CHAPTER 24

Hazard and Risk

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

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

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24. Hazard and risk

24.1 Scope of the chapter

This chapter assesses the North Star to NSW/Queensland Border project's (the proposal) risk of adverse impacts from both natural and proposal-related hazards by:

- Evaluating the risks and hazards in the existing environment
- Identifying and assessing the potential risks to people, property and the environment that might be associated with the construction and operation of the proposal
- Proposing appropriate mitigation measures to be implemented during the life of the proposal.

24.1.1 Purpose

This chapter describes the health, safety and environmental hazards and risk associated with the proposal throughout the design, construction and operation phases. The health and safety of employees and communities, along with risks to the environment and property, have been considered using *State Environmental Planning Policy No 33—Hazardous and Offensive Development* (SEPP 33). While SEPP 33 will not be used in the context of compliance assurance, it is a useful tool to determine relevant hazards and risks that should be considered for the proposal.

This chapter describes a preliminary risk assessment for the proposal, which covers potential risks to people, property and the environment, including:

- Natural hazards (e.g. flooding, wildlife, sudden subsidence or movement of soil or rocks, biosecurity, bushfire, landslide and implications related to climate conditions)
- Construction and commissioning hazards and risk (e.g. existing infrastructure and land contamination)
- Operational hazards and risks (e.g. respirable silica and other airborne contaminants such as naturally occurring asbestos, fatigue and heat management, concurrent or simultaneous operations with existing railway infrastructure)
- Other health, safety and security hazards and risks (e.g. accidents including derailments, pedestrian safety, spillages, fire and abnormal events that may occur during all stages of the proposal).

24.1.2 Proposed requirements

Although the Secretary's Environmental Assessment Requirements (SEARs) for the proposal do not describe specific requirements regarding a hazard and risk assessment, to maintain consistency of assessments and demonstration of commitment to risk reduction across the Inland Rail Program, a hazard and risk chapter has been included. This chapter has been prepared using SEPP 33.

24.1.3 Approach

The hazard and risk assessment considered potential impacts to people, property and the environment either initiated or exacerbated by the proposal. Furthermore, the hazard and risk assessment assessed risks from external factors such as climate conditions, subsidence or biosecurity hazards. Findings and outcomes of environmental investigations completed during the development of the Environmental Impact Statement (EIS) have been incorporated into the assessment.

Mitigation measures will be applied throughout the life of the proposal, to eliminate or manage hazards and reduce risk to an acceptable level. This risk assessment will be conducted as part of the larger risk management process.

The hazard and risk chapter aims to:

- Identify the relevant legislative framework associated with the risk assessment
- Identify the natural and environmental values
- Document the proposal construction (and commissioning) and operation activities with the potential to cause health, safety and risk impacts
- Describe how the proposal may affect hazards outside the rail alignment and implications of climate conditions
- Demonstrate how the risk assessment process has been applied throughout the life of the proposal in accordance with *AS/NZ ISO 31000:2009* (compliant with *ISO 31000:2018*)
- Discuss mitigation measures to be implemented during construction (and commissioning) and operation, and mitigation measures incorporated in the design
- Outline the relevant emergency management plan including consultation undertaken with relevant emergency management authorities, such as local disaster management groups.

24.1.4 Assumptions and limitations

The assessment described in this chapter has been carried out based on information available at the time of preparing the EIS. The proposal will continually monitor identified risks and conduct future risk assessments to identify and mitigate any risks as they emerge throughout the life of the proposal.

A draft outline Environmental Management Plan (EMP), which establishes a framework for implementing mitigation measures, has been developed as part of this EIS to identify environmental values potentially affected by the proposal (refer Chapter 27: Environmental Management Plan). A detailed Construction EMP (CEMP) including relevant sub-plans, will also be prepared as the proposal progresses. This will address all measures and requirements of the Outline EMP, together with primary and secondary approval conditions and other legislative requirements from permits, licences and other project commitments, before the proposed works begin. Additional mitigation measures will be continually developed and documented throughout the construction program, as required.

Australian Rail Track Corporation (ARTC)'s existing hazard and risk management procedures will be reviewed and applied throughout the operational phase.

The impacts from natural hazards on the proposal discussed in this chapter are based on existing and historical natural events. Detailed assessments of these refer to the appropriate EIS chapter, where applicable.

Emergency management plans are described based on ARTC's existing *Emergency Management Procedure* (RLS-PR-044) considering possible emergency events throughout all phases of the proposal, including construction and commissioning and operation phases.

24.2 Policies, standards and guidelines

The assessment of hazards and risks to people, property, and the environment associated with the proposal has been conducted against legislative and policy level objectives for the management of risk.

The following legislation is relevant to the assessment of hazards and risks for the proposal:

- *Rail Safety National Law No 82a* (NSW)
- *Work Health and Safety Act 2011 No 10* (NSW)
- *Explosives Act 2003* (NSW)
- *Public Health Act 2010 No 127* (NSW)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth)
- *State Emergency and Rescue Management Act 1989 No 165* (NSW)
- *Biosecurity Act 2015 No 24* (NSW)
- *Fisheries Management Act 1994 No 38* (NSW)
- *Fire and Rescue NSW Act 1989 No 192 Land Act 1994* (Qld)
- *Heritage Act 1977 No 136* (NSW).

Policies and guidelines relevant to this assessment and their respective requirements are described in Table 24.1.

TABLE 24.1 APPLICABLE STANDARDS AND GUIDELINE CONTEXT

Policy or guideline	Relevance to the proposal
New South Wales State Environmental Planning Policy (SEPP)	Provides guidelines to ensure the risks associated with natural hazards are avoided or mitigated during planning and development to protect people and property and enhance the community's resilience to natural hazards. Forms the basis of design decisions such as route selection and impact assessment which inform risk assessment for the development.
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG code) edition 7.7 (National Transport Commission, 2020)	Details the technical specifications, requirements and recommendations applicable to the transportation of dangerous goods in Australia by road and rail. Taken as the basis of dangerous goods handling and considered in the development and assessment of mitigation measures.
Rail Safety Principles and Guidance (Great Britain Railway Inspectorate, 1996)	Provides safety principles and guidelines for the construction of railways. Principles applied to risk assessment consider expected mitigation measures and approach to rail construction.
Accreditation of Rail Transport Operators, *Rail Safety Act 2008*	Legislates the requirement for being an accredited rail operator in Australia and to attest that a rail transport operator has demonstrated the competence and capacity to manage rail safety risks. Requirements considered in risk assessment.
Guideline—Rail Safety Management System (Office of the National Rail Safety Regulator, 2019)	Provide accredited rail transport operators with guidance about legislative requirements for safety management. The assessment has considered that the system requirements will be applied to the Inland Rail Program, specifically in the context of ARTC's *Safety Management System*.
National Standard for Health Assessment of Rail Safety Workers (National Transport Commission, 2017)	Provides guidance for rail transport operators to manage the risk and protect the safety of the public, rail employees and the environment. Specifically, the standard outlines requirements to limit the impact of individual health issues on rail safety.
Development Near Rail Corridors and Busy Roads—Interim Guideline (Department of Planning, 2008)	This interim guideline provides criteria to be considered in the assessment of development adjacent to specific roads and railway corridors to reduce the health impacts of rail and road noise and adverse air quality on sensitive adjacent development.
Rail Infrastructure Noise Guideline (EPA, 2013)	This guideline ensures noise and vibration impacts associated with rail development projects are evaluated in a consistent and transparent manner.
AS ISO 31000: (2009 and 2018) Risk Management—Guidelines (Standards Australia, 2009 and 2018)	Describes the risk management process that can be applied throughout the life of an organisation and to a wide range of activities. Also provides guidance on the identification and assessment of risk which has been applied in the methodology of this chapter.
AS 4801:2001 Occupational Health Safety Management Systems (Standards Australia, 2001)	Sets requirements for the formation of health and safety policy and objectives.
AS 4084:2001 Occupational Health and Safety Management Systems—General Guidelines on Principles, Systems and Supporting Techniques (Standards Australia, 2001b)	Provides guidance on the development and the implementation of occupational health and safety management systems and principles and their integration with other management systems.
AS 4292.1-2006 Railway Safety Management (Standards Australia, 2006)	Specifies railway safety requirements and management systems associated with design, specifications, operating and maintenance procedures. Considered in the assessment of mitigation measures and risk assessment associated with railway incidents.
AS 2187.1-1998 Explosives—storage, transport and use (Standards Australia, 1998)	Sets requirements of storage, transport and use of explosives associated with their location, design, construction and maintenance. Consideration of separation distances, handling requirements and restrictions on quantities has informed the risk assessment of potential explosives activities.

Policy or guideline	Relevance to the proposal
AS 1678A1-2004 Emergency Procedure Guides—Transport (Standards Australia, 2004)	Provides information on transport requirements for different classes of dangerous goods, specifically with respect to the actions taken and likely response procedures to be in place in the event of an incident.
AS 2931:1999 Selection of Use of Emergency Procedure Guides for Transport of Dangerous Goods (Standards Australia, 1999)	Provides lists of Emergency Procedure Guides (EPGs) and Group Text Emergency Procedure Guides (GTEPGs) and guidance on their selection, completion and use. This standard serves as a reference when selecting the appropriate EPG for specific dangerous goods.
AS 1940:2017 Storage and Handling of Flammable and Combustible Liquids (Standards Australia, 2017)	Sets requirements for the storage and handling of flammable and combustible dangerous goods Class 3. Considered in the development of mitigation measures for the storage of construction chemicals.
AS 3780:2008 The Storage and Handling of Corrosive Substances (Standards Australia, 2008)	Sets requirements for storage and handling of corrosive dangerous goods Class 8. Considered in the development of mitigation measures for the storage of construction chemicals.
AS 2436:2010 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites (Standards Australia, 2010)	Details the requirements in assessing noise and vibration control measures of construction, demolition and maintenance sites. Mitigation measures are expected to be in accordance with the requirements of this guide and are considered in the assessment.
AS 5100 Set:2007 Bridge Design (Standards Australia, 2007)	Details the acceptable requirements for the design of bridges and related structures intended to support railway and pedestrian traffic loads. Mitigation measures are expected to be in accordance with requirements of this standard and are considered in the assessment.
AS 7636:2013 Railway Structures (Standards Australia, 2013)	Details the requirements that encourage rail organisations to use a whole-of-life approach to rail structures, and cover the general management requirements, material composition, manufacturing, construction, maintenance, decommissioning and disposal of rail structures used in Australian rail operations. Mitigation measures are expected to be in accordance with requirements of this standard and are considered in the assessment.
HB203:2012 Managing Environmental Related Risk (Standards Australia, 2012)	Provides guidelines to help organisations manage environment-related risk.
AS 7658 Railway Infrastructure: Railway Level Crossings (Standards Australia, 2011)	Provides the Australian rail industry with a set of mandatory and recommended requirements to be used to control level crossing risks and to promote a consistent treatment of Australian level crossings.
AS 7637:2014 Railway Infrastructure: Hydrology and Hydraulics (Standards Australia, 2014)	Provides a framework that promotes consistency and efficiency in design, construction, commissioning, maintenance, monitoring and decommissioning of track drainage and waterway crossings for the design and assessment of railway infrastructure in relation to all forms of drainage and flood-prone areas.
Australian Rainfall and Runoff: A Guide to Flood Estimation (BoM, 2019)	A national guideline document that can be used for the estimation of design flood characteristics in Australia, which is pivotal to the safety and sustainability of Australian infrastructure, communities and the environment.
AS 4799:2000 Installation of underground utility services and pipelines within railway boundaries (Standards Australia, 2000)	Specifies the requirements for the installation, use and maintenance of utility services and pipelines within railway boundaries.
ARTC Right of way—Code of Practice (2013)	Sets out principles, guidelines and mandatory requirements aimed at providing a uniform approach to rail operations and supports the provision of safe and efficient infrastructure, rollingstock and operating systems.
AS 1742.7:2016 Manual of Uniform Traffic Control Devices, Part 7: Railway Crossings (Standards Australia, 2016)	Specifies traffic control devices to be used to control and warn traffic at and in advance of railway crossings at grade (on the same level) and how these devices are used to achieve the level of traffic control required for the safety of rail traffic and road users, including pedestrians.

24.3 ARTC management plan and procedures

The proposal will implement the *ARTC Safety Management System* that is currently used in all other ARTC-operated rail systems.

24.3.1 Safety policy

ARTC will provide the basis for effective management of employee, contractor and public health throughout the life of the proposal. The Safety Policy includes:

- 'No Harm' is an ARTC value, with the objective that no one is harmed at work or on the ARTC rail network
- The proposal is committed to achieving 'No Harm' via the following protocols:
  - Providing the appropriate tools to support the identification of risk
  - Establishing and maintaining communication, consultation and coordination with and between employees, contractors and relevant stakeholders
  - Providing information, instruction, and training to develop worker capabilities and competence
  - Providing appropriate plant, equipment and personal protective equipment
  - Establishing and maintaining measurable and achievable objectives and targets
  - Promoting safe behaviours and a positive safety culture
  - Monitoring performance and implementation of requirements to ensure continual improvements
  - Maintaining a Safety Management System that is accessible and user friendly
  - Ensuring the processes and work practices are in line with the requirements of applicable laws.

The policy will apply to the Inland Rail Program and the proposal, including to contract workers throughout all phases of the proposal.

24.3.2 Fatal and severe risk program

The Fatal and Severe Risk Program, with accompanying lifesaving behaviours, is a fundamental element of ARTC's 'No Harm' values. This program aims to implement 10 control protocols to manage risk areas with potentially fatal consequences. The risk management protocol will provide safe work practices and establish minimum performance expectations to manage risk and eliminate incidents, including:

- Vehicle accidents (including road/rail vehicles)
- Manual handling
- Struck-by-rail traffic
- Rail traffic collision
- Struck by mobile plant
- Contact with electricity
- Hazardous chemicals, hot materials and confined spaces
- Crushed by a crane or lifted load
- Fall from height.

The program will apply to the Inland Rail Program and the proposal, including to contract workers throughout all phases of the proposal.

24.4 Methodology

24.4.1 Hazard and risk study area

The hazard and risk study area is defined as the area including permanent and temporary infrastructure, with the potential to impact people, environment and property. The extent of the impacts varies according to the nature and requirement of each hazard identified during the preliminary risk assessment, including existing environmental conditions and natural events. For a description of the proposal scope and key features, refer to Chapter 4: Site Description, or each chapter for the definition of the relevant discipline study area.

The hazard and risk study area, as defined for the hazard and risk assessment, is described as the:

- Natural environment directly and potentially indirectly impacted by the proposal
- Extent of the proposed disturbance footprint, including road–rail interfaces, watercourse crossings, maintenance and construction access sites, construction laydown areas and service locations.

The disturbance footprint includes:

- Permanent: the rail corridor, which includes the rail tracks and associated infrastructure as well as other permanent works associated with the proposal (e.g. where changes to the road network are required)
- Temporary: the permanent disturbance footprint and any temporary storage, laydown areas and access tracks to be used on a temporary basis during the construction phase.

24.4.2 Dangerous goods and hazardous chemicals

Where hazardous chemicals or dangerous goods are stored, handled or transported, specific hazards and risks need to be identified and mitigated throughout the lifecycle of the proposal.

The assessment of hazards and risks associated with dangerous goods has determined the following processes:

- Review of the types and quantity of goods to be stored and handled during construction
- Identification of specific design risks related to freight transport (e.g. dangerous goods fire incident)
- Controlling ignition sources and accumulation of flammable and combustible substances
- Identifying the risk of physical or chemical reaction of dangerous goods and ensuring the stability of goods
- Incorporating dangerous goods management into emergency plans if the quantity of a class of hazardous chemical at a workplace exceeds the manifest quantity.

The risks associated with dangerous goods will be qualitatively assessed based on the expected types and quantities of dangerous goods associated with the construction, operation and decommissioning phases of the proposal.

24.4.3 Preliminary risk screening against State Environmental Planning Policy No 33—Hazardous and Offensive Development

SEPP 33 applies to proposals that fall under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'. Certain activities associated with the proposal may involve handling, storing or processing a range of substances, which, in the absence of locational, technical or operational controls, may create an offsite risk or offence to people, property or the environment. Such activities would be defined as potentially hazardous or potentially offensive.

SEPP 33 provides a process of identifying a potentially hazardous development based on storage and transport screening thresholds. The thresholds represent the maximum quantities of dangerous goods that can be stored or transported without causing a significant offsite risk, while observing typical control measures such as adherence to standards and appropriate design.

Dangerous goods will be used during construction of the proposal and to maintain infrastructure during operation. The transportation of dangerous good by freight also needs to be assessed.

For details of the assessment, refer to Section 24.7.3.

24.4.4 Risk assessment methodology

The risk assessment presented in Section 24.9.1 describes the potential risks of the proposal to people, property and the environment. The assessment considered sensitive receptors of the proposal, including population centres, environmental assets and activities conducted within and around the rail alignment. This provides a basis for the assessment of potential impacts and preparation of safeguards to manage and mitigate impacts that may arise.

The basic methodology for risk assessment is based on *AS/NZ ISO 31000:2009* (compliant with *ISO 31000:2018*) *Risk Management: Principles and Guidelines* and *HB203:2012 Managing Environmental Risk*. Section 6.4.1 of *ISO 31000:2018* describes a risk assessment as the overall process of risk identification, risk analysis and risk evaluation. The risk management process, as shown in Figure 24.1, will be applied throughout the life of the proposal. For the purpose of the risk assessment, the life of the proposal is defined in the following phases:

- Design
- Construction and commissioning
- Operation.

The application of the *AS/NZ ISO 31000:2009* (compliant with ISO 31000:2018) provides a framework that enables ongoing identification and documentation of hazards and risk associated with the proposal. The risk assessment presented in Section 24.9.1 will form part of the larger risk management process under the ARTC Safety Management System.

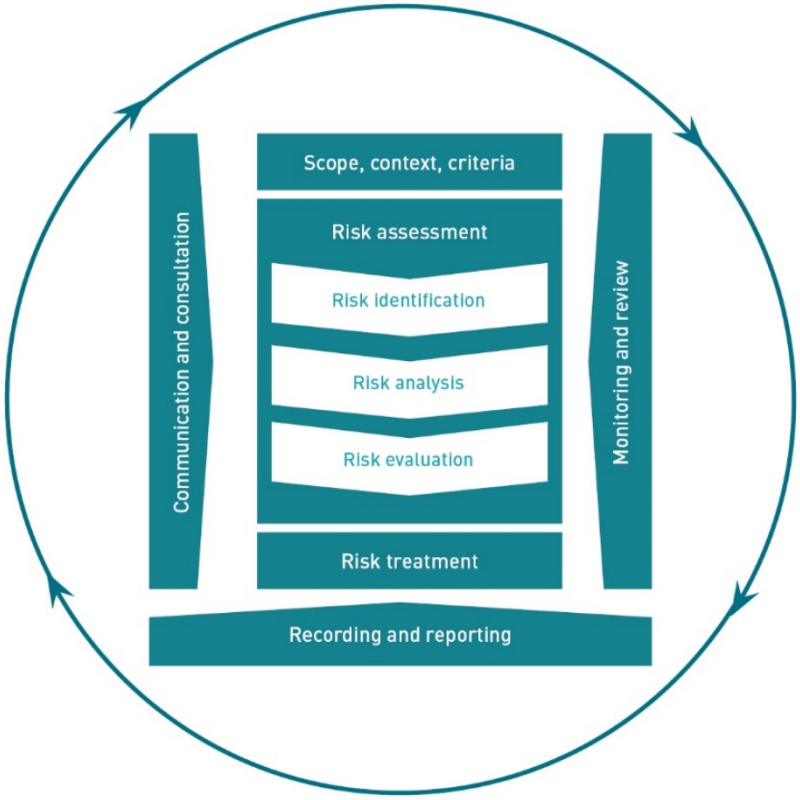

FIGURE 24.1 THE ISO 31000:2018 RISK MANAGEMENT PROCESS

24.4.4.1 Risk identification

The risk identification involved hazards and their potential receptors over the life of the proposal. The proposal phases included design, construction and commissioning, and operation. Receptors were not restricted to individuals or communities, and included sensitive environmental receptors, such as land, habitat, flora and fauna. Potential hazards as identified in other technical studies, proposal risk and proposal safety in design workshops were included to provide breadth of assessment and to capture hazards identified during the design phase.

24.4.4.2 Risk criteria

The level of risk is determined as a function of potential consequence and likelihood considering the presence of any relevant risk-mitigation controls. Table 24.2 shows how the ARTC risk matrix determines risk rank as a function of likelihood and consequence. The risk ranking methodology, including criteria applied to likelihood and consequence factors, is discussed in Chapter 10: Assessment Methodology. Probabilities of events occurring have been assessed from a qualitative view in the likelihood criteria rather than quantitative.

24.4.4.3 Risk analysis

Identified hazards were analysed in terms of the controls, the range of impacts in the context of those controls and the likelihood of those impacts arising. Impacts and likelihood were combined to produce an estimated level of risk in accordance with the ARTC risk criteria, as presented in Table 24.2.

TABLE 24.2 RISK MATRIX

	Consequence				
Likelihood	**Not significant**	**Minor**	**Moderate**	**Major**	**Extreme**
Almost certain	Medium	Medium	High	Very high	Very high
Likely	Low	Medium	High	Very high	Very high
Possible	Low	Low	Medium	High	High
Unlikely	Low	Low	Low	Medium	Medium
Rare	Low	Low	Low	Low	Medium

24.4.4.4 Risk evaluation

Each risk identified and assessed as part of the risk analysis was evaluated in the context of the proposal in accordance with the ARTC risk criteria, as described in Chapter 10: Assessment Methodology.

24.4.4.5 Risk treatment and residual risks

Hazards ranked with 'medium', 'high' and 'very high' risk ratings require further risk treatment throughout the life of the proposal. Treatment includes risk management through the ARTC Safety Management System. Additional options for risk treatment, such as mitigation measures and safeguards, have been described in Section 24.8.

The ability of the proposed mitigation controls to treat the risks is then evaluated by producing a residual risk evaluation from the same risk matrix used for the original evaluation. If the residual risk rank remains high or very high, the risk will not be deemed tolerable. Intolerable risks will not be accepted by the proposal.

As outlined in ARTC's *Risk Management Procedure*, risks with a residual rank of medium will be considered tolerable if ARTC demonstrates that they are reduced so far as is reasonably practicable through the ARTC Safety Management System. Additional options for risk elimination, inclusion of mitigation measures, and incorporation of safeguards have been described in Section 24.8 and Section 24.9. Consideration of risk controls has considered the full life of the proposal, including design, construction and commissioning, and operation of the railway. Transfer of residual risk between the proposal phases will be managed throughout the life of the proposal.

24.4.5 Data sources

The proposal has incorporated risk and opportunity, climate change and adaptation strategy and safety in design workshops. Additionally, several detailed technical studies have been carried out for the proposal. Risk assessments and disaster management plans have been developed by the local governments in the areas in which the proposal is located. The following documents or sections are particularly relevant and are referred to where applicable within this chapter:

- Climate Data—Bureau of Meteorology (BoM)
- Technical Reports
  - Appendix B: Biodiversity Technical Report
  - Appendix D: Consultation Summary Report
  - Appendix E: Aboriginal Cultural Heritage and Archaeological Assessment
  - Appendix F: Historical Heritage Technical Report
  - Appendix G: Surface Water Quality Technical Report
  - Appendix H: Hydrology and Flooding Technical Report
  - Appendix J: Construction Noise and Vibration Technical Report
  - Appendix L: Air Quality Technical Report
  - Appendix M: Traffic Impact Assessment
  - Appendix N: Groundwater Technical Report
  - Appendix Q: Climate Change Risk Assessment Technical Report
- EIS Chapters
  - Chapter 11: Biodiversity
  - Chapter 12: Heritage
  - Chapter 13: Surface Water and Hydrology
  - Chapter 14: Groundwater
  - Chapter 15: Land Resources and Contamination
  - Chapter 16: Noise and Vibration
  - Chapter 17: Air Quality
  - Chapter 19: Climate Change Risk and Adaptation
  - Chapter 20: Traffic and Transport
  - Chapter 21: Landscape and Visual Impact Assessment
  - Chapter 22: Land Use and Property
  - Chapter 23: Socio-Economic Impact Assessment
  - Chapter 25: Waste and Resource Management.

24.5 Sensitive receptors

Identification and assessment of risk requires an understanding of the potential impact of hazards on sensitive receptors. Receptors include people (human), sensitive environmental ecosystems (environmental), and society (industrial and commercial activity/infrastructure).

24.5.1 Human receptors

The key human sensitive receptors that will be potentially exposed to hazardous events associated with the proposal are:

- Residential and rural communities adjacent to the proposal
- Pedestrian, motorists and residents who use the roads and footpath near the disturbance footprint
- Vehicle operators and passengers travelling on roads adjacent to or intersected by the proposal, such as Bruxner Way, North Star Road, Tucka Tucka Road, and Forest Creek Road
- People working on land adjacent to or intersected by the proposal
- Users of water resources that may be impacted by the proposal
- Tourists
- Emergency services workers
- Project construction workers.

The risks to employees are also assessed and managed through ARTC policies and procedures including *ARTC Work Health and Safety Procedure* (WHS-PR-001).

24.5.2 Environmental receptors

The key environmental receptors that may be exposed or introduced to hazardous events associated with the proposal are:

- Indigenous cultural heritage sites, including Aboriginal intangible places that are within 1 km of the disturbance footprint (refer Chapter 12: Heritage), stone artefacts scatters, landscape features, resource areas, grinding grooves, scarred/culturally modified trees, waterholes and rock shelters and spiritual areas
- Border Rivers catchments
- Water crossings of Macintyre River, Mobbindry Creek, Forest Creek, Back Creek and Whalan Creek
- Ecological assemblages including threatened species, along with species of local and state significance and their habitat within and adjacent to the disturbance footprint
- Climate subject to climate change hazard (an RCP 8.5 (high emissions) scenario analysis has been undertaken and can be found in Appendix Q: Climate Change Risk Assessment Technical Report)
- Environmentally sensitive areas including groundwater dependent ecosystems, threatened ecological communities, wetlands, remnant vegetation and areas containing conservation significance species
- Groundwater resources within the disturbance footprint.

24.5.3 Industrial and commercial receptors and utilities

The key industrial or commercial receptors and utilities that may be exposed to hazardous events associated with the proposal are:

- Existing disturbed land, including areas used for industrial, intensive agriculture, livestock farming, mining, storage of chemicals, gas, liquid fuel storage and waste disposal (landfills)
- Existing non-operational Boggabilla rail corridor running between North Star and Boggabilla
- GrainCorp at North Star
- Existing utilities that are impacted by the proposal (e.g. overhead powerlines and telecommunication cables)
- Existing local government road network
- Tourism attractions and facilities, including:
  - North Star Tourist Park
  - Moree Artesian Aquatics Centre
  - Big Rocket
  - Tourist drives, including the Adventure Way, the Great Inland Way and Australia's Country Way.

24.6 Existing environment

Railways can impose risks to surrounding people, property and the environment (e.g. the risk of land contamination due to transport of dangerous goods). Conversely, the surrounding communities, land use, and environment can pose hazards or risks to the railway operation (e.g. through the interaction of people and activities within the disturbance footprint).

Existing sources of hazards and risks have been examined as part of the risk assessment to develop the understanding the impact of the proposal on the risk profile.

Existing hazards and risks affecting the disturbance footprint are described in the relevant EIS including:

- Chapter 11: Biodiversity
- Chapter 12: Heritage
- Chapter 13: Surface Water and Hydrology
- Chapter 15: Land Resources
- Chapter 16: Noise and Vibration
- Chapter 17: Air Quality
- Chapter 20: Traffic and Transport
- Chapter 22: Land Use and Property
- Chapter 25: Waste and Resource Management.

24.6.1 Existing hazards

There are hazards in the existing environment (in the absence of the proposal) such as natural events and infrastructure. These existing hazards have the potential to be impacted by the proposal, and are discussed below in terms of:

- Existing natural hazards
- Existing land conditions
- Existing infrastructure.

24.6.1.1 Existing natural hazards

Natural hazards are external risks on the proposal. Key natural hazards for the proposal identified include bushfire, flooding, landslides, wildlife, biosecurity, and climate conditions. These hazards are discussed in the following sections.

Climate data

There are several meteorological monitoring stations near the disturbance footprint. The BoM station, Moree Aero, is approximately 80 km south of the disturbance footprint. A summary of the long-term climatic data recorded at this BoM station is in Table 24.3.

TABLE 24.3 CLIMATE DATA FROM MOREE AERO BOM STATION (1995 TO 2019)

Parameter		Unit	Value
Highest mean maximum temperature		˚C	34.2
Highest maximum temperature		˚C	47.3
Lowest mean minimum temperature		˚C	4.5
Lowest minimum temperature		˚C	-4.3
Mean monthly rainfall	Highest	mm	77.8
	Lowest	mm	22.4
Monthly rainfall extremes	Highest	mm	222.2
	Lowest	mm	0.0
Mean solar exposure	Highest	MJ/m^2	26.7
	Lowest	MJ/m^2	11.3
Maximum wind gust speed	Highest	km/h	124
	Lowest	km/h	68

The historic temperatures at the Moree Aero BoM station are consistent with a hot and semi-arid climate, and the rainfall data shows distinct wet and dry seasons. These factors are consistent with the general climate of the Central Slopes region.

Historic climate data shows the area has the potential for extreme temperatures, evidenced by the 13 ˚C difference between the highest maximum temperatures and the highest mean maximum temperatures (refer Table 24.3). Extreme temperatures can create two forces in the rail—compression and tension—which have the following impacts:

- **Compression**: rail will try to move sideways to lengthen, to relieve compression. When the compression generated in the rails exceeds the ability of the structure to hold itself in place, track movement or buckling occurs.
- **Tension**: rail will try to move sideways to shorten, to relieve tensile stress. When the tension generated is greater than the resistance offered by the track structure, a curve will pull in towards its centre. This is less dramatic than a buckle; however, it can be extremely dangerous if clearances are affected.

Historic climate data also shows an approximately 150 mm difference between the highest monthly mean rainfall and the highest monthly rainfall, which indicates the current potential for extreme rainfall events. This can lead to an increased potential for flash flooding, the impacts of which are discussed in Section 24.6.1.1.

For further details of the climate across the disturbance footprint, refer to Appendix L: Air Quality Technical Report and Chapter 19: Climate Change Risk and Adaptation.

Climate conditions

Recent extreme events within the disturbance footprint have highlighted the exposure to climatic conditions, including:

- Extreme rainfall in January 2011 resulted in a flooding event (along the Macintyre and Dumaresq rivers) that caused the evacuation of nearly the entire towns of Boggabilla and Toomelah, located adjacent to the corridor (Sydney Morning Herald, 2011). The flooding also closed the Bruxner Way (just outside of Boggabilla) and resulted in delays and cancellations for regional trains and regional coach services.
- Extreme rainfall in January 2013 resulted in a flooding event that closed the Newell Highway near Boggabilla, with no access from either NSW or Queensland (*Northern Star*, 2013). Furthermore, the Bruxner Way between Boggabilla and North Star was closed in both directions because of flood waters.
- A heat wave in 2014 resulted in temperatures of more than 45 °C in Goondiwindi (45.9 °C), while a heat wave in 2017 resulted in three days of at least 43 °C (*The Courier-Mail*, 2018; *The Chronicle*, 2017)
- In the summer of 2016 to 2017, the town of Moree set a NSW record of 52 consecutive days of temperatures exceeding 35 °C (Mashable, 2017).

While these events can occur independently of climate change, modelling indicates the frequency and severity of climatic events will increase. Forecasts from both the Commonwealth Scientific and Industrial Research Organisation (CSIRO, 2019) and AdaptNSW (OEH, 2014) indicate higher average temperatures (+4.2 °C by 2090), more extreme heat days (+43 above 35 °C by 2090) and more extreme rainfall.

Refer Chapter 19: Climate Change Risk and Adaptation for further details.

Bushfire

The disturbance footprint traverses rural areas predominantly used for grazing and agriculture. Most of the land has been cleared and disturbed for agricultural activities; however, some patches of remnant vegetation remain. The potential for bushfires is heightened during spring to mid-summer for New South Wales and southern Queensland, with the greatest danger typically occurring after the dry winter and spring and reducing with the onset of moister conditions into summer (BOM, 2020). The threat of bushfires increases after periods of reduced rainfall and increased temperatures, when there is more dry grass available to burn.

The climate statistics from the BoM show the highest recorded temperature for the disturbance footprint is +34.2 °C, as measured at Moree Aero BoM station in summer. Mean rainfall values collected from the BoM station highlight the distinct wet (summer) and dry (winter) seasons experienced by the region, as well as the large variation in rainfall amounts received across the wider area.

CSIRO (2019) climate modelling suggests that the predicted increased temperatures and lower rainfall combined will lead to a higher incidence of drought and thus an increased fire weather risk in the future. CSIRO (2019) predicts the following increases in fire danger for Central Slopes in the RPC8.5 case:

- Forest Fire Danger Index increases from 1995 baseline by:
  - 15 per cent by 2030
  - 40 per cent by 2090.
- Number of days with severe fire danger rating increases from 1995 baseline by:
  - 70 per cent by 2030
  - 220 per cent by 2090.

Extreme heat during dry periods increases the risk of bushfire. This could have an impact on the proposal, which of itself could also ignite bushfire at these times.

Floods

The proposal crosses approximately 19 km of Macintyre River floodplain and associated tributaries. Key waterways that intersect the proposed alignment include Mobbindry Creek, Forest Creek, Back Creek and Whalan Creek.

Flood modelling prepared by the Office of Environment and Heritage (OEH) indicates that the Macintyre River floodplain comprises an area of approximately 1.1 million hectares (ha), extending from approximately 50 km upstream of Boggabilla to 40 km downstream of Mungindi.

Flooding in the study area generally originates from regional flood events caused by high flows in the Macintyre River, and the Dumaresq and Macintyre Brook systems, or high rainfall over local catchment areas. The Border Rivers floodplain has experienced many recent floods, with the highest on record occurring in 2011, 1996 and 1976.

Seasonal variations in rainfall mean that flooding, particularly flash flooding, is more likely during the storm season, between late spring and summer, as a result of severe storms and tropical cyclones. Refer Chapter 13: Surface Water and Hydrology for further details on the existing flood conditions in the area.

Cyclones

Tropical cyclones are low pressure systems that form over warm tropical waters and are generally formed during summer months. Tropical cyclones do not impact NSW very often; however, they can cause flooding, destructive winds, storm surges and loss of life (BoM, 2018). One such cyclone was Cyclone Oswald, which was downgraded to an ex-tropical cyclone as it moved down through Queensland to Northern NSW, causing severe storms and flooding. The tropical low was recorded to have passed approximately 50 km to the east of the proposal in January 2013.

Landslides, sudden subsidence and movement of soil or rocks

The proposed alignment is characterised by a general decline in gradient from south to north. The highest elevation is at North Star (approximately 260 m Australian Height Datum [AHD]). This gradually descends from the highlands into the low ridges of the NSW/QLD border, with the point of lowest elevation where the corridor passes over Whalan Creek at 223 m AHD.

Soil profiles were examined along the proposed alignment. The road crossing of Back Creek, on the western side of the road, is associated with minor sheet, rill and gully erosion with stable scald erosion. Streambank erosion was evident onsite, but no salting was found. The railway crossing on the western side of North Star Road (located south of Scotts Road) is also associated with minor sheet erosion with stable scald erosion but, again, no salting was evident.

Soil erosion data from the NSW Central West region, which encompasses the proposed alignment, revealed 25 per cent of soil monitoring units reporting sheet erosion as an issue, followed by 4 per cent gully erosion and 4 per cent for wind erosion. However, given that data from Metcalfe & Bui (2016) was broad-scale and has been categorised as 'limited' in confidence, actual erosion risk in proximity to the proposed alignment may vary from the study results.

For more details of landslides, sudden subsidence and movement of soil or rocks as an external hazard, refer to Chapter 15: Land Resources and Contamination.

Wildlife

The proposal is mainly surrounded by rural land that has been previously modified and disturbed for agricultural use, with some remnant patches of native vegetation.

A total of five *Environmental Protection and Biodiversity Conservation Act* (Cth) (EPBC Act) listed and four NSW Threatened Ecological Communities (TECs) are considered present in the ecology study area. The field survey recorded 207 fauna species, including 9 non-native species, comprising 145 birds, 37 mammals, 20 reptiles and 5 amphibians.

Wildlife is an external hazard to the proposal as there is the potential for:

- Animal attacks to workers
- Collisions with fauna
- Fauna adopting rail infrastructure as habitat (e.g. bats)
- Fauna carrying diseases
- Pests and weeds that pose a biosecurity risk
- Flora that pose a risk to human health.

Further information on predicted habitat mapping identified for significant species and Threatened Ecological Communities is in Chapter 11: Biodiversity and Appendix B: Biodiversity Technical Report.

Naturally occurring asbestos

The geotechnical investigations undertaken within the land resources study area (an area defined within Chapter 15: Land Resources and Contamination) found no naturally occurring asbestos.

For more details of naturally occurring asbestos as an external hazard, refer to Chapter 15: Land Resources and Contamination.

24.6.1.2 Existing land conditions

Land contamination

Based on the land uses within the disturbance footprint and the findings of a desktop assessment, potential sources of contamination in the vicinity of the disturbance footprint include:

- Agricultural activities: hydrocarbons (fuel and oil storage and use), pesticides and herbicides, asbestos and lead paint, arsenic (cattle dips) and landfilling
- Housing/sheds: hydrocarbons (fuel and oil storage and use), pesticides and herbicides
- Landfill and waste disposal: hazardous materials, hydrocarbons, metals/metalloids, phenols, polychlorinated biphenyls, phthalates, volatiles, pesticides and herbicides
- Unknown fill material: asbestos, metals/metalloids and hydrocarbons
- Existing railway lines: hydrocarbons (fuel), dangerous goods (freight).

The probability of encountering acid sulfate soils (ASS) within the proposed site was found to be negligible, as described in Chapter 15: Land Resources and Contamination. Further assessment of ASS potential within the proposed site using the CSIRO (2014) *Atlas of Australian Acid Sulfate Soils* map found low probability of ASS occurring, between North Star and the alignment west of Humptybung, and extremely low probability of ASS occurring for the remaining area of the proposal site.

A search of the NSW Environment Protection Authority (EPA) (2018) contaminated land records for the local government areas (LGAs) of Moree Plains and Gwydir Shire confirmed no records within the proposal site.

For more details on land contamination as an external hazard, refer to Chapter 15: Land Resources and Contamination.

Unexploded ordnance

A search of the Department of Defence (2017) online mapping for unexploded ordnances (UXO) identified no existence of related material along the proposal site.

Refer Chapter 15: Land Resources and Contamination for more details on UXO as an external hazard.

Asbestos contamination

Asbestos-containing materials may be present within the existing rail corridors and tie-in locations for the proposal, particularly within structures and rail infrastructure as insulation, signal boxes, switchboxes and building fabric. Asbestos contamination may also be present near existing rail infrastructure because of the historical use of asbestos in rolling stock brake shoes.

For more details on asbestos contamination as an external hazard, refer to Chapter 15: Land Resources and Contamination.

24.6.2 Existing infrastructure

The existing rail network in the area includes the non-operational Boggabilla line located north-west of the proposal site. The Boggabilla rail line branches from the Mungindi railway line at Camurra and runs for 130 km to Boggabilla and is currently truncated at North Star.

Bruxner Way, North Star Road, and Tucka Tucka Road are the major roads that are located within the proposal site. Other roads within the proposal site are local and private rural roads that include both sealed and unsealed roads.

The proposed alignment runs parallel to, and crosses, North Star Road. Additionally, proposed alignment runs parallel to Bruxner Way for approximately 10 km, which is a major east–west link between the Newell Highway in the northwest near Boggabilla and the New England highway in the east at Tenterfield. Tucka Tucka Road also runs east–west, linking to Bruxner Way from Holdfast Road. There are proposed public formed road/rail interface locations with the proposed rail corridor.

For more details on existing infrastructure as an external hazard, refer to Chapter 2: Land Use and Property, Chapter 20: Traffic and Transport and Appendix M: Traffic Impact Assessment.

24.6.3 Safety records

Within the rail corridor there is the potential for railway incidents including train and level crossing collisions and derailments. It is noted that the North Star to NSW/Queensland border rail line will intersect with the existing non-operational Boggabilla line at North Star, where there will be potential for railway incidents between trains.

The Office of the National Rail Safety Regulator (ONRSR) publishes investigation reports into rail incidents, which are available on their website. ONRSR is an independent body corporate established under the *Rail Safety National Law (NSW) 2012*, which aims to encourage and promote national rail operations and safety. In January 2013, NSW joined ONRSR.

For the purposes of analysis, the reports focus on notifiable safety occurrences, including:

- A running line derailment
- A running line collision between rolling stock
- A collision at a railway crossing between rolling stock and either a road vehicle or a person
- An accident or incident that has caused significant property damage, serious injury or death
- An accident or incident involving an inadequacy in the safety management system for the railway operations that could have caused significant property damage, serious injury or death
- A fire or explosion on or in rail infrastructure or rolling stock that affects the safe carrying out of the railway operations or has endangered one or more persons
- A terrorist attack or an act or event suspected to be a terrorist attack.

Over the past six years there has been a relative decrease in the number of notifiable safety occurrences.

Table 24.4 shows data from the *ONRSR Rail Safety Report 2018–2019*. This information provides contextual reference for understanding the potential likelihood and consequence of rail-based incidents.

TABLE 24.4 AUSTRALIAN RAIL SAFETY OCCURRENCE DATA, FROM 2018 TO 2019

Statistic	Value	Units
Running line derailment of freight train	0.423	per million km of train line
Running line collisions (trains with rolling stock)	0.018	per million km of train line
Collisions at crossing (passenger and freight train)	0.142	per million km of train line
Fatalities (involving passengers, workers, public and trespass excluding suspected suicide)	0.088	per million km of train line
Signal Passed at Danger/8Authority Exceeded	2.239	per million km of train line
Fire or explosion	<0.001	per million km of train line
Terrorist attack	<0.001	per million km of train line

The nature of these incidences has informed the design in order to mitigate risks so far as is reasonably practicable. Further information on road–rail interfaces for the proposal are found in Appendix M: Traffic Impact Assessment.

24.7 Hazard identification and potential impacts

Hazards that have the potential to impact people, property, or the environment associated with the proposal have been identified through internal risk identification workshops, design reviews and impact assessments. Identified key hazards are detailed in the risk register outlined in Section 24.9. Risk levels for each hazard identified are provided in the risk assessment table (refer Table 24.11).

Occupational hazards will exist throughout the life of the proposal. These hazards will be managed in compliance with the *Work Health and Safety Act 2011* (Cth) and Work Health and Safety Regulation 2017 (NSW) along with the ARTC's Safety Management System, including procedures, work instructions, engineering standards and guidelines. Ongoing workplace risk assessments will be carried out in accordance with the ARTC Safety Management System and the ARTC Fatal and Severe Risk Program. For the purpose of this EIS, these occupational risks will not be documented in this chapter.

Technical studies undertaken as part of the EIS have been incorporated where applicable; reference is provided to detailed assessments and sections of the EIS as appropriate.

24.7.1 Natural hazards

Existing natural hazards within the disturbance footprint have the potential to introduce risk to proposal activities and therefore require identification and mitigation. Hazards relevant to the proposal are presented in Table 24.5 and include adverse weather conditions and natural events.

The proposal also has the potential to generate or change the risk profile of hazards to the natural environment through interactions with existing sensitive environmental receptors. These risks are discussed in the following sections and include impacts to sensitive environmental receptors through construction and operation.

TABLE 24.5 IDENTIFIED POTENTIAL IMPACTS ARISING FROM NATURAL EVENTS

Potential hazards	Impact category	Construction	Operation
Bush fire	Asset Environment Safety	Potential	Potential
Flooding	Asset Environment Safety	Potential	Potential
Climate conditions (e.g. increase in temperature, rainfall events and heat waves, refer Appendix Q: Climate Change Risk Assessment Technical Report)	Asset Environment Safety	Potential	Potential
Landslide, sudden subsidence, movement of soil or rocks	Asset Environment Safety	Potential	Potential
Wildlife	Safety Environment	Potential	Potential
Biosecurity (e.g. propagation of invasive pests and transport of biohazards)	Safety Environment	Potential	Potential
Naturally occurring asbestos	Safety Environment	No	No

24.7.1.1 Bushfire

The proposal activities have the potential to escalate the risk of bushfire by introducing ignition sources such as welding. Construction activities, particularly the use of temporary facilities, can increase the severity of fire incidents by providing additional fuel, such as combustible liquids storage. Leaks and spills from freight and other machinery can also increase the potential for bushfires.

The proposal is located within rural areas and land that is predominantly used for grazing and agriculture; specifically, North Star and Boggabilla are vulnerable to the risk of bushfires. It is also acknowledged that other assets, including infrastructure, rural-residential properties, agricultural estates, and farming assets are exposed and vulnerable to damage or destruction by bushfire.

Increased bushfire frequency has the potential to result in environmental damage, as well as potential safety and asset loss impacts. The increased temperature predicted, combined with the lower rainfall predicted in the Central Slopes region for the years 2030, 2050, 2070 and 2090 (CSIRO, 2015), will mean a higher drought factor and thus an increased fire weather risk in the future.

The proposal also provides some benefits in the case of a bushfire, such as improved access to the area, acting as a firebreak, and providing the opportunity to involve the local disaster management group/s during construction and operation.

24.7.1.2 Flooding

The proposal crosses one perennial waterway, the Macintyre River, and several ephemeral waterways, including: Whalan Creek, Mobbindry Creek, Back Creek, Forest Creek and an unnamed tributary of Mobbindry Creek. Construction of bridges and rail in the vicinity of water crossings has the potential to affect drainage characteristics, which may impact existing dwellings, sheds, farm buildings and infrastructure, crops and roads.

Hydrology and flooding studies (refer Appendix H: Hydrology and Flooding Technical Report) identified that the proposal can potentially impact flooding characteristics through:

- Changes in peak water levels and associated areas of inundation
- Concentration of flows, redirection of flows and/or changes to flood-flow patterns
- Increased velocities leading to localised scour and erosion
- Changes to duration of inundation
- Increased depth of water affecting trafficability of roads and tracks.

The proposal can also increase risk to the environment and persons if extreme flooding occurs in the operational phase because there is the potential for the spread of dangerous goods should there be a loss of containment of freight.

For further discussion of the potential impacts of flooding, refer to Chapter 13: Surface Water and Hydrology, Appendix G: Surface Water Quality Technical Report, and Appendix H: Hydrology and Flooding Technical Report.

24.7.1.3 Climatic conditions

The potential impacts of climatic conditions that may affect the management of the proposal are generally associated with variability of temperature, wind, rainfall and flooding. As discussed in Section 24.6.1.1, the proposal is subject to a warm sub-tropical climate and is vulnerable to seasonal conditions consistent with the general climate of Northern NSW (i.e. wet and dry seasons). Because of previous events experienced in and around the rail corridor, risks to rail infrastructure, by way of physical damage, delays in schedule and potential risks to human health and safety are likely. The increased frequency and intensity of extreme weather events, increased rainfall, bushfires and rising temperatures are already causing strain on existing rail networks and associated infrastructure. More extreme weather events are likely to damage rail infrastructure and, by 2030, design criteria for extreme events are likely to be exceeded more frequently (Hennessy et al., 2007).

Climate modelling from CSIRO projects an increase in intensity of heavy rainfall events. The heaviest rainfall events usually occur in summer, which is strongly influenced by the easterly trough, and an elongated zone of low-pressure forms as a result of strong surface-heating west of the Great Dividing Range. Summer thunderstorms can be hazardous because of accompanying winds, hail, flash floods and potentially damaging lightning strikes. During the operational phase of the proposal, potential impacts of climatic conditions include tracks buckling because of increased heat events (e.g. heat waves), inundation of tracks and trackside infrastructure from increased flooding, and interruption to power supply or network communications from severe weather events.

For more details on the potential impacts of climatic conditions, including the impacts of flooding under climatic conditions and increases in rainfall intensity (as per *Australian Rainfall and Runoff Guidelines* (BoM, 2019)), refer to Chapter 18: Sustainability and Chapter 13: Surface Water and Hydrology.

24.7.1.4 Landslide, sudden subsidence, movement of soil or rocks

The proposal can impact soil and geology to increase the consequence and/or the likelihood of landslides, sudden subsidence, or movement of soil or rocks, such as:

- Cracking and/or settlement of structures, including sudden subsidence due to the high potential for shrinkage and swelling of the black soils and cracking clays. Cracking may also result from the removal of vegetation with roots in these soils
- Slope instability including sudden subsidence requiring stabilisation of cut faces
- Sudden movement of soil or rock
- Erosion due to the loamy soils on alluvial plains and terraces
- Rock fall onto track due to colluvial loose scree on existing slopes or weathering
- Risks of landslides, slump features and mass wasting due to some instability issues including the erodibility of the Marburg Subgroup.

For further discussion of the impact of landslide, sudden subsidence, movement of soil or rocks, refer to Chapter 15: Land Resources and Contamination.

24.7.1.5 Wildlife

Land clearing for construction and the rail operation can increase wildlife interactions, including the potential for wildlife to be struck by plant equipment or vehicles. Rail operations may impact fauna passages and habit connectivity.

For further discussion of the types of wildlife found in the disturbance footprint, refer to Chapter 11: Biodiversity.

24.7.1.6 Biosecurity

The proposal has the potential to negatively impact land use and biodiversity within the area through:

- Transfer of biosecurity hazards into the disturbance footprint and surrounding areas. This includes hazards that may be transported with goods during operations
- Dispersion and potential encouraged growth of weeds during construction activities by exposing soil and clearing vegetation
- Proliferation of weed and pest species. Weeds can affect the ecological diversity and balance by competing with native flora and reducing available food sources, while pest species can impact native vegetation and wildlife through grazing, digging, trampling and predation. Specifically, the disturbance footprint will traverse areas contained within fire ant biosecurity zones
- Exotic grasses can make bushfires hotter and spread faster.

For further discussion of how the proposal potentially impacts biosecurity, refer Chapter 11: Biodiversity and Appendix B: Biodiversity Technical Report.

24.7.2 Proposal hazards

Activities associated with the construction and commissioning, operation and maintenance phases of the proposal have the potential to cause harm to surrounding environmental, community and other sensitive receptors. Construction activities, including clearing, may impact areas of sensitive environmental value, while operations on the rail alignment may impact nearby communities.

Potential hazards are identified in Table 24.6.

TABLE 24.6 IDENTIFIED POTENTIAL IMPACTS ARISING FROM THE PROPOSAL

Potential hazards	Potential cause	Impact category	Construction	Operation
Health (e.g. fatigue, asbestos, respirable silica, noise, vibration)	Earthworks Land clearing Physical activity	Asset Safety Environment	Potential	No
	Rolling stock	Asset Safety Environment	No	Potential
Road incident	Construction traffic Detours Changing traffic condition	Safety	Potential	Potential
Rail incident	Interface with live rail Concurrent operation Proposal traverses travelling stock reserves	Safety	No	Potential
Pedestrian safety	Proposal traverses private access Level crossing Poor visibility Trespass	Safety	Potential	Potential
Infrastructure and utilities	Buried telecommunication cables Overhead transmission lines	Asset Safety Environment	Potential	Potential
Contaminated land (e.g. hydrocarbons, arsenic, lead paint)	Leaks and spills from freight and vehicles	Asset Safety Environment	Potential	Potential
Overbridges	Structural failure Derailment at elevated track	Asset Safety	Potential	Potential
Emergency access	Restricted access for emergency evacuation Restricted emergency vehicle route Restricted fire trail	Safety	Potential	Potential
Dangerous goods	Storage, handling, use and transport	Asset Safety Environment	Potential	Potential (freight)
	Explosive (e.g. potential blasting for borrow pits)	Asset Safety Environment	Potential	Potential

24.7.2.1 Health

Proposal activities have the potential to impact the health of site workers and the local community.

Mental health

There is potential for stress related to proposal uncertainties (e.g. concern about flooding impacts) to affect the mental health of some people, particularly those who live in proximity to the proposal. There is also potential for changes to the environment near Toomelah to contribute to stress or mental illness.

The proximity of the proposal within walking distance of Toomelah, which has a high-risk profile for substance abuse and mental illness, increases the possibility of suicide by people with mental health issues or who are experiencing trauma.

Conversely, the proposal also represents a positive contribution to the regional community by increasing employment opportunities for up to 350 construction personnel and up to 20 operations personnel, which may support mental health by enabling financial and housing security, self and family care, and social connections.

Refer Chapter 23: Socio-economic Impact Assessment for further details on potential mental health impacts.

Fatigue and heat stress

Heat stress can lead to cramps, dizziness, disorientation, exhaustion and, in severe cases, death. Fatigue can increase the risk of incidents, for example, errors during equipment operation or misjudging the speed and distance of approaching traffic. The onset of fatigue can lead to poor decision making, lack of alertness, and slower reaction to a situation. In this way, fatigue and heat stress can impact surrounding communities through escalation of incidents initiated by the proposal.

Asbestos

Disturbance of asbestos-containing materials can result in the release of airborne fibres. Asbestos fibres are carcinogenic and have significant potential health impacts over the long term. Asbestos fibres released into the environment are persistent and can result in contamination of soil.

Impacts associated with asbestos release are generally limited to the local environment. The extent of potential impacts are influenced by the quantity and type of asbestos-containing material and weather conditions during disturbance. The inappropriate handling of asbestos material, such as improper disposal and transport, can also contribute to widespread impacts.

No naturally occurring asbestos has been found to be present during geotechnical investigations undertaken to date; however, asbestos-containing materials may be present in infrastructure within the disturbance footprint including sheds and houses as well as rail infrastructure (e.g. signal boxes, insulation) associated with the non-operational Boggabilla rail line,

Dust, respirable silica and other airborne contaminants

Earthworks and truck movements over unpaved surfaces during construction (e.g. land clearing and blasting) result in the disturbance of surface material, which may generate airborne contaminants (e.g. silica) affecting sensitive receptors including flora downwind. High levels of silica exposure can lead to the development of lung cancer, acute and accelerated silicosis, kidney disease, and chronic obstructive pulmonary disease (Cancer Council, 2019). For the general community, the risk of exposure to respirable crystalline silica is very low; however, low levels of silica dust exposure can lead to chronic silicosis. This causes fibrotic nodules and shortness of breath if the exposure is repeated for a long period.

Other aerosol emissions from construction activities include combustion products from the operation of diesel engines. These pollutants include carbon monoxide, nitrogen dioxide and particulate matter, which make up a large proportion of airborne dusts and can be drawn deep into the lungs. Carbon monoxide reduces the amount of oxygen that can be carried by haemoglobin, which then leads to a lack of blood supply to vital organs (DoEH, 2005a). Both nitrogen dioxide and particulate matter can cause respiratory problems (DoEH, 2005b). Some airborne contaminants can also impact sensitive receptors by entering sources of water open to the air, such as personal water tanks. Potential sources of pollution can come from:

- Erosion of exposed areas such as cleared vegetation, uncovered stockpiles and haul roads have the potential to generate dust depending on the prevailing meteorological conditions.
- Dust can be generated during operation, owing to dust creation from the train movement or loss of containment of transported materials such as coal.

For further information of how the proposal potentially impacts air quality, refer to Chapter 17: Air Quality.

Noise and vibration

Given the rural context, with ambient noise levels likely to be relatively low, receivers, including residents of North Star, will possibly be more sensitive to construction and operation noise.

The proposal traverses land that is slightly undulating with limited opportunity for natural screening. As such, construction plant and equipment may impact the local ambient noise environment during standard hours where construction activities are being carried out.

Earth-moving machinery, vibratory rollers and impact plant such as piling rigs and hydraulic hammers are likely to result in perceptible vibration impacts for sensitive receivers, but typically dissipates to negligible levels within 50 to 200 m of the vibration source. Blasting and pilling activities also generate high levels of noise and vibration.

Exposure to loud noise and vibration over an extended period are expected to result in human discomfort, which may include:

- Disturbance to sleep pattern and quality
- Reduction in level of concentration and slower reaction times
- Increase in stress and depression level affecting mental wellbeing.

Additionally, vibration can cause damage to infrastructure, which can lead to asset damage of both the proposal infrastructure and surrounding infrastructure sensitive receptors. Damaged infrastructure has the potential to physically harm humans.

Noise and vibration will be acute and temporary during the construction phase because of the requirement of construction plant, vehicles, equipment (including earth moving machinery, vibratory rollers, and hydraulic hammers) and activities such as blasting; however, train and freight movements will also be a potential source of noise pollution and vibration during the operations phase.

For detailed discussion of noise and vibration impacts associated with the proposal, refer to Chapter 16: Noise and Vibration, Appendix J: Construction Noise and Vibration Technical Report and Appendix K: Operational Railway Noise and Vibration Assessment.

24.7.2.2 Incidents

Incidents that could potentially occur within, or in the vicinity of the disturbance footprint, arise from increased traffic on roads, concurrent operation of trains, trespassing and interactions at level crossings. Further information regarding traffic interactions and assessment of conditions can be found in Chapter 20: Traffic and Transport.

Road incidents

Increased light and heavy vehicle traffic on Bruxner Way, Tucka Tucka Road and other roads in the local area surrounding the proposal is expected during the construction phase of the proposal. Vehicles used during construction and maintenance include graders, loaders and light vehicles. Construction and maintenance vehicles operating on roads and access roads around the proposal site can create interface conflict with local roads and access roads.

Altered traffic conditions such as detours, restricted lane widths and temporary access points may also result in accidents during the construction phase. Changes in road access, including increased road–rail interface, has the potential to decrease the accessibility and increase travel times for local residents.

Road routes can be interrupted by minor motor vehicle accidents or interactions with wildlife. Major road interruptions usually arise from heavy vehicle use or accidents involving vehicles carrying hazardous chemicals. Heavy vehicles may also increase the risk of accidents occurring that could cause serious injury or death. The consequence of this type of accident could affect the capacity of emergency and essential services and cause disruption to essential road freight networks for the supply of goods.

Private access and travelling stock reserve

Consultation and community engagement carried out to date has identified that livestock and machinery move across North Star Road, Tucka Tucka Road and Bruxner Way on regular basis. The potential upgrade of the rail line at the interface of these roads and access routes has been raised as a key change for landowners using the rail corridor and road reserve to move stock and machinery between properties.

Within NSW, there are three travelling stock reserves (TSRs) that cross the proposed rail alignment: parallel to Tucka Tucka Road, discontinuous around North Star Road/Bruxner Way/Oakhurst Road, and near Scotts Road/North Star Road.

TSRs allow safe movement of stock between locations as well as protect threatened species. Sharing of land uses can create conflict of rolling stock encountering wildlife, potentially causing livestock loss, interrupting livestock transport and food supply.

The state TSR network is primarily used by the pastoral industry as:

- An alternative to transporting stock by rail or road
- Pasture for emergency agistment
- Long-term grazing.

Local Land Services are reviewing the management of TSRs in NSW. The reference design for the proposal has sought to maintain the integrity (connectivity and functionality) of the local TSR network.

Refer Chapter 23: Socio-Economic Impact Assessment for further discussion on private land-use impacts.

Rail incidents

Increased frequency of rail movements during the operational phase will increase the potential of rail incidents, including derailment. The impact of rail incidents increases significantly when considering the freight of dangerous goods. Derailments can result in significant damage to people, property, and the environment, depending on the location of an incident and the contents of the freight train involved.

As shown in Table 24.4, derailments are possible. Historical incident data indicates a potential annual frequency of 0.464 per million freight train kilometres based on 2015 to 2019 four year's average data (ONRSR Rail Safety Report 2018–2019). Other events include vehicle strikes at level crossings, running line collisions with rolling stocks and trespassing.

Refer to Chapter 20: Traffic and Transport for more information regarding the interactions between operating trains.

Level crossing and pedestrian safety

During the feasibility design phase, existing and proposed road–rail interface locations, including level crossings, were identified in consultation with affected local government areas and landowners. The location and preferred treatment for each road–rail interface will be further reviewed in consultation with affected landowners during the detailed design phase. There are currently active and passive level crossings proposed for the proposal.

Level crossings can introduce dangerous points at which trains, cars and pedestrians meet. Level crossings introduce the potential for collisions between heavy vehicles and fully loaded rolling stock, which may result in loss of life and impacts to communities. Such crashes can have a significant social and economic impact.

While the assessment recognises that human factors and on-road user behaviours similarly contribute to level crossing incidents, the number of tracks and the speed of trains approaching these crossing points are also prominent factors that determine potential impacts.

The proposal is likely to have both positive and negative effects on community mental health. It represents a positive contribution to the regional community by increasing employment opportunities; however, evidence shows that access to a lethal means is a key risk factor in turning thoughts of suicide into actual suicide and a rail line provides such lethal means. This impact on mental health is addressed in Appendix O: Social Impact Assessment Technical Report.

Road–rail interfaces

The proposal includes five public level crossings. Level crossings can introduce dangerous points at which trains, cars and pedestrians meet.

Within areas of agricultural land use, interactions between stock and farm equipment and operating trains are also a potential risk. Improper access to the rail track by trespass, during movement of farm equipment or by travelling stock can result in rail incidents such as train strikes.

Most level crossing incidents are classified as 'near-miss' incidents between trains, road vehicles and pedestrians. While rare, actual collisions can occur at level crossings, which can cause property damage, service disruptions, impact to adjacent infrastructure, injury and, in most traffic cases, death.

While the assessment recognises that human factors and influence on road-user behaviours contribute to level crossing incidents, the number of tracks and the speed of trains approaching crossings are also prominent factors that determine the potential impacts. These are all considered as part of the national Australian Level Crossing Assessment Model (ALCAM).

24.7.2.3 Safety

Underground and overhead services

Approximately 40 existing utilities within 60 m of the disturbance footprint (i.e. 30 m either side of the disturbance footprint) would be impacted. Construction activities around existing services introduce a risk of service strikes to underground utilities during excavation (e.g. underground gas pipelines) or collision of plant and equipment with aboveground services (e.g. transmission lines). Other risks to existing services include vibration from piling and blasting activities, along with the movement of construction equipment.

Interactions with existing services could pose a risk to public safety and the natural environment and habitat. Damage to or contact with services during construction could result in service outage to nearby communities.

The following high-risk utilities have been identified as being impacted by the proposal:

- 24 Telstra communication asset clashes, consisting of copper and optic fibre cables
- 14 Essential Energy electrical asset clashes, consisting of 22kV and 66kV overhead powerlines (two assessed as high risk)
- 1 Moree Plains Shire council water reticulation asset clash—a PE100 pipe
- 1 private ground water bore clash—10.3 m deep.

Contaminated land

Construction activities in existing rail corridors have the potential to generate contaminated waste as a product of demolition of existing services, excavations and drainage construction.

The probability of encountering ASS is generally considered low; however, in the unlikely event ASS is present, disturbance/exposure can generate sulfuric acid, iron, aluminium and sometimes heavy metals. Excavation activities can expose ASS and cause major impacts to the environment and to infrastructure.

The construction activities will also introduce the production of waste either as waste from construction materials or domestic waste from works. Domestic waste can attract vermin, while hazardous waste can pollute groundwater. Construction can also cause contamination as a result of spills or leaks from construction equipment and site compounds.

There is also the potential for contamination to occur during operation, as a result of fuel or oil spills, leaks from trains or transportation of hazardous materials. The extent and severity of land contamination will depend on the type of incident and where it is in the landscape (e.g. crossing loops over waterways); however, leaks and minor spills are generally expected to have limited extent and will generally be confined to areas within the rail corridor.

Chapter 15: Land Resources and Contamination presents further discussion on the potential impacts that the proposal could have on land contamination, while Appendix R: Laboratory Certificates provides the searches of the Environmental Management Register or Contaminated Land Register to determine existing land uses that may have caused contaminated land. Appendix N: Groundwater Technical Report presents further details on the potential impacts of contamination of groundwater.

Bridges

The proposal includes two rail-over-road bridge crossings of major transport infrastructure, including Bruxner Way and Tucka Tucka Road.

Structural failures of bridge crossings have the potential to impact major transport corridors, along with the local road networks, and could result in significant harm to motorists, railway workers and, where applicable, railway passengers. As the bridges could be used for freight transport of dangerous goods, collapse or damage to rail bridges can lead to freight falling from elevated tracks, loss of containment, and spills of hazardous materials resulting in environmental damage.

Emergency access

The disturbance footprint crosses rural residential areas, large-lot grazing areas of North Star and Boggabilla. The increase in the number of construction vehicles and oversize machinery along the construction corridor has the potential to impact the existing fire trails in the vicinity, reducing access to bushfire response.

Additionally, construction activities may also introduce obstruction and congestion on adjacent (existing) public roads, which could impact private landowner evacuation during emergency incidents (e.g. bushfire). Failure to accommodate for emergency access or the provision of poor access can result in interaction with emergency vehicles, delays in response or rescue time and even fatality in the event of emergency.

The proposal includes 39 culvert locations and 9 rail-over-water bridges that cross the Macintyre River floodplain and associated tributaries. Bridges can potentially cause scouring impacts on creek beds and disturb the natural waterways, and there is potential to increase the extent or duration of flooding of local roads within Macintyre River floodplain. This could lead to road closure and restrict movement of emergency vehicles.

24.7.3 Dangerous goods and hazardous chemicals

The proposal has been assessed against the criteria for potentially offensive developments and potentially hazardous developments provided in SEPP 33 and Applying SEPP 33 (Department of Planning, 2011) respectively. Classification is necessary as potentially offensive or hazardous developments guide the requirements for hazard management and would form the basis for hazard assessments completed as part of this EIS.

24.7.3.1 Potentially offensive development

SEPP 33 defines a 'potentially offensive development' as:

'A development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.'

The proposal is a potentially offensive development due to the potential for impacts during construction and the ongoing freight transport of potentially offensive materials as per Schedule 3 of the Environmental Planning and Assessment Regulation 2000. The proposal is also considered to have possible impacts based on noise and air releases.

Potential noise and air pollution impacts associated with the proposed modification have been assessed in Chapter 16: Noise and Vibration and Chapter 17: Air Quality.

24.7.3.2 Potentially hazardous development

SEPP 33 defines a 'potentially hazardous development' as:

'A development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:

a. to human health, life or property, or

b. to the biophysical environment,

and includes a hazardous industry and a hazardous storage establishment.'

The proposal is not strictly a hazardous industry nor a hazardous storage establishment in the context of the SEPP 33. The proposal will, however, involve the storage of hazardous chemicals during construction and maintenance, and the ongoing transport of freight, including hazardous chemicals. As such, assessment against the SEPP 33 criteria has been conducted.

To determine the appropriate level of risk assessment for the development, a preliminary hazard screening was carried out in accordance with applying SEPP 33 (2011). Both the storage and handling of hazardous chemicals at construction facilities during construction and a consideration of potential freight transport were applied.

The storage and handling assessments against the SEPP 33 guidelines for hazardous chemicals considered throughout the proposal lifecycle are outlined in:

- Section 24.7.3.3—Construction and maintenance chemicals
- Section 24.7.3.4—Freight.

24.7.3.3 Construction and maintenance chemicals

The construction, operational and decommissioning phases of the proposal will involve the use and storage of hazardous chemicals, including fuel, lubricant, oil, solvents, degreaser, concrete and other cleaning agents. Chemicals used during decommissioning activities are expected to be similar in type and usage to construction requirements. The storage and handling of hazardous chemicals introduce potential impacts associated with material properties such as flammability, corrosiveness and toxicity. Significant releases of hazardous chemicals can impact nearby sensitive receptors, particularly sensitive environmental areas and communities.

The expected list of chemicals used throughout the proposal lifecycle, along with their purpose and dangerous goods details or status are presented in Table 24.7. The majority of chemical requirements are Class 3 flammable liquids and combustible liquids, such as diesel fuel, which have the potential to cause fires or escalate the risk of bushfires; although, their high flash points (temperature at which the chemical will ignite in air) reduce the potential for small incidents to create significant consequences. Generally, low volumes of hazardous chemicals would be stored in laydown areas within the disturbance footprint for construction near to points of use. The quantities stored will be equivalent to the demand for activities within that area of the proposal.

Constructability investigations have identified proposed chemical storage locations and quantities to be stored throughout the construction phase based on the planned execution of works within the disturbance footprint. Predictions of operational chemical requirements are based on expectations for rail activities across similar proposals. While the chemical quantities may change due to operational requirements and refinement during detailed design, the types and indicative quantities identified below are considered to represent the usage requirements.

During the construction phase, the following facilities are expected to be provided, which will include facilities for the storage and distribution of construction chemicals:

- Laydown areas to be located at each bridge and throughout the disturbance footprint, which will include small quantities of lubricants and oil (e.g. drum and intermediate bulk container package stores)
- Diesel fuel depots have the potential to be located in large construction laydown areas along the disturbance footprint, which could include volumes of up to 40 kilolitres (kL) bulk storage of diesel
- Although dangerous goods incidents are not expected to occur during construction, incidents would generally be limited to the local area of storage; although, there is the potential for incidents to spread via drainage lines and overland flow pathways.

The locations of the laydown areas have been chosen to avoid areas that are within the 1% Annual Exceedance Probability (AEP) floodplains, where possible; however, by virtue of the requirement of laydown areas for constructing bridges, some laydown areas must be within flood plains and near watercourses.

Specifically, the laydown areas for bridges crossing the Macintyre River, Mobbindry Creek, Forest Creek, Back Creek and Whalan Creek are located on a floodplain with nearby low-lying watercourses. While the proposal cannot preclude the storage of hazardous materials in laydown locations within the 1% AEP, contractors will be required to prepare and implement a Hazardous Materials Management Sub-plan as a component of the CEMP and locate laydown areas in suitable locations, e.g. away from residential housing and remnant vegetation.

Operational usage of chemicals is expected to be required throughout the rail corridor and will typically involve the temporary storage of limited quantities during specific maintenance activities.

Indicative chemical storage and usage details are provided in Table 24.7.

TABLE 24.7 INDICATIVE LIST OF DANGEROUS GOODS AND HAZARDOUS SUBSTANCES

Chemical type	Typical chemicals	Design lifecycle stage	Purpose/ use	Dangerous goods class	Packing group	Indicative rate of use	Expected storage method
Fuel oil	Diesel	Construction Operation	Fuel for mobile equipment	Combustible liquid (C1)*	III	40 kL/2 weeks	40 kL bulk storage (fuel depots)
Grease	Rocol Rail Curve Grease	Construction Operation	Lubricate plant and equipment	Combustible liquid (C2)**	N/A	Limited	Package storage
	Caltex 904Grease	Construction Operation	Lubricate plant and equipment	Combustible liquid (C2)**	N/A	Limited	Package storage
	Shell GADUS Gauge Face Curve Grease	Construction Operation	Lubricate plant and equipment	Combustible liquid (C2)**	N/A	Limited	Package storage
	RS Claretech Biodegradable Grease	Construction Operation	Lubricate plant and equipment	Combustible liquid (C2)**	N/A	Limited	Package storage
Explosives	Ammonium Nitrate	Construction	Borrow pit operations	Oxidising substances (5.1)	III	As required for construction	Not stored for proposal
	Blast caps, detonators, boosters etc	Construction	Borrow pit operations	Explosives (1)	N/A	As required for construction	Not stored for proposal
Concreting	Concrete and Concrete Residue	Construction	Concreting for slab construction	N/A	N/A	As required for construction	Truck deliveries from Goondiwindi or Moree
	Concrete Curing Compound	Construction	Concreting for slab construction	N/A	N/A	As required for construction	Truck deliveries from Goondiwindi or Moree
Welding gases	Oxygen	Construction	Welding	Non-flammable, non-toxic gases (2.2)/ Oxidising substances (5.1)	N/A	Cylinders and/or manifold packs as required for construction	Cylinder storage
	Acetylene	Construction	Welding	Flammable gases (2.1)	N/A	Cylinders and/or manifold packs as required for construction	Cylinder storage
Pesticides	Australian Pesticides and Veterinary Medicines Authority Approved Pesticides	Construction Operation	Pests and weeds control	Toxic substances (6.1) or Miscellaneous dangerous substances and articles (9)	II or III	As required	Not stored for proposal

Table notes:
*Class C1—a combustible liquid that has a flashpoint of 150 °C or less
**Class C2—a combustible liquid that has a flashpoint exceeding 150 °C

For the construction chemicals identified in Table 24.7, the screening assessment against the criteria of SEPP 33 is presented in Table 24.8.

The list of chemicals is compared to the storage and transport thresholds in SEPP 33. These thresholds represent the maximum amounts of dangerous goods that can be stored or transported to and from the proposal site without causing a significant risk to offsite receptors.

TABLE 24.8 HAZARDOUS CHEMICALS SCREENING ASSESSMENT

Chemical class	Storage scenario	Storage quantity	SEPP 33 thresholds	Potentially hazardous
C1	Bulk tank storage of diesel at fuel depots	40 kL	N/A—If combustible liquids of class C1 are present onsite and are stored in a separate bund or within a storage area where there are no flammable materials stored, they are not considered to be potentially hazardous.	No
C2	Package storage of grease, oils and lubricants	Variable—package storage	N/A	No
Class 2.1	Acetylene and fuel gas cylinders used for welding/ construction work	Variable—cylinder storage as required (<1 tonne)	50 m to sensitive land use	No
Class 2.2/5.1	Oxygen cylinders associated with welding works	Variable—cylinder storage as required	N/A	No
Class 6.1	Pesticide for construction and operational control of weeds	<1 tonne	2.5 tonne	No

The construction facilities are typically located in remote areas and achieve the 50 m separation distance to sensitive land uses in the context of land-use safety planning; therefore, the construction facilities are not considered to be potentially hazardous based on the storage of dangerous goods and hazardous chemicals.

Traffic assessments for the construction phase are detailed in Chapter 20: Traffic and Transport.

Expected dangerous goods vehicle movements are not expected to exceed the SEPP 33 screening criteria during construction activities for each site.

24.7.3.4 Freight dangerous goods

The proposal will enable freight transport as part of the larger Inland Rail Program. The design of the freight system, including bridges, allows for the transport of dangerous goods. ARTC has indicated that the rail corridor is intended to be used for the freight of all classes of dangerous goods, excluding explosives. ARTC cannot provide an exhaustive list of the types and quantities of dangerous goods that will be transported; however, explosives will not be included, and transportation of any other dangerous goods will be managed under the Australian Dangerous Goods Code.

Operational transport of dangerous goods associated with freight activities has a risk of loss of containment during incidents such as derailment. Loss of containment of dangerous goods could have severe consequences depending on the location and type of goods. Minor leaks and spills are expected to be limited to within the rail corridor.

Where the proposal traverses areas of environmental sensitivity, such as watercourses, there is the potential for loss of containment events to significantly damage the environment through the release of toxic, corrosive or flammable materials.

Fires and the release of harmful chemicals can result in injuries and fatalities. Other potential loss of containment from flammable liquid, solid or gas and toxic chemicals, can also create major incidents such as pool fire, jet fire, explosion or toxic release.

Although explosives are not intended for freight, ammonium nitrate may be transported as a Class 5.1 dangerous good. When mixed with fuel, such as diesel, ammonium nitrate can explode with similar effects to that of Class 1 explosives. Additionally, ammonium nitrate is at risk of explosion if exposed to a heat source or ignition source, especially when in a confined space. Ammonium nitrate is regulated under the Explosives Regulation 2013 if it is defined as a security sensitive dangerous substance. Security sensitive dangerous substances including ammonium nitrate or any Class 1 explosive will not be freighted during the operational phase.

ARTC does not own or operate rolling stock; however, the transportation of dangerous goods on the proposal by independent operators will require authorisation by ARTC. The quantities and types of dangerous goods that may be present as freight, and the allowance of bulk and packaged dangerous goods, will be managed in accordance with the requirements of the Australian Dangerous Goods Code.

Based on the variability of potential types and quantities of dangerous goods, there is the potential for freight activities to have significant impact on people, property and the environment surrounding the disturbance footprint. Accidents involving dangerous goods freight trains have the potential to create hazards for people and the environment associated with the properties of dangerous goods, including flammability, toxicity (people and environmental) and corrosiveness.

24.7.3.5 Explosives

Explosive are classified as Class 1 dangerous goods. The proposal does not require significant cutting or the construction of tunnels that may require the use of explosives; however, borrow pit operations are expected to require explosives based on the location and geotechnical properties of the identified locations. Ammonium nitrate explosives are hazardous by nature and may result in harm to the environment and people during storage, handling or transport in the event of inadvertent detonation. Blasting activities associated with construction work also introduces hazards to the surrounding environment through noise and vibration. Noise and vibration impacts are discussed in detail in Chapter 16: Noise and Vibration.

The generation of dust from poorly managed blasting can create dust clouds, which may contain high concentration of dust particulates. This can cause health impacts to the construction workers as well as nearby communities. Further information is presented in Chapter 17: Air Quality.

Explosives require specific storage and handling procedures and licencing, such as those described by the *Explosives Act 2003* (NSW). The specific 'blasting explosive user licence' form must be completed in line with the *Explosive Act 2003* (NSW) and Explosives Regulation 2013 (NSW) and the 'notification of blasting activity' form needs to be lodged with SafeWork NSW at least seven days before blasting works commence in line with the Explosives Regulation 2017. Construction methodologies are being evaluated and have considered the requirements for explosives use.

24.8 Potential mitigations

24.8.1 Design considerations

The mitigation measures and controls presented in Table 24.9 have been incorporated into the feasibility designs for the proposal. These design measures have been identified through collaborative development of the design and consideration of environmental constraints and issues, including proximity to sensitive receptors. These design measures are relevant to both construction and operational phases of the proposal.

TABLE 24.9 INITIAL MITIGATION OF RELEVANCE TO HAZARD AND RISK

Aspect	Initial design mitigations
Natural hazards	
Flooding	▸ The design of the proposal has been developed to comply with ARTC standards such as: ▸ *Engineering Practice Manual for Track Drainage—Inspection and Maintenance* ▸ *Engineering Practice Manual for Track Drainage—Design and Construction* ▸ *Engineering Practice Manual—Flooding* ▸ *Engineering Practice Manual—Structures* ▸ *Engineering Code of Practice—Flooding and Automatic Rainfall Monitoring.* ▸ *AS 7637:2014 Railway Infrastructure: Hydrology and Hydraulics* ▸ *Australian Rainfall and Runoff: A Guide to Flood Estimation* (Geoscience, 2016).

Aspect	Initial design mitigations

Flooding	▸ The proposal has been designed to achieve a 1% AEP flood immunity and at the same time minimise unacceptable impacts upon the existing flooding and drainage regime, except for connections to existing infrastructure that has an existing lower immunity.
	▸ Key strategies incorporated into the design include:
	  ▸ Use of bridge and culvert structures to maintain existing flow paths and flood flow distributions
	  ▸ Locating and sizing bridge and culvert structures to avoid unacceptable increases in peak water levels, velocities and duration of inundation
	  ▸ Inclusion of scour and erosion protection measures in areas at risk.
	▸ Local and regional flooding event—drainage design has been undertaken to control cross flow and longitudinal flow from local and regional catchments to ensure the rail alignment has the required immunity and there are minimal impacts upstream.

Climatic Conditions	▸ The design of the proposal has been developed to comply with ARTC standards. Operation and maintenance practices according to ARTC Standard *ETM-06-08 Managing Track Stability* (and associated standards), provide the means for managing buckling force by establishing and re-establishing, if necessary, the correct stress-free temperature, and managing the track resistance to buckling. ETM-06-08 includes preparation of Track Stability Management Plans (TSMP), required for each section of track, which outline the activities to ensure track stability during hot weather. The plans are reviewed at the end of the high temperature season each year, at which time the trigger temperature for imposing speed restrictions and undertaking inspections is re-evaluated. Yearly review of the TSMP will provide a currency in management practice through changes in seasonal conditions. The reference track structure design has allowed for temperature-based adjustment in operation particularly with regard to rail stress, to minimise chance of buckling incidents. This is an ongoing procedure that provides adequate track management in changing seasonal conditions.

Landslide, sudden subsidence, movement of soil or rocks	▸ Design and ratings of earthwork and geotechnical structures including culverts, viaducts, and bridges has been developed in accordance with geotechnical investigation findings and slope design. ARTC existing requirements that the proposal complies with include:
	  ▸ *ARTC Engineering Code of Practice—Earthworks*
	  ▸ *ARTC Engineering Code of Practice—Structures*
	  ▸ *AS 5100 Bridge Design*
	  ▸ *AS 7636 Railway Structures* and other applicable Australian Standards.

Proposal hazards	
Rail incidents	▸ The elements of the railway including railway radius curves and vertical grades has been designed to prevent uncontrolled movement. ▸ Rolling stock has been designed in accordance with *ARTC Engineering Code of Practices* which nominate the applicable industry and Australian Standards.

Road–rail interfaces	▸ The design of the proposal has been developed to complied with ARTC standards and Australian Standards and guidelines, including:
	  ▸ *AS 1742.7:2016 Manual of Uniform Traffic Control Devices, Part 7: Railway Crossings* (Public Crossings)
	  ▸ *AS 7637:2014 Railway Infrastructure: Hydrology and Hydraulics.*
	▸ The appropriate road–rail interface treatment has been assessed case-by-case for design purposes, with consideration given to current and future usage, its location relative to other crossings of the rail corridor and the road and rail geometry at the crossing location.
	▸ In the development of the proposed treatments, ARTC have taken into consideration state and national guidelines and strategies.
	▸ Treatments for public road–rail interfaces have been categorised as:
	  ▸ Grade separated crossings—road and rail cross each other at different heights so that traffic flow is not affected
	  ▸ Level crossings—road and rail cross each other at the same level. Level crossings have either passive or active controls to guide road users
	  ▸ Passive—have static warning signs (e.g. stop and give way signs) that are visible on approach and are unchanging with no mechanical aspects or light devices
	  ▸ Active—flashing lights with or without boom barriers for motorists, and automated gates for pedestrians. These devices are activated prior to and during the passage of a train through the level crossing.

Aspect	Initial design mitigations
	▸ To assess potential level crossings locations, ARTC used ALCAM , which considers factors such as future road traffic numbers, vehicle types, train numbers, speeds and sighting distances. ▸ The proposal will be fenced with three- or four-strand barbed wire fence, except where fauna fencing or superior fencing is specified. The fencing is reflective of the largely agricultural land use of the proposal and seeks to ensure that stock and people do not enter the railway line. It is also consistent with fencing used in other sections of the line. Where superior fencing is required near roads or where trespass is likely to occur, a 1.8 m chain wire fence is proposed.
Underground and overhead services	The design of the proposal has been developed to complied with ARTC standards and Australian Standards and guidelines, including *AS 4799:2000 Installation of Underground Utility Services and Pipelines Within Railway. Boundaries.* ▸ Site investigations of the corridor have been undertaken to identify underground and overhead utility hazards. Inspections have focused on identifying soil conditions, trenches, pits, bores, standing water and any potentially dangerous obstruction, in accordance with ARTC's *Underground/Overhead Services Work Method Statement*.
Contaminated land	▸ Potential sources of contamination, including registered sites, hazardous facilities and known areas of dryland salinity and ASS risk, have been identified within the corridor and mapped using Geospatial Information System (GIS).

Bridges	▸ Risk of ballast dropping from rail-over-road bridges has been mitigated by incorporating *ARTC's Construction Specification* into the track design, such as the *ARTC Engineering Code of Practice—Ballast.* This code requires that ballast profile for concrete sleepers or timber sleepers achieve enough height and width for their corresponding nominal freight speed.
	▸ Design upholds the following ARTC and Australian Standards:
	  ▸ *Engineering Code of Practice—Earthworks*
	  ▸ *Engineering Code of Practice—Structures*
	  ▸ *AS 5100 Bridge Design*
	  ▸ *AS 7636 Railway Structures* and other applicable Australian Standards.

Dangerous goods and hazardous chemicals hazards	
Freight dangerous goods	▸ The rail corridor is intended to be used for the freight of all classes of dangerous goods.

24.8.2 Proposed mitigation measures

To manage proposal risks, a number of mitigation measures have been proposed for implementation in future phases of proposal delivery, as presented in Table 24.10. These proposed mitigation measures have been identified to address proposal-specific issues and opportunities, including legislative requirements and accepted government plans, policies and practices. Table 24.10 identifies the relevant proposal phase, the aspect to be managed, and the proposed mitigation measure, which is then factored into the assessment of residual risk/significance in Table 24.11.

Chapter 27: Environmental Management Plan provides further context and the framework for implementation of these proposed mitigation measures.

24.9 Impact assessment

24.9.1 Risk assessment

Potential impacts to people, property and the environment associated with the proposal in the construction and commissioning, and operation phases are outlined in Table 24.11. These impacts have been subjected to a risk assessment as per the methodology detailed in Section 24.4 and Chapter 10: Assessment Methodology.

The initial risk assessment is undertaken based on the design measures in Table 24.9 being incorporated into the proposal design.

Proposed mitigation measures, listed in Table 24.10, were then developed and applied as appropriate to the phase of the proposal to reduce the level of potential impact.

The residual risk level of the potential impacts was then reassessed after the proposed mitigation measures were applied. The pre-mitigated risk levels were compared to the residual risk levels in order to assess the effectiveness of the mitigation measure.

TABLE 24.10 HAZARD AND RISK MITIGATION MEASURES

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

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

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

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

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

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

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

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Operation	Natural	Bushfire	▸ Existing ARTC management plans and strategies including Engineering (*Track and Civil*) *Code of Practice—Section* 17 *Right of Way, Fire Prevention Management and Total Fire Ban Engineering Procedures* will be applied throughout the proposal lifecycle to minimise damage to property and maximise the safety of people ▸ The ARTC *Engineering (Track and Civil) Code of Practice—Section 17 Right of Way: Vegetation Management* will be implemented to minimise fire risk within the rail corridor, which includes specifications for vegetation management/fire hazard reduction within the corridor ▸ Local fire authorities and local emergency services will be consulted to ensure appropriate operational actions are taken, such as providing feedback on the firefighting vehicles accessibility, Fire Prevention Plans and cooperation on burning-off activities.
	Natural	Flooding and flash flooding	▸ Established site safety protocol (procedures, warnings, depth, indicators, etc.) ▸ Inspections and assessments will be carried out regularly to identify drainage defects that impact the operation of the proposal.
	Natural	Landslide, sudden subsidence, movement of soil or rocks	▸ Regular earthworks inspections will be implemented to determine defects and conditions that may affect or indicate problems with the stability of earthworks.
	Natural	Climatic conditions	▸ Operations on the corridor will comply with the ARTC *Route Access Standard General Information Route Standards: Speed Restrictions During Hot Weather* ▸ ARTC Standard *ETM-06-08 Managing Track Stability* will be employed to ensure integrity of the track during increased extreme heat events. The *Track Stability Handbook* (ENT-06-01) will be used as guide for track buckling mitigation plans through managing track stability. These will ensure regular rail inspection, maintenance, and de-stressing of the rail to maintain track stability during both seasonal and annual temperature fluctuations. The track structure design has allowed for temperature-based adjustment in operation.
	Natural	Wildlife	▸ Stock fencing, fauna fencing and wildlife permeability structures will be inspected and maintained as per ARTC *Engineering (Track and Civil) Code of Practice—Section 17 Right of Way: Inspection and Assessment* (ARTC, 2013).
	Natural	Biosecurity	▸ Pest and weed management will be carried out within the rail corridor in accordance with the ARTC *Engineering (Track and Civil) Code of Practice—Section 17 Right of Way: Vegetation Management* (ARTC, 2013) ▸ Adhere to quarantine rules and regulations.
	Proposal	Noise and vibration	▸ During the operational phase, environmental management will be managed in accordance with ARTC's Environmental Management System (EMS), which will incorporate the requirements of the Outline EMP, as appropriate, in line with the Noise and Vibration Management Sub-Plan ▸ Adhere to the Noise and Vibration Management requirements as per ARTC standards ▸ Noise and vibration sources from maintenance work involving heavy machinery will incorporate appropriate noise mitigation equipment in compliance with relevant state policy and guidelines.

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Operation	Proposal	Asbestos	▸ Adhere to *Work Health and Safety Work Instruction for Asbestos* (Safe Work Australia, 2018a), along with Safe Work Australia *Model Code of Practice—How to Manage and Control Asbestos in the Workplace 2016* (Safe Work Australia, 2020) and Safe Work Australia *Model Code of Practice—How to Safely Remove Asbestos 2018 (*Safe Work Australia, 2018b).
	Proposal	Dust, respirable silica and other airborne contaminants	▸ Trains to minimise idling time near sensitive receivers (where possible) ▸ Operators must ensure that significant dust-generating activities on the proposal are managed in a proper and efficient manner to minimise dust emissions and comply with any relevant conditions of approval ▸ Conduct proactive community consultation where undertaking operational works with potential for adverse air quality impacts.
	Proposal	Road–rail interface Pedestrian interface at level crossings	▸ ARTC will conduct routine inspections of crossing infrastructure, in accordance with ARTC *Engineering (Track and Civil) Code of Practice—Section 17 Right of Way: Inspection and Assessment* (ARTC, 2013) and will regularly review crossing performance and incident information to identify and remedy potential hazards ▸ ARTC is committed to continued delivery of railway safety messages to the community, in line with the Social Impact Management Plan (SIMP), through the awareness activities, community engagement activities and campaigns to increase public awareness.
	Proposal	Bridges	▸ Safety elements for double stacked freight trains such as loading requirements, centre of gravity and inspections for rolling stock are required to meet the organisational rolling stock and loading requirements to ensure stability and prevent excessive movements of loads and containers during train movements or severe weather events.
	Proposal	Emergency access	▸ Local fire authorities and local emergency services will be consulted to ensure appropriate operational actions are taken.

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

	Proposal	Contaminated land	▸ Hazardous (regulated) waste such as hydrocarbons and hydrocarbon-contaminated products (e.g. oily waste or oil filters) that could potentially be generated during operation (either from maintenance operations or from freight spillages) will be collected and disposed of by a licensed waste transporter ▸ Implementation of the Contaminated Site Management Sub-plan if contaminated land is suspected.

Delivery phase	Hazard type	Aspect	Proposed mitigation measures
Operation	Dangerous goods and hazardous chemicals	Freight dangerous goods	▸ Emergency information holders must be readily available, containing *Initial Emergency Response Guide* (Standards Australia/Standards New Zealand, 2010), dangerous goods transport and consignment documents ▸ The freight transportation of dangerous goods on the proposal will be in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (National Transport Commission, 2020). Freight carts will be required to display appropriate Hazchem signage, including placards, and carry appropriate spill containment equipment to be used by emergency services personnel in the event of an emergency ▸ ARTC will develop a Spill Response Plan as part of a Hazardous Materials Management Sub-plan to outline the appropriate actions to be taken to minimise the effects of a spill ▸ Train operators will comply with the ARTC *Inspecting Trains Policy* (ARTC, 2015), such that inspections of dangerous goods loading (e.g. restraining of packages, segregation of dangerous goods), brake conditions and train integrity are compliant with the ARTC *Train Operating Conditions Manual* (ARTC, various) before and during travel on the ARTC network. Details of the train's consist (a sequence of train carriages or cars) and content will also be provided to the ARTC network control.

ABLE 24.11 IMPACT ASSESSMENT FOR POTENTIAL IMPACTS ASSOCIATED WITH HAZARD AND RISK

			Initial risk			Residual risk		
Aspect	**Potential impact**	**Phase**	**L**	**C**	**Risk**	**L**	**C**	**Risk**
Bushfire	Damage to infrastructure, injury to workers or public from bushfire	Construction	Possible	Moderate	Medium	Possible	Moderate	Medium
		Operation	Possible	Moderate	Medium	Possible	Moderate	Medium
Flooding	Damage to infrastructure, potential for impacts to freight goods caused by flooding events	Construction	Possible	Major	High	Unlikely	Major	Medium
		Operation	Possible	Major	High	Unlikely	Major	Medium
Climatic conditions	Increased temperatures, leading to failure of infrastructure, caused by climate change (extreme weather events)	Construction	Possible	Major	High	Unlikely	Major	Medium
		Operation	Possible	Major	High	Unlikely	Major	Medium
Landslide, sudden subsidence, movement of soil or rocks	Damage to infrastructure and worker/public injury from landslide, sudden subsidence, movement of soil or rocks	Construction	Possible	Moderate	Medium	Unlikely	Moderate	Low
		Operation	Possible	Minor	Low	Unlikely	Minor	Low
Wildlife	Wildlife injury or deaths from impact with proposal or worker injury from wildlife	Construction	Likely	Minor	Medium	Possible	Minor	Low
		Operation	Likely	Minor	Medium	Possible	Minor	Low
Biosecurity	Damage to biosecurity of surrounding environment due to propagation invasive species	Construction	Likely	Minor	Medium	Possible	Minor	Low
		Operation	Likely	Minor	Medium	Possible	Minor	Low
Noise and vibration	Disruption to public from noise and vibration	Construction	Likely	Minor	Medium	Possible	Minor	Low
		Operation	Likely	Minor	Medium	Possible	Minor	Low
Fatigue and heat stress management	Worker injury from fatigue and heat stress	Construction	Almost Certain	Moderate	High	Possible	Moderate	Medium
		Operation	Likely	Moderate	High	Possible	Moderate	Medium
Asbestos	Health impacts from asbestos	Construction	Possible	Moderate	Medium	Unlikely	Moderate	Low
		Operation	Possible	Moderate	Medium	Unlikely	Moderate	Low
Dust, respirable silica and other airborne contaminants	Impacts from dust, respirable silica and other airborne contaminants	Construction	Possible	Moderate	Medium	Unlikely	Moderate	Low
		Operation	Possible	Minor	Low	Unlikely	Minor	Low
Rail incidents	Rail accidents caused by increased rail movements	Construction	N/A	N/A	N/A	N/A	N/A	N/A
		Operation	Possible	Extreme	High	Unlikely	Extreme	Medium
Rail incidents	Rail interactions with farm equipment and travelling stock from adjacent stock routes/crossings	Construction	N/A	N/A	N/A	N/A	N/A	N/A
		Operation	Possible	Major	High	Rare	Major	Low

			Initial risk			Residual risk		
Aspect	**Potential impact**	**Phase**	**L**	**C**	**Risk**	**L**	**C**	**Risk**
Road–rail interface	Road accidents caused by increased vehicles required for the proposal (e.g. traffic from construction, maintenance, or decommissioning)	Construction	Possible	Extreme	High	Unlikely	Extreme	Medium
		Operation	Unlikely	Extreme	Medium	Unlikely	Extreme	Medium
Road–rail interface	Accidents due to increased number of road–rail interface	Construction	N/A	N/A	N/A	N/A	N/A	N/A
		Operation	Possible	Major	High	Unlikely	Major	Medium
Pedestrian safety	Pedestrian interactions at level crossings	Construction	Unlikely	Major	Medium	Rare	Major	Low
		Operation	Likely	Major	Very High	Rare	Major	Low
Bridges	Bridge collapse or falling object strikes	Construction	Unlikely	Major	Medium	Unlikely	Major	Medium
		Operation	Unlikely	Major	Medium	Unlikely	Major	Medium
Overhead and underground services	Worker injury from services strike at existing infrastructure and underground and overhead utilities	Construction	Possible	Extreme	High	Unlikely	Extreme	Medium
		Operation	Unlikely	Extreme	Medium	Unlikely	Extreme	Medium
Contaminated land	Health impacts to workers and public and environmental impact from contaminated land	Construction	Possible	Major	High	Unlikely	Major	Medium
		Operation	Possible	Minor	Low	Unlikely	Minor	Low
Emergency access	Impaired emergency access resulting in escalation of incident	Construction	Possible	Major	High	Unlikely	Major	Medium
		Operation	Possible	Major	High	Unlikely	Major	Medium
Chemicals spillage and loss of containment	Loss of containment of dangerous goods during storage and handling	Construction	Possible	Moderate	Medium	Unlikely	Moderate	Low
		Operation	N/A	N/A	N/A	N/A	N/A	N/A
Freight dangerous goods	Loss of containment of freight dangerous goods and hazardous chemicals	Construction	N/A	N/A	N/A	N/A	N/A	N/A
		Operation	Possible	Extreme	High	Rare	Extreme	Medium
Explosives	Damage to infrastructure or injury or fatality caused by explosives incidents during blasting during construction or by adjacent operators	Construction	Possible	Extreme	High	Rare	Extreme	Medium
		Operation	Unlikely	Extreme	Medium	Rare	Extreme	Medium

24.9.2 Residual risks

From the assessment conducted (provided in Table 24.11), risks that remain with a medium residual risk ranking include potential incidents related to:

- Bushfire
- Flooding or severe weather events
- Natural events exacerbated by climatic conditions
- Employee fatigue and/or heat stress
- Rail accidents caused by increased rail movements (operation)
- Increased use of road vehicles for the proposal
- Operating live trains in the disturbance footprint (operation)
- Increased number of interfaces between live trains and road users including pedestrians and land users (operation)
- Interaction with existing underground and overhead services
- Health and environmental impacts from contaminated land (construction)
- Bridges
- Interference with emergency access
- Transport of dangerous goods freight (operation)
- Potential use of explosives for construction.

Other potential risks assessed as a low residual risk rating include potential incidents related to:

- Landslide, sudden subsidence, or movement of rocks or soil (construction)
- Wildlife hazards
- Biosecurity threats
- Natural events
- Disturbing asbestos
- Dust, respirable silica and other airborne contaminants (including operational dust from transporting materials such as coal)
- Noise and vibration impact to sensitive receptors
- Disturbing or contributing to contaminated land
- Use of dangerous goods (including storage) during construction actives.

No risks were assessed as having a high residual risk ranking, with all remaining risks having either a low or medium residual risk ranking. As outlined in ARTC's *Risk Management Procedure*, a low residual risk ranking is considered tolerable while a medium residual risk ranking is considered tolerable if the risks have been reduced so far as is reasonably practicable through the ARTC Safety Management System. For these residual risks, the Program Safety Management System will include monitoring activities to ensure the ongoing effectiveness of the risk controls and identification of risk opportunities for further improvement. This includes the specific management plans listed in Section 24.9.3.

24.9.3 Specific management plans

Both the CEMP and ARTC's Operational Environmental Management Plan (OEMP) will include requirements for managing hazardous substances and dangerous goods (Refer Chapter 27: Environmental Management Plan and Chapter 15: Land Resources and Contamination). These plans will cross-reference and/or be supported by other specific management plans that will be developed to further enhance environmental, health and safety values as the proposal progresses.

Some of these may be sub-plans to the EMP and others may be standalone plans focusing on an aspect of proposed activities. Sub-plans to support EMPs will include but not be limited to:

- Air Quality Management Sub-plan; refer Chapter 17: Air Quality
- Surface Water Management Sub-plan; refer Chapter 13: Surface Water and Hydrology
- Groundwater Management Sub-plan; refer Chapter 14: Groundwater
- Noise and Vibration Management Sub-plan; refer Chapter 16: Noise and Vibration
- Hazardous Materials Management Sub-plan (including spill response plan)
- Heritage Management Sub-plan; refer Chapter 12: Heritage
- Waste and Resource Management Sub-plan; refer Chapter 25: Waste and Resource Management.

Other plans that will be developed, as required, will include but not be limited to:

- Social Impact Management Plan; refer Chapter 23: Socio-economic Impact Assessment
- Traffic Management Plan; refer Chapter 20: Traffic and Transport
- Remediation and Rehabilitation Plan; refer Chapter 15: Land Resources and Contamination
- Biosecurity Management Plan (includes species and habitat management plans); refer Chapter 11: Biodiversity
- Soil Management Plan (includes erosion and sediment control plans); refer Chapter 15: Land Resources and Contamination
- Contaminated Land Management Plan; refer Chapter 15: Land Resources and Contamination
- Hazard and Risk Management Plan; refer Chapter 24: Hazard and Risk
- Land Resources Management Plan; refer Chapter 15: Land Resources and Contamination.

24.9.4 Emergency management

ARTC's existing *Emergency Management Procedure (RLS-PR-044)*, which provides a systematic approach to incident response and recovery or incident investigation on the ARTC network, will be applied to the Inland Rail Program and the proposal. As such, an Incident Management Plan will be developed for the Inland Rail Program to detail the procedures and resources with which emergencies related to the risks identified in Table 24.10 will be responded to and managed. The *Emergency Management Procedure (RLS-PR-044)* itself will be used for emergency management including emergency response and emergency planning. The procedures required to manage incidents and emergencies are the responsibilities of ARTC and rail operators.

Security and crisis management will be developed for the Inland Rail network and will be in line with business continuity plans which will be issue specific.

24.9.4.1 Incident management plan

The Inland Rail program will develop an Incident Management Plan, which will detail the response procedures and available resources to manage emergencies. The Incident Management Plan will be in accordance with the ARTC Emergency Management Procedure and will consider the requirements in relation to training, availability of resources and communication interfaces with relevant emergency organisations.

The Incident Management Plan will address the incident scenarios identified in Table 24.11. An outline of the information that will be provided in the Incident Management Plan for each incident is outlined in Table 24.12.

TABLE 24.12 OUTLINE MANAGEMENT OF INCIDENTS IDENTIFIED

Aspect	Incident	Incident Management Outline
Bushfire	Damage to infrastructure, injury to workers or public from bushfire	▸ Follow ARTC's *Fire Prevention Management Procedure (PP0167)* ▸ Operations (including construction works) to stop in areas affected by bushfire ▸ Construction workers to have access to firefighting equipment ▸ Trains to be equipped with firefighting equipment ▸ Emergency phones provided on trains to ensure drivers can reach emergency services in the event of a bushfire.

Aspect	Incident	Incident Management Outline
Flooding	Damage to infrastructure, potential for impacts to freight goods caused by flooding events	▸ Follow ARTC's *Code of Practice: Flooding* ▸ Operations (including construction works) to stop in areas affected by flooding ▸ Emergency phones provided on trains to ensure drivers can reach emergency services in the event of flooding.
Climatic conditions	Failure of infrastructure/ derailment accidents i.e. track buckling resulting in loss of dangerous goods freight	▸ Follow ARTC's *Track Stability Handbook (ENT-06-01)* for track buckling incident management through managing track stability ▸ Follow ARTC's *Accidents or Derailments—Actions to be Taken (SMP 03)* in the event of a derailment ▸ Emergency phones provided on trains to ensure drivers can reach emergency services in the event of derailment.
Landslide, sudden subsidence, movement of soil or rocks	Damage to infrastructure and worker/public injury from landslide, sudden subsidence, movement of soil or rocks	▸ Regular earthworks inspections will be implemented to determine defects and conditions that may affect or indicate problems with the stability of earthworks.
Wildlife	Wildlife injury or deaths from impact with the proposal or worker injury from wildlife	▸ Emergency phones provided on trains and at construction sites to ensure workers can reach emergency services in the event of an animal attack ▸ If safe to do so, leave area where animal attack occurred ▸ Contact the applicable Council (Moree Plains Shire, Goondiwindi, Gwydir Shire, or Inverell Shire) for animal control services.
Biosecurity	Damage to biosecurity of surrounding environment due to propagation invasive species	▸ Notify an inspector of a biosecurity notifiable incident under the *Biosecurity Act 2015* (NSW).
Noise and vibration	Disruption to public from noise and vibration	▸ Noise and vibration sources from construction or maintenance work involving heavy machinery will incorporate appropriate noise mitigation equipment and devices including mufflers and acoustic barriers ▸ Noise disruption from night works are kept to a minimum and work will be as quickly and efficiently as possible ▸ Follow ARTC's *Asset Management System* by maintaining equipment in good working order to reduce the potential for offensive noise.
Fatigue and heat stress management	Worker injury from fatigue and heat stress	▸ Follow ARTC's *Fatigue Policy and Work Health and Safety Work Instruction for Fatigue Management* ▸ Follow Safe Work Australia, *Managing the Risks of Working in Heat to Manage Heat Stress* ▸ Emergency phones provided on trains and at construction sites to ensure workers can reach emergency services.
Asbestos	Health impacts from asbestos	▸ Follow ARTC's *Work Health and Safety Work Instruction for Asbestos*, along with Safe Work Australia *Model Code of Practice— How to Manage and Control Asbestos in the Workplace 2016* and Safe Work Australia *Model Code of Practice—How to Safely Remove Asbestos 2018* ▸ The proposal will engage with competent contractors who are appropriately licensed for asbestos disturbance work.
Dust, respirable silica and other airborne contaminants	Impacts from dust, respirable silica and other airborne contaminants	▸ Inform relevant stakeholders with enough information to enable them to understand the likely nature, extent and duration of dust and emissions impacts.

Aspect	Incident	Incident Management Outline
Rail incidents	Rail accidents caused by increased rail movements	▸ Emergency phones provided on trains to ensure workers can reach emergency services ▸ Follow ARTC's *Accidents or Derailments—Actions to be Taken* (SMP 03) in the event of a derailment.
Road incidents	Road accidents caused by increased vehicles required for the proposal	▸ Emergency phones provided on construction sites to ensure workers can reach emergency services.
Road–rail interface	Accidents due to increased number of road–rail interface	▸ Emergency phones provided on trains to ensure workers can reach emergency services.
Tunnel	Accidents due to construction of and rail use through the tunnel	▸ Emergency phones provided on trains and at construction sites to ensure workers can reach emergency services ▸ Comply with Safe Work Australia *Guide for Tunnelling Work*.
Bridges	Bridge collapse or falling object strikes	▸ Report the incident to ARTC's Network Control ▸ Emergency phones provided on trains and at construction sites to ensure workers can reach emergency services.
Overhead and underground services	Worker injury from services strike at existing infrastructure and underground and overhead services	▸ Inform the owner of the service impacted as soon as possible ▸ Emergency phones provided on trains and at construction sites to ensure workers can reach emergency services in the event of services strike ▸ Lodge a Dial Before You Dig enquiry prior to excavation or drilling work ▸ Comply with Safe Work Australia *Model Code of Practice—Excavation Work.*
Contaminated land	Health impacts to workers and public and environmental impact from contaminated land	▸ Notify the regulator as required, undertake an impacted site review, report site contamination to authorities as required, record the site contamination on ARTC *Contaminated Site Register*, and develop and implement an action plan.
Emergency access	Impaired emergency access resulting in escalation of incident	▸ Plan and develop alternative means of access for use in emergencies ▸ Emergency phones provided on trains and at construction sites to ensure workers can reach emergency services.
Chemicals spillage and loss of containment	Loss of containment of dangerous goods during storage and handling	▸ Workers to assess the risk and respond appropriately ▸ Leaders to assess severity of events and confirm relevant stakeholders are aware as appropriate ▸ Emergency phones provided on trains and at construction sites to ensure workers can reach emergency services ▸ Follow ARTC's *Work Health and Safety Work Instruction for Chemicals* (WHS-WI-214) (ARTC, 2016)
Freight dangerous goods	Loss of containment of freight dangerous goods or hazardous chemicals	▸ Report the incident to ARTC's *Network Control Incident* response to protect people and the environment based on type of dangerous goods or hazardous chemicals freighted.
Explosives	Damage to infrastructure or injury or fatality caused by explosives incidents during blasting during construction or by adjacent operators	▸ Report the incident to ARTC's Network Control ▸ Emergency phones provided on trains and at construction sites to ensure workers can reach emergency services.

24.9.4.2 Emergency response

Throughout the life of the proposal, emergency management will adhere to the ARTC's *Emergency Management Procedure*. Where sources of emergency and disruption are foreseeable, the coordinated approach to the management of incident response will be based on the following components:

- A structured approach for initiating and implementing incident assessment, escalation and response
- The availability of trained and capable response personnel
- Appropriate and timely communications and decision-making between site and ARTC management
- Debriefing sessions for incidents with the relevant emergency management authorities as listed in Chapter 20: Traffic and Transport.

In the event of an incident or imminent threat, the nominee from which the information was reported and ARTC management will assess the incident as Level 1, 2, 3 or 4. The categories of incidents are determined based on the impact level following the incident:

- Level 1—An occurrence that has been classified as an emergency requiring a sustained response, by Police or Fire services
- Level 2—An occurrence that involves or affects operations on the network, which has resulted in or has the potential to result in death or serious injury to a person, significant impact/damage to the environment, property or infrastructure. These incidents will require external resources, control and sustained coordinated response
- Level 3—An occurrence where minor injury, disruption, damage or environmental impact to the network has occurred. These incidents will not require a sustained response from other organisations or outside resources and will be managed and investigated by the line manager or the organisation involved
- Level 4—An occurrence that has resulted in a small impact on the ARTC network. These incidents are nominally routine operational incidents and unsafe acts identified during safety observations.

The Incident Management Team will be available to manage threats including large-scale natural disasters and other type of incidents involving medical emergencies, such as electric shock, burn, height rescue, snake and insect bites, hazardous chemical spill and threats in accordance with ARTC's *Emergency Management Procedure.* An appropriately trained Incident Management Team will be triggered to coordinate site restoration, unless emergency services are present.

Emergency services organisations may be in attendance depending on the nature and magnitude of the incident. These services may take charge of an incident site. Where more than one emergency service attends, the site will be under the overall command of the police service, except in the event of a fire or dangerous goods spill, where the fire service will take charge. ARTC and network operators will interact and coordinate with local emergency services.

Following an incident, an incident investigation team will commence investigation of the incident. The incident investigation team will have the authority to take action to preserve any evidence that may be required to assist in the investigation, including requesting sections of the incident site to be quarantined from entry, delaying the restoration work until the completion of incident investigation and instigating interviews with personnel involved in the incident. All relevant data and information will be collected in a clear and concise manner to complete an investigation report.

Figure 24.2 illustrates the overview of the ARTC's incident management and investigation.

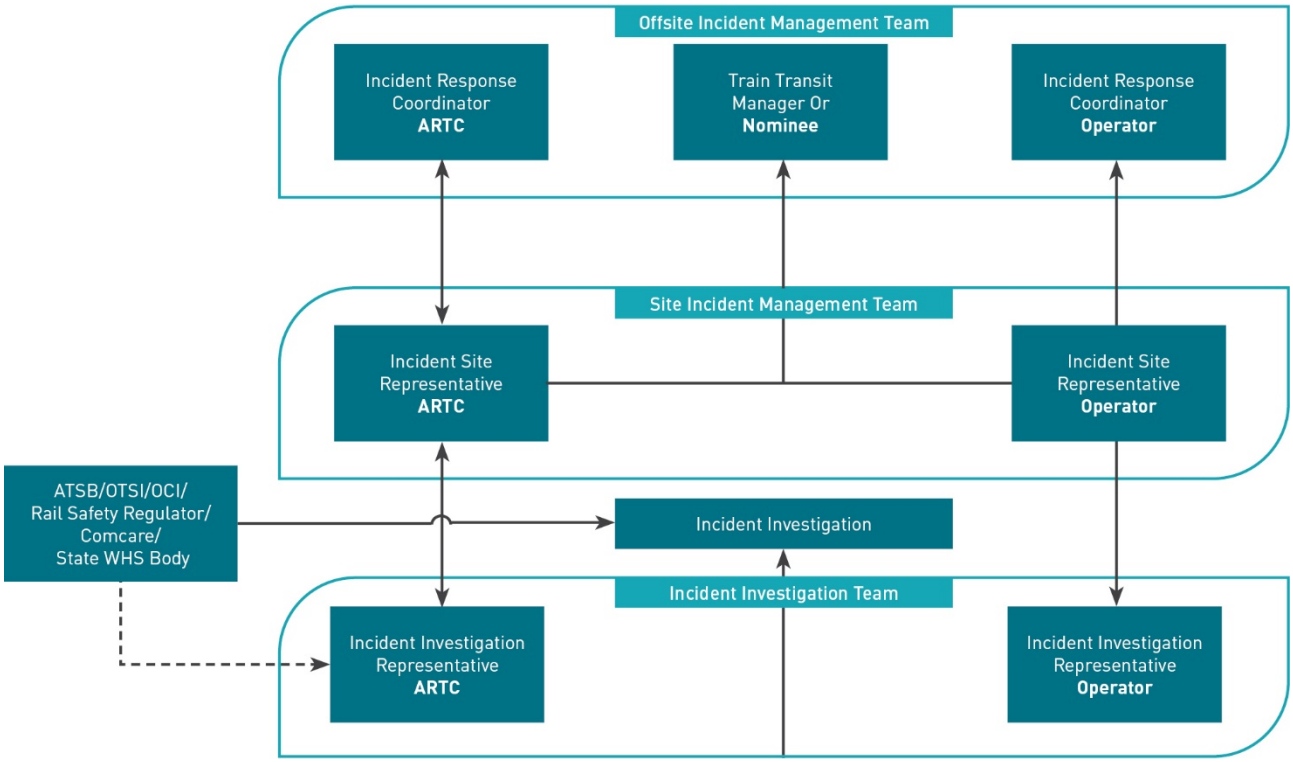

FIGURE 24.2 ARTC EMERGENCY MANAGEMENT

Figure notes: ATSB = Australian Transport Safety Bureau; OTSI = Office of Transport Safety Investigations; OCI= Office of the Chief Investigator—Regulatory Authority for transport safety investigations in Victoria

Source: ARTC *Emergency Management Procedure RLS-PR-044*

24.9.4.3 Emergency planning

Emergency procedures will be tested to evaluate the effectiveness of emergency preparedness and response. Emergency procedure testing will involve desktop scenarios and procedural tests, through to complete organisation-wide simulated incident exercises involving emergency services, dependent on relevant emergency risk potential. Desktop test exercises will take place only when an actual event involving parties has not occurred within a two-year period.

Rail operators will obtain approval from ARTC prior to any exercise on the network with the potential to affect network operations. A safety plan will be prepared for all exercises involving full size equipment on the network.

Desktop and simulated test exercises will be designed to ensure that individually and collectively the *Incident Management Procedures* adequately address the requirements for emergency management and that the procedures are effectively integrated. The exercise will nominally evaluate communications response time, interface working relationship recovery mechanisms, procedures response and training needs that will then be used to amend the Incident Management Plan, where required. Pre-incident planning with external emergency responders will be undertaken.

Competency of ARTC personnel in emergency response roles will be ensured through competency training. Appropriate, compliant and maintained first-aid equipment, consumables, trained personnel, facilities and medical support will be available to minimise any adverse impact on the health and safety of people or operations.

Incident management personnel will be visibly identifiable onsite to assist in the recovery and restoration in the event of an emergency. Urgent medical or emergency capabilities, including warning, communication and evacuation, will be provided in accordance with the ARTC *Emergency Management Procedure*.

The business-level ARTC *Emergency Management Procedure* will be used as guidance for an asset specific integrated emergency management plan for the proposal. This will be developed in later stage of the proposal, closer to the construction of the asset.

24.9.4.4 Consultation

The proposal has been and will continue to be developed in consultation with relevant emergency management authorities to ensure that external support will be provided by these services in an event of an emergency. These include:

- Federal and state government departments and elected representatives
- Moree Plains Shire Council
- Goondiwindi Regional Council (Queensland)
- Gwydir Shire Council
- Inverell Shire Council.
- Emergency Services including:
  - NSW Fire and Rescue
  - Boggabilla Rural Fire Service
  - NSW Police (including Boggabilla Police)
  - NSW Ambulance.

Due to the proximity to the NSW/QLD border, additional consultation with Queensland emergency services has been undertaken, including:

- Queensland Police—Goondiwindi
- Queensland Ambulance—Goondiwindi.

Consultation and engagement activities focusing on engaging with the local community including landowners, local governments and regional community groups have been ongoing since 2017. Consultation activities have included providing information and gathering feedback from stakeholders and the local community allowing ARTC to gain an understanding of the issues and opportunities across the disturbance footprint.

The key stakeholders for Inland Rail include:

- Elected members of the parliaments of NSW, Queensland and Australian governments
- Local governments
- Government agencies
- Landowners and residents with the potential to be directly or indirectly impacted by the proposal
- Community and environment groups
- Traditional Owners
- Utility providers
- Representatives of neighbouring and related projects.

Refer to Chapter 23: Socio-economic Impact, Chapter 8: Consultation, and Appendix D: Consultation Summary Report for more detail of emergency management consultation.

24.10 Cumulative impact assessment

24.10.1 Dangerous goods and hazardous chemicals

Due to the potential risks associated with the hazardous chemicals, storage can have offsite impacts depending on the quantities and types of materials.

Loss of containment of transport of dangerous goods during freight transport is considered to have a potential for cumulative impacts between the proposal and the local environment or future projects within the proposal site.

Cumulative impacts arising from loss of containment of dangerous goods on surrounding environment and community will be largely the product of:

- Temporal construction impacts: the requirements for hazardous chemical laydown area, potential bushfire events and increase in workforce and machinery operating on adjoining projects at the same time
- Spatial operational impacts: the residual impact freight dangerous goods on Inland Rail to sensitive receptors.

During construction, the expected quantities of hazardous chemicals are not considered to be enough to introduce significant offsite impacts or the potential to contribute to cumulative impacts at the adjacent, regional and national level. Impacts associated with construction storage of hazardous chemicals are expected to be localised to the area of use for the expected quantities and types of chemicals. Natural hazards in the surrounding area such as bushfire may increase the risk at site and can negatively impact hazardous chemical storage; however, hazardous chemical storage locations have been located outside bushfire impact areas where possible. The Newell Highway upgrades may also overlap with the proposal resulting in an increase of workforce and transportation of construction materials within the proposal site. The duration of these activities are only temporary, therefore the potential of hazardous chemicals transportation collision is considered to be low.

The potential for cumulative impacts during operations are associated with dangerous goods freight. Freight of dangerous goods across significant infrastructure, such as the Gwydir Highway, Newell Highway and Bruxner Way have the potential for cumulative impacts. The sharing land uses and infrastructure increase the interactions between live trains and the local community and environment which have the potential to increase the societal risks.

The consequence of dangerous goods loss of containment, considering the worst-case scenario could have significant impacts. For instance, a combination of events could lead to a severe fire. A severe cumulative impact outcome would typically require several concurrent events to realise consequences. Certain conditions can increase the potential for harm, such as hot work activities within the bushfire zone, the presence of highly reactive chemicals or compressed gas and strong wind conditions. The presence of the controls described in Section 24.8 reduce the probability of a release occurring, while procedures for hot works and alignment maintenance reduce the probability of an incident resulting in a significant consequence.

Overall, the outcome of cumulative impact assessment of loss of containment associated with the proposal is likely to be range between low and medium. The outcomes of the risk assessment are shown in Table 24.13.

TABLE 24.13 CUMULATIVE IMPACT ASSESSMENT FOR DANGEROUS GOODS AND HAZARDOUS CHEMICALS

Impact	Impact characteristic	Relevance factor	Sum of relevance factors	Impact significance
Loss of containment of dangerous goods during construction	Probability of the impact	2	5	**Low**
	Duration of the impact	1		
	Magnitude/intensity of the impact	1		
	Sensitivity of the receiving environment	1		
Loss of containment due to freight of dangerous goods during operations	Probability of the impact	1	5	**Low**
	Duration of the impact	1		
	Magnitude/intensity of the impact	2		
	Sensitivity of the receiving environment	1		

Further information on the assessment of cumulative impacts is provided in Chapter 26: Cumulative Impacts.

24.11 Conclusion

The development of railway infrastructure has hazards and risks that must be identified and managed throughout the lifecycle of the proposal, through design, construction and commissioning, and operation. The proposal has incorporated risk identification and assessment practices throughout the feasibility design development phase and ARTC have a strong commitment to implementing and maintaining appropriate safety practices throughout operations.

The health and safety of employees and communities, along with risks to the environment and property, have been considered using SEPP 33 as guidance. While SEPP 33 will not be used in the context of compliance assurance, it is a useful tool to determine relevant hazards and risks that should be considered for the proposal.

The implementation of ARTC risk management policies and procedures, as described in Section 24.8 and Chapter 27: Environmental Management Plan are anticipated to effectively reduce all of the initial risks associated with the proposal to a low to medium residual risk level. As outlined in ARTC's *Risk Management Procedure*, a low residual risk ranking is considered tolerable while a medium residual risk ranking is considered tolerable if the risks have been reduced so far as is reasonably practicable through the ARTC Safety Management System. The residual risks that remain medium include potential incidents related to:

- Bushfire
- Flooding or severe weather events
- Natural events exacerbated by climatic conditions
- Employee fatigue and/or heat stress
- Rail accidents caused by increased rail movements (operation)
- Increased use of road vehicles for the proposal
- Operating live trains in the disturbance footprint (operation)
- Increased number of interfaces between live trains and road users including pedestrians and land users (operation)
- Interaction with existing underground and overhead utilities
- Health and environmental impacts from contaminated land (construction)
- Bridges
- Interference with emergency access
- Transport of dangerous goods freight (operation)
- Potential use of explosives for construction (construction and operation).

For these residual risks, the Program Safety Management System will include monitoring activities to ensure the ongoing effectiveness of the risk controls, and identification of risk opportunities for further improvement.