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. |
| | Emissions from combustion engines (construction vehicles and generators) | Construction plant, vehicles and machinery will be maintained and operated in accordance with manufacturers' recommendations. |
| | Use of non-potable water for dust suppression | Water used in dust suppression will 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 hard stand areas) be risk assessed prior to adoption. |
| | Dust generated by traffic on access tracks | To reduce emissions from construction vehicle movements on unsealed roads, road watering or other appropriate measures will be applied. Water additives used to improve dust suppression effectiveness will be considered. |
| | Fugitive dust emissions from vehicles transporting materials to and from site | Vehicles transporting potentially dust and/or spillage generating material to and from the construction site will have their loads covered immediately after loading (prior to traversing public roads).<br>Rumble grids and the operation of truck washdown areas will be maintained to reduce trackout of material onto public roads where it may become resuspended.<br>Site-based construction traffic is limited to identified haul routes as per the Project Construction Traffic Management Plan. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Cumulative effects of dust emissions from construction and external land uses or activities | Sensitive receptors near the existing Boral Purga Quarry may be impacted by the operation of the quarry and the construction phase of the Project. The cumulative impact of both sources on sensitive receptors and the effectiveness of the proposed mitigation measures for Project construction activity near the quarry will be monitored via visual monitoring and air quality monitoring as discussed in Section 23.13.5.4. In the event of validated complaints or measured exceedances of the Project air quality objectives, enhanced mitigation will be implemented.<br>Project construction activities to be undertaken near the quarry that have the highest potential to generate air emissions include excavation works and material handling for the construction of the alignment, activity within the laydown area nearest the quarry and vehicle travel on unsealed roads. |
| | Dust generation and deposition as a result of adverse weather conditions | Avoid ground-disturbing activities including excavation and vegetation clearing during windy conditions, where practical.<br>When avoidance of ground-disturbing activities is not practical, implement enhanced management measures, such as water application and/or implementation of temporary stabilisation treatments. |

#### 23.13.5.4 Monitoring and reporting requirements

Monitoring and reporting on compliance with the mitigation measures identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

Emissions reporting during construction (e.g. NGERs and reporting against Sustainability Management Plan targets) is to be undertaken where applicable.

In addition, this section describes how the Project will monitor, report and audit compliance with the Project air quality objectives.

**Construction phase—weather conditions monitoring**

To help avoid dust generation during adverse weather conditions, weather forecasts and observations for adverse weather (e.g. winds > 36 km/hr or 20 knots) will be observed during the construction phase of the Project using existing BoM weather stations.

To assist with auditing and analysis of air quality monitoring and complaints (if received), periods of adverse weather conditions will be recorded in monthly environmental reports.

**Construction phase—air quality monitoring**

Visual and quantitative air quality monitoring will be undertaken for the construction phase of the Project.

Visual monitoring of dust generation (visible plumes) will be undertaken throughout construction.

Daily onsite inspections of dust generation will be undertaken by construction staff to monitor dust being generated onsite to inform mitigation measures.

In addition, weekly offsite inspection will be undertaken at sensitive receptors located near high-intensity construction areas such as:

- Heavily trafficked haul roads
- Excavation areas
- Laydown areas.

Visual monitoring should include checks of dust deposition on horizontal surfaces such as cars and window sills.

Quantitative air quality monitoring will be undertaken via monitoring of dust deposition at sensitive receptor locations near the Boral Purga Quarry, which have the potential to be impacted by emissions from the construction phase of the Project and emissions from the operation of the quarry.

Selection of the exact locations for the installation of dust deposition gauges will be undertaken by a suitably qualified air quality professional. The monitoring locations will be demarcated and sign posted.

In the event that dust deposition monitoring determines exceedance of the Project air quality goal (120 mg/m$^2$/day) at sensitive receptors, additional monitoring, including monitoring of airborne particulate concentrations (e.g. TSP or PM$^{10}$), may be required. If legitimate air-quality complaints are received from locations that are not represented by the location of air monitoring stations, additional monitoring stations may be deployed.

Air quality monitoring data and logs of visual monitoring inspections will be included in the environmental monitoring reports prepared by the construction contractor.

### 23.13.6 Surface water and hydrology

#### 23.13.6.1 Environmental outcomes

Project works are designed to minimise the use of water resources and maximise the opportunities for re-use of suitable water from the construction site.

Discharge of surface water from construction sites does not adversely affect the environmental values of receiving water and habitats.

Project works are designed consistent with the Project hydraulic design criteria to achieve the flood impact objectives established for the Project at flood sensitive receptors.

#### 23.13.6.2 Performance criteria

- Steps are taken to investigate and maximise the use of water collected onsite, including use of water captured within sediment basins.
- Use of potable water is minimised, where possible.
- Project works are undertaken in accordance with the ESCPs (refer Section 23.13.2.3).
- Project works are planned and staged to minimise the potential for adverse impacts on existing water flows and/or flooding profiles.
- Water quality monitoring demonstrates that the Project works do not have an adverse impact on water quality upstream or downstream of works.
- Stormwater discharges released from the Project worksites to receiving surface waters must comply with goals established in the CEMP at the nominated discharge points.
- Project works must not cause flooding impacts that exceed the flood impact objectives established for the Project at flood sensitive receptors including:
  - 10 mm or more at existing habitable and/or publicly used commercial structures, buildings or premises
  - 50 mm or more at existing habitable residential or publicly used commercial properties or lots where flooding does not impact dwellings or buildings
  - 100 mm or more at existing non-habitable structures or industrial building or premises
  - 100 mm or more at existing roadways (currently in use)
  - 200 mm or more at existing agricultural and grazing land.

#### 23.13.6.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.10.

**TABLE 23.10: MITIGATION MEASURES—SURFACE WATER AND HYDROLOGY**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design | Water quality of waterways | Seek to further refine the disturbance footprint identified and assessed in the EIS, to avoid and, where avoidance is not possible, further minimise impacts to all waterways including defined watercourses, currently unmapped waterways and drainage features (defined by *Water Act 2000* (Qld)) and water quality of Western Creek, the Bremer River, Warrill Creek, Sandy Creek, Purga Creek, Woollaman Creek, Undullah Creek, Teviot Brook, their tributaries and downstream impoundments or users by:<br>▸ Avoiding, then minimising the extent and duration of temporary waterway diversions<br>▸ Avoiding, then minimising the extent of permanent waterway diversions or realignments. Where unavoidable, permanent waterway realignment/diversion design to include simulation of natural features e.g. meanders, pools, riffles, shaded and open sections, deep and shallow sections and different types of sub-strata, depending on the pre-disturbance environmental values<br>▸ Planning and defining maintenance activity locations, construction compounds and storage areas, and management procedures<br>▸ Undertaking pre-construction water quality monitoring and detailed design hydraulic modelling to inform temporary and permanent drainage design. Requirements for treatment train controls, scour protection etc., to be incorporated where necessary to achieve modelled compliance with established water quality objectives. Temporary and permanent measures must be appropriate to the site conditions, responding to the erosion risk assessment, environmental receptors, climatic zone and seasonal factors<br>▸ Developing ESCP, in accordance with International Erosion Control Association's *Best Practice Erosion and Sediment Control* (IECA, 2008) for implementation during pre-construction, construction and commissioning, which will establish and specify the monitoring and performance objectives for handover on completion of construction<br>▸ Ensuring the disturbance footprint defined during detailed design allows sufficient space for provision of the required temporary and permanent erosion and sediment control measures/pollution control measures<br>▸ Designing batters, cuts and other exposed surfaces to reduce erosion risk<br>▸ Designing watercourse crossing structures (including culverts and bridges) to minimise the need for ongoing maintenance and inspection to maintain aquatic fauna (e.g. fish) passage and minimise the risk of debris deposition during large flow events in accordance with relevant regulatory requirements. |
| | Monitoring | Develop the surface water monitoring framework to inform the development of the CEMP and the construction water quality monitoring program. It will identify monitoring locations including upstream, downstream and at the intersection of the Project disturbance footprint and watercourse. It will include the relevant water quality objectives, parameters, criteria and specific monitoring locations, frequency and duration identified in consultation with relevant regulators to reduce impacts to surface water quality.<br>The water quality monitoring program will include (as a minimum):<br>▸ Analysis of the representative background monitoring dataset<br>▸ Identification of Project works and activities during construction and operation, including runoff, emergencies and spill events, that have the potential to impact on surface water quality of potentially affected waterways and riparian land (via discharge points)<br>▸ A risk management framework for evaluation of the risks to surface water quality and ecosystems in the receiving environment, including definition of impacts that trigger contingency and ameliorative measures |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design (continued) | Monitoring (continued) | ▸ The identification of locality specific and construction activity erosion and sediment control and stormwater management requirements relating to surface waters during construction, commissioning and operation<br>▸ The presentation of Water Quality Objective (WQO) trigger values, standards and parameters against which changes to water quality will be assessed, having regard to the ANZECC/ARMCANZ 2000/2018 Guidelines, or other suitable guidelines. As a minimum this should include values for:<br>  ▸ TSS–Equivalent to corresponding background (milligrams per litre (mg/L))<br>  ▸ Turbidity–Equivalent to corresponding background (Nephelometric Turbidity Units (NTU))<br>  ▸ pH 6.5–8<br>  ▸ Oils and grease (no visible films)—if oils and grease are visually evident, a sample will be forwarded to the laboratory for analysis<br>▸ Establishment of construction surface water monitoring locations including waterways, waterbodies and wetlands (e.g. upstream of, downstream of, and at the intersection of the Project disturbance footprint and watercourse and tunnel dewatering into the Purga Creek sub-catchment) and discharge points, which are representative of the potential extent of impacts from the Project, including relevant analytes and frequency of monitoring<br>▸ Identification of seasonal factors with the potential to influence water quality at the monitoring sites<br>▸ A minimum monitoring period following the completion of construction completion criteria. Surface-water quality during baseflow conditions that meet representative pre-construction up and downstream background monitoring, and/or WQOs will confirm adequate rehabilitation<br>▸ The post-construction monitoring will assess the efficacy of constructed water control measures, as defined as part of drainage during detailed design of the Project, such as vegetated buffer strips basins and vegetated swales<br>▸ Contingency and ameliorative measures in the event that adverse impacts to water quality are identified, with reference to the impact triggers defined as part of the water quality monitoring program<br>▸ Surface water quality samples are to be collected and analysed in accordance with industry-accepted standards and quality assured procedures, with laboratory analysis undertaken by NATA-accredited facilities.<br>Commence the baseline water quality monitoring to obtain a suitable dataset, prior to construction, at waterway crossing locations to establish baseline water conditions and provide a sufficient seasonal variation. |
| | Drainage design, erosion sediment control | Water-quality modelling will be undertaken to inform permanent drainage design for the rail and road realignments (i.e. requirements for treatment train controls, where necessary to comply with established water quality objectives, scour protection) and to inform erosion and sediment control plans.<br>Design defines temporary and permanent stormwater, erosion and sediment/pollution control measures in ESCPs and Reinstatement and Rehabilitation Plans, that comply with IECA's *Best Practice Erosion and Sediment Control* (IECA, 2008). The aforementioned plans are to also establish and specify the monitoring and performance objectives for handover on completion of construction. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design (continued) | Construction water | Developing a dewatering strategy where dewatering of artificial impoundments is required (e.g. dewatering of artificial impoundment at Ch 2.90 km and Ch 4.60 km) to comply with the *Biosecurity Act 2014* (Qld) to take reasonable measures to avoid the spread of pest species (with capacity to affect water quality) and in accordance with any required aquatic fauna species management plans.<br>Requirements for construction water (volumes, quality, demand curves, approvals requirements and lead times) will be defined during detailed design and construction planning. This should include identification of opportunities to use dewatered artificial impoundments (where impacted along the alignment) for construction purposes.<br>Construction water sources and demand will use a hierarchical approach to confirm the suitability of water sources, with a focus on using existing sustainable allocated water entitlements from private water holders.<br>Licences, approvals and agreements to access water from sources identified in the finalised construction water strategy will be obtained. These may include water licences under the Water Act or access agreements with bulk water suppliers or private landholders.<br>Specify performance criteria in the CEMP for construction water requirements to minimise the risk of adverse water quality, environmental or health impacts and avoid the use of potable water where non-potable sources can be applied. |
| | Tunnel dewatering | Groundwater quality and hydraulic modelling will be undertaken to inform the design for the Teviot Range Tunnel dewatering treatment facility.<br>Develop a treatment and discharge plan, consistent with the water quality monitoring framework for implementation at the tunnel dewatering plant. The collected water will be required to meet the water quality objectives (to be established during baseline water quality monitoring) for release, and schedule release periods so as to minimise changes in hydrological regime, physical and chemical characteristics and ecological processes. The treatment and discharge plan will also establish criteria and protocols in the event that releases during no-flow conditions is required. |
| | Flooding and hydrology | Incorporate outcomes from consultation with stakeholders including directly impacted landholders, local government authorities, State government departments and recognised subject matter experts to inform and refine the Project design.<br>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. The hydrologic and hydraulic modelling for Western Creek, Bremer River, Warrill Creek and Purga Creek will be reviewed and updated to consider the Ipswich City Council hydrologic and hydraulic modelling completed in early 2020. This will confirm bridge lengths, culvert sizing and numbers, localised scour and erosion protection measures for both rail, road and other permanent Project infrastructure. When finalised positions of infrastructure elements (e.g. abutments/piers etc.) are confirmed and detailed soil studies are complete, a geomorphological assessment of identified risk locations will be undertaken.<br>Undertake a Project flood risk assessment to inform the siting and scale of temporary construction areas (including stockpiles, construction compounds, access, laydown areas etc.).<br>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.<br>Impacts must be determined at all drainage structures and waterways affected by Project 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% AEP event. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction | Erosion and sediment control (water quality related) | ESCPs will be developed as part of the CEMP, in accordance with the International Erosion Control Association's *Best Practice Erosion and Sediment Control* (IECA, 2008). The ESCP will include the following procedures and protocols relevant to potential impacts on water quality values:<br>• Soil/land conservation objectives for the Project<br>• Management of problem soils, such as:<br>  ◦ Acid sulfate soils, which may occur in proximity to artificial waterbodies or impoundments<br>  ◦ Erosive or dispersive soils, such as sodosols that are expected to be encountered at Ch 10.00 km (associated with Ebenezer)<br>  ◦ Cracking clays (vertosols) that are expected to be encountered in the disturbance footprint associated with the alignment in proximity of Purga and Willowbank<br>  ◦ Saline soils, particularly in high salinity hazard areas such as between Ch 7.50 km and Ch 22.50 km<br>• Specification of the type and location of erosion and sediment controls. The erosion and sediment control measures will be developed by a CPESC and be in accordance with the International Erosion Control Association's *Best Practice Erosion and Sediment Control* (IECA, 2008)<br>• A Soil Management Plan that will include:<br>  ◦ Locations for specific temporary/permanent erosion and sediment control measures, such as:<br>  ◦ Sediment retention basins<br>  ◦ Scour protection (included in the design)<br>  ◦ Sediment fencing<br>  ◦ Berms and other surface flow redirection through disturbance areas<br>• Nomination of location-specific erosion controls will include consideration of site conditions, proximity to environmental receptors, adjoining land uses, climatic and seasonal factors, and will be based on an erosion risk assessment<br>• Minimise the area of disturbance during each stage to that required to enable the safe construction, operation and maintenance of the rail corridor<br>• Scheduling of works in areas proximal to waterways (as risk water quality receptors) with consideration to periods of higher rainfall (summer months), where practical<br>• Establish and specify the monitoring and performance objectives for handover on completion of construction<br>• Stockpiling and management/segregation of topsoil, where it contains native plants seedbank or weed material<br>• Vehicle, machinery and imported fill hygiene protocols and documentation, in accordance with the requirements of the *Biosecurity Act 2014* (Qld)<br>• Requirements for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction.<br>The ESCPs are to include a process for site- and activity-specific preparation when forecast large or high-intensity wet weather events are predicted. This may include, but not be limited to, removing plant and equipment out of riparian zones, stabilising/covering live work areas, additional application of soil binders/veneers and pre event treatment and dewatering of sediment basins. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction (continued) | Water quality | Review and adjust (as required) the surface water monitoring framework and develop the water quality monitoring program as part of the Surface Water Sub-plan of the CEMP, with reference to the baseline (representative background) monitoring dataset.<br>Dewatering/extraction of water from artificial impoundments will be undertaken after consultation with relevant stakeholders.<br>To the extent possible and where required, stage Project works to use dewatered artificial impoundments to reduce external water requirements.<br>Dewatering strategies will be required to comply with the *Biosecurity Act 2014* (Qld) to take reasonable measures to avoid the spread of pest species (with capacity to affect water quality). |
| Construction and commissioning | Erosion and sediment control | Clearing extents are limited to the disturbance footprint, and clearing is scheduled to minimise the exposure time of unprotected materials to prevent sedimentation of receiving waterways.<br>Appropriate erosion and sediment control measures are to be implemented for each stage or element of the Project works, in accordance with the progressive revisions of the ESCPs that are undertaken by a CPESC in accordance with International Erosion Control Association's *Best Practice Erosion and Sediment Control* (IECA, 2008). Stages/elements are expected to include (but not be limited to):<br>▸ Vegetation clearing and grubbing<br>▸ Temporary access tracks and/or temporary waterway crossings<br>▸ Early installation of stormwater drainage and clean water catch drains to divert clean water flows through/around the construction site<br>▸ Bulk earthworks and interim topography changes<br>▸ Waterway diversions<br>▸ Bridge and culvert works<br>▸ Ballast placement<br>▸ Reinstatement activities<br>▸ Rehabilitation and landscape activities.<br>Temporary waterway crossings are rehabilitated in accordance with the Reinstatement and Rehabilitation Plan.<br>Where practical and or in accordance with specific flora and fauna management plans, vegetation clearing and ground disturbing works will be staged sequentially across the Project to minimise areas exposed to erosion and sediment risk of receiving waterways and drainage lines in accordance with the general environmental duty of the *Environmental Protection Act 1994* (Qld). |
| | Water quality | Implementation of the Surface Water Sub-plan.<br>The surface water monitoring framework will include the relevant water quality objectives, parameters, criteria and specific monitoring locations, frequency and duration identified in consultation with relevant regulators to reduce impacts to surface water quality.<br>To the extent possible, schedule works to use dewatered artificial impoundments along the alignment to reduce external water requirements. Dewatering strategies will be required to comply with the *Biosecurity Act 2014* (Qld) to take reasonable measure to avoid the spread of pest species (with capacity to affect water quality).<br>In the event that water quality objectives cannot be achieved for waters to be released, alternate treatment/disposal options are to be implemented prior to release or re-use. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Water quality (continued) | Water will need to meet the established water quality objectives for receiving waterways before being released/discharged into local waterways. Water that does not comply with relevant water quality objectives will either be:<br>▸ Treated onsite to enable discharge<br>▸ Used for construction water purposes that is not quality dependent, if safe to do so and adequate environmental controls are in place<br>▸ Removed from site for disposal at an appropriately licensed facility.<br>Bulk storage areas for dangerous goods and hazardous materials will be located away from areas of social and environmental receptors such that offsite impacts or risks from any foreseeable hazard scenario will not exceed the dangerous dose for the defined land use zone, i.e. either sensitive, commercial/community, or industrial, in accordance with the intent of the SPP.<br>Appropriate register and records of chemicals, hydrocarbons and hazardous substances and materials onsite will be maintained 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 onsite, plus a Safety Data Sheet Register.<br>Licensed transporters operating in compliance with Australian Code for the Transport of Dangerous Goods by Road & Rail will be used for the transportation of dangerous goods.<br>Chemicals stored and handled as part of construction activities will be managed in accordance with:<br>▸ *Work Health Safety Act 2011* (Qld) and Regulation<br>▸ *AS 2187 Explosives—storage, transport and use*<br>▸ *AS 1940:2017 Storage and Handling of Flammable and Combustible Liquids*<br>▸ *AS 3780:2008 The Storage and Handling of Corrosive Substances*<br>▸ Requirements of chemical safety data sheets<br>▸ Any relevant ERA conditions.<br>Procedures will be established for safe and effective fuel, oil and chemical storage and handling. This includes storing these materials within roofed, bunded areas. The bunding will have floors and walls that are lined with an impermeable material to prevent leaching and spills.<br>Construction tasks will be scheduled to avoid, where possible, bulk earthwork activities within the 1% AEP during periods of elevated flood risk. Where works cannot be scheduled outside of this time period, activity-specific flood readiness and response planning will be required. This planning will be developed in consultation with the relevant local government and QFES.<br>Laydown areas and other construction facilities that are located within the 1% AEP will be temporary. Their planning and function in supporting construction will reflect the local flood risk. For example, hazardous goods will not be bulk stored in these locations.<br>Mobile plant will not be stored in the 1% AEP when not scheduled to be in use for construction purposes.<br>Plant maintenance and refuelling will be carried out with appropriate interception measures in place to avoid impacts to waterways, aquatic habitats and groundwater. Appropriate spill control materials including booms and absorbent materials will be onsite at refuelling facilities at all times.<br>Appropriate waste bins will be located in laydown areas to facilitate segregation and appropriate containment of waste materials. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Construction water | The extraction of water will occur in accordance with licences, approvals and/or agreements.<br>Volume monitoring during extraction will be required for each source point, with extraction logs maintained.<br>Extraction reporting will occur, as required, in accordance with requirements of relevant licences, approvals and/or agreements obtained to cover this activity. |
| | Waterways | Maintenance activities and refuelling will be carried out at an appropriate distance from riparian vegetation and waterways, with appropriate measures in place to avoid impacts to surface water quality. Where this is not achievable due to type of activities (e.g. piling activities within a riparian zone), additional mitigation measures must be implemented to prevent impacts on water quality. |

#### 23.13.6.4 Monitoring

A surface water monitoring framework will be developed as part of the CEMP. It will identify monitoring locations at discharge points, and selected locations in watercourses where works are being undertaken. Monitoring is to be undertaken as close as possible to the proposed discharge points of the project to the receiving waters. The sampling locations are to be representative of where the site discharge mixes with the receiving waters. Upstream and downstream samples are to be taken. The surface water monitoring framework will include the relevant water quality objectives, parameters and criteria from the surface water EIS chapter. Specific monitoring locations, frequency and duration will be established as per the water quality monitoring program.

Rainfall and weather monitoring and recording will also be undertaken across the EIS disturbance footprint for live input into mitigation measures and reporting throughout the Project.

Monitoring and reporting on compliance with the mitigation measures identified in this Draft Outline EMP Sub-plan will be captured in the processes identified above in Section 23.8.

### 23.13.7 Groundwater

#### 23.13.7.1 Environmental outcomes

Groundwater inflow to Project works, including the Teviot Range tunnel, cuttings and excavations, is minimised.

Project works do not adversely impact groundwater quality.

Project works are designed to minimise the use of, and impacts on, groundwater resources and existing users.

#### 23.13.7.2 Performance criteria

- Contamination of groundwater by Project works is avoided.
- Risks associated with dewatering (i.e. water table lowering) and environmental management requirements during construction are identified through appropriate baseline groundwater monitoring and analysis prior to commencement of Project works.

#### 23.13.7.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.11.

**TABLE 23.11: MITIGATION MEASURES—GROUNDWATER**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design | Water resources | Undertake additional investigations and assessment of potential drainage/dewatering impacts associated with the tunnel through the Teviot Range, portals and deep cut sections to further refine current understanding, inform detailed design, identify potential for impacts to and mitigation measures for groundwater users. This will also inform requirements for monitoring during construction and potentially operation.<br>Refine seepage analysis for deep cuts to inform detailed design (for example drainage blanket specifications, shotcrete and weep hole specifications.<br>Review the proposed groundwater monitoring network to ensure locations are accessible during pre-construction, construction, commissioning and operation of the Project. Continue collection of baseline groundwater monitoring data (levels and quality) to confirm seasonal variation and inform detailed design and the development of the final Groundwater Monitoring and Management Plan (GMMP). Include monitoring at any additional bores identified during the development of the GMMP to establish a comprehensive monitoring regime prior to construction and operation.<br>Engage with relevant landholders to confirm the location of existing bores, identification/confirmation of new monitoring bore locations, and procure access agreements to existing registered groundwater bores included in the GMMP.<br>Confirm (i.e. physical survey or ground truth) the location of registered and unregistered bores that may be lost due to construction or operation of the Project and engage with licensed users to determine an appropriate mitigation strategy.<br>Undertake field 'truthing' of identified potential aquatic and terrestrial groundwater dependent ecosystems (GDEs) within the groundwater study area that can potentially be impacted by the Project and confirm their status.<br>Confirm sources for construction water requirements via consultation with relevant stakeholders (including landholders/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 landholder agreements are met. |
| | Water quality | Undertake detailed geotechnical investigations at deep cut sections to inform design and location-specific construction management of groundwater.<br>Risks associated with dewatering (i.e. water table lowering) and environmental management requirements during construction are identified through appropriate baseline groundwater monitoring, modelling and analysis. |
| Pre-construction | Water resources | Continue collection of baseline groundwater monitoring data (levels and quality) to confirm seasonal variation and inform detailed design and the development of the GMMP. Include monitoring at any additional bores identified during the development of the GMMP to establish a comprehensive monitoring regime prior to construction and operation. |
| | Water quality | Undertake site inspections prior to the construction of cuts, including visual examination of surface outcrops for sulfide minerals or evidence of sulfide mineralisation. Use the information from these inspections to inform the management of potential acid rock drainage (ARD) from cuttings prior to Project works. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning | Water resources | Implement the CEMP and the construction GMMP with appropriate groundwater level- and quality-monitoring criteria based on the baseline groundwater monitoring, modelling analysis and regulatory requirements, with make-good arrangements with the owners of groundwater bores as necessary.<br>Opportunities to re-use/recycle groundwater water drawn from tunnel and cuttings where encountered, are identified and implemented where feasible during construction. |
| | Water quality | Vehicle and plant maintenance will be undertaken in suitable bunded hardstand areas, to minimise the risk of contaminants from incidental spills or leaks from entering aquifers via infiltration or surface runoff.<br>Personnel involved in ground-disturbing works are familiar with hazardous spill management procedures.<br>Spill kits will be available at all work fronts and laydown areas in the event of a spill or leak. All vehicles and machinery will have dedicated spill kits. These refuelling locations will be equipped with onsite chemical and hydrocarbon absorbent socks/booms and spill kits.<br>Chemical and dangerous goods storage areas will be located in appropriately designed facilities, such as bunded areas, sealed or lined surfaces, hardstand areas, or storage within containers. Storage of chemicals, oils, fluids and other hazardous substances will be in accordance with the appropriate safety data sheets and relevant Australian Standards. These measures would minimise the risk of contaminants from incidental spills or leaks from entering aquifers via infiltration or surface runoff. Where possible, laydown areas and storage areas will be located away from creeks, rivers and sensitive receptors such as existing groundwater bores or known GDEs.<br>Imported fill material will be clean, certified contaminant free and be required to comply with regulatory guidelines for the intended use.<br>Material won from site will be tested and assessed for suitability prior to use within proximity to potential groundwater infiltration sites.<br>Any excavated material that is suspected to contain sulfides will be stockpiled, lined and covered, and managed to minimise rainfall infiltration and leaching. Where possible, treatment and onsite reuse are preferred to offsite disposal. A case-by-case assessment of the suitability of material for treatment and reuse will be required.<br>Routine sampling of discharge waters from the deep cuts intersecting groundwater will be undertaken to assess the potential for ARD processes taking place. Screening of the seepage water onsite for pH (trending down) and electrical conductivity (EC) (trending up) and comparison to the baseline groundwater monitoring program results/trends will allow for indication of ARD processes. Further laboratory analyses for the key analytes pH, TDS, EC, TSS, alkalinity, and dissolved metals will validate the presence or absence of ARD potential.<br>If ARD-contaminated discharge water is found to be generated from the deep cuts, this water will need to be impounded in ponds and neutralised via treatment with hydrated lime or dilution prior to release into the surrounding catchment or other discharge mechanism.<br>Implement the construction GMMP.<br>Any groundwater supply and/or monitoring that require decommissioning will be undertaken in accordance with the *Minimum Construction Requirements for Water Bores in Australia—Edition 3* (National Uniform Drillers Licensing Committee, 2012). |

#### 23.13.7.4 Monitoring

Continue collection of groundwater baseline data (levels and quality) to further inform the dataset to be incorporated into the GMMP which is discussed further in Chapter 14: Groundwater.

Implementation and adherence to the CEMP GMMP with appropriate groundwater level and quality monitoring criterion based on the baseline groundwater monitoring, modelling, analysis and regulatory requirements and enter into make-good arrangements with the owners of the groundwater bores as necessary.

Routine sampling of discharge waters from the deep cuts intersecting groundwater will be undertaken during construction to assess the potential for ARD processes taking place. Screening of the seepage water onsite for pH (trending down) and EC (trending up) and comparison to the baseline groundwater monitoring program results/trends will allow for indication of ARD processes. Further laboratory analyses for the key analytes pH, TDS, EC, TSS, alkalinity, and dissolved metals will validate the presence or absence of ARD potential.

Requirements for monitoring during the operational phase will be established during detailed design. Monitoring and reporting on compliance with the mitigation measures identified in this Draft Outline EMP Sub-plan will be captured in the processes identified above in Section 23.8.

### 23.13.8 Noise and vibration

#### 23.13.8.1 Environmental outcomes

Project works are designed, planned and implemented to maintain human health and wellbeing with respect to noise and vibration, to the extent reasonable and practicable.

Project works are designed, planned and implemented to maintain daily patterns of activity, and to minimise sleep disturbance at night.

Project works are managed to avoid vibration-related structural damage on all properties.

#### 23.13.8.2 Performance criteria

- Project works aim to not exceed noise levels to achieve the goals presented in Table 23.12 at a sensitive receptor, measured in accordance with section 5 of DTMR Code of Practice (CoP) Volume (Vol) 2, to the extent reasonable and practicable:
  - Although the below-standard hours are not consistent with the CoP Vol 2, ARTC is seeking to strike a balance between maintaining a reasonable amenity, and cost and program implications.
  - In some cases, extended construction hours that limit the overall duration of construction will, in themselves, be a mitigation measure.
- Project works aim to not exceed the following airblast limits:
  - Airblast overpressure:
    - 115 dB (Lin) Peak for 9 out of any 10 consecutive blasts
    - 120 dB (Lin) Peak for any blast.
- Project works are designed, planned and implemented to achieve the blasting ground vibration criteria in Table 23.14, to the extent reasonable and practicable.
- Project works are designed, planned and implemented to achieve the vibration goals in Table 23.15, Table 23.16, Table 23.17 and Table 23.18, at a sensitive receptor, to the extent reasonable and practicable.

**TABLE 23.12: CONSTRUCTION NOISE GOALS (EXTERNAL)**

| | External noise level $L_{Aeq,adj,15min}$[4,5], dBA | | | |
|---|---|---|---|---|
| **Work period** | **Lower goal** | **Upper goal[6]** | | |
| Proposed standard hours<br>Monday–Friday<br>6.30 am–6.00 pm<br>Saturday<br>6.30 am–1.00 pm<br>No work on Sundays or public holidays | RBL + 10[1,2,3]<br>Minimum 50 dBA<br>Maximum 75 dBA | 75 where RBL > 55 dBA | 70 where 40 dBA < RBL ⩽ 55 dBA | 65 where RBL ⩽ 40 dBA |
| Non-standard hours | RBL + 5<br>Minimum 45 dBA | RBL + 5 | | |

**Table notes:**

1. RBL + 5 dBA to be considered where a facility, equipment and long-term earthworks are required in an area for greater than six months.
2. Where the lower goal value exceeds the upper goal value, the lower goal value is taken to equal the upper goal value.
3. Minimum lower goal is 50 dBA for Standard hours and 45 dBA for non-standard hours. A maximum lower goal of 75 dBA applies to non-standard hours.
4. Noise contribution from construction activity determined as the component level.
5. The noise level from construction includes adjustment factors in Table 23.13 (for example, low frequency noise, impulsivity, tonality, intermittency and modulation).
6. For a single short event in a 24-hour period, the upper goal may be increased by:
   a) for standard hours:
      i) 2 dBA for event of 6 minutes to 15 minutes
      ii) 10 dBA for event of 1.5 minutes to 6 minutes
      iii) 15 dBA for event of less than 1.5 minutes
   b) for non-standard hours:
      i) 5 dBA for event of less than 1.5 minutes.

**TABLE 23.13: ADJUSTMENT FACTORS**

| Table factor | Assessment/ measurement | When to apply | Correction | Comments |
|---|---|---|---|---|
| Tonal noise | 1/3 octave or narrow band analysis | Level of 1/3 octave band exceeds the level of the adjacent bands on both sides by:<br>▸ 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz<br>▸ 8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive<br>15 dB or more if the centre frequency of the band containing the tone is below 160 Hz | 5 dB | Narrow-band frequency analysis may be required to precisely detect presence of tonality |
| Low-frequency noise | Measurement of C-weighted and A-weighted level | Measure/assess C-weighted and A-weighted frequency levels over the same time period<br>Correction to be applied if the difference between the two levels is 15 dB or more | 5 dB | C-weighting is designed to be more responsive to low-frequency noise. All noise energy down to 10 Hz is to be considered |
| Impulsive noise | A-weighted fast response and impulse (I) response or C-weighted for low frequency noise | If difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2 dB<br>If difference in C-weighted maximum noise levels between fast response and impulse response is greater than 2 dB for low frequency noise | Apply difference in measured levels as the correction, up to a maximum of 5 dB | Impulse response is defined by a short rise time of 35 milliseconds (ms) and decay time of 1.5 s |

| Table factor | Assessment/ measurement | When to apply | Correction | Comments |
|---|---|---|---|---|
| Intermittent/ modulating noise | Measurement of difference between $L_{A10}$ and $L_{A90}$, average difference between short-term samples, or subjectively assessed | ▸ Difference between $L_{A10}$ and $L_{A90}$ exceeds 5 dB repeatedly for a characteristic averaging period (for example, 10 seconds) for intermittent sources<br>▸ Average difference between measured $L_{Aeq}$ levels exceeds 5 dB for a characteristic sampling frequency (for example, 10 Hz) for rapidly varying source<br>▸ Subjectively annoying for a combination not easily characterised | 5 dB | Adjustment to be applied for night-time only |
| Maximum adjustment | Refer to individual modifying factors | Where two or more adjustment factors are indicated | Maximum correction of 10 dBA | - |

**TABLE 23.14: BLASTING GROUND VIBRATION CRITERIA**

| Category | Human comfort | Structural damage |
|---|---|---|
| Sensitive structures (e.g. residential, theatres, schools etc.) | 5 millimetres per second (mm/s) for 95% blasts per year 10 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply | 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above |
| Occupied non-sensitive structures of reinforced concrete or steel construction (e.g. factories and commercial premises) | 25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration is to be kept below manufacturers' specifications or levels that can be shown to adversely affect the equipment operation | 50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply |
| Occupied non-sensitive structures that include masonry, plaster and plasterboard in their construction (e.g. factories and commercial premises) | 25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration is to be kept below manufacturers' specifications or levels that can be shown to adversely affect the equipment operation | 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above. |
| Unoccupied non-sensitive structures of reinforced concrete or steel construction (e.g. factories and commercial premises) | N/A | 50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply |
| Unoccupied non-sensitive structures that include masonry, plaster and plasterboard in their construction | N/A | 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above |
| Buildings of special value or significance (may include historical buildings, monuments) | 2 mm/s | N/A |

**Source:** AS 2187.2

**TABLE 23.15: STRUCTURAL DAMAGE LONG-TERM CONSTRUCTION VIBRATION GOALS**

| Group | Type of structure | Peak Particle Velocity (PPV) in mm/s of vibration in horizontal plane of highest floor, at all frequencies |
|---|---|---|
| 1 | Buildings used for commercial purposes, industrial buildings and buildings of similar design | 10 |
| 2 | Dwellings and buildings of similar design and/or use (i.e. residential) | 5 |
| 3 | Structures that, because of their particular sensitivity to vibration, cannot be classified under groups 1 or 2 and are of great intrinsic value (e.g. listed buildings under preservation order) | 2.5 |

**TABLE 23.16: STRUCTURAL DAMAGE SHORT-TERM CONSTRUCTION VIBRATION GOALS**

| | | PPV in mm/s | | |
|---|---|---|---|---|
| | | At foundation at a frequency of | | |
| Group | Type of structure | 1 to 10 Hz | 10 to 50 Hz | 50 to 100 Hz |
| 1 | Buildings used for commercial purposes, industrial buildings and buildings of similar design | 20 | 20 to 40 | 40 to 50 |
| 2 | Dwellings and buildings of similar design and/or use (i.e. residential) | 5 | 5 to 15 | 15 to 20 |
| 3 | Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 and have intrinsic value (e.g. heritage-listed) | 3 | 3 to 8 | 8 to 10 |

**TABLE 23.17: HUMAN COMFORT CONSTRUCTION VIBRATION GOALS**

| | | Resultant PPV (mm/s) | |
|---|---|---|---|
| Building | Work period[1] | Lower goal | Upper goal |
| Dwellings (including hotels and motels) | Standard hours | 1.0 | 2.0 |
| | Non-standard hours | 0.3 | 1.0 |
| Medical/health buildings (wards, surgeries, operating theatres, consulting rooms) | All | 0.3 | 1.0 |
| Educational facilities (rooms designated for teaching purposes) | While in use | | |
| Court of law (court rooms) | | | |
| Court of law (court reporting and transcript areas, judges' chambers) | | | |
| Community buildings (libraries, places of worship) | While in use | 1.0 | 2.0 |
| Commercial (offices) and retail areas | | | |

**Table note:**
1. Work periods are defined as per Table 23.13.

**TABLE 23.18: CONSTRUCTION VIBRATION GOALS ON BURIED PIPEWORK**

| | | Guideline values for peak particle velocity measured on the pipe in mm/s | |
|---|---|---|---|
| Line | Pipe material | Short-term vibration | Long-term vibration |
| 1 | Steel (including welded pipes) | 100 | 50 |
| 2 | Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange) | 80 | 40 |
| 3 | Masonry, plastic | 50 | 25 |

### 23.13.8.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.19.

**TABLE 23.19: MITIGATION MEASURES—NOISE AND VIBRATION**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detailed design | Noise and vibration impacts on sensitive receptors | Avoid/minimise impacts on nearby sensitive receptors during detailed design.<br>Update the construction noise and vibration assessment to reflect/inform the final location of construction sites, construction activities and construction scheduling to inform the development of the Noise and Vibration Sub-plan to achieve the performance criteria and inform Construction Noise and Vibration Management Plans. |
| | Operational railway noise and vibration impacts on sensitive receptors | Review and, if necessary, update the operational noise and vibration assessment to reflect/inform the detailed design, including incorporation of potential noise or vibration treatments. The vibration assessment will include consideration of:<br>▸ Buildings/structures that will remain near the Project works<br>▸ Other vibration-sensitive receptors (including buildings/structures of heritage value).<br>The vibration assessment will identify building condition survey requirements at vibration-sensitive receptors that are expected to exceed the structural damage vibration limits given by DIN 4150.3 and recommended by the CoP Vol 2.<br>The following treatments are to be considered as part of detailed design:<br>▸ Source controls: mitigations applied to the railway infrastructure to control the emission of noise and vibration at its source. Such measures included—rail dampers, track lubrication (for control of curving noise), identification of rollingstock causing discrete high-noise events or lower noise emission alarm bells<br>▸ Pathway controls: measures to impede and limit the propagation of railway noise to the sensitive receptors and typically constructed within the rail corridor. Measures can include—railway noise barriers, low height noise barriers or earth mounding<br>▸ Receptor controls: measures to mitigate noise and vibration levels or manage potential noise and vibration impacts at the sensitive receptor properties and land uses. Measures can include—architectural acoustic treatment of property, property construction/relocation, upgrades to existing property fencing or negotiated agreement with property owners. |
| | Operational road traffic noise impacts on sensitive receptors | Review/update the operational road traffic noise assessment to reflect/inform the detailed design, including incorporation of potential noise treatments.<br>The following mitigation measures are to be considered as part of detailed design where operational road traffic noise impacts are predicted to exceed the adopted road traffic noise limit based on the detailed design:<br>▸ Pavement surface treatment<br>▸ Provision of acoustic façade treatments to affected sensitive receptors<br>▸ Noise barriers in the form of a landscaped earth mound and/or a noise fence.<br>A combination of mitigation measures may be appropriate. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction | Noise and vibration impacts on sensitive receptors | Develop and implement a Construction Noise and Vibration Management Plan, under the CEMP.<br>The Construction Noise and Vibration Management Plan will include:<br>▸ Location of sensitive receptors in proximity to the disturbance footprint<br>▸ Requirements for pre-construction dilapidation surveys and/or vibration monitoring at vibration-sensitive receptors during construction<br>▸ Specific management measures for activities that could exceed the construction noise and vibration criteria at a sensitive receptor<br>▸ 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 receptors.<br>Noise management measures may include controlling noise and vibration at the source, controlling noise and vibration on the source to receptor transmission path and controlling noise and vibration at the sensitive receptor.<br>Practicable and reasonable measures to minimise the noise and vibration impacts of construction activities on sensitive receptors.<br>Any other measures necessary to comply with conditions of approval or regulatory requirements.<br>Where it is found that existing mitigation measures are not sufficient to reduce noise and vibration impacts to acceptable levels, additional mitigation measures will be investigated and implemented, including consultation with affected sensitive receptors. |
| Construction and commissioning | Noise and vibration impacts on sensitive receptors | Sensitive receptors identified in the Construction Noise and Vibration Management Plan, as well as residents within at least 2 km of the disturbance footprint and other relevant stakeholders are to be provided with sufficient information to enable them to understand the likely nature, extent and duration of noise and vibration impacts during construction.<br>Sensitive receptors with the potential to be affected by exceedances of noise goals will be notified prior to the commencement of relevant works.<br>Construction progress and upcoming activities will be regularly communicated to local residents/stakeholders, particularly when noisy or vibration-generating activities are planned, such as vibratory compaction and piling. |
| | Damage to buildings and structures | Building condition surveys will be undertaken for vibration-sensitive receptors identified as potentially exposed to vibration impacts from the Project works during the detailed design phase modelling and assessment.<br>Surveys are to take place prior to commencement and on completion of vibration-generating works (such as pile-driving). Following such surveys, more accurate data may be used to assess the impacts to vibration-sensitive receptors.<br>If, during detailed design and construction methodology assessments, vibration impacts are predicted to exceed the criteria at a vibration-sensitive receptor the following mitigation must be undertaken:<br>▸ Consultation with the owner of the structure to determine the sensitivity of the structure to construction vibration. A more appropriate criteria to be applied at the location may be agreed on as a result<br>▸ Baseline vibration monitoring is to be undertaken prior to the activity commencing and monitored throughout the activity to assess compliance with vibration limits set as part of the Construction Noise and Vibration Management Plan for the relevant receptor. Vibration monitoring results are to be assessed and used to refine vibration predictions and management measures as applicable, such as developing and enforcing exclusion zones around the sensitive structure or implementing remediation measures.<br>Where reasonable and practicable, modify the construction methodology to reduce the predicted vibration impacts. This could include:<br>▸ Using smaller equipment, such as a handheld jackhammer instead of a rock breaker<br>▸ Changing the construction methodology. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Damage to buildings and structures (continued) | Vibration monitoring will be undertaken at locations where the potential for building/structural damage risk has been identified during the detailed design and is warranted. This includes vibration-sensitive receptors at which vibration impacts are expected to exceed the structural damage criteria recommended by DIN 4150.3 and recommended by the CoP Vol 2. Vibration monitoring will be undertaken by a suitably qualified professional, in accordance with the CoP Vol 2. |
| | Noise impacts on sensitive receptors | Where practicable and feasible, noise monitoring will be undertaken at noise sensitive receptors where the potential for noise impacts to exceed the criteria in Table 23.13 has been identified.<br>Noise and/or vibration monitoring will also be undertaken in response to valid noise or vibration complaints. |
| | Noise impacts on sensitive receptors—hours of work | Project works will be undertaken in accordance with the hours of work in Table 23.3 and as per advice to stakeholders and sensitive receptors regarding permitted out of hours activities. |
| | Noise impacts on sensitive receptors—staff | Staff training is to be undertaken so that unnecessary sources of noise are avoided. Training must enforce that:<br>▸ Unnecessary shouting or loud stereos/radios onsite are not tolerated<br>▸ Materials are not to be dropped from height<br>▸ Metal items are not thrown<br>▸ Doors/gates are not slammed<br>▸ Vehicle radios and engines are to be turned off or volume lowered wherever possible. |
| | Noise and vibration impacts on sensitive receptors—selection of construction equipment near sensitive receptors | Quieter and non-vibratory construction equipment will be selected for use near sensitive receptors, where feasible and reasonable. This is particularly important for any non-standard/out of hours construction activities where sensitive receptors are nearby. This is also particularly important for loud and/or vibration-intensive plant such as mulchers and piling rigs.<br>Appropriately sized equipment is to be selected for the task, such as vibratory compactors and rock excavation equipment. For example, a 22-tonne excavator is expected to operate 8 dBA quieter than a 40-tonne excavator, based on equipment noise emissions given by BS5228.1. |
| | Noise and vibration impacts on sensitive receptors— selection of construction methods near sensitive receptors | Where reasonable and practicable, alternative construction methods will be adopted to reduce the noise and vibration impacts in the vicinity of sensitive receptors, such as:<br>▸ Using damped tips on rock-breakers where appropriate<br>▸ Using rock saws instead of blasting<br>▸ During clearing, using excavators with grabs and rake attachments instead of chainsaws and mulching cleared material at locations away from sensitive receptors<br>▸ Avoiding onsite fabrication work where possible<br>▸ Using alternatives to impact pile driving where possible, such as continuous flight auger injected piles, pressed-in preformed piles, auger bored piles, impact bored piles or vibratory piles<br>▸ When piling, avoiding dynamic compaction using large tamping weights near sensitive and critical receptors where possible<br>▸ Reducing energy per blow when piling (consider first whether this may result in prolonged exposure with no realised reduction in community disturbance). |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and Commissioning (continued) | Noise and vibration impacts on sensitive receptors—blasting | Where blasting impacts are expected to exceed the vibration goals, the following measures are to be implemented where reasonable and practicable:<br>▸ Reducing the charge size by use of delays and reduced charge masses<br>▸ Ensuring adequate blast confinement to minimise the amount of overpressure<br>▸ Avoiding secondary blasting where possible; the use of rock breakers or drop hammers may be an acceptable alternative<br>▸ Avoiding blasting during heavy cloud cover or during strong winds blowing towards sensitive receptors<br>▸ Establishing a blasting timetable through community consultation for example, blasts times negotiated with surrounding sensitive receptors. |
| | Noise and vibration impacts on sensitive receptors—during hours of construction | Where reasonable and practicable, 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.<br>Vibration-intensive stationary plant located near sensitive receptors will be isolated with resilient mounts.<br>Noise-emitting plant and equipment, construction compounds laydown areas will be orientated away from sensitive receptors where feasible and reasonable.<br>Equipment will be operated in the correct manner and correctly maintained including replacement of engine covers, repair of defective silencing equipment, tightening of rattling components and repair of leakages in compressed air lines. Construction plant, vehicles and machinery will be maintained and operated in accordance with manufacturers' instructions to minimise noise and vibration emissions.<br>When piling, the pile and rig are to be carefully aligned, and cable-slap and chain-clink minimised. |
| | Noise and vibration impacts on sensitive receptors—mechanical plant management | All mechanical plant near sensitive receptors will be modified to reduce noise by practical means, such as:<br>▸ Internal combustion engines are fitted with a suitable muffler in good repair, operating as per the manufacturer's specifications, as a minimum<br>▸ Pneumatic tools are fitted with an effective silencer on their air exhaust port, where feasible and practicable<br>▸ Aggregate bins and chutes are lined with a rubber material, to dampen the vibration of the structure<br>▸ When piling, acoustic damping are provided to sheet steel piles to reduce vibration and resonance<br>▸ When piling, resilient pads are used between pile and hammerhead. Care is to be taken when selecting a resilient pad as energy is transferred to the pad in the form of heat. |
| | Noise impacts on sensitive receptors—stationary noise sources | Stationary noise sources near noise sensitive receptors will be shielded or enclosed where feasible and reasonable. Acoustic shielding must also be considered where works are expected to occur close to sensitive receptors for lengthy periods. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and Commissioning (continuing) | Noise and vibration impacts on sensitive receptors— shielding of noise emitting plant | Where feasible, structures and noise-emitting plant will be located such that the structures provide some shielding to any nearby receptors. Structures include:<br>▸ Temporary site buildings such as sheds<br>▸ Materials stockpiles<br>▸ Fencing<br>▸ Storage/shipping containers.<br>Where vibration impacts at sensitive receptors are expected to exceed the structural damage goals, and where reasonable and safe to do so, cut-off trenches to interrupt the direct transmission path of vibrations between source and receptors will be provided. |
| | Noise impacts on sensitive receptors | Non-tonal reversing beepers (or an equivalent mechanism) will be fitted and used on all construction vehicles and mobile plant regularly used onsite and for any out of hours work. |
| | Noise impacts on sensitive receptors— delivery of materials | Site access points and roads will be sited as far as is practicable from sensitive receptors.<br>Acoustic shielding will be considered if loading/unloading areas are close to sensitive receptors.<br>Delivery vehicles will be fitted with straps rather than chains where feasible.<br>Offsite truck parking areas, if required, will be located away from residences and will be nominated where practicable.<br>The drop height of materials will be minimised, for example, while loading and unloading vehicles or in storage areas.<br>Reversing movements of vehicles are to be minimised to reduce the use of reversing alarms. Where practicable, sites are to be designed such that delivery vehicles are able to drive through the site and not be required to reverse. |
| | Noise impacts on sensitive receptors— construction traffic | Where reasonable and practicable, unsealed areas will be regularly graded and potholes filled in sealed access roads and hardstand areas to reduce noise from construction vehicles.<br>Where practicable, night time construction traffic will be redirected away from noise sensitive receptors, in accordance with the Construction Traffic Management Plan.<br>Appropriate construction traffic speed limits will be established and managed near noise sensitive receptors. |

#### 23.13.8.4 Monitoring

Vibration monitoring will be undertaken at locations where the potential for building/structural damage risk has been identified and deemed warranted. This includes vibration-sensitive receptors at which vibration impacts are expected to exceed the structural damage criteria recommended by DIN 4150.3 and recommended by the CoP Vol 2. Vibration monitoring will be undertaken by a suitably qualified professional.

Noise monitoring will be undertaken to verify compliance at locations nominated in the Construction Noise and Vibration Management Plan and at noise sensitive receptors which have the potential for noise impacts to exceed relevant criteria.

Noise and/or vibration monitoring will also be undertaken in response to substantiated noise or vibration complaints.

Monitoring and reporting on compliance with the mitigation measures identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

### 23.13.9 Cultural heritage

#### 23.13.9.1 Environmental outcomes

Project works that involve excavation, construction or other activities that may cause harm to Aboriginal cultural heritage must not take place unless permitted under a Cultural Heritage Management Plan (CHMP) in accordance with the ACH Act (CHLH17009).

Project works are to be designed, located and undertaken to avoid or minimise impacts or disturbance of Aboriginal, historic and natural heritage items.

#### 23.13.9.2 Performance criteria

- Comply with the approved CHMPs under the ACH Act.
- Provide opportunities for ARTC staff and contractors to learn about the Aboriginal cultural heritage and non-Indigenous heritage associated with delivery of the Inland Rail Program.
- Clearing extents avoid impacts to previously undisturbed areas as far as practicable.
- Project works avoids direct and indirect impacts (e.g. vibration) to identified items/sites/areas of Aboriginal heritage significance, historic and natural heritage significance where practicable.

#### 23.13.9.3 Proposed mitigation measures

Relevant aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.20.

**TABLE 23.20: MITIGATION MEASURES—CULTURAL HERITAGE**

| Delivery phase | Aspect | Proposed additional mitigation measures |
|---|---|---|
| Detailed design | All heritage | Design to avoid direct impacts to identified Indigenous and non-Indigenous heritage significance, where practicable.<br>Design to respond to the outcomes of any further cultural heritage surveys. |
| Pre-construction | All heritage | Construction planning avoids directly impacting on identified sites of Indigenous and non-Indigenous heritage significance where practicable.<br>The Heritage Management Sub-plan will be developed and will detail mitigation and management measures to be implemented during construction in relation to cultural heritage. It is expected to include:<br>▸ Requirements for site induction, training, heritage monitors, inspections, audits, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction<br>▸ Heritage management actions to be undertaken by suitably qualified persons<br>▸ Specific requirements for cultural heritage sites/items that cannot be avoided during construction<br>▸ Unexpected finds procedure, including assessment by a suitably qualified person and notification obligations under the applicable legislation<br>▸ Procedure for encountering potential burial sites or potential human skeletal material including notification obligations under applicable legislation<br>▸ Any other requirements necessary to comply with conditions of approval, subsequent approvals, regulatory requirements or ARTC cultural heritage management plans/agreements. |
| | Vibration | Building condition surveys will be undertaken at all vibration-sensitive receptors identified during detailed design as being subject to potential vibration impacts, which may include structures of heritage value. Surveys will occur before and after undertaking vibration-generating works (e.g. pile-driving), with the potential for monitoring during the construction activities as per the Construction Noise and Vibration Management Plan:<br>▸ Tailor construction methodology to limit vibration impacts to heritage structures<br>▸ Vibration at heritage places to be kept below 2.5 mm/sec wherever possible (in accordance with DIN4150)<br>▸ Pre-construction and post-construction condition dilapidation surveys to be undertaken at all heritage places at risk of vibration impact<br>▸ Vibration to be monitored at places where thresholds exceedances are possible<br>▸ Where vibration exceedances occur, change design/construction methodology where possible to reduce impact. |
| | Non-Indigenous built heritage | If impacts cannot be avoided, the following pre-construction measures may be implemented:<br>▸ Archival recording<br>  ▸ Undertake archival photographic recording in accordance with the Department of Environment and Heritage Protection's *Guideline: Archival Recording of Heritage Places* (DEHP, 2013)<br>  ▸ Copies of archival records to be lodged with the John Oxley Library, and local libraries or historical societies as appropriate.<br>▸ Relocation<br>  ▸ Relocation of heritage items is generally undesirable, as setting forms an intrinsic part of heritage value (International Council on Monuments and Sites Australia, 2013)<br>However, if impacts cannot be managed in any other way, it may be appropriate to relocate buildings or items of moveable heritage to another location, such as a local historical society. The approach for any such requirements will be defined in the Heritage Management Sub-plan. |

| Delivery phase | Aspect | Proposed additional mitigation measures |
|---|---|---|
| Pre-construction (continued) | Non-Indigenous archaeological heritage | If impacts to non-Indigenous cultural heritage places cannot be avoided, the following pre-construction measures may be implemented by suitably qualified historical archaeologists:<br>- Archaeological survey<br>  - Undertake archaeological survey to map all elements of complex sites and identify areas of possible subsurface deposit.<br>- Archaeological excavation<br>  - If warranted by results of archaeological survey, undertake a two-stage archaeological excavation:<br>  – Stage 1: test excavation to confirm subsurface deposit<br>  – Stage 2: salvage excavation of subsurface deposits (if required)<br>- Archaeological surface collection<br>  - Collect archaeological artefacts on the ground surface<br>  - Depending on nature of site may be undertaken in conjunction with, or in place of, excavation. |
| | Indigenous heritage | Cultural heritage to be managed in accordance with CHMPs. This might include:<br>- Undertaking comprehensive cultural heritage surveys for Project works with the Traditional Owners<br>- Undertaking archaeological survey (including excavations where necessary)<br>- Generating survey reports to provide detailed assessment and management recommendations<br>- Assessing significance of any cultural heritage<br>- Recording (where project activities may have a direct impact on cultural heritage values).<br>Archaeological investigations will only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the Aboriginal Parties, in accordance with the CHMPs. |
| Construction and commissioning | All heritage | Where impacts can be avoided to known Indigenous or non-Indigenous heritage, appropriate precautionary measures, such as informing relevant staff and contractors of the nature and location of the items and need to avoid impacts, detailing location onsite maps, along with temporary protective fencing and signage will be implemented for those sites within close proximity of the area of works.<br>Works will not be performed on known or potential heritage items without required approvals and appropriate management plans.<br>If a suspected Aboriginal or historical heritage item or site is identified, any works that may impact the item or site will stop, and the unexpected finds procedure in the Heritage Management Sub-plan will be followed.<br>Any responses to chance finds will only be undertaken by archaeologists qualified and experienced in the relevant discipline.<br>In the event of the discovery of potential human remains, all work in the area will cease and the relevant statutory process for the notification and management of human remains will be instigated, in accordance with the Heritage Management Sub-plan and other relevant plans. |
| | Non-Indigenous built heritage | Vibration monitoring will be undertaken at vibration-sensitive receptors where the potential for building/structural damage risk is identified during the detailed design phase or as part of pre-construction building surveys. Vibration monitoring will be undertaken by a suitably qualified person, in accordance with relevant standards and guidelines. Where monitoring is required occur at a heritage structure, placement of equipment will be carried out on advice from a suitably qualified person (heritage practitioner).<br>Any damage that occurs at heritage places as a result of vibration or other Project activity will be repaired in accordance with Burra Charter principles (Article 1.4). |

| Delivery phase | Aspect | Proposed additional mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Non-Indigenous archaeological heritage | Depending on the outcome of archaeological assessments undertaken during pre-construction, ground breaking activities may be subject to archaeological monitoring by a suitably qualified person.<br>In the case of unexpected archaeological finds anywhere in the Project, the protocol included in the Heritage Management Sub-plan is to be followed. |
| | Indigenous heritage | Cultural heritage values to be managed in accordance with the CHMPs. This will include:<br>▸ Constraining of all surface disturbance to areas which have been previously surveyed for cultural heritage<br>▸ Establishing buffer zones around areas of heritage value that are to be retained<br>▸ Monitoring of ground breaking where warranted by the presence of known or potential archaeological values.<br>In the case of unexpected archaeological finds anywhere in the Project, the protocol included in the Heritage Management Sub-plan is to be followed.<br>Archaeological investigations will only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the Aboriginal Parties, in accordance with the CHMPs. |

#### 23.13.9.4 Monitoring

Vibration monitoring will be required at locations where the potential for building/structural damage risk is identified through the EIS reporting, further surveys during the detailed design phase or as part of pre-construction dilapidation surveys. Vibration monitoring will be undertaken by a suitably qualified person, in accordance with relevant standards and guidelines. Where monitoring is required to occur at a heritage structure, placement of equipment will be carried out on advice from a suitably qualified person (heritage practitioner).

Monitoring and reporting on compliance with the mitigation measures identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

### 23.13.10 Traffic, transport and access

#### 23.13.10.1 Environmental outcomes

Project construction traffic is managed to avoid or minimise and mitigate adverse impacts on road safety and traffic flow, public transport, school bus routes, property access and existing road pavements.

Workforce parking is provided within the disturbance footprint and managed to avoid, minimise and mitigate adverse impacts to the local community.

Traffic access for emergency services to Project worksites and adjoining properties and wider road network identified within the Traffic Impact Assessment is maintained throughout the construction phase.

Reasonable access is maintained to properties throughout Project works.

#### 23.13.10.2 Performance criteria

- Construction vehicles travel on designated routes defined in the Construction Traffic Management Plan.
- Construction vehicles, including spoil haulage vehicles, are managed to avoid school zones during school pick up and drop off, and minimise the use of local roads.
- Construction vehicles that are 'heavy vehicles' are managed appropriately to avoid speeding, queuing, traffic incidents and to manage and avoid over-loading, spills and safety incidents.
- Information about the timing and scale of changes to traffic and transport conditions on traffic networks in the vicinity of Project works is provided in advance to the local community, road users and on request to other people interested in the Project works.
- Access to private properties is maintained during construction, unless an acceptable solution is agreed with the landholder.
- A Construction Traffic Management Plan will be developed and implemented by the construction contractor and communicated to all site personnel during site induction, including requirements for traffic routes and parking.
- The construction workforce is provided with adequate onsite parking and use of parking is reinforced during induction and training.

#### 23.13.10.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.21.

**TABLE 23.21: MITIGATION MEASURES—TRAFFIC, TRANSPORT AND ACCESS**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction/ detailed design | Pavement/road safety | Develop procedures for managing and responding to road impacts for the duration of the construction period in consultation with DTMR and relevant local governments.<br>Communicate developed procedures to the Project consultation team for inclusion within community consultation plans.<br>Undertake road safety audits for all road designs in accordance with the Austroads guidelines. Level crossing treatments and suitability will be determined through the Australian Level Crossing Assessment Model (ALCAM) risk tool to confirm:<br>▸ The level of protection continues to be appropriate<br>▸ The infrastructure is appropriate for the traffic conditions<br>▸ The crossing is designed to provide suitable stacking and sight. |
| | Road network | A Construction Traffic Management Plan is to be prepared prior to construction. This plan will identify the impacts that construction traffic (including workforce commuting) is likely to have on the local transport infrastructure and road users and detail ameliorative measures required to avoid, reduce or mitigate all identified impacts of the project. It will also establish performance criteria and monitoring requirements during construction. The Plan will be developed in consultation with DTMR, relevant local governments and emergency services.<br>A Road Use Management Plan (RUMP) is to be prepared and implemented for the Project, in accordance with DTMR's *Guide to Traffic Impact Assessment* (GTIA) (DTMR, 2018). Where road realignments or closures are envisaged, traffic management requirements associated with these works will have to be included in the RUMP. This will need to include the requirements for obtaining necessary approvals and permits from relevant authorities as well as notifying the community on any changes to traffic conditions during the construction and operations phase. |
| | Intersections | Traffic management plans, traffic control plans and temporary road works arrangements, 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*, (TNSW, 2018) and *Australian Standard 1742.3 Manual of uniform traffic control devices—Traffic control for works on roads* (Standards Australia, 2019). Traffic management plans should consider construction activity delivery timeframes that avoid peak hour travel conditions. |
| | Access | Ongoing consultation with local council/DTMR and asset owners will be undertaken to ensure proposed access arrangements are suitable. |
| Pre-construction | Management plans | The RMAR strategy, traffic management plans and traffic control plans developed during the detailed design phase to be reviewed and updated to ensure they remain effective and appropriate to the construction activities and staging. |
| Construction and commissioning | Road safety | Temporary traffic management will be implemented, as per the Construction Traffic Management Plan.<br>Fatigue management measures will be introduced and enforced for all workers during construction.<br>Road safety measures will be implemented taking into consideration speed restrictions, driver fatigue, in-vehicle communications, signage, demarcations, maintenance, safety checks, and interaction with public transport, transport of hazardous and dangerous goods and emergency response and disaster management.<br>Relevant emergency services will be notified in advance prior to the movement of all hazardous/dangerous or oversize construction material and equipment. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction and commissioning (continued) | Road safety (continued) | Appropriate construction traffic controls will be implemented where construction traffic is required to travel on school bus routes during pick-up and set-down times on school days. This may include limiting construction traffic at these times or installing appropriate school bus infrastructure.<br>All over-size and/or over-mass and restricted access vehicles will comply with *Guideline for Excess Dimension Vehicles in Queensland* version 8 (DTMR, 2013d) in terms of transport safety. |
| | Road network and intersections | A Construction Traffic Management Plan will be implemented and reviewed periodically for effectiveness by relevant stakeholders including local governments, DTMR, police and emergency services.<br>Ongoing consultation with relevant councils, DTMR, police, emergency services and affected landholders to provide information on project status and likely traffic disruptions and temporary road closures.<br>Directional signage and line marking around construction sites and the surrounding network will be implemented as per Traffic Management Plans, including using variable message signs (VMS) if appropriate.<br>Relevant emergency services will be notified in advance prior to the movement of all hazardous/dangerous or oversize construction material and equipment.<br>Secondary alternative construction route activities will be determined as part of the traffic management plans, in the event of the primary route is blocked off by an emergency/accident.<br>Traffic management plans, traffic control plans and temporary road works to be implemented and reviewed periodically with relevant stakeholders to ensure effectiveness. |
| | Road–rail interface | Road safety audits will be undertaken post construction in accordance with the *Austroads Guide to Traffic Management: Part 3 Traffic Studies and Analysis* (Austroads, 2017) (refer Table 19.7 of Chapter 19: Traffic, Transport and Access).<br>Level crossings will be assessed through ALCAM post-construction to confirm:<br>▸ The level of control continues to be appropriate<br>▸ The infrastructure is appropriate for the traffic conditions. |
| | Pavement—dirt tracking/debris management | Install rumble grids and inspection points at exits onto the sealed road from unpaved roads to reduce potential for rocks and debris transporting offsite.<br>For local government roads, undertake a condition assessment prior to and at ongoing intervals during construction and at the conclusion of construction activities in consultation with councils.<br>Implement procedures for managing and responding to road impacts for the duration of the construction period in consultation with DTMR and relevant local governments. This may entail works such as crack sealing, pothole patching, edge repairs, resealing and grading (of gravel roads) etc. |

#### 23.13.10.4 Monitoring

Requirements for monitoring will be documented in the Traffic, Transport and Access Sub-plan.

In the event that traffic transport and access management conditions vary from those documented in detailed design, a review of compliance with conditions of the CEMP will be undertaken by the contractor and revised as required.

Monitoring and reporting on compliance with the mitigation measures identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

### 23.13.11 Hazard and risk

#### 23.13.11.1 Environmental outcomes

Appropriate measures are implemented to avoid or minimise the risk of a health, safety or environmental incident during Project works.

Emergency management plans are in effect to manage potential natural hazards including flooding, fire, cyclone or heatwave events during Project works.

#### 23.13.11.2 Performance criteria

- A safe working environment is maintained for the construction workforce, nearby landholders and other stakeholders.
- A Project Hazard and Risk Register is maintained to record and implement appropriate systems and procedures to manage and respond to both natural and manmade hazards and risks during construction.
- Comply with relevant Australian Standards for the handling and storage of hazardous goods.

#### 23.13.11.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.22.

**TABLE 23.22: MITIGATION 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. |
| | Natural | Flooding and flash flooding | 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.<br>Review flood risk assessment to inform the siting and scale of temporary construction areas (including stockpiles, construction compounds, access roads, laydown areas etc.).<br>Locate plant and equipment maintenance activities and fuel storage facilities in accordance with *AS1940:2017: Storage and Handling of Flammable and Combustible Liquids.* |
| | Natural | Landslide, sudden subsidence, movement of soil or rocks | Incorporate batter slopes and scour protection into design. |
| | Natural | Climatic conditions | The design will implement safety measures for the potential damage of tracks and assets 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.<br>The design will be developed to achieve a design life of 100 years. In doing so, designs for formation, track and structures will be 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.<br>Factor for the potential increase in flood risk arising from any increase in extreme rainfall as a consequence of climate conditions. Adaption strategies such as installing an early flood warning system to alert ARTC to impending flood risks and requirements for suspension of local operations, 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 to be considered for incorporation into the detailed design.<br>Design for future climate, including consideration of existing ARTC protocols for operating in extreme temperatures.<br>Sustainability initiatives, particularly in relation to energy consumption and savings throughout the project lifecycle will be incorporated in detailed design. |
| | Project | Underground and overhead services | The Project will comply with the clearance distance as specified in the ARTC *Engineering Standard for Requirements—Electric Aerials Crossing ARTC Infrastructure* to ensure sufficient clearance and prevent contact with live electricity.<br>Design to confirm that the construction methods will not infringe on Defence air space restrictions. |
| | Project | Gas and pipelines | The Project design will comply with the clearances or agreed risk mitigation design treatments developed through consultation with Santos. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Detailed design (continued) | Project | Road–rail interfaces | Any physical controls such as boom gates and warning lights that have been determined necessary from ALCAM will be detailed in the project design.<br>Detailed design of 1.8 m chain link fencing is required near roads or where trespass risk is identified. |
| | Project | Emergency access | Emergency access will be addressed by the development of an access strategy. Consideration of the use of the Rail Maintenance Access Road (RMAR) 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. This will include the consideration for the access of three pumpers, one rescue/incident control appliance, one Urban Rescue Tender and one Urban Hazmat Medium in the event of a major train tunnel incident (QFES, 2018).<br>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. |
| | Project | Tunnel | Tunnel design to incorporate fire and life safety mitigation measures including limiting the amount of combustible materials used in construction, providing fire detection systems, preventing derailed trains from entering the tunnel, and systems to prevent trains that are on fire from stopping in the tunnel. |
| | Project | Abandoned mines and underground collieries | Continue to engage with Abandoned Mines Program in the Department of Natural Resources, Mines and Energy (DNRME) to identify potential risk of the disturbance footprint interacting with abandoned or disused mines or underground collieries. |
| Pre-construction | Project | Underground and overhead services | The Project will identify known services that require relocation prior to construction, with the exception of enabling works as discussed in Section 23.3.4.<br>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 the *Electrical Safety Act 2002* (Qld) and subordinate legislation and the *Model Code of Practice—Managing Electrical Risk in the Workplace* (Safe Work Australia, 2018b). The Project has considered the alignment to minimise the potential interference with these overhead utilities.<br>The Project 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 Project will ensure that excavation work will comply with *Model Code of Practice—Excavation Work* (Safe Work Australia, 2018c). |
| | Project | Contaminated land | Undertake contaminated land assessments and investigations for land identified as having known or suspected contaminated areas and prepare a Contaminated Site Management Plan to document management controls for works on the relevant contaminated areas and outline the process to identify, document and manage each of the contaminated sites. |
| | Project | Asbestos | Older infrastructure and previously disturbed land within the disturbance footprint may contain asbestos. The Project will adhere to *Model Code of Practice—How to Manage and Control Asbestos in the Workplace* (Safe Work Australia, 2018d) and *Model Code of Practice—How to Safely Remove Asbestos* (Safe Work Australia, 2018a).<br>Survey of infrastructure that will be removed or disturbed by the Project will be conducted to potentially identify asbestos containing materials.<br>Construction activities likely to disturb asbestos will review the presence and requirement for specific controls.<br>The Project will engage with competent contractors who are appropriately licensed for asbestos disturbance work. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Pre-construction (continued) | Project | Bridges | Ground surveys will be carried out with boreholes at all pier locations and abutments during construction early works to mitigate against bridge collapse. |
| | Project | Abandoned mines and underground collieries | In the event an interface with abandoned mines or underground collieries is determined, develop a construction management strategy to minimise risk in consultation with DNRME. |
| | Project | Road–rail interfaces | 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* and *Total Fire Bans Procedure*. These procedures establish processes to manage hot work/high fire risk activities, including observation of relevant QFES directives, check extent of work site 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.<br>Locate laydown areas away from creeks such as the Bremer River, Bundamba Creek, Purga Creek, Reynolds Creek, Warrill Creek, Western Creek, Sandy Creek, Wild Pig Creek and Teviot Brook. |
| | 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 ESCPs.<br>Regular earthworks inspections will be implemented to identify defects and conditions that may affect or indicate problems with the stability of earthworks.<br>The period that soil is exposed will be minimised through progressive ground cover revegetation to minimise erosion.<br>Temporary construction facilities will be sited to avoid flood areas, overland flow paths and minimise clearance of established vegetation where possible. |
| | Natural | Climatic conditions | Consider opportunities to minimise greenhouse gas generation during construction.<br>Construction water will be obtained from appropriate sources, with the necessary water entitlement, water allocation, water licence or water permit. |
| | Natural | Wildlife | Project works will be undertaken in accordance with a Flora and Fauna Sub-plan. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Construction and commissioning (continued) | Natural | Biosecurity | Develop and implement a Biosecurity Management Plan as part of the CEMP to include:<br>▸ Requirements for pre-clearing surveys to determine the risk of weeds or pest animals being present<br>▸ Maps of the existing extent and severity of weed infestation and weed management requirements<br>▸ Pest animal management (including fire ants in fire ant biosecurity zones)<br>▸ Site hygiene and waste management procedures to deter pest animals<br>▸ Weed surveillance and treatment during construction and rehabilitation activities<br>▸ Requirements in relation to pesticide and herbicide use and documentation, including any limitations on use, such as, restrictions on use in sensitive environmental areas, drainage lines that flow to waterways and aquatic habitats, and ensuring that broad-scale use does not result in an increased erosion and sediment risk<br>▸ Vehicle, machinery and imported fill hygiene protocols and documentation<br>▸ Erosion and sediment control risks associated with broad-scale weed removal or treatment. |
| | Project | Fatigue and heat stress management | Ensure construction management plans, systems, workplace conditions and facilities align with requirements of the *Work Health and Safety Act 2011* (Qld).<br>Follow *Guide to managing the risks of working heat* (Safe Work Australia, 2020). |
| | Project | Asbestos | Depending on the type and amount of asbestos containing materials, if they are disturbed by the Project, the Project will engage with a Class A or Class B licensed asbestos removalist for the handling and disposal of asbestos. In the event there is uncertainty as to whether exposure standards will be exceeded, or work will generate airborne fibres by any method, air monitoring will be carried out by appropriately qualified personnel. |
| | Project | Dust, respirable silica and other airborne contaminants | Direct construction worker exposure to respirable silica and other airborne contaminants will be controlled through application of appropriate source controls and the use of appropriate personal protective equipment.<br>Where sensitive receptors, agricultural land uses or protected vegetation are near Project works, or visible dust is generated from vehicles using unsealed access roads, road watering or other appropriate controls are to be implemented.<br>Cover vehicles transporting potentially dust and/or spillage generating material to and from the construction site immediately after loading (prior to traversing public roads).<br>Visually inspect vehicles entering/exiting the site and implement and maintain additional controls such as wheel wash and or rumble grids.<br>Limit clearing to the Project disturbance footprint.<br>Where practical, stage clearing and grubbing and construction activities to minimise exposure to erosive processes.<br>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).<br>Avoid ground-disturbing activities during windy conditions (i.e. winds >10m/s) or when prevailing winds are likely to result in dust impacts to sensitive receptors.<br>Implement additional dust suppression controls prior to the onset of adverse weather including covering or stabilisation of temporary stockpiles and additional treatment of access roads.<br>Longer-term material stockpiles will be suitably treated to prevent risk of windborne erosion and dust. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Construction and commissioning (continued) | Project | Noise and vibration | The Project will develop and implement a Noise and Vibration Management Plan as part of the CEMP.<br>Noise and vibration sources from construction involving heavy machinery will incorporate appropriate noise mitigation equipment and devices including mufflers and acoustic barriers. The Project will reduce and manage noise as much as is possible through a range of noise management measures. Noise disruption from night works are kept to a minimum and work will be undertaken as quickly and efficiently as possible. |
| | Project | Roads | A Construction Traffic Management Plan will be developed and implemented to identify the impacts that construction traffic is likely to have on transport infrastructure and detail ameliorative measures required to mitigate all identified impacts of the development.<br>Specific hazard control measures that will be applied include 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.<br>Access roads and laydown areas established for construction that will have no permanent use will be decommissioned following construction, unless otherwise agreed with relevant landholders. Storage areas and equipment laydowns will be maintained in good condition to maintain visibility for vehicles. |
| | Project | Tunnel | Tunnel construction will likely require blasting work. The use of explosive substance will comply with the *Explosives Act 1999* (Qld). |
| | Project | Underground and overhead services | Procedural control for the Project will ensure that excavation work will comply with *Model Code of Practice—Excavation Work* (Safe Work Australia, 2018c). |
| | Project | Gas and pipelines | Procedural control for the Project will ensure that excavation work will comply with Safe Work Australia's *Model Code of Practice—Excavation Work* (Safe Work Australia, 2018c) and other construction safety and clearance measures as agreed with Santos. |
| | Project | 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.<br>Waste generation from construction activities can potentially contaminate the surrounding land and will be managed in accordance with the Waste Management Sub-plan. A Contaminated and Hazardous Materials Management Plan will be developed and implemented as part of the Waste Management Sub-plan.<br>Identification of unexploded ordnance will be subject to a risk assessment. Where there is a risk of encountering known or possible unexploded ordnance, a suitably qualified person will assess and identify management options.<br>Implementation of the Contaminated Site Management Plan if contaminated land is suspected. |
| | Project | Emergency access | The maintenance of emergency access will be managed through the development and implementation of a project access strategy. Access for emergency vehicles during construction of the Project will be discussed with contractors during development of the strategy. In instances where construction phase emergency access is affected, use of the RMAR by emergency vehicles may be appropriate. Multiple access points into and out of the rail corridor will be provided.<br>A Project Traffic Management Plan will be implemented to minimise impacts to surrounding land users. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Construction and commissioning (continued) | Project | Abandoned mines and underground collieries | If an unrecorded historic colliery is encountered during construction, the measures outlined under the unexpected finds protocol/procedure in the CEMP will be followed. Noting this risk will be controlled during construction such that construction above collieries or abandoned mines will be avoided, leading to a removal of the risk in the operational phase. |
| | Dangerous goods and hazardous chemicals | Chemicals spillage and loss of containment | Construction facilities where hazardous materials may be used or stored will be located outside of floodplains and away from areas of social and environmental receptors in accordance with the *Queensland State Planning Policy 2017*. Additionally, the locations of construction facilities where vehicle maintenance and refuelling activities are expected to occur, will be selected to achieve appropriate separation to riparian vegetation and waterways.<br>During the construction phase of the Project, 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* will be used for dangerous goods deliveries.<br>Construction chemicals stored and handled will be managed in accordance with the *Work Health and Safety Act 2011* (Qld) 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 during construction, the works will be undertaken by licensed shotfirers in accordance with the *Explosive Act 1999* (Qld) and *AS 2187–Explosive–Storage, Transport and Use*.<br>Where explosives are used during construction, a Blast Management Plan will be developed as part of the Noise and Vibration Sub-plan within the CEMP.<br>At all times, the handling and use of explosives will follow procedures to:<br>▸ Prevent misfire<br>▸ Minimise the risk associated with material projected by a blast<br>▸ Minimise adverse effects of ground vibration and shock waves caused by a blast<br>▸ Ensure explosives are not used after either the manufacturer's recommended shelf life or the approved, extended shelf-life<br>▸ Ensure public safety, vehicular access and security<br>▸ Identify other activities within proximity of explosive use<br>▸ Identify the environment of explosive use, including flood, bushfire, landslide zones.<br>Work Health and Safety Management Plans to include appropriate measures to manage risk associated with blasting such as consultation with contractors, compliance with separation requirements and access controls, exclusion zones, trails, and buffers. |

#### 23.13.11.4 Monitoring

Regular earthworks inspections will be implemented to determine defects and conditions that may affect or indicate problems with the stability of earthworks such as fissures, rocks or debris on or near tracks, loss of track geometry, track subsidence, water seepage and damage to embankments.

Monitor actual hours of construction work and take action to reduce risk of fatigue where required.

Monitoring and reporting on compliance with the mitigation measures identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

### 23.13.12 Waste and resource management

#### 23.13.12.1 Environmental outcomes

All wastes generated during Project works are stored, handled, treated, reused, recycled and/or disposed of lawfully and to reduce environmental harm.

Measures are implemented to reduce the amount of waste generated by the Project works.

#### 23.13.12.2 Performance criteria

- Adopt the waste hierarchy (avoid/reduce, reuse, recycle, recover, treat, dispose) across the Project.
- Assess, classify, manage, and dispose of waste in accordance with the relevant state regulatory requirements and guidelines.
- Establish and meet construction waste targets.
- Implementation of opportunities identified for beneficial reuse of spoil and other materials during detailed design and construction in accordance with appropriate management procedures and relevant applicable legislation and regulations.
- Minimise the import and disposal of fill material.

#### 23.13.12.3 Proposed mitigation measures

Relevant environmental aspects and proposed mitigation and management measures for the detailed design, pre-construction and construction and commissioning phases of the Project are included in Table 23.23.

#### 23.13.12.4 Monitoring

Monitoring compliance of the development and implementation of the waste and resource management related management processes and performance criteria identified in this Draft Outline EMP Sub-plan will be captured in the processes identified in Section 23.8.

**TABLE 23.23: MITIGATION MEASURES—WASTE AND RESOURCE MANAGEMENT**

| Delivery Phase | Aspect | Proposed design objectives and mitigation measures |
|---|---|---|
| Detailed design | Waste | Cut-and-fill balance and minimisation of transport requirements for import/disposal of spoil to be further refined during detailed design by implementing the spoil management hierarchy presented in Appendix V: Spoil Management Strategy.<br>Establish waste reduction targets for design and construction.<br>A waste reduction review will be undertaken to identify opportunities to meaningfully achieve the waste reduction targets through detailed design and construction of the Project.<br>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 Project.<br>Establish waste reporting requirements for the pre-construction, construction and commissioning phases of the Project for incorporation into the Waste Management Sub-plan. |
| Pre-Construction | Waste | Develop a Waste Management Sub-plan as part of the CEMP, which complies with the Project conditions of approval and relevant regulatory requirements, including:<br>▸ Waste targets (or waste reduction targets) to be achieved for the Project<br>▸ Waste reporting requirements<br>▸ General protocols and performance objectives for keeping the work site clean and tidy<br>▸ Describe potential waste impacts, waste streams and estimated volumes<br>▸ Identify temporary waste storage areas and disposal locations onsite and offsite (including stockpiles and landfilling)<br>▸ Waste disposal at third party disposal sites is undertaken in line with regulatory requirements including the requirement for sites to be operating under a current environmental authority<br>▸ Requirements for waste segregation e.g. green waste, spoil, construction and demolition waste, general waste, regulated waste and recyclables<br>▸ Requirements for secure temporary storage, collection frequency and disposal/recycling requirements<br>▸ Effluent management for construction staff amenities<br>▸ Procedures and reporting/documentation requirements for ensuring waste transporters and receivers are appropriately licenced according to the type of waste<br>▸ 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 | Waste from the Project works must be tested, treated and managed in accordance with the EP Act.<br>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 Waste Management Sub-plan. |

| Delivery Phase | Aspect | Proposed design objectives and mitigation measures |
|---|---|---|
| Construction and commissioning | Waste | Where practicable, spoil will be re-used within the disturbance footprint through treatment, amelioration or drying and any material that cannot be treated for appropriate re-use may then be disposed offsite.<br>Identify opportunities to achieve waste reduction targets appropriate to the scope of the Project works.<br>Reduce the amount of spoil generated through construction methodology. For example, the use of roadheader in tunnelling construction allows for accurate cut while maintaining efficient spoil management.<br>Implement the Construction Spoil Management Plan described in the Land Resources Sub-plan (Table 23.6).<br>All cut material suitable for reuse will be stockpiled separately and reused onsite where possible.<br>Careful specification of construction material requirements to avoid overestimation.<br>Source good quality construction materials, in accordance with relevant design standards.<br>Purchase construction materials in bulk to minimise packaging waste.<br>Develop and implement administrative controls on the transportation of waste materials from the Project, within the disturbance footprint and offsite.<br>Ensure plant and equipment used in the Project is appropriately maintained.<br>Construction maintenance activities, refuelling, concrete washout will be carried out in defined locations with appropriate measures in place to reduce the potential for impacts to waterways, aquatic habitats, and groundwater.<br>Portable toilets and amenities to be serviced and maintained to ensure efficient operation and minimise environmental risks associated with their operation and decommissioning.<br>Contractors to adhere to the practices of the *Waste Reduction and Recycling Act 2011* (Qld) waste and resource management hierarchy, which sets out an order of preference for options for managing waste from avoiding, to reusing, recovering, treating and disposing of waste.<br>Appropriate waste bins, facilitating segregation of waste, to be located at key site compounds to facilitate segregation and prevent cross contamination.<br>Comply with the waste reporting requirements established in the Waste Management Sub-plan. |
| | Hazardous waste | Contaminated waste must be classified and disposed in accordance with the Waste Management Sub-plan.<br>Hazardous or dangerous waste (e.g. asbestos, chemicals, oils) to be correctly stored, managed and disposed of by a licensed 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. |