TECHNICAL REPORT

11

Agriculture and land use assessment

NARROMINE TO NARRABRI ENVIRONMENTAL IMPACT STATEMENT

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

ARTC Inland Rail

Narromine to Narrabri Project

Agriculture and Land Use Assessment

Technical Report 11

2-0001-250-EAP-00-RP-0011

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Executive summary

The proposal

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland. Inland Rail is a major national program that will enhance Australia's existing national rail network and serve the interstate freight market.

The proposal consists of about 306 kilometres of new single-track standard gauge railway with crossing loops. The proposal also includes changes to some roads to facilitate construction and operation of the new section of railway, and ancillary infrastructure to support the proposal.

The proposal would link the Parkes to Narromine section of Inland Rail located in central western NSW, with the Narrabri to North Star section of Inland Rail located in north-west NSW.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') is seeking approval to construct and operate the Narromine to Narrabri section of Inland Rail ('the proposal').

The proposal is State significant infrastructure and is subject to approval by the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposal is also determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and requires approval from the Australian Minister for the Environment.

This report

This Agriculture and Land Use Assessment has been prepared on behalf of ARTC for the proposal to support the environmental impact statement (EIS) for the proposal and responds to the Secretary's Environmental Assessment Requirements (SEARs) for land use and property.

The assessment presented in this report has included a review of relevant legislation, consideration of the existing conditions, an impact assessment to determine the significance of agriculture and land use impacts as a direct result of the construction and operation of proposal and a cumulative impact assessment. Recommended mitigation and management measures were identified in response to the impact assessment findings.

Existing environment

The history of agricultural enterprises within the regional study area is typical of the development in agriculture that has occurred in many parts of Australia. The land was inhabited prior to colonisation and today by Indigenous people from a number of Aboriginal nations. Since colonisation, the vegetation in the region has largely been cleared for agriculture or has been substantially modified. The large areas of native vegetation remaining are in national parks, nature reserves, state forests and travelling stock routes. These public lands also support the Australian apiary industry as they provide important seasonal floral resources for Australia's migrating beekeepers.

Agriculturally, the broader region is highly diverse with the even spread of winter and summer rainfall supporting productive grazing and cropping systems. The construction of irrigation dams across the regional study area in the 1960s enabled areas of land suitable for irrigation to be developed for intensive cropping. The agricultural production sector supports a range of industries associated with agriculture, including farm input services and enterprises associated with the transporting, processing and marketing of farm products. Agricultural production includes a mixture of cropping and grazing enterprises and accounts for 80 per cent of the total land area across the regional study area (44 per cent grazing, 32 per cent cropping, four per cent irrigated cropping and 0.1 per cent other agriculture). The major crops grown within the regional study area are wheat, barley and chickpeas with areas of irrigated crops around Narromine and Narrabri, while beef cattle and sheep and lambs are the predominant livestock. The annual gross value of agricultural production across the regional study area is $988 million. Generally, the typical farm unit in this area are either grazing businesses, or mixed farming operations that run several different livestock and cropping enterprises on the same farm. Employment in the agriculture, forestry and fishing industries accounts for 24 per cent of the regional study area workforce.

Much of the regional study area is subject to mining exploration and assessment. A major coal seam gas proposal, the Narrabri Gas Project, is proposed in the Pilliga forests. In Narromine, two hard rock quarry proposals are currently under assessment.

Impacts from the proposal during construction

About 3,335 hectares of land would be acquired or leased to construct and operate the proposal, of which about 1,613 hectares would be required temporarily during construction.

The temporary land requirements would include use of land within about 413 properties, including about 1,158 hectares of privately owned land and about 454 hectares of publicly-owned land, mainly owned by the NSW Government.

Construction of the proposal would have a range of potential impacts on agricultural resources with the degree of impacts varying with the different stages of development. Construction activities may also, in addition to land use change, directly impact on land capability, farm infrastructure and biosecurity, which has the potential to reduce the productive potential of agricultural land.

During the construction phase, 3,316 hectares of land would be affected, comprising the proposal's permanent land requirements, the additional temporary construction requirements, land already owned by ARTC, and other areas that do not require acquisition (such as existing road corridors). In total, the land that would be affected is currently mainly used for cropping (44 per cent), grazing (34 per cent) and production native forests (18 per cent). The direct impacts during construction relate to the removal of agricultural land from production.

It is estimated that about 2,554 hectares of agricultural land would be affected during construction, representing about 0.07 per cent of agricultural land in the regional study area. This includes about 1,512 hectares of agricultural land that would be temporarily affected during construction only. Following completion of construction, this land would be rehabilitated and available for agricultural use.

Construction would impact around 618 hectares of state forests, which may require the rearrangement of forestry compartments and access tracks.

Impacts from the proposal during operation

About 1,805 hectares of land would be permanently affected by the proposal, comprising land that is mainly used for:

- agriculture (about 1,300 hectares, 75 per cent of the proposal site)
- production native forestry (about 429 hectares, 24 per cent of the proposal site)
- transport and communication (about 51 hectares, three per cent of the proposal site).

Across agricultural land, the rail corridor would traverse predominately dryland cropping (38 per cent), grazing (34 per cent) and production native forestry (24 per cent).

The area of agricultural land affected by the proposal represents about 0.04 per cent of agricultural land across the regional study area.

The gross value of agricultural production across the proposal site has been calculated using a combination of publicly available data from NSW Department of Planning, Industry and Environment and knowledge of agricultural production across the regional study area. The economic impact of the permanent removal of agricultural land for the proposal is estimated to be a loss of $258 million which is equivalent to 0.16 per cent of the annual value of agricultural production in the regional study area.

The proposal includes some alterations to the public road network, as described in chapter A7 of the EIS. The proposal seeks to maintain access to properties by a reasonable public road route. Alternative access, generally in the form of a level crossing and/or access road, would be provided at a number of private properties where the proposal would sever the existing access to a public road.

Where creation of the rail corridor would sever a lot that currently has legal access to a public road, access would continue to be provided to both parts of the lot from a public road (or roads). The proposal allows for stock crossings at the majority of travelling stock reserves crossed by the proposal site.

The proposal generally would not measurably impact on existing urban land uses.

The proposal passes through Lot 52, DP 661453, Eumungerie Road, Narromine. This land is currently used for broadacre agriculture but was rezoned to R5 Large Lot Residential in 2015. Construction of the proposal would require land from this lot, resulting in a small reduction (about seven per cent) of the area available for any future development of the lot. In addition, given the proximity of the remaining land to the proposal site, any future development of land near the rail corridor would have the potential to be affected by amenity impacts (particularly noise and visual impacts) during operation.

The proposal is unlikely to impact on the capacity of mineral resources to be accessed. The proposal would not significantly impact on any environmentally sensitive lands and processes.

Recommended mitigation measures

Various mitigation and management measures have been identified to address agriculture and land use impacts identified in this report. Management measures would be implemented during construction to manage potential impacts on properties within and adjacent to the proposal site.

The design and construction planning would continue to be refined to minimise potential impacts on land uses and properties as far as reasonably practicable.

All property acquisitions would be undertaken in consultation with landowners and in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991*.

Guidance would be provided to agricultural landholders at the commencement of operation regarding the frequency of train movements to assist with safe scheduling of routine agricultural activities.

This Agriculture and Land Use Assessment has been informed by extensive consultation undertaken by ARTC with directly impacted landholders to document the direct and indirect impacts arising from the proposal. While the proposal would result in either the temporary or permanent removal of agricultural land during the construction and operation phase respectively, the total areas and gross value of production impacts across the regional study area are relatively low and these would likely be offset by some of the broader benefits arising from the proposal.

Glossary and abbreviations

Acronym / term	Definition
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
ACLUMP	Australian Collaborative Land Use and Management Program
AIS	Agricultural Impact Statement
ARTC	Australian Rail Track Corporation
AWI	Australian Wool Innovation
BOM	Bureau of Meteorology
BSAL	Biophysical strategic agricultural land
CCA	Community Conservation Area
CEMP	Construction Environmental Management Plan
DAWE	Department of Agriculture, Water and Environment
DCP	Development control plan
DECCW	Department of Environment Climate Change and Water
DEE	Department of Environment and Energy
DPIE	Department of Planning, Industry and Environment
EES	Environment, Energy and Science Group within the Department of Planning, Industry and Environment.
EIA	Environmental impact assessment
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
FMP	Farm Management Plan
GM	Gross Margin
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Local Environmental Plan
LGA	Local Government Area
LSPS	Local Strategic Planning Statement
LUCRA	Land use conflict risk assessment
ML	Megalitre
MLA	Meat and Livestock Australia
N2IP	Northern NSW Inland Port
NSW	New South Wales
NSW DPI	NSW Department of Primary Industries (now DPIE)

Acronym / term	Definition
OEH	Office of Environment and Heritage (now Environment, Energy and Science Group (EES) within the Department of Planning, Industry and Environment.
The proposal	Defined as the construction and operation of the Narromine to Narrabri section of Inland Rail.
the proposal site	Defined as the area that would be directly affected by construction of the proposal. It includes the location of proposal infrastructure, the area that would be directly disturbed by the movement of construction plant and machinery, and the location of the compounds and laydown areas that would be used during construction.
the regional study area	The boundaries of the LGAs intersecting the proposal.
Rail corridor	The corridor within which the rail tracks and associated infrastructure would be located.
SEARs	Secretary Environmental Assessment Requirements
WMA	*Water Management Act 2000*

1. Introduction

1.1 Overview

1.1.1 Inland Rail and the proposal

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland. Inland Rail is a major national program that will enhance Australia's existing national rail network and serve the interstate freight market. The Inland Rail route, which is about 1,700 kilometres long, involves:

- using the existing interstate rail line through Victoria and southern NSW
- upgrading about 400 kilometres of existing track, mainly in western NSW
- providing about 600 kilometres of new track in NSW and south-east Queensland.

The Inland Rail program has been divided into 13 sections, seven of which are located in NSW. Each of these projects can be delivered and operated independently with tie-in points on the existing railway.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') is seeking approval to construct and operate the Narromine to Narrabri section of Inland Rail ('the proposal').

1.1.2 Approval and assessment requirements

The proposal is State significant infrastructure and is subject to approval by the NSW Minister for Planning and Public Spaces under the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). The proposal is also determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and requires approval from the Australian Minister for the Environment.

This report has been prepared by the JacobsGHD Joint Venture as part of the environmental impact statement (EIS) for the proposal. The EIS has been prepared to support the application for approval of the proposal, and address the environmental assessment requirements of the Secretary of the NSW Department of Planning, Industry and Environment (the SEARs), dated 9 September 2020.

1.2 The proposal

The proposal consists of about 306 kilometres of new single-track standard gauge railway with crossing loops. The proposal also includes changes to some roads to facilitate construction and operation of the new section of railway, and ancillary infrastructure to support the proposal.

The proposal would be constructed to accommodate double-stacked freight trains up to 1,800 metres long and 6.5 metres high. It would include infrastructure to accommodate possible future augmentation and upgrades of the track, including a possible future requirement for 3,600 metre long trains.

The land requirements for the proposal would include a new rail corridor with a minimum width of 40 metres, with some variation to accommodate particular infrastructure and to cater for local topography. The corridor would be of sufficient width to accommodate the infrastructure currently proposed for construction, as well as possible future expansion of crossing loops for 3,600 metre long trains. Clearing of the proposal site would occur to allow for construction and to maintain the safe operation of the railway.

1.2.1 Location

The proposal would be located between the towns of Narromine and Narrabri in NSW. The proposal would link the Parkes to Narromine section of Inland Rail located in central western NSW, with the Narrabri to North Star section of Inland Rail located in north-west NSW.

The location of the proposal is shown in Figure 1.1.

1.2.2 Key features

The key design features of the proposal include:

Rail infrastructure

- a new 306 kilometre long rail corridor between Narromine and Narrabri
- a single-track standard gauge railway and track formation within the new rail corridor
- seven crossing loops, at Burroway, Balladoran, Curban, Black Hollow/Quanda, Baradine, The Pilliga and Bohena Creek
- bridges over rivers and other watercourses (including the Macquarie River, Castlereagh River and the Namoi River/Narrabri Creek system), floodplains and roads
- level crossings
- new rail connections and possible future connections with existing ARTC and Country Regional Network rail lines, including a new 1.2 kilometre long rail junction between the Parkes to Narromine section of Inland Rail and the existing Narromine to Cobar Line (the Narromine West connection)

Road infrastructure

- road realignments at various locations, including realignment of the Pilliga Forest Way for a distance of 6.7 kilometres
- limited road closures.

The key features of the proposal are shown in Figure 1.2.

Ancillary infrastructure to support the proposal would include signalling and communications, drainage, signage and fencing, and services and utilities.

Further information on the proposal is provided in the EIS.

Figure 1.1 **Location of the proposal**

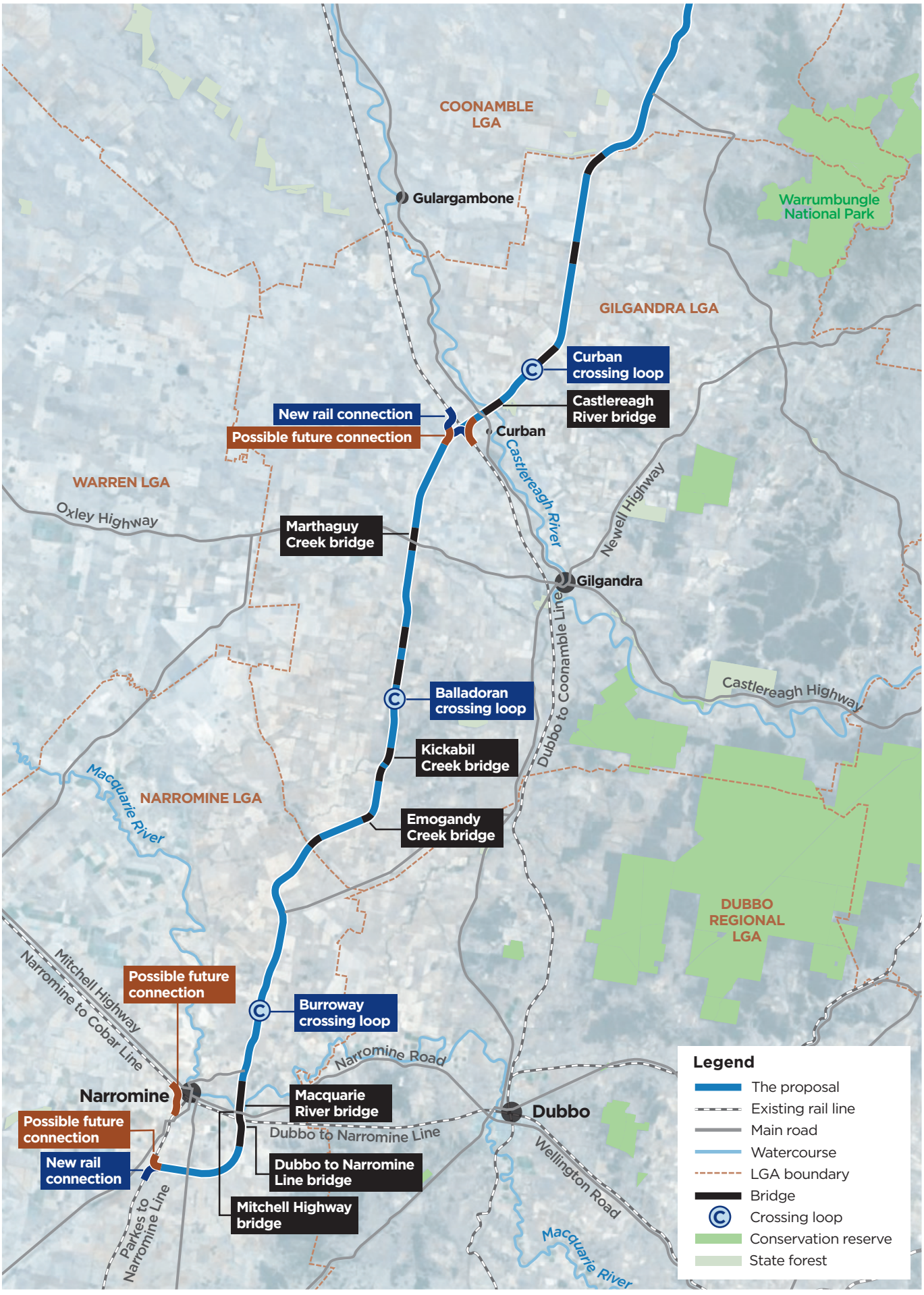

Figure 1.2a **Key features of the proposal**

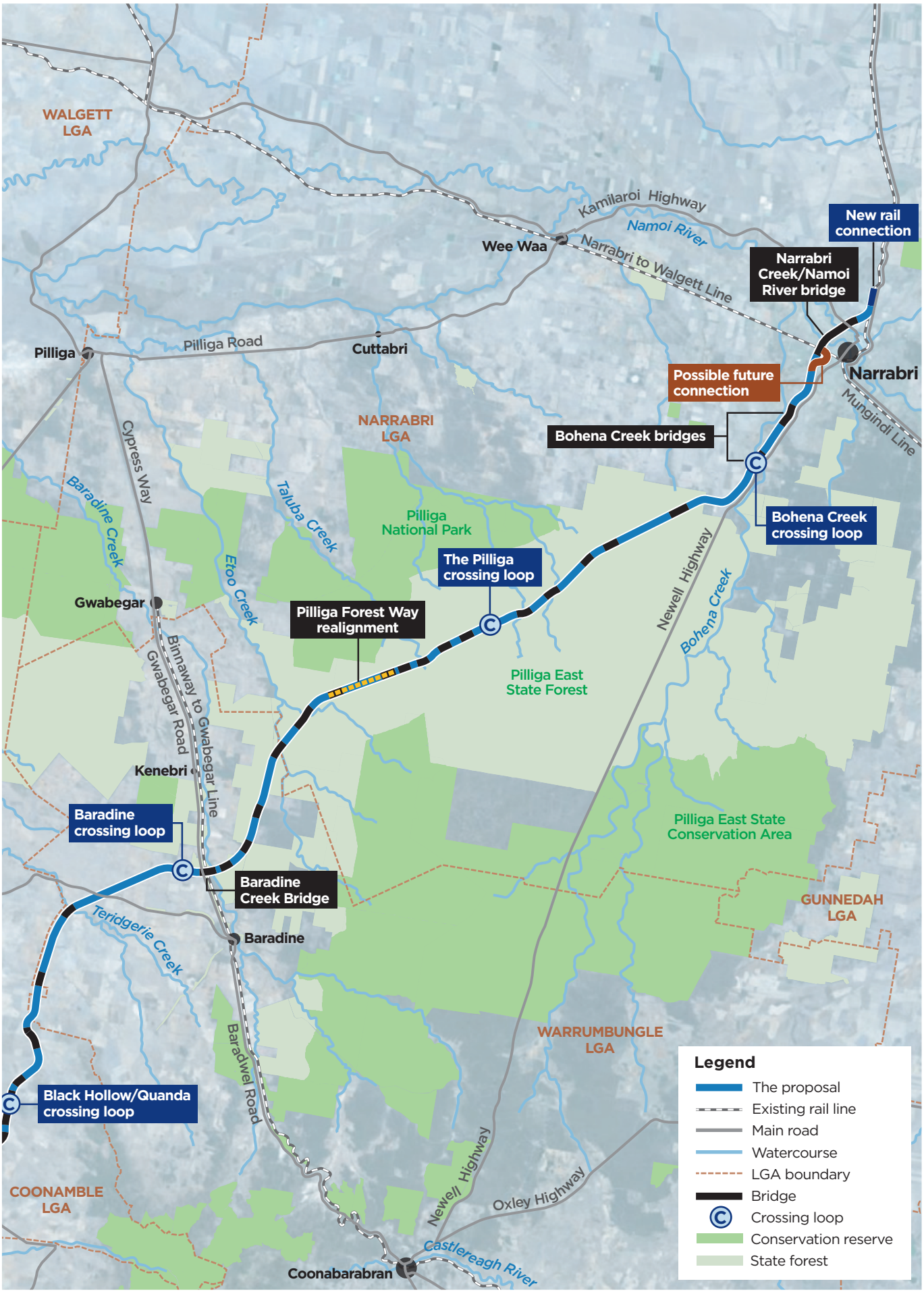

Figure 1.2b **Key features of the proposal**

1.2.3 Construction overview

An indicative construction strategy has been developed based on the current reference design to be used as a basis for the environmental assessment process. Detailed construction planning, including programming, work methodologies, staging and work sequencing would be undertaken once construction contractor(s) have been engaged and during detailed design.

Timing and work phases

Construction of the proposal would involve five main phases of work as outlined in Table 1.1. It is anticipated that the first phase would commence in late 2021, and construction would be completed in 2025.

Table 1.1 Main construction phases and indicative activities

Phase	Indicative construction activities
Pre-construction	• Establishment of areas to receive early material deliveries • Delivery of certain materials that need to be bought to site before the main construction work
Site establishment	• Establishment of key construction infrastructure, work areas and other construction facilities • Installing environmental controls, fencing and site services • Preliminary activities including clearing/trimming of vegetation
Main construction works	• Construction of the proposed rail and road infrastructure, including earthworks, track, bridge and road works
Testing and commissioning	• Testing and commissioning of the rail line and communications and signalling systems
Finishing and rehabilitation	• Demobilisation and decommissioning of construction compounds and other construction infrastructure • Restoration and rehabilitation of disturbed areas

Key construction infrastructure

The following key infrastructure is proposed to support construction of the proposal:

- borrow pits:
  - borrow pit A – Tantitha Road, Narromine
  - borrow pit B – Tomingley Road, Narromine
  - borrow pit C – Euromedah Road, Narromine
  - borrow pit D – Perimeter Road, Narrabri
- three main compounds, which would include a range of facilities to support construction ('multi-function compounds'), located at:
  - Narromine South
  - Curban
  - Narrabri West
- temporary workforce accommodation for the construction workforce:
  - within the Narromine South multi-function compound
  - Narromine North
  - Gilgandra
  - Baradine
  - within the Narrabri West multi-function compound.

The key construction infrastructure are shown in Figure 1.3.

Other construction infrastructure would include a number of smaller compounds of various sizes located along the proposal site, concrete batching plants, laydown areas, welding yards, a concrete pre-cast facility and groundwater bores for construction water supply.

1.2.4 Operation

The proposal would form part of the rail network managed and maintained by ARTC. Train services would be provided by a variety of operators. Inland Rail as a whole would be operational once all 13 sections are complete, which is estimated to be in 2025.

It is estimated that Inland Rail would be trafficked by an average of 10 trains per day (both directions) in 2025, increasing to about 14 trains per day (both directions) in 2040. This rail traffic would be in addition to the existing rail traffic using other lines that the proposal interacts with.

The trains would be a mix of grain, bulk freight, and other general transport trains. Total annual freight tonnages would be about 10 million tonnes in 2025, increasing to about 17.5 million tonnes in 2040.

Train speeds would vary according to axle loads, and range from 80 to 115 kilometres per hour.

1.3 Purpose and scope of this report

The purpose of this report is to assess the potential agriculture and land use impacts from constructing and operating the proposal. The report:

- addresses the relevant SEARs listed in Table 1.2
- describes the existing environment with respect to agriculture and land use
- assesses the impacts of constructing and operating the proposal on agriculture and land use
- recommends measures to mitigate and manage the impacts identified.

The methodology for the assessment is described in section 3.

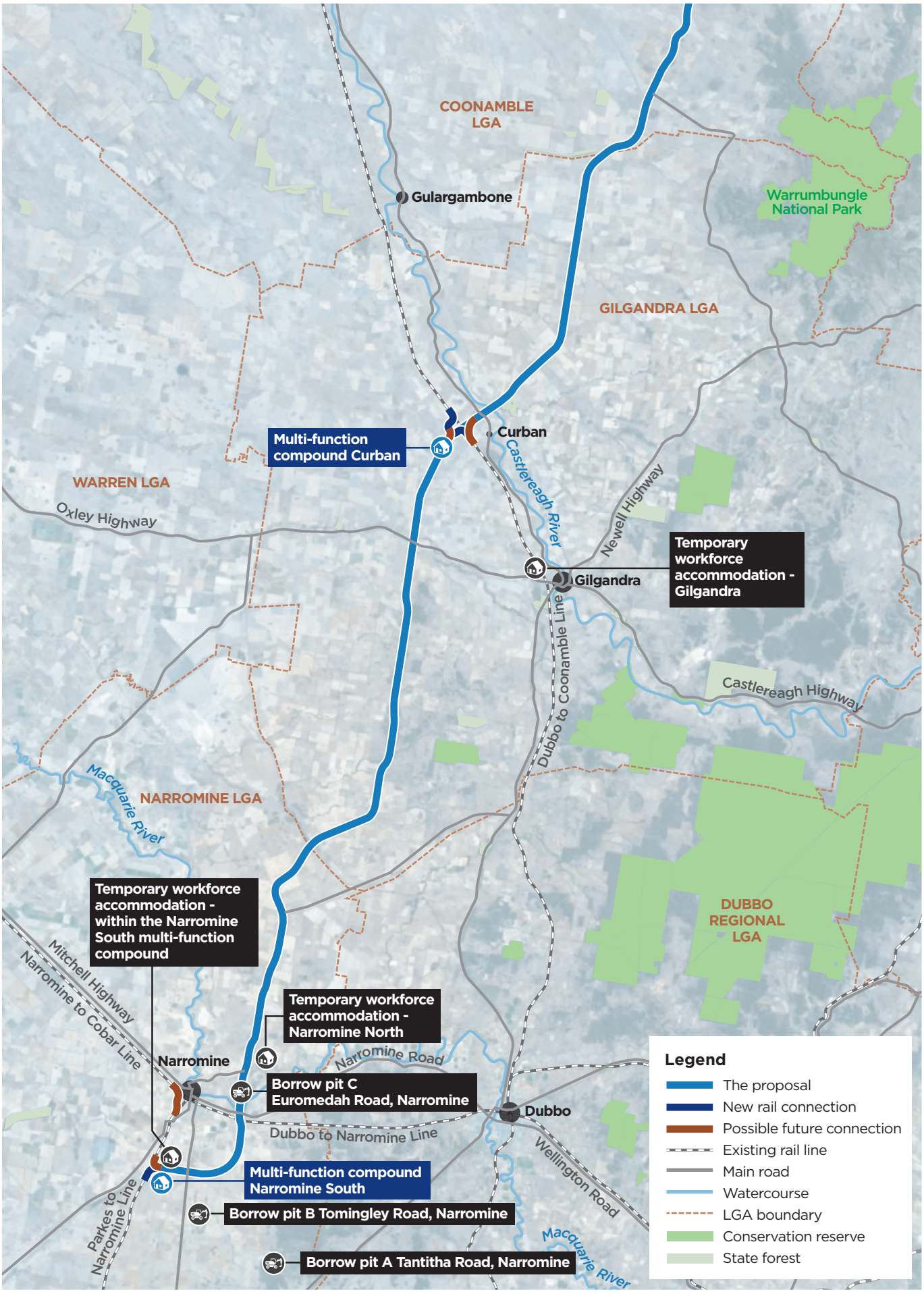

Figure 1.3a **Key construction infrastructure**

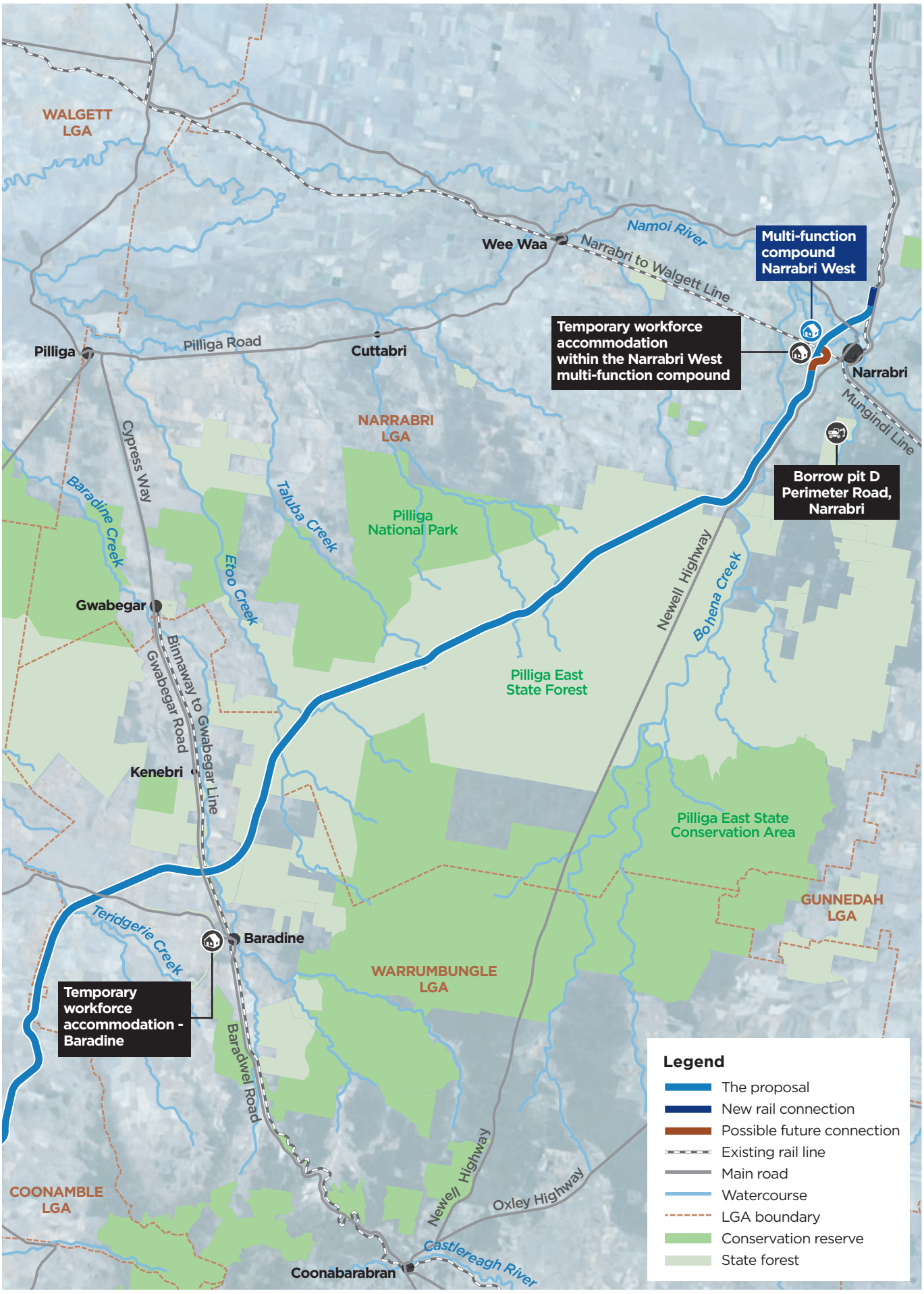

Figure 1.3b **Key construction infrastructure**

Table 1.2 SEARs relevant to this assessment

SEAR number	Requirements	Where addressed in this report
5.2	The Proponent must assess agricultural land use impacts in accordance with the current guidelines, including:	
	a. Current and potential Important Agricultural Land within the project and surrounding locality, including land capability and agricultural productivity;	Section 4.1 identifies agricultural land use across the regional study, while section 4.2.2 includes an overview of strategic agricultural land. Land and soil capability has been addressed in section 4.2.3 for the regional study area. Agricultural productivity has been addressed in 5.2 and 5.3. Sections 7.1 to 7.5 provide a summary of the land impacts on agricultural land use and productivity as a result of the proposal during the construction and operation phases. Section 7.6 quantifies the direct impacts resulting from the removal of agricultural land from production.
	b. Division or fragmentation of property and changes to property management, which could lead to the loss of viability;	To facilitate construction and operation of the proposal, land is required for the new rail corridor, realignment of roads and other parcels of land impacted by or required for the proposal. Section 7.7 provides a summary of impact of severance on farming operations. Section 7.10 calculates the annual value of impacts on agricultural production during construction and operation as a percentage of agricultural production in the regional study area.
	c. Process for the amalgamation or subdivision of land affected by the rail corridor, taking into account council zoning and minimum lot size requirements for subdivisions and dwellings;	Section 5.5 outlines regional and local planning strategies and section 5.6 provides a summary of land use regulation within the regional study area and the zoning and other LEP controls broadly across all relevant LGAs.
	d. Property access and the efficient and safe crossing of the rail corridor by vehicles, machinery and livestock, with consideration of grade separated access;	Section 7.9 contains a detailed list of activities that might directly impact on land capability, farm infrastructure and biosecurity. This section also addresses farm access, while section 9 provides a list of the measures proposed to mitigate and manage the potential impacts of the proposal.
	e. Connectivity of property infrastructure severed by the rail corridor; and	Connectivity of property infrastructure has been addresses in section 7 including the isolation of hubs and inter and intra farm access. Appropriate mitigation measures provided in section 9.

SEAR number	Requirements	Where addressed in this report
	f. Livestock exclusion/management and rail corridor protection measures to minimise harm and losses.	Section 7.9 specifically addresses the issues and potential impacts arising from damaged or unrepaired fences, while section 9 provides suitable mitigation measures to safely and effectively manage livestock.
5.3	The Proponent must assess impacts from construction and operation on potentially affected properties, businesses, recreational users and land and water users (for example, recreational and commercial fishers, including property acquisitions/adjustments, access, amenity and relevant statutory rights.	Property and business impacts were assessed in section 7.6 (loss of land), 7.7 to 7.9 (impacts of severance on agricultural businesses), 7.10 and 7.12 (broader regional effects). Section 7.14.10 considers the potential impact of the proposal on access rights for recreational fishing. Impacts on urban and peri-urban land uses are considered in section 7.14.4.
5.6	The Proponent must assess biosecurity risks and identify management measures to minimise the spread of pests, diseases or weeds along the rail corridor (including residual lands), in accordance with the 'general biosecurity duty' under the *Biosecurity Act 2015*.	Section 7.9 outlines the issues and potential impacts from the introduction and or spreading of pests, weeds and diseases including details about assessing and identifying biosecurity risks and mitigation measures outlined in section 9.
5.7	The Proponent must assess the impact of the project on significant mineral and extractive resources, including a. Any operating mines, extractive industries or known mineral, extractive or petroleum resources; b. Exploration activities in the vicinity of the proposed development; and c. Access for future exploration in the area.	Section 4.5 contains an outline of active mining licences, including mining exploration licences, coal seam gas wells and hard rock resources. Section 7.14.7 assesses the potential impacts of the proposal on active mines, mining exploration activity and mining applications.
5.8	The Proponent must identify encroachments into adjoining road reserves, travelling stock routes, Crown land and paper roads.	Section 4.6 provides a description of the current arrangement and usage of road reserves, including Crown roads (section 4.6.1) Travelling stock reserves (section 4.6.2) and other Crown land (section 4.6.3). The assessment of impacts on road reserves, including Crown roads is contained in section 7.14.1, travelling stock reserves in section 7.14.2 and other Crown land in 7.14.3.

SEAR number	Requirements	Where addressed in this report
7.1	The Proponent must assess the impacts of the project on environmentally sensitive land and processes (and the impact of processes on the project) including, but not limited to: a. Protected areas (including land and water) managed by OEH and/or DPI Fisheries under the *National Parks and Wildlife Act 1974* and the *Marine Estate Management Act 2014*; b. Key Fish Habitat as mapped and defined in accordance with the FM Act; c. Waterfront land as defined in the *Water Management Act 2000*; d. Land or waters identified as Critical Habitat under the BC Act, FM Act or EPBC Act; and e. Biobank sites, private conservation lands and other lands identified as offsets.	A description of the protected areas is contained in section 4.4.1, biobank sites and private conservation land, (where known) in section 4.4.2 and waterfront land in section 4.4.3. Section 7.14.8 considers potential impacts on protected areas and critical habitats, 7.14.9 on biobank sites and private conservation land and section 7.14.10 considers potential impacts on and waterfront land. Note Key Fish Habitat is assessed in *ARTC Inland Rail Narromine to Narrabri Aquatic Ecology Assessment* (JacobsGHD, 2020f).

1.4 Structure of this report

The structure of the report is outlined below.

- Section 1 – provides an introduction to the report
- Section 2 – provides an overview legislation, policies and guidelines application to this assessment describes the methodology and approach for the assessment
- Section 3 – describes the methodology and approach for the assessment
- Section 4 – described the existing environment
- Section 5 – describes the land use, agricultural resources and current enterprises within the locality
- Section 6 – describes consultation undertaken for the assessment
- Section 7 – provides an assessment of impacts
- Section 8 – provides a cumulative assessment of impacts
- Section 9 – provides recommended mitigation and management measures
- Section 10 – concludes the key findings and recommendations from the investigation
- Section 11 – lists all references used in this report.

2. Legislation and policy context

2.1 Legislative framework

Table 2.1 provides a summary of the planning legislation that could potentially apply to the proposal.

Table 2.1 Relevant legislation

Legislation	Function	Relevance to this report
Native Title Act 1993 (Cwlth)	Provides for the determination and recognition of Native Title claims.	Native title claims have been considered in this assessment.
Native Title (New South Wales) Act 1994 (NSW)	Provides validation of past state actions with respect to the extinguishment of Native Title.	
Aboriginal Land Rights Act 1983 (NSW)	Provides for the establishment and the operation of Aboriginal Land Councils and for the claiming of certain Crown Land by Aboriginal Land Councils.	
Biosecurity Act 2015 (NSW)	Provides the regulatory framework for the prevention, elimination, minimisation and management of biosecurity risks; and for other purposes.	Under the *Biosecurity Act 2015,* there is a general obligation on people to be aware of their surroundings and take action to prevent the introduction and spread of pests, diseases, weeds and contaminants. ARTC will have obligations under this Act.
Crown Land Management Act 2016 (NSW) *Local Land Services Act 2013* (NSW)	Principal legislation for defining and managing Crown Land, including travelling stock reserves.	The proposal would intersect a number of travelling stock reserves and encroach on some areas of Crown land. Under these acts there are penalties for unauthorised use or damage to travelling stock reserves or Crown land. Potential impacts and recommended management and mitigation measures will be considered in this assessment, in accordance with the SEARs.
State Environmental Planning Policy (Primary Production and Rural Development) 2019	Protects nominated agricultural lands from the impact of other uses and facilitates the execution of certain farming activities without consent.	Provides for the protection of designated agricultural lands, farm dams, holding of livestock, and aquaculture. Currently no agricultural lands are nominated for protection.

Legislation	Function	Relevance to this report
Coonamble Local Environmental Plan 2011 *Gilgandra Local Environmental Plan 2011* *Narrabri Local Environmental Plan 2012* *Narromine Local Environmental Plan 2011* *Warrumbungle Local Environmental Plan 2013*	Provides for local planning controls in the applicable local government area.	Designates permissible land uses across each LGA. Zoning mapping has been used to inform the land use assessment in this report.
Mining Act 1992 (NSW)	Provides a legislative framework for mining activity in NSW, including the provision and granting of leases and licences.	The proposal corridor may pass close to or through areas subject to leases or licences under these Acts. This assessment will consider potential impacts on leases and licences in accordance with the SEARs.
Petroleum (Onshore) Act 1991 (NSW)	Provides a legislative framework for mining of onshore petroleum in NSW, including the provision and granting of leases and licences.	

2.2 Regulatory and policy framework

The SEARs and the six supplementary documents listed below provide relevant legislation and guidance material references to assist in the preparation of the EIS and more specifically an Agricultural Impact Statement (AIS). With respect to this Agriculture and Land Use Assessment, the key policy documents guiding the assessment are:

1. ***Guideline for agricultural impact statements at the exploratory stage*** **(2012) NSW Government**

   This guideline assists applicants and others understand the information required for an AIS for State Significant Development applications.

2. ***Agricultural Impact Statement Technical Notes*** **(2013a) NSW Department of Primary Industries**

   These explanatory notes provide more detailed information in relation to the *Strategic Regional Land Use Policy - Guideline for Agricultural Impact Statements at the Exploration Stage* (NSW Government, 2015). A cross reference of requirements of the explanatory notes with sections of this report is provided in Table 2.2.

3. ***Infrastructure proposals on rural land*** **(2013b) NSW Department of Primary Industries**

   This guideline is to help consent authorities to maintain sustainable primary production and development opportunities and minimise land use conflict when assessing infrastructure proposals affecting rural resource lands.

4. ***New South Wales Invasive Species Plan 2018-2021*** **(2018) NSW Department of Primary Industries**

   The *NSW Invasive Species Plan 2018-2021* (DPI, 2018) sets out key deliverables to help prevent new incursions, eliminate or contain existing populations and effectively manage already widespread invasive species. The Plan adopts four goals (consistent with the broad objectives of the NSW Biosecurity Strategy) to achieve this: Goal 1: Exclude – prevent the establishment of new invasive species Goal 2: Eradicate or contain – eliminate, or prevent the spread of new invasive species Goal 3: Effectively manage – reduce the impacts of widespread invasive species Goal 4: Capacity building – ensure NSW has the ability and commitment to manage invasive species.

5. ***North West Regional Strategic Weed Management Plan 2017-2022*** **(2017) North West Local Land Services**

   The Plan provides a framework for regional weed management and supports regional implementation of the *NSW Biosecurity Act 2015* by articulating community expectations in relation to effective weed management and facilitating a coordinated approach to weed management across the North West Local Land Services Region.

6. ***Central West Regional Strategic Weed Management Plan 2017-2022*** **(2017) Central West Local Land Services**

   Biosecurity protects the economy, environment and community from the negative impacts of pests, diseases and weeds. The plan sets the vision and goals for weed management in the Central West, and outlines strategies and actions to achieve outcomes based on principles of shared responsibility, sustainable landscapes, collaborative leadership and innovation and supports regional implementation of the *NSW Biosecurity Act 2015.*

The following table (Table 2.2) provides a cross-reference to where the relevant sections of the AIS guidelines have been addressed in this assessment.

Table 2.2 Cross reference with AIS guidelines

AIS requirement	Section where addressed in this report
Detailed assessment of the agricultural resources and agricultural production of the proposal area	
Soil information	Section 4.2.3
Slope and land characteristics	Section 4.2.3
History of agricultural enterprises within proposal areas	Section 5
Location and areas of land to be temporarily removed from agriculture	Sections 7.1 to 7.4
Location and area of land to be returned to agricultural use post proposal	Sections 7.1 to 7.4
Location and area of land that will not be returned to agriculture, including areas to be used for environmental plantings or biodiversity offsets	Sections 7.1 to 7.4
Agricultural enterprises to be undertaken on any buffer and/or offset zone lands for the life of the proposal	Section 3.1.2
Identification of the agricultural resources and current enterprises within the surrounding locality of the proposal area	
Agricultural resources within locality	Section 5.1
Current agricultural enterprises within the surrounding locality	Section 5.2

AIS requirement	Section where addressed in this report
Assessment of impacts	
Identification and assessment of the impacts of the proposal on agricultural resources or industries	Section 7
Account for any physical movement of water away from agriculture	Section 7.9
Assessment of socio-economic impacts	Sections 7.10 and 7.12
Mitigation measures	
Proposal alternatives	Chapter A5 and AG of EIS
Monitoring programs to assess predicted verses actual impacts as the proposal progresses	Section 9 and to be addressed in the CEMP
Trigger response plans and trigger points at which operations will cease or be modified or remedial actions will occur to address impacts including a process to respond to unforeseen impacts	Section 9 and to be addressed in the CEMP
The proposed remedial actions to be taken in response to a trigger event	Section 9.1 and to be addressed in the CEMP
The basis for assumptions made about the extent to which remedial actions will address and respond to impacts	Section 9 and to be addressed in the CEMP
Demonstrated capacity for the rehabilitation of disturbed lands to achieve the final land use and restore natural resources	Sections 7.12 and 9
Demonstrated planning for progressive rehabilitation that minimises the extent of disturbance	Section 9
Consultation	Section 6

3. Assessment methodology

3.1 Overall approach

The proposal is about 306 kilometres long, with the majority of the proposal being of greenfield construction. The proposal traverses mainly rural land (grazing and cropping) and in addition to rural freehold land, the proposal includes Crown land (eg Pilliga East State Forest), travelling stock reserves, and land containing mineral resources and Native Title land.

The proposal intersects 274 properties, of which 141 are privately owned and 133 publicly owned. The route also traverses five local government areas (LGAs) - Narromine, Gilgandra, Coonamble, Warrumbungle and Narrabri. The boundaries of these five LGAs that intersect the proposal is referred to as the regional study area throughout this assessment.

The Agriculture and Land Use Assessment identifies impacts on each of the different land use types affected by the proposal and recommends mitigation to address the impacts. This assessment has been informed by the following assessments undertaken for the proposal:

- *ARTC Inland Rail Narromine to Narrabri Groundwater Assessment* (JacobsGHD, 2020a)
- *ARTC Inland Rail Narromine to Narrabri Flooding and Hydrology Assessment* (JacobsGHD, 2020b)
- *ARTC Inland Rail Narromine to Narrabri Noise and Vibration Assessment – Construction and Other Operations* (JacobsGHD, 2020c)
- *ARTC Inland Rail Narromine to Narrabri Noise and Vibration Assessment – Operational Rail* (SLR, 2020)
- *ARTC Inland Rail Narromine to Narrabri Social Assessment* (JacobsGHD, 2020d)
- *ARTC Inland Rail Narromine to Narrabri Biodiversity Development Assessment Report* (JacobsGHD, 2020e)
- *ARTC Inland Rail Narromine to Narrabri Aquatic Ecology Assessment* (JacobsGHD, 2020f).

The Agriculture and Land Use Assessment consists of three key phases as outlined below.

3.1.1 Baseline

The first phase was to define the land use and land tenure within and surrounding the proposal site. This stage included both desktop and field assessments to verify land uses. Desktop research included an analysis of publicly available data. This data includes Australian Bureau of Statistics (ABS) and Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) statistics, Australian Collaborative Land Use and Management Program (ACLUMP) land use, MinView application data from the Department of Regional NSW, Forestry Corporation of NSW supplied datasets, Environment, Energy and Science Group (EES) within the Department of Planning, Industry and Environment (DPIE) (formerly NSW Office of Environment and Heritage) land capability assessment and land use zoning and associated planning information from councils and DPIE public databases.

Following desktop analysis, an investigation of the different types of land uses was completed in November 2018. The field investigations involved driving the extent of the study area from Narromine to Narrabri and recording the different land uses, land capability and agricultural infrastructure from public roads. JacobsGHD did not undertake any consultation with landholders specifically for the purposes of this report, although engagement by ARTC and its specialist consultant with landholders provided valuable input for this report, as noted in section 3.2 and chapter 6 below. Landholder and community engagement for the proposal is also discussed in other technical papers, including (for example) the *Social Assessment* (JacobsGHD, 2020d) and chapter A4 of the EIS.

3.1.2 Impact assessment

The second phase involved documenting the range of impacts on agriculture and land use within the proposal site and surrounds. The agricultural component of this assessment has been structured to align with the *Agricultural Impact Statement Technical Notes* (DPI, 2013a). In particular, section 4.2.3 and section 4.1 analyse the land and soil capability and the land use of the proposal site respectively. This analysis and the corresponding figures includes an overview of existing land and soil capability and land use for the regional study area (section 4) and then provides a comparison of the location and areas of land to be temporarily removed from agriculture (section 7), areas to be returned post construction and areas that would not be returned to agriculture.

Potential non-agricultural impacts which are addressed in this report include impacts on mining, access to waterways and roads and known/proposed developments or planning strategies. Impacts on natural environmental values, including biodiversity, are addressed in the *Biodiversity Development Assessment Report* (JacobsGHD, 2020e).

From an agricultural perspective, impacts would be both direct and indirect as well as being influenced by seasonality (ie coincidence with key farming activities such as crop planting and harvesting, and livestock management including calving and lambing).

Severance of properties by the proposal would also impact on land use and would need to be recognised in planning and mitigation activities. For example, isolation of key agricultural infrastructure (eg grain silos, shearing sheds, sheep and cattle yards) would impact on agricultural production unless recognised and addressed appropriately.

Biosecurity with respect to weeds, pests and diseases are other important elements which need to be considered, and failure to do so could have long term impacts on agriculture.

A standardised approach to impact assessment would also be used to describe and assess the potential impacts on agriculture and other land uses.

3.1.3 Consultation

Since November 2017, ARTC has been undertaking consultation activities in association with the proposal. The efforts to date are summarised in the *Inland Rail Narromine to Narrabri (N2N) Consultation Report* (ARTC, 2020) that outlines the objectives, strategies and consultation completed by ARTC Inland Rail as both part of delivering the proposal and the EIS.

As part of the consultation and engagement program, ARTC has engaged Inclusive Engagement, an agricultural consultant, to undertake one-on-one consultation with around 100 landholders who owned property or resided in the study area. In February 2020, JacobsGHD met with Inclusive Engagement to discuss and analyse information from the property visits and to understand the key issues raised during individual consultation for incorporation into this report, where relevant.

3.1.4 Cumulative impacts

A cumulative impact assessment has been completed for land use and property, focussing on major projects in the vicinity of the proposal that are proposed or approved (refer to section 8). The area of influence for consideration is the extent of properties or commercial operations impacted by the proposal, and would extend to travelling stock reserves as well as any strategic cropping land.

3.2 Data sources

JacobsGHD completed the assessment as a desktop review drawing on a range of publicly available data sources and other information provided by ARTC. All data sources within the document are referenced. This study also relies on other specialist technical studies completed for the EIS. Accordingly, reference to the source document is provided where information from other specialist studies is used in this report.

ARTC also undertook one-on-one meetings with landholders who owned property or resided in the study area. These meetings were attended by representatives from ARTC and Inclusive Engagement. The information collected was provided to JacobsGHD to understand likely impacts of the proposal on agricultural land.

An assessment of potential impacts to land use and agriculture associated with the proposal was undertaken during a workshop on 19 February 2020 and was informed by the findings of studies undertaken for land use and agriculture, as described in this document. The workshop was attended by JacobsGHD staff and Inclusive Engagement.

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4. Existing environment

4.1 Land use

Land use mapping data (2017) is available from the Environment, Energy and Science Group (EES) within DPIE and captures how the landscape in NSW is being used for food production, forestry, nature conservation and urban development. The mapping shows land use occurring at the time the satellite imagery was acquired in September 2017 and the land use generally reflects the land and soil capability mapping as described in section 4.2.3.

JacobsGHD reviewed the DPIE spatial land use mapping and ground truthed it during an inspection of the proposal site in November 2018 and considers that the NSW DPIE land use mapping is suitable for use in this study. The following section provides an overview of land uses across the regional study area, followed by a detailed assessment of the factors that influences land use across the region including climatic conditions and land and soil capability.

4.1.1 Regional study area

Table 4.1 provides a summary of the main land uses within the regional study area. These are as follows:

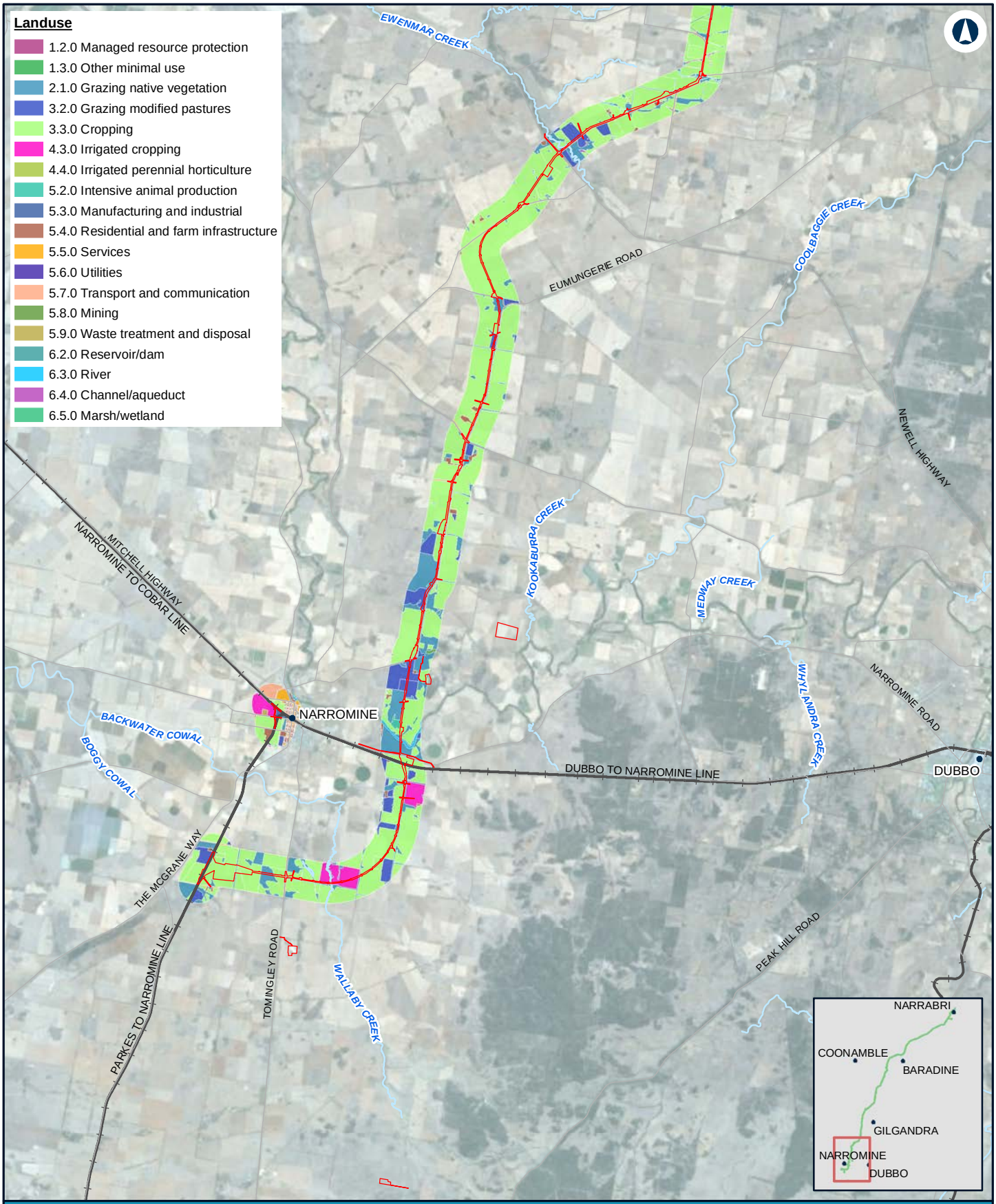
- Agricultural related land uses account for 80 per cent of the total land area (44 per cent grazing, 32 per cent dryland cropping, four per cent irrigated cropping and 0.1 per cent other agriculture).
- Irrigated cropping is primarily located in Narromine and Narrabri LGAs.
- Intensive animal production accounts for 561 hectares and includes poultry farms, beef and sheep feedlots, piggeries, horse studs, aquaculture and saleyards.
- Horticultural enterprises (dryland and irrigated) comprise 1,105 hectares and include tree fruits, olives, vegetables and herbs and grapes.
- Conservation accounts for 13 per cent of the total land area and includes the Pilliga State Conservation Area, Macquarie Marshes Nature Reserve, Nombinnie State Conservation Area and Yathong Nature Reserve.
- The Pilliga State Forest also provides valuable forest materials that are not available from NSW coastal forests. These forests include Pilliga East State Forest, Bibblewindi State Forest and Jacks Creek State Forest.

The final column in Table 4.1 includes the percentage of the different land uses for the proposal site and this shows the similarity in land uses between the proposal site (Figure 4.1) and the regional study area. This shows that the land uses within the proposal site are proportionally similar to land uses across the regional study area, although the proposal site intersects proportionately more cropping land than grazing land.

Table 4.1 Land use for the regional study area

Land use	Regional study area (ha)						Regional study area (per cent)	Proposal site (per cent)
	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle	Total		
Nature conservation	31,350	24,907	169,523	4,384	132,017	362,181	8	<0.1
Managed resource protection	387	264	70	90	147	959	0.02	0.01
Other minimal use	14,551	21,982	5,556	2,613	160,063	204,765	5	0.2
Grazing native vegetation	440,232	108,637	409,427	111,987	401,882	1,472,164	32	25
Production native forests	17,838	4,350	173,364	1,204	52,242	248,999	5	24
Plantation forests	37	0	34	6	665	741	0.02	<0.1
Grazing modified pastures	78,779	72,128	77,010	55,616	218,241	501,773	11	9
Cropping	391,815	240,648	328,435	255,137	239,327	1,455,362	32	38
Perennial horticulture	0	2	45	126	73	245	0	<0.1
Seasonal horticulture	0	0	0	89	0.2	90	0	<0.1
Land in transition	0	9	0	0	16	26	0	<0.1
Grazing irrigated modified pastures	3	0	0	612	0	614	0.01	<0.1
Irrigated cropping	1,590	554	110,731	77,439	3,922	194,236	4	0.75
Irrigated perennial horticulture	18	54	125	363	300	860	0.02	<0.1
Irrigated seasonal horticulture	0	0	0	1	0	1	0	<0.1
Irrigated land in transition	0	0	31	0	0	31	0	<0.1
Intensive horticulture	0	0	0	15	9	25	0	<0.1
Intensive animal production	130	52	193	72	113	561	0.01	<0.1
Manufacturing and industrial	64	50	745	427	91	1,378	0.03	0.3
Residential and farm infrastructure	3,048	2,837	6,544	3,641	8,477	24,547	1	0.3
Services	462	146	696	367	514	2,185	0.05	0.03

Land use	Regional study area (ha)						Regional study area (per cent)	Proposal site (per cent)
	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle	Total		
Utilities	2	1	82	3	7	95	0	<0.1
Transport and communication	4,999	2,354	2,852	3,796	4,131	18,131	0.40	3
Mining	30	38	4,092	555	167	4,882	0.11	0.21
Waste treatment and disposal	62	30	243	38	52	426	0.01	<0.1
Lake	0	0	0	66	0	66	0.00	<0.1
Reservoir/dam	909	215	7,282	2,417	227	11,050	0.24	0.02
River	3,912	3,658	2,930	1,809	13,168	25,477	1	0.1
Channel/aqueduct	132	248	157	1,207	0	1,743	0.04	0.01
Marsh/wetland	1,182	151	1,321	2,037	151	4,842	0.11	0.12
Grand total	**991,532**	**483,314**	**1,301,486**	**526,118**	**1,236,005**	**4,538,454**	**100**	**100**



NARROMINE TO NARRABRI Land use for the corridor around the proposal site Figure 4.1a

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

The proposal site

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; Landuse: OEH; Footprints: GHDJACOBS

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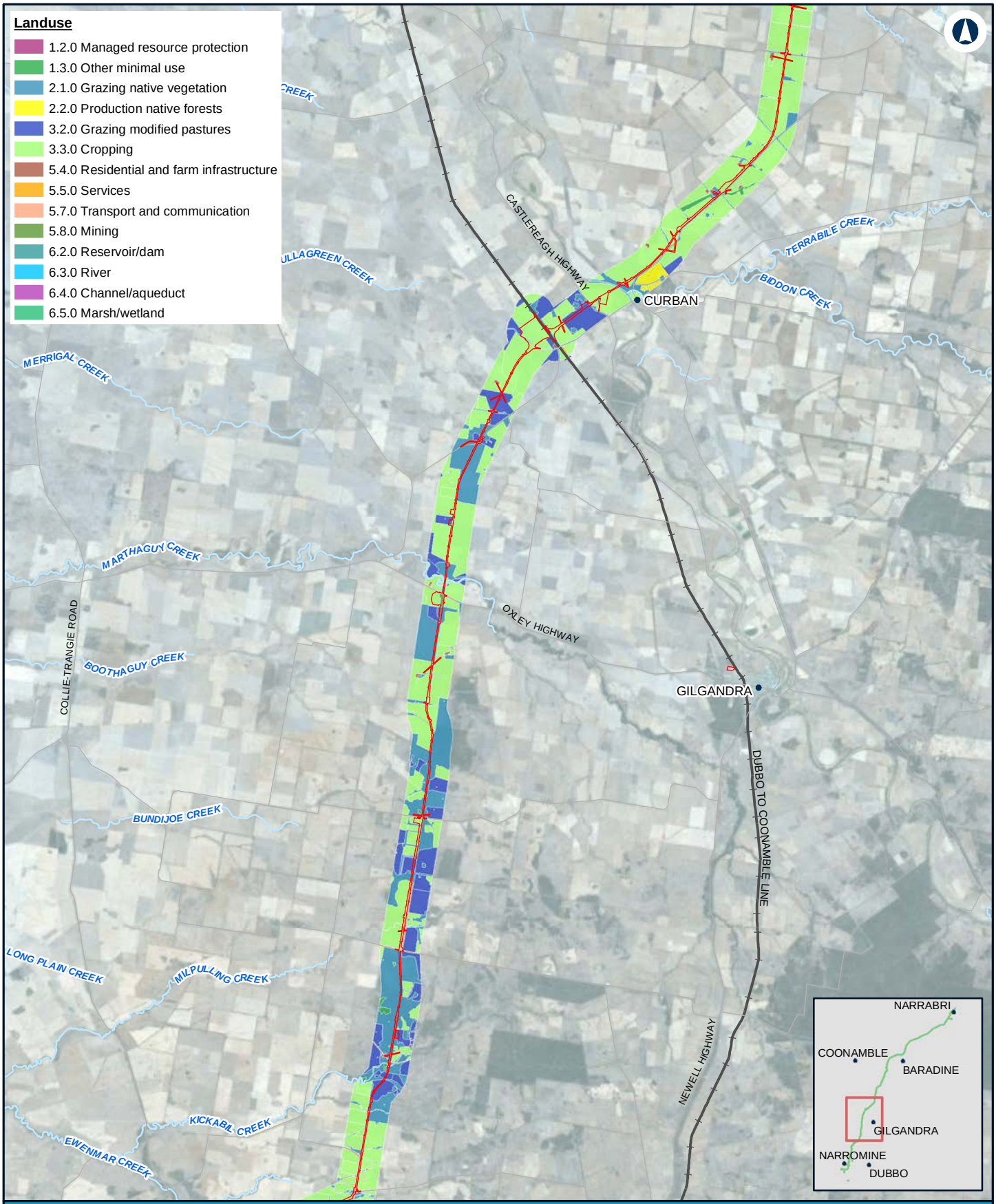

NARROMINE TO NARRABRI Land use for the corridor around the proposal site Figure 4.1b

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

The proposal site

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; Landuse: OEH; Footprints: GHDJACOBS

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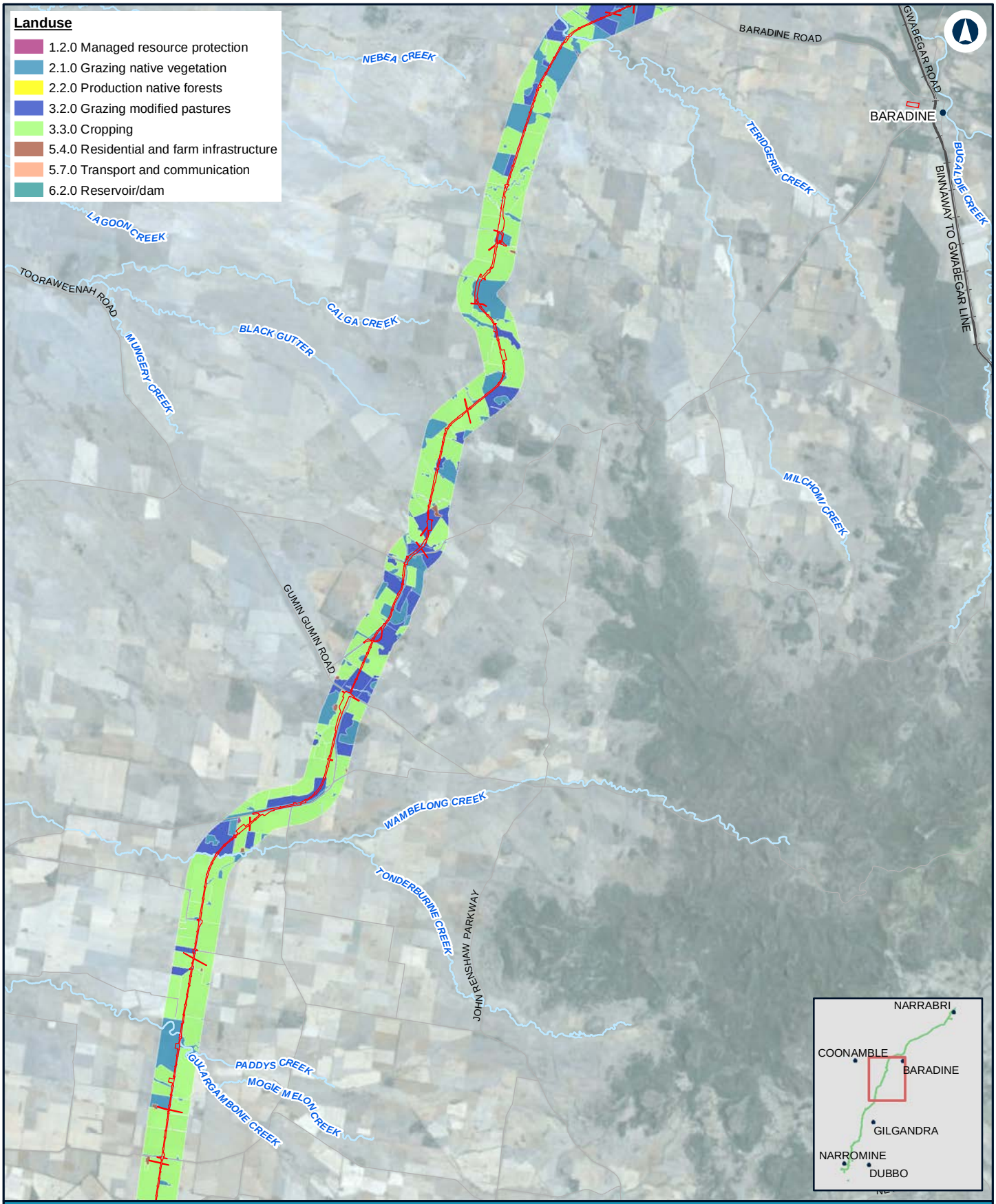

NARROMINE TO NARRABRI Land use for the corridor around the proposal site Figure 4.1c

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

The proposal site

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Data Sources: Basemap layers: NSWSS; Landuse: OEH; Footprints: GHDJACOBS

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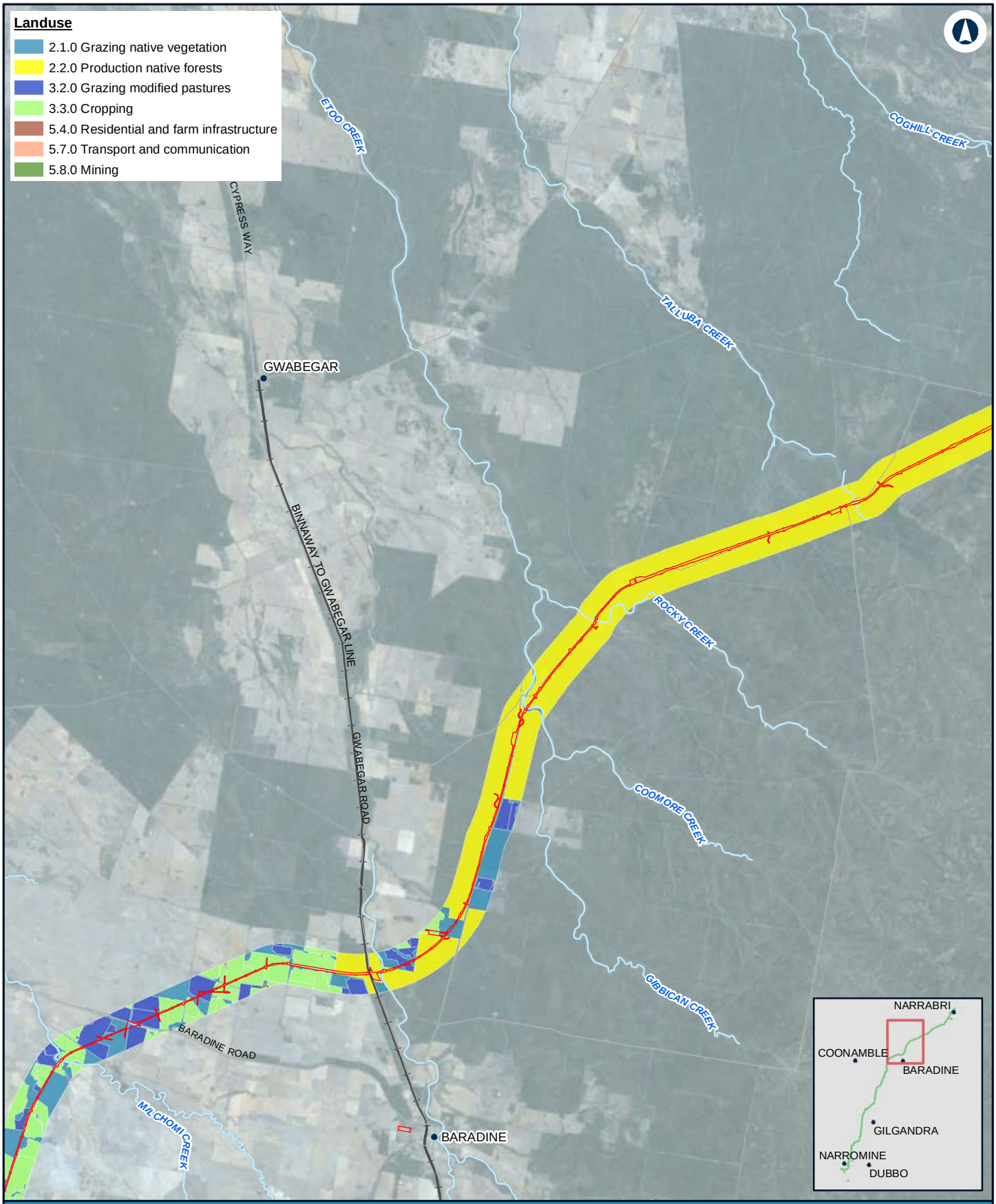

NARROMINE TO NARRABRI Land use for the corridor around the proposal site Figure 4.1d

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

The proposal site

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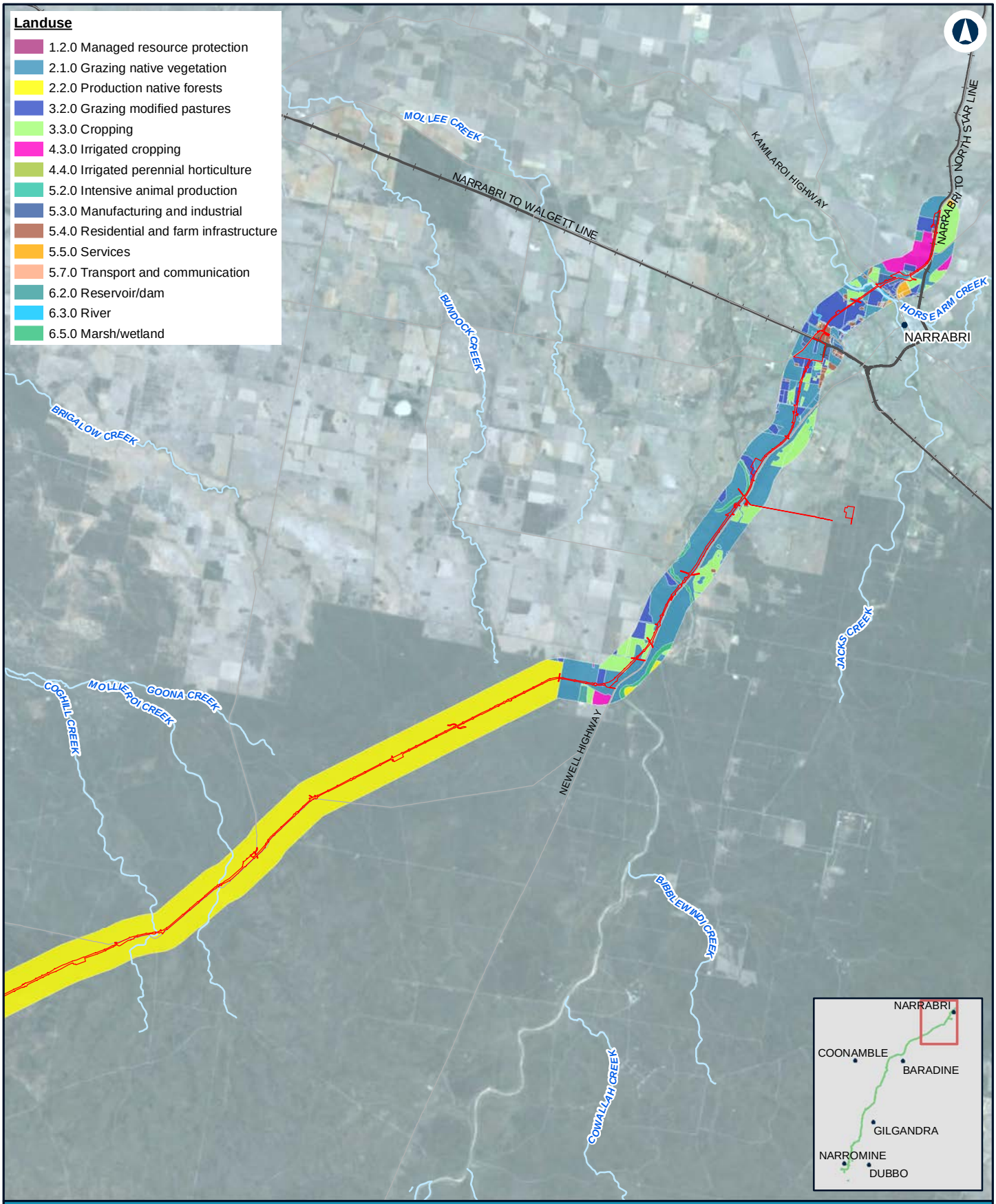

NARROMINE TO NARRABRI Land use for the corridor around the proposal site Figure 4.1e

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

The proposal site

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4.2 Agriculture

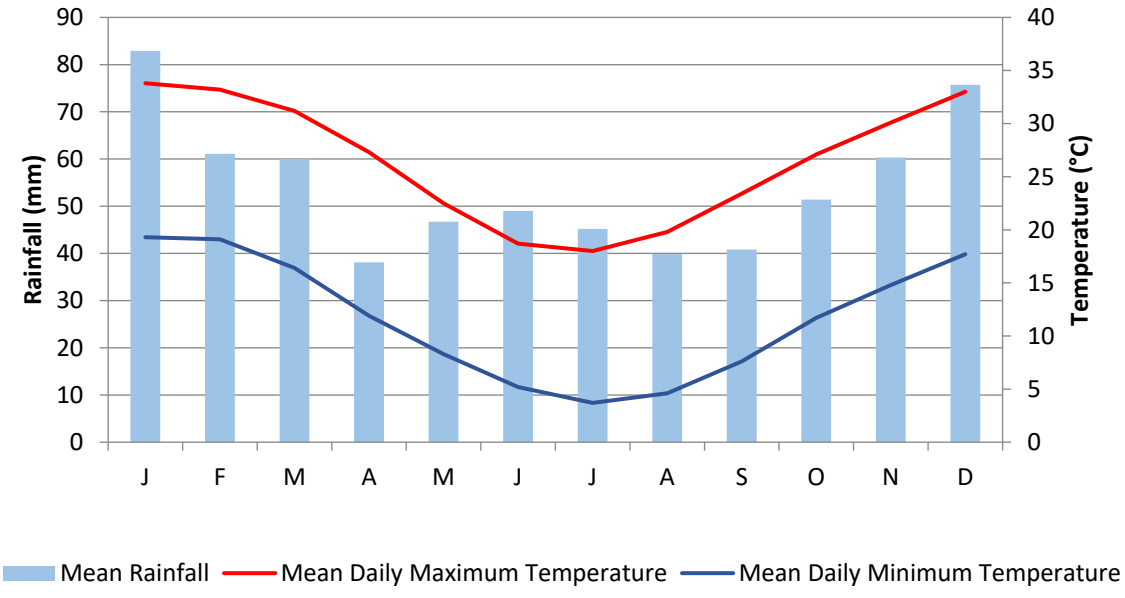
4.2.1 Climate

Climatic conditions have been analysed for two locations across the study area - Narrabri in the north-east and Trangie in the south-west of the proposal site These locations were chosen due to the availability of current and historic climate data and because they represent the range of climatic extents along the proposal site that have an influence on agricultural production.

Narrabri is located in the North West Slopes and Plains region of NSW. The average annual rainfall at Narrabri is 658.5 millimetres per year with a pattern of higher rainfall in summer compared to winter months (refer to Figure 4.2). Temperatures are characterised by hot maximum temperatures in summer (with high evaporation rates) and low minimum temperatures in winter (including frost risk).

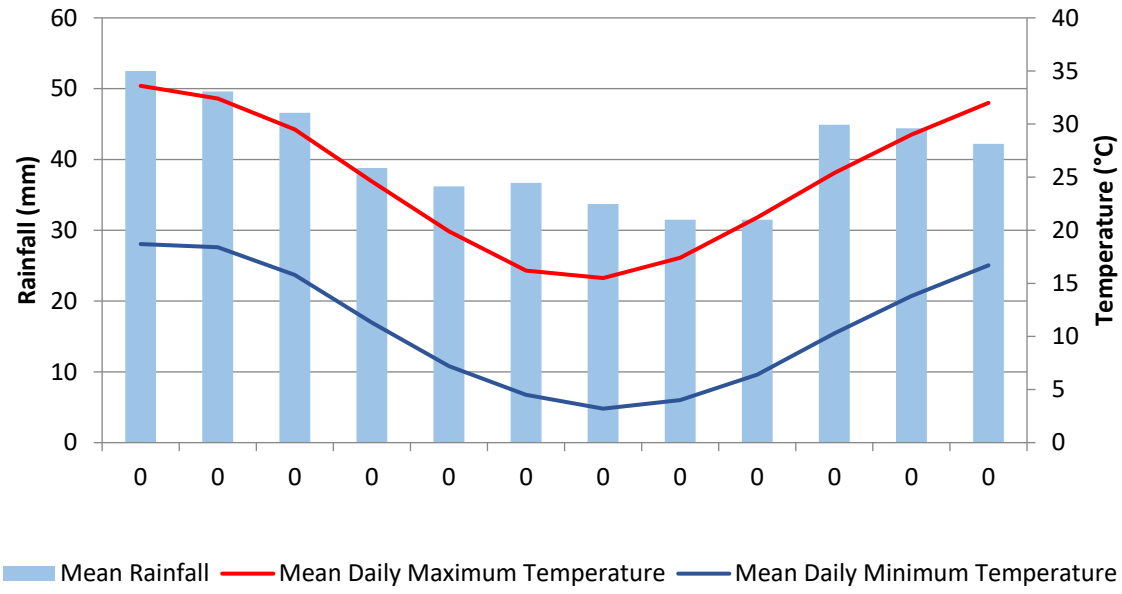
Trangie is located to the south-west of the study area and has an average annual rainfall of 498 millimetres. Unlike Narrabri, Trangie's rainfall is more evenly distributed across the year (refer to Figure 4.3). Mean daily maximum and minimum temperatures are slightly lower than Narrabri.

The climatic data for Narrabri is from the Bureau of Meteorology (BOM) Narrabri West Post Office (Station Number 053030) based on records dating from 1891 through to 2018. Such long-term records provide information on rainfall and temperature patterns throughout the year that assist in understanding agricultural enterprise selection and production in the area. Likewise, climatic data for Trangie Research Station AWS (Station Number 051049) is based on BOM records dating from 1922 through to 2018.



Source: Bureau of Meteorology Narrabri West Post Office Station Number 053030

Figure 4.2 Climate statistics for Narrabri West Post Office



Source: Bureau of Meteorology Trangie Research Station AWS Number 051049

Figure 4.3 Climate statistics for Trangie (near Narromine)

Average rainfall and temperature conditions at selected locations have an impact on the choice of agricultural enterprises, however the actual selection of enterprises on individual properties relies on a complex interaction of a range of variables in addition to climate, in particular land and soil capability which is described in section 4.2.2. While average rainfall and temperature are important indicators of potential rain-fed agricultural production, actual annual production is greatly influenced by monthly variability compared to the monthly average. Variability of rainfall is illustrated in Table 4.2 with the comparison of rainfall per month in 2019 and the long-term mean monthly rainfall for Trangie Research Station. For example, while average rainfall for March is 46.6 millimetres the amount recorded for March 2019 was 17.6 millimetres. By contrast, the average rainfall for October is 44.9 millimetres while the amount recorded for October 2019 was 2.2 millimetres.

While rainfall impacts on all forms of agricultural production, surface water and groundwater resources also have an impact depending on availability. These resources provide opportunities for irrigation and livestock drinking water and are discussed further in section 5.

Table 4.2 Mean rainfall statistics against monthly statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean rainfall (mm)	52.5	49.7	46.6	38.8	36.2	36.7	33.7	31.5	31.5	44.9	44.4	42.2
Rainfall in 2019 (mm)	58.0	16.8	17.6	0.0	18.6	5.8	9.8	3.2	5.4	2.2	20.2	2.4

Source: Bureau of Meteorology Trangie Research Station AWS Number 051049

4.2.2 Strategic agricultural land

Strategic agricultural land is identified under the NSW Government's *Strategic Regional Land Use Policy* (2012). Strategic agricultural land is highly productive land that has unique natural resource characteristics (such as soil and water resources) and socio-economic value (such as high productivity, infrastructure availability and access to markets). Two categories of strategic agricultural land have been identified by the NSW Government: critical industry clusters and biophysical strategic agricultural land.

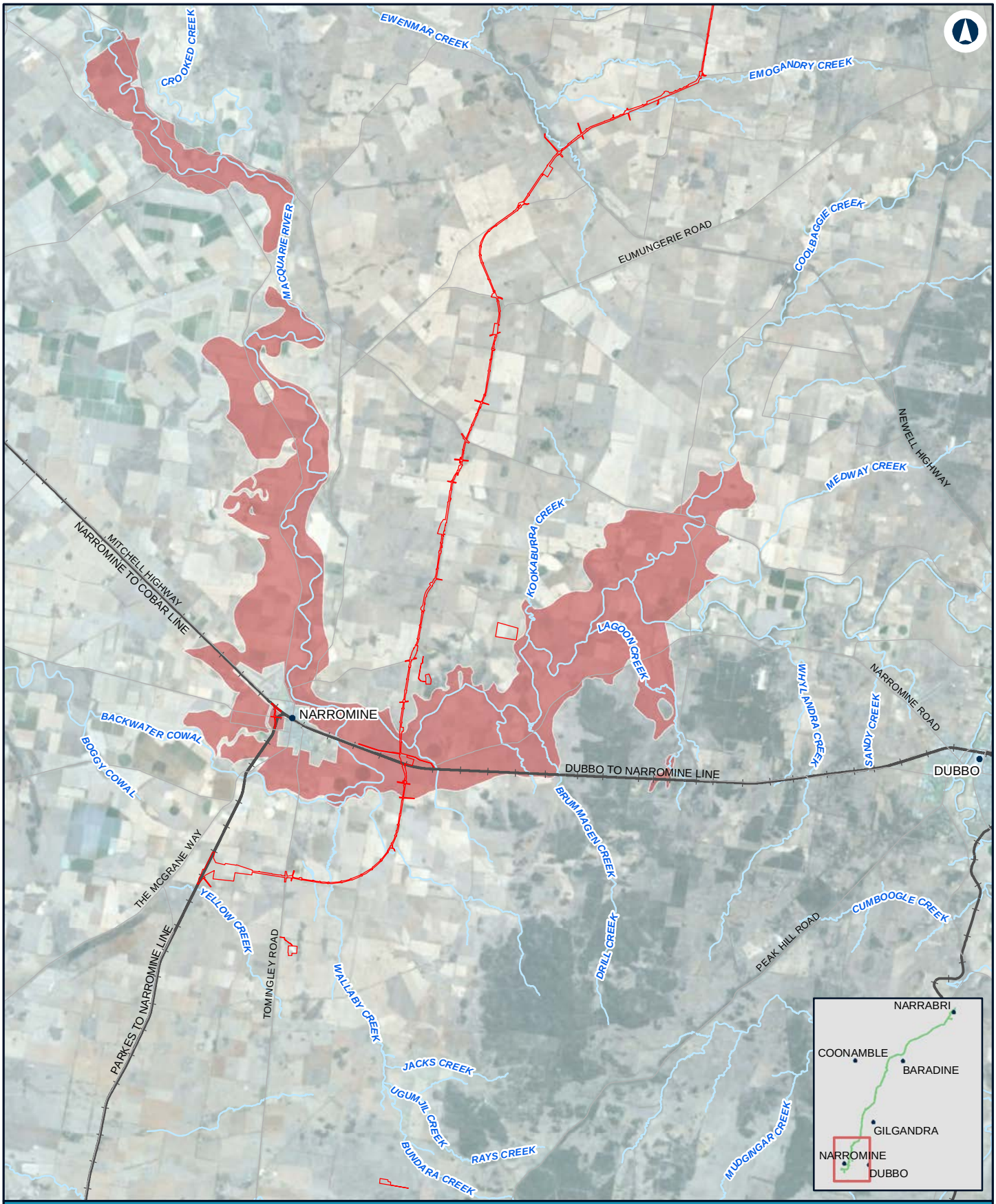
Critical industry clusters

Critical industry clusters are concentrations of highly productive industries within a region that are related to each other, contribute to the identity of that region and provide significant employment opportunities.

No critical industry clusters have been identified by the NSW Government in the proposal site or regional study area.

Biophysical strategic agricultural land

Biophysical strategic agricultural land (BSAL) is land with high quality soil and water resources capable of sustaining high levels of productivity. A total of 2.8 million hectares of BSAL has been identified and mapped at a regional scale across the State by the NSW Government. BSAL is shown on NSW Government mapping at multiple locations intersected by the proposal as shown in Figure 4.4. Refer to section 7.2 for the total area of BSAL intersected by the proposal site. As this proposal is not being developed under the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (NSW), a site verification process has not been undertaken to determine the existence of BSAL.



NARROMINE TO NARRABRI Biophysical strategic agricultural land Figure 4.4a

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; BSAL: DPE; Footprints: GHDJACOBS

LEGEND

- The proposal site
- Biophysical Strategic Agricultural Land

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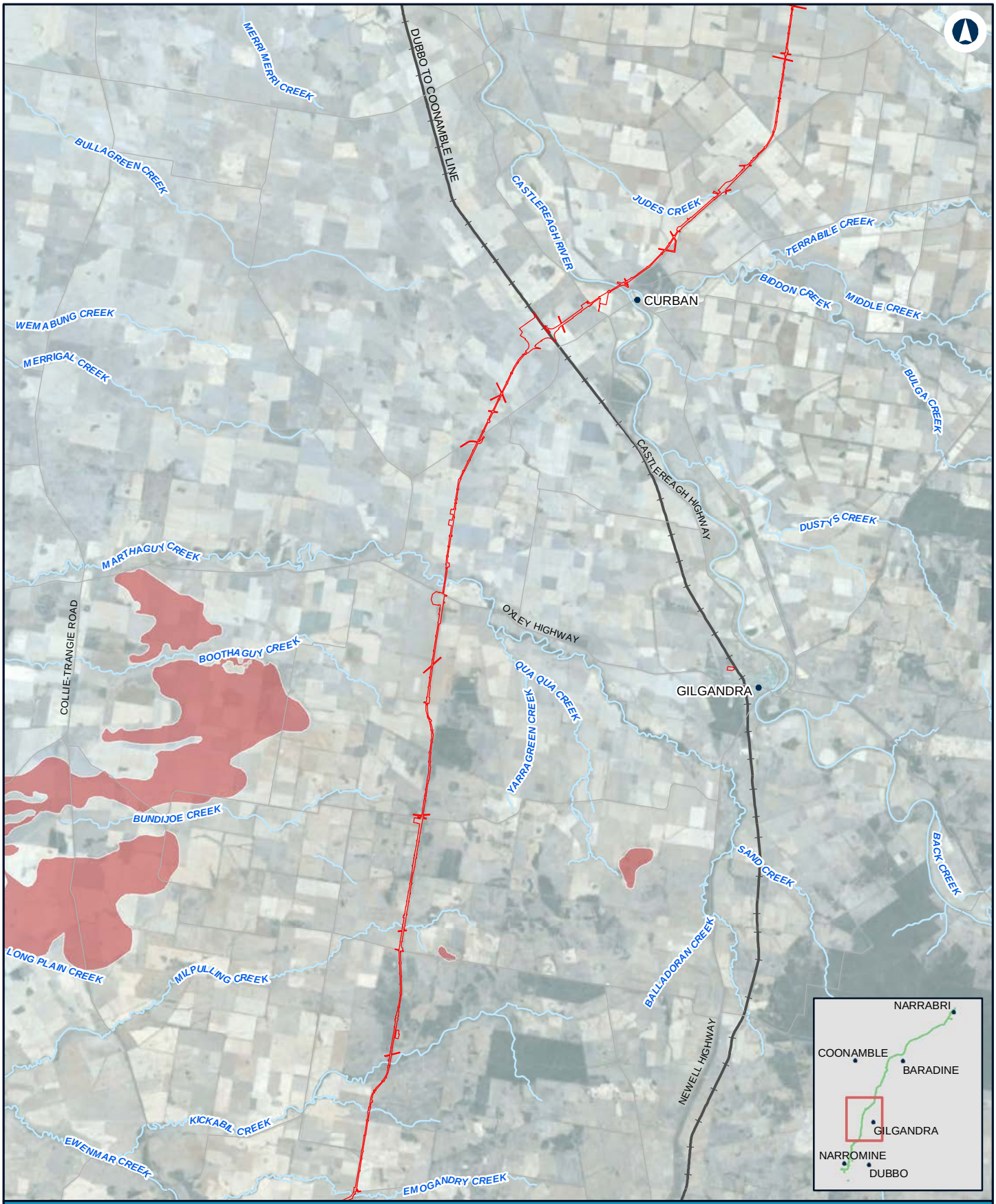

NARROMINE TO NARRABRI Biophysical strategic agricultural land Figure 4.4b

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/05/2020 Paper: A4
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Data Sources: Basemap layers: NSWSS; BSAL: DPE; Footprints: GHDJACOBS

LEGEND

- The proposal site
- Biophysical Strategic Agricultural Land

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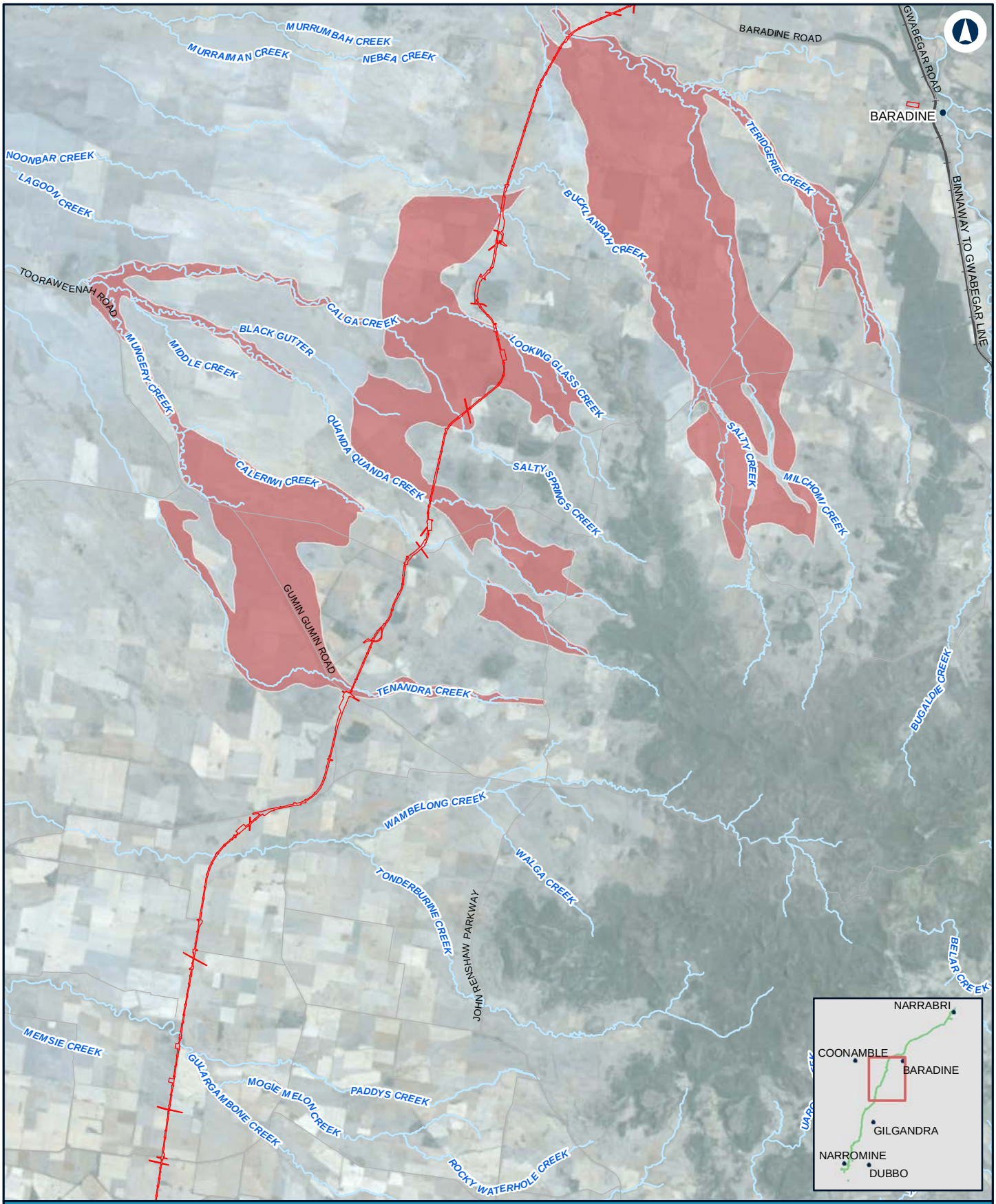

NARROMINE TO NARRABRI

Biophysical strategic agricultural land

Figure 4.4c

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- The proposal site
- Biophysical Strategic Agricultural Land

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; BSAL: DPE; Footprints: GHDJACOBS

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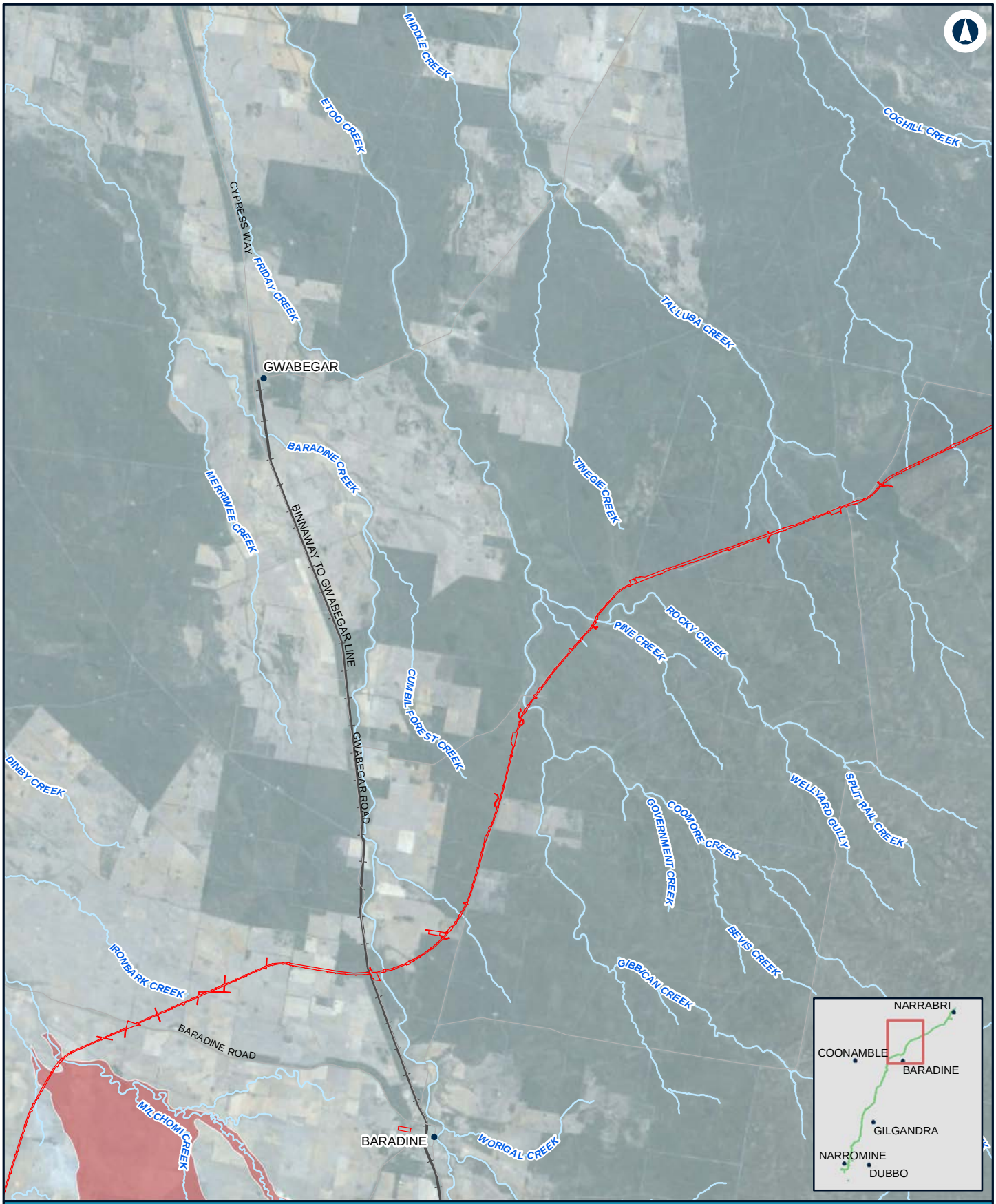

NARROMINE TO NARRABRI Biophysical strategic agricultural land Figure 4.4d

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; BSAL: DPE; Footprints: GHDJACOBS

LEGEND

- The proposal site
- Biophysical Strategic Agricultural Land

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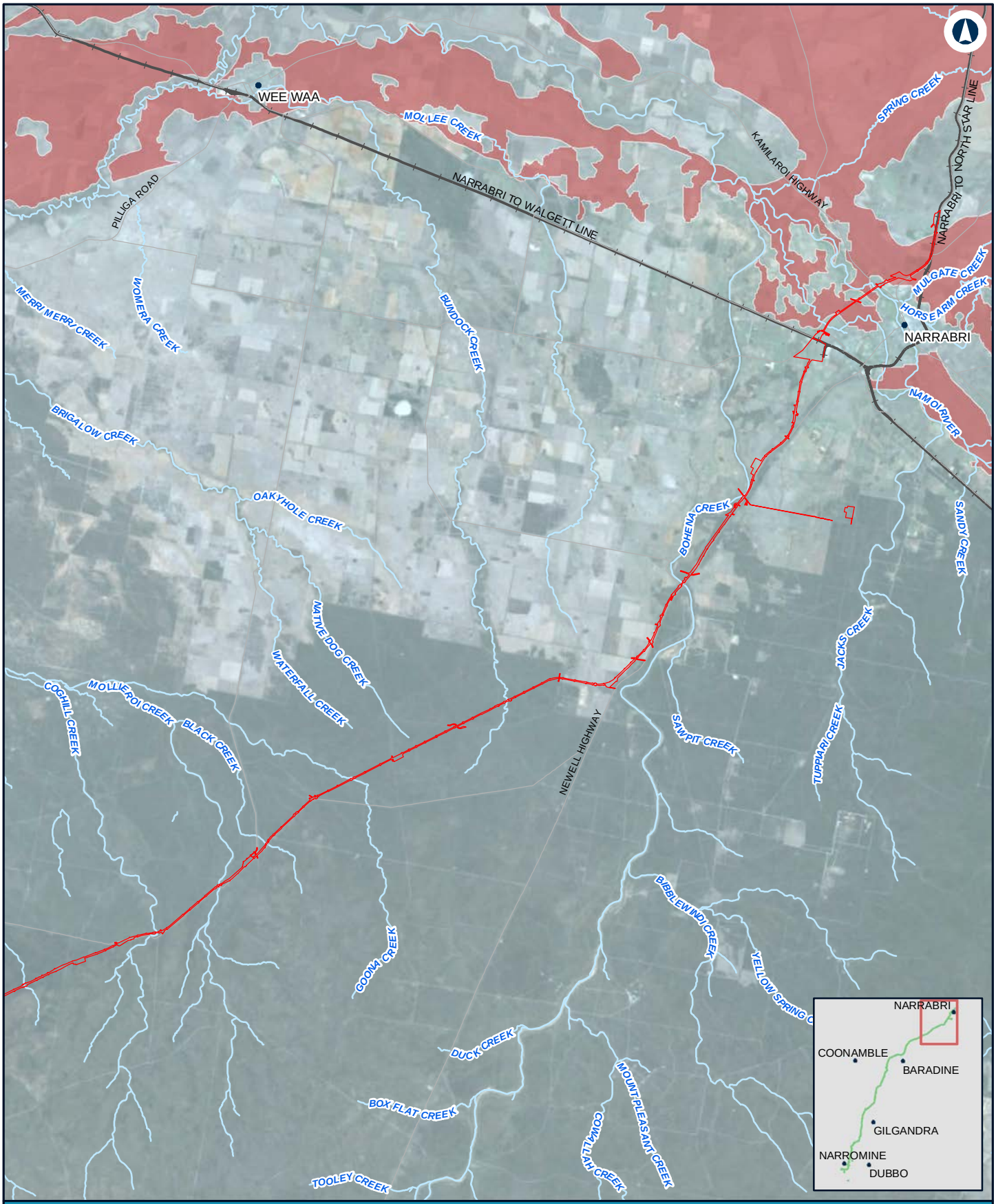

NARROMINE TO NARRABRI

Biophysical strategic agricultural land

Figure 4.4e

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- The proposal site
- Biophysical Strategic Agricultural Land

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4.2.3 Land and soil capability, including slope

Most agricultural enterprises depend on the local natural resource base that determines the suitability of a location for a specific enterprise. There is a range of natural resources that need to be considered including soil type, topography, and climate and water availability. The land and soil capability assessment scheme uses the biophysical features of the land and soil including landform, slope gradient, drainage, climate, soil properties to provide a broad-scale assessment of land capability. Land capability for agricultural production in the regional study area is a function of a range of natural resource conditions including geomorphology, topography, vegetation and soils.

Land in NSW is commonly classified according to the capability of land to remain stable under particular land uses. Land capability systems classifies land in terms of inherent physical characteristics or constraints, it considers the optimum use of land rather than the maximum use and in general will not change over time. The 8-class classification is shown in Table 4.3 and shows that Class 1 to Class 3 are considered to be capable of being regularly cultivated while the remaining classes are not capable of being regularly cultivated and are suitable for grazing. It should be noted, however, that the adoption of nil-till or minimum till cropping technology can extend the capability of Class 4 and above land as suitable for cultivation.

Table 4.3 Land and soil capability

Broad category	LSC Class	General definition
Land capable of being regularly cultivated and used for a wide variety of land uses (cropping, grazing, horticulture, forestry, nature conservation) (Slope <10%)	1	**Extremely high capability land:** Land has no limitations. No special land management practices required. Land capable of all rural land uses and land management practices.
	2	**Very high capability land:** Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation.
	3	**High capability land:** Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation.
Land capable of a variety of land uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation) (Slope 10% - 20%)	4	**Moderate capability land:** Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.
	5	**Moderate–low capability land:** Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.

Broad category	LSC Class	General definition
Land capable for a limited set of land uses (grazing, forestry and nature conservation, some horticulture) (Slope 20% - 33%)	6	**Low capability land:** Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation
Land generally incapable of agricultural land use (selective forestry and nature conservation) (Slope > 33%)	7	**Very low capability land:** Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation.
	8	**Extremely low capability land:** Limitations are so severe that the land is incapable of sustaining any land use apart from nature conservation. There should be no disturbance of native vegetation.
Other	98	Rock and disturbed terrain
	99	Water

Source: The land and soil capability assessment scheme (NSW OEH (2012)) – second approximation

Regional study area

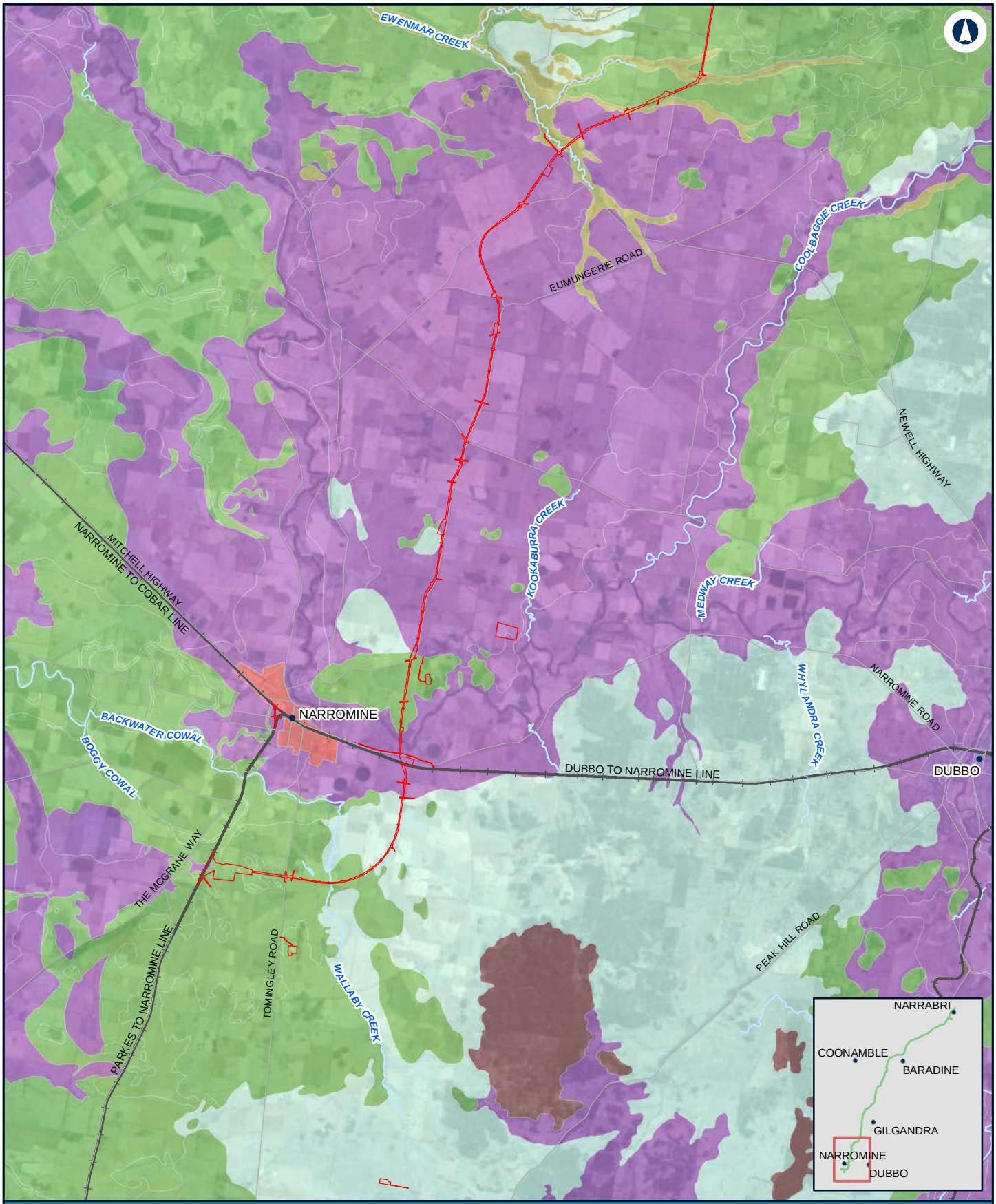
Table 4.4 provides an overview of the land and soil capability for the regional study area. Almost 89 per cent of the land is classified as land and soil capability Class 2 to Class 5 (as per the description of each category outlined in Table 4.3). Table 4.4 includes a column of the percentage of the different land and soil capability classes for the proposal site – operation (from Table 7.2) and this shows the similarity between land and soil capability between the proposal site and the regional study area, noting that the proposal site primarily avoids land classes 2, 7 and 8. The land and soil capability classification scheme provides a good indication of the capability of the land to support other types of land use practices across the regional study area which is discussed in further detail in section 4.1.

Table 4.4 Land and soil capability for the regional study area

Land and soil capability class	Regional study area (ha)						Regional study area (per cent)	Proposal site (per cent)
	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle	Total		
2	4,196	16,761	246,285	5,842	48,236	321,319	7	1
3	201,743	97,149	288,093	187,352	154,572	928,908	20	24
4	620,942	248,126	225,494	277,325	290,500	1,662,387	37	35
5	100,731	57,935	446,231	43,621	499,836	1,148,354	25	36
6	54,855	47,141	27,063	2,318	180,781	312,158	7	4
7	8,665	16,129	63,626	7,946	58,553	154,917	3	0
8	4	0	4,648	0	4,025	8,678	0.2	0
Other[1]	0	0	997	1,430	123	2,550	0.1	0.2
Total[2]	**991,136**	**483,240**	**1,302,436**	**525,833**	**1,236,627**	**4,539,271**	**100**	**100**

Notes: 1. Other category includes water bodies and not assessed areas including rock and disturbed terrain.

2. Numbers have been rounded to the nearest whole number with the exception of any figures <1%.



NARROMINE TO NARRABRI Land and soil capability for the study area Figure 4.5a

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; LSC: OEH; Footprints: GHDJACOBS

LEGEND

The proposal site

Land and soil capability

- 3. High capability land
- 4. Moderate capability land
- 5. Moderate-low capability land
- 6. Low capability land
- 7. Very low capability land
- 98. Not assessed (rock, disturbed terrain)

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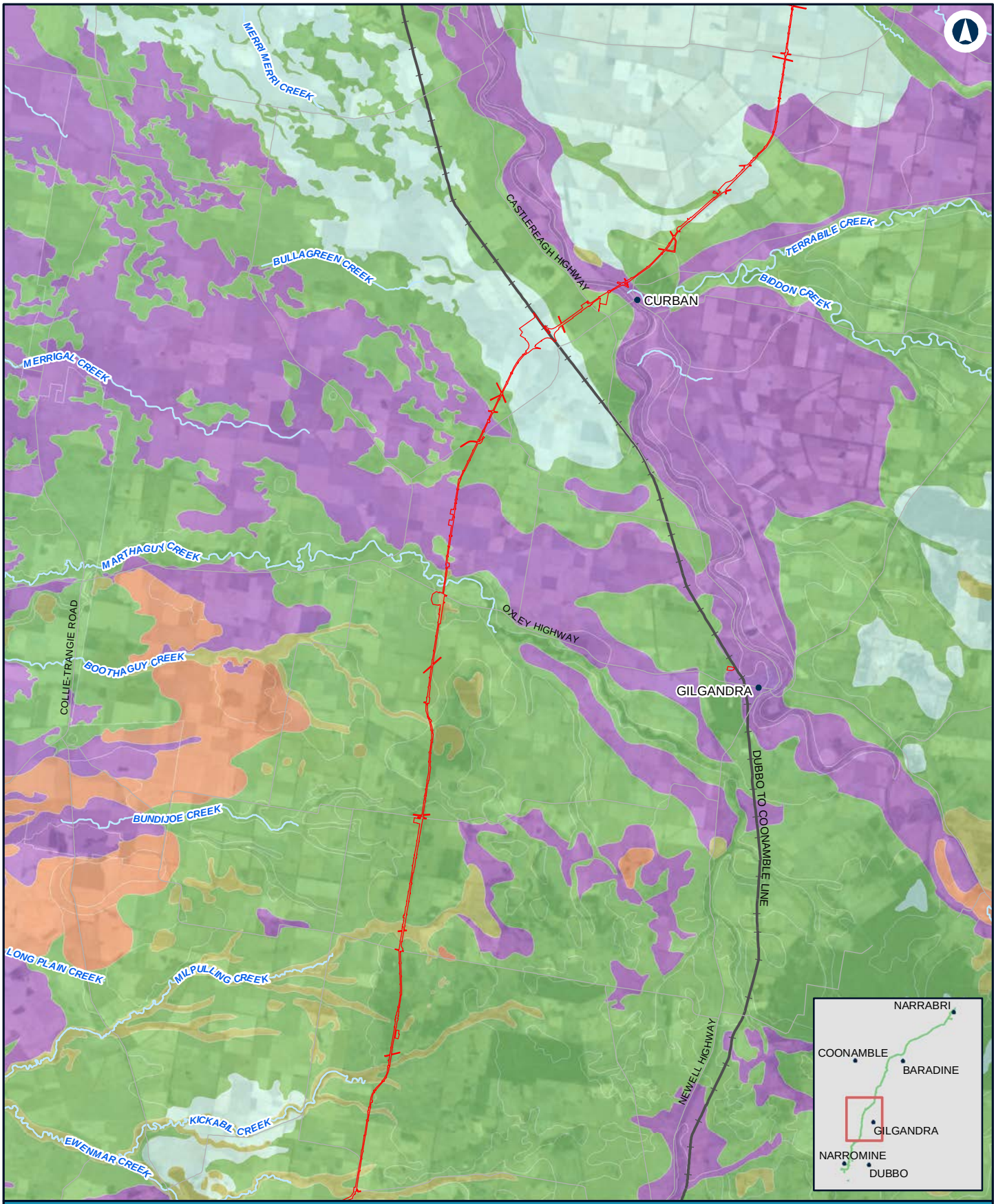

NARROMINE TO NARRABRI Land and soil capability for the study area Figure 4.5b

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; LSC: OEH; Footprints: GHDJACOBS

LEGEND

The proposal site

Land and soil capability

- 2. Very high capability land
- 3. High capability land
- 4. Moderate capability land
- 5. Moderate-low capability land
- 6. Low capability land
- 99. Water

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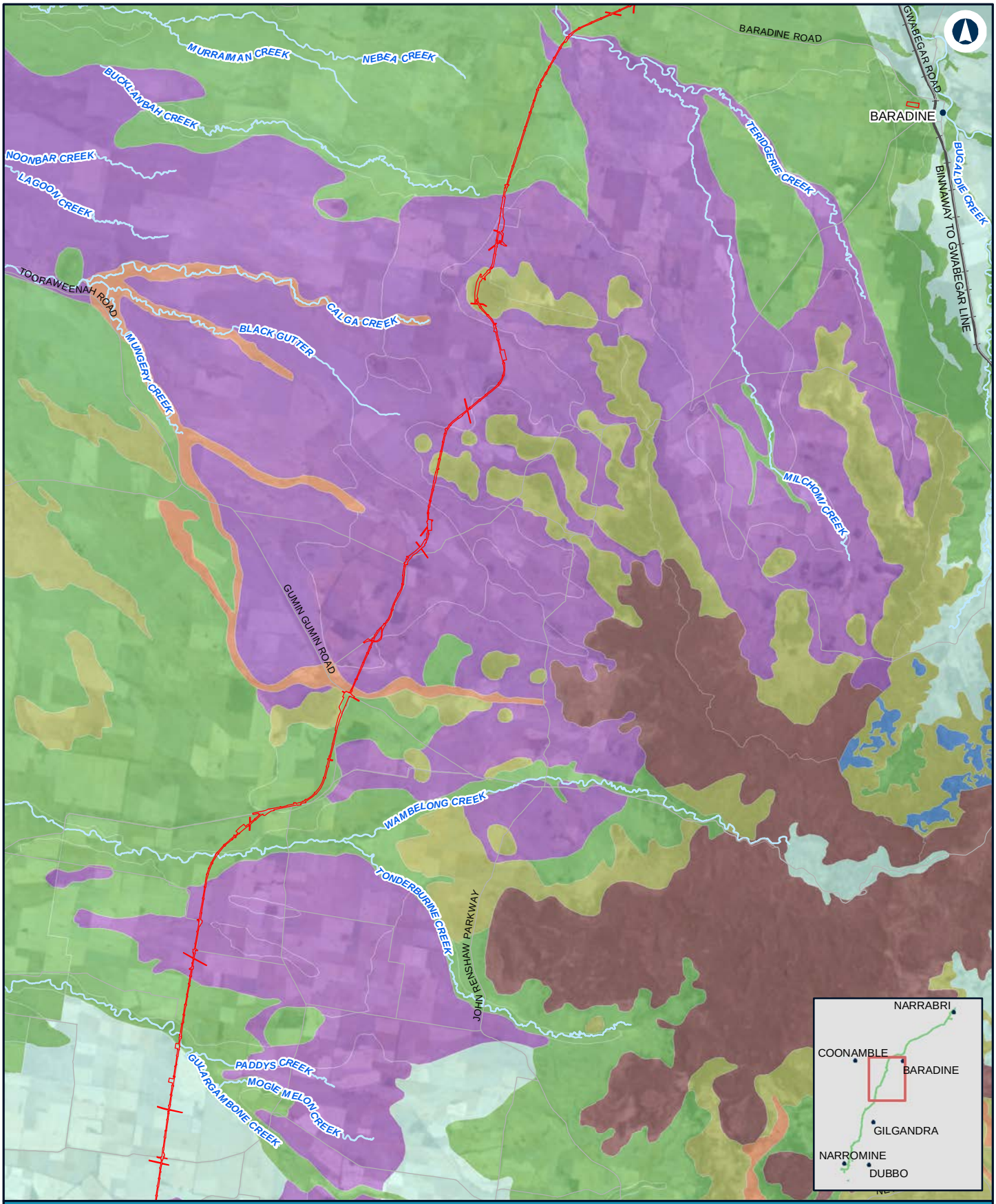

NARROMINE TO NARRABRI Land and soil capability for the study area Figure 4.5c

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; LSC: OEH; Footprints: GHDJACOBS

LEGEND

The proposal site

Land and soil capability

- 2. Very high capability land
- 3. High capability land
- 4. Moderate capability land
- 5. Moderate-low capability land
- 6. Low capability land
- 7. Very low capability land
- 8. Extremely low capability land

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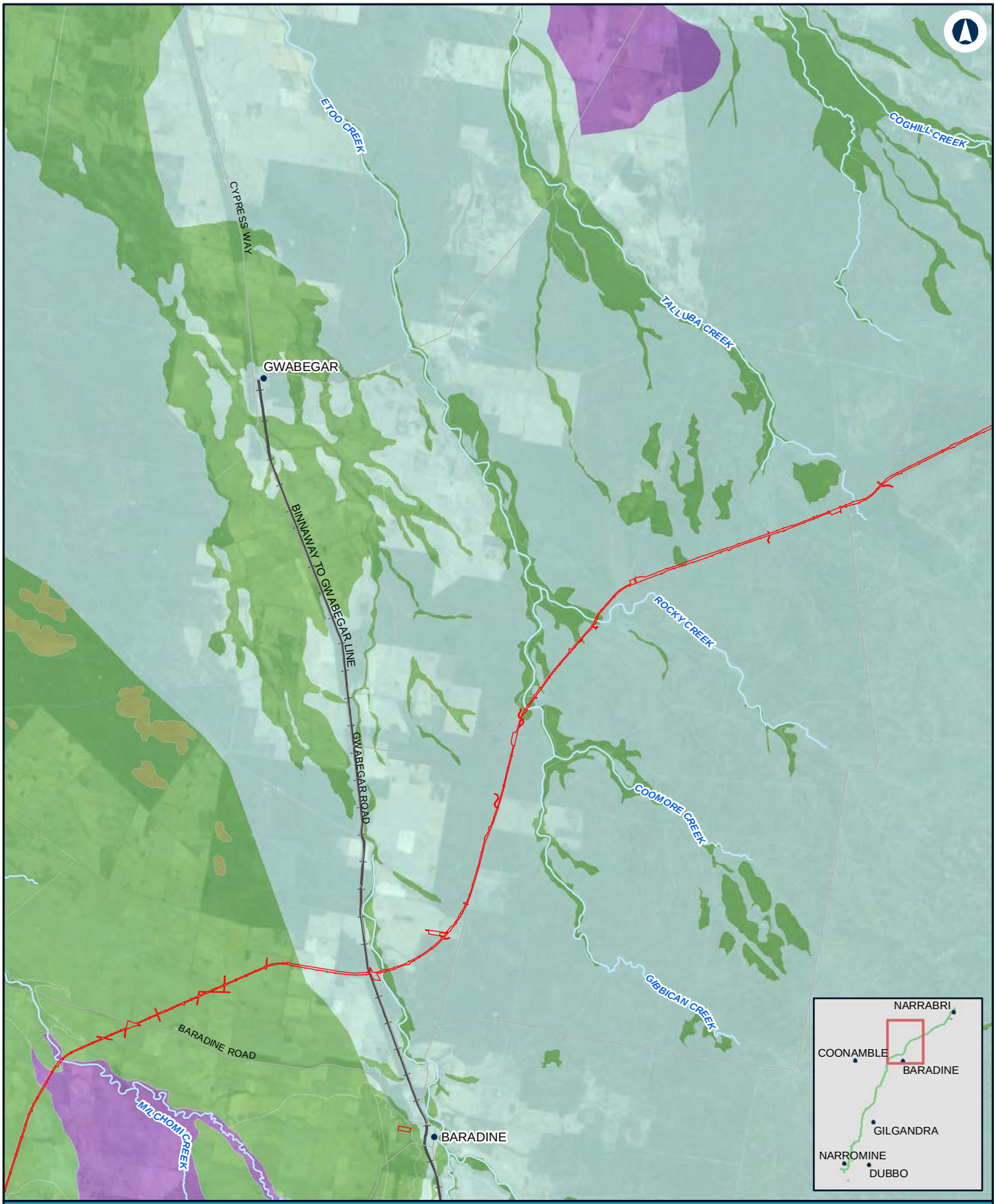

NARROMINE TO NARRABRI

Land and soil capability for the study area

Figure 4.5d

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; LSC: OEH; Footprints: GHDJACOBS

LEGEND

The proposal site

Land and soil capability

- 3. High capability land
- 4. Moderate capability land
- 5. Moderate-low capability land
- 6. Low capability land

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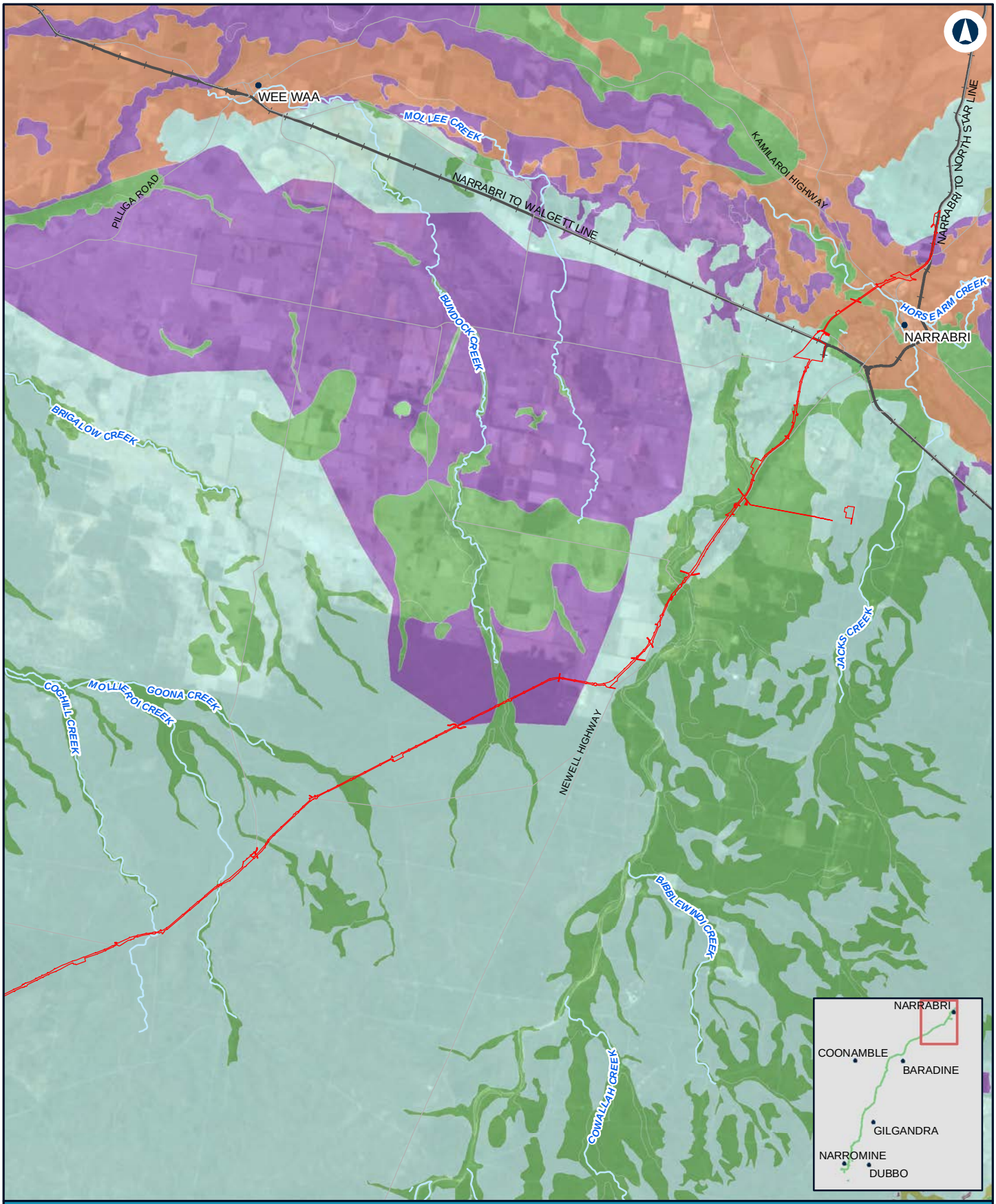

NARROMINE TO NARRABRI Land and soil capability for the study area Figure 4.5e

0 3.5 7 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/05/2020 Paper: A4
Author: JacobsGHD Scale: 1:260,000
Data Sources: Basemap layers: NSWSS; LSC: OEH; Footprints: GHDJACOBS

LEGEND

The proposal site

Land and soil capability

- 2. Very high capability land
- 3. High capability land
- 4. Moderate capability land
- 5. Moderate-low capability land
- 6. Low capability land
- 7. Very low capability land

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4.3 Forestry

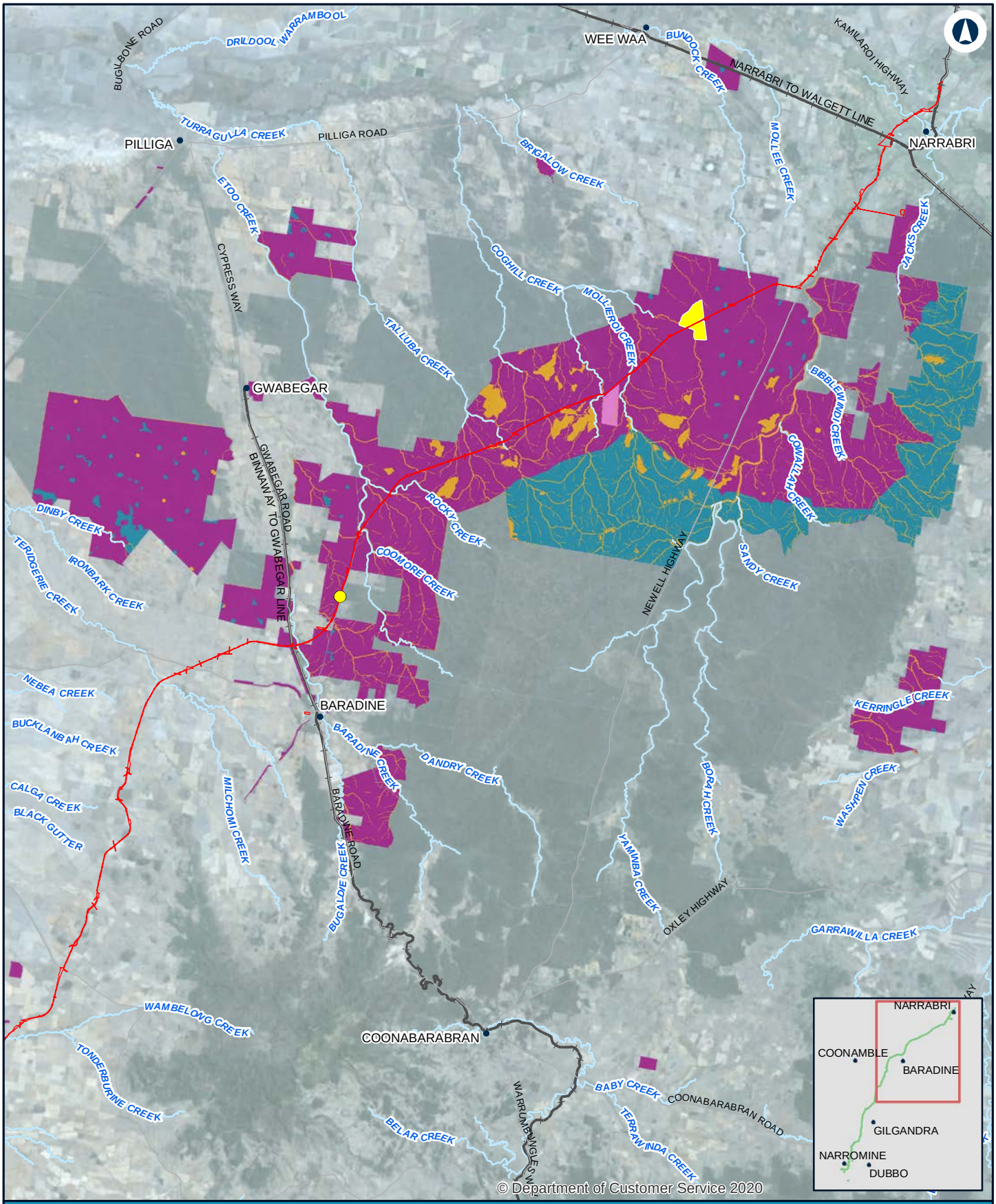
The regional study area contains forests providing valuable forest materials that are not available from NSW coastal forests. Within the regional study area, the key state forests are the state forests of the Pilliga. Figure 4.6 shows the forest management zoning system for the Pilliga forests. The Pilliga forests are managed by Forestry Corporation of NSW who are the largest manager of commercial native and plantation forests in NSW. Forestry Corporation of NSW manage around two million hectares of native forests for sustainable timber production, recreation and biodiversity.

Forestry in the region is managed under the *Integrated Forestry Operations Approval for Brigalow-Nandewar Region* (NSW Government, 2010), which guarantees a supply of logs until 31 December 2025, in exchange for establishment of the Brigalow and Nandewar Community Conservation Area (CCA). The key resources available for forestry in the regional study area are white cypress and western ironbark logs (NSW Government, 2010, clause 5).

White cypress is valued as softwood timber due to its superior durability, density and termite resistance (Natural Resources Commission, 2010, p76). The tree is generally harvested for sawlogs. The slow rate of growth means that the trees do not reach a harvestable condition for at least 50 years.

The Integrated Forestry Operations Approval restricts the harvesting of timber for low value uses such as charcoal production.

The forests in the regional study area also support passive and active recreation activities, including hunting with a permit. Recreational sites include the Aloes Picnic Ground in the Cumbil State Forest, the location of a historic homestead, and the Rocky Creek Mill historic site in the Euligal State Forest, also now used as a picnic area.



NARROMINE TO NARRABRI

State forest resources

Figure 4.6

0 8 16 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 18/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:600,000
Data Sources: Basemap layers: NSWSS; Footprints: GHDJACOBS

LEGEND

- The proposal site
- Harvest planned by end 2020

Forest management zones

- Zone 1 - Special Protection Zone
- Zone 3A - Harvesting Exclusions Zone
- Zone 3B - Special Prescription Zone
- Zone 4 - General Management Zone
- Zone 7 - Non Forestry Use Zone
- Continuous Forestry Inventory Plot

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4.4 Environmentally sensitive lands and processes

4.4.1 Protected areas and critical habitats

The regional study area contains a number of protected lands managed under the *National Parks and Wildlife Act 1974*, shown in Figure 4.7. The *Brigalow and Nandewar Community Conservation Area Act 2005* significantly increased the quantity of protected lands in the regional study area.

The regional study area does not have any areas protected under the *Marine Estate Management Act 2014*.

The regional study area does not contain any critical habitat identified under the *Biodiversity Conservation Act 2016*, the *Fisheries Management Act 1994* or the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

4.4.2 Biobank sites, private conservation lands and other offset lands

Searches of public registers under the former *Threatened Species Conservation Act 1995* and the *Biodiversity Conservation Act 2016* was completed on 5 March 2020 identifying:

- one Biodiversity Banking Agreement located in Narrabri LGA and the Peel-Namoi Interim Biogeographic Regionalisation for Australia (IBRA) subregion
- one Biodiversity Banking Agreement located in the Warrumbungle LGA and the Liverpool Plains (Part B) IBRA subregion.

Public register data does not identify the precise location of biobank sites, private conservation lands and other offset lands, but does identify the LGA and the IBRA subregion. The portion of the proposal in the Narrabri LGA and Warrumbungle LGAs, corresponds with the Pilliga and Pilliga Outwash IBRA subregions, while the biobank agreements are identified as being in the Peel-Namoi and Liverpool Plains (Part B) IBRA subregions.

No Biodiversity Stewardship Agreements or Private Conservation Agreements are listed in the Biodiversity Conservation Trust registers for the regional study area.

Two Private Conservation Agreements have been established under Division 12, Part 4 of the *National Parks and Wildlife Act 1974* on land located at High Park Road, Narromine. Under s69I of the Act a statutory authority may not carry out the development in a conservation area without the consent of the Minister administering the Act.

The *Biodiversity Development Assessment Report* (JacobsGHD, 2020e) for the proposal assess the potential ecological impacts of the proposal in accordance with the NSW Biodiversity Offsets Scheme. This report also provides a discussion of the likely requirement for offsets to comply with the EPBC Act *Environmental Offsets Policy* (Department of Sustainability, Environment, Water, Heritage and the Arts 2012). In addition, ARTC is also undertaking an offset strategy for the entire Inland Rail program in NSW, including the proposal.

4.4.3 Waterfront land

Part 7 of the FM Act relates to the protection of aquatic habitats, including providing management of dredging and reclamation works within permanently or intermittently flowing watercourses, as well as the temporary or permanent blockage of fish passage within a watercourse. However, by force of section 5.23 of the EP&A Act, the requirement to receive permits for these activities (listed under sections 201, 205 or 219 of the *Fisheries Management Act 1994*) do not apply.

The final design of watercourse crossings would also need to consider impacts on waterfront land and the riparian zone. The *Guidelines for watercourse crossings on waterfront land* (DPI Office of Water, 2012) indicate that crossing works should be designed and constructed to protect and enhance water flow, water quality, stream ecology and existing riparian vegetation, minimising impacts the hydrologic, hydraulic and geomorphic functions of a watercourse. The guidelines preference the selection of bridges that fully span the watercourse, although alternatives that can achieve equivalent riparian functions may be acceptable.

4.5 Mineral resources

4.5.1 Active mining licences

There is extensive mining exploration in the regional study area. Department of Regional NSW Resources and Geoscience data shows that the Narrabri LGA is the only LGA hosting active mines (black coal) and coal seam gas wells. All LGAs have some exploration activity occurring, generally for metallic minerals. A summary of mining activity is provided as Table 4.5, with the distribution of titled areas and sites shown in Figure 4.8.

Table 4.5 Mining activities in the regional study area

Type	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle	Total[1]
Active mines	0	0	4	0	0	4
Coal seam gas boreholes[2]	0	0	122	0	0	122
Mining and assessment licences	0	0	18	1	0	19
Exploration licences	6	8	20	22	18	58
Exploration applications	0	1	4	3	1	8

Source: Department of Planning, Industry and Environment: Resources and Geoscience, accessed 18 March 2020.

Notes: 1. Where licences span LGA boundaries, the licence is accounted for in both LGAs.
2. Excludes boreholes that have been plugged and abandoned.

The four active (black coal) mines in Narrabri are located some distance from the proposal site. The nearest mine is the Narrabri North Mine, located about 17 kilometres from the proposal site. The Maules Creek, Boggabri and Tarrawonga mines are located between 39 to 46 kilometres from the proposal site.

4.5.2 Coal seam gas wells

The Department of Regional NSW Resources and Geoscience data indicates that while a variety of coal seam gas boreholes have been developed in the study area, there are no production wells currently in service. There are, however, a number of operational exploration and pilot wells. The nearest non-plugged coal seam gas well is over five kilometres from the proposal. Coal seam gas wells are shown in Figure 4.8.

The Narrabri Gas Project is a current proposal to extract coal seam gas in the Pilliga forests, shown as a Mining Application in Figure 4.8. A State Significant Development Application lodged by Santos in 2017 proposes to develop a 95,000 hectare coal seam gas field of up to 850 gas wells over 20 years, including ancillary infrastructure (SSD-6456, EPBC ID 2014/7376). The ancillary infrastructure includes gas compression facilities, water and brine storage cells and local gas pipeline connections. A connection to the Sydney to Moomba pipeline would be constructed as part of a separate proposal. At the time of writing this application has not been determined.

4.5.3 Other resources

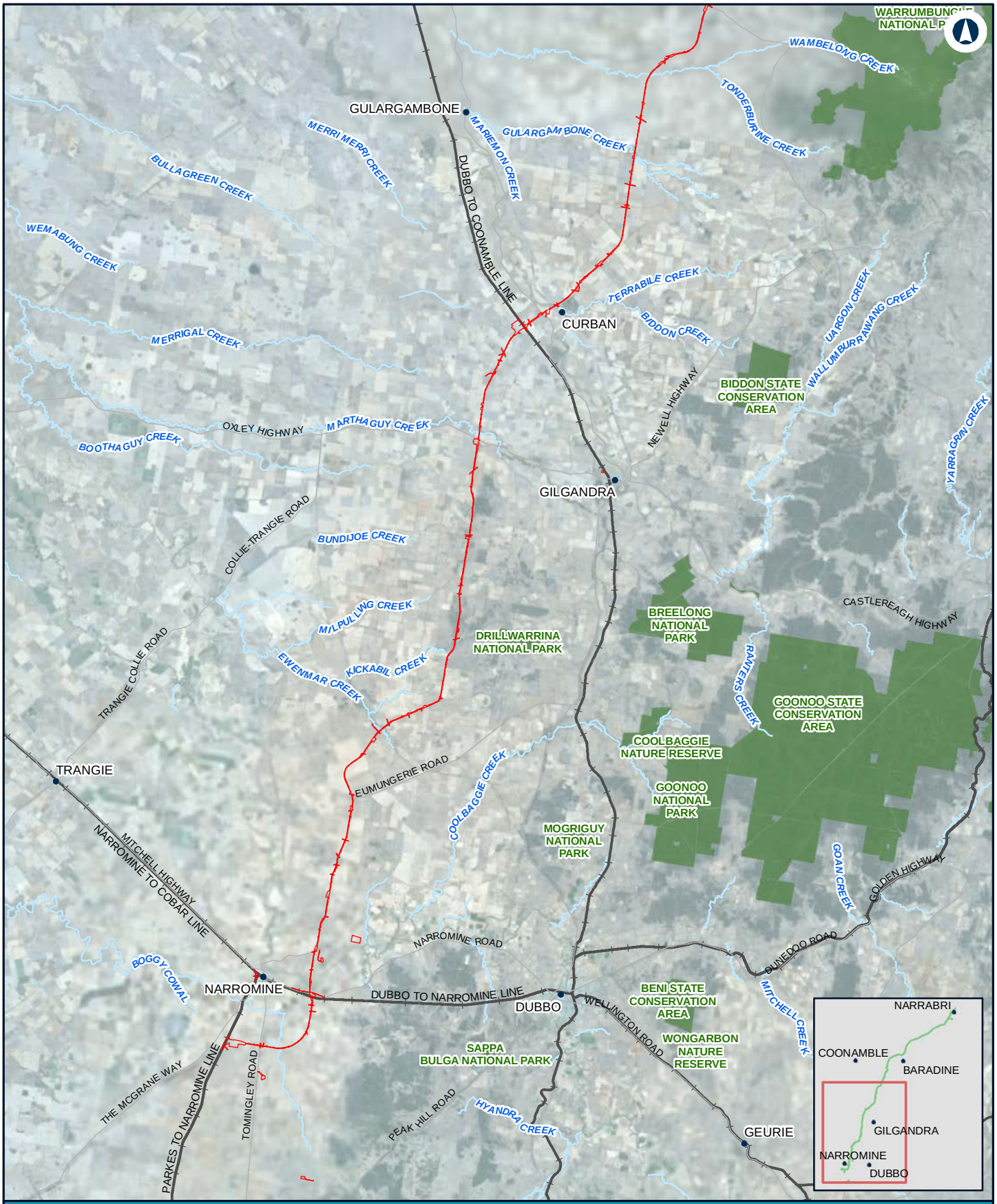
Two hard rock quarry proposals located in the vicinity of the proposal site near Narromine are currently under assessment – see section 5.7.

4.6 Interaction with road reserves and Crown land

4.6.1 Road reserves

There is an extensive network of trafficable roads in the regional study area. Land reservations for these roads provide for public movement and as a corridor for utilities and services. Some corridors are substantially wider than required for the road carriageway or may be co-located with other functions such as travelling stock reserves.

There are a number of Crown or ‘paper’ roads in the study area. These were established during the settlement of NSW and are part of the state’s public road network. Generally, Crown public roads provide access to freehold and leasehold land where little or no subdivision has occurred since the original Crown subdivision of NSW in the early nineteenth century. Some Crown roads now form a valuable component of remnant vegetation, while others are made available for agricultural use under lease or permit. Crown roads which are no longer required for access may be sold or converted to a Crown reserve.



NARROMINE TO NARRABRI Areas protected under the *National Parks and Wildlife Act 1974* Figure 4.7a

0 8 16 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- The proposal site
- National park

Date: 1/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:7,163,937
Data Sources: Basemap layers: NSWSS; CSG, Mining applications/titles: DPIE; Footprints: GHDJACOBS

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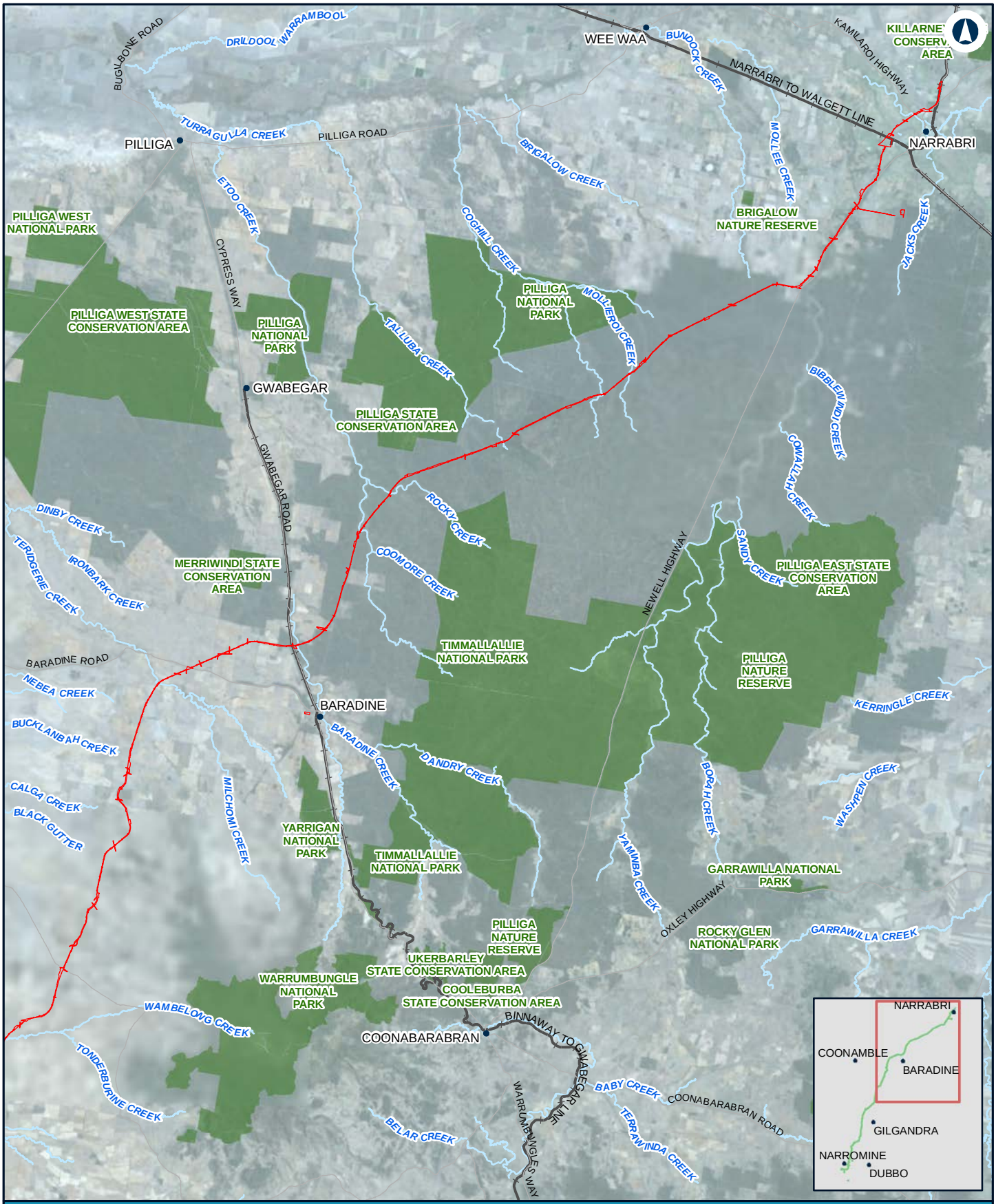

NARROMINE TO NARRABRI Areas protected under the *National Parks and Wildlife Act 1974* Figure 4.7b

0 8 16 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- The proposal site
- National park

Date: 1/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:7,163,937
Data Sources: Basemap layers: NSWSS; CSG, Mining applications/titles: DPIE; Footprints: GHDJACOBS

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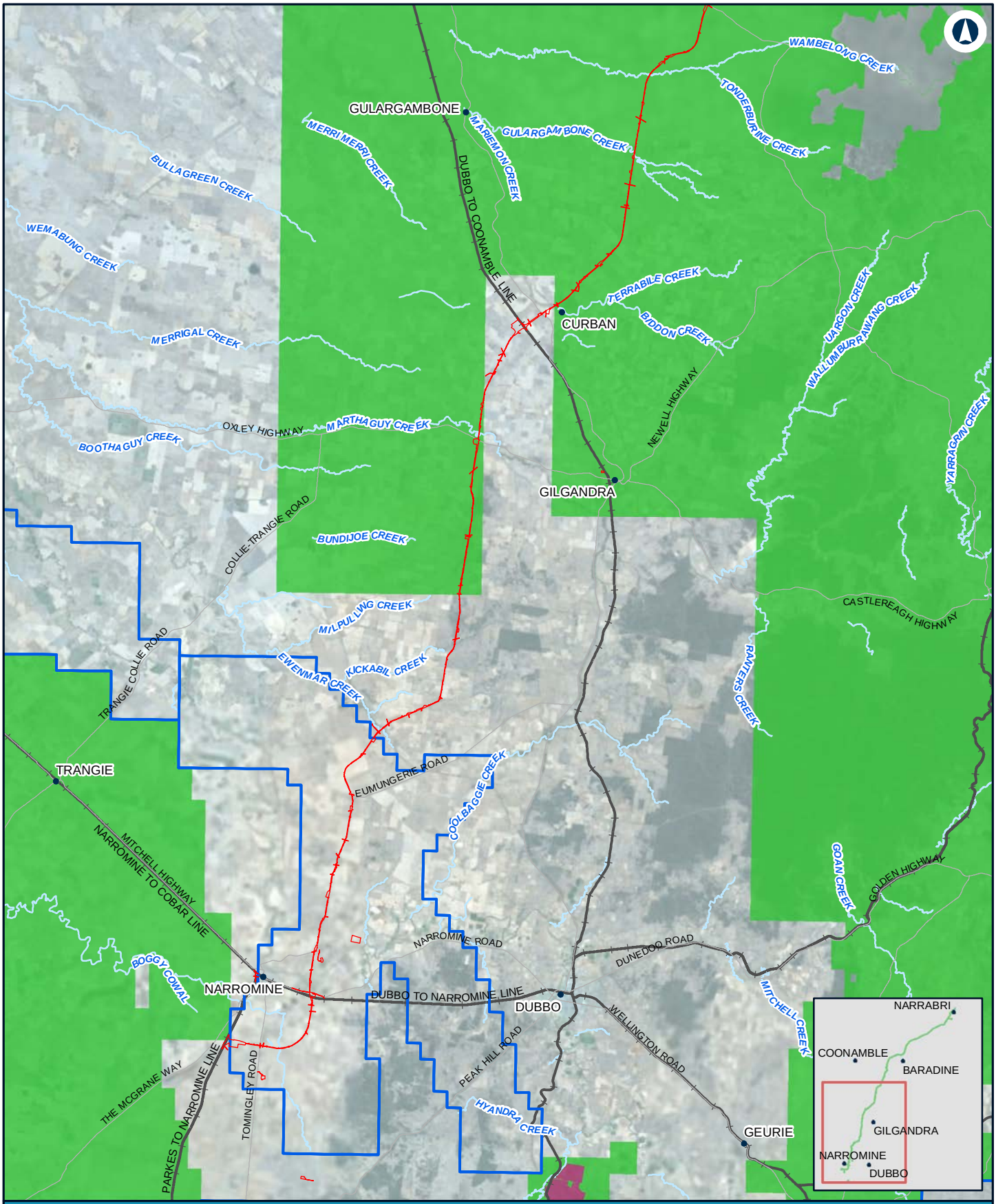

NARROMINE TO NARRABRI Mineral resource licences and coal seam gas wells Figure 4.8a

0 8 16 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:600,000
Data Sources: Basemap layers: NSWSS; CSG, Mining applications/titles: DPIE; Footprints: GHDJACOBS

LEGEND

The proposal site

Mining applications

Exploring

Mining titles

Exploring

Mining

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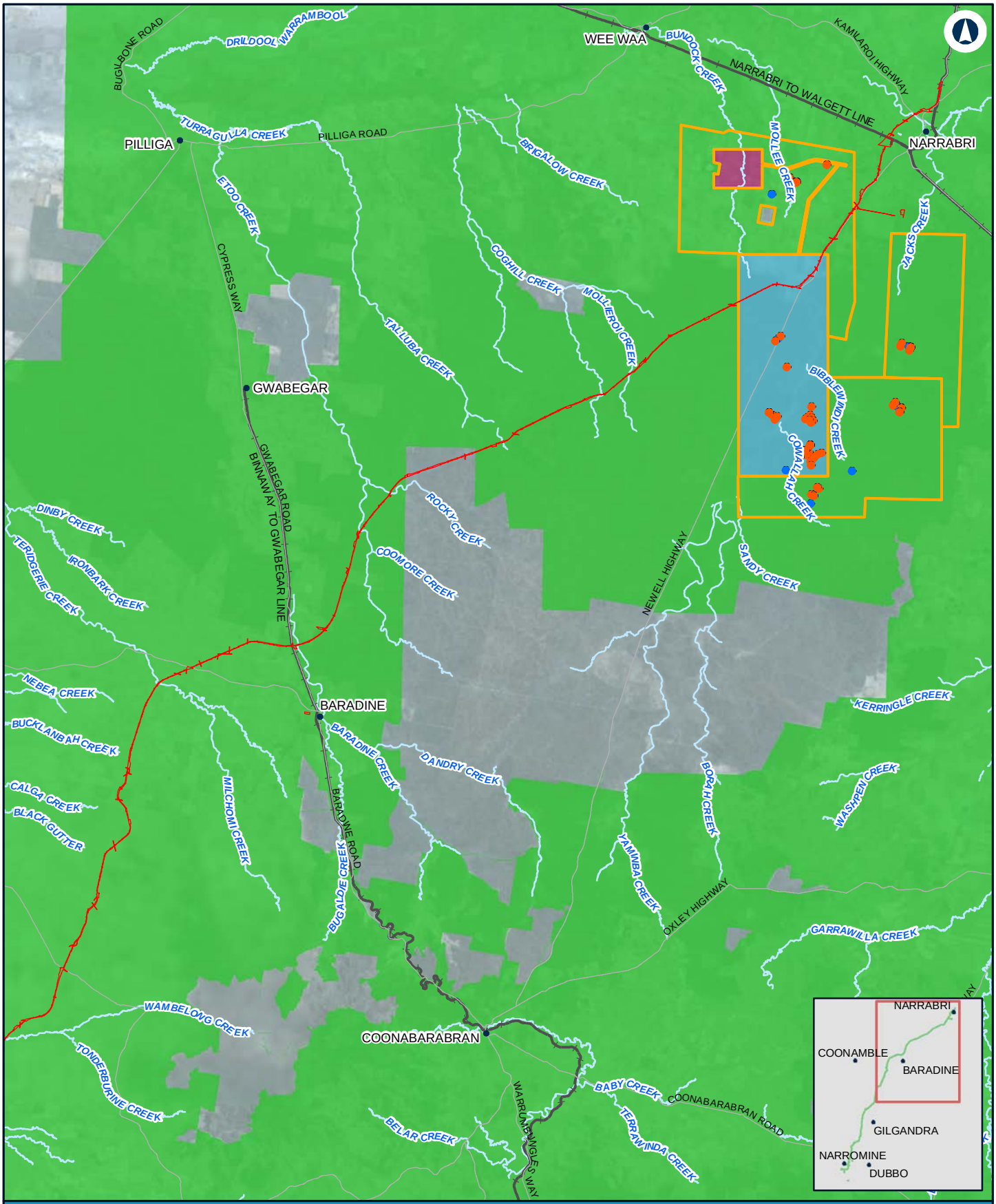

NARROMINE TO NARRABRI Mineral resource licences and coal seam gas wells Figure 4.8b

0 8 16 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- The proposal site
- **Coal seam gas wells**
  - Exploration
  - Pilot
- **Mining applications**
  - Mining
- **Mining titles**
  - Assessment
  - Exploring
  - Mining

Date: 1/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:600,000
Data Sources: Basemap layers: NSWSS; CSG, Mining applications/titles: DPIE; Footprints: GHDJACOBS

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4.6.2 Travelling stock reserves

Travelling stock reserves are parcels of Crown land originally reserved for the use of travelling stock (Local Land Services, 2015). The travelling stock reserve network is now utilised for a series of purposes, including:

- travelling stock, emergency stock refuge and transport of stock to market
- providing biodiversity corridors
- providing access and connection to country for Aboriginal peoples
- maintaining heritage.

In the regional study area, the majority of travelling stock reserves are to the west of Narromine, Gilgandra and the Pilliga forests. A “Livestock Highway” (a highly linked string of travelling stock reserves) is provided from Narromine to Coonamble via Tenandra. Incomplete corridors are provided from Dubbo to Walgett via Gilgandra and Coonamble, and Binnaway to Pilliga via Coonabarabran. Figure 4.9 shows the travelling stock reserves in the regional study area.

The Inland Rail corridor crosses or passes close to numerous travelling stock reserves. A summary of the travelling stock reserves near the proposal is provided in Table 4.6.

Table 4.6 Travelling stock reserves intersecting or in the vicinity of the proposal

Reserve ID	Location	Type	Conservation value
R34248	Webbs Siding: Mitchell Hwy near High Park Rd, Narromine	Travelling stock	Low
R3420	Bugabada: Collie Road, Kickabil	Travelling stock	High
R43452	Buramilong: Berida Road, Collie	Stock camping	Medium
R23332 R48093 R81052	Callangoan, Terrabile: Near National Park Road and East Coonamble Road, Curban	Travelling stock, stock camping	Not assessed
R28097 R44590 R49937 R68136	Newell Highway between The Pilliga and Narrabri West	Travelling stock	Medium to High
R941 R44591	Cains Crossing: Cains Crossing Road, Bohena Creek	Stock camping and water	High
R9489 R68136	Yarrie Lake Road, Narrabri West	Travelling stock	Medium

Source: OEH 2017

4.6.3 Other Crown land

The majority of Crown land in the regional study area consists of lands that are managed under specialised legislation. The balance of Crown lands, being Crown roads and Crown reserves, are managed under the *Crown Land Management Act 2016*.

Crown reserves are lands retained in public ownership for specified purposes. In the regional study are common purposes are for the retention of native vegetation and forestry.

4.6.4 Native Title

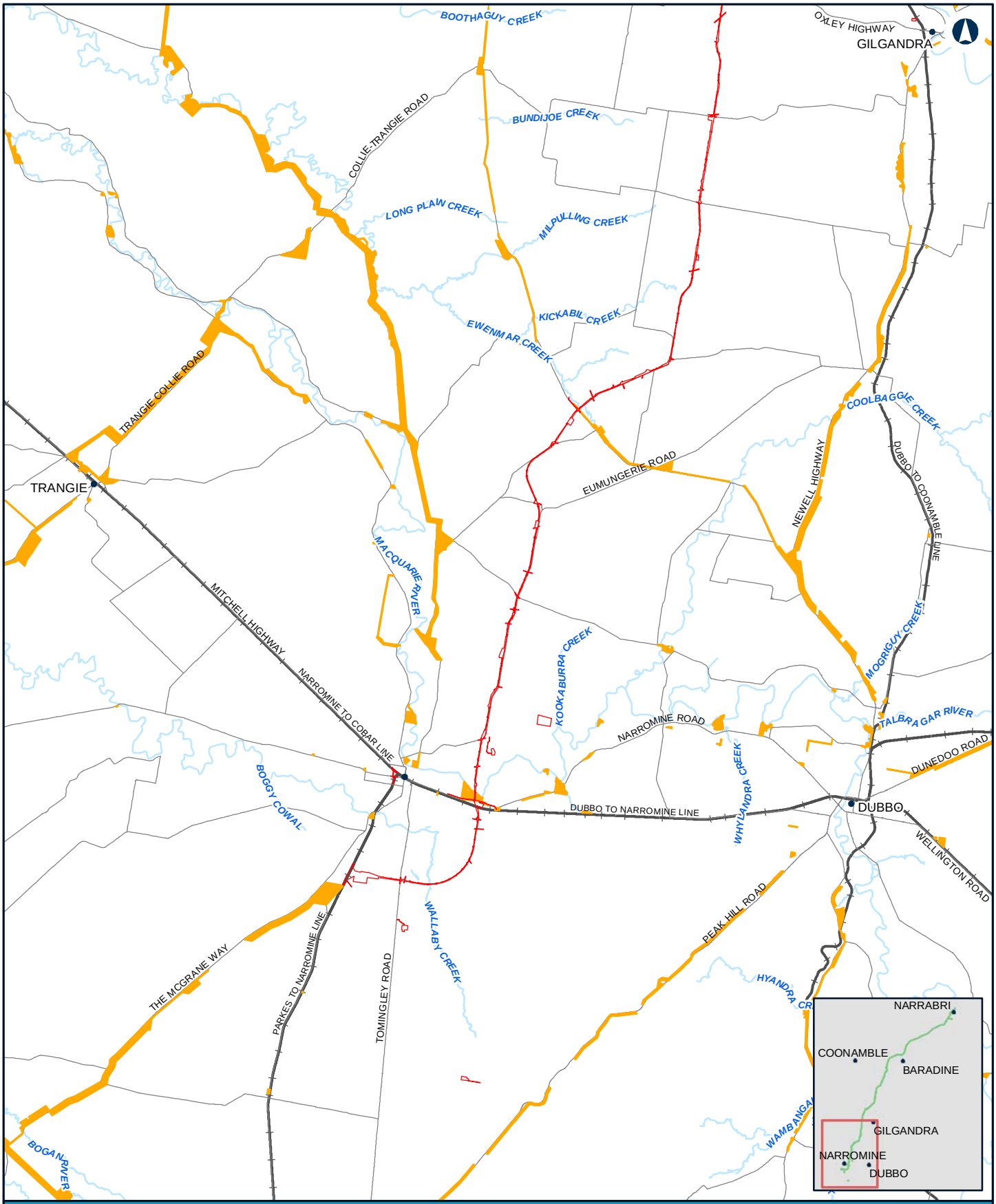
The regional study area is affected by two Native Title claims.

The Ngemba, Ngiyampaa, Wangaaypuwan and Wayilwan claim (NSD38/2019) generally extends to the west of the proposal. The proposal passes through the portion of the application between Nancarrows Road, Gilgandra, and the Castlereagh River at Curban. The claim has been accepted for registration and is awaiting determination.

The Gomeroi People claim (NSD2308/2011) extends from the Castlereagh River at Curban to the Barwon River where it forms the New South Wales-Queensland border. The claim has been accepted for registration and is awaiting determination.

4.7 Services and utilities

The proposal site contains gas, electricity, communications, water and wastewater services, particularly around Narromine and Narrabri. Santos has also identified two routes for a new gas line in the vicinity of Narrabri.



NARROMINE TO NARRABRI Travelling stock reserves Figure 4.9a

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 2/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:400,000
Data Sources: Basemap layers: NSWSS; TSR: Local Land Services (LLS); Footprints: GHDJACOBS

LEGEND

- The proposal site
- Travelling stock reserves

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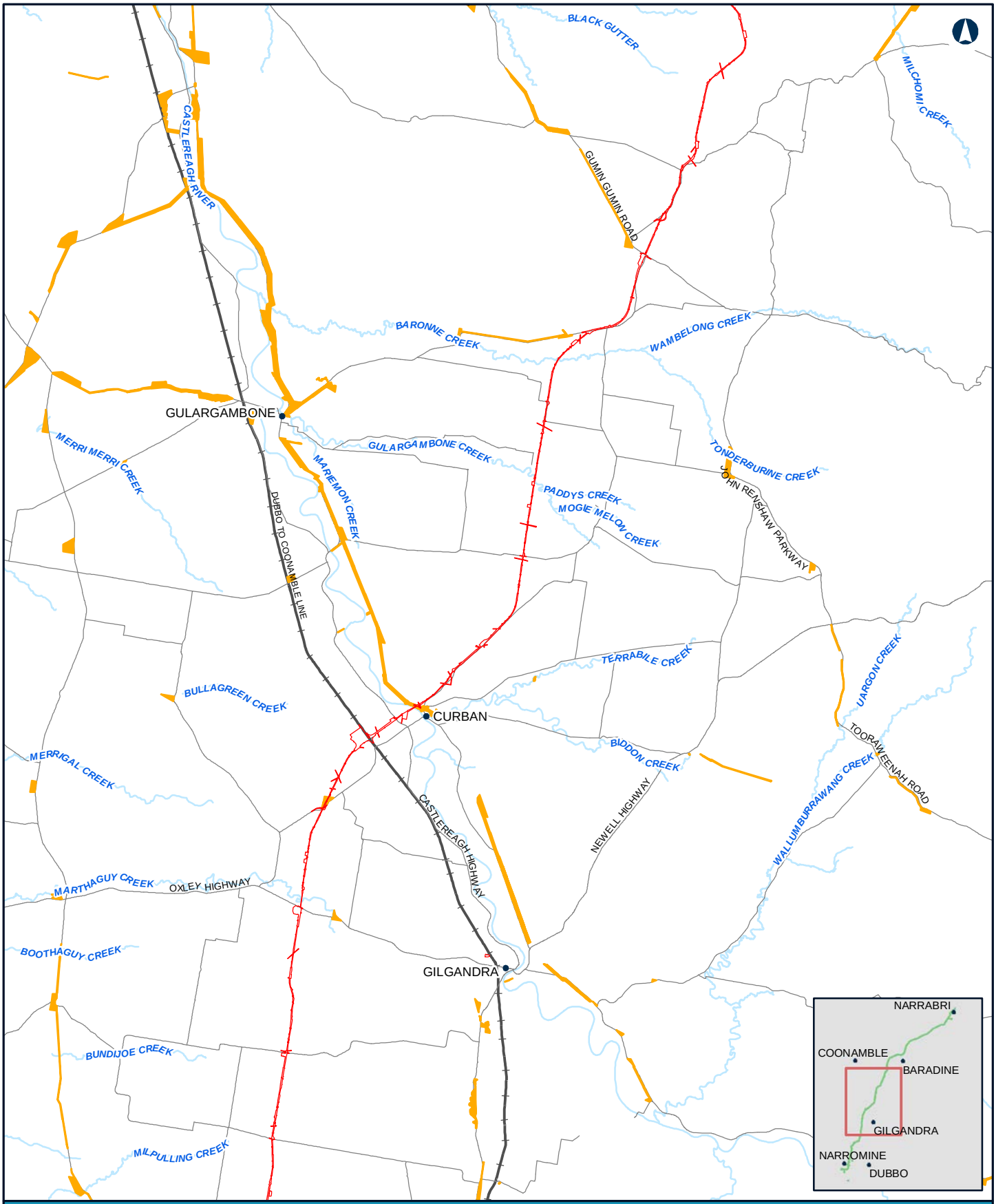

NARROMINE TO NARRABRI Travelling stock reserves Figure 4.9b

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 2/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:400,000
Data Sources: Basemap layers: NSWSS; TSR: Local Land Services (LLS); Footprints: GHDJACOBS

LEGEND

- The proposal site
- Travelling stock reserves

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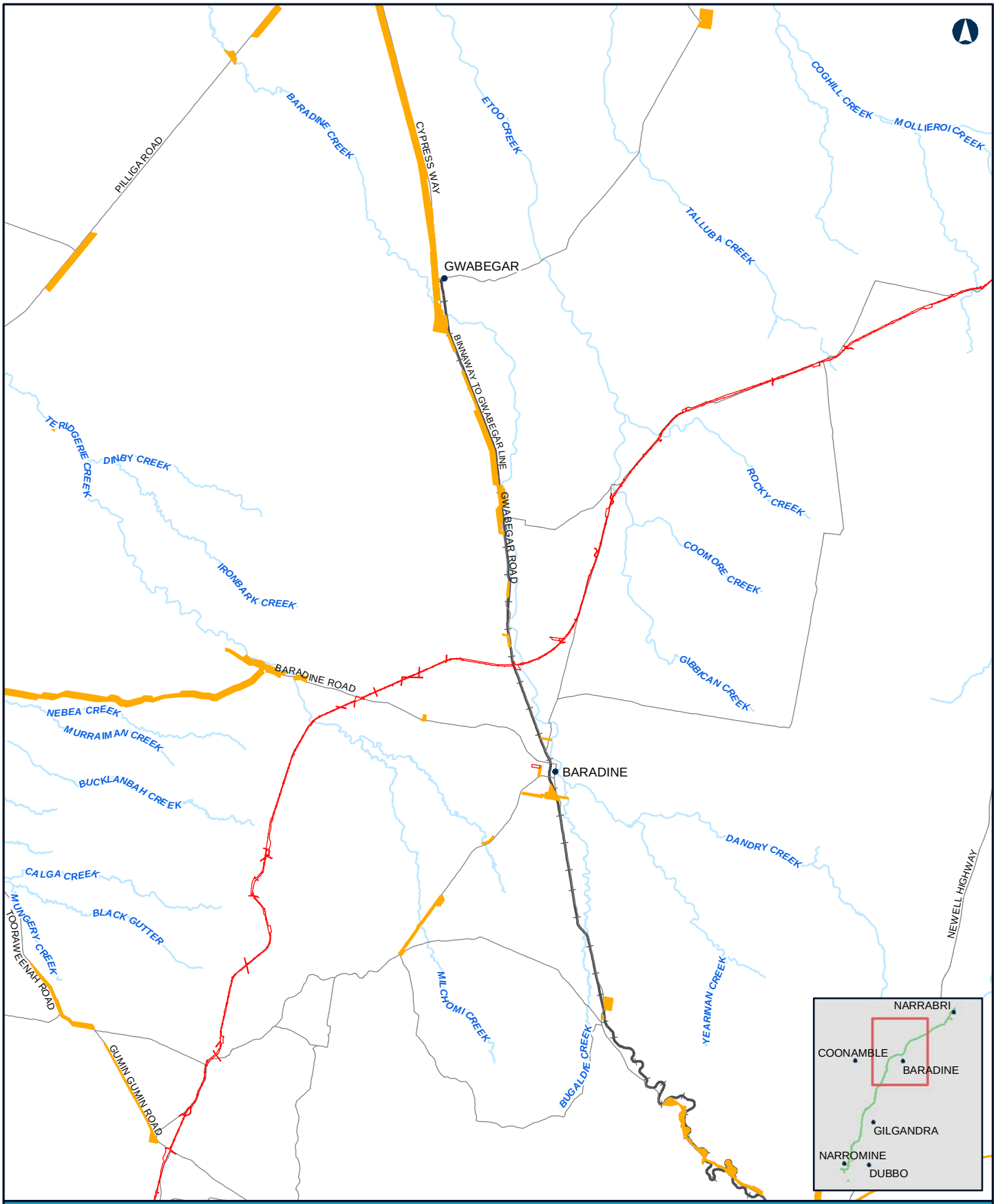

NARROMINE TO NARRABRI Travelling stock reserves Figure 4.9c

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 2/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:400,000
Data Sources: Basemap layers: NSWSS; TSR: Local Land Services (LLS); Footprints: GHDJACOBS

LEGEND

- The proposal site
- Travelling stock reserves

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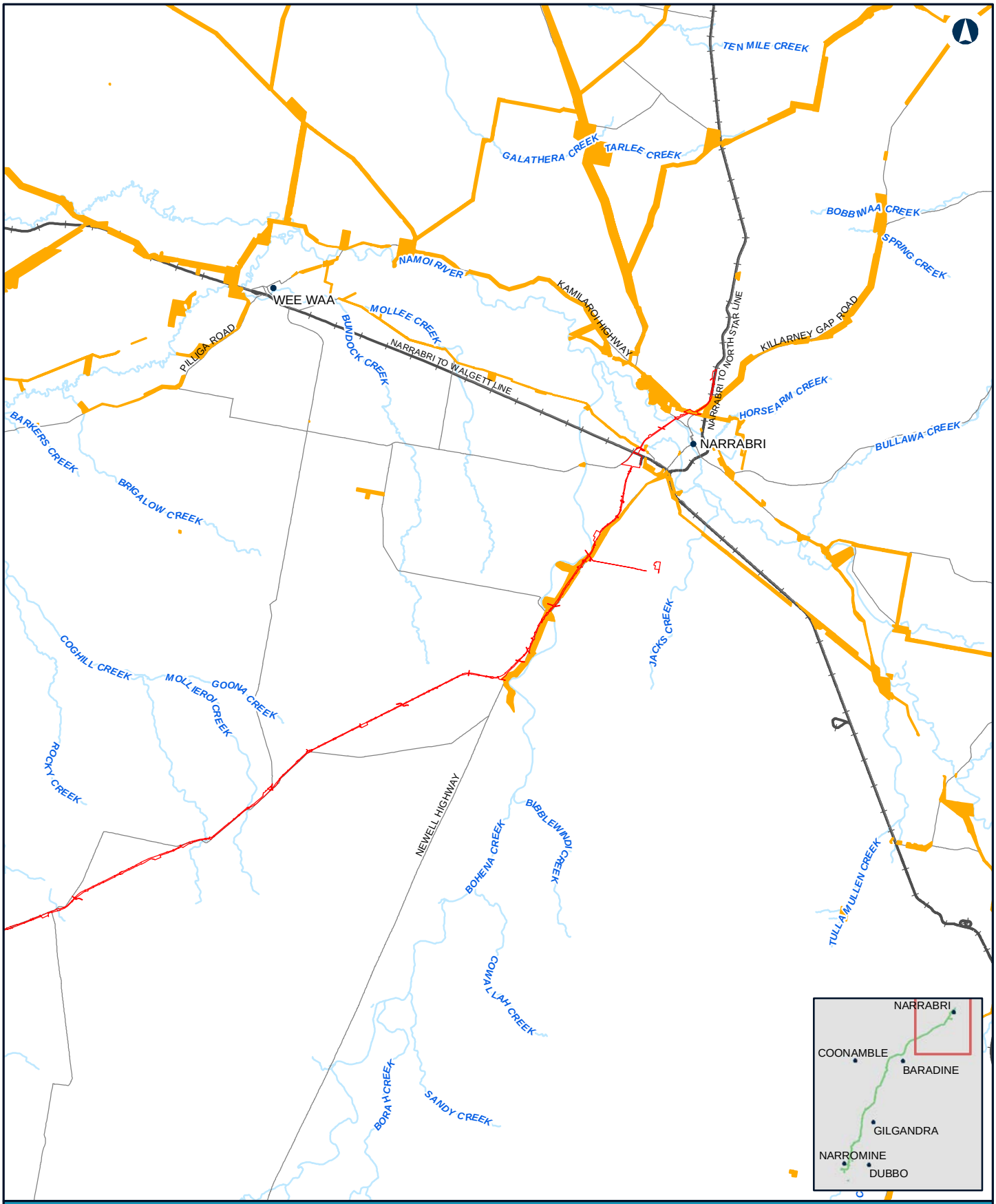

NARROMINE TO NARRABRI

Travelling stock reserves

Figure 4.9d

0 5.5 11 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- The proposal site
- Travelling stock reserves

Date: 2/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:400,000
Data Sources: Basemap layers: NSWSS; TSR: Local Land Services (LLS); Footprints: GHDJACOBS

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5. Land use, agricultural resources and current enterprises within the regional study area

5.1 Agricultural resources within the locality

The agricultural resources within the regional study area are described in the following sections.

5.1.1 History of agricultural enterprises within the locality

The history of agricultural enterprises within the regional study area is typical of the development in agriculture that has occurred in many parts of Australia. Regional profiles have been developed by both the North West and Central West Local Lands Service agencies and the following is a summary of those profiles (Local Land Services, 2017).

The land was inhabited prior to colonisation and today by Indigenous people from a number of Aboriginal nations. Since colonisation, the vegetation in the region has largely been cleared for agriculture or has been significantly modified. The large areas of native vegetation remaining are in national parks, nature reserves, state forests and travelling stock routes or on soils unsuitable for cultivation. Wetlands are a major ecological feature, including the major streams and watercourses of the Macquarie Marshes, the Macquarie and Namoi rivers and the Macquarie and Upper Namoi floodplains.

Agriculturally, the broader region is highly diverse with the even spread of winter and summer rainfall supporting productive grazing and cropping systems. There are substantial groundwater and surface water resources and the construction of irrigation dams in the 1960s enabled areas of land suitable for irrigation to be developed for intensive cropping.

The agricultural production sector supports a range of industries associated with agriculture, including farm input services and enterprises associated with the transporting, processing and marketing of farm products.

The range of agricultural enterprises within the proposal site area is broadly similar to the enterprises within the regional study area.

5.1.2 Key agricultural support infrastructure

Across the regional study area, there is a diverse range of agricultural enterprises and this has resulted in the development of:

- various support services including farm input suppliers, consultants, agronomists, financiers, accountants and legal services
- infrastructure including product storage, marketing, transport and processing facilities
- a number of dedicated research institutions.

Located in the south of the regional study area are a number of dedicated food and agribusinesses within close proximity of Narromine. Large businesses include Agrigrain and Auscott Limited. Agrigrain, has been operating in Narromine for over 25 years, and is involved in grain trading, container packing, seed and fertiliser sales, grain storage, grading, fumigation and handling. With over 100,000 tonnes of storage capacity, there is warehousing available to growers and third party end users. Agrigrain pack six trains of containers every week to over 30 export destinations, mostly to south-east Asian ports. Agrigrain also operates a second facility in Coonamble.

Auscott Limited (Trangie) is Australia's largest vertically integrated cotton company, providing services in ginning, marketing and classing of cotton and cotton seed for cotton farmers around Trangie and Narromine as well as Warren and Narrabri. Auscott Limited was first established in 1970 in the Namoi Valley and has since expanded to the Macquarie, Gwydir and Murrumbidgee valleys where it operates gins and farming operations.

Other businesses based around Narromine include:

- Pioneer Seeds, a producer of corn, grain sorghum, canola and summer forage hybrid seed which is grown and processed to world-class, quality-assured standards at its Narromine based Seed Production Operations.
- Enza Zaden, an international vegetable-breeding company who breed lettuce, onion, pumpkin, cauliflower and broccoli for DNA, disease-screening, double haploid plant production and plant-pathology work.
- Narromine Transplants is a containerised nursery specialising in forestry seedlings and cutting grown forestry clones and revegetation seedlings. The business also produces fruit trees, blueberries and nut trees for retail and commercial markets.

Dubbo is located to the east of the regional study area and has long been known as the 'hub of the west' due to its location as a key service centre. A number of major agricultural businesses are located within the Dubbo region including Fletchers International Exports, one of Australia's most integrated processors and exporters of lamb and sheep meat products. This private, family-owned company operates processing facilities in Dubbo and Albany (Western Australia) and combined they have a processing capacity of more than 90,000 sheep and lambs per week, which equates to over 4.5 million head per year. Fletcher's also operates its own logistics division moving in excess of 18,000 twenty-foot equivalent container units per annum.

AgHealth Australia based in Dubbo, is an academic unit of the School of Rural Health (University of Sydney), and has been leading research in relation to injury and deaths on Australian farms for over 30 years and provides on-farm health and safety auditing services.

The NSW Department of Primary Industries also operates the Trangie Agricultural Research Centre which provides services to the agricultural and pastoral industries and is renowned for its sheep research and development of conservation farming technology.

In the north of the regional study area, the agricultural industries are supported by specialist supply, engineering, chemical and consulting firms. AGT Foods Australia is a processor and supplier of all types of Australian pulses and speciality crops. Namoi Cotton has the largest ginning network in Australia, comprising 14 cotton ginning sites strategically positioned throughout the cotton growing regions of NSW and southern Queensland, including a gin at Boggabri which is 60 kilometres south-east of Narrabri. Another gin is also located at Trangie and warehouse sites at Warren and Wee Waa.

GrainCorp and Louis Dreyfus have significant grain storage infrastructure in Narrabri and freight rail services are available to the Sydney and Newcastle port system for export markets. The region is serviced by the Newell and Kamilaroi highways and established regional road network that provides a reliable land transport corridor to Sydney, Brisbane and Melbourne. GrainCorp currently has operations in Narromine, Mungeribar, Nevertire, Gilgandra, Curban, Amartree, Gular, Coonamble, Baradine, Merha North, Wee Waa and Narrabri. There are numerous other GrainCorp controlled sites outside of the regional study area.

In late 2018, Cargill closed its Narrabri Oilseeds plant after 46 years of operations. The plant used to process about 250,000 tonnes of cottonseed each year with the recent prolonged drought a key factor in the decision to close the plant.

In addition, world-ranked agricultural research establishments are located in the Narrabri district, being:

- the I.A. Watson Grains Research Centre (operated by the University of Sydney)
- the Australian Cotton Research Institute (owned by the NSW Department of Primary Industries and used as its Centre of Excellence for Cotton, Pulses and Oilseed Improvements)
- the Cotton Catchment Communities Cooperative Research Centre (Cotton CRC) and the CSIRO Divisions of Plant Industry and Ecosystem Services (Cotton Research Unit).

There is also a wide range of agricultural and related businesses around the region including:

- major commercial nurseries
- plant and seed production companies and research facilities
- large machinery manufacturers
- rural produce stores
- aquaculture.

As discussed in section 5.2, livestock industries are a significant enterprise within the regional study area with many selling centres, feedlots and abattoirs located throughout the region.

A range of livestock selling facilities occur throughout the region, including Dubbo Regional Livestock Markets, Tamworth Saleyards, Central West Livestock Exchange (CWLX Forbes), Walgett Saleyards, Narrabri Livestock Selling Centre and Coonamble Saleyards. In terms of annual throughput, Dubbo is the largest cattle selling centre in NSW with 241,282 cattle and the third largest selling centre for sheep in NSW (1,815,559 sheep sold in 2017-18) (MLA, 2019).

5.1.3 Water resources and extraction locations

In addition to land capability considerations, agricultural production is also influenced by surface and groundwater resources (refer to *ARTC Inland Rail Narromine to Narrabri Groundwater Assessment* (JacobsGHD, 2020a)).

Cotton (mostly irrigated) accounts for 39,417 hectares (refer to Table 5.1) within the regional study area with about 85 per cent located within the Narrabri LGA. The Macquarie and Namoi rivers and their tributaries provide water to support communities, agriculture and the environment. Access to water (both groundwater and surface water) and favourable soil conditions has allowed agriculture in the regional study area to diversify into other intensive plant enterprises (citrus, viticulture, vegetables, nurseries and cut flowers particularly within the Narromine LGA) that assist to provide resilience in the economy when faced with fluctuating seasonal and market conditions. The total volume of irrigation water applied across the New England and North West region and the Far West and Orana region is 1,315,389 ML (ABS, 2019).

Burrendong Dam was constructed following World War II and is one of the largest inland dams in NSW. It was constructed to boost agricultural production in the Macquarie Valley. There are seven irrigation schemes that operate within the Macquarie Valley and provide water for cotton, horticulture (perennial and seasonal horticulture) and other irrigated crops. The dam also supplies environmental water to the Macquarie Marshes and can be used for flood mitigation.

There are three dams within the Namoi Valley that were constructed to boost agricultural production within the region. Construction on Keepit Dam commenced in 1939 and was the first of the three dams constructed followed by Chaffey Dam and Split Rock Dam. There are no irrigation schemes within the Namoi Valley however, landholders draw water directly from

licenced river pumps or groundwater bores to apply directly to crops or to fill off-river storages for later irrigation.

Groundwater and surface water resources are also used for stock and domestic purposes. The stock and domestic bores are generally less than 100 metres deep. Surface water dams for livestock drinking water are an important resource for the livestock industries.

5.1.4 Apiary industry

The Australian beekeeping industry is an important agricultural industry. It not only produces honey and beeswax but bees are also important for the pollination of a number of agricultural crops and also supporting the economies of regional towns. Public lands provide important seasonal floral resources for Australia's migrating beekeepers. Forests and woodlands provide up to 80 per cent of pollen and nectar resources. In order to optimise production across seasons, it is necessary to migrate hives across landscapes to seek out the most productive sources of pollen and nectar and take advantage of floristic diversity on public lands.

About 50 per cent of land in NSW is classed as public land (Crown land, national park estate or state forest). NSW accounts for about 45 per cent of Australia's national honey production and has the largest beekeeping industry of all Australian States and Territories with around 3,400 registered beekeepers managing 214,000 hives (RIRDC, 2015). The total gross value of honey and associated bee products in Australia is estimated at $94 million (NSW DPI, 2015).

Apiarists generally rely on the use of public land for their hives with 70 per cent of NSW's honey production derived from eucalyptus species (NSW Apiarists' Association Inc., 2013). Important trees for apiaries are ironbarks, boxes and gums. Eucalypt species tend to flower on a two to five-year cycle. Therefore, it is important for apiarists to have a variety of forests available in different locations throughout the year.

Honey production is significant in the Narrabri region especially in the Pilliga forests where beekeeping dates back to the 1930s (Stace, 1996). The Pilliga East State Forest is a preferred site for beekeepers as production responds positively to increase in rainfall. In addition, the forest offers protection from pesticide use and locust control measures that occur elsewhere in the region.

A study by the Natural Resources Commission (2014) looking at how to actively manage the Brigalow and Nandewar Bioregions for better ecological outcomes examined the characteristics and extent of the apiary industry. The apiary industry within the Brigalow and Nandewar bioregion (rail corridor traverses the Brigalow bioregion) employs 49 people. While this represents a small share of regional employment, it represents a significant share of the NSW beekeeping industry.

The NSW Government has recently implemented a 'whole of government' policy framework (DPI, 2019a) for the management of apiary sites on public lands, including state forests, travelling stock reserves and national parks. This framework streamlines regulatory arrangements by establishing a standard procedure for allocation of sites, pricing, permit tenure and conditions. From 1 July 2020, the NSW Government introduced compulsory registration under the *Biosecurity Act 2015* in order to prevent the spread of unwanted pests and diseases including Varroa and tracheal mites. A condition of registration is that beekeepers adhere to the *Australian Honey Bee Industry Biosecurity Code of Practice* (Plant Health Australia, 2016).

5.2 Current agricultural enterprises within the regional study area

5.2.1 Agricultural production

The major crops grown within the regional study area are wheat, barley and chickpeas (refer to Table 5.1). The majority of cotton is in the Narrabri LGA and is grown using irrigation. Winter cropping of cereal grains, oilseed and pulses is one common land use with pre-crop fallowing for moisture conservation the usual practice throughout the regional study area. Cropping decisions are dependent on rainfall which is highly variable as described in section 4.1.

The number of livestock establishments, livestock types and numbers within the regional study area is provided in Table 5.2. Beef cattle and sheep and lambs are the predominant livestock within the region. Merinos are bred for wool production and prime lamb production is focused on wool and meat production and beef breeding and cattle trading are solely focused for beef production. There is also a small number of pigs (pork production) and dairy cattle (milk production) within the area.

Table 5.1 Major crops within the regional study area

Crop variety	Area (ha)						No. of businesses
	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle	Total	
Wheat	82,030	57,213	128,284	98,019	30,341	395,887	788
Barley	30,034	19,182	37,271	15,233	9,305	111,025	479
Chickpeas	21,453	11,155	41,166	22,848	7,884	104,506	231
Oats	3,478	10,900	5,239	10,561	12,660	42,838	445
Cotton	1,345	116	33,379	4,161	416	39,417	104
Sorghum	574	827	17,042	83	5,804	24,329	72
Canola	2,645	2,909	2,558	9,744	3,165	21,020	100
Lupins	3,891	6,400	461	4,788	958	16,499	127
Faba beans	1,186	2,260	10,431	1,604	549	16,029	79

Source: ABS (2018) Agricultural Commodities Small Area Data, Australia, 2015-16, Cat. No. 7121.0

Table 5.2 Livestock numbers for the regional study area

Livestock type	Total numbers						No. of businesses
	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle	Total	
Cattle (beef)	85,935	30,718	63,290	31,090	172,492	383,526	1,168
Cattle (dairy)	584	907	291	473	152	2,407	24
Sheep and lambs	323,001	327,844	126,641	301,452	509,785	1,588,722	860
Pigs	24	1,991	582	219	4,621	7,437	30

Source: ABS (2018) Agricultural Commodities Small Area Data, Australia, 2015-16, Cat. No. 7121.0

5.3 Agricultural value

5.3.1 Gross value of agricultural production at the regional study area

The importance of agriculture to the region can be demonstrated by considering the gross value of agricultural production from the most recent Agricultural Census (ABS 2018). The annual gross value of agricultural production across the regional study area is almost $1 billion (Table 5.3). The majority of the value of production is from dryland crops (mainly wheat, barley and other cereals) and cotton, with the value of livestock slaughtering (mainly cattle, sheep and lambs) and livestock products (mainly wool) also significant. Generally, the typical farm unit in this area are either grazing businesses, or mixed farming operations that run several different livestock enterprises and cropping enterprises on the same farm.

On a per hectare basis, the value of agricultural production across the regional study area in 2016 was $593 per hectare for crops (ie $674.95 million from 1,138,743 hectares – refer to Table 4.1 and Table 5.3) and $141 per hectare for livestock (ie $308.93 million from 1,138,743 hectares – refer to Table 4.1 and Table 5.3) (ABS 2018).

Table 5.3 Gross value of agricultural production within the regional study area by LGA ($ million)

Commodity	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle	Total
Broadacre crops	$84.33	$66.61	$327.18	$125.74	$45.95	$649.82
Hay	$4.90	$4.12	$4.52	$5.88	$5.72	$25.13
Horticulture	$0.01	$0.04	$0.29	$3.06	$0.69	$4.09
Livestock products	$12.71	$13.28	$4.98	$11.35	$19.03	$61.34
Livestock slaughtered and other disposals	$53.80	$27.12	$38.01	$24.59	$104.06	$247.59
Total	**$155.75**	**$111.15**	**$374.99**	**$170.63**	**$175.45**	**$987.98**

Source: ABS (2018) Value of Agricultural Commodities Produced, Australia–2015-16, Cat. No. 7503.0

5.3.2 Gross value of agricultural production in the regional study area

The value of agricultural production in the regional study area can be calculated by adopting the value of agriculture per hectare and multiplying this by the land area impacted (hectares). While there is a level of confidence in the accuracy of the hectares impacted, the actual value per hectare is more difficult to establish because of the variability in natural resource conditions and climatic influences throughout the regional study area. Managerial expertise on agricultural holdings can also greatly influence economic returns.

A relatively simple approach of determining the per hectare value of production is to use ABS data for the gross value of agricultural production for the five LGAs provided in Table 5.3 and divide this by the agricultural land area within the five LGAs (a total of 3,334,465 hectares of cropping, grazing, horticulture and intensive animal production in Table 4.1). The average gross value of production using this approach is $296 per hectare ($987.9 million from 3,334,465 hectares).

Using this simplified average approach is considered inaccurate because it is based on dated statistics (2015-16 ABS Agricultural Census Data) and it is unknown if this value was reduced by abnormal seasonal events (eg drought, late frosts). As a result, it is considered that this approach may undervalue the impacts of the proposal on agricultural land.

JacobsGHD also notes that the degree of severance would have different impacts on different enterprises across a range of direct and indirect impacts that are discussed in section 7. In determining the value of production, JacobsGHD further notes that individual enterprise management regimes can outperform these estimates.

An alternative method to estimate the value of production is to use a combination of publicly available data from the NSW DPI website and JacobsGHD's knowledge of agricultural production across the regional study area. Table 5.4 denotes the gross income ($/hectares/year) for major agricultural enterprises in the regional study area. Note these values may overestimate the actual gross value of production because they assume identical crop yields and livestock production across the full length of the regional study area.

In determining these values, JacobsGHD split cropping and livestock enterprises and applied the following methodology:

1. Reviewed long term yield estimates from the NSW DPI and applied gross margin (GM) yields as per the current recommendations via its website. A gross margin calculates income and deducts variable costs (animal health, pasture maintenance, crop expenses selling costs) but does not consider labour or other overhead costs including capital requirements.
2. Assessed long term price averages for each commodity from *NSW DPI Performance Data & Insights 2019 (*2019b) and applied these prices rather than current spot prices.
3. Reviewed current spot prices for each commodity noting increases due to prevailing seasonal conditions and supply shortages for reference then discounted to longer term averages.
4. Reviewed 4 year average stock sale prices at Dubbo Saleyards (Merino Wethers and Yearling Steers via Meat and Livestock Australia (MLA) Data).
5. Cross checked Australian Wool Innovation (AWI) long term wool prices and applied longer term averages rather than current spot prices that have increased significantly.
6. For livestock, applied stocking rates as per NSW DPI Gross Margin Analysis.
7. Cross checked the above with ABARES production data.

The summary of these figures is provided in Table 5.4.

Table 5.4 Assumed gross income per hectare for major enterprises within the regional study area

Enterprise	Gross Income ($/ha/year)
Cropping Enterprises	
Irrigated Cotton	8,364
Dryland Cotton	2,419
Canola (Winter)	1,400
Chickpeas (Winter)	1,051
Faba Beans (Winter)	1,010
Sorghum	768

Enterprise	Gross Income ($/ha/year)
Wheat (Winter)	728
Lupins (Winter)	705
Barley (Winter)	488
Oats (Winter)	440
Livestock Enterprises	
Steer Trading	993
Merino Breeding 21 Microns	866
Prime Lambs XB Ewes	815
Beef Breeding	457
Steer Trading	993

5.3.3 Gross value of agricultural production in the proposal site

To calculate gross income per hectare in the proposal site, JacobsGHD has adopted a nominal percentage of contribution of key enterprises across the regional study area based on the identified area of land use and weighting of livestock enterprises. The weighted average of gross income per hectare each individual enterprise was then calculated (see Table 5.5).

Table 5.5 Gross income averages in the proposal site

Enterprise	Basis	% of weighting	Weighted gross income ($AUD)	Total weighted gross income ($/ha/year)
Winter Cropping	Wheat	50	363.83	$717.94
	Barley	25	121.88	
	Chickpeas	20	210.24	
	Oats	5	22.00	
Grazing	Cattle Breeding	30	137.10	$771.20
	Cattle Trading	30	297.90	
	Sheep Merino	20	173.20	
	Sheep 1st X	20	163.00	

The weighted average of cropping income takes into consideration long term trends and future supply scenarios and as noted above, certain management regimes are likely to be able to outperform this estimate. In terms of livestock, there has been general upward pressure on prices in recent times based on available supply and general demand for red meat. This is expected to be maintained with improving seasonal conditions and demand for restocking activities following prolonged drought.

In summary, to calculate a weighted average of income per hectare across the entire regional study area, JacobsGHD estimated that of the agricultural production area within the proposal site, about 60 per cent would fall into cropping and 40 per cent grazing (refer to Table 5.6).

Table 5.6 Weighted gross income averages in the proposal site

Enterprise	Basis	Weighted average gross income ($/ha/year)
Cropping	(50% wheat, 25% barley, 20% chickpeas, 5% oats)	$430.76
Grazing	(30% cattle breeding, 30% cattle trading, 20% sheep merino, 20% sheep 1st X)	$308.48
Average	**60% cropping, 40% grazing**	**$739.24**

It is to be noted that the lower crop average in the proposal site (refer to Table 5.5) is due to the absence of irrigated crops particularly around Narromine and Narrabri (such as cotton). The higher livestock average is likely to be the result of DPI gross margin information being based on higher stocking rates compared to actual stocking rates in the proposal site.

JacobsGHD has adopted the higher value of $739.24 per hectare (see Table 5.6) to calculate the economic impact of the proposal but considers that the value of the impact is considered realistic in current trading conditions, but unlikely to be higher noting that livestock prices in particular can fluctuate. This figure also represents the ability of this region to shift commodity production basis depending on prevailing prices and seasonal conditions. Refer to section 7.10 for the calculation of the annual value of the impacts on agricultural production.

5.4 Agricultural employment

Agriculture, forestry and fishing are the largest employment industries within the regional study area employing 3,503 persons (24 per cent of the workforce) in 2016 (refer to Table 5.7). Health care and social assistance (10 per cent), mining (nine per cent) education and training (nine per cent) and retail trade (eight per cent) are the other main industries of employment. The aforementioned five industries account for about 60 per cent of employment in the regional study area. Table 5.7 also demonstrates changes in employment between the 2011 and 2016 census years. Over this period, employment in the agriculture, forestry and fishing industry declined by only five persons while employment in the mining industry increased by 958 persons. Further discussion on employment impacts are outlined in the *ARTC Inland Rail Narromine to Narrabri Social Assessment* (JacobsGHD, 2020d).

Table 5.7 Industry by employment within the regional study area

Industry of employment	2011		2016		Change 2016-2011
Agriculture, forestry and fishing	3,508	27%	3,503	24%	-5
Mining	342	3%	1,300	9%	958
Manufacturing	458	3%	344	2%	-114
Electricity, gas, water and waste services	179	1%	142	1%	-37
Construction	524	4%	564	4%	40
Wholesale trade	430	3%	283	2%	-147
Retail trade	1,327	10%	1,160	8%	-167
Accommodation and food services	786	6%	808	6%	22

Industry of employment	2011		2016		Change 2016-2011
Transport, postal and warehousing	568	4%	558	4%	-10
Information media and telecommunications	54	0.4%	66	0.5%	12
Financial and insurance services	151	1%	114	1%	-37
Rental, hiring and real estate services	89	1%	89	1%	-
Professional, scientific and technical services	434	3%	456	3%	22
Administrative and support services	193	1%	296	2%	103
Public administration and safety	759	6%	837	6%	78
Education and training	1,232	9%	1,327	9%	95
Health care and social assistance	1,443	11%	1,529	10%	86
Arts and recreation services	110	1%	69	0.5%	-41
Other services	518	4%	528	4%	10
Inadequately described/Not stated	108	1%	624	4%	516
Total	**13,213**	**100%**	**14,586**	**100%**	**1,373**

5.5 Strategic land use planning

5.5.1 Regional plans

Regional plans provide a 20-year vision and directions for land use management in regional NSW, supporting the development of regional economies, strengthening communities and protecting the environment. Regional plans form a bridge between State level plans and local plans. The majority of the proposal is located in the Central West and Orana Region, with the balance being in the New England North West Region.

The *Central West and Orana Regional Plan 2036* and *New England North West Regional Plan 2036* were both adopted in 2017 (NSW Department of Planning and Environment, 2017a and 2017b). Both plans highlight the role of freight transport networks to develop regional economies and enable efficient connections to major ports and identify that the Inland Rail program could contribute to an increase in connectivity and capacity.

The plans also identify the need to diversify food production in the regions. The *Central West and Orana Regional Plan* prioritises the facilitation of food processing and manufacturing to value add the existing supply chains, while the *New England North West Regional Plan* prioritises the diversification of agricultural industry. The *Central West and Orana Regional Plan* also identifies that productive agricultural land needs to be protected from encroachment and fragmentation.

5.5.2 Local strategic planning statements

Local strategic planning statements (LSPSs) form part of the new strategic planning framework in NSW. Section 3.9 of EP&A Act requires each council to prepare an LSPS at least once every seven years, addressing the basis for strategic planning, planning priorities, actions and implementation monitoring.

LSPSs will, once adopted, provide a strategic 'line of sight' from the regional plans to local planning, providing a vision and priorities for each local government area. LSPSs are expected to form the basis of future changes to local planning controls.

At the time of writing all councils in the study area have exhibited their draft LSPSs, with Coonamble's LSPS adopted in May 2020.

The draft LSPSs generally consider the impacts of the proposal. Table 5.8 provides a summary of planning priorities that are relevant to the proposal.

Table 5.8 Relevant planning priorities in draft local strategic planning statements

LGA	Planning priorities and actions
Coonamble (adopted May 2020)	**Priority 3** - Provide contemporary services and local infrastructure for the community to thrive. • Providing the right infrastructure and services to connect both people and freight is essential to the survival and growth of Coonamble • Prioritise funding and upgrades to key regional freight network corridors (National, State, regional and local links) **Action 12**- Identify opportunities for delivery of complimentary investments and infrastructure to leverage off the Inland Rail Project development.
Gilgandra (draft on exhibition January 2020)	**Priority 3** – Infrastructure connectivity for people and freight • Develop and implement evidence based freight and transport strategies that integrate the key regional freight network and support the recommendations of the Transport for NSW Connecting the Central West and Orana Transport Program. • Identify opportunities for delivery of complimentary investments and infrastructure to leverage off the Inland Rail project, with a strong focus on the proposed industrial subdivision adjacent to the existing rail corridor. • Advance a business case to encourage construction for modern and efficient infrastructure that provides connectivity between Inland Rail and the existing Country Rail network (Dubbo to Coonamble line) at Curban. **Priority 4** – Industry diversification • Support the uptake of new business/industry opportunities within Gilgandra's new industrial estate.
Narrabri (draft on exhibition March-April 2020)	**Priority 1** – Promote agriculture, grow the agri-business sector, encourage diversification in the agricultural sector and harness domestic and international opportunities. **Action 1.5** –Review planning controls in the LEP and DCP to accommodate agribusiness and to encourage intensive food production and more intensive agribusiness. **Priority 3** – Build strong economic centres.

LGA	Planning priorities and actions
	Action 3.1 – Identify and develop a Precinct Plan for an integrated manufacturing, freight and logistics precinct. **Priority 13** – Support the emerging N2IP (Northern NSW Inland Port). **Action 13.1** – Amend the LEP to facilitate the delivery of N2IP master plan.
Narromine (draft on exhibition April 2020)	**Priority 7** – Development, diversification and sustainability of the local business and industry base. **Direction 7.2** – Grow the agribusiness sector and supply chains **Direction 7.3** – Develop advanced manufacturing and food processing sectors **Priority 8** – Encourage employment and skills development to address industry needs and grow the region's knowledge base. **Action 38.1** – Inland Rail Project presents a key opportunity for the Narromine Shire Narromine Shire; this represents a significant opportunity to create a secondary inland hub focussing on agricultural commodities. Sites identified with good intermodal transport links to be identified in strategic planning.
Warrumbungle (draft on exhibition January 2020)	**Priority 2** – Deliver infrastructure and transport networks. Council will work with ARTC in relation to the Inland Rail to ensure the best outcome for the Warrumbungle Shire's affected communities. **Priority 5** – Agricultural lands. On review of the Warrumbungle LEP, investigate the appropriateness of minimum lots sizes rural zones through undertaking a strategic analysis of agricultural land and practices.

5.6 Land use regulation within the regional study area

Land uses within the study area are primarily regulated by the EP&A Act. The EP&A Act relies on a series of environmental planning instruments to implement zoning controls on land. Each of the LGAs in the study area have adopted LEPs to define detailed controls, which largely follow a standardised format. At times State Environmental Planning Policies can override an LEP.

In this context, it is noted that as the proposal has been declared to be State significant infrastructure, the consent requirements of the LEP do not apply and the proposal will be determined under Division 5.2 of the EP&A Act.

The land use zones along the corridor are presented in Table 5.9 and shown in Figure 5.1**.** The study area has largely been zoned for primary production purposes (zone RU1) and forestry purposes (zone RU3). There is some variation in the range of permissible uses in this zone from one LGA to another, so Table 5.9 describes the zoning and other LEP controls broadly across all relevant LGAs.

Table 5.9 Distribution of land use zones near the proposal

Land use zone	% of land within 1 km of proposal	Comments
RU1 Primary Production	77	This land use control allows for a wide variety of non-urban purposes. The land use controls for the five LGAs in the study area generally permit extensive agriculture and forestry operations without consent. More intensive agriculture and related activities such as freight, home occupations, accommodation, mining and some industrial activities are often permissible with consent. Within the study area, land zoned RU1 Primary Production is subject to large minimum lot size controls. The Coonamble, Gilgandra, Narrabri and Narromine LEPs generally apply a minimum lot size control of 500 hectares. The Warrumbungle LEP generally applies a minimum lot size control of 1000 hectares. The minimum lot size control limits the subdivision of land by development application. Development may be permissible on lots are already smaller than the minimum lot size, although LEP provisions may result in developments such as dwellings and rural workers' dwellings becoming impracticable on those lots. Some LEP controls permit subdivisions and boundary adjustments for lots below the minimum lot size where the consent authority is satisfied that the adjustment is consistent with the primary purpose of the land use.
RU3 Forestry	21	Activities permissible under the *Forestry Act 2012* or Part 5B of the *Local Land Services Act 2013* are permitted without development consent. Forests in the study area are managed under the Forestry Management Zoning system (State Forests of NSW, 1999). The majority of forests in the study area fall under Zone 4: General Management Zone, with areas near waterways falling under Zone 3A: Forestry Exclusion Zone. Small pockets fall under Zone 3B: Special Prescription Zone, with a dominant purpose of Wildlife (fauna).
R5 Large Lot Residential	0.7	LEPs focus the use of these lands for residential purposes and specified home industry purposes, including landscape supplies. A broad range of activities are prohibited, including most agriculture. The corridor passes through one land parcel zoned R5 Large Lot Residential on Eumungerie Road, Narromine. The land was rezoned in 2017. The land parcel has not been subdivided and continues to be used for extensive agriculture. The corridor passes near land zoned R5 Large Lot Residential located west of Newell Highway and south of Kamilaroi Highway, Narrabri.
SP2 Infrastructure	0.7	The corridor intersects major roads and railway lines which have been zoned for this purpose.

Land use zone	% of land within 1 km of proposal	Comments
R1 General Residential	0.5	This zoning provides for housing needs of communities, providing for a broad range of housing and a selection of other uses that provide for the needs of residents. The corridor passes near these uses at Narromine and Narrabri, where the corridor interfaces with existing railway lines.
IN1 General Industry and IN2 Light Industry	0.4	The corridor passes through these industrial zonings located on the fringe of Narrabri. These zones permit a variety of industrial uses, generally with consent, while prohibiting uses that may not be compatible with industrial activity. The IN2 Light Industrial zoning is more restrictive than the IN1 General Industrial zoning, reflecting its closer proximity to more sensitive land uses. Rail-related facilities, including freight transport facilities, are generally permissible with consent.

5.7 Major proposed developments in the regional study area

A search of Regional Planning Panel decisions in May 2020 identified five development approvals, representing major proposed land use changes in the vicinity of the proposal site. All sites are located near the town of Narromine.

5.7.1 'Wahroonga' solar farm, Euromedah Road, Narromine (DA2019/47)

This development consists of a five megawatt peak solar electricity generating works located on Lots 41 and 46, DP 752581, Euromedah Road Narromine. The proposal consists of an array of elevated tracking solar panels, two inverter stations and a connection to the high voltage electricity network. The development would be accessed via a gravel road from Euromedah Road near its intersection with Eumungerie Road. The development application was approved by the Western Joint Regional Planning Panel in 2016. At the time of writing the project does not appear to have commenced.

5.7.2 Solar farm, Eumumgerie Road, Narromine (DA80/16)

This development consists of an 11 megawatt peak, ground-mounted solar farm located on Lot 32 DP 1129935, Eumungerie Road Narromine. The development would be accessed via a new site access on Eumungerie Road, near Burroway Road. The development application was approved by the Western Joint Regional Planning Panel in 2016. At the time of writing the project does not appear to have commenced.

5.7.3 Macquarie Manor quarry, Euromedah Road, Narromine (DA2019/36)

The Macquarie Manor quarry is an existing hard rock quarrying facility. The development application seeks consent to extend the quarrying operation to allow for the quarrying of up to 500,000 tonnes per annum for 30 years. Extracted and stockpiled materials would be transported via Euromedah and Eumungerie Roads. The application is under assessment by the Western Regional Planning Panel.

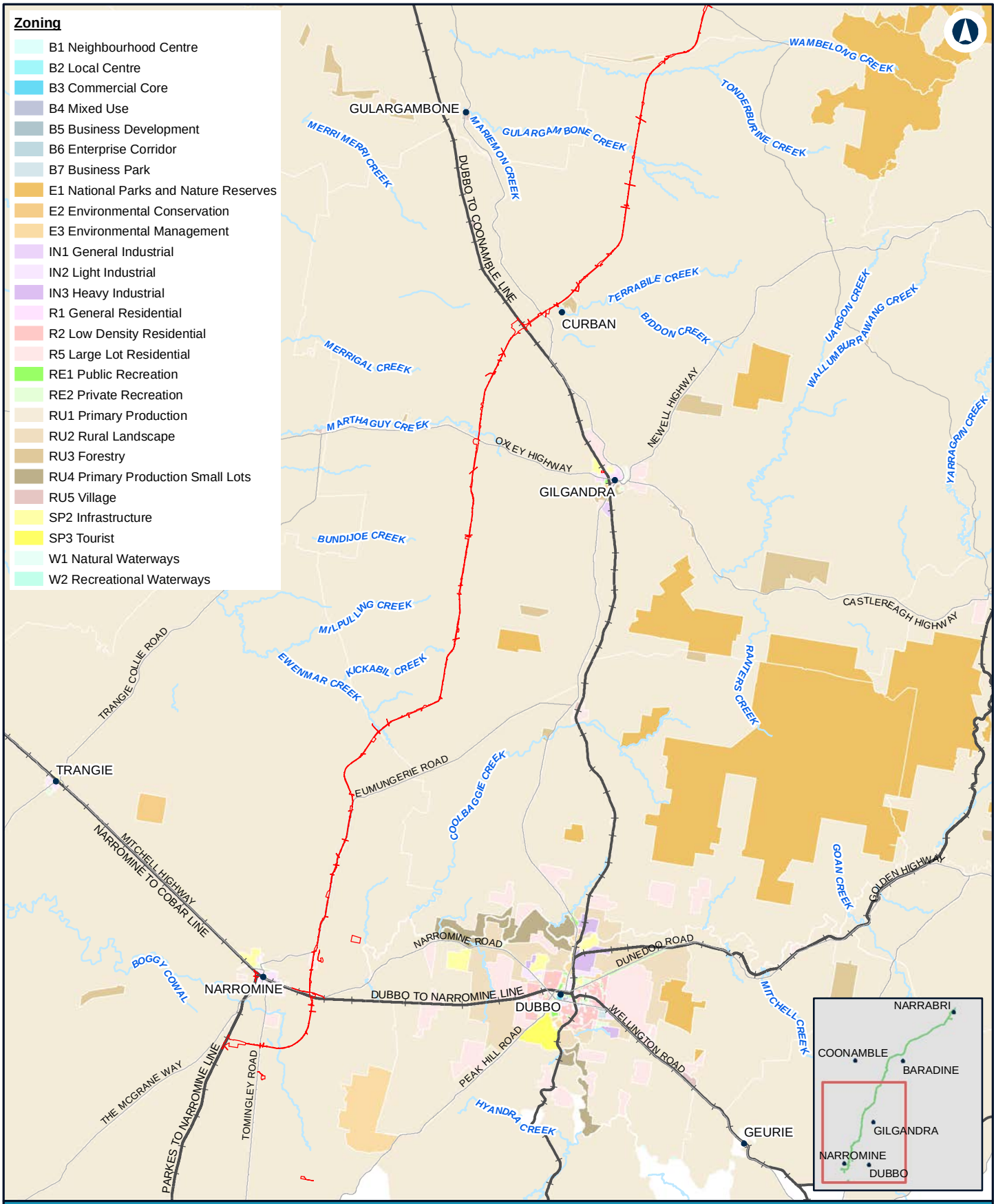
5.7.4 Redden quarry, Wallaby Road, Narromine (DA2019/58)

The Redden quarry is proposed to extract and process up to 490,000 tonnes per annum, including crushing, stockpiling and transport to work sites associated with Inland Rail and other road projects. The proposal allows for train loading operations as required. The application is under assessment by the Western Regional Planning Panel.

5.7.5 Rezoning of Lot 52 DP661453 to Large Lot Residential

This land currently is used for extensive agriculture as part of a larger land holding. In 2017 the Narromine LEP was amended to zone the land R5 Large Lot Residential with a minimum lot size of five hectares, yielding 21 lots. The intent of the rezoning was to provide for the future supply of rural residential land, consistent with the *Narromine Shire Rural Residential Lands Strategy 2013* (Narromine Shire Council, 2015). To date no subdivision of the land has been proposed.

Discussion relating to the cumulative impact of the proposal on adjacent major projects is provided in section 8.



NARROMINE TO NARRABRI Land use zonings in the study area Figure 5.1a

0 8 16 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

The proposal site

Date: 1/06/2020 Paper: A4
Author: JacobsGHD Scale: 1:7,163,937
Data Sources: Basemap layers: NSWSS; Zoning: DPE; Footprints: GHDJACOBS

INLAND RAIL ARTC

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

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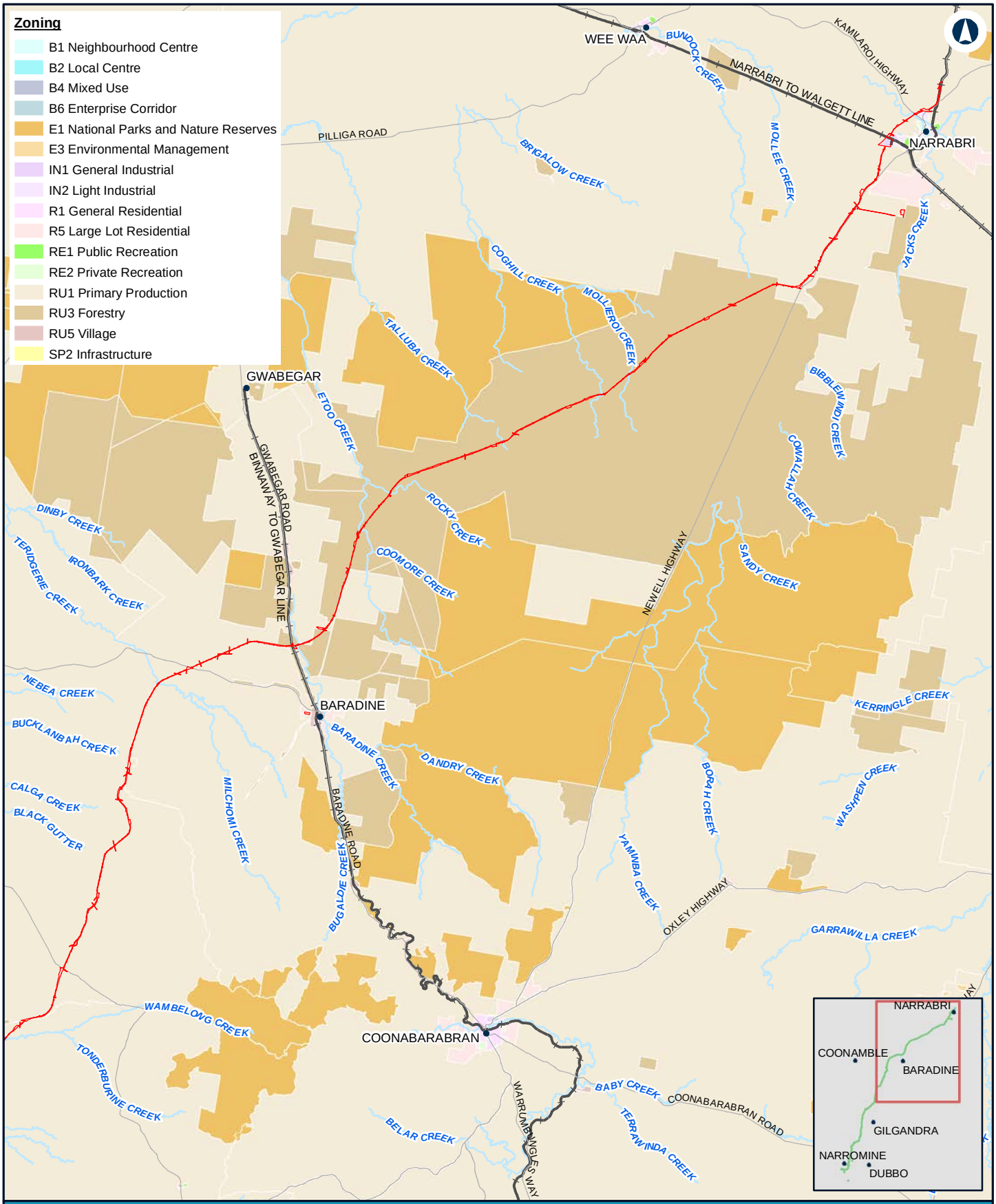

NARROMINE TO NARRABRI Land use zonings in the study area Figure 5.1b

0 8 16 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

The proposal site

Date: 1/06/2020 Paper: A4

Author: JacobsGHD Scale: 1:7,163,937

Data Sources: Basemap layers: NSWSS; Zoning: DPE; Footprints: GHDJACOBS

INLAND RAIL ARTC

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

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6. Consultation

6.1 Overview

Since November 2017, ARTC has been undertaking consultation activities for the proposal. The efforts to date are summarised in the *Inland Rail Narromine to Narrabri Consultation Report* (ARTC, 2020) that outlines the objectives, strategies and consultation completed by ARTC Inland Rail as both part of delivering the proposal and the EIS. As part of the consultation and engagement program, ARTC has engaged Inclusive Engagement, an agricultural consultant, to undertake one-on-one consultation with around 100 landholders who own property or reside in the study area. These meetings were attended by representatives from ARTC and Inclusive Engagement.

6.2 Issues identified

As part of the development of the EIS, JacobsGHD and Inclusive Engagement met on two occasions to disseminate information from the property visits and to understand the key issues raised as part of this process. A number of issues were identified during this process and while a number of the key issues were specific to individual properties, the following list outlines some of the overarching issues identified during the consultation process:

- Degree of severance (broad hectares in total) – noting some minor and some major and in severely affected areas what is the minimum viable lot size for continued agricultural production.
- Access issues – farm vehicles, machinery and livestock. These may be viewed as non-direct impacts but road closures can have a big impact on operations.
- Value of lost production (based on NSW DPI GM on a $/hectares across key commodities) – noting individual management regimes can outperform these estimates.
- Impact on paddock shapes for GPS / precision farming – what percentage of landholders might be impacted.
- Potential area for change in land use (eg cropping to grazing) based on severance.
- Any identified impact on water infrastructure (working dams / water troughs / poly pipe infrastructure).
- Flood mitigation measures – flood fencing to allow stock movement and prevent smothering in extreme events. Also concerns raised by landholders about the effects any infrastructure will have on the concentration of overland flow, giving rise to erosion and flood damage.
- Any possible requirements for relocation of key farming infrastructure and isolation of ‘hubs’ on farm.
- Animal welfare and stock behaviour concerns.
- Ensuring biosecurity impacts during operation and construction are appropriately managed.
- Public liability concerns around stock that may get on to roads/rail line.
- Timetables for works so that impacted landholders can plan around this.
- Understanding of operation schedule to assist with movement of vehicles, machinery and livestock.

The above potential impacts are discussed in further detail in section 7.

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7. Assessment of impacts

7.1 Land requirements

The proposal would require the use of land both temporarily and permanently. While the permanent land requirements would be long-term and relate to the operation, these impacts would commence during construction and are summarised in Table 7.1.

Table 7.1 Temporary and permanent land requirements

	Temporary		Total	Permanent		Total
	Privately owned	Publicly owned		Privately owned	Publicly owned	
Hectares	1,158.2[1]	454.3	**1,612.5**	1,221.6	501	**1,722.6**
Lots	284	244	**528**	225	143	**368**
No. properties	180	233	**413**[2]	141	133	**274**

Notes: 1. Includes temporary requirements for construction only. Total construction footprint requirements would comprise temporary and permanent areas.
2. Includes properties also impacted by permanent land requirements.

The temporary and permanent land requirements shown above relate to areas of land that would be the subject of acquisition or lease negotiations. This would exclude areas along the proposal site, such as waterways, which would not be acquired or leased. Consequently, the areas of land requirements show here are necessarily different (slightly smaller) to the broader land use impacts discussion in subsequent sections.

Land required during construction only would be via a lease or memorandum of understanding with the relevant government agency or private landholder. Following the construction phase, this land would be rehabilitated and returned to pre-construction condition where possible, or as agreed with landowners.

Some land acquired as part of the acquisition process may not be required for the proposal's operational footprint. The preferred option for the future use of residual/surplus land (including sale or transfer) would be confirmed for each land parcel during detailed design.

Where land is acquired, compensation would be assessed in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and *Determination of compensation following the acquisition of a business* (NSW Government, undated). Depending on the individual circumstances of each land/business owner and the proposed impacts upon the land and to operations, compensation may take the form of money or land/works – as agreed by the parties. Further detail on temporary and permanent land requirements is provided in Appendix F of the EIS.

7.2 Biophysical strategic agricultural land – proposal site

As outlined in section 4.2.2, the proposal site intersects biophysical strategic agricultural land as shown in Figure 4.4. The total area of BSAL within the proposal site is 90.9 hectares out of a total area of 141,286 hectares mapped across the regional study area. This equates to removal of 0.064 per cent of BSAL from the regional study area. While there would be an incremental increase in the fragmentation of BSAL, it is not expected to diminish the agricultural productivity and output across the regional study area. There is a variety of land uses adjacent to the proposal site and it is uncertain if landholdings have adopted agricultural practices that take advantage of BSAL. The configuration of paddocks means that BSAL areas are not separately fenced and therefore due to the broad regional scale of the mapping, the inherent value of the land is unlikely to differ within an agricultural enterprise.

7.3 Land and soil capability – proposal site

Table 7.2, Table 7.3 and Figure 4.5 show, respectively, the land areas and map of the land and soil capability classifications of the proposal site with the total area being 1,805 hectares.

The comparison of land capability classification of land within the proposal site compared to land capability across the regional study area is described in section 4.2.3. This shows that the land within the proposal site is generally representative of the broader land capability within the regional study area. Within the proposal site there is slightly more Class 3 and 5 land than the regional study area while conversely the proposal site includes less Class 2 and 4 land then regional study area.

The proposal would require slightly more land during the construction phase than during operation. During the construction phase (see Table 7.3), similar categories of land as the operations phase would be temporarily removed from production, however would be reinstated following construction. Following the construction phase, 1,512 hectares would be rehabilitated and returned to pre-construction condition in accordance with the rehabilitation strategy outlined in section 9.

Table 7.2 Land and soil capability for the proposal site – operation

Land and soil capability class	Area (ha)					Total (ha)	Per cent
	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle		
2	3.6	0	21.8	0	0	25.4	1
3	124.1	79.7	34.4	176	21	435.3	24
4	42.3	315.1	80.9	84.7	104.5	627.5	35
5	0	123.4	387.6	19.6	117.8	648.3	36
6	28.5	35.5	0	0	0	64.0	4
Other	0	0	0	4.2	0	4.2	0.2
Total	198.5	533.8	524.7	284.5	243.3	1,804.8	100

Source: Land and Soil Capability Mapping of NSW (NSW OEH (2012))

Table 7.3 Land and soil capability for the proposal site – construction

Land and soil capability class[1]	Area (ha)					Total (ha)	Per cent
	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle		
2	5.7	0	57.5	0	0	63.2	2
3	194.3	125.3	271.8	381.3	36.1	1008.8	30
4	74.6	504.6	29.3	265.5	176.9	1050.9	32
5	0	280.3	409.7	40.3	175.2	905.5	27
6	49.5	68.4	163.5	2.1	0	283.5	9
Other	0	0	0	4.3	0	4.3	0.1
Total	324.3	978.5	931.9	693.5	388.2	3316.4	100

Source: Land and Soil Capability Mapping of NSW (NSW OEH (2012))

Note: 1. there are minor variations in land areas compared to those presented in Section 7.1 due to differences in assessment techniques.

The land and soil capability classifications of the proposal site have also been analysed against the key design features (rail and road infrastructure) and the key construction infrastructure.

Road and rail infrastructure occur throughout the proposal site, with land and soil capability being representative of the areas identified in Table 7.2.

Key construction infrastructure is dispersed across the proposal site and land and soil capability has influenced the selection of these sites. The four borrow pits are on Class 4 and 5 land and have been identified due to their moderately low capability land from an agricultural perspective.

The three main compounds and temporary workforce locations are on land ranging from Class 3 to 6. These key construction infrastructure are temporary in nature and would be rehabilitated and returned to agricultural production following construction. Workforce accommodation camps outside of agricultural land are in the proximity of urban areas and not on land currently used for agriculture.

7.4 Land use – proposal site

Table 7.4 and Figure 4.1 summarise land use for the proposal site - operation, and Table 7.5 land use for the proposal site - construction. The proposal site (operation) area traverses predominantly grazing and dryland cropping land use areas. Grazing land use occupies 603.7 hectares (34 per cent) and dryland cropping occupies 682.3 hectares (38 per cent). The proposal site area impacts on 13.6 hectares (less than one per cent) of irrigated cropping land. Production native forestry accounts for 429.3 hectares (24 per cent) of land use within the proposal site. The breakdown of land uses affected during the construction phase (Table 7.5) are generally consistent with the land use of the operation phase. Following construction, the rehabilitation strategy (refer to section 9) would include measures to restore disturbed sites as close as possible to the pre-construction condition or better, or to the satisfaction of landowners. This would result in the rehabilitation of 1,512 hectares.

Table 7.4 Land use within the proposal site – operation

Land use[1]	Area (ha)					Total	Per cent
	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle		
Managed resource protection	0	0.3	0	0	0	0.3	0.01
Other minimal use	0	4.2	0	0	0	4.2	0.23
Grazing native vegetation	60.5	164.1	125.5	36.6	57.6	444.3	25
Production native forests	0	0	337.2	0	92	429.3	24
Grazing modified pastures	45	49.9	26.7	20.5	17.3	159.4	9
Cropping	93	313.8	8.8	191.2	75.5	682.3	38
Irrigated cropping	0	0	2.2	11.5	0	13.6	0.75
Manufacturing and industrial	0	0	5.4	0.0	0	5.4	0.30
Residential and farm infrastructure	0	0	5.1	0.8	0	5.9	033
Services	0	0.5	0	0	0	0.5	0.03
Transport and communication	0	15.7	11.4	23.3	0.8	51.3	3
Mining	0	3.8	0	0	0	3.8	0.21
Reservoir/dam	0	0.3	0	0.0	0	0.3	0.02
River	0	0.9	0.5	0.4	0	1.8	0.1
Channel/aqueduct	0	0.1	0	0	0	0.1	0.01
Marsh/wetland	0	0.1	1.9	0.2	0	2.2	0.14
Total	**198.5**	**553.8**	**524.7**	**284.5**	**243.3**	**1,804.8[2]**	**100**

Notes: 1. Land use data reflects all mapped land uses within the operational footprint, including areas that would not need to acquired or leased for the proposal, consequently the totals differ slightly from those discussed in Section 7.1.

2. Totals may not correlate due to rounding.

Table 7.5 Land use within the proposal site – construction

Land use[1]	Area (ha)					Total	Per cent
	Coonamble	Gilgandra	Narrabri	Narromine	Warrumbungle		
Managed resource protection	0	0.4	0	0	0	0.4	0.01
Other minimal use	0	5.3	0	0	0	5.3	0
Grazing native vegetation	87.1	233.6	321.0	90.8	92.1	824.6	25
Production native forests	0	0	481.3	0	131.1	612.4	18
Grazing modified pastures	69.9	90.3	53.6	40.5	31.7	286.0	9
Cropping	167.3	612.1	20.1	497.9	119.8	1417.2	43
Perennial horticulture	0	0	0	1.0	0	1.0	0
Irrigated cropping	0	0	5.6	17.1	0	22.7	1
Irrigated perennial horticulture	0	0	0	0.0	0	0.0	0.00
Intensive animal production	0	0	0	0.1	0	0.1	0.00
Manufacturing and industrial	0	0	9.4	0.0	0	9.4	0.28
Residential and farm infrastructure	0	1.8	17.6	1.4	0	20.8	1
Services	0	0.6	0	1.9	12.1	14.7	0.44
Transport and communication	0	22.7	18.5	31.8	1.3	74.3	2.24
Mining	0	9.2	0	10.2	0	19.4	0.58
Reservoir/dam	0	0.4	0.9	0.0	0	1.3	0.04
River	0	1.7	0.7	0.6	0	3.0	0
Channel/aqueduct	0	0.2	0	0	0	0.2	0.01
Marsh/wetland	0	0.2	3.2	0.3	0	3.7	0.11
Total	**324.3**	**978.5**	**931.9**	**693.5**	**388.2**	**3316.4**	**100**

Note: 1. Note there are minor variations in land areas compared to those presented in Section 7.1 due to differences in assessment techniques.

The land use classifications of the proposal site have also been analysed against the key design features (rail and road infrastructure) and the key construction infrastructure.

Road and rail infrastructure occur throughout the proposal site, with land uses to be impacted consistent with the general split of the operational land use as outlined above in Table 7.4.

Key construction infrastructure is dispersed across the proposal site and the land use has helped to inform the key infrastructure. As discussed in section 7.3, the four borrow pits are located on moderately low capability land. These borrow pits are located on land use classified as grazing native vegetation and therefore the land use is unimproved pasture and there has not been any impacts on the higher capability land such as improved pastures and cropping have not been impacted.

Similarly, the location of the three main compounds and the location of temporary workforce accommodation locations have been chosen for their proximity to support a range of construction activities across the proposal site. This land has been assessed as either grazing or dryland cropping with the exception of the temporary workforce accommodation located in towns. These key construction components are temporary in nature and the land they occupy would be rehabilitated and returned to agricultural production following construction.

7.5 Agricultural resources or industries

The assessment of potential impacts to land use and agriculture associated with the proposal was undertaken using a number of mechanisms. Key inputs included the findings of studies undertaken for land use and agriculture including consultation activities, as described in this report. In addition, a workshop was undertaken on 19 February 2020. It was attended by relevant staff of JacobsGHD and Inclusive Engagement. This workshop included the consideration of both the significance and risk of potential impacts to land use and agriculture. During construction and operation phases, impacts to agricultural land have been assessed according to the following categorisation:

- Removal of agricultural land from production
- Direct potential impacts to agricultural resources:
  - property severance
  - impeded access
  - reduced land and water capability and changes to farming operations
  - damage to internal roads and load limits
  - isolation of hubs
  - reconfiguration of paddocks due to fragmentation
  - damage to fences
  - damage to irrigation and livestock water supplies
  - potential for flooding
  - biosecurity
  - animal welfare and stock behaviour concerns
  - Indirect potential impacts to agricultural production
  - interrupted management
  - dust, noise and light generation
  - movement of water away from agriculture
  - labour supply
  - regional services
  - bushfire
  - use of travelling stock reserves
  - economic impacts to agriculture
  - industry and regional effects

– impacts on roads, travelling stock reserves and Crown reserves
– impacts on mineral resources.

7.5.1 Effects on agricultural resources

The proposal would have a range of impacts on agricultural resources with the degree of impacts varying with the different stages of development namely planning, construction and operation. A substantial impact on agricultural production is the permanent removal of the land for operation and other impacts arising from impeded access and property severance. Some additional land would also be temporarily removed from agricultural production during the construction phase and following rehabilitation, normal agricultural production should be able to resume.

The key design features of the proposal are discussed in section 1.2.2 and construction of the proposal would involve five main phases of work, commencing in 2021 with completion scheduled for 2025.

The above activities would have direct and indirect impacts on agricultural resources and farm management activities with the most significant impacts being the removal of agricultural land from production. In addition, the scale of impacts would be influenced by the timing of construction due to the seasonal nature of farm management activities. The seasonal nature of farm management activities includes preferred timing of operations that suit the particular agro-climatic location. This includes the planting and harvesting of crops, and livestock husbandry operations such as calving, lambing and shearing. Disruption of farm management activities during these periods could cause greater impacts on agricultural enterprises.

The impacts of the proposal would vary for individual landholders because of the diverse nature of enterprises adopted by individuals. Many businesses typically operate several crop and livestock enterprises on the same farm or across a number of properties within the same locality.

The following sections provide a description of the potential direct and indirect impacts of the proposal that could occur, including differentiation of impacts considered to be of a temporary or longer term nature. Section 9 describes the mitigation measures that can be adopted to limit these impacts.

7.5.2 Benefits arising from Inland Rail

The key overall benefits of Inland Rail as a whole can be summarised as:

- **Improved network efficiency and reliability:** transit time between Melbourne and Brisbane is less than 24 hours with 98 per cent reliability, which matches current road transport levels.
- **Safety improvements:** up to 15 serious crashes, involving fatalities and serious injuries, will be avoided every year. Road congestion on some of Australia's busiest highways, including the Hume, Newell and Warrego, will also be reduced.
- **Boost to the Australian economy:** Inland Rail is expected to increase Australia's GDP by $16 billion during its construction and first 50 years of operation.
- **Job creation:** Inland Rail is expected to create up to 16,000 new jobs at the peak of construction, with an additional 700 long-term jobs once it is operational.
- **Improved sustainability:** moving freight by rail is four times more fuel efficient than moving freight by road. Carbon emissions will be reduced by 750,000 tonnes per year and truck volumes will be reduced in more than 20 of our regional towns (based on a 2050 estimate).

Key benefits of Inland Rail that will benefit industries such as agriculture that are dependent on the freight industry are:

- **Improved access to and from regional markets:** two million tonnes of agricultural freight shifted from road, with a total of 8.9 million tonnes of agricultural freight more efficiently diverted to Inland Rail.
- **Reduced costs for the market:** reduced rail costs for inter-capital freight travelling between Melbourne and Brisbane by $10 per tonne.
- **Increased capacity of the transport network:** additional rail paths for freight (160 round trip paths per week), a 105 per cent increase on current freight paths on the coastal route alone, along with releasing capacity for passenger services in Sydney and Brisbane and removing 200,000 truck movements (5.4 billion net tonne kilometres of freight) from roads each year from 2049-50.
- **Reduced distances travelled:** a 200 kilometre reduction in rail distance between Melbourne and Brisbane, and a 500 kilometre reduction between both Brisbane and Perth and Brisbane and Adelaide.
- **Reduced travel time:** reducing the travel time for freight (mainly grain) trains from Goondiwindi to the Port of Brisbane by about four hours and 30 minutes compared with the current rail trip.
- **Improved sustainability:** providing an alternative north–south freight path to counter weather, climactic or other disaster disruption to the transport network.

Section 7.10 outlines the industry and regional effects of the proposal including an estimated $258.90 million in incremental benefits to the project area, consisting of $243.72 million in freight benefits and $15.18 million in community benefits ($2019 present value terms) (KPMG, 2020).

7.6 Direct impacts – removal of agricultural land from production

Direct impacts refer predominately to the impact of temporary or longer term removal of agricultural land and infrastructure from agricultural production as a result of planning, construction and operation activities. Table 7.6 and Table 7.7 denote the area of agricultural land that could be impacted by the construction (temporary) and operation (longer term) phases respectively.

The majority of the land would be temporarily removed for construction (2,554 hectares, representing 0.07 per cent of agricultural land in the regional study area) for a period of up to 48 months during the construction phase. Rehabilitation of disturbed areas would be undertaken progressively and in accordance with the rehabilitation strategy to be prepared during detailed design for the proposal (see Table 7.6). Following construction, 1,254 hectares of land would be rehabilitated and returned to its former agricultural production levels, assuming that the reinstatement (returning topsoil, cleaning up, reinstating and rehabilitating construction area) is effectively completed. Following construction, there could also be a permanent change in land use from cropping to grazing in some areas due to the reconfiguration of paddocks (see section 7.7).

Table 7.6 Area of land to be removed from agricultural production – construction

Land use	Construction (ha)	Per cent
Grazing native vegetation	825	32
Grazing modified pastures	286	11
Cropping	1,417	55
Perennial horticulture	1	0.04
Irrigated cropping	23	1
Irrigated perennial horticulture	0.01	0
Intensive animal production	0.13	0.1
Farm buildings / infrastructure	2.2	0.1
Total	**2,554**	**100%**

The area of land to be permanently removed from agricultural production as a result of the operation of the rail corridor is 1,300 hectares and this represents 0.04 per cent of the agricultural land across the five LGAs that comprise the regional study area (see Table 7.7).

Table 7.7 Area of land to be removed from agricultural production – operational

Land use	Operation (ha)	Per cent
Grazing native vegetation	444	34
Grazing modified pastures	159	12
Cropping	682	52
Irrigated cropping	14	1
Intensive animal production	0.02	<0.1
Farm buildings / infrastructure	0.80	0.1
Total	**1,300**	**100**

The above land areas are for those directly impacted by the construction and operation. The impacts on production are likely to extend beyond operation and construction due to additional areas potentially being unavailable for production as a result of temporary restrictions to access and changes to farm management. The value of the loss of agricultural land as a result of these indirect impacts is calculated in section 7.10.

7.7 Property severance

The proposal includes two main types of infrastructure:

- Rail infrastructure – about 306 kilometres of new single-track standard gauge railway and associated rail infrastructure within a new rail corridor.
- Road infrastructure – to establish the new rail corridor and railway, various new roads and changes to the existing road network are required.

To facilitate construction and operation of the proposal, land is required for the new rail corridor, the realignment of roads, and other associated construction and operation activities. The design has sought to follow property boundaries as far as practicable in order to minimise severance of properties and sterilisation of parts of larger properties. A total of about 141 private properties (comprising 228 lots) would be permanently impacted by the proposal and does not include those temporarily impacted during construction. The proposal would require about 1,200 hectares of privately held land. The proposal would also result in about 5,000 hectares of privately held land being separated from about 60,000 hectares of private land holdings. Table 7.8 and Figure 7.1 provides an overview of the degree of severance grouped by holding size. On a land area basis, holdings larger than 750 hectares are the most affected, with the severed parcels commonly being less than 250 hectares.

Table 7.8 Severance of holdings as a result of the proposal

		Post-construction holding size (ha)						
		<250	250-500	500-750	750-1,000	1,000-1,250	1,250-1,500	>1,500
Pre-construction holding size (ha)	<250	100%	0%	0%	0%	0%	0%	0%
	250-500	22%	78%	0%	0%	0%	0%	0%
	500-750	6%	24%	70%	0%	0%	0%	0%
	750-1,000	1%	17%	20%	62%	0%	0%	0%
	1,000-1,250	0%	10%	14%	0%	77%	0%	0%
	1,250-1,500	1%	16%	0%	35%	0%	48%	0%
	>1,500	<1%	0%	0%	0%	0%	0%	>99%
	Total post-construction	19%	30%	23%	13%	5%	2%	8%
	Total pre-construction	12%	25%	26%	18%	7%	4%	8%

Notes:

- Holdings are defined as contiguous land under common ownership as listed in Valuer-General records.
- Analysis only considers holdings directly affected during the operation phase of the proposal.
- Analysis is made on a land area basis.

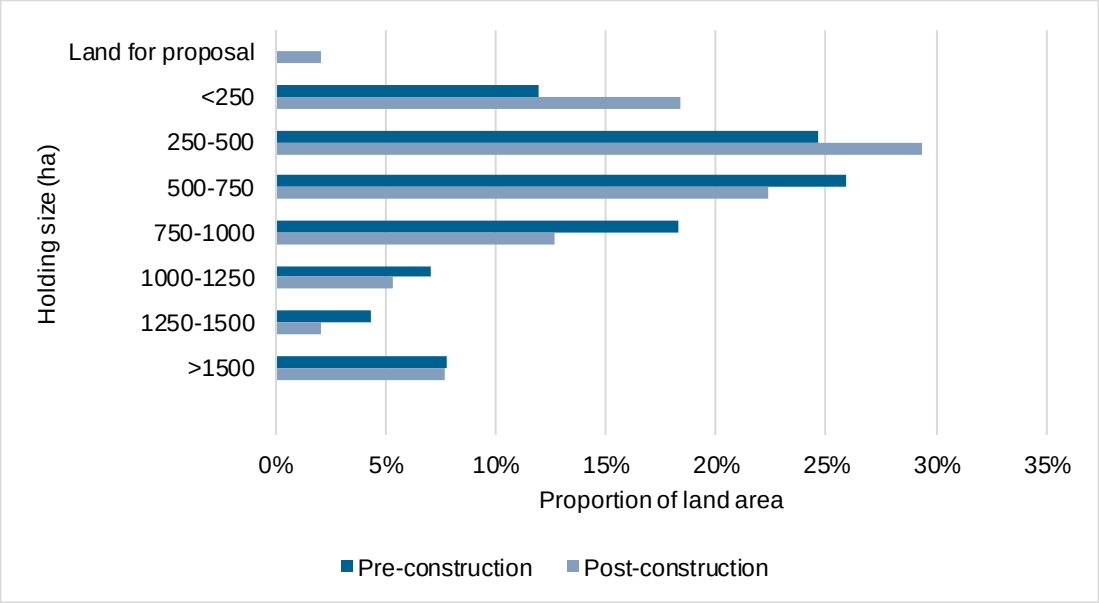

Figure 7.1 Change in the distribution of holding size as a result of severance

LEP controls restrict the subdivision of rural land below a specified size (typically 500-1,000 hectares). Despite this new lots created as a result of the proposal can be below the minimum lot size. This would not limit the capacity of the land to be used for its existing purposes, but in some instances may make it difficult to achieve development approval for new uses. LEP controls allow for dwellings to be provided on rural zoned lots smaller than minimum lot size where it is proposed to replace an existing dwelling or where the lot fell below the minimum size as a result of a subdivision for a public purpose.

The impact of severance on farming operations is highly dependent on the circumstances of each farming business. Relevant factors include nature of farming enterprise, the capacity of severed land to be accessed from on-farm operational hubs and the capacity of the enterprise to adapt to the changed operational circumstances. Measures to address severance impacts, including but not limited to amalgamation opportunities, would need to be considered on a property-by-property basis as part of the land acquisition process, consistent with Division 4 of Part 3 of the *Land Acquisition (Just Terms Compensation) Act 1991*.

Land capability, farm infrastructure and biosecurity

Construction and operation activities may also, in addition to land use change, directly impact on land capability, farm infrastructure and biosecurity which unless mitigated would reduce the productive potential of agricultural land. Potential direct impacts are outlined in Table 7.9 and while some of the impacts may not occur and, if they do occur, the extent of impacts could vary across individual properties, they can be minimised by adopting appropriate mitigation measures which are discussed in section 9.

Consultation with landholders could also minimise the potential impacts caused through the development of a collaborative planning framework to ensure that construction practices and timing of activities lessen the impacts on agricultural production.

Table 7.9 Potential direct impacts on land capability, farm infrastructure and biosecurity

Item	Issue	Potential impact
Property severance	As outlined in section 7.7, construction and operation activities could permanently disrupt property configuration and may result in the severance of properties and the isolation of key agricultural infrastructure (refer below to isolation of hubs). Many agricultural properties within the proposal site operate as a single management unit. The severed portions may become unviable due to remaining area, configuration or access. These properties have been progressively developed to maximise efficiency of stock and equipment movement (eg stock laneways, holding paddocks and livestock handling yards). Other issues resulting from severance are addressed in the other items outlined below.	Without mitigation, impacts during construction phase could include inability to access areas for routine husbandry operations (eg crop spraying, harvesting), inability for livestock to graze pastures (eg due to the unavailability of stock water). Similarly, during the operation phase, impacts could result in additional travel and time costs in moving livestock and machinery between severed parcels of land. In some circumstances, additional capital investment could be required to replace current infrastructure (eg livestock handling yards, laneways, forcing yards and holding pens) and constructed to a standard to accommodate cattle and sheep and allow for the short term containment of animals, including sufficient capacity to hold average sized mobs. Similar infrastructure would also be required for travelling stock reserves. In the alternative, if underpasses are constructed, they need to be of a sufficient height to allow for the movement of stock and vehicles. Production loses could vary from zero up to a percentage of annual production. A multiplier has been adopted in section 7.10 to reflect the cost of impacts if appropriate mitigation measures are not adopted (section 9).

Item	Issue	Potential impact
Impeded access	Construction and operation activities would permanently disrupt property access through the rationalisation of access points. The proposal would include new level crossings at intervals along the main alignment, allowing for the efficient and safe crossing of the rail corridor by vehicles, machinery and livestock. Various adjustments were made to the vertical rail alignment to manage earthwork quantities (ie desired cut/fill balance) and minimise grade changes for roads where level crossings would be provided. Consideration was given to crossing consolidation, road relocation, diversion or realignment concept design as part of the design process (as described in chapter A6 of the EIS). Access within farms (intra and inter), other properties and onto public roads is a major issue for the movement of agricultural machinery and movement of livestock. Construction activities may temporarily block access to land which is not otherwise directly associated with land required for the proposal site. During the operation phase, there could be additional time and costs associated with accessing paddocks, properties and undertaking routine agricultural operations within the same property. Property access needs to be of a sufficient standard to cater for current and future requirements (including wider gates, appropriate clearance and suitable approach grades). Access tracks are required for beekeepers to allow timely placement and retrieval of hives.	As outlined above, without mitigation, impacts during construction phase could include inability to access areas for routine husbandry operations (eg crop spraying, harvesting), inability for livestock to graze pastures (eg due to the unavailability of stock water). Similarly during the operation phase, impacts could result in additional travel and time costs for landholders' standard business and personal requirements. Properties would require access for a B-double to safely enter and exit properties for the transport of agricultural commodities on/off farm. Current internal farm access roads, have been constructed to provide maximum efficiency and provide all weather access to hubs and key infrastructure (including homesteads). Refer to internal roads and load limits below. Interrupted access to beekeepers could reduce honey production depending on the timing of events.

Item	Issue	Potential impact
Land and water capability	Soil and/or surface/groundwater resources are compromised by construction and operation activities. Realignment of paddocks as a result of severance might impact on the sustainability, productivity and profitability of individual paddocks that have previously been set up for controlled traffic (tramline) and precision farming systems. This system of farming has been set up to provide economic and environmental benefits to the grower.	Soil erosion and/or contamination cause productivity declines for crops and livestock. Controlled traffic (tramline) farming systems are built using permanent wheel tracks. Farm machinery implements have a specific span and confined to specific lanes therefore improving profitability and sustainability. The realignment of lots could cause issues where farm machinery can no longer achieve the efficiencies in long continuous runs and new crops unable to achieve the previous yields on compacted soils if new tramlines have to be established. Recent technological advances to monitor soil fertility, moisture and general productivity may need to be realigned in order to maximise the efficiency of this data collection and management. Livestock are unable to obtain adequate quantity and/or quality of stock water.
Internal roads and load limits	Heavy construction vehicles / equipment could damage internal roads, crossings etc and temporarily limit access through a property. Post construction settlement of new internal farm roads could also interrupt traffic movements. Internal roads to key infrastructure should allow all-weather access. Farm machinery and equipment and contracted transport operators will require adequate safe distance to enter/exit properties onto public roads.	Inability to access paddocks and hubs at critical times (eg planting, harvesting, wet weather) could impact on crop yields and/or product quality. Disruption to transport of grain or livestock could affect marketing opportunities resulting in reduced prices.
Isolation of hubs	Farming operations are generally centralised around a central ‘hub’. These hubs often contain key agricultural infrastructure including sheds, grain silos, livestock handling yards, woolsheds, weighbridges, hard stands and homesteads and farm residences. Property severance may isolate these hubs from the balance of the farming operations. As discussed above in relation to internal roads, hubs have been built on areas that are ‘high and dry’ which allows for all weather access.	Impacts would depend on property severance and impeded access, however it is expected that there would be increased time and travel costs to access the other areas of the same agricultural holding due to a rationalisation of access points and alternative road access. This could result in additional costs when moving agricultural machinery or livestock. Additional farm infrastructure might be required on isolated parcel(s) of lands (eg livestock handling yards, laneways and loading facilities).

Item	Issue	Potential impact
Reconfiguration of paddocks	Precision agriculture and farm machinery configuration are set up for large continuous runs and broad turning circles.	Some agricultural land traditionally used for cropping activities would no longer be viable due to either the new configuration or size and may need to revert back to grazing activities which would require additional fencing and water supply and limits the opportunities to revert back to cropping in the future.
Fences	Construction activities may result in fences being cut and the placement of temporary gates to allow access. For the operation phase new livestock proof fences would be required to prevent livestock entering the rail corridor.	Unless repaired or appropriately planned, cut fences could result in unintended livestock mixing which in turn could disrupt planned breeding programs. Livestock could also stray onto the rail corridor or public roads where fences have not been reinstated. Both scenarios would add further costs to muster and draft livestock. Inappropriate fence realignment could reduce the future efficiency of completing crop and livestock activities.
Water supply	Construction and operation activities could damage on farm water pipelines, remove dams and drainage channels and therefore could restrict livestock drinking water supplies.	Unless repaired or new infrastructure appropriately planned, damaged/removed water supplies could seriously reduce livestock production and might affect stocking rate or result in livestock mortality. Dams that are spring fed are likely to be at most risk from being relocated as compared to surface water run-off fed dams. Refer to *ARTC Inland Rail Narromine to Narrabri Surface Water Quality Assessment* (JacobsGHD, 2020h) for further details on impacts of surface water quality as it relates to land use and agriculture.
Flooding	Peak flood events could have the potential for debris to collect on fencing, waterlog crops, equipment to bog or isolate livestock. The hubs and internal roads have been constructed over time to be accessible during peak flood events.	Depending on the seasonality, frequency, extent and duration of the flooding could result in repairs to fencing, damage to machinery loss of productivity with the potential to cause erosion Inability to access key infrastructure including homesteads during flood periods. Refer to *ARTC Inland Rail Narromine to Narrabri Flooding and Hydrology Assessment* (JacobsGHD, 2020b) for further details on impacts of flooding on land use and agriculture.

Item	Issue	Potential impact
Biosecurity	Planning, construction and operation activities create the possibility of introducing or spreading weeds, pests and diseases onto a property. In addition, soil disturbance could reduce competition against current weeds and necessitate increased control costs.	Weed, pest and disease incursions or proliferation would potentially reduce crop yield and livestock production and increase farm costs unless properly controlled. Refer to further discussion in the text below this table about assessing and identifying biosecurity risks and mitigation measures have been suggested in section 9.
Animal welfare and stock behaviour concerns	Concerns raised about the effects of visual, light, noise and vibration on animal and flock behaviour during construction and initial stages of operation.	There is potential to impact on lambing and calving percentages that may result in lower productivity or herding away from the rail corridor and applying extra grazing pressure to certain sections of the paddock. Horse owners have expressed concern of potential impacts from operation noise. Refer to indirect impacts listed below in section 7.9 for discussion on dust, noise and light.

7.8 Biosecurity

The productivity and profitability of agricultural production depends in part on the management of pests and diseases, including the prevention of incursion of pests and diseases onto properties. Biosecurity is a term that is commonly used for such management and the set of measures adopted to protect a property from the entry and spread of pests, diseases and weeds.

The *Biosecurity Act 2015* provides a framework for the prevention, elimination and minimisation of biosecurity risks. The General Biosecurity Duty under the Act provides a general obligation on people to be aware of their surroundings and take action to prevent the introduction and spread of pests, diseases, weeds and contaminants. The North West and Central West Regional Weed Management Plans identifies the high risk weeds in each respective region and the specific monitoring and compliance actions for each.

The proposal would result in the increased movement of vehicles and people to, around and within the proposal site during construction. The main biosecurity risk relates to the spread of weeds that may result from the increased movement of vehicles. Weed seeds could be transported through and within the site on clothing and via vehicle wheels and undercarriages. The recommended mitigation measures (section 9) provides specific mitigation measures to for the management of weeds.

If a new pest or disease becomes established, it can affect agricultural properties through increased costs (for monitoring, production practices, additional chemical use and labour), reduced productivity (in yield and/or quality) or loss of markets.

Farms generally prepare an on-farm biosecurity plan based on industry guidelines such as those available on the website: farmbiosecurity.com.au. The guidelines include risk assessments and control option to minimise impacts. The major biosecurity risk from this proposal relate to the movement of people, vehicles and machinery, with the risks occurring at both construction and operation phases. Potential biosecurity risks and measures that may mitigate these risks would be included in the Construction Environmental Management Plan (CEMP) and would detail measures to minimise the potential for biosecurity risk during construction in accordance with the General Biosecurity Duty and *Biosecurity Act 2015* and the regional weed management plans.

ARTC would continue to fulfil its obligations under the General Biosecurity Duty during operation for all lands that remain under its control. This would include managing any surplus/residual land in accordance with the General Biosecurity Duty until such time the land is transferred to another owner (see section 7.1)..

Recommended measures to manage the potential for biosecurity risks are provided in section 9.

7.9 Potential indirect impacts

Potential indirect impacts on agricultural production may occur as a result of both construction and operational activities which alter the ability of landholders to fully utilise the productive capacity of their land. These potential indirect impacts are discussed in Table 7.10.

Table 7.10 Potential indirect impacts of construction and operation activities

Item	Issue	Potential impact
Interrupted management	Planning, construction and operation activities could cause a delay to land owners completing various crop and livestock husbandry operations (eg weed spraying, harvesting, animal health treatments)	Delays could reduce pasture and crop yields, reduce livestock growth rates, reduce product quality and therefore price, increase livestock mortality. A multiplier has been adopted in section 7.10 to reflect the cost of impacts if appropriate mitigation measures are not adopted (section 9).
Dust, noise and operational light	During construction, there is the potential for impacts as a result of airborne particulate matter and dust deposition to settle on crops and pastures. Construction and operation would produce noise and light which could affect the grazing patterns of livestock. The operation of the trains on the project can be a potential source of vibration and associated ground-borne noise. During operation of the proposal, it is expected that the main potential contributors to lighting impacts would be trains and warning lights associated with active level crossings. As the trains are freight trains, the only source of night time lighting is likely to be a single light source, or a group of lights at the front of the train. These lights, together with the warning lights at active level crossings, are not expected to result in impacts, given the relatively limited output and temporary nature.	The proposal would be operated with the aim of achieving the operational noise and vibration criteria identified by the noise and vibration assessment, the requirements of the conditions of approval, and the relevant environment protection licence. Dust suppression would reduce risk of dust settling on crops and pastures. Dust accretions are removed at each rainfall event resulting in negligible impact. Livestock generally become habituated to noise and although grazing patterns may be altered, productivity is not affected (refer to discussion in text below about the response of livestock to loud noises). During construction there would be some lighting associated with security at compounds. Standard work construction hours are 6am to 6pm (7 days a week) and depending on seasonal conditions there might be some additional lighting at either daily commencement or conclusion. Some additional construction activities could also be scheduled which could result in additional lighting and out of hours work protocol prepared.

Item	Issue	Potential impact
		Generally during construction lighting will be minimal, directional in accordance with the relevant guidelines for lighting to reduce glare/over light During operation no lighting is provided – only train lights. During operation, air quality would be managed to achieve compliance with the operational environment protection licence. Refer to further discussion on dust and noise in the text below this table.
Movement of water away from agriculture	Use of water during construction and operation could reduce water availability for agriculture.	Total area used for irrigated cropping could decline as irrigation water is used for non-agricultural purposes. Refer to further discussion in the text below this table.
Labour supply	Construction and operation could require labour resources resulting in competition for labour required for agriculture. This could also impact on finding seasonal labour for some agricultural related activities.	The cost of labour in the regional study area could rise as a result of increased demand for general labour. A multiplier has been adopted in section 7.10 to reflect the costs. Refer also to *ARTC Inland Rail Narromine to Narrabri Social Assessment* (JacobsGHD, 2020d)
Regional services	A reduction in total agricultural production as a result of the construction and operation could reduce throughput for local agricultural supply, marketing and transport services.	The reduction in area is minimal from a regional perspective and would have insignificant impacts on volumes of production and thus minimal impact on other agricultural industries. Refer to section 7.11.
Bushfires	Risk of bushfire escaping and entering agricultural properties during construction and operation activities.	Potential for bushfire to spread due to delays in response time as a result of longer travel times to bushfire location or difficulty accessing source of bushfire. An emergency response plan would be included as a sub-plan in the CEMP to ensure that appropriate controls and procedures are implemented during construction activities to avoid or minimise impacts due to the occurrence of emergency situations including flooding and inundation, bushfires, fires and explosions.

Dust

During construction, there is the potential for impacts as a result of airborne particulate matter and dust deposition to settle on crops and pastures, however dust suppression protocols would reduce the occurrence and the impacts on production are likely to be insignificant. During construction, dust impacts would vary substantially from day to day depending on the level of activity, duration, soil type and topography and the wind speed and direction.

The air quality assessment identified that the main potential for air quality impacts would be during construction, when there would be the potential for dust impacts if works are not effectively managed. These impacts would be limited to sensitive receivers located within the separation distances identified within the assessment. The key approach to managing the identified air quality impacts during construction, including dust and emissions from construction plant, would involve preparing an air quality management plan, which would be implemented as part of the CEMP. Where sensitive receivers are located within the separation distances determined for each key activity, or visible dust is generated from vehicles using unsealed access roads, road watering and/or other stabilising approaches would be implemented. During operation, air quality would be managed to achieve compliance with the operational environment protection licence (refer to *ARTC Inland Rail Narromine to Narrabri Noise and Vibration Assessment – Construction and Other Operations* (JacobsGHD, 2020c).

Noise

Research has shown that animals will readily adapt to reasonable levels of continuous sound, such as white noise and miscellaneous sounds. While some experiments found continuous exposure to sounds over 100 dB reduced daily weight gain in sheep, other trials showed that continuous background sound can actually improve weight gain (Grandin 2014). While anecdotal evidence suggests sudden noise can upset livestock and potentially result in miscarriage of young, no published studies could be found to link such noises (eg mine blasting) with stock miscarriage (Grandin 2014). Similarly, a study by Cassidy and Lehman (1967) tested the responses of farm animals to sonic booms that were scheduled at varying morning intervals. The results of the study showed that sheep and horses showed slight reactions to noise and lactating dairy cattle were very little affected. The researchers found that the few abnormal behavioural changes observed were well within the range of activity variation within a group of animals.

Noise during construction and operation may alter livestock grazing patterns but this is not expected to have an impact on productivity. The potential noise sources from the operation of the proposal considered in the assessment include rail and road infrastructure and is expected to achieve the objectives of the *NSW Rail Infrastructure Noise Guideline* (NSW EPA, 2013) for the management of noise and vibration from railway operations. Where the noise criteria are achieved, including with the implementation of mitigation measures, there remains potential for noise to be perceptible (audible) within the surrounding environment refer to *ARTC Inland Rail Narromine to Narrabri Noise and Vibration Assessment – Construction and Other Operations* (JacobsGHD, 2020c) and *ARTC Inland Rail Narromine to Narrabri Noise and Vibration Assessment – Operational Rail* (SLR, 2020)) for construction and operational noise impacts.

Movement of water away from agriculture

Water is a critical resource required over the entire length of the proposal site for a range of activities including:

- Earthworks and formation preparation and material conditioning
- Dust suppression (stockpiles and haul roads)
- Concrete

- Washdown
- Temporary workforce accommodation.

The water requirements are subject to weather conditions and methodology selected by the construction contractor however, it has been estimated at a total of about 4,635 ML would be required (see Table 7.11).

Table 7.11 Water requirements for the proposal

Use	Volume (ML)
Earthworks and formation preparation and materials conditioning	1,850
Dust suppression (stockpiles and haul roads)	2,270
Concrete	25
Washdown	20
Temporary workforce accommodation (potable water)	470
Total	**4,635**

Potable water for workforce accommodation and office facilities would be supplied by on-site water rainwater tanks (filled by rainfall, commercial suppliers or mains connections) and bottled water respectively.

Water for earthworks and dust suppression comprise the bulk of the water requirements for the proposal and the need varies along the proposal site based on the areas of cuts and fills. Generally there is limited opportunity to reduce these however, opportunities that would be further explored during detailed design and construction include use of additives and use of different materials for haul roads. The estimated volumes for dust suppression are based on assumed weather conditions (ie less water would be required when it is raining) and typical rates used to minimise the generation of nuisance dust outside of construction and provide for safe operation (ie driver visibility) of haul roads. Subject to consideration of potential off-site impacts and safety of haul road operations, a reduced dust suppression regime may be possible along parts of the proposal site.

A number of potential water sources have been investigated, including connection to local water supply networks, extraction of groundwater or surface water and private bores. Based on existing weather conditions (ie drought) and the availability of water licences, it is proposed that the primary source of water would be groundwater extraction from deep aquifers.

The deep aquifers have been identified as a potential source of water where there is generally limited extraction by other parties in the region. The shallow aquifers (usually associated with alluvial systems) are already heavily utilised by landholders and are therefore not considered viable as a primary source of water.

However, other options that would be further explored during detailed design include re-use of excess water from the Narrabri Gas Project (if approved), leasing or purchase of existing licences from nearby landholders and excess water from other facilities in the area.

Based on available information, the deep aquifers have low yields meaning that a network of bores would need to be established along the proposal site to meet the water demands. A total of 12 bore fields are proposed. It is noted that the deep aquifers are not being heavily used for agricultural related activities and where there is benefit to the local community, the potential for retaining facilities installed for construction (eg bores and sedimentation basins) would be investigated and negotiated in consultation with relevant stakeholders (eg local councils). Any legislative approvals associated with retention and ongoing use of these facilities would be the responsibility of the party who takes ownership.

The economic impact of the removal of 4,165 ML (potable water for temporary workforce accommodation excluded) of water can be assessed by comparing the use of water to an irrigated crop such as cotton. As the construction of the proposal would take about 48 months, the annual water requirement is 1,041 ML. CottonInfo (2019) gross margin budget for furrow irrigated cotton suggests a requirement of 9.61 ML per hectare with a gross margin for irrigation water of $479 per hectare.

The volume of water is insignificant as a total percentage of the overall water demand for irrigation. Across the regional study area, irrigated cropping requires between 4 – 10 ML per hectare of irrigation water and therefore the removal of 1,041 ML annually would reduce the irrigated area by 104-260 hectares. This is an insignificant area (represents 0.13 per cent of irrigated land area) when compared to the total irrigated land area within the regional study area of 194,236 hectares (see Table 4.1).

In addition, there may be short term, localised disruption to irrigation and other water supplies during construction and therefore the timing and extent of the interruption would need to be planned with water users to minimise the impacts on agricultural production.

Water required for construction of the proposal that cannot be sourced from deep aquifers, could be purchased from the regulated river, unregulated or groundwater allocation market. This could provide a moderate financial benefit for sellers. The volumes of allocation trade are expected to be negligible in comparison to the usual volume of water market trading across the regional study. The water needs/demands for the proposal are further discussed in the other technical assessments including measures to mitigate and manage the potential impacts of the proposal (refer to ARTC *Inland Rail Narromine to Narrabri Flooding and Hydrology Assessment* (JacobsGHD, 2020b), ARTC *Inland Rail Narromine to Narrabri Groundwater Assessment* (JacobsGHD, 2020a), ARTC *Inland Rail Narromine to Narrabri Surface Water Quality Assessment* (JacobsGHD, 2020h).

7.10 Economic impact

Following construction, 1,254 hectares of agricultural land would be returned to agricultural production across the proposal site (see section 7.3 and 7.4). The return of this agricultural land to production has been used to calculate the economic impact of the above physical impacts is denoted in Table 7.12 for the construction phase and Table 7.13 for the operation phase. The impacts are calculated by multiplying the area of agricultural land impacted (Table 7.6 and Table 7.7) by the weighted averaged adopted gross income of $739.24 (refer to Table 5.6). The annual economic impact during the construction phase is estimated at $4.25 million based on the area of land impacted. The calculation includes both direct and indirect impacts, while the removal of agricultural land is the main impact, the other impacts include impeded access (severance), interrupted management and labour and other costs. The impact is calculated as 0.43 per cent of the annual value of agricultural production across the regional study area and assumes that the entire 2,554 ha is required for the entire duration of construction activities. The annual economic impact could be less if the rehabilitation of disturbed areas is undertaken progressively, consistent with the rehabilitation strategy.

Impeded access (severance) occurs on land that is not directly affected by the proposal but which cannot be easily accessed by agricultural landholders during construction or operation. This impeded access is a function of the topography of the land, natural waterways, paddock layout, location of farm infrastructure (eg livestock holding yards, farm dams) and internal road network with the impacts potentially many and varied. Impeded access could lead to lost grazing opportunities and/or interruptions to crop and livestock husbandry that could reduce production and profitability. An example of impeded access is where construction activities may block access to agricultural land which is not directly associated with land required for the proposal.

Interruption to management is where landholders are required to divert time and energy away from their normal property management when confronted with impacts during construction and operation phase. This may result in the landholder incurring additional costs to ensure the efficient operation of their enterprise. In addition, diversion of management time to oversee other managerial activities due to the interruption could reduce oversight of agricultural enterprises, which in turn could cause production losses. An example is where construction activities could cause a delay to property owners completing various crop and livestock husbandry operations (eg weed spraying, harvesting, animal health treatments etc.) with delays reducing pasture and crop yields or reduce livestock growth rates and potential for livestock mortality. These impacts could lead to reduced product quality and therefore affect prices and ultimately farm profitability.

Labour and other costs refer to the additional labour requirements that are essential over and above normal daily farming operations. These labour and time costs could include additional effort and impact in liaising with ARTC and its contractors about construction activities, additional time costs involved in moving farm machinery within farms (intra and inter) and additional time to access hubs for standard business and personal reasons due to relocation of farm entry points. In some instances, additional contract labour and approvals could be required to move livestock and equipment between properties as a result of the proposal.

It is noted that there is some uncertainty around the estimates, especially for those around impeded access, interrupted management and labour and other costs. However, this uncertainty is accounted for in the adoption of a conservatively high value of agricultural production ($739/hectare). As such, the value is considered to be a conservative over-estimate of the impacts.

Table 7.12 Annual value of impacts on agricultural production (construction)

Impact	Agricultural land	Annual value of agricultural
Direct		
Construction	2,554 (ha)	$1,887,857
Indirect		
Impeded access	90%	$1,699,072
Interrupted management	20%	$377,571
Labour and other costs	15%	$283,179
Total		**$4,247,679**
Per cent of the regional study area total		0.43%

A similar approach has been used to value the economic impacts of the operation phase with the main impact being the permanent removal of agricultural land for the proposal. Table 7.13 shows the annual impact is estimated to be a loss of $1.54 million which is equivalent to 0.16 per cent of the annual value of agricultural production in the regional study area and assumes the maintenance of current agricultural capability within the proposal site.

Table 7.13 Annual value of impacts on agricultural production (operation)

Impact	Agricultural land	Annual value of agricultural
Direct		
Operation	1,300 (ha)	$961,302
Indirect		
Impeded access	40%	$384,521
Interrupted management	10%	$96,130
Labour and other costs	10%	$96,130
Total		**$1,538,083**
Per cent of the regional study area total		0.16%

In addition, economic impacts would be taken into account in assessing the compensation payable to landholders who have interests in land acquired for the purposes of the project. Following operation of the proposal, there could be added direct and indirect benefits for landholders which could compensate for the loss of agricultural production (refer to section 7.12).

Economic impacts would be taken into consideration at the individual property level as part of the property acquisition negotiations, and undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.

7.11 Land use conflict risk assessment

Land use conflicts occur when one land use is perceived to infringe upon a neighbouring land use. In rural areas land use conflicts commonly occur between agricultural and residential uses. As the proposal would result in an activity that differs from the agricultural activities across the regional study area, a land use conflict risk assessment (LUCRA) has been prepared to assess the potential of any negative impacts on surrounding land use and provide options for mitigation of potential impacts. This LUCRA has been developed based on the *Land Use Conflict Risk Assessment Guide* (DPI, 2011).

There are four key steps in undertaking a LUCRA. These are:

- gather information about proposed land use change and associated activities
- evaluate the risk level of each activity
- identify risk reduction management strategies
- record LUCRA results.

A risk assessment matrix (Table 7.14) has been adopted to assess potential land use conflict risks from the proposal. It has been used to identify the effects of the proposed land use on neighbouring land uses and identifies a risk rating of each impact based on the probability (P) of occurrence and the consequence (C) of the impact.

Table 7.14 Land use conflict risk ranking matrix

		Probability				
		A	**B**	**C**	**D**	**E**
		Almost Certain	**Likely**	**Possible**	**Unlikely**	**Rare**
Consequence	**1. Severe**	25	24	22	19	15
	2. Major	23	21	18	14	10
	3. Moderate	20	17	13	9	6
	4. Minor	16	12	8	5	3
	5. Negligible	11	7	4	2	1

Source: Land Use Conflict Risk Assessment Guide (DPI, 2011)

The activities likely to cause the greatest land use conflict were changing use of agricultural land, dust, fencing, flooding, bushfire, lights, noise and vibration, pesticides, roads, straying livestock, theft/vandalism, weeds/pests and visual amenity. Mitigation measures to address these risks have been identified and further discussed in section 9 and an assessment of the potential risk to adjacent land uses and activities has been demonstrated in Appendix A. Refer to the EIS for the complete list of the measures proposed to mitigate and manage the potential impacts of the proposal.

7.12 Industry and regional effects

KPMG (2020) has prepared an economic impact assessment to establish the existing economic environment and local context and to identify potential economic benefits and impacts on affected local and regional communities in order to assess the projected economic benefits of the proposal. As outlined above, there would be a loss of agricultural land (through disturbance, acquisition, or sterilisation), disruption to farm management, or changes in accessibility or connectivity to market.

The economic benefits assessment estimates that the proposal is expected to provide a total of $258.90 million in incremental benefits which offsets the per annum loss of agricultural production. These benefits result from improvements in freight productivity, reliability and availability, and benefits to the community from crash reductions, reduced environmental externalities and road decongestion benefits. Observing the composition of benefits, the largest share of benefits for the proposal is improved availability of freight, representing approximately 62 per cent of the total benefits. Agricultural industries in the regional study area would benefit from improvements in supply chain efficiency. In particular, the proposal would increase competition between road and rail freight modes, driving savings in freight costs which would benefit producers, consumers and the regional community.

Furthermore, the benefits of the Inland Rail Program is anticipated to deliver a net positive impact of $16 billion on gross domestic product over its 10 year construction period and 50 years of operation. Nationally, the program is also expected to deliver an additional 16,000 jobs at the peak of construction, and an average of 700 additional jobs per annum during operation. In addition to job creation, there is also the opportunity to enhance competition between rail and road freight and the potential to promote the expansion and development of freight precincts around Inland Rail terminals as a result of the benefits from co-location and clustering of industries.

7.13 Social values

The *ARTC Inland Rail Narromine to Narrabri Social Assessment* (JacobsGHD, 2020d) describes the existing social and economic characteristics and features of the local study area. This includes information on property characteristics, amenity, local roads and connectivity and places of social and cultural value.

The top industries in Narromine, Gilgandra, Coonamble and Warrumbungle LGAs by economic input included agriculture and real estate. Consultation with local representatives and chambers of commerce has identified that all communities in the study area have been in drought which has placed increased pressure on landholders, particularly those who are dependent on their properties to provide household income and do not have access to other income sources. It has also been identified that many local farmers and workers in the agricultural industry are seeking alternate income opportunities due to the current drought.

ARTC EIS consultation indicates that uncertainty around the proposal over recent years, particularly in relation to potential impacts on property, family lifestyle and farming operations, has caused a level of frustration and stress for some property owners. Many affected properties have been owned and farmed by the same family over many generations, with families of these properties having strong emotional attachment and family connections to their land. The potential loss of this family history and changes to rural lifestyles is likely to contribute to the level of stress and uncertainty about the proposal felt by these property owners and their families.

7.14 Impacts on non-agricultural land uses

7.14.1 Road and Crown road reserves

In general, the proposal does not run within existing formed road corridors. The exception is at the Newell Highway north of Cains Crossing Road, where the limited space between Bohena Creek and Newell Highway requires the corridor to encroach into the existing road corridor. At this location the road corridor is about 75 metres wide. The impact of this encroachment would be that if the highway needed to be modified in the future there would be less design flexibility than otherwise would have been the case. Subject to detailed design it may be possible to provide a narrower rail corridor in this location, compared to the typical 40 metre width allowed for. Given the constraints at this location the impact is considered to be acceptable.

To facilitate construction and operation of the proposal various changes to the existing road network including some road realignments and closures at various locations and provision of new access roads to various properties are required.

Changes to public roads would be undertaken in accordance with the minimum safe standard of the existing road, unless otherwise agreed with the responsible road authority.

In some instances, where it is not feasible to provide a level crossing, permanent road closures are required in certain locations. Access would be provided via a road realignment to a new level crossing or around the proposal via an existing road.

Of the 42 paper roads and nominal tracks that the proposal site interacts with, one would be provided with an underpass and three would be provided with passive level crossings. Fourteen forestry tracks/roads within State forests managed by the Forestry Corporation of NSW would be closed and realigned.

The proposed treatment of roads, including Crown roads, is described in section 7.3 of the EIS.

7.14.2 Travelling stock reserves

The proposal allows for stock crossings at the following travelling stock reserves:

- R34248 by passing under the proposed bridge over the Macquarie River
- R3420 via the adjacent proposed level crossing
- R48903 and R23332 by passing under the proposed bridge over the Castlereagh River
- R23332 (northern) via the adjacent level crossing
- R44590 and R941 by passing under the proposed bridge over the tributary to Bohena Creek
- R27999 via a culvert.

These crossings would enable the continued use of the travelling stock reserves for their intended purposes.

In the majority of cases, the corridor achieves near-perpendicular crossings of TSRs. However between the Pilliga forests and Narrabri, the alignments run more parallel to the reserves as both the reserves and the rail alignment tend to follow the Newell Highway. The proposal would require land within connected TSRs R44590 and R941, located near Cains Crossing Road and immediately west of Newell Highway. These travelling stock reserves have been classified by Local Land Services as a Category 3 sites “rarely if ever used for travelling stock or emergency management, but are important, valued and used for other reasons” (Local Land Services, 2018, p7). Reserve access would be maintained via the diverted Cains Crossing Road.

Travelling stock reserve R43452 “Marchants”, a stock camp, would be divided by the proposal. The reserve has also been classified by Local Land Services as a Category 3 site. This site would not be provided with a crossing as consultation to date has not indicated a need for access. The proposal would split this reserve into two about equal parts, with each part of the reserve accessible via Berida Road. About 12 per cent of the reserve would be directly affected.

About 0.03 hectares of travelling stock reserve R9489 “Narrabri West” would be encroached by the construction impact zone. Given the minimal encroachment, detailed design should be able to avoid impacting the travelling stock reserve.

The proposal would also affect an area used as an informal recreation reserve/rest area, located adjacent to the Mitchell Highway and the Macquarie River. This area, which is known as three mile reserve, forms part of travelling stock reserve R34248. The proposal site crosses the Macquarie River and reserve at this location via a bridge. Construction may affect access within areas of the reserve.

No livestock highways would be affected.

7.14.3 Other Crown land

At this stage of the design process, it is estimated that land acquisition would affect two parcels of Crown land, excluding travelling stock reserves and Crown roads. One parcel, Lot 7004 DP 1060845, in Quanda, has been reserved for the preservation of native vegetation. The impacts of the proposal on native vegetation are considered by the *ARTC Inland Rail Narrabri to Narromine Biodiversity Development Assessment Report* (JacobsGHD, 2020e).

The acquisition of Crown land would be undertaken in consultation with the Department of Industry, and in accordance with the requirements of the *Crown Land Management Act 2016,* and the *Land Acquisition (Just Terms Compensation) Act 1991*.

The physically large scale of Native Title claims and their undetermined status makes it difficult to assess the ultimate impact of the proposal on these claims. Any acquisition of non-alienated Crown lands will be subject to the 'future acts' provisions of the *Native Title Act 1993* (Commonwealth).

7.14.4 Urban and peri-urban land uses

The proposal is unlikely to impact on the capacity of urban zoned land to be used for that purpose. The part of the operation closest to sensitive urban land uses, the Narromine West Connection, is already located immediately adjacent to existing rail infrastructure, consequently the addition of additional rail infrastructure is unlikely to substantially alter the urban land use potential for this area.

The proposal passes through Lot 52, DP 661453, Eumungerie Road, Narromine. This land is currently used for broadacre agriculture but was rezoned to R5 Large Lot Residential in 2015. Construction of the proposal would require land from this lot (about nine hectares would need to be acquired). This would result in a small reduction (about seven per cent) of the area available for any future development of the lot. In addition, given the proximity of the remaining land to the proposal site, any future development of land near the rail corridor would have the potential to be affected by amenity impacts (particularly noise and visual impacts) during operation.

In addition, the proposal passes within 200 metres of land zoned R5 Large Lot Residential to the south of Narrabri town centre. No development of this land has occurred to date. About 200 hectares of the total area (about 1,900 hectares) of this land is located within one kilometre of the proposal site. The proposal has the potential to affect the amenity of this land (mainly as a result of the potential for night-time noise impacts during operation).

It is expected that amenity changes at properties along the rail corridor resulting from train operations would be intermittent throughout the day. The landscape and visual amenity of some areas close to the proposal site would change as a result of rail infrastructure (eg rail line, fencing, bridges and culverts) and train operations. The extent of impacts would depend on the location. Potential operational noise and visual impacts are considered in *ARTC Inland Rail Narromine to Narrabri Noise and Vibration Assessment – Operational Rail* (SLR, 2020) and *ARTC Inland Rail Narromine to Narrabri Landscape and Visual Assessment* (JacobsGHD, 2020g), and measures are provided in these reports to minimise the potential impacts as far as reasonably practicable.

In Narrabri, the development of land zoned for industrial purposes may benefit from the proposal as a result of improvements in logistics connectivity.

7.14.5 Forestry

The proposal site extends through the Merewindi, Baradine, Cumbil, Euligal, and Pilliga East state forests for a distance of about 70 kilometres.

The proposal would impact about 618 hectares of land zoned RU3 Forestry during construction (including temporary and permanent impacts). The proposal generally intersects forests classified Zone 4: General Management Zone, with areas near waterways classified Zone 3A: Forestry Exclusion Zone. The proposal site also intersects two areas zoned Zone 3B: Special Prescription Zone. The proposal would require the full removal of forest resources in areas permanently required for the proposal, although some trees may be able to be retained in areas required for construction only.

As a result of these impacts, the rearrangement of forestry compartments and access tracks may be required to allow for the efficient harvesting of timber, with a review of the affected Zone 3B components required to ensure the appropriate retention of fauna habitat. About 60 per cent of the new rail corridor is located adjacent to existing roads, minimising the level of fragmentation of the forest resource. The balance of the alignment is located in areas with minimal road infrastructure.

New level crossings would be provided along the main alignment within the affected forests, to allow the rail corridor to be crossed by access tracks about every three to ten kilometres.

The proposal would also require realignment of about 6.7 kilometres of Pilliga Forest Way to minimise the number of level crossings. This would affect forestry operations at this location during construction as a result of changed access arrangements with the potential for longer travel distances to access appropriate detours.

Hunting is permissible with a licence in State forests. For safety reasons there would need to be some limitations imposed during construction. ARTC would consult with the relevant stakeholders to establish appropriate management measures and communications requirements.

About two kilometres of the proposal site would pass through compartment 505 of the Pilliga East State Forest, which is proposed to be harvested before the end of 2020. As a result, the impact of the proposal on yield would be minimal at this location. The proposal would also intersect with the southern edges of compartments 477, 478 and 479, where the proposal is immediately adjacent to Pilliga Forest Way.

Compartment 330 (T330) in the Cumbil State Forest includes a Continuous Forestry Inventory Plot, research area covering 0.1 hectares of the 385 hectare compartment located about 70 metres west of Cumbil Road. The proposal would permanently remove about 14 hectares along the western boundary of the compartment. The detailed design of the project would need to consult with NSW Forestry Corporation to determine buffers and exclusion zones to avoid impacting the research area.

Forest products that would need to be removed as part of the proposal could be used for a number of beneficial uses. Where trees are suitable, the highest and best use would be for use as sawlogs. Lower value applications would need to conform to the requirements of the Integrated Forestry Operations Agreement.

At the completion of construction, about 184 hectares of RU3 Forestry land could potentially be returned to forestry uses. ARTC would consult with the Forestry Corporation of NSW to agree final land uses and outcomes.

Construction has the potential to increase the risk of bushfire in forest areas. Potential ignition sources include uncontrolled discarding of cigarettes and domestic rubbish (such as glass bottles) by construction workers and the generation of sparks through hot works such as welding or an excavator bucket making contact with rock. Fuel leaks and spills from plant and machinery and the storage of flammable goods during construction could also provide a fuel source for bushfires if ignited.

7.14.6 Solar farm projects

'Wahroonga' solar farm (DA2019/47)

The proposal would pass through the same land as the recently approved 'Wahroonga' solar farm. The Statement of Environmental Effects supporting the Development Application and Narromine Shire Council's assessment report both acknowledge the potential for Inland Rail to pass through the same land as the solar farm. As the land required by the solar farm is less than the land available for the development, there is potential for the solar arrays to be reconfigured to address any conflicts. The approved access route for the solar farm would not be affected by the proposal.

Solar farm, Eumungerie Road, Narromine (DA80/16)

The proposal is unlikely to be impacted by the proposal given the maintenance of access to site and the low elevation of the railway line relative to the site.

7.14.7 Mineral resources

The Department of Regional NSW Resources and Geoscience data does not identify any operating mines in the vicinity of the proposal.

The majority of the proposal passes through areas that are licensed for exploration or assessment. About 56 per cent of the proposal passes through areas with active mining exploration or assessment licences, including areas proposed for coal seam gas extraction as part of the Narrabri Gas Project. A further 14 per cent passes through areas subject to exploration applications.

A summary of the licence holdings is provided in Table 7.15 and are shown on Figure 4.8.

Table 7.15 Mining licences intersecting or in the vicinity of the proposal

Licence ID	Type	Location relative to the proposal	Resource
EL8744	Exploration	The proposal intersects the area the south-east corner of the licensed area near the junction with the existing Parkes-Narromine Railway.	Metallic minerals
ELA5900	Exploration Application	The proposal bisects the proposed licensed area between the junction with the existing Parkes-Narromine Railway and Collie Road, Kickabil.	Metallic minerals
PEL434	Exploration	The proposal intersects the area north of Milpulling Road to Forans Road. The proposal is close to the eastern boundary of the licensed area.	Petroleum (Coal Seam Methane)
PEL433	Exploration	The proposal intersects the north-west corner of the licensed area near Curban State Forest.	Petroleum (Coal Seam Methane)
PEL462	Exploration	The proposal bisects the licensed area between the intersections of National Park Road and Nalders Access Road, and Tooraweenah Road and Goorianawa Road.	Petroleum (Coal Seam Methane)
PEL450	Exploration	The proposal traverses the western portion of the licensed area between Tooraweenah Road and Goorianawa Road, and Munns Road.	Petroleum (Coal Seam Methane)

Licence ID	Type	Location relative to the proposal	Resource
PEL428	Exploration	The proposal traverses the southern portion of the licensed area between Munns Road and Merriwindi State Forest.	Petroleum (Coal Seam Methane)
PEL238	Exploration	The proposal intersects from the south west corner of the licensed area through to the north east immediately north of Narrabri.	Petroleum (Coal Seam Methane)
PAL2	Assessment	The proposal passes through the northern portion of the licensed area.	Petroleum (Coal Seam Methane)

The size of these exploration areas is very large relative to the proposal site, making the likelihood of high value resources being discovered under the operation being reasonably low despite being in an exploration area. The proposal is generally aligned close to other major infrastructure and property boundaries, minimising the potential for the proposal to sterilise land from mining. Similarly, the provision of level crossing facilities for the proposal means the proposal is unlikely to form a barrier to future exploration of the area.

The proposal site passes immediately north of the existing Leewood Produced Water and Brine Management Ponds, which would form part of the Narrabri Gas Project. The proposed Leewood to Wilga Park underground power line would pass under the proposal site within an existing gas pipeline corridor. The nearest existing coal seam gas wells are located about five kilometres from the proposal. Given the nature of coal seam gas extraction processes, it is unlikely that the proposal would impact on the capacity to extract coal seam gas. The Narrabri Gas Project proponent was consulted during the reference design phase of the Inland Rail proposal.

The proposal passes close to two proposed quarries in Narromine. The proposal is unlikely to negatively impact on the viability of these proposed activities, with road access maintained to both sites. The proposal would have a positive impact on the viability of these quarries by increasing the demand for the resources extracted by these quarries.

7.14.8 Protected areas and critical habitats

The nearest protected areas are:

- Pilliga State Conservation Area (Community Conservation Area (CCA) Zone 3), the nearest point is 1.6 kilometres from the proposal.
- Drillwarrina National Park (CCA Zone 1) the nearest point is 4.5 kilometres from the proposal.

The proposal is not likely to impact on the capability of those lands to be used for their intended purposes. As no critical habitats have been identified in the regional study area, no critical habitat impacts are expected to be impacted by the proposal.

7.14.9 Biobank sites, private conservation lands and other offset lands

Two land parcels are the subject of a private conservation agreement under Division 12, Part 4 of the *National Parks and Wildlife Act 1974*. As these sites are located over 900 metres from the proposal, the proposal is unlikely to impact on the use of this land as a conservation area.

No biobank sites or other offset lands have been identified in the vicinity of the proposal.

7.14.10 Waterfront land and access for recreational fishing

The proposal crosses numerous watercourses and floodplains via bridges and culverts. Each crossing would interface with waterfront land and the riparian corridor as defined under the *Water Management Act 2000*. The design of the bridges and culverts has primarily been undertaken to meet the required flooding and hydrology design standards (eg flood levels) for Inland Rail. However, where possible the design has also taken into consideration impacts on bed and bank stability, water quality and maintenance of habitat diversity and connectivity.

The construction and operation of the proposal would involve works on the bed and bank of waterways and land within 40 metres of the river banks (waterfront land). Activities that are expected to impact waterfront land include:

- riparian vegetation clearing
- instream works
- earthworks, including cuttings and embankments and movement/use of vehicles across exposed soil
- construction compounds and associated activities.

Where possible, construction would be minimised to reduce clearing in the riparian corridor and implement practises to minimise disturbance of the banks. Bank stabilisation processes would also be undertaken after installation of water crossing structures.

Recreational access to watercourses crossed by the proposal, including the Macquarie River, Namoi River and Castlereagh River, would be restricted in the vicinity of the proposal site during construction for safety reasons.

All bridges and culverts have been designed with consideration to the *Guidelines for watercourse crossings on waterfront land* (DPI Office of Water, 2012). Where bridges are provided, the proposal is unlikely to impact accessibility for recreational fishing. Given the non-perennial nature of most watercourses where culverts are proposed it is unlikely that these streams would be used for recreational fishing.

7.14.11 Services and utilities

The design has taken into account the location and potential impacts on services and utilities within and adjacent to the proposal site. Where required these would be relocated and/or protected. The majority of overhead electrical cables would require raising to provide adequate clearance for the double stacked freight trains. All relocations would be developed in consultation with the relevant asset owner.

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8. Cumulative impact assessment

8.1 Overview

For an EIS, cumulative impacts can be defined as the successive, incremental, and combined effect of multiple impacts, which may in themselves be minor, but could become significant when considered together. The methodology and projects considered for the cumulative impact assessment are provided in detail in the EIS (Part D chapter D1). The study area for the cumulative agricultural and land use assessment is the LGAs of Bogan, Cobar, Coonamble, Gilgandra, Gwydir, Lachlan, Moree Plains, Narrabri, Narromine, Parkes, Walgett and Warren. Seven major projects were identified as having a cumulative impact and sufficient information to undertake a cumulative impact assessment. These include:

- APA - Western Slopes Pipeline
- Inland Rail – Narrabri to North Star
- Inland Rail – Parkes to Narromine
- Narrabri Gas Project
- Silverleaf Solar Farm, Narrabri
- Gilgandra Solar Farm
- Narromine Solar Farm.

8.2 Construction and operation

Table 8.1 and Figure 8.1 outline key major infrastructure and energy related projects that are currently in the planning process in the vicinity of the proposal. The impacts of these projects differ depending on their final use and might result in the temporary loss of agricultural production across the regional study area or following decommissioning land can be returned to agricultural production. The cumulative impact of the below listed projects would result in a small reduction in agricultural land.

Table 8.1 Impacts of projects in the vicinity of the proposal

Project	Contributory impacts
APA - Western Slopes Pipeline	The Western Slopes largely passes through agricultural land and would result in temporary loss of agricultural land during construction. After construction normal agricultural operations can resume with only a small number of surface facilities required for operation.
Inland Rail - Narrabri to North Star	The proposal is generally located within the existing rail corridor between Narrabri and the town of North Star. There are predicted to be some temporary impacts to land use and property during construction with some limited property acquisitions. During operation, this project would result in the loss of 0.001 per cent of the total land used for grazing and cropping in the Narrabri and Moree LGAs.
Inland Rail - Parkes to Narromine	Impacts on agriculture during construction would be temporary and short term as impacts would move along the corridor progressively. During operation, no impacts to surrounding agricultural land uses are predicted primarily because the project is located mostly within an existing rail corridor.

Project	Contributory impacts
Narrabri Gas Project (Santos)	The project would result in the removal of relatively small areas of agricultural land from production during both the construction and operation phase. Above loss of agricultural land could be compensated by the proposal treating the water produced from gas wells the Leewood centralised water treatment facility and make this available for irrigated agriculture. If approved the re-use of excess water from this project could be used for the proposal for construction activities. State forests cover approximately 56 per cent of the total project area and include the Pilliga east State Forest, Bibblewindi State Forest and Jacks Creek State Forest. Potential impacts on forestry operations include direct loss of sawlog through clearing and obstruction of access to forestry operations. These potential impacts are considered low as Forestry Corporation of NSW would retain the right to timber removed for the project.
Silver Leaf Solar Farm	A 120 megawatt solar farm will be constructed on 450 hectares of agricultural land with previous disturbance from vegetation clearing and drainage channels. It is estimated that this proposal would result in the removal of 0.0003 per cent of land use and representing 0.07 per cent of the total value of agricultural production in Narrabri LGA.
Narromine Solar Farm	The total site area is about 32.3 hectares on land that is currently used for agriculture. The project would result in the removal of moderate capability land.
Gilgandra Solar Farm	The project would result in the removal of around 188 hectares of agricultural land from production within Gilgandra LGA.

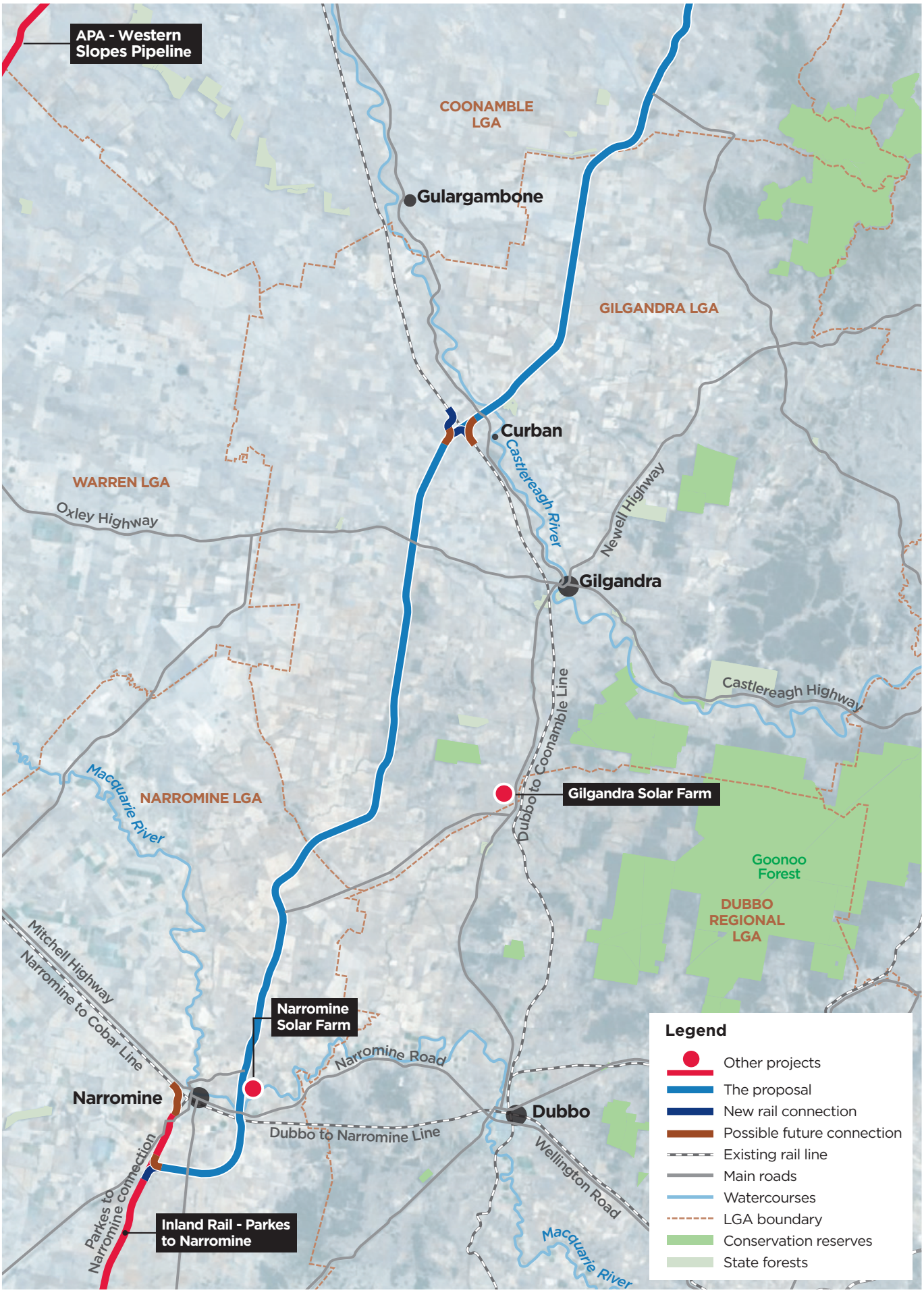

Figure 8.1 **Projects with the potential for cumulative impacts (map 1)**

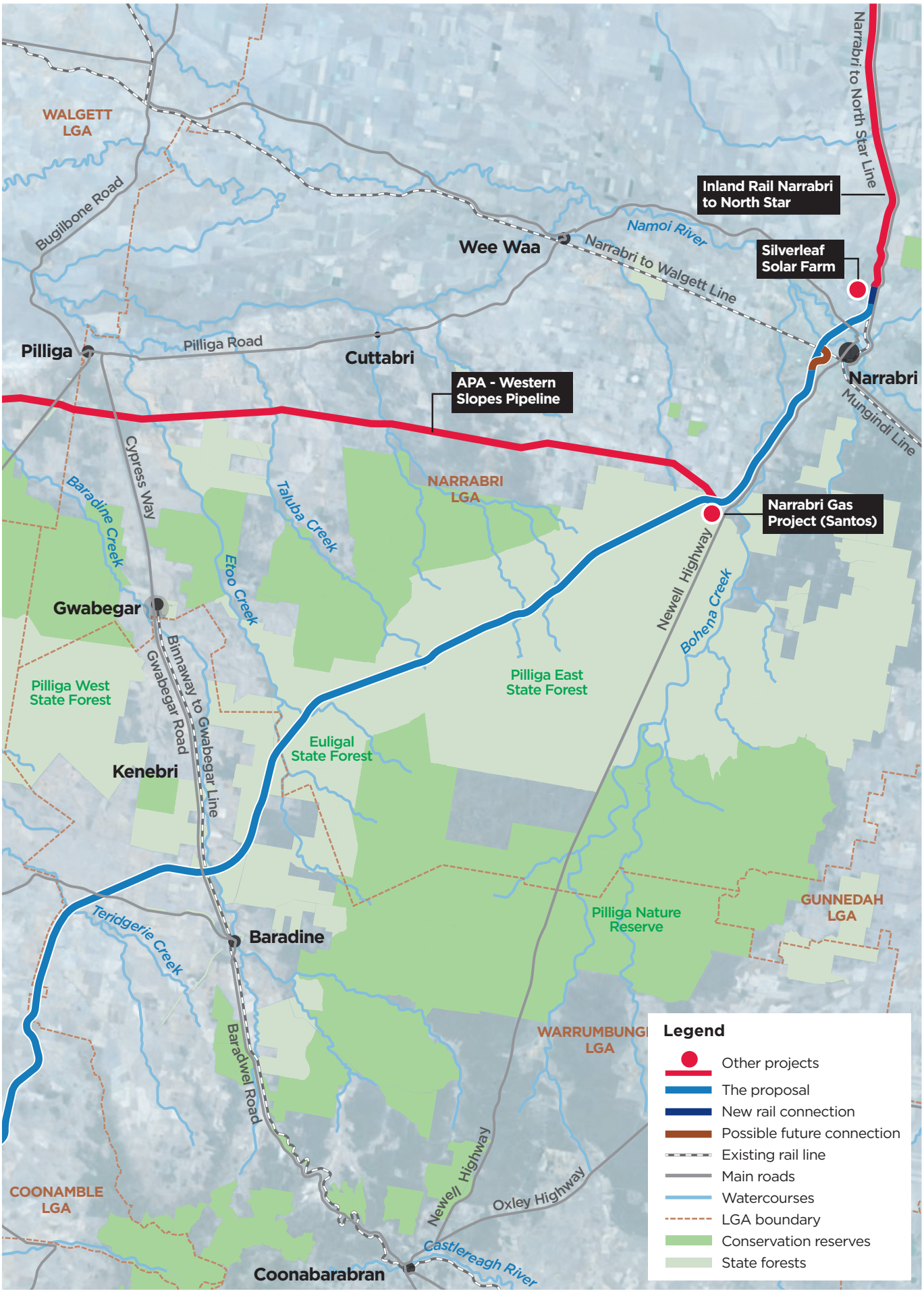

Figure 8.1 **Projects with the potential for cumulative impacts (map 2)**

9. Recommended mitigation measures

9.1 General measures

The management of environmental impacts during construction would be documented in the CEMP to be prepared by the construction contractor(s). The CEMP would provide a centralised mechanism through which all potential construction-related environmental impacts will be managed. It would also provide the overall framework for the system and procedures to ensure that environmental impacts are minimised, and that legislative and approval requirements are fulfilled.

The CEMP would include detailed management plans (environmental sub-plans), which would detail how specific environmental issues are to be managed during construction in accordance with the mitigation measures provided in the EIS and the conditions of approval. It would be prepared in accordance with the Inland Rail Construction Environmental Management Framework.

Where impacts could not be avoided, mitigation measures to minimise or manage impacts to land use and property are detailed in Table 9.1, Table 9.2 and Table 9.3. Additionally, Table 9.4 includes management measures which should be included in the biodiversity management plan and CEMP to manage impacts during construction.

As discussed in section 7, impacts to land use and property can also be related to rehabilitation of biodiversity, noise and vibration, visual amenity and flooding and hydrological issues. The mitigation measures detailed in *ARTC Inland Rail Narromine to Narrabri Biodiversity Development Assessment Report* (JacobsGHD, 2020e), *ARTC Inland Rail Narromine to Narrabri Noise and Vibration Assessment – Construction and Other Operations* (JacobsGHD, 2020c), *ARTC Inland Rail Narromine to Narrabri Noise and Vibration Assessment – Operational Rail* (SLR, 2020), *ARTC Inland Rail Narromine to Narrabri Landscape and Visual Assessment* (JacobsGHD, 2020g), and *ARTC Inland Rail Narromine to Narrabri Flooding and Hydrology Assessment* (JacobsGHD, 2020b) are therefore also relevant to land use and property.

9.2 Site-specific measures for construction and operational impacts

Table 9.1, Table 9.2 and Table 9.3 list the mitigation and management measures that have been identified to mitigate the potential impacts associated with detailed design/pre-construction, construction and operation of the proposal.

Table 9.1 Recommended mitigation measures for detailed design/pre-construction

Issue/impact	Mitigation measures
Land use and property impacts, including severance and other impacts on operations	The design and construction planning would continue to be refined to minimise potential impacts on land uses and properties as far as reasonably practicable. Consultation with landholders would be ongoing to identify opportunities to minimise impacts on operations where practicable. Property owners and occupants would be consulted in accordance with the communication management plan for the project, to ensure that owners/occupants are informed about: • the timing and scope of activities in their area • any potential property impacts/changes, particularly in relation to potential impacts on access, services, or farm operational arrangements • activities that have the potential to impact on livestock. Feasible and reasonable property-specific measures would be identified in consultation with landholders, and implemented during construction, where construction is located on or immediately adjacent to private properties and has the potential to affect farm operational arrangements.
Maintaining permanent access, addressing changed access arrangements	Where any legal access to a property is permanently affected and a property has no other legal means of access, alternative access to and from a public road would be provided to an equivalent standard, where feasible and reasonable. Where an alternative access is not feasible or reasonable, and a property or part of a property is left with no access to a public road, consideration would be given to acquisition of the property or part of the property in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991.* In accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, ARTC's preference is for acquisition by agreement where practicable. Where the proposal affects property access arrangements, input would be sought from relevant landholders as part of the property acquisition process. Where changes to access arrangements are required for individual properties, ARTC would advise relevant property owners/occupants and consult with them in advance regarding alternative access arrangements.

Issue/impact	Mitigation measures
Acquisition	During the property acquisition process, ARTC would seek to secure agreement with affected landholders, to guide property-level design requirements and the management of construction on or immediately adjacent to private properties. The agreements may include: • measures to minimise property impacts, including on agricultural operations • specific requirements to ensure that operations, including the movement of livestock and farm machinery are able to be maintained as efficiently as possible • measures to manage severance impacts where practicable, including appropriate access solutions and amalgamation opportunities • required adjustments to affected structures. Where land is acquired compensation would be assessed in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and *Determination of compensation following the acquisition of a business* (NSW Government, undated). Depending on the individual circumstances of each land/business owner and the proposed impacts upon the land and to operations, compensation may take the form of money or land/works – as agreed by the parties.
Impacts on Crown land	The acquisition of Crown land would be undertaken in consultation with the Department of Planning, Industry and Environment, and in accordance with the requirements of the *Crown Lands Management Act 2016* and the *Land Acquisition (Just Terms Compensation) Act 1991*.
Impacts on livestock	The need for additional stock management infrastructure on either side of level crossings, such as forcing yards and holding pens, would be identified in consultation with the relevant landholders.
Maintenance of fencing	Maintenance agreements would be established for fencing along the rail corridor located within private properties. The agreements would include protocols for reporting damage and arranging repairs of shared boundary fencing.
Minimising impacts on travelling stock reserves	Local Land Services would continue to be consulted during detailed design to confirm how impacts on travelling stock reserves would be avoided during construction and operation. Alternative access arrangements would be made as required, subject to maintaining rail safety. Opportunities to refine the design to avoid construction footprint impacts on travelling stock reserve R9489 “Narrabri West” would be investigated.
Impacts on services and utilities	The location of all utilities, services and other infrastructure, and requirements for access to, diversion, protection and/or support, would be confirmed prior to construction. This would include (as required), undertaking utilities investigations, including intrusive investigations, and consultation and agreement with service providers.
Biosecurity	The biodiversity management plan included in the CEMP (mitigation measure BD8) would detail measures to minimise the potential for biosecurity risks during construction in accordance with the *Biosecurity Act 2015.*

Issue/impact	Mitigation measures
Impacts on, and construction within, State forests	The Forestry Corporation of NSW would be consulted in relation to opportunities for beneficial reuse of forest products that would be removed during construction. Appropriate management measures and communication requirements for users of State forests in the vicinity of the proposal site would be defined in consultation with the Forestry Corporation of NSW and forest users.

Table 9.2 Recommended mitigation measures for construction

Issue/impact	Mitigation measures
Property impacts	Property owners/occupants would continue to be consulted during construction in accordance with the requirements of the communication management plan.
Access to properties	Access to individual residences, services and businesses, and for livestock across the rail corridor, would be maintained during construction. The construction traffic and transport plan included in the CEMP would include measures to ensure that access to properties would be maintained at all times during construction. Where alternative access arrangements need to be made, these would be developed in consultation with affected property owners/occupants, and Local Land Services for travelling stock reserves.
Access within State forests	The construction traffic and transport plan included in the CEMP would detail measures to ensure that access within State forests is retained to enable forestry operations to continue during construction.
Rehabilitation	The rehabilitation strategy would include measures to restore disturbed sites that do not form part of the operational footprint (such as compounds, temporary workforce accommodation) to as close as practicable to the pre-construction condition or better, or as agreed with the landholders. Rehabilitation of disturbed areas would be undertaken progressively, consistent with the rehabilitation strategy.
Water supplies for farm operations	Farm water pipelines, dams and drainage channels would be replaced or reinstated to ensure continuity of stock and domestic water supplies prior to removal of existing impacted infrastructure.
Bushfire risk in forest areas	The flood and emergency response plan would include measures to minimise the potential for bushfire risks.

Table 9.3 Compilation of mitigation measures for operation

Issue/impact	Mitigation measures
Safety	Guidance would be provided to agricultural landholders at the commencement of operation regarding the frequency of train movements to assist with safe scheduling of routine agricultural activities.

Table 9.4 Management measures

Issue/impact	Mitigation measures
Biosecurity	A biodiversity management plan would be prepared and implemented as part of the CEMP. It would include measures to ensure controls and procedures are implemented during construction to avoid, minimise or manage potential adverse impacts on biodiversity within and adjacent to the proposal site. The plan would also see to retain and protect existing flora and fauna habitat wherever possible and also appropriately manage the spread of weeds and plant pathogens. The biodiversity management plan included in the CEMP would detail measures to minimise the potential for biosecurity risks during construction in accordance with the *Biosecurity Act 2015*. These biosecurity measures should also address the following areas: **People** • Limit entry points to the property. • All construction vehicles, equipment and boots should be cleaned upon entering the property in a wash-down bay. • Limit worker contact with livestock, crops or plant materials as much as possible and eliminate any unnecessary contact altogether. • Keep a visitor register. **Vehicles** • Limit the number of entry and exit points (one is preferable). • Clearly sign and lock restricted access areas. • Ensure construction vehicles are clean and are parked in a designated area away from livestock or crops. • Establish a vehicle high pressure wash down facility well away from livestock and crops to clean vehicles and equipment which need to enter the property. • Ensure construction vehicles remain on designated tracks. **Equipment** • Clean machinery and equipment from the top down and dismantle it as far as possible to gain access to internal spaces.
Monitoring and rehabilitation of agricultural land	The CEMP would detail requirements for the rehabilitation and monitoring of disturbed areas to be undertaken progressively, and in accordance with the rehabilitation strategy.

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10. Conclusion

ARTC is seeking approval to construct and operate the Narromine to Narrabri section of Inland Rail comprising of about 306 kilometres of new single-track standard gauge railway with crossing loops. The proposal also includes changes to some roads to facilitate construction and operation of the new section of railway, and ancillary infrastructure to support the proposal.

This Agriculture and Land Use Assessment has addressed the relevant SEARs, describes the existing environment with respect to agriculture and land use, identifies the potential impacts to agricultural and non-agricultural land uses from constructing and operating the proposal, and provides recommendation and measures to mitigate and manage the impacts identified.

The majority of the proposal would be greenfield development, impacting on mainly rural land (predominately cropping and grazing), as well as state forests, Crown land and some travelling stock reserves.

The proposal would have a range of impacts on agricultural resources with the degree of impacts varying with the different stages of development namely planning, construction and operation. The most significant impact on agricultural production is the permanent removal of the land for operation and other impacts arising from impeded access and property severance. Land would also be temporarily removed from agricultural production during the construction phase and following rehabilitation, normal agricultural production would be able to resume.

The land use and property impacts would generally need to be managed on an individual property basis. Where land is acquired on either a permanent or temporary basis, compensation would be assessed in accordance with *the Land Acquisition (Just Terms Compensation) Act 1991* and *Determination of compensation following the acquisition of a business* (NSW Government, undated).

Inland Rail will travel through some of Australia's richest farming and mining regions. The overall project is expected to draw significant volumes of grain, cotton, chilled beef, coal and other commodities onto rail. The project will also be a major economic enabler in regional Australia during construction. ARTC's policy is to utilise local procurement and employment as much as possible in order to deliver these benefits to rural and regional areas.

This Agriculture and Land Use Assessment has been informed by extensive consultation with directly impacted landholders to document the direct and indirect impacts arising from the proposal. While the proposal will result in either the temporary or permanent removal of agricultural land during the construction and operation phase respectively, the total areas and gross value of production across the regional study area are relatively low and these will likely be offset by some of the broader benefits arising from the proposal.

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Appendices

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TECHNICAL REPORT

11

Agriculture and land use assessment

Appendix A Land use conflict risk assessment

NARROMINE TO NARRABRI ENVIRONMENTAL IMPACT STATEMENT

Land use conflict risk assessment framework which considers the probability (P), consequence (C) of the activity and the risk ranking (RR). The risk ranking matrix is included in section 7.11. Refer to the EIS for a compilation of the measures proposed to mitigate and manage the potential impacts of the proposal.

Activity	Identified potential conflict	Risk Ranking			Mitigating factors (method of control)	Controlled Ranking		
		P	C	RR		P	C	RR
Agricultural land	Impacts to agricultural land are summarised below: • Removal of agricultural land for the life of the proposal. The loss of agricultural land would be permanent (operation) and temporary (construction). Following construction, land not required for operational activities would be rehabilitated and returned to agricultural production • Disturbance to mapped biophysical strategic agricultural land (BSAL) • Potential changes to soil properties • Property severance and access to a property as a result of the corridor • Property access and movement of vehicles and livestock across the • Soil and/or surface/groundwater resources could be compromised by construction and operation activities. • Isolation of hubs from the balance of farming operations • Impact on use of travelling stock reserves and Crown Reserves.	A	2	23	During construction, 2,554 hectares of agricultural land and infrastructure will be removed from agricultural production. This represents 0.07% of agricultural land in the regional study area. During operation, the proposal will result in the removal of 1,300 hectares or 0.04% of agricultural land from production across the regional study area. The rehabilitation strategy would include measures to restore disturbed sites that do not form part of the operational footprint (such as compounds, temporary workforce accommodation) to the pre-construction condition or better. Rehabilitation of disturbed areas would be undertaken progressively, consistent with the rehabilitation strategy. During the property acquisition process, ARTC will seek to secure agreement with affected landholders, to guide property-level design requirements and the management of construction on or immediately adjacent to private properties. The agreements may include: • measures to minimise property impacts, including on agricultural operations • specific requirements to ensure that operations, including the movement of livestock and farm machinery are able to be maintained as efficiently as possible	C	3	13

Activity	Identified potential conflict	Risk Ranking			Mitigating factors (method of control)	Controlled Ranking		
		P	C	RR		P	C	RR
					• measures to manage severance impacts where practicable, including appropriate access solutions • required adjustments to affected structures. Where land is acquired, compensation will be assessed in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and *Determination of compensation following the acquisition of a business* (NSW Government, undated). Depending on the individual circumstances of each land/business owner and the proposed impacts upon the land and to operations, compensation may take the form of money or land/works – as agreed by the parties. Potential impacts would be managed through the appropriate measures identified in consultation with individual landholders.			
Dust	During construction, there is the potential for impacts as a result of airborne particulate matter and dust deposition to settle on crops and pastures, however dust suppression protocols would reduce the occurrence and the impacts on production are likely to be minimal. Air quality within and surrounding the proposal is expected to be consistent with a typical rural environment dominated by cropping and grazing activities.	B	3	17	Where sensitive receivers are located within the separation distances determined for each key activity, or visible dust is generated from vehicles using unsealed access roads, road watering and/or other stabilising approaches would be implemented.	C	4	8

Activity	Identified potential conflict	Risk Ranking			Mitigating factors (method of control)	Controlled Ranking		
		P	C	RR		P	C	RR
Fencing	Construction actives may result in fences temporarily cut and/or permanently realigned to improve access efficiency. Unless repaired or appropriately planned, cut fences could result in unintended livestock mixing which in turn could disrupt planned breeding programs, require added costs to muster and draft livestock. Inappropriate fence realignment could reduce the future efficiency of completing crop and livestock activities. Fences with adjoining agricultural land would need to be maintained in a condition to minimise the possibility of livestock straying onto the corridor from adjoining properties. The maintenance of shared boundary fencing between ARTC and property owners to be confirmed.	C	3	13	Prior to construction, internal and boundary fencing to be undertaken on new alignment and to stock proof standard. Location of gates to be undertaken in consultation with property owners. Maintenance agreements would be established for fencing along the rail corridor located within private properties. The agreements would include protocols for reporting damage and arranging repairs of shared boundary fencing.	D	4	5
Flooding	Depending on the seasonality, frequency, extent and duration of the flooding could result in repairs to fencing, damage to machinery loss of productivity with the potential to cause erosion Inability to access key infrastructure including homesteads during flood periods.	B	2	21	The design would continue to be refined where practicable to not worsen existing flooding characteristics at sensitive buildings, up to and including the one per cent AEP event. Detailed flood modelling would consider potential changes to: • building and property inundation (including floor level surveys and consideration of existing inundation levels) • existing rail line, at rail connections • road flood levels and extent of flooding along roads • overland flow paths and storage effects of construction and operational infrastructure.	C	3	13

Activity	Identified potential conflict	Risk Ranking			Mitigating factors (method of control)	Controlled Ranking		
		P	C	RR		P	C	RR
					Flood modelling would have regard to the guidelines listed in section B3.1.1 of the EIS. Flood modelling, and any mitigation identified as an outcome of modelling, would consider floodplain risk management plans, and would be undertaken in consultation with the relevant local council and local emergency management committees, the Department of Planning, Industry and Environment, the NSW State Emergency Service and potentially impacted landholders.			
Bushfire	Risk of fire escaping and entering agricultural properties during construction and operation activities.	C	3	13	The emergency response plan developed as part of the CEMP would include measures to minimise the potential for bushfire risks.	D	3	9
Lights	Construction of the proposal might result in lights impacting on adjoining rural properties. During operation of the proposal, it is expected that the main potential contributors to lighting impacts would be trains and warning lights associated with active level crossings. As the trains are freight trains, the only source of night time lighting is likely to be a single light source, or a group of lights at the front of the train. These lights, together with the warning lights at active level crossings, are not expected to result in impacts, given the relatively limited output and temporary nature.	C	3	13	During construction, lighting of work areas, compounds, and work sites would be oriented to minimise glare and light spill impact on adjacent receivers. During operation no lighting is provided – only train lights.	D	4	5

Activity	Identified potential conflict	Risk Ranking			Mitigating factors (method of control)	Controlled Ranking		
		P	C	RR		P	C	RR
Noise and Vibration	Construction of the proposal might result in noise impacting on sensitive receivers. It is estimated that Inland Rail would be trafficked by an average of 10 trains per day (both directions) in 2025, increasing to about 14 trains per day (both directions) in 2040 and operations could have an impact on animal welfare and livestock behaviour. The operation of the trains on the project can be a potential source of vibration and associated ground-borne noise.	C	3	13	A construction noise and vibration management plan would be prepared and implemented as part of the CEMP in accordance with the Inland Rail NSW Construction Noise and Vibration Management Framework. The plan would include measures, processes and responsibilities to manage noise and vibration and minimise the potential for impacts during construction. The proposal would be operated with the aim of achieving the operational noise and vibration criteria identified by the operational noise and vibration review, the requirements of the conditions of approval, and the environment protection licence for Inland Rail.	D	3	9
Pesticides	Pesticides may be used to control weeds during construction and operation.	C	4	8	Apply pesticides in accordance with the *Pesticides Act 1999*, such that only registered pesticides are used based on label instructions and are designed to minimise impact on adjoining land.	D	5	2

Activity	Identified potential conflict	Risk Ranking			Mitigating factors (method of control)	Controlled Ranking		
		P	C	RR		P	C	RR
Roads	Increased traffic and disruption in the area as a result of construction traffic. Heavy construction vehicles/ equipment could damage internal roads, crossings etc. and temporarily limit access throughout a property. Inability to access paddocks at critical times (eg planting, harvesting) impact on crop yields and/or product quality. Disruption to transport of grain or livestock could impact on marketing opportunities resulting in reduced prices.	C	3	13	Access to individual residences, services and businesses, and for livestock across the rail corridor, would be maintained during construction. The construction traffic and transport plan included in the CEMP include measures to ensure that access to properties would be maintained at all times during construction. Where alternative access arrangements need to be made, these would be developed in consultation with affected property owners/occupants, and Local Land Services for travelling stock reserves. A traffic, transport and access management plan would be prepared and implemented as part of the CEMP. The plan would include measures, processes and responsibilities to minimise the potential for impacts on the community and the operation of the surrounding road and transport environment during construction. The plan would be developed in consultation with local councils, Transport for NSW and public transport/bus operators.	D	3	9
Straying livestock	See fencing for potential conflict of straying livestock.	C	3	13	See fencing for mitigation measures of straying livestock.	D	4	5
Theft/vandalism	Interference with crops, livestock, fodder, machinery and equipment due to increased people in close proximity and adjacent to agricultural land for the construction period. During operation, this issue is not expected to be an issue.	D	4	5	Site security during construction to be addressed in the CEMP.	D	5	2

Activity	Identified potential conflict	Risk Ranking			Mitigating factors (method of control)	Controlled Ranking		
		P	C	RR		P	C	RR
Weeds and pests	Planning, construction and operation activities may create the possibility of introducing or spreading weeds, pests and diseases onto a property. In addition soil disturbance could reduce competition against current weeds and necessitate increased control costs. Weed incursions or proliferation would reduce crop and livestock production unless properly controlled. Weed and pest control, including for noxious weed and pests, would be subject to ongoing routine monitoring and management and consultation with relevant regulatory bodies as required. Refer also to biosecurity mitigation measures.	C	3	13	Weed inspections would be undertaken and weed management would occur in accordance with ARTC's standard operating procedures to meet its obligations under the *Biosecurity Act 2015*.The biodiversity management plan included in the CEMP (mitigation measure BD8) would detail measures to minimise the potential for biosecurity risks during construction in accordance with *the Biosecurity Act 2015*.	D	4	5

Activity	Identified potential conflict	Risk Ranking			Mitigating factors (method of control)	Controlled Ranking		
		P	C	RR		P	C	RR
Visual/amenity	Visual impact to sensitive receivers nearby and loss of scenic agricultural views. The proposal would result in temporary changes to visual amenity during the construction period. The potential impacts on visual amenity of these changes would depend on the nature and intensity of the construction activity. The proposal would result in the introduction of infrastructure in what is currently mainly a rural area. This would result in a change in the character of properties that are directly impacted by the proposal, and a change in views to the proposal site.	A	2	23	Detailed design and construction planning would seek to minimise the construction and operation footprints and avoid impacts on mature native vegetation as far as reasonably practicable. An urban design and landscape plan would be prepared to provide a consistent approach to project design and landscaping. The urban design and landscape plan would include: • vegetation screening in strategic locations to visually mitigate impacts from new structures and rail operations, including around bridges and locations where the proposal would be visible from sensitive receivers, where the presence of screening does not impact safe rail operations • appropriate species that respond to the existing landscape character setting and environmental conditions • design guidelines to minimise the visual impacts of bridges, with consideration of the existing landscape and visual context and with regard to Bridge aesthetics: design guidelines to improve the appearance of bridges in NSW (Roads and Maritime Services, 2012). Detailed design would be undertaken in accordance with the urban design objectives developed for the design, and the urban design and landscape plan. Refer to *ARTC Inland Rail Narromine to Narrabri Landscape and Visual Assessment (*JacobsGHD, 2020g) for a compilation of mitigation measures and suggested management practices associated with visual impacts from sensitive receptors.	C	3	13

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