NARRABRI TO TURRAWAN LINE UPGRADE

REVIEW OF ENVIRONMENTAL FACTORS

PREPARED FOR ARTC, MARCH 2022

ARTC

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PR166

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EXECUTIVE SUMMARY

Introduction

The Australian Rail Track Corporation Limited (ARTC) is an Australian Government owned statutory corporation that maintains approximately 8,500 kilometres (km) of rail track across five states. In New South Wales (NSW), ARTC is responsible for the Interstate Network (which includes the Sydney metropolitan freight network), Hunter Valley rail network, and delivery of Inland Rail which traverses the state.

ARTC proposes to upgrade approximately 35 km of track between Narrabri and Turrawan, which is currently capable of accommodating sub 25 tonne axle load (TAL) and has capability limitations resulting from the aging rail and poor track geometry.

The 'proposal', known as the Narrabri to Turrawan Line Upgrade, will enhance the quality and capability of the 35 km connection between the Hunter Valley rail freight network, south of Turrawan, and Inland Rail at Narrabri North, to provide a consistent service offering between north western NSW, Inland Rail and the ports of Newcastle and Sydney.

The proposal will deliver a corridor capable of an enhanced weight rating of 25 TAL at 80 kilometres per hour (km/h), thereby allowing longer and heavier freight trains travelling from north western NSW to access international ports in Newcastle and Sydney.

The proposal aligns with the Australian Government's infrastructure investment goals to maximise the productivity and efficiency of the Australian freight network.

The proposal is permitted without development consent under State Environmental Planning Policy (Transport & Infrastructure) 2021 (Infrastructure SEPP). As such this review of environmental factors (REF) has been prepared to satisfy provisions under Part 5, Division 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and section 171 of the NSW Environmental Planning and Assessment Regulation 2021 (EP&A Regulation).

The purpose of a REF is to assist in meeting the statutory requirements to examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment and to establish whether or not the activity is likely to significantly affect the environment

This REF has been prepared by Element Environment Pty Ltd, on behalf of ARTC, and has been prepared in accordance with the principles of ecologically sustainable development and environmental due diligence.

Proposal description

The proposal will generally include:

- replacement of existing steel and timber sleepers with heavy duty concrete sleepers;
- replacement of the existing rail with new 60 kg/m rail for 8.1 km between the Whitehaven Coal balloon loop junction (540.38 km) and the northern end of Turrawan passing loop (548.490 km);
- replacement of the existing rail with cascaded 53 kg/m rail for 26.7 km in length between the northern end of Turrawan passing loop (548.490 km) and the future Inland Rail interface at Narrabri North (575.00 km);
- lifting of the track in some sections in order to accommodate approximately 100 mm of new ballast below the new concrete sleepers;
- potential sleeper and rail replacement at the Turrawan crossing loop, using recovered steel sleepers and recovered 53 kg rail;
- track formation works at bridge ends, where required;

- partial level crossing upgrades (including new concrete sleepers, steel crossing panels and partial track lift or lifting of level crossing, where feasible); and
- repair of existing culverts which are in poor condition along the proposal alignment and replacement of small diameter culverts, where required.

Existing environment

The proposal comprises upgrades to two sections of track on the Main North Line between the Whitehaven Coal junction at the approximate chainage of 540.3 km and Narrabri North at approximate chainage 575 km. The proposal is in the Narrabri local government area (LGA).

Most of the proposal is on land zoned RU1 Primary Production. A section of rail corridor within the township of Narrabri is on land zoned SP2 Infrastructure.

Land uses in the broader study area include rural and large lot residential premises. Within Narrabri, adjacent land uses include industrial, residential and commercial premises. Several public recreation land uses are also located in the vicinity of the rail corridor.

The rail corridor is owned by the NSW Government and leased by ARTC. The rail infrastructure in the rail corridor is owned and operated by ARTC. The proposal area will predominately be in the rail corridor or on land for which ARTC has existing access agreements. In some instances, sections of the adjacent road reserve and private land will be required to provide for temporary compound/storage areas.

Key environmental aspects

The following provides a summary of the key environmental factors addressed in this REF.

Noise and vibration

Background noise in the vicinity of the proposal is typical of an urban and rural environment, with the predominant sources of noise associated with existing rail traffic, power tools, maintenance vehicles, domestic animals and human activity, including adjacent industrial, commercial and agricultural land uses. Road traffic noise from nearby major roadways including the Kamilaroi Highway and Newell Highway also contribute to the noise environment.

The nearest sensitive receivers to the proposal with a potential to be impacted by adverse noise emissions are residential, commercial, educational and recreational land users near the rail line in Narrabri.

Sensitive receivers outside of Narrabri include isolated residential dwellings associated with rural land uses. These sensitive receivers are typically situated more than 100 metres (m) from the rail line.

During construction the proposal will generate noise along the rail line at various locations and within the ancillary facilities from operating plant and machinery.

Some noise from construction will exceed the noise management levels which have been determined in accordance with the Interim Constriction Noise Guidelines (ICNG) (EPA, 2009). Noise impacts will however be intermittent, and no residents or businesses will be highly noise affected.

There is potential for sensitive receivers to be impacted at night from construction noise as the ambient environmental noise in the locality is low. The construction works may result in sleep disturbance for select residents up to 750 m from the proposal alignment.

Work activities to be undertaken outside of standard construction hours are subject to the conditions of ARTC's environment protection licence (EPL) 3142. The out of hour works are required to facilitate a safe working environment within the rail corridor, while undertaking

scheduled maintenance and rail operation activities critical to the functioning of the railway, with the least operational impact.

Given the confinement of construction to the rail corridor, vibration levels at or above the relevant criteria for most commercial and residential structures are not expected.

It is likely that vibration from operating plant and equipment will be noticeable for occupants of adjoining residences and businesses. Despite this, it is considered that potential vibration impacts will be minimised with effective community consultation and the implementation of recommended mitigation measures.

There is one heritage structure, Narrabri railway station, which has the potential to incur cosmetic and structural damage associated with vibration. Additionally, residential dwellings located within` 25 m of the proposal alignment may also be impacted, including structures at 2 Logan Street and 7 Wade Street, Narrabri.

Where construction vibration has the potential to result in cosmetic or structural damage to these structures, following the selection of final plant and equipment, minimum offset distances will be reviewed. Where works will occur within the nominated minimum safe working distances and there is a risk of exceeding the cosmetic damage objective, a different construction method with lower source vibration levels will be considered and/or vibration monitoring will be undertaken at the commencement and through the works within the vicinity of the structures.

This REF has also considered the ICNG and identified potentially affected sensitive receivers, potential noise sources and impacts, and stipulated reasonable and feasible noise management measures to be implemented to minimise noise impacts.

With no material changes to operational conditions anticipated and improved acoustic performance of concrete sleepers relative to wooden sleepers, it is considered that operational rail noise levels will decrease by upwards of two decibels due to the proposal. It is therefore concluded that compliance with the Rail Infrastructure Noise Guideline (RING) (EPA, 2013) will be achieved.

Traffic and access

The Kamilaroi Highway is the major link between the major town centres of Narrabri and Gunnedah and passes through Turrawan. The Kamilaroi Highway runs parallel to the rail corridor between Turrawan and Narrabri West before proceeding west towards Wee Waa.

From West Narrabri, the rail corridor diverts away from major roadways and traverses through greenfield areas adjacent to local roadways within Narrabri township.

To the north of Narrabri, the rail corridor runs parallel to Old Cemetery Road before meeting the Newell Highway at the northern end of the proposal alignment. The Newell Highway is the major link between Narrabri and Moree to the north.

It is likely that traffic volumes along the Kamilaroi and Newell Highway within the vicinity of the proposal are moderate, with average daily traffic volumes comprised of heavy vehicles transporting freight from the region, local traffic travelling between town centres and access for residents.

Traffic volumes along local roadways, including residential streets within Narrabri town centre are anticipated to be low and primarily confined to thoroughfare traffic and residents situated along the respective roadways.

During construction, an increase in traffic along major highways and other local roadways will be generated by:

- construction site establishment activities;

- movement of work crews to and from the construction site; and
- delivery of construction materials and removal of waste materials.

Any increases in traffic movements are anticipated to be intermittent and minor in nature. Given the existing traffic volumes on the affected roads, the minor increase in traffic associated with construction of the proposal is not anticipated to affect the capacity or waiting times on the local road network. To reduce construction traffic, ARTC will deliver concrete sleepers and rail materials by rail where possible.

To establish a safe working environment, it is likely that public roadways adjacent to proposed level crossing upgrades will require temporary closure during the works period. Appropriate signage will be deployed to manage any public traffic, with access to private property to be maintained.

Biodiversity

The proposal is located within a highly disturbed and modified rail corridor. Remnant native vegetation has historically been cleared to facilitate construction and operational maintenance of the railway line; however areas of regrowth are evident.

Segments of the proposal are mapped as containing listed threatened ecological communities (TECs). The vegetation present may also represent suitable habitat for threatened flora species and/or foraging or roosting habitat for threatened fauna species.

Most work activities will not require ground disturbance or vegetation clearance due to confinement to previously disturbed areas such as the rail infrastructure and existing access points and maintenance tracks. Such work activities include rail replacement, ballasting, track resurfacing, welding and adjustment, rail grinding and level crossing upgrades.

Sleeper replacement is unlikely to require clearing of vegetation, however sleepers may be stored on groundcover vegetation which may result in minor surface disturbance.

Work activities associated with track reformation and culvert upgrades may remove vegetation during ground disturbing works and access to the work locations. Other surface disturbance may result from equipment laydown and stockpiling areas within the rail corridor.

Indirect impacts (e.g. weed dispersal, light spill) may occur during construction of the project, however will be short term and largely confined to the proposal area and immediate surrounds.

Vegetation within the proposal area may provide connectivity with denser stands of vegetation along the proposal alignment and areas of potential fauna habitat. The proposal is considered unlikely to contribute to additional habitat fragmentation given works will be confined to the rail corridor and fauna habitat outside the rail corridor will not be impacted.

Weed species are present within the rail corridor given the highly disturbed nature of the site. No priority weeds were identified.

The proposal will not result in significant impact upon endangered or threatened ecological communities, populations or species, nor potential habitat of threatened fauna. Provided that the mitigation and management measures are implemented prior to, during and after completion of the proposal, potential adverse impacts on biodiversity values will be minimised.

Hydrology and drainage

The proposal is in the Namoi River catchment.

The rail corridor is within the localised catchment of, or traverses the following waterways:

- Pine Creek.
- Jones Hollow Creek.

- Sandy Creek.
- Jacks Creek.
- Namoi River.
- Narrabri Creek.
- Horsearm Creek.
- Mulgate Creek.

Surface runoff from the rail corridor proceeds downstream, via ephemeral drainage lines to waterways.

Much of the Narrabri township is flood impacted from both 'regional flooding' associated with flows from the Namoi River, and 'local flooding' associated with tributaries (Mulgate Creek and Horsearm Creek) on the eastern side of the town.

Over time, the railway has degraded due to deteriorating sleepers, movement of ballast material and degradation of the subgrade and foundation soils. This has resulted in an uneven track profile. The proposal will remove these profile inconsistencies, reinstate previous levels and, in some areas, increase track levels to achieve a more efficient operation of the railway.

The existing flood behaviour across Narrabri means that small changes in surface levels over the floodplain, particularly for linear structures such as rail embankments that traverse the floodplain, will have an impact on water movement and flood levels.

For the purposes of concept design, conservative allowances of 100 mm of track lifting within the 1% annual exceedance probability (AEP) flood area have been modelled.

Modelling indicates the proposal will result in alteration to existing regional and local flood events, including:

- A minor confined increase to existing flood levels in areas already inundated by the 1% AEP and roadways in confined areas of Narrabri.
- A minor increase in land which will change from low to high flood hazard.

There are limited mitigation measures available to offset the impact of raising the railway given the existing extent of flood impact in the floodplain and the nature of the proposal, being within an existing rail corridor with established drainage infrastructure.

The proposal will continue to be refined during detailed design and will be adjusted to avoid worsening flooding characteristics, where feasible and reasonable. This will include further subgrade investigations undertaken during detailed design of the proposal, to confirm the minimum extent required for raising of the track levels within the 1% AEP flood extents. Whilst modelling has assumed a conservative worst case lift of 100 mm, it may be that during detailed design the extent of lifting in select area is in fact lower than this estimate, which may in turn reduce potential flood impact.

Further flood modelling will be undertaken during detailed design to confirm compliance with quantitative design limits (QDLs) outlined in this REF. Where it is not feasible or reasonable to satisfy the QDLs, and non-compliance with the QDLs will change the flood hazard category to residential land uses (as defined in Appendix L of the NSW Government Floodplain Development Manual 2005), flood mitigation measures will be developed in consultation with the affected property/structure/infrastructure owners, NSW State Emergency Service and Narrabri Shire Council.

ARTC intends to replace culverts which are in poor condition along the proposal alignments. Additionally, existing maintenance access tracks which cross waterways may require repairs as part of the proposal. All culverts will be replaced with a like for like design, including identical pipe dimensions. As such, there will be no alteration to existing cross drainage regimes at these individual locations and as such no potential hydrological impacts are anticipated.

Providing best practice industry guidelines are considered in the detailed design of the culvert structures and waterway crossings, the proposal is unlikely to impact on the existing hydrological functioning of the respective drainage line or waterway, nor their existing flooding regimes.

Other environmental aspects

Air quality

Background air quality in the vicinity of the proposal is predominantly influenced by:

- vehicle borne emissions arising from traffic movements along the Kamilaroi and Newell Highway, as well as traffic on nearby local roads;
- train movements along the established rail network, which generate dust and diesel emissions;
- vehicle movements along unsealed roadways which generate dust into the local airshed; and
- minor or seasonal air pollution sources may include controlled burning and bushfires.

During construction, the main potential impacts on air quality will be dust generated during earthworks, stockpiling, exhaust emissions from diesel powered equipment and vehicles transporting materials to and from the site.

Construction of the proposal will involve only minimal surface disturbance at any one time as excavation works will be minor and soils stabilised progressively. Therefore, the proposal is unlikely to generate more than a minor amount of windborne particulates.

Additional vehicle movements during construction and the operation of construction machinery may also result in a minor increase in vehicle borne emissions. Such an increase will be temporary and minor.

Overall, potential impacts from construction activities on air quality are anticipated to be temporary and minor, and will be managed through the implementation of recommended mitigation and management measures.

The proposal will not change or alter air quality impacts during the operational phase.

Soils and water quality

Construction activities will involve ground disturbance. This will include vehicle movements on exposed surfaces, excavation activities, stockpiling of soils and the removal of existing groundcover vegetation. Given composition with silt and sand particles, material to be excavated will be highly susceptible to erosion by wind and rainfall and may result in sedimentation off-site if not managed appropriately.

Some existing maintenance access tracks cross through ephemeral drainage lines or waterways, and where required theses access track will be repaired or upgraded within the same disturbance footprint, inclusive of erosion control measures such as introduction of rock armouring.

Generally, potential impacts on water quality are associated with construction activities such as the disturbance of soil and movement of sediment, contaminated or otherwise, into nearby water courses such as the Namoi River and Narrabri Creek, and associated tributary waterways. The potential also exists for litter and other construction waste to be mobilised by both wind and stormwater runoff and deposited in downstream waterways.

The potential for adverse water quality impacts associated with the proposal will be minimised provided the implementation of recommended mitigation measures, including erosion and sediment controls that are installed and maintained in accordance with the requirements of Soils and Construction, 4th Edition, 2004, Managing Urban Stormwater (the ‘Blue Book’).

Upon completion of the works, all disturbed areas will be stabilised against erosion in accordance with Blue Book requirements, thereby negating the risk of long-term erosion impacts.

The proposal is not anticipated to intercept the underlying aquifer or groundwater resources despite being adjacent to waterways, as earthworks will be confined to a maximum depth of two metres within the existing operational rail track foundations. Dewatering of excavations may be necessary after prolonged periods of rainfall; however quantities are not expected to be significant. If the groundwater is saline, acidic, or contains heavy metals, discharge to the environment will be managed to minimise any adverse impacts to waterways and aquatic biota vegetation.

Contamination

A search of the EPA's Contaminated Land Record and List of Contaminated Sites notified to the EPA identified the following contaminated sites within proximity to the proposal.

- Former Lowes Petroleum (3 Old Gunnedah Road, Narrabri) – located immediately adjacent to the south of the rail corridor.
- Caltex Service Station (12 Reid Street, Narrabri) – located to the south of Narrabri railway station.

Within the proposal area, activities or materials which may have resulted in historical contamination include:

- contamination associated with rail activities that may be present in ballast and formation materials and soils in and next to the rail corridor;
- importation of fill containing metals, asbestos and other contaminants during landfilling; and
- use of land adjacent to the proposal area for illegal dumping activities.

Contact with contaminated soil poses a health risk to those directly exposed as well as having a potential wider impact if the contaminant is spread. Contamination entering the adjacent stormwater network or waterways, or being deposited on neighbouring lands via wind erosion, can pose a threat to downstream aquatic ecology and water quality, as well as the wider community.

Although unlikely, earthworks associated with the proposal have the potential to encounter unexpected contaminated soils, particularly near high risk land uses adjacent to the rail corridor, such as petroleum depots. In the event that unexpected contaminated soils are identified, the material will require adequate management and analysis prior to any re-use of spoil material at the site as backfill, or otherwise disposal of excess spoil from the site.

Potential contaminated groundwater is not expected as the proposal will not intercept groundwater.

Storage of fuel, the process of re-fuelling and the storage and use of other chemicals on site, also has the potential to contaminate soil.

Aboriginal heritage

A search of the Aboriginal Heritage Information Management System database confirmed that the proposal is located a sufficient distance from identified Aboriginal sites and as such will not result in harm to a registered Aboriginal object or site.

The proposal will disturb ground in a landform which has the potential to support unidentified Aboriginal objects.

Despite this, the proposed works will be within the disturbed rail corridor and immediate surrounds. This area has been subject to previous ground disturbance, associated with earthworks to level the ground in some sections of the alignment, emplacement of fill material to form embankments and construction of the rail line. Land adjoining the rail corridor to be used for ancillary facilities has also been subject to disturbance associated with agricultural land use and construction of road reserves and utility infrastructure.

With this history of disturbance, it is likely that natural soil profiles within the rail corridor which existed prior to European occupation of the vicinity have been altered and modified, removing much of the archaeological potential in the area.

Excavation works and other surface disturbance associated with the proposal will be predominantly confined to fill material associated with the rail embankment, however will also partially delve into natural soil profiles. Despite this, as there is considerable evidence of historical disturbance within and surrounding the rail corridor, the risk of encountering previously unidentified *in situ* Aboriginal items is low.

Therefore, with the implementation of mitigation measures outlined in this REF, the proposal is unlikely to result in harm to Aboriginal objects and can proceed with no requirement for further investigations or application for an Aboriginal heritage impact permit.

Non-Aboriginal heritage

A search of relevant heritage databases identified Narrabri railway station as occurring within the proposal area. The station is listed on the Transport Asset Holding Entity (TAHE) Section 170 Heritage and Conservation Register and Narrabri Local Environmental Plan 2012.

No other heritage listings were identified with the potential to be impacted by the proposal.

The proposal will have no impact on significant station buildings or built heritage elements and as such the proposal will have a negligible impact on the significance of Narrabri railway station as the proposed work activities are consistent with maintenance and upgrade work commonly undertaken throughout the rail network and are necessary for continued operation and survival of the rail line.

Due to the nature and scale of the proposal there will be no permanent impact to views within or adjacent to the station precinct.

The setting of Narrabri railway station will see a minor change to the appearance of the yard with the replacement of timber sleepers with concrete, and the replacement of rail and ballast. This constitutes a minor and inconsequential change to the railway setting.

A risk of indirect impacts to the station platform via vibration emissions from construction works may result in the potential for structural or cosmetic damage to heritage fabric associated with the station. These indirect impacts can be appropriately monitored and mitigated, providing the recommended safeguards are implemented on site.

Waste management

Waste material will be generated during construction of the proposal and may include:

- excess and unsuitable (for construction) spoil;
- waste oils and liquids from construction machinery and equipment;
- general building and demolition waste e.g. ballast, steel, concrete, timber, packaging (including plastic and paper); and
- contaminated material, which may occur from hydrocarbon spillages, ballast or unexpected contamination finds.

Failure to appropriately classify, store, transport and dispose of waste can result in adverse environmental impacts as well as penalties. Any identified contaminated or waste material will be classified in accordance with the NSW Waste Classification Guidelines (EPA, 2014) prior to disposal or re-use on site.

Visual amenity

The proposal area is highly disturbed given historical land use as an operational rail corridor.

The topography of the surrounding landscape is relatively flat, with gentle slopes and distant ranges. The rail corridor is slightly raised above the surrounding landscape making it a prominent visual element for surrounding land uses and major arterial roadways such as the Kamilaroi and Newell Highway.

The visual catchment of the surrounding landscape is dominated by rural land uses such as agricultural activities and grazing land. The township of Narrabri is typical of an urban environment, with land uses including residential, commercial, educational, infrastructure and industrial, intermixed with public space such as modified parklands.

Rural landscapes dominate the surrounding area outside of Narrabri township, built structures such as silos, rural residential dwellings and sheds are common.

Existing road infrastructure, such as the Kamilaroi and Newell Highway, and major waterways such as the Namoi River are also prominent features in the landscape.

The proposal will be within an operational rail corridor and the proposed works will not require major change to existing rail infrastructure (apart from upgrade of ballast, rail and sleepers). The proposal will therefore not result in substantial changes to the visual amenity of the locality, or the views of surrounding land uses.

During construction, the presence of site amenities, temporary stockpiles and truck and equipment movements may impact on the visual amenity of the proposal area and surrounding community. Temporary visual impacts may also be incurred by adjoining properties and thoroughfare motorists along the proposed access routes associated with construction traffic.

Potential visual impacts are likely to be greater within Narrabri township, associated with a larger population density. For sections of the rail line outside of Narrabri, potential visual impacts will be less prominent and largely confined to adjacent land uses and thoroughfare motorists of local roadways and Kamilaroi and Newell Highway.

The use of lighting will be required during night works, which will have potential to result in light spill into adjacent residences and businesses.

In general, the potential visual impacts associated with the proposal are temporary and minor and will not result in significant negative impact to the visual amenity of the locality in the long term.

Social and economic

The generation of noise, air quality and visual impacts, along with traffic and access disruptions may result in temporary amenity impacts on the surrounding community. Specifically, construction of the proposal may result in:

- increase in noise for residents located close to the proposal due to the operation of plant and equipment and general construction works;
- increase in traffic and associated road noise for residents located adjacent to the proposal alignment and construction access routes;
- increase in dust generated during construction, predominantly for residents located close to the proposal alignment; and
- temporary changes to the visual appearance of the locality resulting from construction works and the presence of construction plant and machinery.

The above impacts will be minimised as far as practical by the implementation of appropriate consultation and mitigation measures proposed in this REF.

The proposal will aid in economic benefit for the LGA by allowing increased freight volumes to travel through to Newcastle and Sydney ports, where most of the grain and cotton from this region is exported.

If the proposal is not delivered, Narrabri to Turrawan will be the last section that cannot accommodate 25 TAL trains when Inland Rail is completed and will constrain productivity across the supply chain of northern NSW, restricting volumes and adversely impacting on the international competitiveness of producers in the region.

Key economic benefits of the proposal include:

- improved productivity for freight operators through higher speeds and higher axle loads by increasing rail size to enable an increase in maximum axle loading to 25 TAL at 80km/h;
- operational cost savings via increased capability of upgraded track to enable heavier and longer trains to operate along the line leading to reduction of freight costs on a per tonne basis;
- enhanced performance of rail to enable improved competitiveness of rail against road; and
- a reduction in recurring maintenance costs.

To establish a safe working environment, it is likely that the local roads will require partial occupation or temporary closure during the works period. Appropriate signage will be deployed to manage any public traffic, with access to property maintained at all times.

The current passenger train service through Narrabri comprises a morning departure to Sydney and an evening arrival service from Sydney. To facilitate extended working hours and therefore faster construction of the proposal, ARTC may temporarily alter the departing time of the passenger train schedule to depart from Narrabri without passengers at approximately 6 am, with passengers following on a bus service to join the train at Gunnedah at the usual scheduled time. The returning passenger train will arrive at Narrabri in the evening (with passengers) as normal.

It is considered that the proposed alteration to departing train services will result in a minor and temporary impact to commuters from Narrabri. Despite the potential for short term inconvenience caused, the proposed schedule will permit an extension of working hours for the proposal by up to three hours per day. This in turn will facilitate construction of the proposal faster, thereby minimising the duration of other social impacts such as generation of noise, air quality and visual impacts, and disruptions to local traffic and property access. ARTC will however, endeavour to program the construction works around the existing commuter services, where possible.

Conclusion

Under clause 2.91(1) of the Infrastructure SEPP, development for a railway or rail infrastructure facilities may be carried out by or on behalf of a public authority without development consent. ARTC is a public authority according to the EP&A Regulation and the Infrastructure SEPP.

The proposal is being assessed, and will be determined, under Division 5.1 of the EP&A Act with ARTC as the determining authority. This REF has been prepared to consider the environmental impacts of the proposal as required by section 5.5 of the EP&A Act and section 171 of the EP&A Regulation.

Provided the mitigation measures outlined in this document are implemented, the proposal is unlikely to have a significant adverse impact on the environment and therefore an environmental impact statement is not required. Standard environmental management practices, including the mitigation measures cited in this REF, will be documented in a construction environmental management plan.

Display of the REF

This REF is on display for comment between Tuesday 5 April 2022 and Tuesday 26 April 2022.

How can I make a submission?

To make a submission about this proposal please:

- email us at nswprojects@artc.com.au; or
- send comments via mail to:

  NSW Projects Community Engagement Team:
  Narrabri to Turrawan Line Upgrade Project
  GPO Box 14
  Sydney NSW 2001

All submissions must be received by **Tuesday 26 April 2022**.

All submissions will be managed in accordance with ARTC's Code of Practice for Environmental Impact Assessment of Development Proposals in NSW (the Code)

What happens next?

ARTC will consider all submissions received. After due consideration, ARTC will determine whether any changes need to be made to address issues raised in the submissions and whether or not the proposal should proceed.

A copy of ARTC's determination will be made publicly available on the project website at: www.artc.com.au/n2tupgrade

If the proposal is determined to proceed, ARTC will continue to engage and consult with the community and stakeholders prior to and throughout construction activities.

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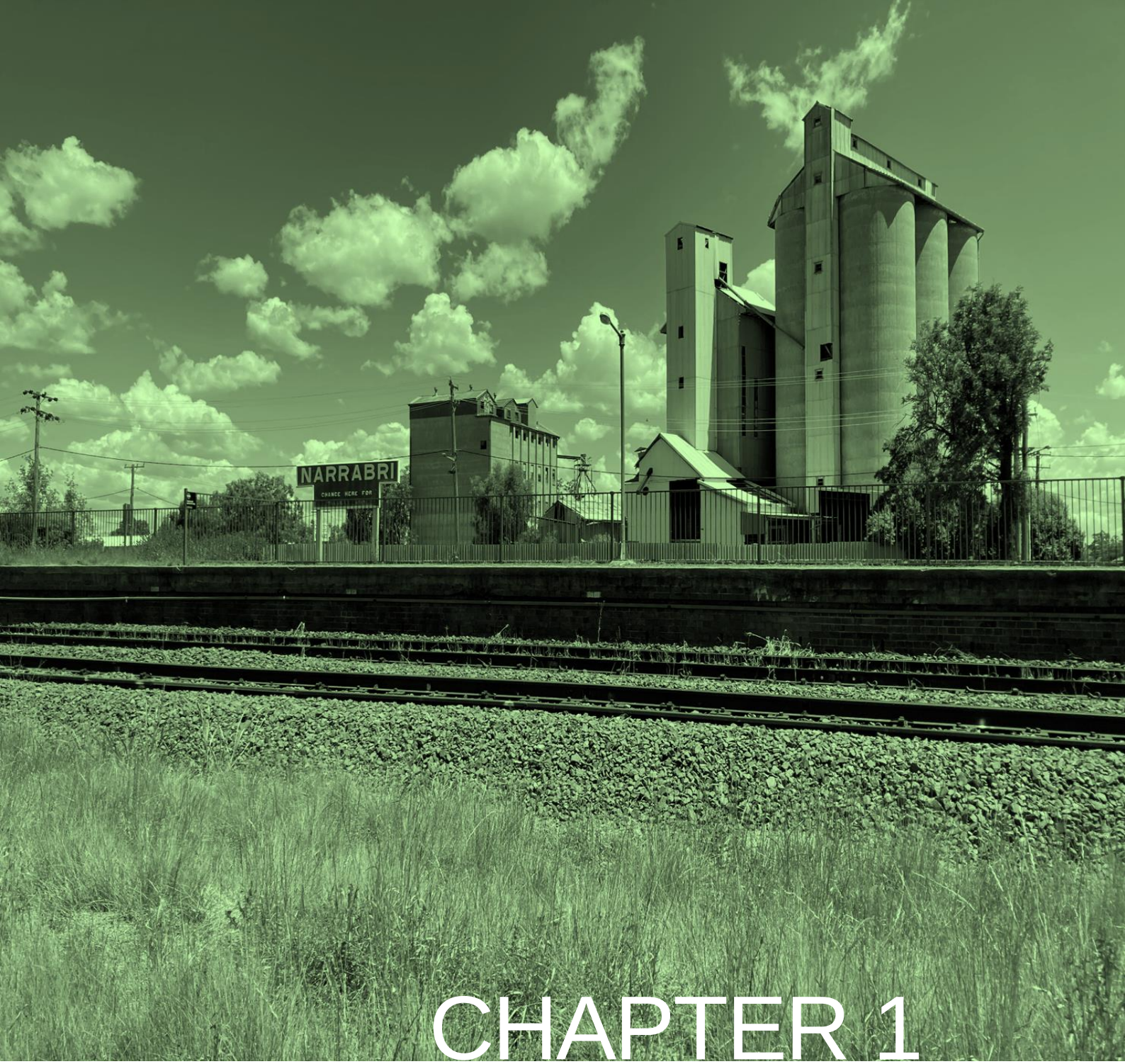


CHAPTER 1
INTRODUCTION

1 INTRODUCTION

1.1 Background

The Australian Rail Track Corporation Limited (ARTC) is an Australian Government owned statutory corporation that maintains approximately 8,500 kilometres (km) of rail track across five states. In New South Wales (NSW), ARTC is responsible for the Interstate Network (which includes the Sydney metropolitan freight network), Hunter Valley coal rail network, and delivery of Inland Rail which traverses the state.

ARTC propose to upgrade approximately 35 km of track between Narrabri and Turrawan, which is currently capable of accommodating sub 25 tonne axle load (TAL) and exhibits capability limitations resulting from the presence of steel and timber sleepers, aging rail for most of the line and poor track geometry.

The 'proposal' known as the Narrabri to Turrawan Line Upgrade, will enhance the quality and capability of the 35 km connection between the Hunter Valley rail freight network, south of Turrawan and Inland Rail at Narrabri North, to provide a consistent service offering between north western NSW, Inland Rail and the port of Newcastle.

The proposal will deliver a corridor capable of an enhanced weight rating of 25 TAL at 80 kilometres per hour (km/h), thereby allowing longer and heavier freight trains travelling from northern NSW to access international ports in Newcastle and Sydney.

This proposal aligns with the Australian Government's infrastructure investment goals to maximise the productivity and efficiency of the Australian freight network.

1.2 Purpose of this report

The proposal is permitted without development consent under State Environmental Planning Policy (Transport and Infrastructure) 2021 (Infrastructure SEPP). The proposal will not exceed the $50 million threshold specified under Schedule 3 to State Environmental Planning Policy (Planning Systems) 2021 (Planning SEPP) and is, therefore, not State significant infrastructure. As such, this review of environmental factors (REF) has been prepared to satisfy provisions under Part 5, Division 5.1 of the NSW *Environmental Planning and Assessment Act 197*9 (EP&A Act).

The purpose of a REF is to assist in meeting the statutory requirements to examine and consider, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of a proposed activity and establish whether or not the activity is likely to significantly affect the environment.

The findings of this REF are to be considered when assessing:

- whether the proposal is likely to have an impact on the environment such that it would require an environmental impact statement (EIS) under section 5.5 and 5.7 of the EP&A Act;
- possible impacts upon any threatened species as defined by the NSW *Biodiversity Conservation Act 2016* (BC Act), and referenced within the EP&A Act, which may require a species impact statement (SIS);
- possible impacts upon any Aboriginal or non-Aboriginal heritage items as defined by the NSW *National Parks and Wildlife Act 1974* (NP&W Act) and NSW *Heritage Act 1977*; and
- the potential for the proposal to impact any Matters of National Environmental Significance (MNES) or Commonwealth land that would require referral to the Commonwealth Environment Minister in accordance with the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This REF has been prepared by Element Environment Pty Ltd (Element) on behalf of ARTC and has been prepared generally in accordance with the ARTC REF template (ENV-GL-009) and ARTC REF Guidance Note (ENV-FM-021).

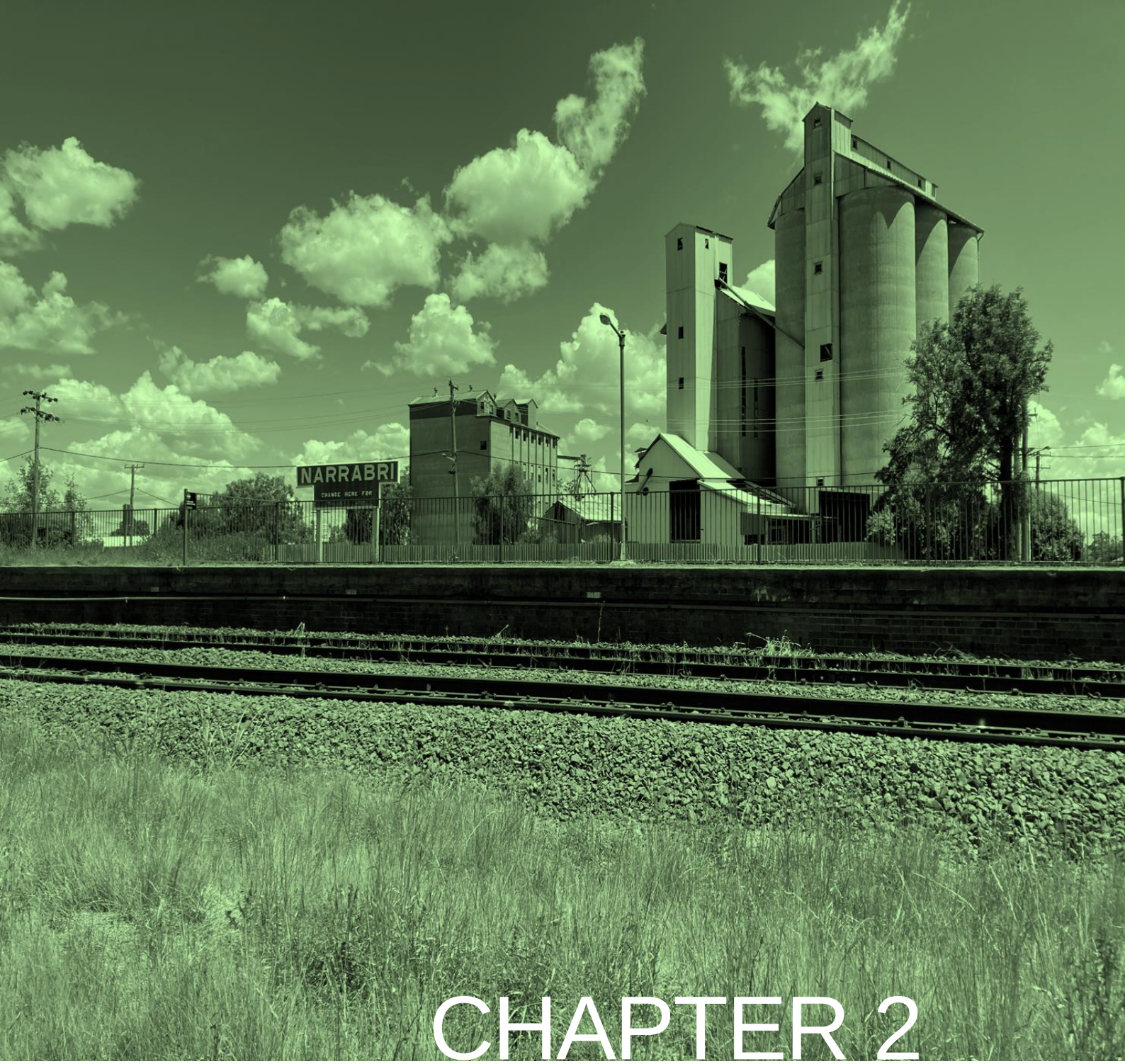
This REF has been prepared in accordance with the principles of ecologically sustainable development (ESD) and environmental due diligence. In preparing this assessment consideration has been given to the EP&A Act, the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) and other relevant environmental legislation. In addition, the potential impacts associated with the proposal have been considered against the matters listed under section 171 of the EP&A Regulation, as summarised in chapter 8 of this REF.

This REF has been informed by the concept design for the proposal, technical input from ARTC, as well as technical specialist input for biodiversity, surface water, heritage and noise impacts. If the scope of the proposal is altered at a later date, the need for supplementary environmental impact assessment will be considered.

1.3 The proponent

ARTC is the proponent for the proposal and a prescribed public authority as defined in section 1.4 of the EP&A Act and clause 1, schedule 1 of the EP&A Regulation. ARTC is the sole determining authority for the proposal under Part 5, Division 5.1 of the EP&A Act.

Under section 5.5 of the EP&A Act, ARTC is responsible for assessing the impacts of its activities. This REF presents an assessment of the potential environmental impacts associated with the proposal and identifies the measures to be implemented to avoid or minimise potential environmental impacts associated with the proposal.



CHAPTER 2

NEED AND OPTIONS CONSIDERED

2 NEED AND OPTIONS CONSIDERED

2.1 Need and objectives of the proposal

The Australian Government's infrastructure investment goals include maximising the productivity and efficiency of the Australian freight network.

As part of a wider program of works to achieve the above objective, the proposal will enhance the quality and capability of the 35 km rail connection between the Hunter Valley rail freight network, south of Turrawan, and Inland Rail at Narrabri North. The proposal will thus provide a consistent service offering between north western NSW, Inland Rail and international ports in Newcastle and Sydney.

With sections of Inland Rail to be gradually delivered over the next few years, maximising the benefit of these upgrades requires consistency in track capability to allow increased freight volumes to travel from north western NSW through to Newcastle and Sydney ports, where the majority of grain and cotton from this region is exported.

If the proposal is not delivered, Turrawan to Narrabri will be the last section that cannot accommodate 25 TAL trains when Inland Rail is completed. This will stimulate the growth in freight demand, which is likely to increase pressure on the road network and impact the international competitiveness of producers in the region with associated safety and environmental issues, increased freight costs, and a loss of economic opportunity.

This proposal aligns with the Australian Government's infrastructure investment goals and provides the opportunity to achieve rail infrastructure upgrades that boost national productivity, increase supply chain efficiency and enhance the competitiveness of Australian exports.

Key benefits of the proposal include:

- improved productivity for freight operators through higher speeds and higher axle loads by increasing rail size to enable an increase in maximum axle loading to 25 TAL at 80km/h;
- facilitate increased freight volumes (predominantly comprising cotton and grain) to travel from north western NSW through to Newcastle and Sydney ports for export;
- upgrade of the Narrabri to Turrawan Line to 25 TAL at 80km/h, which completes the 'missing link' between the Hunter Valley rail freight network and Inland Rail, thereby enabling a consistent service offering;
- enhanced competitiveness of rail freight;
- enable safety and environmental benefits created by transport mode shifts because of improved rail competitiveness; and
- greater volumes of freight moved on each train, reduced operating costs, reduced transport costs per tonne, greater supply chain efficiency and enhanced competitiveness of Australian exports.

2.2 Alternatives and options

Various options for the proposal were considered during initial planning and design and are summarised as follows.

2.2.1 Option 1 - Do nothing

This option would result in the continued deterioration of track quality and train performance and would continue to further constrain the supply chain between northern NSW, ports in Newcastle and Sydney and ultimate export destinations, thereby resulting in higher transport costs.

This option was not considered further as it does not address the proposal objectives or the constraints identified across the supply chain of northern NSW.

2.2.2 Option 2 - Progressive upgrade

This option would result in the upgrade of the line over the next 25 years as part of the normal track renewal cycle. As this option would defer the benefits of delivering the upgrade it will result in a loss of efficiency in the delivery model when compared to delivering the proposal as a major project, and thus the estimated cost of this approach is substantially higher compared to other options.

2.2.3 Option 3 - Upgrade the line but leave the formation intact

This option would involve upgrading the line with concrete sleepers and heavier rail, but the formation would remain intact.

Due to the potential for future formation failures on some sections of the line this option was not considered to be feasible.

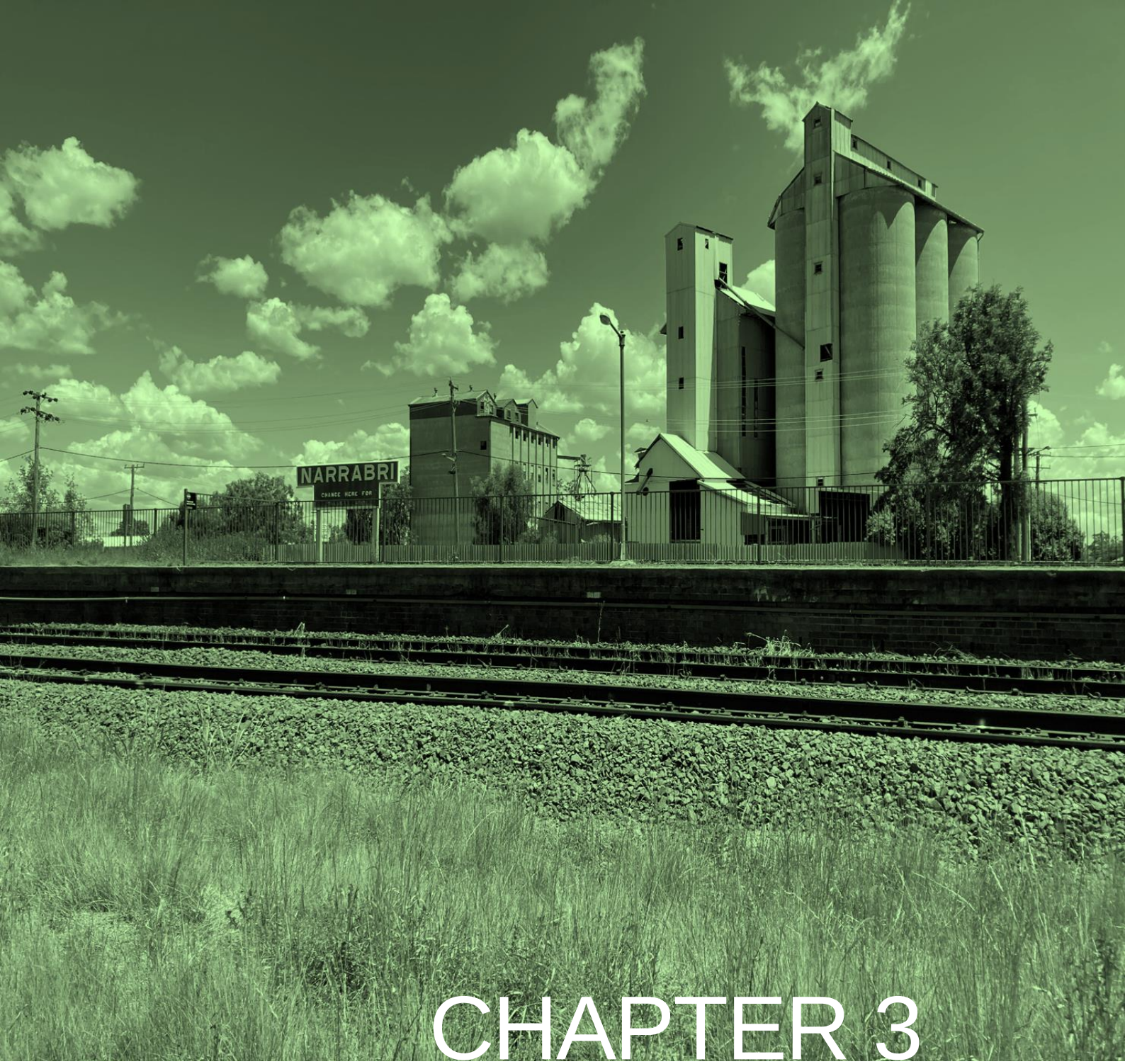
2.2.4 Option 4 - Upgrade the line, including upgrade to formation.

This option involves upgrading the line with concrete sleepers and heavier rail and upgrade the formation in targeted sections where required.

This option forms the basis of the proposal.

2.3 The preferred option

Option 4 is the preferred option as it achieves the proposal objectives, delivers benefits as early as possible and can deliver them efficiently as a major project. This option also addresses the potential for future formation failures by including upgrades to the track formation.



CHAPTER 3

PROPOSAL DESCRIPTION

3 PROPOSAL DESCRIPTION

3.1 Proposal overview

The proposal will include:

- replacement of existing steel and timber sleepers with heavy duty concrete sleepers;
- replacement of the existing rail with new 60 kg/m rail for 8.1 km between the Whitehaven Coal balloon loop junction (540.38 km) and the northern end of Turrawan passing loop (548.490 km);
- replacement of the existing rail with cascaded 53 kg/m rail for 26.7 km in length between the northern end of Turrawan passing loop (548.490 km) and the future Inland Rail interface at Narrabri North (575.00 km);
- lifting of the track in some sections in order to accommodate approximately 100 mm of new ballast below the new concrete sleepers;
- potential sleeper and rail replacement at the Turrawan crossing loop, using recovered steel sleepers and recovered 53 kg rail;
- track formation works at bridge ends, where required;
- partial level crossing upgrades (including new concrete sleepers, steel crossing panels and partial track lift or lifting of level crossing, where feasible); and
- repair of existing culverts which are in poor condition along the proposal alignment and replacement of small diameter culverts, where required.

3.1.1 Level crossing upgrades

The proposal will include major upgrades to the following level crossings:

- Greylands Road, Turrawan.
- Turrawan Road Crossing, Turrawan.
- Sandy Creek Lane, Narrabri.
- Private level crossing at chainage 561.820 km.
- Old Turrawan Road, Narrabri.
- Fraser Road, Narrabri.
- Private level crossing at 573.885 km.

The proposal will also include minor upgrades to the following level crossings:

- McKenzie Road, Narrabri.
- Fitzroy Street, Narrabri.
- Old Cemetery Road, Narrabri.
- Stock Route, Narrabri at 570.360

3.1.2 Culvert pipe upgrades

Culvert pipes which are in poor condition or non-compliant will be replaced along the proposal alignment.

Culverts pipes will be replaced at the following locations within the rail corridor (refer to Appendix A for culvert locations):

- Narrabri Junction (564.930 km) – two 300 mm steel pipes to be replaced with 300 mm steel pipes with new concrete headwalls.
- Narrabri Junction (565.130 km) – one 450 mm concrete pipe to be replaced with 450 mm reinforced concrete pipe and new concrete headwalls.

- East of Fraser Street, Narrabri (565.616 km) – two 600 mm corrugated pipes to be replaced with twin 600 mm reinforced concrete pipes and new concrete headwalls.
- North of Fitzroy Street, Narrabri (568.915 km) – two 450 mm corrugated pipes to be replaced with twin 450 mm steel pipes with new concrete headwalls.

Additional to the above culvert pipe replacement, the following culvert repairs will be undertaken:

- Chainage 546.110 km – inlet and outlet concrete surrounds to be repaired.
- Chainage 549.250 km – inlet and outlet concrete surrounds to be repaired.
- North of Killarney Gap Road, Narrabri (chainage 573.406 km) – new concrete headwalls to be installed.

3.1.3 Bridge works

The proposal will require bridge works at four transom top underbridges located at:

- Jacks Creek (chainage 559.900 km), inclusive of re-railing and potential bridge end reconditioning.
- Namoi River (chainage 565.755 km, inclusive of bridge end reconditioning.
- Narrabri Creek (chainage 567.633 km), inclusive of bridge end reconditioning.
- Mulgate Creek (chainage 571.605 km), inclusive of re-railing and potential bridge end reconditioning).

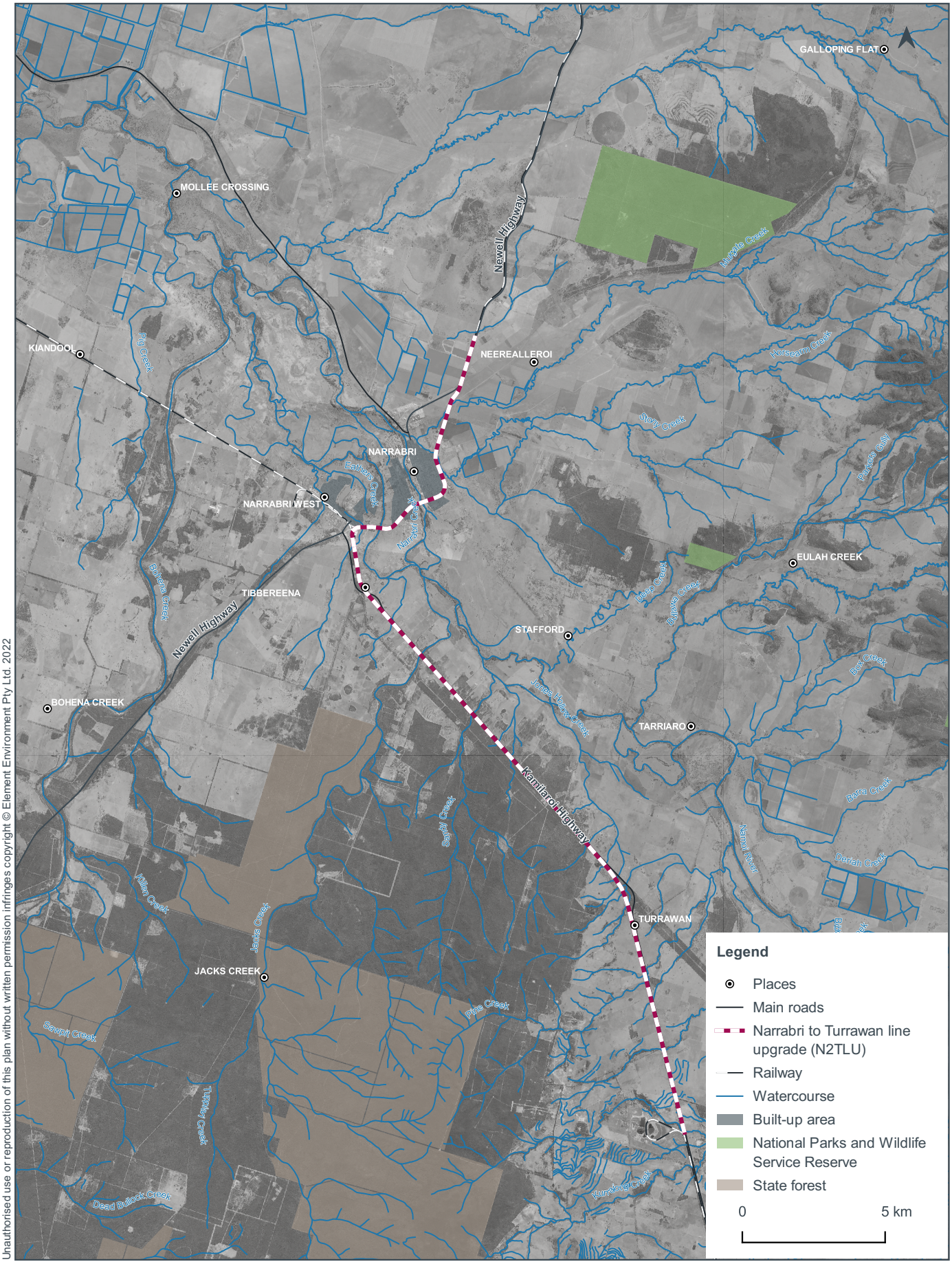
Refer to Appendix A for bridge locations.

3.2 Location

As illustrated in figure 3.1, the proposal comprises upgrades to two sections of existing operational track on the Main North Line between the Whitehaven Coal junction at the approximate chainage of 540.3 km and Narrabri North at approximate chainage 575 km. The proposal is in the Narrabri local government area (LGA).

Figure 3.1
Regional context

Narrabri to Turrawan Line Upgrade
REVIEW OF ENVIRONMENTAL FACTORS



3.3 Proposal area

As illustrated in Appendix A, the 'proposal area' is defined as the area that will be directly disturbed by construction of the proposal. The project area generally comprises areas within the rail corridor, surrounding access tracks and access points and material delivery routes within the local area.

The 'study area' comprises the project area, along with the broader area that has potential to be directly or indirectly affected by the proposal.

The proposal will primarily utilise existing 'operational areas' in the rail corridor to minimise ground and vegetation disturbance. Operational areas include:

- existing maintenance access tracks (maximum five metres wide);
- operational areas, defined as three metres either side of the outermost rail; and
- existing access points from Kamilaroi Highway and Newell Highway (maximum six metres wide).

Temporary areas of disturbance will also be required outside of operational areas within the rail corridor, and include:

- storage areas for sleepers and ballast.
- temporary access pathways for vehicle movements between existing access tracks and the operational areas of the rail corridor.
- access and laydown areas at level crossings, other areas throughout the rail corridor, and in some locations adjacent to the rail corridor.

The construction activities will largely be confined to the eastern side of the rail line between Turrawan and Narrabri with access predominately from the east off the Kamilaroi Highway, and the Newell Highway to the north of Narrabri. Through Narrabri, works will predominately be located on the western side of the rail corridor with access provided via the western side of the rail corridor through Narrabri township.

Areas within the rail corridor which are subject to temporary disturbance will be assessed based on site constraints, with areas of environmental sensitivity including waterways, densely vegetated areas, steep embankments and waterlogged areas avoided. Vegetation within these areas will not be cleared however may be impacted via movement of vehicles over groundcover vegetation and compaction with storage of materials. Material storage areas will be confined to previously cleared areas where feasible to minimise disturbance.

3.4 Land use and ownership

Most of the alignment is on land zoned RU1 Primary Production. The section of rail corridor within the township of Narrabri is zoned SP2 Infrastructure.

Land uses in the broader study area comprise rural and large lot residential premises. Within Narrabri, adjacent land uses include industrial, residential and commercial premises. Several public recreation land uses are also located in the vicinity of the rail corridor.

The rail corridor is owned by the NSW Government and leased by ARTC. The rail infrastructure in the rail corridor is owned and operated by ARTC. The proposal area will predominately be in the rail corridor or on land for which ARTC has existing access agreements. In some instances, sections of the adjacent road reserve may be required to provide for temporary compound/storage areas

In some locations along the proposal alignment, access via private property will be required. Landowner consent for access via private property will be obtained in accordance with ARTC

protocols. It is recommended that prior to access via private property an environmental constraints analysis is carried out to confirm the access pathway will not risk potential impact to biodiversity or heritage values. If access may result in potential impacts, alternative access should be sought, however if this is not feasible supplementary environmental impact assessment will be required.

3.5 Key design features

A concept design and alignment for the proposal was prepared in accordance with relevant ARTC standards and guidelines.

Further review and refinement of the design will occur prior to construction of the proposal. All infrastructure will be designed to be compliant with relevant industry standards. Additionally, culverts should be designed to incorporate objectives of the *Guidelines for outlet structures on waterfront land* (DPI, 2012), including scour protection measures.

3.5.1 Sustainability in design

ARTC's environmental, social and governance (ESG) ambition is to support Australia's sustainable future through modal shift to rail. A key objective of the ESG strategy is to build projects efficiently, collaboratively, and by maximising the benefits to the Australian economy.

During scope development and review, it is considered the Proposal can positively contribute to the priorities of ARTC's ESG Strategy – network safety and resilience, socially responsible, environmental benefits and a skilled and diverse workforce.

Key design elements and strategies to achieve positive sustainability outcomes will be refined in detailed design and implemented through the Construction Environmental Management Plan (CEMP), with a focus on the following key areas:

- Management and leadership.
- Procurement.
- Resource conservation.
- Waste.
- Ecology and heritage.
- Community and stakeholder engagement.

3.6 Construction activities

3.6.1 Construction methodology

At this stage, ARTC envisages that execution of the proposal will comprise several construction activity types that will be most likely completed in stages, and in some cases overlapping stages. These activities will be refined once the detailed design is completed, and construction contractors are appointed to undertake selected works under relevant construction contracts.

The activity types will generally include:

Site establishment

Prior to the commencement of construction of the proposal, the following general activities will be conducted:

- notify affected landowners and stakeholders in accordance with a community and stakeholder engagement plan;

- if required, conduct preliminary investigations including ground survey, underground and overhead services location, potholing, geotechnical investigations and soil testing.
- completion of Dial Before You Dig (DBYD) plans;
- establish environmental controls including erosion and sediment controls and exclusion fencing for sensitive areas;
- site establishment including setting up temporary site security fencing, traffic and pedestrian management controls, protection of existing services, temporary ancillary facilities, parking and laydown areas within the proposal area;
- delivery of construction equipment and materials by road and rail (e.g. rail, ballast, pre cast concrete headwalls) to designated ancillary facilities in advance of construction commencement;
- remove vegetation where approved by this REF.

Formation reconditioning

Formation reconditioning will be completed as required at bridge ends, culvert replacements, level crossing reinstatements, sections of poor rail track stability and potentially in sections through Narrabri where a track lift is impractical due to fixed level constraints (level crossings, turnouts, rail platforms, etc.)

The formation reconditioning methodology will broadly comprise:

- cut and remove existing rail in sections using track tools (track saw, oxy-acetylene, rattle guns etc.), excavators, hi-rail excavators and front-end loaders;
- remove existing sleepers using excavators and front-end loaders and stockpile;
- remove ballast and landscaping using excavators;
- excavate existing track formation material to required depth using excavators, dump trucks and front-end loaders. Excavated material to be stockpiled for re-use in backfill or where required waste classification and disposal;
- trim subgrade to profile using excavator, pozitrack or grader;
- install imported structural fill and capping (typically from stockpile) using excavator, pozitrack/ grader and tip trucks/dump trucks, and compact using rollers and plate compactors (as required);
- install new ballast using excavators, front-end loaders, dump trucks, pozitrack/grader and compact with rollers;
- install new concrete sleepers using excavators, front-end loaders and pozitrack;
- install new 60 kg rail or cascaded 53 kg rail as detailed in the design using excavators, front-end loaders and track tools;
- weld rail using combination of free and adjustment welding using welding equipment and trucks, flash-butt welding truck, hi-rail excavators and front-end loaders;
- completion of track horizontal and vertical alignment to design level and ballast profile using ballast trains, hi-rail excavators, hi-rail hydrema's, tampers and regulators; and
- sleeper replacement, where existing steel and timber sleepers will be replaced with heavy duty concrete sleepers, the existing steel sleepers will be stockpiled for reuse or scrap disposal if damaged. The existing timber sleepers will likely be disposed due to generally poor condition.

Access to the respective construction sites will be via existing maintenance access roads or using hi-rail equipment. Material stockpiles and laydown areas will be required during construction within the rail corridor.

Ballasting

Ballast will be applied using a dedicated rake of ballast wagons, thereby minimising disturbance to the rail corridor.

Ballast is applied to the crib and shoulders and spread out to ensure adequate quantity of ballast is available to be packed in and under the sleepers that have been replaced.

Water is used to suppress dust generated by the unloading process where applicable.

Rail replacement

The existing rail will be replaced with new 60 kg rail or cascaded 53 kg rail as detailed in the design. The existing rail within the Turrawan crossing loop will potentially be replaced also with recovered 53 kg rail from elsewhere along the proposal alignment.

The existing rail will be classified and either cut up for recycling/srcap or stockpiled in 110 m lengths (or similar) for future reuse.

Rail is normally replaced due to its sub-standard cross section, rail weight per metre or its general shape due to excessive side and top wear.

Rail replacement generally involves:

- removal of existing rail fastenings using mechanical equipment operated by skilled labourers;
- removed sections of rail are removed to the side of the track using a 15-20 tonne excavator with a special rail threader attachment (hi-rail);
- replacement rail is then lifted into place by the excavator/rail threader and placed onto sleepers; and
- fastenings are reattached using mechanical equipment, and once rails are in place and fastened the track is then ready for ballasting and tamping.

Rail will be delivered to site via a rail set and unloaded. The rail will be stored within three metres of the outermost rail to minimise any disturbance to the corridor.

Sleeper replacement

Timber and steel sleepers along the rail line are to be replaced with concrete sleepers. This will potentially be carried out also within the Turrawan crossing loop.

The removal of sleepers generally involves:

- timber sleeper fastenings are extracted by small mechanical machines operated by skilled labourers;
- the sleepers are then extracted using a sleeper grab on a small excavator (hi-rail); and
- concrete sleepers are then inserted as a replacement and fastenings attached to the rail.

Sleepers will be delivered to site and placed off the ground on timber bracing along the maintenance access tracks, adjacent to the rail track and within the rail envelope.

Sleeper replacement will be completed using hi-rail excavators and associated hi-rail plant and trailers, minimising disturbance to the rail corridor.

The side insertion methodology for concrete re-sleepering will broadly comprise:

- pre-lift of track using tamper and regulator;
- removal of excess ballast and landscaping using excavators;
- remove existing sleepers (side removal) using excavators and front-end loaders to stockpile;
- side insert new sleepers using excavators and front-end loaders to distribute new sleepers;
- replace ballast using either hydrema dump trucks, ballast hoppers and shunt engine; and
- interim resurfacing using hi-rail excavator with tamping banks, track tamper and regulator.

The removed timber sleepers will be classified and recycled, stockpiled for future reuse or disposed to an appropriately licenced waste management facility.

Track realignment (vertical and horizontal)

Track geometry is adjusted using an on rail mechanical tamping / lining machine.

Track tamping is a process where ballast is compacted beneath the sleepers to provide support under train loading.

Following tamping, ballast is profiled on the shoulder and crib to ensure standard profiles are installed.

All track resurfacing will be performed by specialised rail bound equipment within the rail envelope, minimising disturbance to the rail corridor.

Welding and adjustment

Following rail replacing, rails are welded into a continuous pattern which eliminates mechanical joints.

The normal process used is an aluminothermic welding process, however flash butt welding may be required and provides an improved quality weld.

All welding resources will access the construction sites via existing maintenance access roads or using hi-rail equipment and works are restricted to the rail envelope, minimising disturbance to the rail corridor.

Rail grinding

Rail grinding is a process used to re-profile the existing rail head shape to enable an optimum wheel rail interface.

The process is also used to remove surface defects from rail and is performed by specialised rail bound track grinders, with multiple grind stones operated by electric motors.

All rail grinding resources will access the construction sites via existing maintenance access roads or using hi-rail equipment and works are restricted to the rail envelope, minimising disturbance to the rail corridor.

Hi-rail equipment will also have water and firefighting resources on board to minimise any ignition of fires from the welding.

Level crossing upgrades

Level crossings are upgraded using a similar process to track reconditioning, where track geometry is poor due to degraded ballast and formation.

The process involves removing rails and sleepers and excavating to a predetermined depth depending on geotechnical conditions.

New formation and capping is installed, compacted and trimmed. A bottom layer of ballast is laid and compacted. Sleepers and rail are reinstalled and fastened. Top ballast is then added, the track is then resurfaced, and ballast profiled using a mechanical tamper and ballast regulator.

Once the level crossing track has been reconditioned, the road surface is re-applied using a range of different configurations including:

- Asphalt.
- Steel panel top.
- Cast in situ concrete.
- Rubber modular panels.

- Pre cast concrete panels.

Once the road surface at the crossing has been completed, the track is then welded and adjusted to stress free temperature. Level crossing signs and line marking is then installed to complete the process.

There is no requirement to upgrade electrical signalling or alarm systems.

Culvert upgrades

Culverts will be replaced via conventional open excavation or pipe jacking methodology.

Culverts being replaced via open excavation will include the following:

- relocating of any utility infrastructure which may affect the works;
- cutting the track and removing panel;
- excavating the area where pipe / culvert is to be replaced;
- installing new pipe or culvert runs;
- compacting and rebuilding rail embankment;
- installing bottom ballast;
- installing track panel and resurfacing; and
- welding and adjustment of tracks.

Pipe jacking will comprise a less intrusive methodology and include:

- relocating any utility infrastructure which may affect the works;
- installing jacking pits and jacking equipment;
- installing pipes and commence jacking pipes through the rail embankment;
- completing pipe jack installation;
- installing headwalls; and
- certifying tracks.

Bridge works

The reinstatement of bridge ends will include:

- removal of existing track (rail, sleepers, and ballast) to expose the track formation over the specified length;
- excavation to required depth to install new structural layer and capping as required;
- installation of a reinforced pre-cast concrete transition slab at each abutment using cranes.
- Re-construction of the track with new ballast, concrete sleepers, and new 60 kg rail or cascaded 53kg rail as detailed in the design.

The construction methodology will be as per that of formation reconditioning at the bridge locations.

Demobilisation

Upon completion of construction of the proposal, the following activities will be carried out:

- dispose all redundant waste materials to an approved waste management facility;
- restore all disturbed areas to pre-existing condition or better, or where this is impractical stabilise disturbed surfaces to meet the requirements of Managing Urban Stormwater: Soils and Construction' published by Landcom (commonly, and hereafter, referred to as 'the Blue Book'); and
- demobilise site amenities, remove security fencing and environmental controls.

3.6.2 Plant and equipment

Table 3.1 outlines the construction plant and equipment expected to be used for the proposal. Additional plant and equipment may be utilised as required, and not all listed equipment will be used simultaneously.

Table 3.1: Plant and equipment

Plant and equipment	Construction aspect			
	Site establishment	Track works	Level crossing works	Culverts/ drainage
Temporary barriers	x			x
Excavators 5-8 tonnes				x
Excavators 12-20 tonnes		x	x	x
Excavators 30 tonnes		x	x	
Front end-loaders		x	x	x
Dump truck		x	x	x
Pozitrack or grader		x	x	x
Vibratory rollers (tonnes)		x	x	x
Hydrema dump truck		x	x	
Track tools		x	x	x
Welding and oxy-cutting equipment		x	x	
Flash-butt welding truck		x		
Hi-rail excavator		x	x	
Ballast trains	x	x	x	x
Tamper / regulator		x	x	
Ballast hoppers and shunt engine		x		
Hi-rail excavator with tamping banks		x		
Track saw		x		
Oxy-acetylene equipment		x		
Rattle guns		x		
Generators	x	x	x	x
Mobile crane			x	x
Water cart (10,000 litres)	x	x	x	x
Saws (concrete/ rail)		x	x	x
Semi-trailers		x	x	x

3.6.3 Personnel and parking requirements

The number of personnel onsite at any time will fluctuate depending on activities, with maximum personnel required during scheduled track possessions.

Outside of scheduled track possessions, the average number of personnel will be approximately 50, distributed across several locations. During scheduled track possessions a peak workforce may be up to 150 people, distributed across several locations.

Construction worker parking will be limited to the site compounds or within the proposal area where equipment or vehicles are required adjacent to the worksite.

Where private vehicles for construction personnel are used, for example between travel from a company office to the proposal work site, parking may also be required on public roadways adjacent to formal access points to the rail corridor.

3.7 Lease area and ancillary facilities

The proposal will be confined to the existing rail corridor, with no property acquisition required. Where temporary occupation of Narrabri Shire Council (council), Crown and/or private land is required for ancillary facilities, landowner consent will be obtained in accordance with ARTC protocols.

To facilitate construction of the proposal, supporting ancillary facilities such as site amenities, laydown and stockpile storage areas will be required to be established. These facilities will be temporary and confined to the rail corridor and will be removed upon completion of the proposal. Laydown areas will likely be required approximately every 500 m along the rail corridor.

In addition to laydown areas inside the rail corridor, construction compounds for the proposal will be located:

- in road verge areas leased by council on the western side of Old Turrawan Road, Narrabri;
- in private land adjacent to the Fraser Street level crossing, Narrabri; and
- in road verge areas leased by council on the western side of the rail corridor at Logan Street and James Street, Narrabri.

The final location of ancillary facilities required to support the proposal will be confirmed during construction planning by the appointed construction contractor, however these areas will generally be confined to the area nominated as the proposal area (refer to section 3.3).

Where alternate ancillary facilities and laydown areas are required, outside the proposal area, the following general environmental criteria will be considered:

- located on generally flat land;
- limit proximity to sensitive receivers (>100 m);
- no disruption to property access;
- no impact to known items of non-Aboriginal and Aboriginal heritage;
- use existing cleared areas and existing access tracks;
- no impacts to remnant native vegetation or key habitat features;
- will not result in more than a minor impact to the local road network;
- at least 100 m from waterways and drainage lines; and
- no disturbance of contaminated material.

Where additional ancillary facilities beyond those nominated in this REF are required, the construction contractor will undertake additional assessment as required by ARTC in accordance with the above environmental criteria. Where the environmental criteria cannot be met, or facilities are located outside the rail corridor, further environmental assessment will be required.

3.8 Access

As illustrated in Appendix A, the rail corridor will be accessed via existing access points from the public domain, with no new access points required. Within the corridor, construction personnel will utilise existing maintenance access tracks to the location of the respective work site and/or ancillary facilities.

Where existing maintenance access tracks cross through ephemeral drainage lines or waterways, where required the access track will be repaired or upgraded within the same disturbance footprint, inclusive of erosion control measures such as introduction of rock armouring.

Access points within Narrabri will be limited to entry points along the main haulage routes associated with construction traffic. However, alternate existing access points may be utilised for smaller vehicle access and material delivery as required.

Refer to section 6.4 for detail on construction traffic movements.

3.9 Source and quantity of materials

The proposal is predominantly comprised of re-railing and re-sleepering works with some areas requiring track upgrade works, which include removing some of the existing material and replacing it with 'structural' and 'capping' materials. These materials are specification controlled and are therefore generally required to be imported to site from a quarry or other suitable location.

The proposal has been designed to reuse as much existing material as possible. By undertaking this approach, import quantities have been reduced and spoil quantities have been minimised.

Table 3.2 provides an estimate of the quantities of materials to be imported for construction of the proposal.

Table 3.2: Estimated construction materials and quantities

Materials	Estimated quantity
Structural fill	5,163 cubic metres (m^3)
Capping material	1,239 m^3
Concrete sleepers	55,150
Ballast	82,715 tonnes
Rail	17,000 m of 60 kg 38,000 m of 53 kg

3.10 Construction hours and duration

The construction period is estimated at 15 months, to be completed in stages between July 2022 and September 2023 (subject to weather and COVID-19 restrictions).

Construction within an operational rail corridor is subject to restriction and as such works may be co-ordinated as per the below options:

- Option 1:
  - Where works are permitted, a roster schedule will be implemented (typically 10 days on and four days off) working predominately between the hours of 6 am to 6 pm Monday to Friday.
  - Additionally, certain aspects of the proposal will be constructed during the scheduled annual rail possessions, which are typically 3 days long, with 24 hour construction.
  - This option will result in a smaller team of construction personnel working at a lower intensity for a period of approximately 6-15 months (subject to staging).
- Option 2:
  - This option will construct the proposal exclusively during the scheduled annual rail possessions, which are typically 3 days long, with 24 hour construction.
  - This option will result in a significantly larger team of construction personnel working at a 'higher intensity' at multiple sites for a period of 3-4 days, six times a year for approximately 15 months (subject to staging).
  - Construction works will be continuous throughout this period. A combination of day and night shifts will be implemented throughout the restricted possession of the rail corridor.

Option 1 is the preferred arrangement however will be subject to construction planning by the appointed contractor.

3.11 Operation and maintenance

Following completion of the proposal, the section of the Main North Line between chainages will be capable of supporting 25 TAL and the rail line will have improved reliability permitting track speeds of 80 km/h both north and south of Narrabri.

Interstate freight trains of up to 1.5 km long will continue to use the alignment and grain trains of up to 1.3 km in length could be accommodated, up from the current 750 m to 1 km long trains.

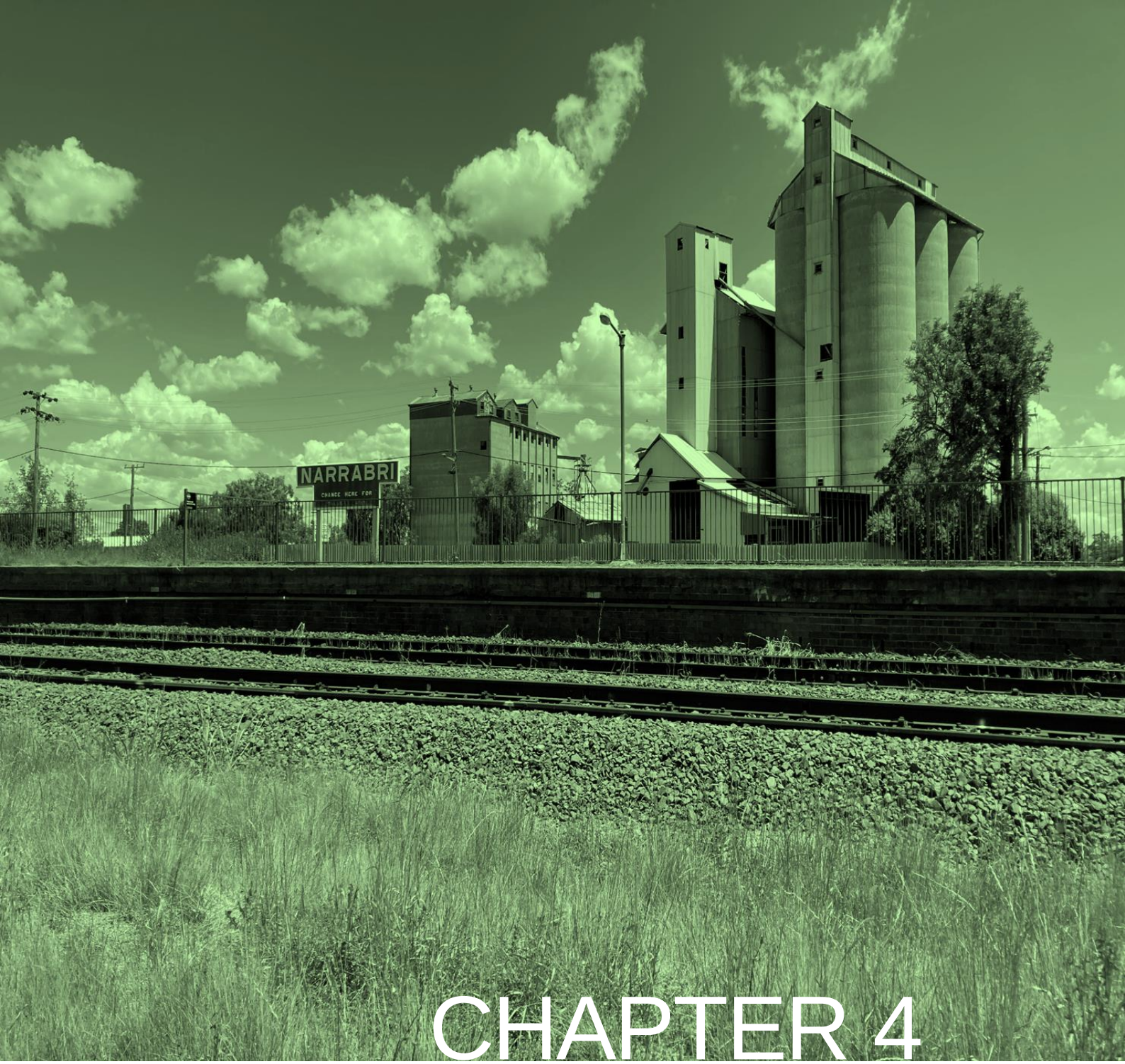
Future mandatory freight paths will average 2-3 services per day (i.e. 4-6 train movements), while grain and cotton freight paths will continue to be seasonal with an anticipated 4-6 services per day (8-12 train movements).

The existing daily passenger service through Narrabri will continue, with two services per day in the morning and evening.

Standard ARTC maintenance activities will be undertaken during operations. Typically, these activities include minor maintenance works, such as bridge and culvert inspections, access track maintenance, vegetation maintenance, rail grinding and track tamping, through to major maintenance, such as reconditioning of track and topping up of ballast as required.

3.12 Estimated capital investment

The Australian Government has announced a commitment of $44 million to fully fund ARTC in delivering the proposal.



CHAPTER 4

STATUTORY AND PLANNING CONSIDERATIONS

4 STATUTORY AND PLANNING CONSIDERATIONS

4.1 Introduction

This chapter describes the Commonwealth and NSW planning legislation and policy framework under which the proposal will be assessed and approved.

4.2 Commonwealth legislation

4.2.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the primary environmental legislation at the Federal level and is administered by the Commonwealth Department of Agriculture, Water and the Environment (DAWE), providing a legal framework to protect and manage national and international important flora, fauna, ecological communities and heritage places, defined under the EPBC Act as MNES.

The EPBC Act also confers jurisdiction over actions that have a significant impact on the environment where the actions affect, or are taken on, Commonwealth land.

A controlled action is any development, undertaking or activity that will have or is likely to have a significant impact on a MNES as set out in Part 3 Division 1 of the EPBC Act. Carrying out a controlled action without approval is an offence against the EPBC Act.

An action that has, will have or is likely to have a significant impact on an MNES or Commonwealth land may not be undertaken without prior approval from the Commonwealth Minister, as provided under Part 9 of the EPBC Act.

The Protected Matters Search Tool (PMST) is managed by DAWE and is used to identify MNES near a development. The PMST was searched in September 2021 to determine the protected matters records in a 10 km radius of the proposal area, with a summary of the findings presented in table 8.2.

In summary, the proposal will not have, or is unlikely to have, a significant impact upon a MNES or on Commonwealth land.

4.2.2 Native Title Act 1993

The *Native Title Act 1993* recognises that Aboriginal people have rights and interests to land and waters which derive from their traditional laws and customs. Native title may be recognised in places where Indigenous people continue to follow their traditional laws and customs and have maintained a link with their traditional country. It can be negotiated through a Native Title Claim, an Indigenous Land Use Agreement or future act agreements.

The National Native Title Register, Register of Native Title Claims, and Register of Indigenous Land Use Agreements were searched in September 2021 for reported native title claimants in the LGA.

One native title claim filed by the Gomeroi People in 2012 covers the proposal area. However, as specified in clause 3 of the claim, all land covered by the establishment of any public work (where commenced prior to December 1996) is excluded from the claim. Given the rail corridor is a public work and the proposal is maintenance of such a public work, the native title claim is not relevant to the proposal.

4.3 New South Wales legislation

4.3.1 Environment Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act is the principal legislation for assessment and determination of development proposals in NSW. It aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development.

Implementation of the EP&A Act is the responsibility of the Minister for Planning, statutory authorities and local councils. It contains the following parts that impose requirements for planning approval:

- Division 5.1 of Part 5 which provides for control of activities that do not require approval or development consent under Part 4; and
- Division 5.2 of Part 5 which provides for control of SSI that does not require approval or development consent under Part 4.

The EP&A Act also determines the consent authority for the proposal. The Act allows for the development to occur as exempt, with consent or without consent.

As detailed in Section 1.2, this proposal is development permitted without consent and is not SSI.

Section 5.5 of the EP&A Act requires a determining authority to examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of the Proposal.

4.3.2 Environmental Planning and Assessment Regulation 2021

Under section 5.5 of the EP&A Act, prior to carrying out an activity, ARTC has a duty to examine and consider all matters affecting or likely to affect the environment. Section 171 of the EP&A Regulation defines the factors that must be considered when determining the likely impact of an activity on the environment. Section 171 factors are assessed in section 8.2 of this REF.

Sections 199 and 200 of the EP&A Regulation set out special provisions relating to ARTC operations within NSW, including implementation of the ARTC Code of Practice for Environmental Impact Assessment of Development Proposals in NSW 2006 (The Code).

Development for the purposes of rail infrastructure facilities that is not SSI and subject to Part 5 of the EP&A Act is to be carried out in accordance with the Code required under clause 198 of the EP&A Regulation.

The proposal is consistent with a Class 4 development and is to be formally assessed under the Code.

4.3.3 Other New South Wales legislation

In addition to the requirements under Division 5.1 of Part 5 of the EP&A Act, the proposal will require additional approvals, licences and/or authorisation under various other pieces of NSW legislation, which are summarised in table 4.1.

Table 4.1: NSW legislation

Legislation	Objective	Application to the proposal
NSW *Protection of the Environment*	The POEO Act aims to protect, restore and enhance the quality of the environment in the context of ecologically sustainable development	Clause 48 of the Act outlines that an Environment Protection Licence (EPL) is required where any scheduled activity

Legislation	Objective	Application to the proposal
Operations Act 1997 (POEO Act)	and to reduce risks to human health and prevent degradation of the environment.	described in Schedule 1 of the POEO Act is to be undertaken at a premise. ARTC currently holds an EPL (licence number 3142) to undertake 'Railway activities—railway infrastructure operations' as defined in clause 33A. On this basis, the proposal does not trigger a new or different scheduled activity, and consequently an additional EPL is not required. The proposal is consistent with the definition of 'maintenance activities' per condition E1.1 of the EPL. As such, the relevant EPL conditions specific to maintenance of railway infrastructure apply to the proposal. The need for any variation to the existing EPL will be further reviewed once the construction contractor has been appointed and the construction methodology has been confirmed.
NSW *Biodiversity Conservation Act 2016*	The BC Act provides protection for threatened plants and animals native to NSW (excluding fish and marine vegetation) and integrates the conservation of threatened species into development control processes under the EP&A Act.	As outlined in section 6.5, there will be no significant impact on threatened ecological communities, populations or species, nor potential habitat of threatened species afforded protection under the BC Act.
NSW *Biosecurity Act 2015*	The NSW *Biosecurity Act 2015* provides a framework to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants. The Act requires any person who deals with any biosecurity matter or who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. Whilst the Act provides for all biosecurity risks, implementation of the Act for weeds is supported by regional strategic weed management plans developed for each region in NSW.	The proposal will be carried out within a highly disturbed rail corridor, in which noxious and environmental weed species may occur and require removal during the construction of the proposal. Noxious weed management measures will be included in a Construction Environmental Management Plan (CEMP) and will be implemented during construction of the proposal to aid in the management and control of identified noxious weeds.
NSW *Contaminated Land Management Act 1997* (CLM Act)	The CLM Act establishes a process for investigating, and where required remediating contaminated lands, that pose a risk to human health and the environment. The CLM Act outlines the circumstances in which notification of the Environment Protection Authority (EPA) is required in relation to the contamination of land. The provisions of the CLM Act may become relevant during construction and/or operation of the proposal, should land become contaminated.	The EPA's Contaminated Land Record and List of Contaminated Sites notified to the EPA was searched in September 2021. No recorded contaminated sites requiring remediation under the CLM Act were identified in or adjacent to the proposal area. Additionally, ARTC's contamination register similarly does not have any sites recorded in or near the proposal area.
NSW *Fisheries Management Act 1994* (FM Act)	The objectives of the FM Act are to conserve, develop and share the fisheries resources of NSW for the benefit of present and future generations. Various permits are	Section 201 of the FM Act states that dredging or reclamation work must not be carried out unless authorised via a permit issued by the Minister under Part 7.

Legislation	Objective	Application to the proposal
	required for certain activities that have the potential to impact waterways and associated fishery resources.	Dredging is defined under the FM Act as any work that involves excavating 'water land', which includes land which is intermittently submerged by water. As the proposal will involve working within a flood prone area which may intermittently be submerged by water and will require repair and upgrade to access tracks which cross waterways mapped as providing key fish habitat, a permit under Part 7 of the FM for the purposes of dredging will be required prior to construction. As outlined in section 6.5, there will be no significant impact on threatened ecological communities, populations or species, nor potential habitat of threatened species afforded protection under the FM Act.
NSW *Water Management Act 2000* (WM Act)	The WM Act regulates the management of water by granting licences, approvals for taking and using water, and trading groundwater and surface water. The WM Act applies to those areas where a water sharing plan (WSP) has commenced. Alternatively, if a WSP has not yet commenced, the *NSW Water Act 1912* (Water Act) applies. The WM Act is progressively replacing the Water Act as relevant WSPs are introduced across the State. Water sharing plans have commenced for most of NSW. Licensing of monitoring bores continues under the Water Act until a regulation for aquifer interference gives a mechanism to approve these activities. Licensing of reinjection into groundwater systems is also still currently managed under the Water Act.	The proposal falls within the following water sharing plans: ▪ NSW Murray Darling Basin Porous Rock Groundwater Sources 2011 (Gunnedah-Oxley Basin Groundwater Source). ▪ NSW Great Artesian Basin Groundwater Sources 2008 (Southern Recharge Groundwater Source). ▪ Upper and Lower Namoi Groundwater Sources 2003 (Upper Zone 5, Namoi Valley (Gin's Leap to Narrabri) Groundwater Source and Lower Namoi Groundwater Source). The provisions of the WM Act therefore apply to the proposal. The WM Act provides for access licences (section 60A) to take water, approvals to use water (a water use approval – section 91A) and approvals to build any of the works required to extract and store water (a water management works approval, which includes; a water supply works approval, a drainage work approval and a flood work approval, section 90, 91B, 91C, 91 D). The WM Act also provides for approvals for 'controlled activities' which are works on waterfront land within 40m of any river, lake or estuary (section 91E, 91G). ARTC can access a number of exemptions under the Water Management (General) Regulation 2018, including; ▪ exemptions from water access licences, providing less than 3 megalitres is required or where water extracted is used in the construction of railway infrastructure facilities (e.g. for the purposes of dust suppression) (Schedule 4 Part 1). ▪ exemptions from the need to obtain water use approvals in circumstances where ARTC is also exempt from water access licences (clause 34).

Legislation	Objective	Application to the proposal
		▪ exemptions for controlled activities (Schedule 4 Part 2). ARTC may require a water supply works approval for any dewatering of groundwater that may infiltrate into excavations. ARTC will assess the likely requirement for excavation dewatering during detailed design and if it is likely to be a requirement for construction of the proposal, a water supply works approval will be obtained.
NSW *Heritage Act 1977* (Heritage Act)	The Heritage Act provides for the protection and conservation of non-Aboriginal cultural heritage items such as buildings, works, relics and other places of historic, cultural, social, archaeological, architectural, natural and aesthetic significance.	ARTC must seek approval under section 60 of the Heritage Act if it is likely to impact an item of heritage significance listed on the state heritage register (SHR). Section 57 specifies that approval is required to 'demolish, damage, excavate, carry out development, alter buildings, display any notice on or damage or destroy any tree or other vegetation in relation to buildings, places, precinct or land, relic or moveable object which has an interim heritage order or listing on the SHR'. ARTC (and other transport authorities) have important obligations which include the requirement to maintain a section 170 heritage and conservation register of heritage assets they own, occupy, control, manage or is under their care. ARTC and other transport authorities are also obliged to protect and maintain these heritage items to minimum standards of maintenance and repair. The proposal is in the curtilage of Narrabri Station, which is listed under the Transport Asset Holding Entity (TAHE) Section 170 heritage conservation register and local heritage listed under the Narrabri Local Environmental Plan 2012 (Narrabri LEP). As outlined in section 6.10, the proposal will result in a minor change to the setting of the rail corridor, through the replacement of timber and steel sleepers with concrete. The proposed works are considered acceptable given the proposal intends to perform works to ensure the continued operation of the rail line. The area of proposed works has been found to have nil to low potential for relics.
NSW *National Parks and Wildlife Act 1974* (NPW Act)	The objective of the NPW Act is to conserve objects, places or features (including biological diversity) of cultural value. This includes places, objects and features of significance to Aboriginal people.	Under the NPW Act it is an offence to harm threatened species; buy, sell or possess threatened species; damage critical habitat; or damage the habitat of a threatened species without the issuing of a section 120 licence. Where impact to an Aboriginal object or place will occur, an Aboriginal Heritage Impact Permit (AHIP) may be required under Part 6, Division 2 of the NPW Act.

Legislation	Objective	Application to the proposal
		An Aboriginal cultural heritage due diligence assessment for the proposal determined that based on the location of the study area and the nature of previous disturbance, it is considered that the potential for archaeological deposits to be present is low. Therefore, if undertaken with care, the proposal is unlikely to result in harm to Aboriginal objects and can proceed with no requirement for further investigations or application for an AHIP.
NSW *Waste Avoidance and Resource Recovery Act 2001* (WARR Act)	The purpose of the WARR Act is to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecological sustainable development. The WARR Act provides for the making of policies and strategies to achieve these ends.	The WARR Act promotes a hierarchy of avoidance of unnecessary resource consumption; resource recovery (including reuse, reprocessing, recycling and energy recovery), and disposal (as a last resort). The proposal will generate waste during the construction phase. Requirements of the WARR Act including the waste management hierarchy will therefore be applicable to the proposal. The principles of the waste management hierarchy and other relevant waste management requirements will be included within the CEMP for implementation on site.
NSW *Roads Act 1993* (Roads Act)	The Roads Act provides for the classification of roads and determines which public authority is the appropriate road authority for public roads.	Under section 138 of the Roads Act, the consent or concurrence of the appropriate roads authority is required to: ▪ erect a structure or carry out a work in, on or over a public road; ▪ dig up or disturb the surface of a public road; ▪ remove or interfere with a structure, work or tree on a public road; ▪ pump water into a public road from any land adjoining the road; or ▪ connect a road (whether public or private) to a classified road. Under the schedule 2, clause 5(1) of the Roads Act, approval to work in an unclassified road (other than a Crown Road) is not required by a public authority. As ARTC is not a defined public authority for the purposes of the Roads Act (as defined by clause 83 of the Roads Regulation 2008), consent is required for works in both a classified road (controlled by Transport for NSW) and unclassified road (controlled by council). Level crossing upgrades may require the occupation of local roadways and as such road occupancy licences are likely required to be obtained under the Roads Act prior to commencement of constriction.
NSW *Crown Land Management Act 2016*	The NSW *Crown Land Management Act 2016* provides for the administration and management of Crown land in NSW. Crown land may not be occupied, used, sold, leased,	Numerous Crown land parcels are located adjacent to the rail corridor. The proposal may be accessed via Crown land and require temporary construction laydown areas within Crown land.

Legislation	Objective	Application to the proposal
	dedicated, reserved, or otherwise dealt with unless authorised by this Act.	Where Crown land is required outside the rail corridor to facilitate the proposal, ARTC will consult with the relevant land manager and obtain a licence agreement (or other agreement as required) prior to the use and/or temporary occupation of the land required.

4.4 Environmental Planning Instruments (EPIs)

Environmental planning instruments (EPIs) such as State environmental planning policies (SEPPs) and local environmental plans (LEPs) are legal documents that regulate land use and establish requirements for development consent in NSW.

4.4.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

The Infrastructure SEPP provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process. This SEPP facilitates the development of State infrastructure, including telecommunication facilities, sewerage works and storm water management, and specifies when development consent is (and is not required) for such development when carried out in certain zones.

Under Part 2.2, Division 15, clause 2.90 of the Infrastructure SEPP, 'rail infrastructure facilities' are defined and include: 'railway tracks, associated track structures, cuttings, drainage systems, fences, tunnels, ventilation shafts, emergency access ways, bridges, embankments, level crossings and roads, pedestrians and cycleway facilities'.

Under clause 2.91(1) of the Infrastructure SEPP, 'development for the purpose of a railway or rail infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land'.

As the proposal is considered to fall within the definition of rail infrastructure facilities under the Infrastructure SEPP, development consent is not required. The potential environmental impacts associated with the proposal can therefore be assessed in accordance with ARTC's Code and the preparation of this REF, to fulfil the requirements of Part 5, Division 5.1 of the EP&A Act.

Consultation requirements under Part 2.2, Division 1 may also apply if the proposal will have impacts on the following:

- Council related infrastructure or services;
- local heritage;
- flood liable land;
- certain land within the coastal zone (such as land within a coastal vulnerability area as defined in the NSW *Coastal Management Act 2016*); and/or
- the proposal is *specified development* as defined in clause 2.15(2), including development in or adjacent to a national park, aquatic reserve, marine park, foreshore area, dark sky region, defence facility or mine-subsidence district.

State Environmental Planning Policy (Planning Systems) 2021

The Planning SEPP provides detail as to the categories of projects that will be State significant development (SSD), State significant infrastructure (SSI) and those projects declared to be critical State significant infrastructure.

The proposal does not meet the criteria for SSI under clause 2.6(1)(a) because it is permissible without development consent under Part 5 of the EP&A Act due to the application of clause 2.9(1) of Infrastructure SEPP.

Classes of development and the criteria for development to be considered as SSI include:

- Development for the purpose of rail infrastructure by or on behalf of ARTC that has a capital investment value (CIV) of more than $50 million.

ARTC projects that are above $50 million in value will conform to the definition of SSI.

Conversely, projects below $50 million in value and are 'development without consent' will require assessment under Part 5, Division 5.1 of the EP&A Act.

The proposal has been assessed under Part 5, Division 5.1 of the EP&A Act as proposed works and activities have a capital investment value of less than $50 million.

Additionally, under clause 14(1) of the Planning SEPP, development is declared SSI if:

- the development on the land concerned is, by the operation of a State environmental planning policy, permissible without development consent under Part 4 of the Act; and
- the development is specified in Schedule 3.

Clause 1 of Schedule 3 of the Planning SEPP relates to:

Infrastructure or other development that (but for Division 5.2 of the Act and within the meaning of Part 5 of the Act) would be an activity for which the proponent is also the determining authority and would, in the opinion of the proponent, require an environmental impact statement to be obtained under Part 5 of the Act.

The proposal will not require an EIS under Part 5 of the EP&A Act as it is unlikely to result in significant environmental impacts. As the proposal is not of a type specified in Schedule 3, it is not SSI.

Based on the above, the proposal is not SSI requiring approval under Division 5.2 of the EP&A Act.

State Environmental Planning Policy (Resilience and Hazards) 2021

Clause 4.16(3) of State Environmental Planning Policy (Resilience and Hazards) 2021 (Hazards SEPP) states 'If a provision of another State environmental planning policy or of a regional environmental plan, whether made before or after this Policy, permits a remediation work without development consent, a requirement in this Policy to obtain development consent to carry out the work does not prevail over that provision'.

As the Infrastructure SEPP suggests that remediation works for the purpose of rail infrastructure facilities is permitted without consent, development consent is not required under the Hazards SEPP. But if the remediation is not for the purpose of rail infrastructure facilities, consent may be required under the Hazards SEPP.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2021 (BCD SEPP) provides for the protection of koala habitat by ensuring that areas subject to development proposals are considered for their value as habitat or potential habitat for koalas.

The BCD SEPP is applicable to the Narrabri LGA.

In accordance with clause 4.4 (3)(d), the koala habitat protection provisions of BCD SEPP do not apply to land zoned as RU1 Primary Production within the LGA. This land use zoning covers the majority of the proposal area, including areas of proposed vegetation clearing.

4.4.2 Local Environmental Plan

Council regulates land use within the Narrabri LGA through the provisions of the Narrabri Local Environmental Plan 2012 (Narrabri LEP).

With reference to the Narrabri LEP, the proposal is permitted with consent. However in accordance with section 2.7 of the Infrastructure SEPP the Infrastructure SEPP prevails over LEPs and under section 2.91 of the Infrastructure SEPP the proposal is permissible without consent on any land.

4.5 Other plans and policies

4.5.1 New England North West Regional Plan 2036

The New England North West Regional Plan (NNWRP) applies to 12 LGAs, namely Tenterfield, Glen Innes Severn, Inverell, Armidale Regional, Uralla, Walcha, Gwydir, Tamworth Regional, Liverpool Plains, Gunnedah, Narrabri and Moree Plains.

By 2036, an additional 13,800 people are expected to be living in the region, bringing the total population to 202,000 (NSW Department of Planning and Environment, 2016). The NNWRP aims to guide the delivery of homes, jobs, infrastructure and services to support the growing and changing needs of the region. The NNWRP provides an overarching framework to guide development and investment in the North West region to 2036.

In preparing the NNWRP, the NSW Government has acknowledged the growing importance of North West region and set the following regionally focused goals:

- a growing and diversified agricultural sector;
- a diversified economy through the management of mineral and energy resources, including renewable energy generation;
- communities resilient to change, with housing choice and services that meet shifting needs and lifestyles;
- prosperous urban centres with job opportunities; and
- protected water, environment and heritage.

As highlighted in the NNWRP, agricultural industries rely on efficient freight networks and benefit from access to domestic and international markets due to the proximity of the ports of Newcastle, Brisbane and Sydney and the three international airports. The rail line to Newcastle and Sydney provides bulk shipping and high capacity freight networks that are capable of maintaining high levels of productivity and the competitiveness of the region's agricultural industries.

A key objective of the NNWRP is to promote the growth of broadacre agriculture and grazing by improving the efficiency of freight networks and applying appropriate controls to support these industries.

The proposal by its very nature will assist with the realisation of goals pertaining to a growth in the agricultural sector and diversified economy. By providing an upgraded rail connection between Inland Rail and the ports of Newcastle and Sydney, the proposal will facilitate freight transportation for the agricultural and mineral sectors, thereby bolstering economic benefit to the region.

4.6 Summary of licences, approvals and notifications

Table 4.2 summarises the statutory requirements for the proposal.

Table 4.2: Statutory requirements for the proposal

Aspect	Legislation	Section/clause	Approval authority
Planning pathway	EP&A Act	Part 5, Division 5.1	ARTC
	Infrastructure SEPP	Clause 2.91(1)	ARTC
Other approvals[1]	Roads Act	Section 138	Council / TfNSW
	FM Act	Part 7, Section 200	DPI
	NSW *Crown Land Management Act 2016*	Division 5.6	DPIE – Crown Lands

[1]Other approvals, if required, will be identified during detailed design.

4.7 Confirmation of statutory position

Part 5, Division 5.1 of the EP&A Act imposes environmental assessment obligations on determining authorities, which are usually public authorities and statutory state-owned corporations, but also include other specified agencies such as local government authorities. Part 5, Division 5.1 applies to activities (as defined in section 5.1) that:

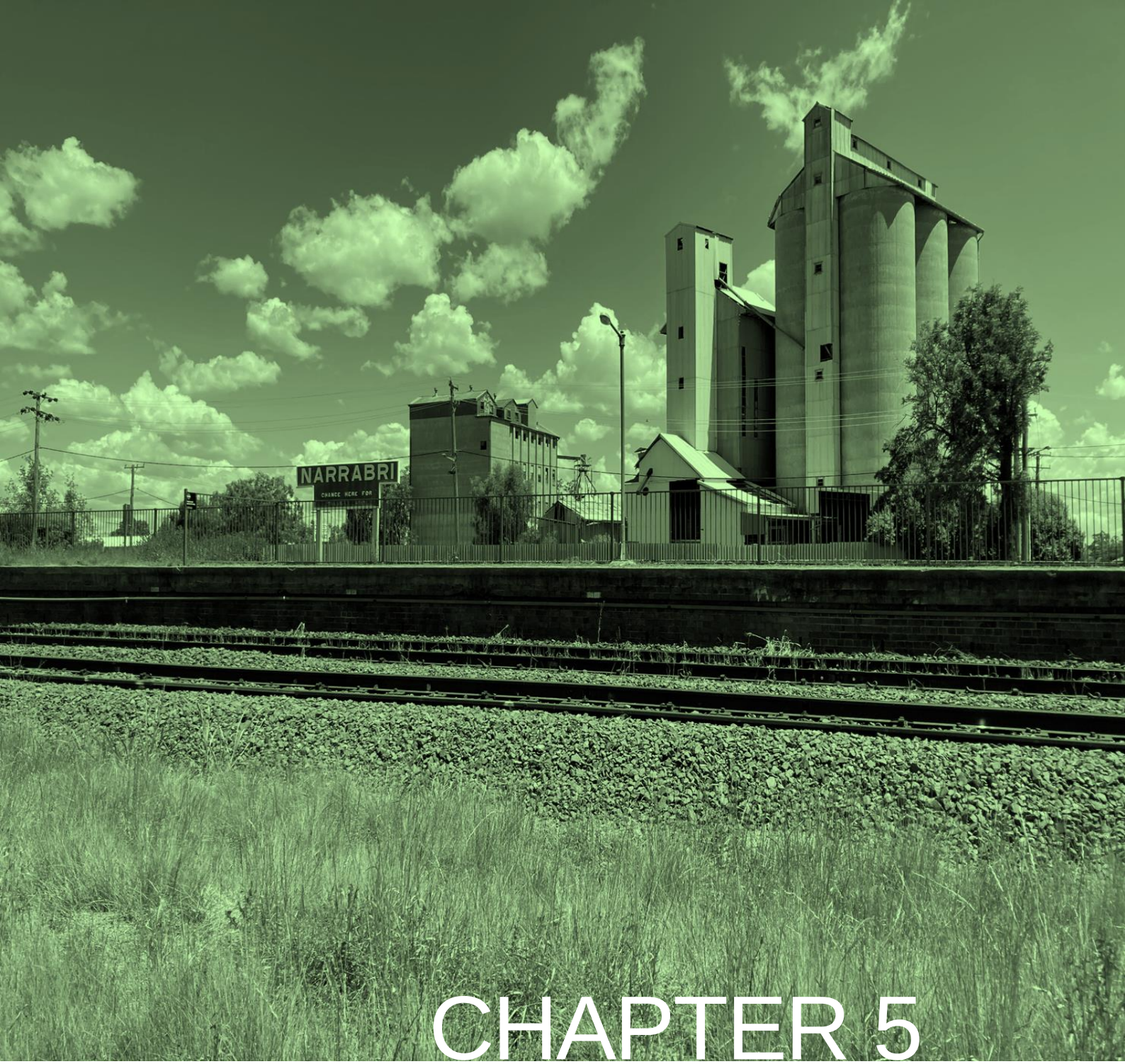
- are to be carried out by a Minister or public authority; or
- are to be carried out on behalf of a Minister or public authority; or
- which require the approval of a Minister or public authority.

Schedule 3 of Planning SEPP clarifies that development for the purpose of rail infrastructure by or on behalf of ARTC is State significant infrastructure (SSI) if the development has a CIV of more than $50 million. The CIV of this proposal is approximately $44.7 million and is therefore not SSI.

This proposal is permitted without development consent under clause 2.91(1) of the Infrastructure SEPP and as such the proposal is assessed under Part 5, Division 5.1 of the EP&A Act.

Accordingly, ARTC is both the proponent and the determining authority.

Under section 5.5 of the EP&A Act, ARTC is responsible for assessing the impacts of its activities. This REF presents an assessment of the potential environmental impacts associated with the proposal. Clause 171 (2) of the EP&A Regulation identifies the factors that must be considered. These factors are summarised in section 8.2.



CHAPTER 5
STAKEHOLDER ENGAGEMENT

5 STAKEHOLDER ENGAGEMENT

5.1 Objectives and approach

ARTC values active engagement with stakeholders and the community. Thorough and robust engagement is fundamental to minimising risk, optimising designs, minimising social and environmental impacts, securing statutory approvals, and gaining and maintaining community acceptance.

ARTC aims to improve engagement with the community by recognising, predicting and responding positively to the community and their expectations by:

- ensuring community interactions are genuine and informative;
- increasing awareness of ARTC's engagement activities to further identify and improve ARTC's community and stakeholder engagement strategies;
- proactively communicating with affected communities and relevant stakeholders, keeping them informed through the provision of timely, relevant and targeted information; and
- identifying and engaging with a wide range of stakeholders and interested parties, building positive working relationships.

5.2 Consultation plan

5.2.1 Consultation during design development and environmental assessment

Infrastructure SEPP consultation

The Infrastructure SEPP contains provisions for public authorities, such as ARTC to consult with local councils and other government agencies prior to the commencement of development that will cause a disruption to relevant infrastructure. ARTC must take into consideration any responses received within 21 days after notification.

Table 5.1 contains a checklist that details triggers for consultation in accordance with clauses 2.10-2.15 of Infrastructure SEPP. Consultation requirements with council in accordance with the Infrastructure SEPP are triggered by the proposal.

Table 5.1: Infrastructure SEPP consultation requirements.

Is consultation with council or other agencies required under clauses 2.10-2.15 of the Infrastructure? SEPP	Is the trigger met?	Comments
Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	No	
Are the works likely to generate traffic to an extent that will strain the existing road system in a local government area?	No	Whilst traffic impacts associated with the proposal are not considered to be significant, ARTC has consulted council with regard to construction traffic movements and routes.
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system?	No	
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?	No	ARTC will likely require connection to council potable water network for the purposes of water supply for construction, however a substantial volume of water is not required.

Is consultation with council or other agencies required under clauses 2.10-2.15 of the Infrastructure? SEPP	Is the trigger met?	Comments
Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow?	No	ARTC will require the temporary occupation of council land to establish construction compounds and laydown areas, however areas utilised are not considered to cause more than a minor disruption to pedestrian or vehicle flow.
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Level crossing upgrades will require occupation and excavation within public roadways under the management of council.
Are the works located on flood liable land? If so, will the works change flooding patterns to a more than minor extent?	Yes	The proposal is located within the Namoi River floodplain and will involve lifting of rail levels within flood hazard areas. ARTC has notified Council and offered to brief council officers on the preliminary flood impact assessment and the process proposed to refine the design of rail levels during detailed design of the proposal.
Are the works located on flood liable land?	Yes	The proposal is partially located within flood liable land and ARTC has notified the State Emergency Service (SES).
Are the works located within a coastal vulnerability area and is inconsistent with a certified coastal management program that applies to that land	No	
Is there a local heritage item (that is not also a state heritage item) or a heritage conservation item in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than minor or inconsequential?	No	Works have been assessed as not affecting the heritage significance of a local heritage item (Narrabri railway station) in a way that is more than minor or inconsequential, therefore notification to Council is not required.
Are the works adjacent to a national park, nature reserve or other area reserved under the *National Parks and Wildlife Act 1974*?	No	
Are the works adjacent to a declared aquatic reserve under the *Fisheries Management Act 1994*?	No	
Are the works adjacent to a declared marine park under the *Marine Parks Act 1997*?	No	
Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998*?	No	
Do the works involve the development of a fixed or floating structure in or over navigable waters?	No	
Are the works for the purpose of residential development, as educational establishment, a health services facility, a correctional facility or group home in an area that is bush fire prone land?	No	
Are the works likely to increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map?	Yes	Some construction may be required at night and will need lighting which may increase the quantity of artificial light in the dark sky region. ARTC has consulted with the Siding Spring Observatory.

Is consultation with council or other agencies required under clauses 2.10-2.15 of the Infrastructure? SEPP	Is the trigger met?	Comments
Are the works on defence communications facility buffer land?	No	
Are the works located on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	

ARTC held a briefing session with representatives from council in November 2021 during development and assessment of the proposal. The objective of the briefing session was to:

- inform council about the proposal;
- provide an overview of the design development and environmental assessment process; and
- incorporate any comments into the design development and environmental assessment phase of the proposal.

Government agency and stakeholder consultation

Consultation with government stakeholders was undertaken throughout the environmental assessment process. All identified stakeholders were consulted to identify any requirements for consideration within the REF.

Table 5.2 provides a summary of stakeholder consultation and outcome.

Table 5.2: Summary of stakeholder consultation

Stakeholder	Comment	Response
Council	A consultation letter was provided to council on 9 March 2022 introducing the proposal, notifying of consultation under the Infrastructure SEPP and requesting any specific comments.	Any response received by Council within 21 days will be factored into consideration in proposal design and planning by ARTC.
NSW State Emergency Service (SES)	A consultation letter was provided to the SES on 9 March 2022 introducing the proposal, notifying of consultation under the clause 2.13 of the Infrastructure SEPP and requesting any specific comments.	Any response received by the SES within 21 days will be factored into consideration in proposal design and planning by ARTC.
Siding Spring Observatory	A consultation letter was provided to the Siding Spring Observatory on 9 March 2022 introducing the proposal, notifying of consultation under the clause 2.15 of the Infrastructure SEPP and requesting any specific comments.	Siding Spring Observatory has advised any impacts from the proposal will be negligible.

5.2.2 Community consultation

ARTC is required to notify:

- Residents on properties adjacent to land on which the proposal is to be carried out.

- Local councils, where work is outside the rail corridor or the proposal will generate substantial road traffic delays.

Notwithstanding this requirement, ARTC is committed to proactively communicating with affected communities and relevant stakeholders, keeping them informed through the provision of timely, relevant and targeted information.

5.2.3 Consultation with Aboriginal groups

A search of the Aboriginal Heritage Information Management System (AHIMS) was conducted. No known Aboriginal objects or places will be impacted by the proposal (refer to section 6.9).

The extensive landscape modification that has occurred across the proposal area suggests that intact evidence of Aboriginal land use is unlikely to occur within the boundaries of the proposal area. Similarly, the high level of disturbance would suggest that the archaeological potential of the area is low. Therefore, it was not considered necessary to undertake specific Aboriginal consultation.

Feedback from Narrabri Local Aboriginal Land Council will be sought during the public display period.

5.2.4 Ongoing consultation

In accordance with ARTC's approach to community and stakeholder consultation and the Code, this REF will be publicly displayed for comment, as follows:

- An advertisement of the REF public display will be placed in the local newspaper ('The Courier') at the commencement of the public exhibition period.
- The REF will be available through ARTC's Project Website at: www.artc.com.au/n2tupgrade.
- Hard copies of the REF will be made available at the following locations:
  - Narrabri Shire Council – Administration Building
    46-48 Maitland Street
    Narrabri, NSW, 2390
  - Narrabri Library
    8 Doyle Street,
    Narrabri, NSW, 2390

The display dates of the REF will be advertised at the commencement of the public exhibition period. The REF will be displayed for a period of approximately three weeks.

Notification to residents in the vicinity of the proposal will also be provided.

During the display period feedback on the proposal can be submitted in the following ways:

- Mail to: NSW Projects Community Engagement Team:
  Narrabri to Turrawan Line Upgrade Project
  GPO Box 14
  Sydney NSW 2001

- Email: nswprojects@artc.com.au

Further information on the proposal may also be requested any time by contacting **1300 550 402**.

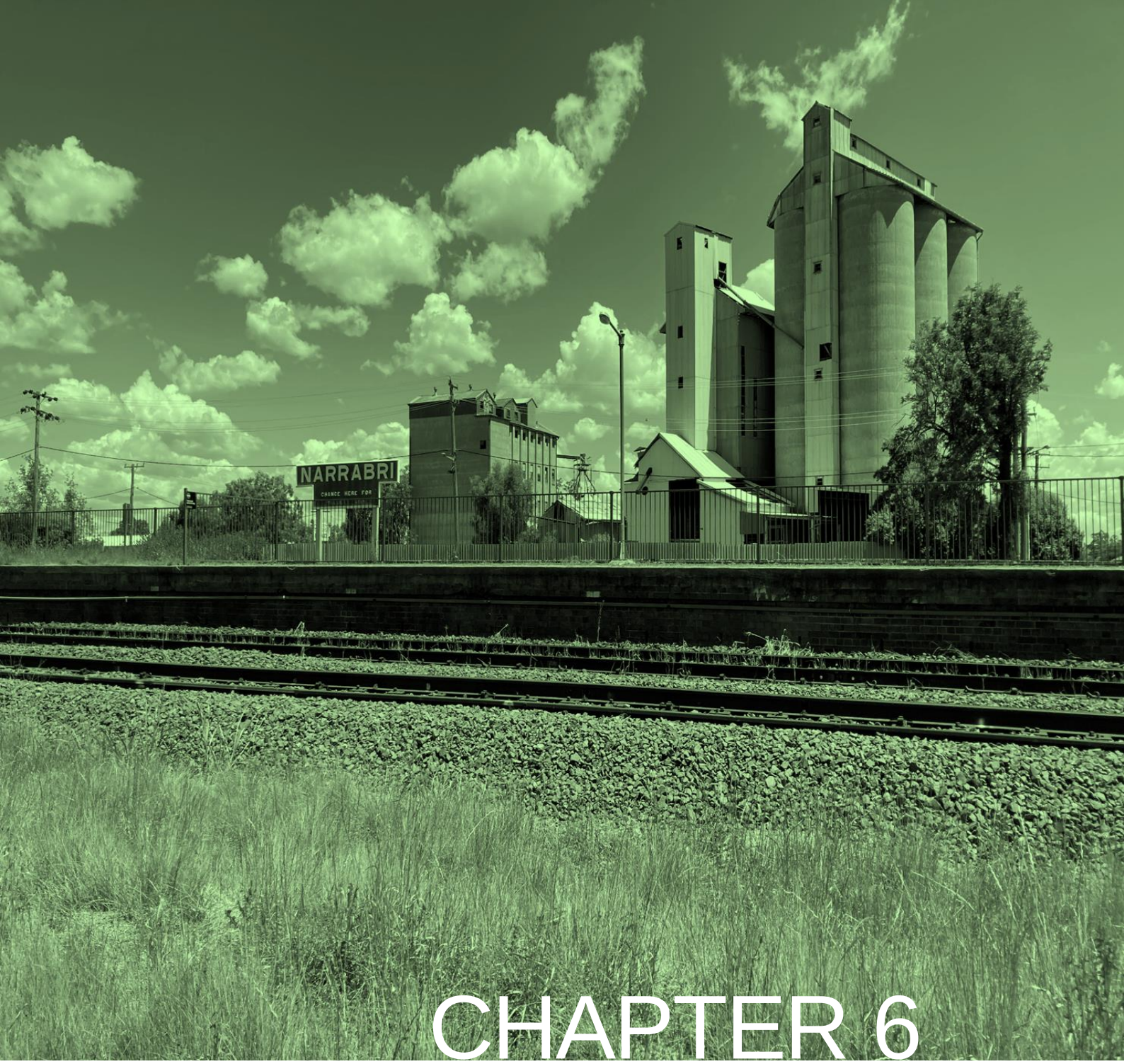
On the conclusion of the public exhibition period, ARTC will review all submissions received. Issues raised in the submissions will be considered in a submissions report, if required. The

submissions report will also consider if any additional mitigation measures or changes to the proposal to address the issues raised, prior to ARTC determining the proposal.

The submissions report and final determination of the proposal will be made publicly available via the project website.

Should the proposal be approved to proceed, ARTC will continue to communicate relevant information to the community, nearby property owners, and stakeholders before and during construction. Consultation will focus on the commencement of construction as well as informing the community of any future works to be completed outside normal working hours.

Following commissioning of the proposal, ARTC's standard policies and procedures for customer and community relations will apply.



CHAPTER 6

ENVIRONMENTAL IMPACT ASSESSMENT

6 ENVIRONMENTAL IMPACT ASSESSMENT

6.1 Overview

This chapter summarises the assessment of potential environmental impacts from the proposal and provides measures to minimise and manage unavoidable impacts.

6.2 Noise and vibration

This section summarises the noise impact assessment report, which is in Appendix B. It describes the noise and vibration assessment criteria which apply to the proposal, potential noise emission and vibration sources, modelling method and results, potential impacts and mitigation measures where impacts are unavoidable.

6.2.1 Existing environment

Background noise in the vicinity of the proposal is typical of an urban and rural environment, with the predominant sources of noise associated with existing rail traffic, power tools, maintenance vehicles, domestic animals and human activity, including adjacent industrial, commercial and agricultural land uses. Road traffic noise from nearby major roadways including the Kamilaroi Highway and Newell Highway also contribute to the noise environment.

The nearest sensitive receivers to the proposal with a potential to be impacted by adverse noise emissions are residential, commercial, educational and recreational land users near the rail line in Narrabri.

Outside of Narrabri, nearby sensitive receivers include isolated residential dwellings associated with rural land uses, with generally larger separation distances to the rail corridor.

As illustrated in Appendix A, residential receivers adjacent to the proposal alignment are categorised into three broad noise catchment areas (NCAs). The NCAs are described as follows:

- NCA 1 – Residential receivers located within the urban centre of Narrabri. Residential receivers are characterised by medium density urban/suburban lots, close to transport routes, and commercial and industrial premises. The noise environment in NCA 1 is typically dominated by urban hum and transport noise. Natural noise sources may be more noticeable during the evening and night periods;
- NCA 2 – Residential receivers on the peri-urban fringe of Narrabri between the Narrabri Triangle and Narrabri Creek. Receivers are typically rural receivers adjacent to road, rail or industrial sources, and isolated communities surrounded by rural lands. The noise environment has local traffic with some limited industry during the day period but is dominated by natural sounds during the evening and night periods; and
- NCA 3 – Rural receivers between the southern limit of works to the suburban fringe of Narrabri to the south of the Narrabri Triangle and from the northern fringe of Narrabri to the northern limit of works. The noise environment within the rural area is characterised by low background noise levels dominated by natural sounds.

To quantify the existing background noise environment, unattended noise monitoring was conducted at two locations representative of the ambient environment within NCA 1 and NCA 2.

Using the existing ambient noise levels, the rating background levels (RBLs) are determined.

6.2.2 Assessment criteria

Potential noise impacts on sensitive receivers associated with construction and operation of the proposal were assessed in accordance with the following:

- Interim Construction Noise Guidelines (2009) (ICNG).
- Noise Policy for Industry, EPA NSW (2017) (NPI).
- Rail Infrastructure Noise Guideline (2013) (RING).

Construction noise

The ICNG recommends noise management levels (NML) to reduce the likelihood of noise impacts arising from construction activities. Construction NMLs are established in reference to the RBL as set out in table 6.1.

Table 6.1: Construction noise criteria

Time of day	Management level ($L_{Aeq(15\ min)}$)	How to apply
Recommended standard hours: ▪ Monday to Friday (7am to 6pm); ▪ Saturday (8am to 1pm); and ▪ No work on Sundays or public holidays.	Noise affected - RBL + 10dB	▪ The noise affected level represents the point above which there may be some community reaction to noise. ▪ Where the predicted or measured $L_{Aeq\ (15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration as well as contact details
	Highly noise affected - 75dB(A)	▪ The highly noise affected level represents the point above which there may be strong community reaction to noise. ▪ Where noise is above this level, the relevant authority (consent, determining, regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: - Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) - If the community is prepared to accept longer periods of construction in exchange for restrictions on construction times.
Outside Standard Hours	Noise affected - RBL + 5dB	▪ A strong justification would typically be required for works outside the recommended standard hours. ▪ The proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

The specific NMLs for the proposal are summarised in table 6.2.

Table 6.2: Noise management levels for the proposal

Location	Assessment period	RBL (dBA)	NML (dBA $L_{Aeq(15\ min)}$)	Highly noise affected NML (dBA $L_{Aeq(15\ min)}$)
NCA 1	Day	35	45	75
	Day (outside of standard	35	40	

Location	Assessment period	RBL (dBA)	NML (dBA $L_{Aeq(15\ min)}$)	Highly noise affected NML (dBA $L_{Aeq(15\ min)}$)
	construction hours)			
	Evening	33	38	
	Night	31	36	
NCA 2	Day	35	45	75
	Day (outside of standard construction hours)	35	40	
	Evening	34	39	
	Night	30	35	
NCA 3	Day	35	45	75
	Day (outside of standard construction hours)	35	40	
	Evening	30	35	
	Night	30	35	

Note: Day (7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday), Evening (6 pm to 10 pm), Night (10 pm to 7 am)

Sleep disturbance

Short duration, but high intensity activities could cause sleep disturbance at night, without significantly affecting the NMLs.

The sleep disturbance criteria in table 6.3 are based on night time RBLs and trigger levels as per condition O9.3 of EPL 3142.

Table 6.3: Sleep disturbance criteria

Location	RBL (dBA)	Sleep disturbance criteria (dB $L_{A1(1\ min)}$)
NCA 1	46	45
NCA 2	45	38
NCA 3	45	36

Construction vibration

Ground vibration generated by construction activities can have a range of effects on buildings and building occupants, with the main effects generally classified as:

- human disturbance – disturbance to building occupants and/or vibration which inconveniences or interferes with the activities of the occupants or users of the building; and
- effects on building structures – vibration which may compromise the condition of the building structure itself.

In general, vibration criteria for human disturbance are more stringent than vibration criteria for effects on building contents and building structural damage. Building occupants will normally feel vibration readily at levels well below those which may cause a risk of cosmetic or structural damage to a structure. However, it may not always be practical to achieve the human comfort criteria. Furthermore, unnecessary restriction of construction activities can prolong construction works longer than necessary, potentially resulting in other undesirable effects for the local community.

Construction vibration criteria have been adopted from the following sources:

- German Standard DIN 4150-3, 1999, Structural Vibration – Part 3: Effects of vibration on structures.
- Assessing Vibration – a technical guideline (DECC, 2006).

Cosmetic and structural damage

The DIN 4150-3 structural and cosmetic damage assessment criteria for different types of buildings are presented in table 6.4. The criteria are specified as peak particle velocity (PPV) levels measured in any direction at or adjacent to the building foundation.

Table 6.4: Cosmetic and structural vibration damage criteria

Structure type	Peak particle velocity (millimetres per second)			
	Foundation of structure			Vibration at horizontal plane of highest floor at all frequencies
	<10 Hertz (Hz)	10-50 Hz	50-100 Hz	
Buildings used for commercial, industrial purposes, industrial buildings and buildings of similar design	20	20-40	40-50	40
Dwelling and buildings of similar design and/or use	5	5-15	15-20	15
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in rows 1 and 2, and are of great intrinsic value (e.g. heritage-listed buildings)	3	3-8	8-10	5

DIN 4150-3 states that exposing buildings to vibration levels higher than that recommended in table 6.4 will not necessarily result in damage. Rather it recommends these values as maximum levels of short term construction vibration, at which experience has shown that damage that reduces the serviceability of structures will not occur due to vibration effects.

DIN 4150-3 is suitable for the assessment of both structural and cosmetic damage as it considers a reduction in serviceability of the structure is deemed to have occurred if:

- cracks form in plastered surfaces of walls;
- existing cracks in the building are enlarged; and
- partitions become detached from loadbearing walls or floors.

Human comfort

The ICNG recommends that vibration from construction works be assessed under ‘Assessing Vibration – a technical guideline’ (DECC, 2006). The vibration assessment criteria defined in this guideline are for human comfort and represent goals that, where predicted or measured to be exceeded, require the application of all feasible and reasonable mitigation measures. Where the maximum value cannot be feasibly and reasonably achieved, ARTC will need to negotiate directly with the affected community.

The guideline defines vibration assessment criteria for continuous, impulsive and intermittent vibration.

Vibration can be classified according to the following definitions:

- Continuous vibration: continues uninterrupted for a defined period. Applies to continuous construction activity such as tunnel boring machinery.
- Impulsive vibration: rapid build-up to a vibration peak followed by a damped decay or the sudden application of several cycles of vibration at approximately the same magnitude providing that the duration is short. Applies to very occasional construction activities that create distinct events such as the occasional dropping of heavy equipment.
- Intermittent vibration: interrupted periods of continuous vibration (such as a drill) or repeated periods of impulsive vibration (such as a pile driver).

Operational noise

Operational rail noise can have a significant effect on sensitive receivers near a rail line. The RING specifies noise and vibration trigger levels, and if exceeded by the proposed rail development, mitigation measures need to be considered to reduce emissions. The noise and vibration triggers apply to existing noise-sensitive receivers and future sensitive receivers associated with any planned developments.

The noise trigger levels (NTLs) differentiate between noise impacts during the day and at night. A more stringent noise trigger is applied for night-time. It is widely accepted that noise is generally more disturbing at night because more noise-sensitive activities occur at that time (e.g. listening activities and sleep). Also, most residents are at home and noise is more intrusive due to lower background levels at night.

The proposal falls into the category of a 'redeveloped rail line' in accordance with the RING. This category includes works on an existing rail line that will increase its capacity to carry rail traffic. Therefore the applicable NTLs for the proposal are reproduced from table 1 of the RING and presented in table 6.5.

Table 6.5: Operational noise criteria

Type of rail development	Day (7 am to 10 pm)	Night (10 pm to 7 am)
Redeveloped rail line	Development increases existing rail noise levels by 2 dB or more, or existing maximum rail noise levels by 3 dB or more and predicted rail noise levels exceed:	
	65 dB $L_{Aeq(15hr)}$ OR 85 dB L_{Amax}	60 dB $L_{Aeq(9hr)}$ OR 85 dB L_{Amax}

Operational ground borne noise typically occurs for underground work where the potential noise impact exceeds the air borne noise levels. As such, ground borne noise is not considered relevant to the proposal given all works will be at the ground surface and air borne noise levels will exceed any potential ground borne noise.

Operational vibration

The proposal is unlikely to result in operational vibration impacts.

It is anticipated that the replacement of timber sleepers with concrete sleepers, along with upgrade of the rail line itself will result in a net reduction in vibration levels.

Vibration monitoring of coal train passby events has been previously carried out by ARTC in the Hunter region, with vibration dose values (VDV) measured below the preferred and maximum criteria at a setback distance of five metres. With regard to the proposal, as the nearest residential receivers are setback approximately 25 m from the rail line, operational vibration levels are similarly anticipated to comply with the VDV criteria.

6.2.3 Potential impacts

Construction phase

Construction noise and vibration sources

The construction noise and vibration assessment for the proposal has considered a potential worst-case scenario, based on the potential maximum likely number of plant and equipment operating simultaneously at the site.

At this stage, it is expected that construction of the proposal will generally involve the following construction stages:

- Stage 1 (site establishment) – including the erection of temporary barriers, and delivery of equipment to site.
- Stage 2 (formation reconditioning) – including the removal of existing track (rail, sleepers and ballast), excavation to required depth to install new structural layers and capping, and reconstruction of track with new ballast, concrete sleepers and new 60 kg rail or cascaded 53 kg rail.
- Stage 3 (re-sleepering) – involving the replacement of existing steel and timber sleepers with heavy duty concrete sleepers using side insertion.
- Stage 4 (re-railing) – replacing the existing rail with new 60 kg rail or cascaded 53 kg rail.
- Stage 5 (re-surfacing) – including completion of track horizontal and vertical alignment.

The plant and equipment to be used during each construction stage is listed in table 16 of Appendix B, along with their respective sound power level.

The worst-case modelled scenario for each stage assumes respective plant and equipment are all operating simultaneously.

Construction noise impact

A summary of the highest predicted construction noise levels at the nearest residential receivers, affected distances, and number of potentially affected receivers is provided in table 6.6.

Table 6.6: Construction noise impacts

Noise catchment area	Construction stage	Highest predicted noise level (dBA)	Day period		Evening period		Night period	
			Affected distance (m)	Affected receivers (approximate)	Affected distance (m)	Affected receivers (approximate)	Affected distance (m)	Affected receivers (approximate)
NCA 1	Site Establishment	64	175	110	300	290	375	360
	Formation Reconstruction	72	350	290	650	580	750	610
	Concrete Re-sleepering	72	350	290	650	580	750	610
	Re-railing	69	200	200	375	360	450	430
	Resurfacing	66	190	130	315	310	390	380
NCA 2	Site Establishment	64	175	170	300	315	400	415
	Formation Reconstruction	72	350	375	600	560	800	710
	Concrete Re-sleepering	72	350	375	600	560	800	710
	Re-railing	69	200	195	350	375	500	475
	Resurfacing	66	190	180	315	330	415	430
NCA 3	Site Establishment	57	175	20	400	65	400	65
	Formation Reconstruction	65	350	60	800	180	800	180
	Concrete Re-sleepering	65	350	60	800	180	800	180
	Re-railing	62	200	20	500	90	500	90
	Resurfacing	59	190	20	415	70	415	70

The following conclusions can be made following a review of table 6.6:

- NCA 1:
  - The day NML will be exceeded up to a distance of approximately 350 m from the proposal alignment. It is assumed that up to 290 residential receivers within this buffer distance will be noise impacted by construction of the proposal, with a maximum exceedance of the NML of up to 27 dB during formation reconstruction and concrete re-sleepering.
  - During the evening and night periods, NMLs for residential receivers are predicted to be exceeded within a buffer distance of up to 650 m and 750 m respectively. Up to 580 residential receivers are anticipated to experience construction noise levels above the evening NML and up to 610 residential receivers anticipated above the night NML. The highest exceedance of the NML is predicted to be in the order of 33 dB during the evening and 37 dB during the night.
  - No receivers in NCA 1 will be highly noise affected.
- NCA 2:
  - The day NML will be exceeded up to a distance of approximately 350 m from the proposal alignment. It is assumed that up to 350 residential receivers will be noise impacted by construction of the proposal, with a maximum exceedance of the NML of up to 27 dB during formation reconstruction and concrete re-sleepering.
  - During the evening and night periods, NMLs for residential receivers are predicted to be exceeded within a buffer distance of up to 600 m and 800 m respectively. Up to 580 residential receivers are anticipated to experience construction noise levels above the evening NML and up to 710 residential receivers anticipated above the night NML. The highest exceedance of the NML is predicted to be in the order of 33 dB during the evening and 37 dB during the night.
  - No receivers in NCA 2 will be highly noise affected.
- NCA 3:
  - The day NML will be exceeded up to a distance of approximately 350 m from the proposal alignment. It is assumed that up to 60 residential receivers will be noise impacted by construction of the proposal, with a maximum exceedance of the NML of up to 27 dB during formation reconstruction and concrete re-sleepering.
  - During the evening and night periods, NMLs for residential receivers are predicted to be exceeded within a buffer distance of up to 800 m. Up to 180 residential receivers are anticipated to experience construction noise levels above the evening and night NMLs. The highest exceedance of the NML is predicted to be in the order of 30 dB during the evening and night.
  - No receivers in NCA 3 will be highly noise affected.

Sleep disturbance

The ICNG states that where the proposal is to extend over two consecutive nights, maximum noise levels should be assessed to consider the potential for sleep disturbance for the adjacent community. It is likely that construction work over consecutive nights will be required during scheduled rail possessions.

Table 21 of Appendix B presents the predicted maximum noise levels during night time construction works for receivers with a clear line of sight to the proposal, and receivers with no line of sight (e.g. shielded by buildings or topography).

It is assessed that receivers up to 750 m from the proposal, with a direct line of sight to construction activities may experience maximum noise levels above the sleep disturbance criteria.

For receivers with a partial line of sight, maximum noise levels are predicted to exceed the sleep disturbance criteria to approximately 475 m from the proposal.

As a result, construction activities outside of standard construction hours will require careful management to minimise the potential for extreme noise generating events to result in sleep disturbance, including limiting the occurrence of items dropped, items slammed such as a truck tailgate or release of air from pneumatic brake systems.

Construction vibration

Table 6.7 outlines the recommended safe working distances for vibration intensive plant that may be used for the proposal with respect to cosmetic damage and human comfort. These are based on industry guidelines and databases of source vibration levels for construction equipment.

Table 6.7: Recommended safe working distances for vibration intensive plant.

Plant item	Rating/description	Safe working distance – cosmetic damage (m)	Safe working distance – heritage structure (m)	Safe working distance – human comfort (m)
Vibratory roller	<50 kN (typically 1-2 tonnes)	5	10	15-20
	<100 kN (typically 2-4 tonnes)	6	12	20
	<200 kN (typically 4-6 tonnes)	12	24	40
	<300 kN (typically 7-13 tonnes)	15	30	100
	>300 kN (typically 13-18 tonnes)	20	40	100
	>300 kN (typically 18 tonnes)	25	50	100
Small hydraulic hammer	5 to 12 tonne excavator	2	4	7
Medium hydraulic hammer	18 to 20 tonne excavator	7	14	23
Large hydraulic hammer	18 to 34 tonne excavator	22	44	73
Vibratory pile driver	Sheet piles	2-20	40	20
Pile boring	≤ 800 mm	2m (nominal)	4m	4m
Jackhammer	Hand held	1 (nominal)		Avoid contact with structure

Given the confinement of construction to the rail corridor, selection of smaller plant and equipment and the typical buffer distance to adjacent private structures outside the rail corridor, vibration levels at or above the relevant criteria for the majority of commercial and residential structures are not expected.

It is likely that the proposal will result in disruption to human comfort for residents and businesses located immediately adjacent to the rail corridor and within the safe work distances specified in table 6.7. Despite this, it is considered that potential vibration impacts will be minimised with effective community consultation and the implementation of recommended mitigation measures in section 6.2.5.

There is one heritage structure, namely Narrabri railway station which has the potential to incur cosmetic and structural damage associated with vibration. Additionally, residential dwellings which are located within 25 m of the proposal alignment may also be impacted, including dwellings at 2 Logan Street and 7 Wade Street, Narrabri.

Where construction vibration has the potential to result in cosmetic or structural damage to these structures, following the selection of final plant and equipment, minimum offset distances will be reviewed. Where works will occur within the minimum safe working distances in table 6.7 and there is a risk of exceeding the cosmetic damage objective, a different construction method with lower source vibration levels will be considered and/or vibration monitoring will be undertaken at the commencement and through the works within the vicinity of the structures.

Cumulative impact

Where ARTC require multiple construction crews operating simultaneously in strategic locations along the proposal alignment, there may be potential for cumulative construction noise impacts to occur. Despite the potential for cumulative impact, it is considered that given NMLs will be exceeded during construction of the proposal in general, the potential effect of several remote working locations constructing in tandem is expected to result in similar exceedance of NMLs.

ARTC will review the likelihood of cumulative construction noise impacts during construction planning. Coordination will occur between concurrent stages and/or activities to minimise the potential for cumulative noise impact for the adjoining community. Concurrent construction locations will be minimised wherever possible and works scheduled to maximise the separation distance of work crews.

Operational phase

The rail alignment will remain consistent with the existing alignment, however to accommodate approximately 100 mm of new ballast below the new concrete sleepers, the rail track will be lifted in some areas as required. It is considered that a track lift of up to 100 mm will have negligible impact on operational noise levels.

Based on the Dutch railway noise calculation method, the change from wooden sleepers to concrete sleepers is expected to result in a decrease in rail noise emissions of up to 2 decibels (dB). Furthermore, studies conducted in Europe in 2018 observed a decrease in noise emissions of up to 3.1 dB from wooden to concrete sleepers. Similarly, the higher density material of the concrete sleepers is predicted to contribute to lower maximum operational noise levels.

The proposed operational line speed through Narrabri will not materially change as a result of the proposal given the speed through Narrabri is governed by infrastructure and safety constraints.

In terms of operations, the Narrabri ‘future state’ (i.e. in years 2025 and 2030) will be consistent or marginally lower than the Narrabri ‘current state’ (i.e. normal operating conditions), which involves two passenger service movements per day, three mandatory train paths (six movements) per day and ad hoc freight services as scheduled.

It is noted that the current and future state operations are below the current enhanced train frequencies of up to six train paths per day, due to current record grain and cotton harvests. Therefore, as line speeds and rail movements between current state and future state are not anticipated to increase, there will be a negligible impact on operational noise. As the volume of train paths returns from enhanced current capacity state to current state, rail noise levels are anticipated to reduce.

With no material changes to operational conditions anticipated and improved acoustic performance of concrete sleepers relative to wooden sleepers, it is considered that operational rail noise levels will decrease by upwards of 2 dB due to the improvements facilitated by the proposal. It is therefore concluded that compliance with the RING will be achieved.

6.2.4 Mitigation and management measures

Prior to the commencement of construction works, reasonable and feasible construction noise and vibration management mitigation measures will be devised in accordance with the recommendations of the Interim Construction Noise Guideline (ICNG) (DEEC 2009) and incorporated into the CEMP. The CEMP will include:

- all potential significant noise and vibration generating activities associated with respective construction activities;
- identification of nearby residences and other sensitive land uses;
- description of approved hours of work and what work will be undertaken;
- description of what work practices will be applied to minimise noise; and
- description of the complaints handling process.

The CEMP will take into consideration the measures for reducing noise levels of construction through construction planning and equipment selection, where practical.

Construction noise management measures may include:

- Construction workers will be made aware of noise concerns during worksite induction training and should be educated on noise sensitive issues and the need to minimise noise emissions as far as practicable.
- All construction machinery and equipment will be operated in accordance with the manufacturer's instructions.
- Avoid shouting on site and manage the volume of UHF radios.
- Equipment which is used intermittently will be shut down when not in use.
- All engine covers will be kept closed while equipment is operating.
- Materials will not be dropped from heights into or out of trucks wherever possible.
- Broadband reversing alarms must be used instead of tonal reversing alarms.
- All mechanical plant should be silenced by best practical means using current technology wherever possible. Noise suppression devices should be maintained to the manufacturer's specifications. Internal combustion engines should be fitted with a suitable muffler in good working order.
- Trucks will not be left standing with their engine running. Trucks will not be permitted to queue near residential dwellings.
- Operate plant and equipment in a conservative manner (no over-revving).
- Where possible, minimise the duration of simultaneous operation of noisy plant within discernible range of a sensitive receivers.
- Where possible, use natural landforms as a noise barrier, e.g. placing fixed equipment behind embankments.
- Where possible, position site shed/containers in locations that will screen potential neighbouring receptors.
- Schedule noisy activities to coincide with high levels of ambient noise so that noise is partially masked and is not as intrusive.
- Plan deliveries and access to the site to occur efficiently and within areas located away from sensitive receivers. Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.
- Minimise the need for vehicle reversing by arranging for one-way site traffic routes.
- Truck movements along uneven surfaces should be restricted to minimum speed adjacent to sensitive receivers.
- The likelihood of cumulative construction noise impacts will be reviewed when the construction methodology is confirmed. Coordination is to occur between concurrent stages and/or activities to minimise the potential for cumulative noise impact.
- Limit continuous blocks of high noise and vibration generating activities to three (3) hours, with a respite period of at least 1 hour between each block.

- If following consideration and reasonable and practical implementation of the mitigation measures outlined in this REF it becomes evident that sleep disturbance criteria is still likely to be exceeded for more than two consecutive nights, consideration should be given to reasonable and feasible mitigation measures at residences to minimise impacts. These may include but are not limited to respite measures such as movie ticket or meal vouchers, or provision of alternative accommodation.

Vibration management

- A pre and post work dilapidation survey will be carried out for the platform associated with Narrabri railway station.
- Where works are required within the minimum working distances and considered likely to exceed the cosmetic damage criteria:
  - different construction methods with lower source vibration levels will be investigated and implemented, where feasible; or
  - attended vibration measurements will be undertaken at the start of the works to determine actual vibration levels at the item. Works will be ceased if the monitoring indicates vibration levels are likely to, or do, exceed the relevant criteria.
- Any damage incurred to heritage structures will be rectified in consultation with council.

Community notification

All noise affected residents must be notified in accordance with EPL 3142, which requires that the notification must be made not less than five days before those works and activities are to be undertaken, unless agreement has been reached with the local community.

The notification must be:

- by letterbox drop or other targeted and equivalent method; and
- published on the project website where one exists.

The notification must:

- clearly outline the reason that the work is required to be undertaken outside standard construction hours (i.e. 7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday and no work on Sundays or Public Holidays).
- include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks;
- include details of relevant time restrictions that apply to the proposed works;
- clearly outline in plain english the location, nature, scope and duration of the proposed works;
- detail the expected noise impact of the works on noise sensitive receivers;
- detail mitigation measures to be implemented to minimise noise and/or vibration impacts;
- clearly state how complaints may be made and additional information obtained; and include the number of telephone complaints line required by the licence, an afterhours contact number specific to the works and activities, and the project website address where applicable.

Approval from ARTC is required for any out of hour works.

Community complaints

- Upon receipt of a noise or vibration complaint, the construction methodology, plant and equipment will be reviewed to ascertain whether improvements can be made to reduce the noise profile of the activity. Where no further noise reductions can be made and noise complaints are still received, noise or vibration monitoring is to be undertaken to verify

predicted noise levels and determine if the activity exceeds noise management levels specified in the ICNG.

- Any noise or vibration monitoring will be undertaken by a qualified professional and with consideration of the source of the noise that may have caused the compliant, relevant standards and guidelines. Attended noise monitoring will be undertaken and reported within a timely manner (three working days).

6.3 Air quality

6.3.1 Existing environment

A search of the National Pollutant Inventory identified the following existing sources of air pollution within proximity to the proposal:

- Narrabri Coal Mine.
- Boland Petroleum Depot.
- Lowes Petroleum Depot.

All three sites are located adjacent to the rail corridor and contribute a wide range of pollutants to the local airshed including:

- Hydrocarbon vapours.
- Heavy metal compounds.
- Volatile Organic Compounds.
- Particulate matter.
- Gaseous emissions (e.g. sulfur dioxide).

Background air quality in the vicinity of the proposal is predominantly influenced by:

- the aforementioned pollutant sources;
- vehicle borne emissions arising from traffic movements along the Kamilaroi Highway, as well as from traffic on nearby local roads;
- train movements along the established rail network, which generate dust and diesel emissions;
- vehicle movements along unsealed roadways which generate dust into the local airshed; and
- minor or seasonal air pollution sources may include controlled burning and bush fires.

The nearest sensitive receivers to the proposal with a potential to be impacted by adverse air quality are predominantly within the township of Narrabri, and include:

- residential dwellings and commercial premises immediately adjacent to the rail corridor;
- industrial premises adjacent to the rail corridor including IOR Petroleum, Lowes Petroleum Depot and Caltex Petroleum Depot;
- Recreational land uses including parkland reserves;
- Narrabri Lawn Cemetery; and
- Educational facilities adjacent to and within close proximity to the rail corridor, including:
  - Narrabri West Public School;
  - St Francis Xavier Primary School and Catholic church; and
  - Narrabri High School.

Regarding the section of the proposal from the Whitehaven Coal junction to Narrabri, and to the north of Narrabri, nearby sensitive receivers include isolated residential dwellings associated with rural land uses, with generally larger separation distances to the rail corridor.

6.3.2 Potential impacts

Construction phase

During construction, the main potential impacts on air quality will be dust generated during earthworks, stockpiling, exhaust emissions from diesel powered equipment and vehicles transporting materials to and from the site. However, the degree of the impact will depend on the level of activity being undertaken at any given time, the weather conditions at that time and the proximity of the construction activities to adjacent sensitive receivers.

Construction of the proposal will involve only minimal surface disturbance at any one time as excavation works will be minor and soils stabilised progressively. Therefore, the proposal is unlikely to generate more than a minor amount of windborne particulates.

In the unlikely event of encountering unexpected soil contamination, there may be a potential for temporary odour impacts within the immediate vicinity of the find.

Additional vehicle movements during construction and the operation of construction machinery may also result in a minor increase in vehicle borne emissions. Such an increase will be temporary and minor.

Greenhouse gas emissions are likely to be generated as a result of the proposal due to the following activities:

- movement of construction vehicles to and from the site;
- energy used in powering equipment on site; and
- embodied emissions in materials consumed for the proposal.

Overall, potential impacts from construction activities on air quality are anticipated to be temporary and minor, and will be managed through the implementation of recommended mitigation and management measures.

Operational phase

The proposal will not change or alter air quality impacts during the operational phase.

6.3.3 Mitigation and management measures

The following mitigation and management measures will be implemented during construction to minimise the potential for air quality impacts:

- Dust suppression controls (e.g. water carts, cease works) shall be implemented when necessary, to control dust on exposed soil surfaces of the site and access roads.
- Cover vehicles and trailers when transporting materials and waste.
- Minimise vehicle movement and speed on unsealed tracks and access paths.
- Service all plant and equipment regularly to ensure exhaust emissions are within specified standards.
- Turn off idling plant and equipment when not in use.
- Stabilise all disturbed areas following completion of works.

6.4 Traffic and access

6.4.1 Existing environment

The proposed access routes to the proposal are in section 3.8 and Appendix A.

The Kamilaroi Highway is the major link between the major town centres of Narrabri and Gunnedah and passes through Turrawan. The Kamilaroi Highway runs parallel to the rail corridor between Turrawan and Narrabri West before proceeding west towards Wee Waa.

From West Narrabri, the rail corridor diverts away from major roadways and traverses through greenfield areas adjacent to local roadways within Narrabri township.

To the north of Narrabri, the rail corridor runs parallel to Old Cemetery Road before meeting the Newell Highway at the northern end of the proposal alignment. The Newell Highway is the major link between Narrabri and Moree to the north.

A review of the TfNSW Traffic Volume Viewer (TfNSW, 2022) confirmed there is no available information on traffic volumes for the Kamilaroi or Newell Highway within the vicinity of Narrabri.

It is likely that traffic volumes along the Kamilaroi and Newell Highway within the vicinity of the proposal are moderate, with average daily traffic volumes comprised of heavy vehicles transporting freight from the region, local traffic travelling between town centres and access for residents.

Traffic volumes along local roadways, including residential streets within Narrabri town centre are anticipated to be low and primarily confined to thoroughfare traffic and residents situated along the respective roadways.

6.4.2 Potential impacts

Construction phase

During construction works, an increase in traffic along the Kamilaroi Highway south of Narrabri, Newell Highway to the north of Narrabri, and local roadways within Narrabri town centre will be generated by:

- site establishment activities;
- movement of work crews to and from the site; and
- delivery of materials and removal of waste.

Despite an estimated 2,363 truck movements required over the duration of the construction period, increases in traffic movements are anticipated to be intermittent and minor in nature. Once established, traffic will largely be associated with travel of work personnel to and from the work site at the beginning and end of each shift and ad hoc deliveries and waste removal during the day via a combination of light and heavy vehicles. Given the existing traffic volumes on affected roads, the minor increase in traffic associated with the proposal is not anticipated to affect the capacity or waiting times on the local road network.

Large plant will not enter or leave site each day, but with approval from ARTC and landowners will be parked in the adjacent ancillary facilities and/or within the rail corridor overnight for the duration of the works.

To establish a safe working environment, it is likely that public roadways adjacent to proposed level crossing upgrades will require temporary closure during the works period, with potential detours in place. Similarly, given low traffic volumes at level crossing locations, temporary road closure and detours are not anticipated to affect capacity or waiting times on the local road network. Appropriate signage will be deployed to manage any public traffic, with access to private property to be maintained at all times, wherever possible.

Given the requirement to temporarily occupy the rail corridor during routine operations, there may be a requirement for freight which would ordinarily travel via rail to be transported via the road network during the construction period. Such movements will be intermittently required and all

freight transportation will be via major highways to minimise potential impacts to road users and the community.

Operational phase

Following completion of the proposal, regular inspection and maintenance activities for the rail infrastructure will be incorporated into the existing maintenance regime of the rail corridor. The volume of traffic associated with these activities will be negligible and will not affect the capacity of any local roads.

6.4.3 Mitigation and management measures

Mitigation and management measures to minimise traffic and access impacts will include:

- A Traffic Control Plan (TCP) will be prepared, in consultation with the relevant roads authority and will meet the requirements of the Traffic Control at Work Sites Technical Manual (TfNSW, 2020). The plan will regulate the entry and exit of vehicles along the proposed access routes and transportation along the wider road network. The TCP will analyse the requirement for any road closures, and outline appropriate detour options.
- A road network dilapidation survey shall be prepared for the proposal.
- ARTC will liaise with the relevant roads authority on access, road closure and restoration requirements and comply with any requirements.
- Road opening and/or occupancy permits are likely to be required for diversions, road openings or placement of materials temporarily on roads. These will specify site-specific traffic management controls, temporary road safety measures (e.g. road plates) and the use of licensed traffic controllers to direct traffic that will be implemented by the contractor.
- Truck movements, including required road freight transportation, will be scheduled to cause minimum disruption to residents and local traffic flows.
- Access to the proposal will be via existing access routes and tracks where feasible.
- Where changes to local access arrangements are unavoidable, affected local users and property owners will be consulted with to determine appropriate access arrangements.

6.5 Biodiversity

Umwelt Australia Pty Ltd prepared an ecological assessment on behalf of ARTC, which is in Appendix C. This chapter summarises the ecological assessment report, describes the biodiversity context of the site, threatened species listings identified during desktop and literature review, field survey effort, potential impacts to biodiversity values and proposed mitigation measures where impacts are unavoidable.

6.5.1 Existing environment

Vegetation communities

Table 6.8 summarises the vegetation communities identified within the proposal area via a review of previous ecological mapping and verification via field survey.

Maps provided in Appendix A illustrate the location of each vegetation community within the proposal area.

Table 6.8: Vegetation communities in proposal area

Vegetation community	Area (ha)	Vegetation composition	BC Act status	EPBC Act status
Brigalow – Pilliga Box Woodland	0 (no impact anticipated)	▪ Canopy dominated by Pilliga box (*Eucalyptus pilligaensus*). ▪ Mid-storey dominated by Brigalow (*Acacia harpophylla*) and Narrow-leaf dessert cassia (*Senna artemisioides* subsp. *Zygophylla).* ▪ Groundcover dominated by native grasses and herbs including Ruby saltbush (*Enchylaena tomentosa)*, Windmill grass (*Chloris truncate*) and Kangaroo grass (*Themeda triandra*).	Consistent with 'Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains bioregions' endangered ecological community (EEC).	N/A
Narrow-leaved Ironbark – White Cypress Pine Woodland	6.9	▪ Canopy dominated by Narrow-leaved ironbark (*Eucalyptus crebra*), White cypress pine (*Callitris glaucophylla*), Bulloak (*Allocasuarina luehmannii*) and Dirty gum (*Eucalyptus chloroclada*). ▪ Mid-storey dominated by Green wattle (*Acacia deanei*), Wilga (*Geijera parviflora*) and Western boobialla (*Myoporum montanum*). ▪ Groundcover dominated by native grasses and herbs including Ruby saltbush, Windmill grass and Kangaroo grass.	N/A	N/A
Pilliga Box – White Cypress Pine Woodland	4.77	▪ Canopy dominated by Poplar box (*Eucalyptus populnea subsp. bimbil*) and White cypress pine. ▪ Mid-storey dominated by Wilga. ▪ Groundcover dominated by native grasses and herbs including Ruby saltbush, Windmill grass and Kangaroo grass.	N/A	N/A
Poplar Box – White Cypress Pine Woodland	0.75	▪ Canopy dominated by Poplar box and White cypress pine in remnant areas adjacent to the rail corridor. Closer to the railway track it is mostly regenerating Poplar box with no remnant trees. ▪ Within remnant areas, the mid-storey is dominated by Wilga and Western boobialla. ▪ Predominantly exotic groundcover comprising Guinea grass (*Megathyrsus maximus*), Johnsons grass	N/A	Broadly consistent with 'Poplar Box Grassy Woodland on Alluvial Plains' EEC.

Vegetation community	Area (ha)	Vegetation composition	BC Act status	EPBC Act status
		(*Sorghum halepense*) and Paspalum (*Paspalum dilatatum*).		
Native Grassland on Cracking Clay Soil	2.84	▪ Generally absent canopy with occurrences of Yellow box (*Eucalyptus melliodora*), White box (*Eucalyptus albens*), Belah (*Casuarina cristata*) and Weeping myall (*Acacia pendula*). ▪ Mid-storey is generally absent from this community, however Waterbush (*Myoporum montanum)* was recorded in association with Weeping myall. ▪ Groundcover dominated by native grasses such as Bluegrass (*Dichanthium sericeum*), Spring grass (*Eriochloa procera*), Couch (*Cynodon dactylon*), Windmill grass, Curly windmill grass (*Enteropogon acicularis*), Plains grass (*Austrostipa aristiglumis*) with Nardoo (*Marsilea drummondii*) and Black roly poly (*Sclerolaena muricata*) also common. Exotic grasses are generally also present, but account for less than 50% of vegetation cover.	Consistent with the 'Native Vegetation on Cracking Clay Soils of the Liverpool Plains' EEC.	Some occurrences within the proposal area are consistent with the 'Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland' critically endangered ecological community (CEEC).
Native grassland	34.06	▪ Canopy generally absent. ▪ Mid-storey is generally absent, however occasional regrowth of Western boobialla, Wilga and Green wattle are present, along with regenerating Eucalypts consistent with the adjacent remnant woodland. ▪ Groundcover dominated by a mixture of native grasses including Kangaroo grass, Windmill grass, Umbrella grass (*Digitaria divaricatissima*), Bluegrass, Spring grass, *Aristida* spp. and Couch. Native forbs are present and include Yellow burr daisy (*Calotis lappulacea*) and Yellow buttons (*Chrysocephalum apiculatum*).	N/A	N/A
Low condition native grassland	34.87	▪ Canopy generally absent. ▪ Mid-storey is generally absent, however occasional regrowth of Waterbush. ▪ Groundcover dominated by a mixture of native grasses and herbs such as Spring grass and Nodding saltbush (*Einadia nutans*), however	N/A	N/A

Vegetation community	Area (ha)	Vegetation composition	BC Act status	EPBC Act status
		also contains weed grass species such as Rhodes grass (*Chloris gayana*) and Guinea grass (*Megathyrsus maximus*).		
Exotic grassland	41.31	▪ Absent canopy and mid-storey layer. ▪ Dominated by exotic grasses such as Rhodes grass, Guinea grass, Johnsons grass (and Paspalum. ▪ Includes regularly mown grassland in road verges.	N/A	N/A

Threatened flora

A review of the NSW BioNet Atlas and PMST indicate that a total of 17 threatened flora species have been previously recorded, or have potential habitat within 10 km of the proposal.

No threatened flora species were identified during ecological survey of the study area, however the following threatened flora species have the potential to occur within the proposal area:

- Finger panic grass (*Digitaria porrecta*).
- Spiny peppercress (*Lepidium aschersonii*).

Threatened fauna

A review of the NSW BioNet Atlas and PMST indicates that a total of 60 threatened fauna species and 10 migratory species have been previously recorded, or have potential habitat within 10 km of the proposal.

No threatened or migratory fauna species were identified during ecological survey of the proposal area, however the proposal area may present suitable foraging habitat for the following threatened species:

- Birds:
  - Spotted harrier (*Circus assimilis*).
  - Black-breasted buzzard (*Hamirostra melanosternon*).
  - Little eagle (Hieraaetus morphnoides).
  - Square-tailed kite (*Lophoictinia isura*).
  - Black falcon (*Falco subniger*).
  - Barking owl (Ninox connivens).
  - Eastern grass owl (*Tyto longimembris*).
  - Masked owl (Tyto novaehollandiae).
  - Dusky woodswallow (Artamus cyanopterus cyanopterus).
  - Grey falcon (Falco hypoleucos).
  - Red goshawk (Erythrotriorchis radiatus).
- Mammals:
  - Yellow-bellied sheathtail bat (*Saccolaimus flaviventris*).
  - Eastern coastal free-tail bat (*Micronomus norfolkensis*).
  - Little pied bat (Chalinolobus picatus).
  - Eastern cave bat (Vespadelus troughtoni).
  - Large bent-winged bat (Miniopterus orianae oceanensis).

- Large-eared pied bat (*Chalinolobus dwyeri*).
- Corben's long-eared bat (*Nyctophilus corbeni*).
- Pilliga mouse (Pseudomys pilligaensis).

- Reptiles:
  - Five-clawed worm skink (*Anomalopus mackayi*).

Fauna habitat

Terrestrial fauna habitat is limited given the proximity to the existing active rail corridor. The cracking clay soils may provide habitat to ground-dwelling reptiles and frogs, while shrubland habitat may provide habitat for woodland birds and mammals. Grassland areas are likely to provide foraging habitat for a range of predatory birds and microbat species.

Small culverts within the proposal area were inspected for potential use by threatened Microchiroptera bats (microbats), with none detected. The culverts are considered unlikely to provide roosting habitat to microbats, given the lack of cracks and fissures, and no evidence of occupation observed, in the form of guano or other indicators.

No hollows or nests were observed during the ecological survey.

Potential habitat for the Pilliga mouse was observed between chainage 554.00 km and 556.00 km in the form of dense, low shrubs on sandy soil.

Weeds

Substantial weed coverage across the study area included dense growth of noxious pasture species including:

- Rhodes grass.
- Guinea grass.
- Johnson's grass.
- Paspalum.

Of the above species, none are weeds of national significance or priority weed species.

Aquatic habitat

The rail corridor is within the localised catchment of, or traverses the following waterways:

- Pine Creek.
- Jones Hollow Creek.
- Sandy Creek.
- Jacks Creek.
- Namoi River.
- Narrabri Creek.
- Horsearm Creek.
- Mulgate Creek.

The aforementioned waterways are all mapped as key fish habitat by DPI, indicating the waterways are likely to support threatened fish species.

A review of the PMST and threatened species distribution maps maintained by DPI indicate that waterways in the proposal area may represent suitable habitat for threatened fauna species afforded protection under the FM Act and/or EPBC Act, including:

- Endangered Murray-Darling Basin population of Eel-tailed catfish (*Tandanus tandanus*).

- Southern purple spotted gudgeon (*Mogurnda adspersa*).
- Silver perch (*Bidyanus bidyanus*).
- Endangered western population of Olive perchlet (*Ambassis agassizii*).

No threatened aquatic species were identified during ecological survey of the study area. It is considered that waterways in the proposal area may only provide suitable habitat for the Southern purple spotted gudgeon.

Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are defined as ecosystems that require access to groundwater to meet all or some of their water requirements to maintain their communities of plants and animals, ecological processes and ecosystem services.

A search of the GDE atlas identified terrestrial GDEs located within the proposal area.

6.5.2 Potential impacts

Direct impacts

As summarised in table 6.9, the proposal will require the potential removal, trimming and/or disturbance of up to 84.2 ha of native vegetation (12.5 ha of woodland and 71.8 ha of grassland) and 41.3 ha of exotic vegetation.

Table 6.9: Direct biodiversity impacts

Vegetation community	Area (ha)
Narrow-leaved Ironbark – White Cypress Pine Woodland	6.9
Pilliga Box – White Cypress Pine Woodland	4.8
Poplar Box – White Cypress Pine Woodland	0.7
Native Grassland on Cracking Clay Soils	2.8
Native Grassland	34.1
Low-condition Native Grassland	34.9
Exotic Grassland	41.3
Total	**125.5**

Most work activities will not require ground disturbance or vegetation clearance due to confinement to previously disturbed areas such as the rail envelope, and existing access points and maintenance tracks. Such work activities include rail replacement, ballasting, track resurfacing, welding and adjustment, rail grinding and level crossing upgrades.

Sleeper replacement is unlikely to require clearing of vegetation, however sleepers will be stored on groundcover vegetation which will result in minor surface disturbance.

Work activities associated with track reformation and culvert upgrades may remove vegetation during ground disturbing works and access to the work locations. Other surface disturbance may result from equipment laydown and stockpiling areas within the rail corridor.

Vegetation within the proposal area may provide connectivity with denser stands of vegetation along the proposal alignment and areas of potential fauna habitat. The proposal is considered unlikely to contribute to additional habitat fragmentation given works will be confined to the rail corridor and fauna habitat outside the rail corridor will not be impacted.

Culverts to be replaced under the proposal are considered unlikely to provide microbat habitat.

Whilst the proposal will require temporary vehicular crossings through ephemeral drainage lines and waterways, the crossings will involve upgrade to existing accessways and will not result in direct disturbance to aquatic habitat, permanent disruption to water flow, or long-term impacts on the structure or function of waterways.

Indirect impacts

Indirect impacts may occur during construction works, however will be short term and largely confined to the proposal area and immediate surrounds.

The primary indirect impacts may include:

- increased noise and dust from construction works;
- increased edge-effects for surrounding vegetated areas;
- inadvertent harm to fauna entering the works site;
- potential disturbance of aquatic vegetation and temporary sediment plumes during temporary water crossings;
- inadvertent leak/spills from plant and equipment and release of chemicals (e.g. hydrocarbons) into adjacent waterways.
- potential sources of ignition leading to a bushfire event (e.g. welding and track grinding, vehicles driving through dry grassland during warmer months);
- erosion and sedimentation in areas adjoining construction activities;
- spread of weed propagules, which could lead to invasion of native vegetation by weeds.

Given the proposal is unlikely to impact groundwater resources, potential indirect impacts to terrestrial GDEs are not anticipated.

Threatened ecological communities

A ‘test of significance’, pursuant to section 7.3 of the BC Act, and ‘assessment of significance’ under the EPBC Act have assessed the extent of impact for each threatened ecological community identified within the proposal area. No significant impacts to threatened ecological communities will occur as a result of the proposal.

Threatened fauna

Tests of significance, pursuant to section 7.3 of the BC Act, and assessments of significance under the EPBC Act have assessed the extent of impact for each threatened species considered as having the potential to utilise habitat within the proposal area. No significant impacts to threatened species will occur as a result of the proposal.

Migratory birds were identified in the PMST, several of which have the potential to occur within or fly over the study area. The habitat within and adjacent to the proposal is unlikely to provide important habitat for significant numbers of migratory species or contain habitat important to their lifecycle. Large aggregations of migratory species are not expected to occur within the study area.

Weeds

Weed species are present within the study area. ARTC have a responsibility to implement appropriate controls to avoid any spread of weed species off site during the construction work. This includes avoiding the spread of seed and fragments of vegetation.

6.5.3 Mitigation and management measures

In summary, the proposal will not result in significant impact upon endangered or threatened ecological communities, populations or species, nor potential habitat of threatened fauna.

Provided that the mitigation and management measures detailed below are implemented prior to, during and after completion of the proposal, potential adverse impacts on biodiversity values will be minimised.

The following mitigation and management measures are recommended to reduce the impact on biodiversity values within and outside the proposal area:

Induction

- Prior to the commencement of works, work personnel will be inducted on the environmental sensitivity of the proposal area, location of threated ecological communities and the potential for these areas to represent habitat for threatened flora and fauna species.

Threatened ecological communities

- Any proposed works within areas identified as containing 'Native Grasslands on Cracking Clay Soils' (refer to Appendix C) must be undertaken considering the requirements of Ecological Management Plan - Native Vegetation on Cracking Clay Soils of the Liverpool Plains (EEC) and Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland (CEEC) (Umwelt, 2018).

Threatened fauna

- Where disturbance is required in areas of high-quality habitat (represented by Native Grassland on Cracking Clay Soils) or where direct ground disturbance is required in areas identified as potential habitat (Native Grassland on Cracking Clay Soils, exotic grassland, low condition native grassland, native grassland, and remnant woodland) (north of chainage 558.5 km) the following mitigation measures must be implemented:
  - Site induction - all construction personnel will be subject to a five-clawed worm-skink induction.
  - Pre-clearance surveys will be undertaken by an ecologist and/or spotter-catcher team prior to and during direct ground disturbance activities within the Five-clawed Worm-skink habitat areas. Ground disturbance includes any disturbance to soil, including vegetation clearing which results in the disturbance to root systems (e.g. grubbing works). Slashing or pruning of vegetation is not considered to result in direct ground disturbance.
  - The surveys will include active searches of microhabitats, including, carefully turning woody debris, rocks, and artificial debris, raking the soil surface or leaf litter beneath trees and looking beneath peeling bark for reptiles or their sloughs, searching for animals during topsoil stripping (working closely with the grader operator).
  - Targeted pre-clearing surveys with survey effort determined by the ecologist and scaled up or down depending on site complexity.
  - Detection protocol – works to be ceased in the vicinity, temporary exclusion zone established, ecologist notified to capture and relocate individuals, and immediate notification to ARTC
  - Reporting - should the detection of a five-clawed worm-skink be validated, ARTC will cease all works in the vicinity of the find. ARTC will review statutory assessments/approvals required under both the BC Act and EPBC Act.
  - Requirement for detailed data to be collected on any future records of five-clawed worm-skink, including GPS coordinates of capture and relocation sites, date and time capture, description of microhabitats, validation photos and measurement of specimens.
  - Should the five-clawed worm-skink be recorded as part of surveys, consider additional mitigation measures as detailed in section 5.11.2 of the Construction Biodiversity Management Subplan - N2NS (Trans4m 2022).

- Prior to commencement of works, check for any relevant changes to the Construction Biodiversity Management Subplan - N2NS (Trans4m 2022, current version dated 6 January 2022). Impacts to the area of Pilliga mouse habitat between chainage 554 km and 556 km will be avoided or minimised wherever possible. In this area shrubland located further than two metres either side if tracks and remnant vegetation within the corridor should be retained where possible.

General pre-clearance surveys

- A pre-clearance inspection will be carried out prior to branch trimming of mature trees to identify the presence of any hollows and fauna potentially residing inside.
- A pre-clearance inspection of culverts by a qualified ecologist is recommended prior to the commencement of demolition work in order to confirm the presence of any roosting bat species which may require relocation.

General mitigation measures

- Prior to commencement, the contractor is to clearly delineate the approved work area with high visibility para-webbing or tape. Declare and maintain all areas outside the area a no-go zone (including access, stockpiling and storage of materials).
- Disturbance of vegetation will be limited to that which has been assessed in this REF.
- If trees do limit access for plant and equipment, branches will be tied back if practicable rather than trimmed. Similarly, vegetation will be trimmed or temporarily tied back where possible rather than the removal of whole plants.
- Trimming of established tree branches will be executed by an appropriately qualified tree surgeon or arborist, with a minimum AQF level of 3 and carried out in accordance with AS 4373-1996 Pruning of Amenity Trees.
- If native fauna are encountered while work is occurring, work should cease until the animal moves out of the impact area. Injured fauna should be taken to the nearest veterinary clinic for assessment. If relocation is required, employ appropriate expert assistance (e.g. WIRES, ecologists etc.).
- Logs or large fallen branches will not be moved unless required. Any such material will be repositioned nearby.
- If any threatened species (flora or fauna) is discovered during the works, all work will stop immediately and ARTC and a qualified ecologist will be notified. Work will only recommence once the impact on the species has been assessed by a qualified ecologist, appropriate control measures provided, and any required additional assessments or approvals are obtained.
- Materials, plant, equipment, work vehicles and stockpiles will be placed to avoid damage to surrounding vegetation, and will be outside tree drip lines.
- No hot works are to be conducted during Total Fire Bans unless other approvals have been obtained.
- Utilise existing maintenance access tracks where possible to minimise disturbance.
- No excavations to be left open overnight, where possible.
- Ensure good site housekeeping to prevent pest animals.

Weed Management

- Avoid distributing weeds on and off site by implementing suitable vehicle and equipment controls, for example checking vehicles prior to leaving the site to remove soil and any plant matter including seeds.
- Remove any noxious or environmental weeds encountered in accordance with the relevant Weed Management Plan released by NSW Department of Primary Industries.
- Weed control will be undertaken by suitably qualified and/or experienced, licenced sub-contractors in accordance with contemporary bush regeneration practices.

- All weeds, propagules, other plant parts and excavated topsoil material that is likely to be infested with weed propagules that are likely to regenerate will be bagged, removed from site and disposed of at a licensed waste disposal facility.
- Cover all vehicles transporting waste containing noxious weeds and seeds for disposal.
- Avoid importing any soil from outside the site to prevent introduction of weeds and pathogens to the site.

6.6 Soils and water quality

6.6.1 Existing environment

Topography

Based on available contour data, the proposal site and surrounding landscape is relatively flat, ranging between 210 m and 240 m Australian Height Datum (AHD). The topography from at Narrabri North end of the alignment is positioned at 220 m AHD and gently slopes towards the township at Narrabri, which ranges between 210 m and 214 m AHD, with a low point at the Namoi River of 208 m AHD. From Narrabri, heading south, the topography once again gently rises to 240 m AHD within the vicinity of Turrawan,

Within much of the proposal area, the rail corridor has been filled above the low lying natural levels of the surrounding landscape, with fill embankments rising from the ground levels of the surrounding landscape to the filled level of the rail line.

Geology and soils

The geology and soils of the works location have been identified following a review of the 1:250,000 Narrabri Geological Map, which indicates that the proposal site is underlain by Quaternary alluvial deposits comprising sand, silt, gravel and clay.

There is no available information on soil landscape for the majority of the proposal area. Within proximity to Narrabri, the underlying soil landscape is noted to include:

- Namoi landscape, which is formed on level floodplains and terraces of Quaternary alluvium. Soils are deep to very deep (>150 centimetre (cm)), imperfectly drained and include grey vertosols (grey clays) and black vertosols (black earths).
- Bohema Creek landscape, which is formed on narrow alluvial terraces on Quaternary alluvium. Soils are dominated by deep (>150 cm), well-drained red kandosols (red earths).
- Tippiari Road landscape, which is formed on gently undulating rises to undulating hills on sandstone in the far south of the Moree plains. Soils are moderate to very deep (50 - 500 cm), and include well drained tenosols (earthy sands), brown or yellow sodosols and abundant gravels.

Acid sulfate soils

Acid Sulfate Soils (ASS) generally occur in low lying areas in and around coastal swamps, estuaries, and other coastal water bodies. If these soils are disturbed or exposed to oxygen, they have the potential to oxidise over time, resulting in acidic water leaching from these soils and scalding vegetation or killing aquatic fauna. ASS can also react with concrete and steel infrastructure.

A review of the ASS maps contained within the Narrabri LEP did not indicate the potential for ASS at the site.

Groundwater

Groundwater is expected to be present within underlying alluvial deposits discharging into the adjacent Namoi River.

A search of available real time groundwater monitoring data maintained by Water NSW identified the following monitoring bores and depth to groundwater within the vicinity of the proposal:

- GW030121 (Narrabri Speedway) – 6.6 m below ground level (bgl).
- GW036005.1.2 (Harparary Road, Harparary) – 10.5 m bgl.

A preliminary contamination assessment was previously conducted as part of ARTC's Narrabri Turnback Facility REF (SMEC, 2021), with data from a former Caltex depot adjacent to Narrabri Station analysed. The data indicated that groundwater in the vicinity of Narrabri Station may be in the vicinity of 8-10 m bgl.

Based on a review of available data, it is anticipated that groundwater within the proposal area may be encountered between 5 – 11 m bgl based on similar positioning within alluvial plains.

6.6.2 Potential impacts

Construction activities will involve ground disturbance. This will include vehicle movements on exposed surfaces, excavation activities, stockpiling of soils and the removal of existing groundcover vegetation. Given composition with silt and sand particles, material to be excavated will be highly susceptible to erosion by wind and rainfall and may result in sedimentation off-site if not managed appropriately.

Where existing maintenance access tracks cross through ephemeral drainage lines or waterways, where required the access track will be repaired or upgraded within the same disturbance footprint, inclusive of erosion control measures such as introduction of rock armouring.

Generally, threats to water quality are associated with construction activities, such as, the disturbance of soil and movement of sediment, contaminated or otherwise, into nearby water courses such as the Namoi River, Narrabri Creek and associated tributary waterways. The potential also exists for litter and other construction waste to be mobilised by both wind and stormwater runoff and deposited in downstream drainage lines and waterways.

The potential for adverse water quality impacts associated with the proposal will be minimised provided the implementation of recommended mitigation measures, including erosion and sediment controls that are installed and maintained in accordance with the requirements of Soils and Construction, 4th Edition, 2004, Managing Urban Stormwater (the 'Blue Book').

Upon completion of the works, all disturbed areas will be stabilised against erosion in accordance with Blue Book requirements, thereby negating the risk of long term erosion impacts.

Excess soil material excavated during the construction of the proposal will need to be managed on-site or disposed of off-site. Where excavated material cannot be reused on site as backfill or other purpose, it is to be classified in accordance with Waste Classification Guidelines (EPA, 2014) and disposed of accordingly.

Despite being adjacent to the Namoi River and tributaries, as earthworks are to be confined to a maximum depth of two metres, where track reconditioning is required, the works are not anticipated to intercept the underlying aquifer or groundwater resources. However, perched groundwater may be encountered during earthworks, especially after periods of prolonged rainfall resulting in seepage into excavations. Dewatering of excavations may therefore be necessary; however quantities are not expected to be significant and will not exceed the three megalitre threshold thereby requiring a water access licence under the WM Act. If the groundwater is saline,

acidic, or contains heavy metals, discharge to the environment may cause adverse impacts to waterways and aquatic biota vegetation.

Should the design alter and/or deeper excavation be identified during detailed design to facilitate the proposal, the need for approvals under the WM Act will be reviewed.

6.6.3 Mitigation and management measures

Management measures to mitigate potential erosion, sediment and water quality issues during construction and operation of the proposal (inclusive of culvert upgrades and proposed waterway crossings) will be incorporated within the CEMP. The measures will be prepared in accordance with 'Soils and Construction, 4th Edition, 2004, Managing Urban Stormwater (Blue Book).

Key mitigation measures to minimise impacts on soils and water quality on adjacent drainage lines and ultimately the Namoi River, may include:

Erosion and sediment control

- Works will be staged, where applicable, to minimise the exposure of bare surfaces and retain ground cover for as long as practicable.
- Construct temporary diversion devices to divert the flow of clean, upslope water away from or through the work site.
- Where possible, ensure compaction following application of new or regraded surfaces.
- Install sediment controls on the downslope side of any disturbed areas including excavated, graded and stockpile sites where erosion may impact the surrounding area.
- Construction of sediment fencing is to be parallel to contours downslope of earthworks (areas of soil disturbance).
- Monitor and maintain all temporary and permanent erosion and sedimentation controls on a daily basis during construction and immediately following heavy rainfall. Monitoring of erosion and sediment controls should be undertaken post construction until the site is no longer in an erosion-prone state (e.g. vegetation has fully established on exposed soil surfaces).
- If erosion or sedimentation is observed, perform remedial action as soon as possible.
- At the end of each working day inspect site access locations for mud tracking on public roadways. Roadways are to be swept if mud or debris from the site is visibly evident on the road.
- Erosion and sediment control plans will be required where earthworks are occurring and where excavated materials are required to be stockpiled

Stockpile management

- Locate stockpiles at least 40 m away from drainage lines and the riparian corridor of the Namoi River and Narrabri Creek, and provide appropriate containment measures around the stockpiles
- Restrict work areas, stockpile sites and access tracks to already disturbed, cleared areas.
- Temporary stockpiles will be managed to prevent wind and water erosion.
- Disturbed areas and stockpiles will be stabilised within 10 days of being disturbed.
- Minimise stockpile storage time where practicable.
- During periods of severe weather (e.g. high rainfall or strong winds), consider temporarily suspending works, minimising vehicular movements and/or cover materials such as exposed stockpiles until weather conditions improve.
- All stockpiles will be limited to a maximum height of two metres.

Culvert upgrades and waterway crossings

- Works within 40 m of a waterway or instream works will require an erosion and sediment control plan (ESCP) and will consider the following measures to prevent and minimise any potential erosion and sediment control impacts:
  - Temporary flow diversion within the waterways may be required depending on weather conditions and flow.
  - Access works will be undertaken as quickly as possible and will maintain the channel shape and bed level to pre-construction condition.
  - Use of a silt curtain within waterways will be implemented if feasible for site conditions.
  - Daily visual monitoring will be undertaken to determine any direct impacts to aquatic habitat. In the event that direct or indirect impacts are suspected or observed, all works will cease and work methodology revised to eliminate impact.
  - Stabilisation of disturbed areas is to be staged during the works consistent with the activities being performed.
  - Cover exposed slopes and banks with jute matting or other stabilising agent where risk of erosion is high.
- If works are required in waterways identified as Key Fish Habitat, ARTC will ensure that valid permits under part 7 of the FM Act are obtained prior to commencement.

Revegetation

- Temporary areas utilised for ancillary facilities or access tracks on private land are to be re-instated to their original state after use in agreement with the landowner.
- Stabilise any areas, as appropriate, until they have been revegetated in accordance with Blue Book requirements.

Groundwater infiltration

- Any groundwater which is encountered during excavation will be tested in order to determine whether it is of an acceptable quality to be released back into the environment. Where excavation water is suspected or confirmed to contain contaminants, or the water is highly turbid, the water will be contained, treated, tested, to determine if it can be re-used or released on site.
- If dewatering of excavations is required, and has been determined by ARTC to be acceptable for discharge to the environment, the activity is to be monitored to ensure existing water quality is maintained.

Spill management

- Emergency spill kits must be onsite at all times. Immediately contain and clean up leakage of fuels, oils, chemicals and other hazardous liquids in accordance with the Safety Data Sheet and relevant emergency response procedures.
- All fuels, chemicals, and other hazardous liquids are to be stored at least 40 m away from drainage lines and waterways, within a sealed and bunded storage area that has a volume of 110% of the largest container being stored.
- Machinery will be checked daily for oil, fuel or other leaks and repairs undertaken as required.
- Avoid refuelling or maintenance of equipment or vehicles on site. If unavoidable use drip trays or catch trays beneath equipment / vehicles being maintained.

6.7 Hydrology and drainage

Over time, the railway has degraded due to deteriorating sleepers, movement of ballast material and degradation of the subgrade and foundation soils. This has resulted in an uneven track profile. The proposal will remove these profile inconsistencies, reinstate previous levels and, in some areas, increase track levels to achieve a more efficient operation of the railway.

Upgrade of the section of railway through the township of Narrabri include three aspects, namely:

- formation reconditioning, involving reconstruction of subgrade material up to a maximum of 1,900 mm deep;
- formation skim, involving replacement of a thin layer of material at ground level and track lift of up to 100 mm; and
- side insertion of new sleepers which involves a track lift of up to 100 mm.

To assess potential hydraulic impacts of raising existing track levels in a flood prone area, a surface water assessment was carried out and is in Appendix D. This section summarises the key findings of hydraulic modelling of the proposal.

For the purposes of the surface water assessment, the sections of track that are to be lifted and that are currently inundated in the 1% AEP flood event were further assessed for potential flood impacts. Sections of the track within the 1% AEP and subject to track lift include:

- Chainage 565.99 km to 566.9 km (Lift A).
- Chainage 567.92 km to 568.92 km (Lift B).
- Chainage 570.00 km to 571.00 km (Lift C).

6.7.1 Existing environment

The proposal is located on the Namoi River floodplain.

The rail corridor is within the localised catchment of, or traverses the following waterways:

- Pine Creek.
- Jones Hollow Creek.
- Sandy Creek.
- Jacks Creek.
- Namoi River.
- Narrabri Creek.
- Horsearm Creek.
- Mulgate Creek.

Surface flows from the rail corridor proceed downslope via ephemeral drainage lines to the aforementioned waterways, which ultimately drain to the Namoi River.

The Narrabri Flood Study (WRM, 2016) addresses causes of flooding in Narrabri, including ‘regional flooding’ associated with flows from the Namoi River, and ‘local flooding’ associated with tributaries (Mulgate Creek and Horsearm Creek) on the eastern side of town.

Much of the Narrabri township is flood impacted from both regional flooding and local flooding events.

For the section of the railway between Turrawan and Narrabri Triangle, there is no interaction with the 1% annual exceedance probability (AEP) flood event, nor smaller events, with the exception of bridges and culverts where flows pass from creek catchments to the west. The regional probable maximum flood (PMF) event will overtop the railway embankment close to the Narrabri Triangle.

For the section of railway from Narrabri Triangle to Narrabri North, the railway embankment is overtopped in the following flood events:

- The 5% AEP (20 year annual recurrence interval (ARI) event) for local flooding, in the area around Narrabri Cemetery.
- Between the 5% and 2% AEP for regional flooding (20 year and 50 year ARI events), in the vicinity of Narrabri Railway Station.

The rail line is currently overtopped in the 1% AEP event in a number of locations in both the local and regional events, including:

- to the east of the Namoi River crossing, including the area around the McKenzie Street level crossing; and
- to the east of Narrabri Creek from around Fitzroy Street, through the station area and north towards Narrabri Cemetery.

6.7.2 Assessment method

The hydraulic model WRM (2016) used a digital elevation model to model flooding behaviour. Whilst sufficient for broadscale flood planning, the accuracy is not sufficient for a linear structure such as a rail embankment. As such, the existing hydraulic model was adjusted to incorporate surveyed rail levels along the rail embankment through Narrabri.

The updated hydraulic model was then adjusted upwards at the three proposed lift areas by 100 mm to represent a ‘worst case’ model of proposed changes along the rail alignment.

The replacement of existing culverts was not incorporated into the hydraulic model as the culvert upgrades are predominantly similar in opening area and are relatively small culverts unlikely to have any influence on water movement in flood events.

As outlined in Appendix M of the NSW Floodplain Development Manual (DIPNR, 2005), the most accurate assessment of the change to flood risk associated with modifications to the floodplain is to assess both the number of properties impacted pre and post the modification in terms of frequency and depth of flooding. This is usually assessed for additional lots flooded and for flooding above habitable floor levels, or commercial or industrial use floor levels.

There are a range of quantitative limits for the determination of an acceptable and unacceptable flood impact from a development in terms of afflux or other parameters outlined in legislation or other guidelines.

Council provides a limit for impacts on council infrastructure to be an increase in flood depth of 50 mm in the 1% AEP event based on council’s Policy for Controlled Works on a floodplain. This limit has been applied for the surface water assessment.

The Narromine to Narrabri (N2N) Inland Rail Flooding and Hydrology Impact Assessment (ARTC, 2020) and other sections of the Inland Rail (i.e. Narrabri to North Star Phase I and Parkes to Narromine) have proposed a range of quantitative design limits (QDLs) in conjunction with the Department of Planning and Environment (DPE) for the assessment of the new Inland Rail line.

For the purposes of the assessment of the proposal, a modified version of QDLs commensurate with the scale and nature of the proposed activities has been selected to assist in estimating the potential impacts of the proposal. The QDLs are based on those applied to similar brownfield rail construction and maintenance projects. The QDLs are outlined in table 6.10. The surface water assessment used surveyed floor levels collected as part of WRM (2016) to determine impacts on habitable floor levels.

Table 6.10: Quantitative design limits

Parameter	Location	Design objective
Afflux (5%, 2% and 1% AEP)	▪ Habitable floor levels for residential land uses. ▪ Sensitive infrastructure, including: – Hospitals. – Flood evacuation routes. – Electricity sub stations. – Water treatment plants.	10 mm (for residences and sensitive infrastructure already inundated)
	Council infrastructure	50 mm
	Other land	200 mm
Velocity (5%, 2% and 1% AEP)	Increase in velocity in residential or built areas	0.05 metres per second (m/s)
Hazard (1% AEP)	All land	No change of flood hazard from 'Low' to 'High' as defined in Appendix L, NSW Floodplain Development Manual (DIPNR, 2005)

6.7.3 Potential impacts

Construction phase

Potential hydraulic impacts during construction may be associated with placement of plant, equipment and/or materials flow paths or waterways, which may result in the local diversion of flows.

Given the size of the Namoi River floodplain, it is not feasible to exclude placement of materials or machinery from flood impacted areas during construction. However, given the temporary and minor nature of the proposal, the implementation of recommended mitigation measures outlined in section 6.7.3, and restoration of disturbed areas, construction of the proposal is not anticipated to permanently alter existing flood or drainage patterns.

Operational phase

Track lifting

The existing flood behavior across Narrabri means that small changes in surface levels over the floodplain, particularly for linear structures such as rail embankments that traverse the floodplain, will have an impact on water movement and flood levels.

In this case, the proposal will alter rail levels and in select areas require slight raising to allow for subgrade improvements, additional ballast and new concrete sleepers.

For the purposes of concept design, conservative allowances of 100 mm of track lifting within the 1% AEP flood area have been modelled.

Table 6.11 presents a summary of hydraulic impacts associated with the proposed track lift.

Appendix A of Appendix D contains mapping showing the changes in flood height for the range of flood events, and areas affected based on the QDLs.

Table 6.11: Hydraulic impact summary

QDL	Regional flood			Local flood		
	5% AEP	2% AEP	1% AEP	5% AEP	2% AEP	1% AEP
Change in afflux (>10 mm) for habitable floor levels of residential land uses already inundated	-	32 dwellings (maximum afflux increase of 49 mm)	16 dwellings (maximum afflux increase of 55 mm)	5 dwellings (maximum afflux increase of 52 mm)	47 dwellings (maximum afflux increase of 48 mm)	50 dwellings (maximum afflux increase of 51 mm)
Change in afflux (>10 mm) for sensitive infrastructure	-	-	-	-	-	-
Change in afflux (>50 mm) for council infrastructure	-	-	▪ Up to 266 m of McKenzie Street ▪ Up to 30 m of Taylor Street ▪ Up to 41 m of Cunningham Close	-	▪ Up to 412 m of Old Cemetery Road ▪ Narrabri Cemetery ▪ Up to 77 m of Stoney Creek Road	▪ Up to 730 m of Old Cemetery Road ▪ Narrabri Cemetery ▪ Up to 220 m of Stoney Creek Road
Change in afflux (>200 mm) on other land	-	-	-	-	-	-
Increase in velocity in residential or built areas (>0.05m/s)	-	-	-	-	-	-
Change in flood hazard	-	-	Change in flood hazard from 'Low' to 'High' over a surface area of 2.2 ha. No residential lots impacted.	-	-	Change in flood hazard from 'Low' to 'High' over a surface area of 4.4 ha. One residential lot potentially impacted.

Regional flooding

The following summary can be made on the impact of the proposal to regional flooding:

- As evident in table 6.11, the 5% AEP event is below all proposed lift areas. As such, there will be no impact on this flood event, or smaller events.
- Lift A will have the largest impact on flood flows, primarily as there is only shallow overtopping of the railway embankment at the modelled 1% AEP. As such, any change in rail height has a relatively large change on flood behaviour.
- In the 2% AEP and 1% AEP event, flood levels in the residential area along McKenzie Street (opposite the level crossing) experience increases of approximately 40 mm and 55 mm respectively, with the remaining residential land between McKenzie Street and Guest Street experiencing an increase of between 10 to 40 mm, reducing towards Guest Street. The existing 1% AEP flood depth in this area is between 700 to 1,100 mm.
- Lift B creates a small impact (20 mm increase in the 2% AEP event) on a single lot on Fitzroy Street, to the east of the railway line.
- Lift C creates a 10 to 20 mm increase in the 1% and 2% AEP event for residential land on Bailey Street, where existing flood depths are between 700 to 1,000 mm.
- The total number of properties impacted in the 1% AEP event is 16 houses, with the majority adjacent to the Lift A area. The maximum change in flood level above existing habitable floor levels is 55 mm in the 1% AEP event and 49 mm in the 2% AEP event.
- There are no areas where the increase in flood levels for any event will exceed 200 mm.
- There are no residential or built areas where the increase in flood velocity will exceed 0.05m/s.
- Approximately 2.3 ha of land will change from low to high flood hazard, the majority of which is located within rural land. There will be small, isolated changes in residential areas and small areas over existing roads in the area upstream of Lift A around Taylor Street and McKenzie Street.

Local flooding

The following summary can be made on the impact of the proposal to regional flooding:

- Lift A has no impact in all local flooding events modelled as no overtopping occurs up to and including the PMF event.
- Lift B creates a small impact (20 mm increase) on a single house on Fitzroy Street to the east of the railway line.
- Lift C will result in relatively substantial changes in flood behaviour, as current overtopping flows in this area are relatively shallow. The change in level will result in increased flow depths upstream of the Lift C area, as well as increased depths in some downstream areas given that flows that previously overtopped the rail embankment and flowed to the sale yard area are diverted to Horsearm Creek.
- Residential areas around Bailey Street will experience up to an 80 mm increase on existing 180-200 mm flood depths in a 5% AEP event, and a 50 mm increase in larger events (2% and 1% AEP). There is in excess of a 50 mm increase over part of Cemetery Road, Narrabri Cemetery and part of Stoney Creek Road.
- Residential areas alongside Horsearm Creek and in the area between Lloyd to Denhurst Streets receive flood increases of between 10 to 35 mm in the 5%, 2% and 1% AEP events, with the largest impact in the 5% AEP event.
- The maximum change in flood level above existing habitable floor levels is between 48 to 52 mm for the 5%, 2% and 1% AEP event, all occurring on Bailey Street.
- The number of properties impacted in the 1% AEP event is 50 houses, with the majority downstream of the railway crossing over Horsearm Creek.
- There are no areas where the increase in flood levels for any event exceeds 200 mm.
- There are no residential or built areas where the increase in flood velocity exceeds 0.05 m/s.

- Approximately 4.4 ha of land will change from low to high flood hazard, the majority of which is located within rural land. There are small, isolated changes in residential areas and small areas over existing roads to the area around Kaputar Street and Reid Street.

Cumulative impacts

A review of detailed hydraulic assessment results for the N2N Inland Rail project shows the increase in flood levels greater than 10 mm around Narrabri is confined to the area downstream of the junction between Horsearm Creek and Narrabri Creek.

Given there is sufficient distance between the modelled flood impact areas for N2N and the proposal, cumulative impacts between the two projects are considered unlikely to occur.

Culvert replacement and waterway crossings

As outlined in section 3.1.2, ARTC intend to replace culverts which are in poor condition along the proposal alignment. Additionally, existing accessways through waterways may require upgrade as part of the proposal.

The following factors identified within the Guidelines for outlet structures on waterfront land (DPI Water, 2012*)* are considered relevant to the proposal and are discussed in detail below:

- channel function maintenance;
- flow velocity and flood patterns; and
- scour protection.

Providing these best practice guidelines are considered in the detailed design of the culvert structures and waterway crossings, the proposal is unlikely to impact on the existing hydrological functioning of the respective drainage line or waterway, nor their existing flooding regimes.

Maintaining channel functions

As existing culverts and access ways will be renewed or replaced, the structures are not anticipated to have a significant effect on stream hydrology. Therefore, not acting as a hydraulic control or the like, the natural flow conditions and hence the geomorphic and ecological functions of the waterway will not be altered significantly.

Natural geomorphic processes shall be maintained as the design of the culvert:

- shall maintain the natural waterway functions;
- shall maintain the natural bed and bank profile;
- shall ensure the movement of sediment and woody debris is not inhibited through adequate sizing and drainage;
- shall not increase scour and erosion of the bed or banks in any storm events; and
- shall avoid locating structures on bends in the channel.

Flow velocity and flood patterns

Although the proposed culvert works are located on alluvial floodplains, they are unlikely to alter or exacerbate local flood patterns/regimes as:

- the proposed culvert designs and access ways will ensure that there is no further obstruction across the drainage line/waterway flow than currently exists;
- the footprint of the culvert structures and access ways will have a negligible impact on the total floodplain storage capacity; and
- the culvert structures and access ways will not increase or alter flooding frequency or alter existing flooding regimes.

Natural hydrological regimes will be maintained through the following parameters:

- accommodating site hydrological conditions;
- no alteration to the natural bank or floodplain flows, or increasing water levels upstream; and
- no change to the gradient of the bed of the drainage line or waterway except where necessary to address existing bed and bank degradation immediately adjacent to the outlet of the existing culvert or access way.

Scour protection

The culvert and access way design requirements for protection against scour include necessary scour protection, such as rock lined rip-rap and vegetation adjacent to the headwall of the culvert outlet and access way. Such features will be designed in accordance with the Guidelines for outlet structures on waterfront land (DPI, 2012).

Providing the mitigation and management measures outlined in section 6.6.3 and 6.7.3 are implemented, it is considered unlikely that the proposal will have an adverse effect on surface water flows or a cumulative impact on water quality, including sedimentation impacts.

6.7.4 Mitigation and management measures

Track lifting

The following management measures will be carried out to minimise the impact of any potential change to the movement of flood waters:

- Further flood modelling will be undertaken during detailed design to confirm compliance with QDLs outlined in this REF. Where it is not reasonable or feasible to satisfy the QDLs, and non-compliance with the QDLs will change the flood hazard category for residential land uses (as defined in Appendix L of the NSW Government Floodplain Development Manual 2005), flood mitigation measures will be developed in consultation with the affected property/structure/infrastructure owners, SES and council.
- A flood verification report will be prepared by an appropriately qualified person within 3 months of the commencement of construction of the proposal. The flood verification report will:
  - outline the final design of the proposal and the results of the revised modelling;
  - confirm any increase to the flood hazard category to residential land use as a result of non-compliance with the QDLs;
  - provide justification as to why non-compliance with the QDLs will not result in significant environmental or social impact; and
  - where required, outline the mitigation measures to be implemented to reduce future impacts of flooding, including the timing and responsibilities for implementation.

Culvert replacement and waterway crossings

Specific mitigation and management measures to minimise impacts on hydrology and flooding during construction of the proposal will be incorporated into the CEMP. Mitigation measures will be prepared in accordance with the blue book and will include best practice controls for:

- The design of the culvert structures and waterway crossings will allow for existing hydrological and flooding regimes to be maintained.
- positioning material stockpile and storage areas outside of flood prone areas wherever feasible, drainage lines and waterway crossings.
- maintaining the natural flow regime of the drainage line/waterway by preventing the creation of barriers to the natural flow of water;
- regularly monitoring weather forecasts and ensuring the construction team are informed of no work policy during high rain or flooding events;

- ensuring measures are in place to allow personnel and machinery within the works area to be evacuated during high rain or flooding events; and
- operational erosion controls are to be designed into culvert headwalls and waterway crossings to prevent long term scouring and may include a rock lined rip rap structure and/or revegetation.

6.8 Contamination

6.8.1 Existing environment

A search of the EPA's Contaminated Land Records and ARTC contamination mapping identified no recorded contaminated sites within proximity to the proposal. A search of the List of Contaminated Sites notified to the EPA identified the following sites within proximity to the proposal:

- Former Lowes Petroleum (3 Old Gunnedah Road, Narrabri) – located immediately adjacent to the south of the rail corridor.
- Caltex Service Station (12 Reid Street, Narrabri) – located to the south of Narrabri railway station.

The aforementioned notified sites do not require remediation under the CLM Act.

No waste materials or potentially contaminated land was identified or observed within the proposal area during previous site inspections.

A preliminary contamination assessment (PCA) was previously conducted as part of ARTC's Narrabri Turnback Facility REF (SMEC, 2021) to investigate the potential for contamination within the vicinity of Narrabri railway station. The findings of the PCA are summarised as follows:

- the locality has been used as a rail corridor (including station and associated structures) since 1956. There have been minimal changes since this time with the exception of minor demolition and construction work;
- areas adjacent to Narrabri railway station were noted to have activities which can cause contamination, in particular a former Caltex fuel depot and existing Lowes fuel depot;
- five suspected asbestos fragments were noted at the surface in the north-western portion of the station. Representative samples were collected and analysed, however no detections for asbestos was confirmed;
- the north west portion of the station was used for storage of various materials including stockpiled rail waste (e.g. ballast), sleepers, plates, scrap metal and empty oil drums;
- several storage sheds are located within the southern portion of the station, which may house stored chemicals. The sheds appear to have been constructed on concrete pads;
- unknown fill mounds were noted. The source/s of the mounds may be related to historical excavation associated with rail line construction;
- based on site observations, nine areas of environmental concern were identified. Strategic soil sampling was carried within some of the areas of environmental concern with laboratory results concluding that some contaminants including several heavy metals, organochlorine pesticides and total petroleum hydrocarbons were noted above the laboratory limit of reporting;
- within the vicinity of the former Caltex depot and station platform, samples collected from deeper within soil profile did not record exceedances, indicating that elevated lead contamination in these locations are likely confined to upper soil layers;
- analysis of selected sample locations, did not show contaminant concentrations exceeding adopted health investigation levels for a commercial/industrial setting, which suggests that the likelihood of adverse impact to construction workers is low in the areas assessed; and
- based on laboratory results and field observations, soils within the areas investigated will potentially be classified as general solid waste (non-putrescible), however additional soil

sampling and waste classification was recommended during construction of the turnback facility.

Elsewhere within the proposal area, activities or materials which may have resulted in historical contamination include:

- contamination associated with rail activities that may be present in ballast and formation materials and soils in and next to the rail corridor;
- importation of fill containing metals, asbestos and other contaminants during landfilling; and
- use of land adjacent to and within the proposal area for illegal dumping activities.

6.8.2 Potential impacts

Contact with contaminated soil poses a health risk to those directly exposed as well as having a potential wider impact if the contaminant is spread. Contamination entering the adjacent stormwater network or waterways, or being deposited on neighbouring lands via wind erosion, can pose a threat to downstream aquatic ecology and water quality, as well as the wider community. It is an offence under the POEO Act to cause contamination or spread contaminated material.

Although unlikely, earthworks associated with the proposal have the potential to encounter unexpected contaminated soils, particularly near Narrabri railway station and other high risk land uses adjacent to the rail corridor including industrial premises such as petroleum depots. In the event that unexpected contaminated soils are identified, the material will require adequate management and analysis prior to any re-use of spoil material at the site as backfill, or otherwise disposal of excess spoil from the site.

Potential contaminated groundwater is not expected as the proposal will not intercept groundwater.

Storage of fuel, the process of re-fuelling and the storage and use of other chemicals on site, also has the potential to contaminate soil.

6.8.3 Mitigation and management measures

The following controls for contaminating activities and waste management measures will be implemented on site:

- Construction personnel will be briefed on the potential for unexpected contamination to occur within the rail corridor and procedures to be implemented in the event contamination is identified or suspected.
- In the event that contamination is identified or suspected, all work in the vicinity of the find shall cease and the area isolated appropriately. A specialist consultant experienced in the identification, sampling and testing of contamination will be engaged to undertake an assessment of site conditions prior to re-commencement of earthworks.

6.9 Aboriginal heritage

The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW published by the former NSW Department of Environment, Climate Change and Water (DECCW) in 2010 assists individuals and organisations to exercise due diligence when carrying out activities that may harm Aboriginal objects, and to determine whether they should apply for consent in the form of an Aboriginal Heritage Impact Permit (AHIP).

The code of practice requires proponents to complete a due diligence process in order to determine whether their activities are likely to impact on an Aboriginal item or object. Part of this

process involves assessing the area for known Aboriginal sites, previous disturbance (i.e. road construction, vegetation clearance, utility construction etc.) and features of the landscape in which the site is located that may indicate previous Aboriginal activity, and a potential to uncover unidentified Aboriginal items.

6.9.1 Existing environment

Previous documentary and archaeological research indicates that archaeological evidence is likely to be found with certain landforms, largely as a result of the resources that were associated with these landforms, or their suitability for long-term and/or repeated occupation. The five landforms are:

- within 200m of waters;
- within a sand dune system;
- on a ridge top, ridge line or headland;
- within 200m below or above a cliff face; and
- within 20m of or in a cave, rock shelter, or a cave mouth.

The proposal is located within 200 m of waterways and is positioned in a landform which may indicate historical Aboriginal occupation and potential for unidentified Aboriginal objects.

Prediction of Aboriginal site types

The Aboriginal Sites Decision Support Tool (ASDST) was developed to support the conservation of Aboriginal site heritage in NSW (Ridges, 2010). It is well recognised that Aboriginal sites occur over the entire landscape. The tool consists of a set of spatial GIS layers combined with analytical techniques that provide visual and quantitative information describing the distribution, accumulated impacts and conservation value of Aboriginal sites and features across the landscape. The ASDST was developed to meet the whole-of-landscape context setting for assessing regional Aboriginal site issues (Ridges, 2010).

The ASDST utilises data from AHIMS and is a projection to the landscape scale of the locality-based site feature information recorded in the database. The ASDST complements AHIMS by providing broadscale datasets and analysis methods to place Aboriginal site heritage within the context of regional conservation planning (Ridges, 2010).

The ASDST plots a ‘survey priority’ layer, which examines the relative likelihood of Aboriginal sites occurring across the landscape. High survey priority areas are defined as:

- areas with a medium to high likelihood of Aboriginal sites based on the original landscape prior to European settlement (pre-1750);
- areas with low accumulated impacts such as land disturbance associated with agricultural land uses; and
- areas with low Aboriginal site coverage and previous archaeological assessment.

As such, areas identified by the ASDST as having high survey priority represent potential areas of the landscape in which further archaeological assessment would be beneficial in identifying new sites and improving overall archaeological coverage of the landscape. Similarly, areas that have low survey priority indicate that the potential occurrence of Aboriginal artefacts is low, the area is extensively disturbed, and/or the area has been surveyed or studied previously.

Based on a review of the proposal alignment, ASDST, and previous archaeological studies in similar environmental contexts, the following general site types are predicted to potentially occur within the proposal areas:

- isolated finds, which may be indicative of a random loss or deliberate discard of a single artefact, the remnant of a now dispersed and disturbed artefact scatter, or an otherwise obscured or subsurface artefact scatter;
- open artefact scatters, which are defined as two or more artefacts, not located within a rock shelter, and located no more than 50 m away from any other constituent artefact. This site type may occur almost anywhere that Aboriginal people have travelled and may be associated with hunting and gathering activities, short or long term camp sites, and the manufacture and maintenance of stone tools;
- culturally modified trees, which contain evidence of the removal of bark (and sometimes wood) in the past by Aboriginal people, in the form of a scar;
- quarry sites and stone procurement sites, which typically consist of exposures of stone material where evidence for human collection, extraction and/or preliminary processing has survived; and
- burial sites, which are generally found in soft sediments such as aeolian sand, alluvial silts and rock shelter deposits. Burials are also known to have occurred on rocky hilltops in some limited areas.

A review of the ASDST indicates that high survey priority areas along the proposal alignment are centred around watercourses, environmental conservation areas and remnant vegetation communities, however large sections of alluvial floodplains along the alignment associated with agricultural land uses are also highlighted with moderate to with high survey priority, potentially attributed to the lack of archaeological records and studies within the area.

A review of the predictive model for a previous modification to Narrabri Coal Mine (ASR, 2009), located adjacent to the west of the southern end of the rail alignment), suggests the following for the region:

- Isolated artefacts may be present and visible in erosion features.
- Low-density artefact scatters may be present and visible in erosion features, but it is unlikely that any debitage will be visible
- There is a potential for trees more than 150 years old to exhibit scarred or carved surfaces
- There are unlikely to be any engravings, and/or grinding grooves.
- There are unlikely to be any potential archaeological deposits, stone quarries, middens, burials or stone arrangements.
- In the absence of shelters or overhangs there is no potential for shelters to exist and therefore no potential for art sites, and therefore no potential for undisturbed occupation deposits.

Desktop search

An extensive search of the AHIMS database was conducted to ascertain whether there are any previously recorded Aboriginal sites within proximity to the proposal.[1] Co-ordinates were sourced from the extensive search and mapped to identify the location of each registered site.

The search identified five registered Aboriginal sites within 200 m of the proposal site, namely:

- 19-3-0185, located approximately 85 m south of the rail centreline.
- 19-3-0186, located approximately 93 m south of the rail centreline.
- 19-3-0187, located approximately 178 m south of the rail centreline.
- 19-6-0153, located approximately 188 m south of the rail centreline.
- 19-6-0155, located approximately 100 m south of the rail centreline.

[1] The location of Aboriginal sites is considered culturally sensitive information. It is advised that this information, including the AHIMS data for the proposal be removed from this report if it is to enter the public domain.

The identified sites consisted of isolated artefacts and artefact scatters.

6.9.2 Potential impacts

Given the distance of the registered Aboriginal sites from the construction footprint, the proposal will not result in harm to a registered Aboriginal object or site.

The proposal will disturb ground within a landform which has the potential to support unidentified Aboriginal objects.

Despite this, the proposed works will be within the disturbed rail corridor and immediate surrounds. This area has been subject to previous ground disturbance, associated with earthworks to level the ground in some sections of the alignment, emplacement of fill material to form embankments and construction of the rail line.

Additionally, other disturbance is evident immediately adjacent to the rail corridor including areas proposed for laydown and storage. Such disturbance, which remains clear and observable includes previous removal of remnant native vegetation, installation of adjacent utility infrastructure, road reserves and other urban and rural development. With this history of disturbance, it is likely that natural soil profiles which existed prior to European occupation of the vicinity have been altered and modified, removing much of the archaeological potential in the area.

Excavation works and other surface disturbance associated with the proposal will be predominantly confined to fill material associated with the rail embankment, however will also delve into natural soil profiles. Despite this, as there is considerable evidence of historical disturbance within and surrounding the rail corridor, the risk of encountering previously unidentified in situ Aboriginal items is low.

Therefore, the proposal is unlikely to result in harm to Aboriginal objects and can proceed with no requirement for further investigations or application for an AHIP.

6.9.3 Mitigation and management measures

The following mitigation measures are recommended to avoid impacts to Aboriginal heritage values:

- Prior to the commencement of works, construction personnel are to be briefed on what Aboriginal objects may look like, along with management measures to be implemented in the event these objects are identified during construction;
- If changes are made to the proposal that may result in impacts to areas not covered by this REF, further archaeological assessment may be required;
- Works are to be confined to the approved disturbance footprint and access routes only;
- Limit the extent of excavations where possible to avoid impacts to undisturbed land;

The following measures will be implemented during construction in the event that previously undiscovered items of potential Aboriginal significance are identified or suspected:

- cease work in the immediate area of the identified potential Aboriginal object or archaeological find;
- secure the area and ensure the site is safe;
- ARTC are to be notified immediately of the find;
- provide temporary exclusion (pedestrian) fencing;
- appropriate advice will be sought from a qualified archaeologist (and in consultation with Heritage NSW and the Local Aboriginal Land Council where appropriate).
- implement additional mitigation measures or controls as required; and

- work in the affected area shall not recommence until permission is granted by ARTC to proceed.

Should human remains or suspected Aboriginal skeletal material be identified, the above unexpected finds procedure will be followed. The NSW Police and DPE will be contacted immediately. Should the burial prove to be archaeological, consultation will be undertaken with a heritage professional, relevant Aboriginal parties and DPE. No further works will occur in the area until authorised in writing by DPE and/or ARTC.

6.10 Non-Aboriginal heritage

This section summarises the statement of heritage impact report, which is provided in Appendix E. It describes the historical context of the region, heritage listings identified during desktop review, the significance of the items, and potential impacts and mitigation measures where impacts are unavoidable.

6.10.1 Existing environment

Historical context

In 1832, explorer John Oxley surveyed the Liverpool Plains area that was to later include the town of Narrabri. A town site was first recommended in 1848 at what had become a road junction to the south and west. Sale of town lots followed soon after the proclamation of the Narrabri township in 1860.

A post office and police station were established, but a major flood devastated the township in 1864. An early sign of the town's importance was the transfer of court services from Wee Waa and the building of a courthouse in 1864-65. A coach service commenced in 1865 and the first public school opened in 1868.

The area was slowly opened up to smaller landowners and wheat-growing began in 1873. Consequently, the population climbed from 313 in 1871 to 1,977 in 1891. Bridges over Narrabri Creek were built in 1877 and the Namoi River in 1879. The railway arrived at Narrabri West in 1882 and a settlement began to develop around it. Narrabri was then declared a municipality in 1883.

The single line from Narrabri Junction to Moree opened on 1 April 1897, with Narrabri railway station officially opened on 9 April 1897. Although no details of the original station building exist, plans of the 1901 refreshments room show the timber building as having a corrugated iron roof, a cantilevered awning with timber curtain boarding, and internally comprising a refreshments room, attendants' room, kitchen, pantry and detached lavatory.

On 8 September 1907 most of the railway buildings at Narrabri railway station were destroyed by fire. The structures lost included the ticket office, parcels office, vestibule and ladies' waiting room. Also lost was the station's telephone and telegraph equipment. The railway refreshment room escaped damage. The main station building was rebuilt in 1908. The new building was of brick with fibro cement roofing, and featured a bracketed awning, terracotta capping, and stone detailing. The building internally comprised of a ladies' room and lavatory, general waiting room, telegraph and booking offices, and a parcels store. The building also featured an in-set rear verandah.

A Station Master's residence was constructed in 1912 on Bowen Street, north of the main station complex.

On 3 March 1922, the railway lands attached to the station were authorised as a forestry depot, likely associated with the exploitation of timber in the Pilliga Scrub located between Narrabri and Coonabarabran. Much of the ironbark that was cut was used for fencing and railway sleepers.

By 1923, changes had occurred to the refreshments room, including the demolition of the previous kitchen and attendants' room, and the addition of a timber mangers office, sitting room, and bedroom, a storeroom, scullery, bathroom facilities, and a new kitchen and pantry. A separate building was also constructed, containing three bedrooms and a latticed veranda. A decade later, the station precinct included a trolley shed, a goods shed and platform, a weighbridge, wheat silo, carriage shed, a detached toilet block and parcels shed on the passenger platform, along with a resident engineer's office.

In 1946, further changes occurred to the main station building, namely the extension and partial closing-in of the rear verandah to create a parcels office and an open public space, with a ramped approach. Plans of the extension also suggest that the telegraph office had by this period been converted into a station master's office. The station building was extended again in approximately 1970 with new bathroom facilities and stores.

Most of the refreshment room facilities were demolished in 1988 and the remaining weatherboard building reduced to its current configuration.

Desktop searches

A search was conducted of the following statutory heritage registers:

- World Heritage List.
- Commonwealth Heritage List.
- National Heritage List.
- State Heritage Register.
- Narrabri LEP.
- Section 170 Heritage and Conservation Registers.

The following non-statutory registers were also searched:

- Register of the National Estate.
- The National Trust.

Two heritage items were identified within the study area, namely:

- Narrabri railway station, listed on the Transport Asset Holding Entity (TAHE) Section 170 Heritage and Conservation Register and Narrabri LEP.
- Narrabri Old Cemetery, listed on Narrabri LEP.

No other heritage listings were identified with the potential to be impacted by the proposal.

Assessment of significance

The significance of a heritage item must be determined before potential impacts on that item's significance can be assessed. In NSW, an item's heritage significance is assessed based on the Burra Charter and considers a combination of its:

- importance to State or local cultural or natural history (historical significance);
- association with the life works of a person or group of importance to State or local cultural or natural history (associative significance);
- demonstration of aesthetic characteristics and/or a high degree of creative or technical achievement (aesthetic significance);
- association with a cultural or community group for social, spiritual or cultural reasons (social significance);

- potential to contribute information about State or local cultural or natural history (research significance);
- possession of uncommon, rare or endangered components (rarity);
- demonstration of the principle characteristics of a class of cultural or natural place or environment (representativeness).

The statement of significance for Narrabri railway station is summarised in section 6.2 of the Appendix E.

Assessment of impacts

In order to identify the impact of the proposal, the terminology and corresponding definitions in table 6.12 are based on those contained within the guidelines produced by ICOMOS (2013).

Table 6.12: Terminology for assessing the magnitude of heritage impact.

Grading	Definition
Major	Actions that would have a long-term and substantial impact on the significance of a heritage item. Actions that would remove key historic building elements, key historic landscape features, or significant archaeological materials, thereby resulting in a change of historic character, or altering of a historical resource. These actions cannot be fully mitigated.
Moderate	Actions involving the modification of a heritage item, including altering the setting of a heritage item or landscape, partially removing archaeological resources, or the alteration of significant elements of fabric from historic structures. The impacts arising from such actions may be able to be partially mitigated.
Minor	Actions that would result in the slight alteration of heritage buildings, archaeological resources, or the setting of an historical item. The impacts arising from such actions can usually be mitigated.
Negligible	Actions that would result in very minor changes to heritage items.
Neutral	Actions that would have no heritage impact.

6.10.2 Potential impacts

Direct impacts

The proposal will result in the removal and replacement of existing rail, sleepers and ballast. These elements are an integral and recognisable part of the railway setting, however are routinely replaced for operational and safety requirements, and as such have little heritage value in their own right. The replacement of these elements will not impact any built heritage items and will have a negligible impact on the heritage significance of Narrabri railway station.

Proposed drainage works within the curtilage of Narrabri railway station are necessary to alleviate existing drainage issues adjacent to the platform and will not impact any built heritage features and therefore result in negligible impact on the heritage significance of Narrabri railway station.

Some timber and steel sleepers are to be replaced with concrete sleepers, which will have a minor impact on the setting of the rail corridor. However, this is a requirement of the proposal and will ensure consistency in track capability across the network and is therefore considered appropriate given it constitutes necessary maintenance and upgrade work.

The proposal will have no impact on significant station buildings or built heritage elements and as such the proposal will have a negligible impact on the significance of Narrabri railway station as the proposed work activities are consistent with maintenance and upgrade work commonly

undertaken throughout the rail network, and are necessary for continued operation and survival of the rail line.

Indirect impacts

Due to the nature and scale of the proposal there will be no permanent impact to views within or adjacent to the station precinct or cemetery.

The setting of Narrabri railway station will see a minor change to the appearance of the yard with the replacement of timber sleepers with concrete, and the replacement of rail and ballast. This constitutes a minor and inconsequential change to the railway setting.

Indirect impacts may also be incurred to the station platform via vibration emissions from construction works, resulting in potential structural or cosmetic damage to heritage fabric associated with the station. Potential impacts will be managed as outlined in section 6.2.4.

Archaeological resources

Given the confinement of excavation to operational areas of the existing rail line and immediate surrounds, the proposal is unlikely to cause impacts to unexpected archaeological remains that may be present within the rail corridor.

6.10.3 Mitigation and management measures

The following mitigation and management measures are required to ensure minimal impact on the of the proposal on Narrabri railway station:

- A heritage induction will be presented to workers before commencement of works in the vicinity of the Narrabri railway station. The induction should include the heritage significance of Narrabri railway station, mitigation and management measures to be implemented, and contacts for reporting unexpected archaeological finds or inadvertent impacts to heritage structures.
- Where feasible, maintain a sufficient buffer from identified heritage items, or implement protective exclusion fencing, or similar, in order to avoid damage or disturbance to the item.

The following measures will be implemented during construction in the event that previously undiscovered items of potential non-Aboriginal significance are identified or suspected:

- cease work in the immediate area of the identified potential archaeological find;
- secure the area and ensure the site is safe;
- ARTC are to be notified immediately of the find;
- provide temporary exclusion (pedestrian) fencing;
- appropriate advice will be sought from a qualified archaeologist (and in consultation with Heritage NSW where appropriate).
- implement additional mitigation measures or controls as required; and
- work in the affected area shall not recommence until permission is granted by ARTC to proceed.

6.11 Waste management

6.11.1 Existing environment

The proposal is located within and adjacent to an operational rail corridor and as such has high risk for unknown contaminants to be encountered during construction.

No waste materials or potentially contaminated land was previously identified or observed within the proposal site or adjacent properties.

6.11.2 Potential impacts

Waste material will also be generated during construction of the proposal and may include:

- excess and unsuitable (for construction) spoil;
- waste oils and liquids from construction machinery and equipment;
- general building and demolition waste e.g. ballast, steel, concrete, timber, sleepers, packaging (including plastic and paper); and
- contaminated material, which may occur from hydrocarbon spillages, ballast or unexpected contamination finds, including contaminated timber sleepers.

Failure to appropriately classify, store, transport and dispose of waste can result in adverse environmental impacts as well as penalties. Any identified contaminated or waste material will be classified in accordance with the NSW Waste Classification Guidelines (EPA, 2014) and the National Environment Protection Measure (NEPC 1999) prior to disposal or re-use on site.

In accordance with the WARR Act, ARTC adopts the principles of the waste management hierarchy.

These principles will be achieved during construction of the proposal by:

- purchasing recycled products where appropriate;
- developing and implementing waste management procedures to minimise the generation of waste and where unavoidable, re-use waste on-site or elsewhere within the ARTC rail network (for example ballast, sleepers and rail may be re-used elsewhere within the rail network);
- recycling as many wastes as practically possible through appropriate handling, separation, storage, and collection; and
- where waste cannot be re-used or recycled, transportation and disposal of waste off-site at an appropriately licenced facility.

According to the waste classification guidelines, wastes that pose similar risks to the environment and human health have been classified into groups that facilitate their management and appropriate disposal. These include:

- special waste;
- liquid waste;
- hazardous waste;
- restricted solid waste;
- general solid waste (putrescible); and
- general solid waste (non-putrescible).

Table 6.13 identifies the likely waste streams to be generated by the proposal, and waste classification requirements for materials to be disposed of off-site. Disposal is required at a fully licenced waste management facility, with potential regional facilities provided below as a guide to be confirmed by the construction contractor prior to construction.

Table 6.13: Waste classification and disposal sites.

Waste stream	Classification	Potential waste management facility
Building and demolition waste (concrete, timber etc)	General solid waste (non-putrescible)	Narrabri Waste Management Facility (Yarrie Lake Road, Narrabri)
Metal waste/off cuts	General solid waste (non-putrescible)	Disposal to scrap metal recycling facility

Waste stream	Classification	Potential waste management facility
		Narrabri Waste Management Facility
Green waste	General solid waste (non-putrescible)	Narrabri Waste Management Facility
General recyclables (glass, paper, cardboard)	General solid waste (non-putrescible)	Narrabri Waste Management Facility
General mixed waste	General solid waste (non-putrescible)	Narrabri Waste Management Facility
Spoil	Dependant on soil analysis. May be classed as excavated natural material (ENM), general solid waste, restricted solid waste or hazardous waste.	Narrabri Waste Management Facility. Facility legally permitted to accept ENM as engineering fill.
Waste oil	Liquid waste	Narrabri Waste Management Facility
Potentially contaminated spoil/ballast	Dependant on soil analysis. May be classed as general solid waste, restricted solid waste or hazardous waste.	Narrabri Waste Management Facility
Timber sleepers	Dependant on analysis, may be reused (on or off site), recycled or disposed of off-site if classified as general solid waste, restricted solid waste or hazardous waste	Potential reuse/recycling to be determined Narrabri Waste Management Facility

6.11.3 Mitigation and management measures

The following mitigation and management measures will be implemented during construction of the proposal to ensure adequate waste management:

- All waste will be assessed, classified, managed, re-used and/or disposed of in accordance with the Waste Classification Guidelines (EPA, 2014) or applicable resource recovery exemption.
- All types and volumes of waste exiting the site will be recorded on a waste register.
- Ensure the waste receiving facility is appropriately licensed to accept the waste type being disposed;
- Waste containers or bins will be made available on site to store domestic recyclable waste, general waste and oil contaminated waste prior to removal from site. Cover receptacles to prevent the loss of waste.
- All waste generated onsite should be segregated, stored and disposed of appropriately.
- Ensure any hazardous or dangerous waste (e.g. asbestos) is correctly stored, managed and disposed of by a licensed contractor or facility.
- All excavated natural, non-contaminated soil, aggregate or rock should be stockpiled separately and re-used onsite where possible.
- Receipts for waste transfer and disposal must be checked to ensure all details are correct and retained for audit purposes.
- The only fill material that may be imported to the site is Virgin Excavated Natural Material (VENM) within the meaning of the POEO Act and/or any other waste-derived material the subject of a resource recovery exemption under clause 51A of the POEO (Waste) Regulation 2005 that is permitted to be used as fill material. Any fill material received at the site must be accompanied by documentation proving its waste classification or the material's compliance with the exemption conditions.

- All Excavated Natural Material (ENM) will be managed in accordance with the ENM Resource Recovery Exemption, and if meets criteria will be disposed at a licensed waste management facility or council approved premises.
- Where possible, timber sleepers will be recycled in accordance with the ARTC resource recovery order and exemption.
- All waste must be removed from the site on completion of the works.
- Upon completion of waste disposal, all original weighbridge / disposal receipts issued by the receiving waste facility must be retained in a waste register as evidence of proper disposal.

6.12 Visual

6.12.1 Existing environment

The proposal area is highly disturbed given historical land use as an operational rail corridor.

The topography of the surrounding landscape is relatively flat, with gentle slopes and distant ranges. The rail corridor is slightly raised above the surrounding landscape making it a prominent visual element for surrounding land uses and major arterial roadways such as the Kamilaroi and Newell Highway.

The visual catchment of the surrounding landscape is dominated by rural land uses such as agricultural activities and grazing land. The township of Narrabri is typical of an urban environment, with land uses including residential, commercial, educational, infrastructure and industrial, intermixed with public space such as modified parklands.

Rural landscapes dominate the surrounding area outside of Narrabri township, built structures such as silos, rural residential dwellings and sheds are common.

Existing road infrastructure, such as the Kamilaroi and Newell Highway, and major waterways such as the Namoi River are also prominent features in the landscape.

6.12.2 Potential impacts

Construction phase

The proposal will be conducted within an operational rail corridor and the proposal will not require major change to existing rail infrastructure (apart from upgrade of ballast, rail and sleepers). The proposal will therefore not result in substantial changes to the visual amenity of the locality, or the views of surrounding land uses.

During construction, the presence of site amenities, temporary stockpiles and truck and equipment movements may impact on the visual amenity of the proposal site and surrounding community. Temporary visual impacts may also be incurred by adjoining properties and thoroughfare motorists along the proposed access routes associated with construction traffic.

Potential visual impacts are likely to be greater within Narrabri township, associated with a larger population density. For sections of the rail line outside of Narrabri, potential visual impacts will be less prominent and largely confined to adjacent land uses and thoroughfare motorists of local roadways and Kamilaroi Highway.

The use of lighting will be required during night works, which will also have potential to result in light spill into adjacent residences and businesses.

In general, the potential visual impacts associated with the proposal are considered to be temporary and minor and will not result in significant negative impact to the visual amenity of the locality in the long term.

All disturbed areas associated with the proposal will be restored to match pre-existing conditions where possible, therefore reducing the visual impact of the proposal during the medium to long term.

Operational phase

Following completion of the proposal, the upgrade to the rail line will facilitate longer trains which may result in minor visual impacts beyond those currently experienced. Despite this, the surrounding community is well accustomed to regular train movements, which are to be expected within an operational rail corridor.

6.12.3 Mitigation and management measures

Mitigation and management measures to minimise visual impacts during the construction of the proposal will include:

- Potentially affected residents will be consulted prior to, during and after the works as required.
- Portable lighting will be directed downwards and away from adjacent sensitive receivers where feasible'
- Visual impacts will be minimised by maintaining the work site in a clean and tidy state.
- Site amenities will be located where they are least visible to the closest sensitive receivers.
- Following the completion of works, all disturbed areas will be restored to their pre-existing condition, or better.
- All work equipment and materials will be contained within the designated boundaries of the work site.
- If required, accurate public information signs will be displayed while work is in progress and until site restoration has been completed. Information to include nature of work, start and end dates, contact details etc.

6.13 Social and economic

6.13.1 Existing environment

The proposal is positioned within an operational rail corridor which services the Narrabri LGA and provides linkage to ports in Newcastle and Sydney.

At the 2016 Census, the Narrabri LGA had a population of 13,278 people, of which 5,903 people (approximately 45%) lived in Narrabri (ARTC, 2020).

Compared to NSW, communities in the Narrabri LGA generally had higher proportions of Aboriginal and older people, and lower proportions of people needing assistance. The LGA also reported lower household incomes and lower rates of unemployment (ARTC, 2020).

Being positioned within the Namoi River floodplain, economic development in the Narrabri LGA is strongly underpinned by agricultural industries, with cotton, wheat, beef and lamb being key commodities. Emerging industries also include mining and gas production, and freight/logistics (ARTC, 2020).

Residents of the LGA value (ARTC, 2020):

- the country lifestyle;
- level of access to, and quality of services and facilities;
- sense of community; and
- the visual amenity of the town of Narrabri.

The LGA also includes a range of natural features that are important to communities, such as environmental conservation areas (such as State forests), which include places of Aboriginal cultural significance.

As a regional centre, Narrabri offers access to a range of retail and community services and facilities, including health and emergency services, education, cultural, and sport and recreation facilities (ARTC, 2020).

6.13.2 Potential impacts

The generation of noise, air quality and visual impacts, along with traffic and access disruptions may result in temporary amenity impacts on the surrounding community. Specifically, construction of the proposal may result in:

- increase in noise for residents located close to the proposal due to the operation of plant and equipment and general construction works;
- increase in traffic and associated road noise for residents located adjacent to the proposal alignment and construction access routes;
- increase in dust generated during construction, predominantly for residents located close to the proposal alignment; and
- temporary changes to the visual appearance of the locality resulting from construction works and the presence of construction plant and machinery.

These impacts will be minimised as far as practical by the implementation of appropriate consultation and mitigation measures proposed in this REF.

The proposal will aid in economic benefit for the LGA by allowing increased freight volumes to travel through to Newcastle and Sydney ports, where most of the grain and cotton from this region is exported.

If the proposal is not delivered, Narrabri to Turrawan will be the last section that cannot accommodate 25 TAL trains when Inland Rail is completed and will constrain productivity across the supply chain of northern NSW, restricting volumes and adversely impacting on the international competitiveness of producers in the region.

Key economic benefits of the proposal include:

- improved productivity for freight operators through higher speeds and higher axle loads by increasing rail size to enable an increase in maximum axle loading to 25 TAL at 80km/h;
- operational cost savings via increased capability of upgraded track to enable heavier and longer trains to operate along the line leading to reduction of freight costs on a per tonne basis;
- enhanced performance of rail to enable improved competitiveness of rail against road; and
- reduce recurring maintenance costs.

To establish a safe working environment, it is likely that the local roads will require partial occupation or temporary closure during the works period. Appropriate signage will be deployed to manage any public traffic, with access to property maintained at all times.

The current passenger train service through Narrabri comprises a morning departure to Sydney and an evening arrival service from Sydney. To facilitate extended working hours and therefore faster construction of the proposal, ARTC may temporarily alter the departing time of the passenger train schedule, to depart from Narrabri without passengers at approximately 6 am, with passengers following on a bus service to join the train at Gunnedah at the usual scheduled time. The returning passenger train will arrive at Narrabri in the evening (with passengers) as normal.

It is considered that the proposed alteration to departing train services will result in a minor and temporary impact to commuters from Narrabri. Despite the potential for short term inconvenience

caused, the proposed schedule will permit an extension of working hours for the proposal by up to three hours per day. This in turn will facilitate construction of the proposal faster, thereby minimising the duration of other social impacts such as generation of noise, air quality and visual impacts, and disruptions to local traffic and property access. ARTC will however, endeavour to program the construction works around the existing commuter services, wherever possible.

6.13.3 Mitigation and management measures

The majority of the socio-economic impacts of the proposal relate to impacts assessed in other sections of this REF, including air quality, traffic and access, noise and visual amenity. Impacts to the surrounding community will therefore be mitigated through the implementation of measures recommended to reduce impacts, as described in the respective sections.

Additional mitigation and management measures that will be implemented to avoid, minimise or manage socio-economic impacts include:

- Consultation with affected landowners/managers must be undertaken prior to any works or activities occurring that may affect private access.
- Permission from the landowner or manager must be sought, where access to or temporary occupation of land outside ARTC's leased area and/or rail corridor is required.
- If required, local residents and businesses will be notified of the construction works and ongoing consultation will be undertaken to provide landowners with information on planned construction activities and changes to access arrangements.
- Any accidental damage to property occurred by the works will be repaired in consultation with the affected property owner.
- ARTC will make available communication tools to any member of the public or affected party who enquires or wishes to complain about the works.
- All services in the vicinity of the works will be located in the field and pegged-out and noted in the work plans prior to excavation works - "Dial 1100 Before You Dig."
- ARTC will co-ordinate any alterations to existing passenger train services with the service operator and local community. Potentially impacted commuters will be given appropriate notice and provided with alternate travel options.

6.14 Cumulative impacts

In accordance with clause 171 of the EP&A Regulation, any cumulative environmental effects of the proposal associated with other existing and future activities must be considered in determining the potential impacts on the environment.

Cumulative impacts are the combined impacts of existing and/or future activities in a locality or region and can be both positive and negative. Cumulative impact assessments are based on the premise that it is not adequate to simply assess the impacts of a single proposal in isolation. The effective evaluation of the significance of the impacts of a proposal needs to also consider the totality of impacts of a proposal and other existing and proposed development in the social, economic and environmental context in which they exist.

Table 6.14 provides a summary of potential cumulative impacts.

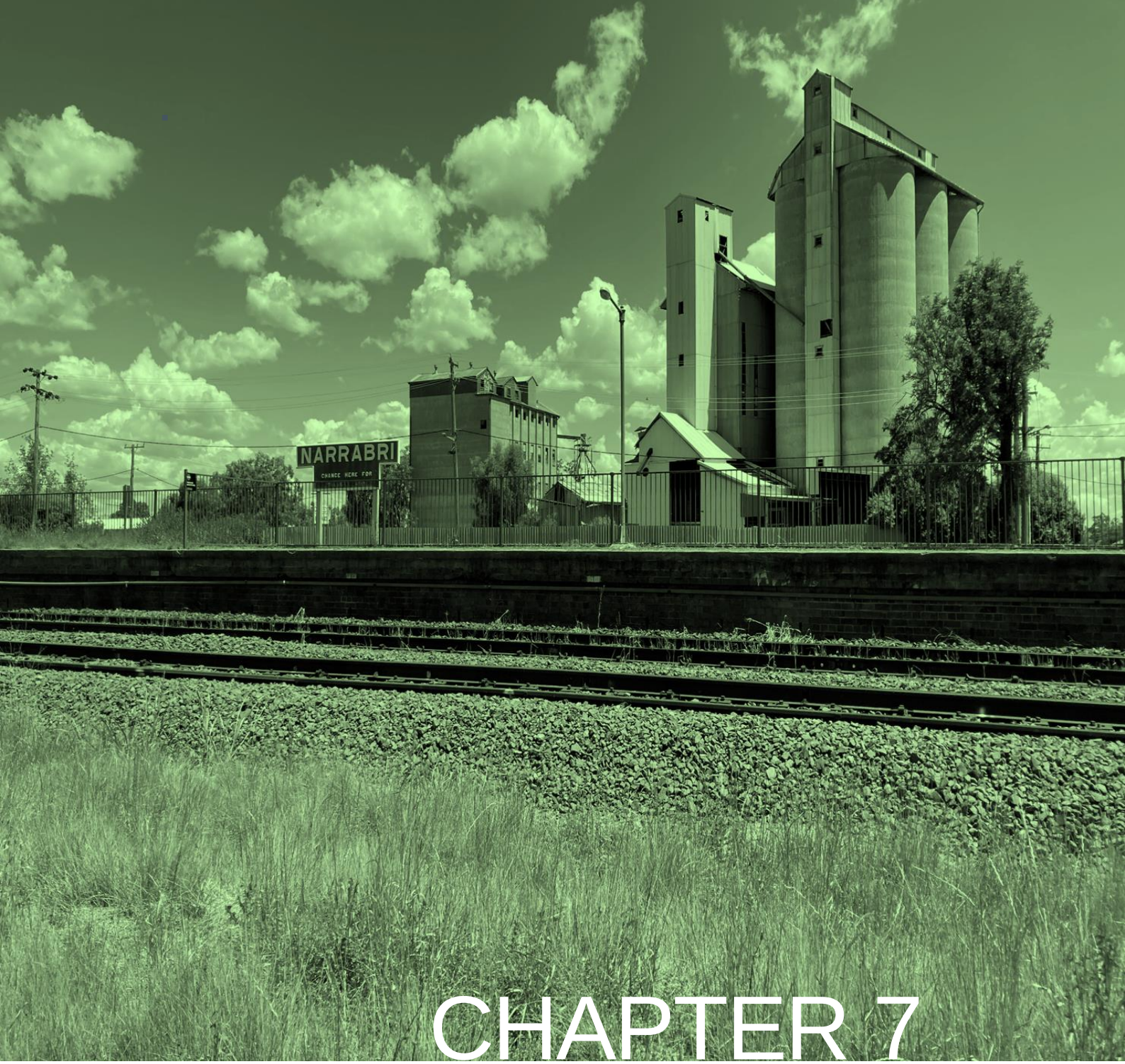
Table 6.14: Cumulative impacts of the proposal

Factor	REF finding
Works currently proposed in the study area	In addition to the works proposed in this REF, there are several other developments proposed or currently underway in the study area. Those projects, their proponent and their current status include:

Factor	REF finding
	▪ TfNSW – Transport Access Program for Narrabri Station – construction in early 2022.
Other known works currently proposed to be undertaken in the surrounding area	In addition to the works proposed in this REF, there are several other developments proposed or currently underway in the Narrabri region. Those projects, their proponent and their current status include: ▪ ARTC – Inland Rail (Narromine to Narrabri) – assessment phase ▪ ARTC – Inland Rail (Narromine to North Star Phase I) – approved and construction commencing in April 2022; ▪ TfNSW – Newell Highway heavy duty pavement upgrades (Narrabri to Moree) – approved and construction to be commenced in 2022; ▪ TfNSW – 25 TAL upgrade – Narrabri to Walgett - planning and design phase; and ▪ Narrabri Gas Project – assessment phase.
Any ways the environment may be affected by the cumulative impact of all these proposed works	It is likely that some or all of aforementioned developments may be constructed at the same time this proposal is being constructed. However, given the minor scale of works of this proposal, the contribution of this proposal to the overall cumulative impact is likely to be minimal.

ARTC utilise internal working groups to coordinate construction works with both Inland Rail and TfNSW.

Wherever possible ARTC will coordinate with the construction works of other developments in the vicinity of the proposal area, to minimise any cumulative impacts, specifically around: noise and vibration, dust management and traffic control.



CHAPTER 7
ENVIRONMENTAL MANAGEMENT

7 ENVIRONMENTAL MANAGEMENT

7.1 Construction environmental management plan

A CEMP will be prepared and provide a structured framework for managing environmental risks associated with the proposal.

The CEMP will incorporate environmental controls identified in this REF and integrate with applicable ARTC procedures, forms and related documentation.

Specifically, the document will address:

- the environmental mitigation and management measures identified in this REF;
- allocation of resources and responsibilities to implement environmental controls;
- procedures, forms and checklists to facilitate consistency; and
- monitoring, incident management and corrective actions.

The CEMP will incorporate relevant mitigation and management measures, including those outlined in table 7.2 below.

The CEMP must be approved by the ARTC Environment Advisor prior to construction works commencing in the area, that is the subject of the CEMP.

The ARTC Environment Representative or delegate will also review any amendments to the CEMP, alterations to the mitigation measures and any management or control plans prepared in accordance with the CEMP.

Prior to the commencement of construction, all contractors shall be inducted on the key project environmental risks, procedures, and mitigation and management measures.

Any modification to the proposal is subject to further assessment and approval by ARTC.

7.1.1 Site establishment activities

A site environmental management plan (Site EMP) must be prepared for any site establishment works (as outlined in section 3.6.1), that are required prior to the approval of the CEMP. The Site EMP is to be developed in accordance with ARTC's existing template and shall detail:

- how the mitigation and management measures identified in this REF, relevant to the separable portion and/or stage, would be implemented throughout works;
- allocation of resources and responsibilities to implement environmental controls;
- procedures, forms and checklists to facilitate consistency; and
- monitoring, incident management and corrective actions.

The ARTC Environment Representative or delegate will review the site establishment activities and the Site EMP to ensure they will have a minimal environmental impact on the environment and the community.

7.1.2 Alternate ancillary facilities

Where alternate ancillary facilities and laydown areas are required, outside the proposal area, they must satisfy the following criteria:

- Located on generally flat land.
- Limit proximity to sensitive receivers (>100 m).
- No disruption to property access.

- No impact to known items of non-Aboriginal and Aboriginal heritage.
- Within existing cleared areas and utilise existing access tracks.
- No impacts to remnant native vegetation or key habitat features.
- Will not result in more than a minor impact to the local road network.
- At least 100 m from waterways and drainage lines.
- No disturbance of contaminated material.

Compliance with the above criteria must be demonstrated to the satisfaction of ARTC Environment Representative.

7.2 Summary of mitigation and management measures

Table 7.1 summarises the mitigation and management measures identified in chapter 6.

Table 7.1: Summary of mitigation and management measures

ID	Mitigation and management measure	Timing
Noise and vibration		
NV1	Construction workers will be made aware of noise concerns during worksite induction training and should be educated on noise sensitive issues and the need to minimise noise emissions as far as practicable.	Pre-construction and construction
NV2	All construction machinery and equipment will be operated in accordance with the manufacturer's instructions.	Construction
NV3	Avoid shouting on site and manage the volume of UHF radios.	Construction
NV4	Equipment which is used intermittently will be shut down when not in use.	Construction
NV5	All engine covers will be kept closed while equipment is operating.	Construction
NV6	Materials will not be dropped from heights into or out of trucks wherever possible.	Construction
NV7	Broadband reversing alarms must be used instead of tonal reversing alarms.	Construction
NV8	All mechanical plant should be silenced by best practical means using current technology wherever possible. Noise suppression devices should be maintained to the manufacturer's specifications. Internal combustion engines should be fitted with a suitable muffler in good working order.	Construction
NV9	Trucks will not be left standing with their engine running. Trucks will not be permitted to queue near residential dwellings.	Construction
NV10	Operate plant and equipment in a conservative manner (no over-revving).	Construction
NV11	Where possible, minimise the duration of simultaneous operation of noisy plant within discernible range of a sensitive receivers.	Construction
NV12	Where possible, use natural landforms as a noise barrier, e.g. placing fixed equipment behind embankments.	Construction
NV13	Where possible, position site shed/containers in locations that will screen potential neighbouring receptors.	Construction
NV14	Schedule noisy activities to coincide with high levels of ambient noise so that noise is partially masked and is not as intrusive.	Construction
NV15	Plan deliveries and access to the site to occur efficiently and within areas located away from sensitive receivers. Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.	Pre - construction and construction
NV16	Minimise the need for vehicle reversing by arranging for one-way site traffic routes.	Construction
NV17	Truck movements along uneven surfaces should be restricted to minimum speed adjacent to sensitive receivers.	Construction
NV18	The likelihood of cumulative construction noise impacts will be reviewed when the construction methodology is confirmed. Coordination is to occur between	Pre - construction

ID	Mitigation and management measure	Timing
	concurrent stages and/or activities to minimise the potential for cumulative noise impact.	and construction
NV19	Limit continuous blocks of high noise and vibration generating activities to three (3) hours, with a respite period of at least 1 hour between each block.	Construction
NV20	If following consideration and reasonable and practical implementation of the mitigation measures outlined in this REF it becomes evident that sleep disturbance criteria is still likely to be exceeded for more than two consecutive nights, consideration should be given to reasonable and feasible mitigation measures at residences to minimise impacts. These may include but are not limited to respite measures such as movie ticket or meal vouchers, or provision of alternative accommodation.	Construction
NV21	A pre and post work dilapidation survey will be carried out for the platform associated with Narrabri railway station.	Pre and post construction
NV22	Where works are required within the minimum working distances and considered likely to exceed the cosmetic damage criteria: ▪ different construction methods with lower source vibration levels will be investigated and implemented, where feasible; or ▪ attended vibration measurements will be undertaken at the start of the works to determine actual vibration levels at the item. Works will be ceased if the monitoring indicates vibration levels are likely to, or do, exceed the relevant criteria.	Construction
NV23	Any damage incurred to heritage structures will be rectified in consultation with council.	Construction and post construction
NV24	All noise affected residents must be notified in accordance with EPL 3142, which requires that the notification must be made not less than five days before those works and activities are to be undertaken, unless agreement has been reached with the local community. The notification must be: ▪ by letterbox drop or other targeted and equivalent method; and ▪ published on the project website where one exists. The notification must: ▪ clearly outline the reason that the work is required to be undertaken outside standard construction hours (i.e. 7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday and no work on Sundays or Public Holidays). ▪ include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks; ▪ include details of relevant time restrictions that apply to the proposed works; ▪ clearly outline in plain english the location, nature, scope and duration of the proposed works; ▪ detail the expected noise impact of the works on noise sensitive receivers; ▪ detail mitigation measures to be implemented to minimise noise and/or vibration impacts; ▪ clearly state how complaints may be made and additional information obtained; and include the number of telephone complaints line required by the licence, an afterhours contact number specific to the works and activities, and the project website address where applicable. Approval from ARTC is required for any out of hour works.	Pre-construction and construction
NV25	Upon receipt of a noise or vibration complaint, the construction methodology, plant and equipment will be reviewed to ascertain whether improvements can be made to reduce the noise profile of the activity. Where no further noise reductions can be made and noise complaints are still received, noise or vibration monitoring is to be undertaken to verify predicted noise levels and determine if the activity exceeds noise management levels specified in the ICNG.	Construction
NV26	Any noise or vibration monitoring will be undertaken by a qualified professional and with consideration of the source of the noise that may have caused the compliant, relevant standards and guidelines. Attended noise monitoring will be undertaken and reported within a timely manner (three working days).	Construction

ID	Mitigation and management measure	Timing
Air quality		
AQ1	Dust suppression controls (e.g. water carts, cease works) shall be implemented when necessary, to control dust on exposed soil surfaces of the site and access roads.	Construction
AQ2	Cover vehicles and trailers when transporting materials and waste.	Construction
AQ3	Minimise vehicle movement and speed on unsealed tracks and access paths.	Construction
AQ4	Service all plant and equipment regularly to ensure exhaust emissions are within specified standards.	Construction
AQ5	Turn off idling plant and equipment when not in use.	Construction
AQ6	Stabilise all disturbed areas following completion of works.	Construction
Traffic and access		
TA1	A Traffic Control Plan (TCP) will be prepared, in consultation with the relevant roads authority and will meet the requirements of the Traffic Control at Work Sites Technical Manual (TfNSW, 2020). The plan will regulate the entry and exit of vehicles along the proposed access routes and transportation along the wider road network. The TCP will analyse the requirement for any road closures, and outline appropriate detour options.	Pre-construction and construction
TA2	A road network dilapidation survey shall be prepared for the proposal.	Pre-construction and construction
TA3	ARTC will liaise with the relevant roads authority on access, road closure and restoration requirements and comply with any requirements.	Pre-construction and construction
TA4	Road opening and/or occupancy permits are likely to be required for diversions, road openings or placement of materials temporarily on roads. These will specify site-specific traffic management controls, temporary road safety measures (e.g. road plates) and the use of licensed traffic controllers to direct traffic that will be implemented by the contractor.	Pre-construction and construction
TA5	Truck movements, including required road freight transportation, will be scheduled to cause minimum disruption to residents and local traffic flows.	Construction
TA6	Access to the proposal will be via existing access routes and tracks where feasible.	Construction
TA7	Where changes to local access arrangements are unavoidable, affected local users and property owners will be consulted with to determine appropriate access arrangements.	Construction
Biodiversity		
B1	Prior to the commencement of works, work personnel will be inducted on the environmental sensitivity of the proposal area, location of threated ecological communities and the potential for these areas to represent habitat for threatened flora and fauna species.	Pre-construction and construction
B2	Any proposed works within areas identified as containing ‘Native Grasslands on Cracking Clay Soils’ (refer to Appendix C) must be undertaken considering the requirements of Ecological Management Plan - Native Vegetation on Cracking Clay Soils of the Liverpool Plains (EEC) and Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland (CEEC) (Umwelt, 2018).	Construction
B3	Where disturbance is required in areas of high-quality habitat (represented by Native Grassland on Cracking Clay Soils) or where direct ground disturbance is required in areas identified as potential habitat (Native Grassland on Cracking Clay Soils, exotic grassland, low condition native grassland, native grassland, and remnant woodland) (north of chainage 558.5 km) the following mitigation measures must be implemented: ▪ Site induction - all construction personnel will be subject to a five-clawed worm-skink induction. ▪ Pre-clearance surveys will be undertaken by an ecologist and/or spotter-catcher team prior to and during direct ground disturbance activities within	Construction

ID	Mitigation and management measure	Timing
	the Five-clawed Worm-skink habitat areas. Ground disturbance includes any disturbance to soil, including vegetation clearing which results in the disturbance to root systems (e.g. grubbing works). Slashing or pruning of vegetation is not considered to result in direct ground disturbance. ▪ The surveys will include active searches of microhabitats, including, carefully turning woody debris, rocks, and artificial debris, raking the soil surface or leaf litter beneath trees and looking beneath peeling bark for reptiles or their sloughs, searching for animals during topsoil stripping (working closely with the grader operator). ▪ Targeted pre-clearing surveys with survey effort determined by the ecologist and scaled up or down depending on site complexity. ▪ Detection protocol – works to be ceased in the vicinity, temporary exclusion zone established, ecologist notified to capture and relocate individuals, and immediate notification to ARTC. ▪ Reporting - should the detection of a five-clawed worm-skink be validated, ARTC will cease all works in the vicinity of the find. ARTC will review statutory assessments/approvals required under both the BC Act and EPBC Act. ▪ Requirement for detailed data to be collected on any future records of five-clawed worm-skink, including GPS coordinates of capture and relocation sites, date and time capture, description of microhabitats, validation photos and measurement of specimens. ▪ Should the five-clawed worm-skink be recorded as part of surveys, consider additional mitigation measures as detailed in section 5.11.2 of the Construction Biodiversity Management Subplan - N2NS (Trans4m 2022). ▪ Prior to commencement of works, check for any relevant changes to the Construction Biodiversity Management Subplan - N2NS (Trans4m 2022, current version dated 6 January 2022).Impacts to the area of Pilliga mouse habitat between chainage 554 km and 556 km will be avoided or minimised wherever possible. In this area shrubland located further than two metres either side if tracks and remnant vegetation within the corridor should be retained where possible.	
B4	A pre-clearance inspection will be carried out prior to branch trimming of mature trees to identify the presence of any hollows and fauna potentially residing inside.	Construction
B5	A pre-clearance inspection of culverts by a qualified ecologist is recommended prior to the commencement of demolition work in order to confirm the presence of any roosting bat species which may require relocation	Construction
B6	Prior to commencement, the contractor is to clearly delineate the approved work area with high visibility para-webbing or tape. Declare and maintain all areas outside the area a No-Go zone (including access, stockpiling and storage of materials).	Pre-construction and construction
B7	Disturbance of vegetation will be limited to that which has been assessed in this REF.	Construction
B8	If trees do limit access for plant and equipment, branches will be tied back if practicable rather than trimmed. Similarly, vegetation will be trimmed or temporarily tied back where possible rather than the removal of whole plants.	Construction
B9	Trimming of established tree branches will be executed by an appropriately qualified tree surgeon or arborist, with a minimum AQF level of 3 and carried out in accordance with AS 4373-1996 Pruning of Amenity Trees.	Construction
B10	If native fauna are encountered while work is occurring, work should cease until the animal moves out of the impact area. Injured fauna should be taken to the nearest veterinary clinic for assessment. If relocation is required, employ appropriate expert assistance (e.g. WIRES, ecologists etc.).	Construction
B11	Logs or large fallen branches will not be moved unless required. Any such material will be repositioned nearby.	Construction
B12	If any threatened species (flora or fauna) is discovered during the works, all work will stop immediately and ARTC and a qualified ecologist will be notified. Work will only recommence once the impact on the species has been	Construction

ID	Mitigation and management measure	Timing
	assessed by a qualified ecologist, appropriate control measures provided, and any required additional assessments or approvals are obtained.	
B13	Materials, plant, equipment, work vehicles and stockpiles will be placed to avoid damage to surrounding vegetation, and will be outside tree drip lines.	Construction
B14	No hot works are to be conducted during Total Fire Bans unless other approvals have been obtained.	Construction
B15	Utilise existing maintenance access tracks where possible to minimise disturbance.	Construction
B16	No excavations to be left open overnight, where possible.	Construction
B17	Ensure good site housekeeping to prevent pest animals.	Construction
B18	Avoid distributing weeds on and off site by implementing suitable vehicle and equipment controls, for example checking vehicles prior to leaving the site to remove soil and any plant matter including seeds.	Construction
B19	Remove any noxious or environmental weeds encountered in accordance with the relevant Weed Management Plan released by NSW Department of Primary Industries.	Construction
B20	Weed control will be undertaken by suitably qualified and/or experienced, licenced sub-contractors in accordance with contemporary bush regeneration practices.	Construction
B21	All weeds, propagules, other plant parts and excavated topsoil material that is likely to be infested with weed propagules that are likely to regenerate will be bagged, removed from site and disposed of at a licensed waste disposal facility.	Construction
B22	Cover all vehicles transporting waste containing noxious weeds and seeds for disposal.	Construction
B23	Avoid importing any soil from outside the site to prevent introduction of weeds and pathogens to the site.	Construction
Soils and water quality		
SW1	Works will be staged, where applicable, to minimise the exposure of bare surfaces and retain ground cover for as long as practicable.	Construction
SW2	Construct temporary diversion devices to divert the flow of clean, upslope water away from or through the work site.	Construction
SW3	Where possible, ensure compaction following application of new or regraded surfaces.	Construction
SW4	Install sediment controls on the downslope side of any disturbed areas including excavated, graded and stockpile sites where erosion may impact the surrounding area.	Construction
SW5	Construction of sediment fencing is to be parallel to contours downslope of earthworks (areas of soil disturbance).	Construction
SW6	Monitor and maintain all temporary and permanent erosion and sedimentation controls on a daily basis during construction and immediately following heavy rainfall. Monitoring of erosion and sediment controls should be undertaken post construction until the site is no longer in an erosion-prone state (e.g. vegetation has fully established on exposed soil surfaces).	Construction
SW7	If erosion or sedimentation is observed, perform remedial action as soon as possible.	Construction
SW8	At the end of each working day inspect site access locations for mud tracking on public roadways. Roadways are to be swept if mud or debris from the site is visibly evident on the road.	Construction
SW9	Erosion and sediment control plans will be required where earthworks are occurring and where excavated materials are required to be stockpiled.	Construction
SW10	Locate stockpiles at least 40 m away from drainage lines and the riparian corridor of the Namoi River and Narrabri Creek, and provide appropriate containment measures around the stockpiles	Construction
SW11	Restrict work areas, stockpile sites and access tracks to already disturbed, cleared areas.	Construction

ID	Mitigation and management measure	Timing
SW12	Temporary stockpiles will be managed to prevent wind and water erosion.	Construction
SW13	Disturbed areas and stockpiles will be stabilised within 10 days of being disturbed.	Construction
SW14	Minimise stockpile storage time where practicable.	Construction
SW15	During periods of severe weather (e.g. high rainfall or strong winds), consider temporarily suspending works, minimising vehicular movements and/or cover materials such as exposed stockpiles until weather conditions improve.	Construction
SW16	All stockpiles will be limited to a maximum height of two metres.	Construction
SW17	Works within 40 m of a waterway or instream works will require an erosion and sediment control plan (ESCP) and will consider the following measures to prevent and minimise any potential erosion and sediment control impacts: ▪ A coffer dam, or other method, may be used to create a temporary diversion of flow within the waterway if required. ▪ Access works will be undertaken as quickly as possible and will maintain the channel shape and bed level to pre-construction condition. ▪ Use of a silt curtain within waterways will be implemented if feasible for site conditions. ▪ Daily visual monitoring will be undertaken to determine any direct impacts to aquatic habitat. In the event that direct or indirect impacts are suspected or observed, all works will cease and work methodology revised to eliminate impact. ▪ Stabilisation of disturbed areas is to be staged during the works consistent with the activities being performed. ▪ Cover exposed slopes and banks with jute matting or other stabilising agent where risk of erosion is high.	Construction
SW18	If works are required in waterways identified as Key Fish Habitat, ARTC will ensure that valid permits under part 7 of the FM Act are obtained prior to commencement.	Pre-construction and construction
SW19	Temporary areas utilised for ancillary facilities or access tracks on private land are to be re-instated to their original state after use in agreement with the landowner.	Construction and post-construction
SW20	Stabilise any areas, as appropriate, until they have been revegetated in accordance with Blue Book requirements.	Construction and post-construction
SW21	Any groundwater which is encountered during excavation will be tested in order to determine whether it is of an acceptable quality to be released back into the environment. Where excavation water is suspected or confirmed to contain contaminants, or the water is highly turbid, the water will be contained, treated, tested, to determine if it can be re-used or released on site.	Construction
SW22	If dewatering of excavations is required, and has been determined by ARTC to be acceptable for discharge to the environment, the activity is to be monitored to ensure existing water quality is maintained.	Construction
SW23	Emergency spill kits must be onsite at all times. Immediately contain and clean up leakage of fuels, oils, chemicals and other hazardous liquids in accordance with the Safety Data Sheet and relevant emergency response procedures.	Construction
SW24	All fuels, chemicals, and other hazardous liquids are to be stored at least 40 m away from drainage lines and waterways, within a sealed and bunded storage area that has a volume of 110% of the largest container being stored.	Construction
SW25	Machinery will be checked daily for oil, fuel or other leaks and repairs undertaken as required.	Construction
SW26	Avoid refuelling or maintenance of equipment or vehicles on site. If unavoidable use drip trays or catch trays beneath equipment / vehicles being maintained.	Construction
Hydrology and drainage		

ID	Mitigation and management measure	Timing
HD1	Further flood modelling will be undertaken during detailed design to confirm compliance with QDLs outlined in this REF. Where it is not reasonable or feasible to satisfy the QDLs, and non-compliance with the QDLs will change the flood hazard category for residential land uses (as defined in Appendix L of the NSW Government Floodplain Development Manual 2005), flood mitigation measures will be developed in consultation with the affected property/structure/infrastructure owners, SES and council.	Detailed design
HD2	A flood verification report will be prepared by an appropriately qualified person within 3 months of the commencement of construction of the proposal. The flood verification report will: ▪ outline the final design of the proposal and the results of the revised modelling; ▪ confirm any increase to the flood hazard category to residential land use as a result of non-compliance with the QDLs; ▪ provide justification as to why non-compliance with the QDLs will not result in significant environmental or social impact; and ▪ where required, outline the mitigation measures to be implemented to reduce future impacts of flooding, including the timing and responsibilities for implementation.	Construction
HD3	The design of the culvert structures and waterway crossings will allow for existing hydrological and flooding regimes to be maintained.	Detailed design and construction
HD4	Position material stockpile and storage areas outside of flood prone areas wherever feasible, including drainage lines and waterway crossings.	Construction
HD5	Maintain the natural flow regime of drainage lines/waterways by preventing the creation of barriers to the natural flow of water.	Construction
HD6	Regularly monitor weather forecasts and ensure the construction team are informed of no work policy during high rain or flooding events.	Construction
HD7	Ensure measures are in place to allow personnel and machinery within the works area to be evacuated during high rain or flooding events.	Construction
HD8	Operational erosion controls are to be designed into culvert headwalls and waterway crossings to prevent long term scouring and may include a rock lined rip rap structure and/or revegetation.	Detailed design and construction
Contamination		
C1	Construction personnel will be briefed on the potential for unexpected contamination to occur within the rail corridor and procedures to be implemented in the event contamination is identified or suspected.	Pre-construction and construction
C2	In the event that contamination is identified or suspected, all work in the vicinity of the find shall cease and the area isolated appropriately. A specialist consultant experienced in the identification, sampling and testing of contamination will be engaged to undertake an assessment of site conditions prior to re-commencement of earthworks.	Construction
Aboriginal heritage		
AH1	Prior to the commencement of works, construction personnel are to be briefed on what Aboriginal objects may look like, along with management measures to be implemented in the event these objects are identified during construction.	Pre-construction and construction
AH2	If changes are made to the proposal that may result in impacts to areas not covered by this REF, further archaeological assessment may be required.	Pre-construction and construction
AH3	Works are to be confined to the approved disturbance footprint and access routes only;	Construction
AH4	Limit the extent of excavations where possible to avoid impacts to undisturbed land;	Construction
AH5	In the event that previously undiscovered items of potential Aboriginal significance are identified or suspected:	Construction

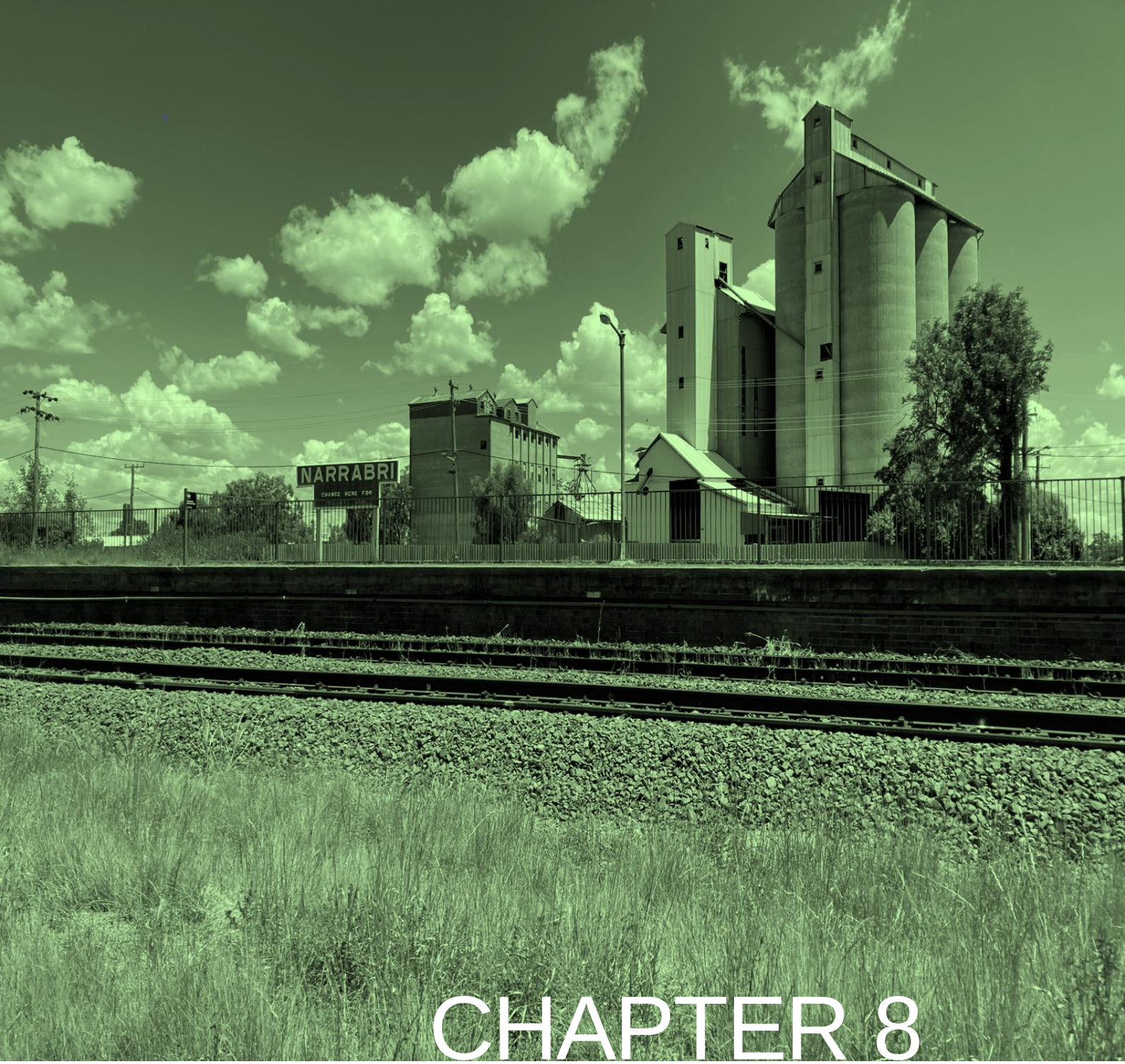
ID	Mitigation and management measure	Timing
	▪ cease work in the immediate area of the identified potential Aboriginal object or archaeological find; ▪ secure the area and ensure the site is safe; ▪ ARTC are to be notified immediately of the find; ▪ provide temporary exclusion (pedestrian) fencing; ▪ appropriate advice will be sought from a qualified archaeologist (and in consultation with Heritage NSW and the Local Aboriginal Land Council where appropriate). ▪ implement additional mitigation measures or controls as required; and ▪ work in the affected area shall not recommence until permission is granted by ARTC to proceed.	
AH6	Should human remains or suspected Aboriginal skeletal material be identified, the above unexpected finds procedure will be followed. The NSW Police and DPE will be contacted immediately. Should the burial prove to be archaeological, consultation will be undertaken with a heritage professional, relevant Aboriginal parties and DPE. No further works will occur in the area until authorised in writing by DPE and/or ARTC.	Construction
Non-Aboriginal heritage		
H1	A heritage induction will be presented to workers before commencement of works in the vicinity of the Narrabri railway station. The induction should include the heritage significance of Narrabri railway station, mitigation and management measures to be implemented, and contacts for reporting unexpected archaeological finds or inadvertent impacts to heritage structures.	Pre-construction and construction
H2	Where feasible, maintain a sufficient buffer from identified heritage items, or implement protective exclusion fencing, or similar, in order to avoid damage or disturbance to the item.	Construction
H3	If required, following the completion of the proposal, the State heritage inventory database record for Narrabri railway station precinct will be updated in consultation with Heritage NSW, TAHE and council.	Post construction
H4	In the event that previously undiscovered items of potential non-Aboriginal significance are identified or suspected: ▪ cease work in the immediate area of the identified potential archaeological find; ▪ secure the area and ensure the site is safe; ▪ ARTC are to be notified immediately of the find; ▪ provide temporary exclusion (pedestrian) fencing; ▪ appropriate advice will be sought from a qualified archaeologist (and in consultation with Heritage NSW where appropriate). ▪ implement additional mitigation measures or controls as required; and ▪ work in the affected area shall not recommence until permission is granted by ARTC to proceed.	Construction
Waste management		
W1	All waste will be assessed, classified, managed, re-used and/or disposed of in accordance with the Waste Classification Guidelines (EPA, 2014) or applicable resource recovery exemption.	Construction
W2	All types and volumes of waste exiting the site will be recorded on a waste register.	Construction
W3	Ensure the waste receiving facility is appropriately licensed to accept the waste type being disposed;	Construction
W4	Waste containers or bins will be made available on site to store domestic recyclable waste, general waste and oil contaminated waste prior to removal from site. Cover receptacles to prevent the loss of waste.	Construction
W5	All waste generated onsite should be segregated, stored and disposed of appropriately.	Construction
W6	Ensure any hazardous or dangerous waste (e.g. asbestos) is correctly stored, managed and disposed of by a licensed contractor or facility.	Construction
W7	All excavated natural, non-contaminated soil, aggregate or rock should be stockpiled separately and re-used onsite where possible.	Construction

ID	Mitigation and management measure	Timing
W8	Receipts for waste transfer and disposal must be checked to ensure all details are correct and retained for audit purposes.	Construction
W9	The only fill material that may be imported to the site is Virgin Excavated Natural Material (VENM) within the meaning of the POEO Act and/or any other waste-derived material the subject of a resource recovery exemption under clause 51A of the POEO (Waste) Regulation 2005 that is permitted to be used as fill material. Any fill material received at the site must be accompanied by documentation proving its waste classification or the material's compliance with the exemption conditions.	Construction
W10	All Excavated Natural Material (ENM) will be managed in accordance with the ENM Resource Recovery Exemption, and if meets criteria will be disposed at a licensed waste management facility or council approved premises.	Construction
W11	Where possible, timber sleepers will be recycled in accordance with the ARTC resource recovery order and exemption.	Construction
W12	All waste must be removed from the site on completion of the works.	Post construction
W13	Upon completion of waste disposal, all original weighbridge / disposal receipts issued by the receiving waste facility must be retained in a waste register as evidence of proper disposal.	Construction
Visual		
V1	Potentially affected residents will be consulted prior to, during and after the works as required.	Pre-construction, construction and post construction
V2	Portable lighting will be directed downwards and away from adjacent sensitive receivers where feasible.	Construction
V3	Visual impacts will be minimised by maintaining the work site in a clean and tidy state.	Construction
V4	Site amenities will be located where they are least visible to the closest sensitive receivers.	Construction
V5	Following the completion of works, all disturbed areas will be restored to their pre-existing condition, or better.	Construction and post construction
V6	All work equipment and materials will be contained within the designated boundaries of the work site.	Construction
V7	If required, accurate public information signs will be displayed while work is in progress and until site restoration has been completed. Information to include nature of work, start and end dates, contact details etc.	Construction
Social and economic		
SE1	Consultation with affected landowners/managers must be undertaken prior to any works or activities occurring that may affect private access.	Pre-construction and construction
SE2	Permission from the landowner or manager must be sought, where access to or temporary occupation of land outside ARTC's leased area and/or rail corridor is required.	Pre-construction and construction
SE3	If required, local residents and businesses will be notified of the construction works and ongoing consultation will be undertaken to provide landowners with information on planned construction activities and changes to access arrangements.	Pre-construction and construction
SE4	Any accidental damage to property occurred by the works will be repaired in consultation with the affected property owner.	Construction
SE5	ARTC will make available communication tools to any member of the public or affected party who enquires or wishes to complain about the works.	Construction

ID	Mitigation and management measure	Timing
SE6	All services in the vicinity of the works will be located in the field and pegged-out and noted in the work plans prior to excavation works - "Dial 1100 Before You Dig."	Pre-construction and construction
SE7	ARTC will co-ordinate any alterations to existing passenger train services with the service operator. Potentially impacted commuters will be given appropriate notice and provided with alternate travel options.	Pre-construction and construction
Sustainability		
SO1	Consider and implement strategies to achieve positive sustainability outcomes as part of the CEMP. The CEMP will also document the sustainability initiatives that will be implemented, the timing, responsibilities and outline a regular reporting frequency to ARTC. Relevant sustainability initiatives include: ▪ Management and leadership: – develop a set of identified and reportable sustainability objectives and targets that include commitments to mitigating negative environment, social and economic risks; – include a risk assessment that considers environmental, social and economic risks; and – detail a program of inspections and audits during construction and include internal/external audits of the construction works and the environmental management system. ▪ Procurement: – consider environmental aspects in the procurement process including purchasing of materials and selection of suppliers and sub-contractors. ▪ Resource conservation: – monitor energy and water use and implement measures where possible to reduce consumption; and – reuse of topsoil and subsoil will be considered and implemented where possible. ▪ Waste: – identify waste streams, monitor and measure these streams to reduce wastes where possible; and – divert 70% of construction and demolition waste from landfill. ▪ Ecology and heritage: – maintain the ecological value of sensitive areas within the proposal areas; and – maintain the heritage value to heritage items within the proposal area and monitor during construction. ▪ Community and stakeholders: – develop a strategy that includes commitments to providing the community with timely information, consultation opportunities and a formal complaints procedure.	Pre-construction and construction Pre-Construction Construction Construction Construction Pre-construction and construction

7.3 Permits and approvals

The environmental permits, licences and/or approvals specified in section 4.6 will be obtained by ARTC prior to the commencement of construction, or during the course of construction prior to carrying out the activity requiring approval.



CHAPTER 8

ENVIRONMENTAL MATTERS AND CHECKLISTS

8 ENVIRONMENTAL MATTERS AND CHECKLISTS

8.1 Ecological sustainable development

One of the objects in section 1.3 of the EP&A Act is 'to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment'.

Section 1.4 of the EP&A Act defers to the NSW *Protection of the Environment Administration Act 1991* (POEA Act) for a definition of ecologically sustainable development (ESD), which is defined in section 6.2(2) of the POEA Act.

ARTC is committed to the principles of ESD and understands that social, economic and environmental matters are interdependent. During the feasibility phase of the proposal, sustainable development decision making was implemented by placing equal importance on social, environmental and economic considerations. The principles of ESD have been applied in concept design, planning and assessment through:

- incorporation of a risk assessment at various stages in the proposal life cycle to inform decision-making processes;
- undertaking detailed independent technical assessments of the significant issues, to fully understand the potential impacts associated with the proposal and to identify necessary environmental controls and management measures to avoid, minimise or at lease mitigate these impacts;
- various design iterations were considered to where possible, eliminate or minimise impacts on the environment and community;
- conservative baseline's and worst-case scenarios adopted when predicting potential impacts; and
- consultation with regulatory and community stakeholders.

8.1.1 Precautionary principle

Where there are threats of serious or irreversible environmental damage, a lack of full scientific certainty should not be used as a reason for postponing measures to prevent such damage.

The precautionary principle reinforces the need to take risk and uncertainty into account, particularly when potential threats of irreversible damage to the environment may be unknown or little understood. In the application of the precautionary principle, ARTC have endeavoured to deliver and monitor similar operations which are successfully operating elsewhere in NSW with little to no environmental impact. This has helped inform decision-making when considering how potential environmental impacts for this proposal may be eliminated or mitigated to an acceptable level.

This understanding gained from delivering and monitoring similar operations has led to the identification of the key issues relating to the proposal which pose the greatest risk to the environment. Detailed independent technical assessments were then undertaken to fully understand the key issues associated with the proposal and to identify necessary environmental controls and management measures to avoid, minimise or at lease mitigate these issues.

The approvals process meets the requirements of the precautionary principle and this REF provides a process for identifying and assessing the potential impacts and environmental consequences of the proposal.

8.1.2 Inter-generational equity

The principle of intergenerational equity is concerned with ensuring that the well-being and productivity of subsequent generations is not compromised by the current generation. This principle spans several environmental aspects but will be most relevant to waste and resources, socioeconomics, biodiversity, water quality, air quality, climate change and cumulative impacts.

This REF has addressed the principles of intergenerational equity through:

- engagement of suitably qualified and experienced technical specialists to ensure that the environmental assessment phase of the proposal has been independently undertaken and is transparent; and
- management strategies, mitigation measures and monitoring programmes to minimise any potential adverse impact upon the local environment and nearby communities.

8.1.3 Conservation of biological diversity and ecological integrity

This is the concept that conservation of biological diversity and ecological integrity should be a fundamental consideration.

As described in section 6.5, the proposal will remove native vegetation and result in unavoidable impact on habitat for threatened fauna species. However, the potential impacts associated with the proposal will be temporary and are not significant.

The proposal has been designed to confine disturbance to previously disturbed areas wherever feasible and avoid the disturbance of large areas of remnant and riparian vegetation. As such, the design is the most effective way to maintain biological diversity and ecological integrity at the site, whilst achieving the objectives of the proposal.

8.1.4 Improved valuation, pricing and incentive mechanisms

The principle of improved valuation, pricing and incentive mechanisms deems that environmental factors should be included in the valuation of assets and services, and that those who generate the pollution and waste should bear the cost of containment, avoidance or abatement.

ARTC acknowledges and accepts the financial costs associated with all the measures required for the proposal to avoid, minimise, mitigate and manage potential environmental and social impacts.

8.2 Section 171 checklist

Section 171(2) of the EP&A Regulation identifies the factors that must be taken into account when consideration is being given to the likely environmental impact of the proposed activity. These factors are addressed and summarised in Table 8.1.

Table 8.1: Consideration of section 171 factors

Section 171 factor	REF finding
a) Any environmental impact on a community?	There is potential for community impacts, associated with temporary noise, dust generation, traffic disruption and visual and access impacts. However, these impacts will be minor, temporary in nature and will be limited to the works period. Potential community impacts will be minimised with adequate community consultation and the implementation of mitigation measures outlined in this REF.

Section 171 factor	REF finding
b) Any transformation of a locality?	The presence of site amenities, temporary stockpiles and truck and equipment movements will temporarily impact on the visual amenity of the proposal site to a minor extent. The presence of site amenities, stockpiles, plant and equipment will be temporary (restricted to the construction phase) and will, therefore, result in a temporary, short term negative visual impact on the locality. Disturbed areas will be stabilised following completion of construction works. The proposal will not result in the significant transformation of the locality.
c) Any environmental impact on the ecosystems of the locality?	The proposal will not significantly impact on any threatened species, ecological communities or populations under the BC Act/FM Act/EPBC Act. It is considered that the potential for adverse water quality impacts associated with the proposal will be minimised provided the implementation of recommended erosion and sediment controls that are installed and maintained in line with the Blue Book.
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	There will be some short term aesthetic impacts from the works associated with noise, dust and visual impacts for nearby sensitive receivers. However, these aesthetic impacts are relatively minor. It is considered that with effective community consultation, temporary community impacts can be managed effectively.
e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.	The proposal will have no impact on significant station buildings or built heritage elements. Due to the nature and scale of the proposal there will be no permanent impact to views within or adjacent to the station precinct. The setting of Narrabri railway station will see a minor change to the appearance of the yard with the replacement of timber sleepers with concrete, and the replacement of rail and ballast. This constitutes a minor and inconsequential change to the railway setting. Potential construction impacts including potential vibration impacts on the heritage fabric of the Narrabri railway station will be of short duration and can be managed as outlined in section 6.2.4. An Aboriginal cultural heritage due diligence assessment has been undertaken as part of this REF to identify the potential for the proposal to impact on Aboriginal heritage. It has been assessed that there is a low likelihood that Aboriginal objects are present within the proposal area. The due diligence assessment recommends that the works proceed with caution, with the mitigation measures outlined in section 6.9.3 to be followed should any unexpected finds occur.
f) Any impact on the habitat of any protected animals (within the meaning of the BC Act)?	The proposal will be conducted within a modified rural and urban environment and highly disturbed existing operational rail corridor, and will have low potential to impact mobile or migratory fauna. The potential for impacts on any habitat of protected fauna will be minimised by implementation of the environmental safeguards identified in this REF.
g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	The proposal will not significantly impact on any threatened species, ecological communities or populations under the BC Act/FM Act/EPBC Act, such that a viable local population will be placed at risk of extinction.
h) Any long-term effects on the environment?	It is envisaged that once construction is completed and the site is rehabilitated appropriately that there will be no long-term effects on the environment as:

Section 171 factor	REF finding
	▪ the proposal will not result in a significant change in the current visual amenity; ▪ the proposal will not cause long term erosion and subsequent sedimentation of local waterways, with the implementation of suitable erosion and sediment controls and stabilisation of exposed soils; ▪ the installed infrastructure will not change current hydrological or flooding regimes; and ▪ the proposal will not result in significant impacts on threatened or endangered fauna or flora species or communities.
i) Any degradation of the quality of the environment?	There is potential for some short-term impacts on the environment including dust, noise and visual amenity during the construction period only. These short-term impacts will be managed within acceptable levels by the implementation of the mitigation measures outlined in this REF. There will be no long-term degradation of the environment as a result of the proposal.
j) Any risk to the safety of the environment?	The safety of the environment will not be reduced because of the proposal.
k) Any reduction in the range of beneficial uses of the environment?	The proposal is not expected to cause any reduction in the existing beneficial uses of the site and surrounding areas. The proposal will not impact on the continuation of surrounding land uses.
l) Any pollution of the environment?	Fugitive dust emissions generated from general construction work and excavation activities may result in minor increases of particulate matter in the local air shed. The operation of plant and machinery will result in minor and temporary increases in the level of exhaust emissions. The potential polluting effects associated with such emissions are not expected to cause any measurable decline in air quality. There is potential for chemical spillages, such as hydrocarbon leaks. A range of appropriate measures will be implemented to minimise potential impacts on surrounding water quality. Similarly, all vehicles will be regularly maintained and serviced in an optimum working condition to reduce potential effects associated with plant emission and leakage. There is also the potential for noise and sedimentation pollution to occur, however provided the recommended mitigation measures are implemented these impacts will be minimal.
m) Any environmental problems associated with the disposal of waste?	Resource and waste management mitigation measures will be included in the CEMP to control, monitor and manage waste generated during construction and to minimise the potential for environmental harm associated with waste disposal. A waste policy of 'avoid, reduce, reuse and recycle' (The Waste Hierarchy) will be employed on site.
n) Any increased demands on resources, natural or otherwise, which are, or are likely to become in short supply?	Ballast will be imported from the closest quarry. These materials as well as other structural materials required for the proposal are not in short supply.
o) Any cumulative environmental effect with other existing or likely future activities?	The proposal is unlikely to contribute substantially to any cumulative environmental effects in either the construction or operational phases.
p) Any impact on coastal processes and coastal hazards, including those under project ed climate change conditions?	The proposed works will not impact on coastal processes or coastal hazards as the proposal is not located on the coastal fringe.
(q) any applicable local strategic planning statements, regional strategic plans or district strategic plans made under Division 3.1 of the EP&A Act?	Relevant regional strategic plans are considered in section 4.5.

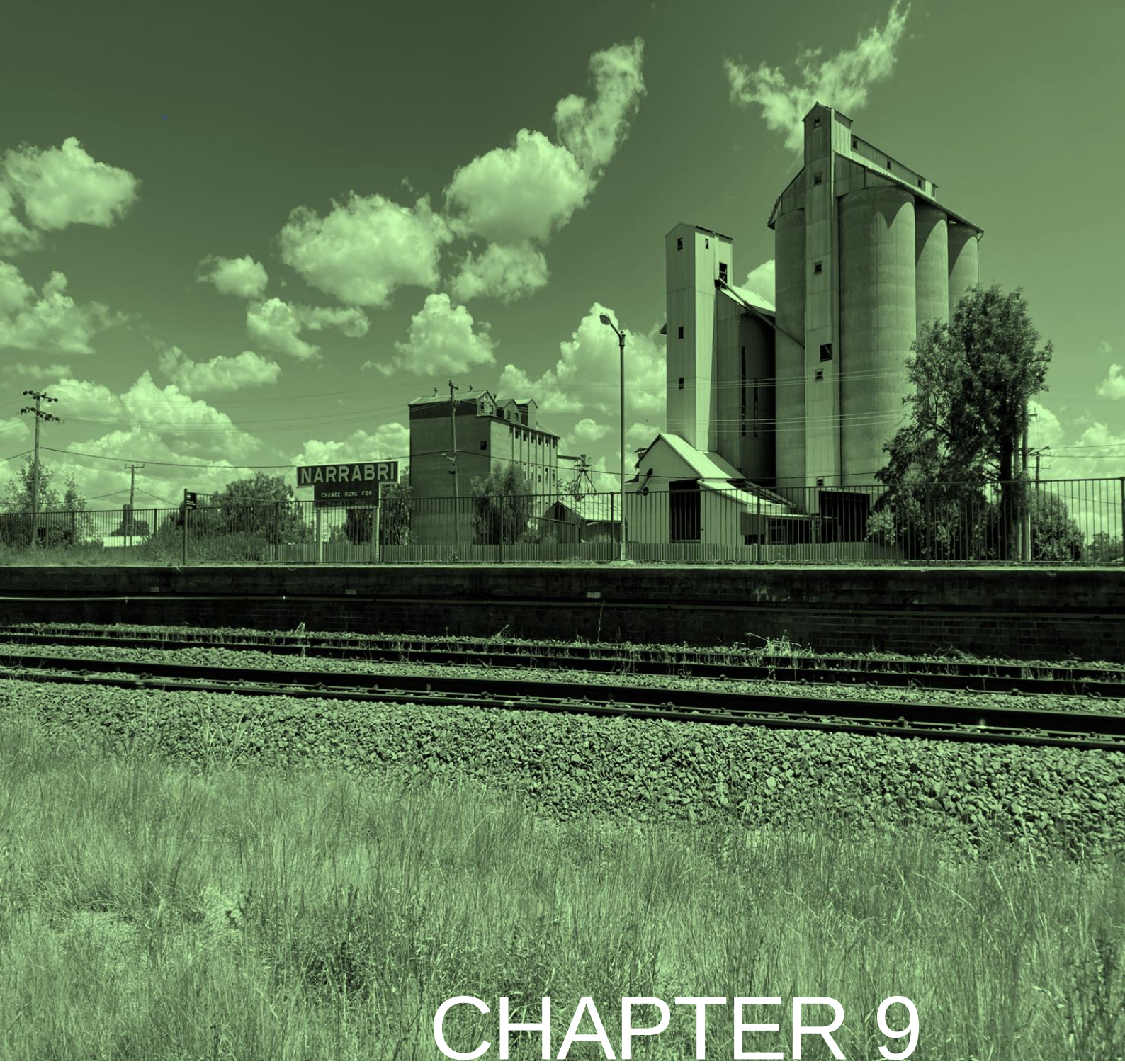
Section 171 factor	REF finding
(r) other relevant environmental factors?	All relevant environmental factors have been considered by this REF.

8.3 Matters of national environmental significance

As highlighted in section 4.2.1, the PMST was searched in September 2021 to determine the protected matters records in a 10 km radius of the proposal area. The findings are summarised in table 8.2.

Table 8.2: Matters of national environmental significance

MNES	Commentary
World heritage properties	There are no world heritage properties within 10 km of the proposal.
National heritage places	There are no national heritage properties within 10 km of the proposal.
Wetlands of international importance (listed under the Ramsar Convention)	There are three listed Wetland of International Importance identified as part of the search which are all more than 900 km from the proposal: The proposal will not impact the listed wetlands due to the minor nature of the works, coupled with the fact it is downstream of two of the wetlands, and over 1,000 km from wetlands downstream of the proposal.
The Great Barrier Reef Marine Park	The Great Barrier Reef Marine Park is not near the proposal.
Commonwealth marine area	There are no Commonwealth marine areas within 10 km of the proposal.
Listed threatened ecological communities	There are eight TECs within 10 km of the proposal. The proposal will not result in significant impact to TECs afforded protection under the EPBC Act.
Listed threatened species	There are 33 threatened species within 10 km of the proposal. The proposal will not result in significant impact to threatened flora and fauna species afforded protection under the EPBC Act.
Listed migratory species	There are 10 migratory species within 10 km of the proposal. The habitat within and adjacent to the proposal is unlikely to provide important habitat for significant numbers of migratory species or contain habitat important to their lifecycle. Large aggregations of migratory species are not expected to occur within the study area.
Commonwealth land	The proposal will not be conducted on Commonwealth land.
Nuclear actions	The proposal is not consistent with a defined nuclear action.
Water resources	The proposal is not coal seam gas or a large coal mining development.



CHAPTER 9

CONCLUSION

9 CONCLUSION

Under section 2.91 of the Infrastructure SEPP, development for a railway or rail infrastructure facilities may be carried out by or on behalf of a public authority without development consent. ARTC is a public authority according to the EP&A Act.

The proposal was assessed, and will be determined, under Division 5.1 of the EP&A Act with ARTC as the determining authority. This REF has been prepared to consider the environmental impacts of the proposal.

The proposal would deliver the following key benefits:

- improved productivity for freight operators through higher speeds and higher axle loads by increasing rail size to enable an increase in maximum axle loading to 25 TAL at 80km/h;
- operational cost savings via increased capability of upgraded track to enable heavier and longer trains to operate along the line leading to reduction of freight costs on a per tonne basis;
- enhanced performance of rail to enable improved competitiveness of rail against road; and
- reduce recurring maintenance costs.

The proposal is considered to have a minimal impact on the surrounding environment and community providing the implementation of mitigation and management measures recommended in chapter 7 of this REF.

Key potential impacts identified through the assessment of the proposal include:

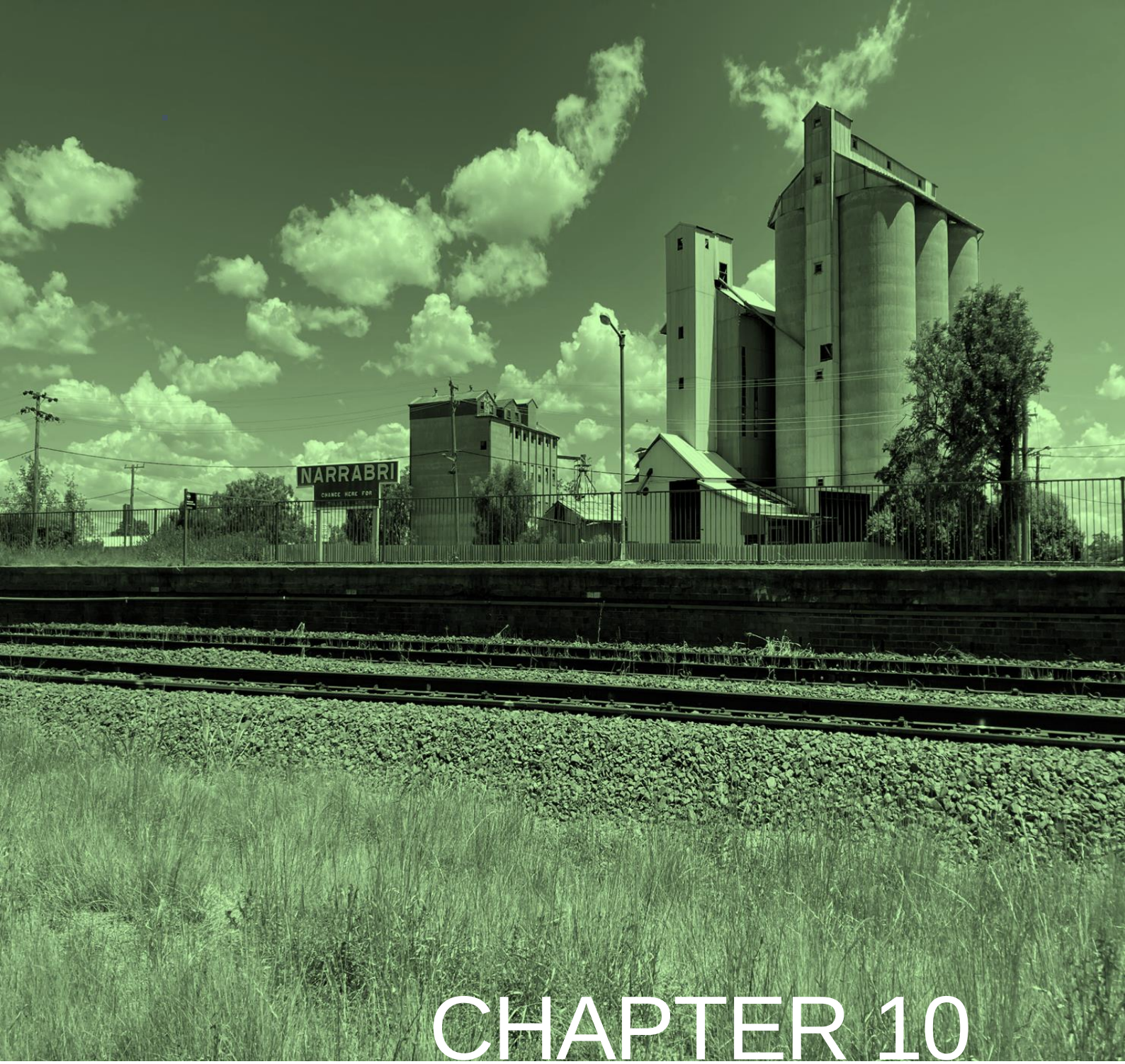
- Flooding impacts.
- Direct and indirect impact to biodiversity values.
- Temporary impacts to the community associated with noise and traffic.

The proposal will not result in a significant impact on threatened ecological communities, populations or species or their habitats. As such a SIS is not required under the BC Act.

Mitigation and management measures have been designed to minimise potential impacts that may arise from the proposal and as such, the impacts of the proposal are predicted to be minimal.

This REF has been prepared in accordance with the principles of ESD and environmental due diligence. In preparing this assessment consideration has been given to the EP&A Act, EP&A Regulation and other relevant environmental legislation.

All matters affecting or likely to affect the environment as a result of the proposal have been considered, as required by section 5.5 of the EP&A Act. Provided the mitigation measures outlined in this document are implemented, the proposal is unlikely to have a significant adverse impact on the environment and therefore an EIS is not required. Standard environmental management practices, including the mitigation measures cited in this REF, will be documented and implemented in a CEMP or Site EMP.



CHAPTER 10

REFERENCES

10 REFERENCES

ARTC (2020). Inland Rail - Narromine to Narrabri. Environmental Impact Statement. Prepared by Jacobs GHD Joint Venture for ARTC. November, 2020.

ASR (2009). Narrabri Coal Mine: Stage 2 Longwall Project. Aboriginal Heritage Assessment. Prepared by Archaeological Surveys & Reports Pty Ltd for Narrabri Coal Operations Pty Ltd. November 2009.

DIPNR (2005). NSW Floodplain Development Manual for the management of flood liable land. NSW Department of Infrastructure, Planning and Natural Resources. April 2005.

NSW Department of Planning and Environment. (2016). New England North West Regional Plan 2036. NSW Government.

Ozark. (2018). Yarrabee Solar Project: Aboriginal Cultural Heritage Assessment Report. Report prepared by Ozark Environmental and Heritage Pty Ltd. October 2018.

Ridges (2010). Aboriginal Sites Decision Support Tool (ASDST). Statewide product outline and technical summary. Department of Environment, Climate Change and Water NSW, Sydney.

SMEC (2021). Review of Environmental Factors. Narrabri Link – Narrabri Turnback Facility. Prepared for ARTC by SMEC Pty Ltd. February 2021.

WRM (2016). Narrabri Flood Study: Namoi River, Mulgate Creek and Long Gully, Report prepared for Narrabri Shire Council by WRM Water & Environment Pty Ltd. December 2016.