CHAPTER

# 05

# Project Description

**BORDER TO GOWRIE** REVISED DRAFT ENVIRONMENTAL IMPACT STATEMENT

Inland Rail is a subsidiary of
Australian Rail Track Corporation

INLAND RAIL

# Contents



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# 5. Project Description

## 5.1 Project scope

This chapter describes the Inland Rail—Border to Gowrie Project (the Project), the subject of this revised draft Environmental Impact Statement (EIS) and addresses additional information requirements from the Coordinator-General following the public notification of the draft EIS.

This chapter addresses the 'Project Description' section of the Terms of Reference (ToR) inclusive of 10.00 to 10.13. Appendix A2: Terms of Reference Cross-reference Table provides links for each ToR against the relevant sections in the revised draft EIS. Since the draft EIS, the Project has been further refined in response to the requests for additional information under Section 34(B) of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act), by the Coordinator-General.

## 5.2 The Project

The Project is a 217.48-kilometre (km) section of new dedicated single-track, open-access freight railway between the New South Wales (NSW)/Queensland (QLD) border and Gowrie, in Queensland. The Project is comprised of 7 km of standard-gauge rail (1,435 millimetres (mm)) and 210.48 km of dual standard/narrow-gauge rail (1,435 mm standard and 1,067 mm narrow). The new railway will comprise approximately 149.48 km of new rail corridor (greenfield) and approximately 68.00 km of existing open access rail corridor (brownfield), that forms part of Queensland Rail's (QR) South Western Line and Millmerran Branch Line.

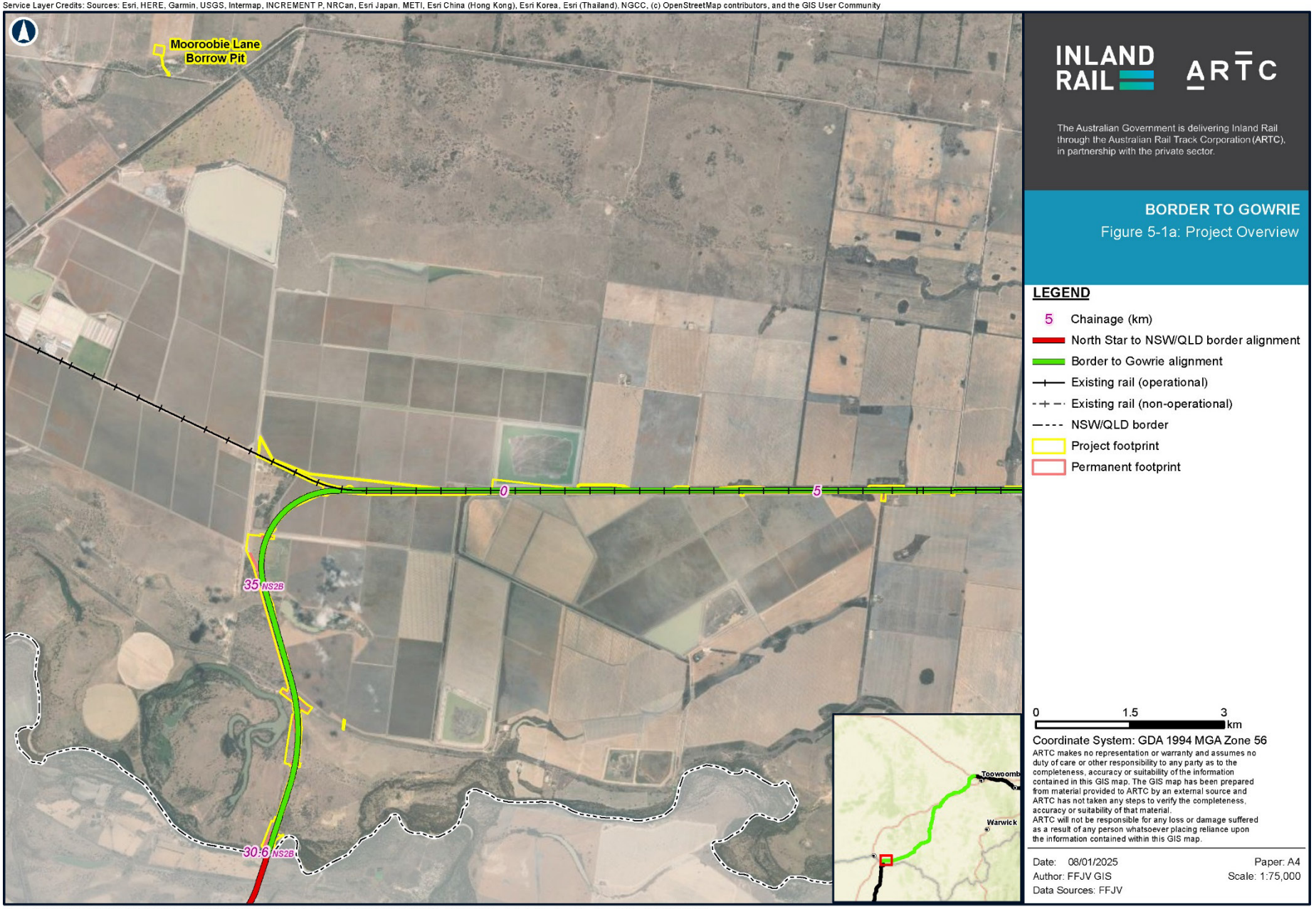
The Project commences at Chainage (Ch) 30.60 km (North Star to NSW/QLD Border (NS2B)) at the NSW/QLD border, approximately 18 km south-east of Goondiwindi. The Project runs north-east via Yelarbon, Inglewood, Millmerran, Pampas, Brookstead, Pittsworth, Southbrook and the Toowoomba Wellcamp Airport to Ch 208.48 km at Gowrie Junction, northwest of Toowoomba.

The Project is one of the missing links within the Inland Rail Program (see Figure 5-1). As part of the broader Inland Rail Program, the Project provides a more direct route between Melbourne and Brisbane in comparison to the existing inland and coastal road and rail networks, and meets the Australian Government's objective of providing a long-term rail solution for competitive freight movement. Further details on the justification for the Project are provided in Chapter 2: Project Rationale.

At the commencement of operation, the Project will accommodate the use of double-stacked 1,800 metre (m) long freight trains. Expected activities during the Project's operations stage are detailed further in Section 5.8.

The Project footprint is the area required to accommodate all permanent and temporary components of the Project, being:

- **Permanent footprint:** the area required to accommodate permanent infrastructure associated with the Project, including rail, road and other miscellaneous infrastructure. Rail infrastructure includes rail tracks, crossing loops, turnouts, earthworks, bridges, drainage, level crossings, grade separations, rail maintenance access roads, signalling and fencing. Road-related works resulting from the Project encompass new and upgraded roads, realignments and diversions, intersection improvements and closures. These components are described in Section 5.4.
- **Temporary footprint:** the area required to accommodate construction activities and facilities of a temporary nature and duration to support the Project. The temporary footprint is generally wider than the permanent footprint to allow for the construction of Project elements, including: fencing; drainage features including erosion and sediment control measures; temporary stockpiling of soil and cleared vegetation; and to allow necessary construction access and turnaround provisions. Temporary Project facilities include laydown areas, site office areas, non-resident workforce accommodation, a material distribution centre, concrete batch plants and borrow pits. These components are described in sections 5.4 and 5.6.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Mooroobie Lane Borrow Pit
0
5
35 NS2B
30·6 NS2B
Toowoomba
Warwick
INLAND RAIL
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BORDER TO GOWRIE
Figure 5-1a: Project Overview
LEGEND
5 Chainage (km)
North Star to NSW/QLD border alignment
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
NSW/QLD border
Project footprint
Permanent footprint
0 1.5 3 km
Coordinate System: GDA 1994 MGA Zone 56
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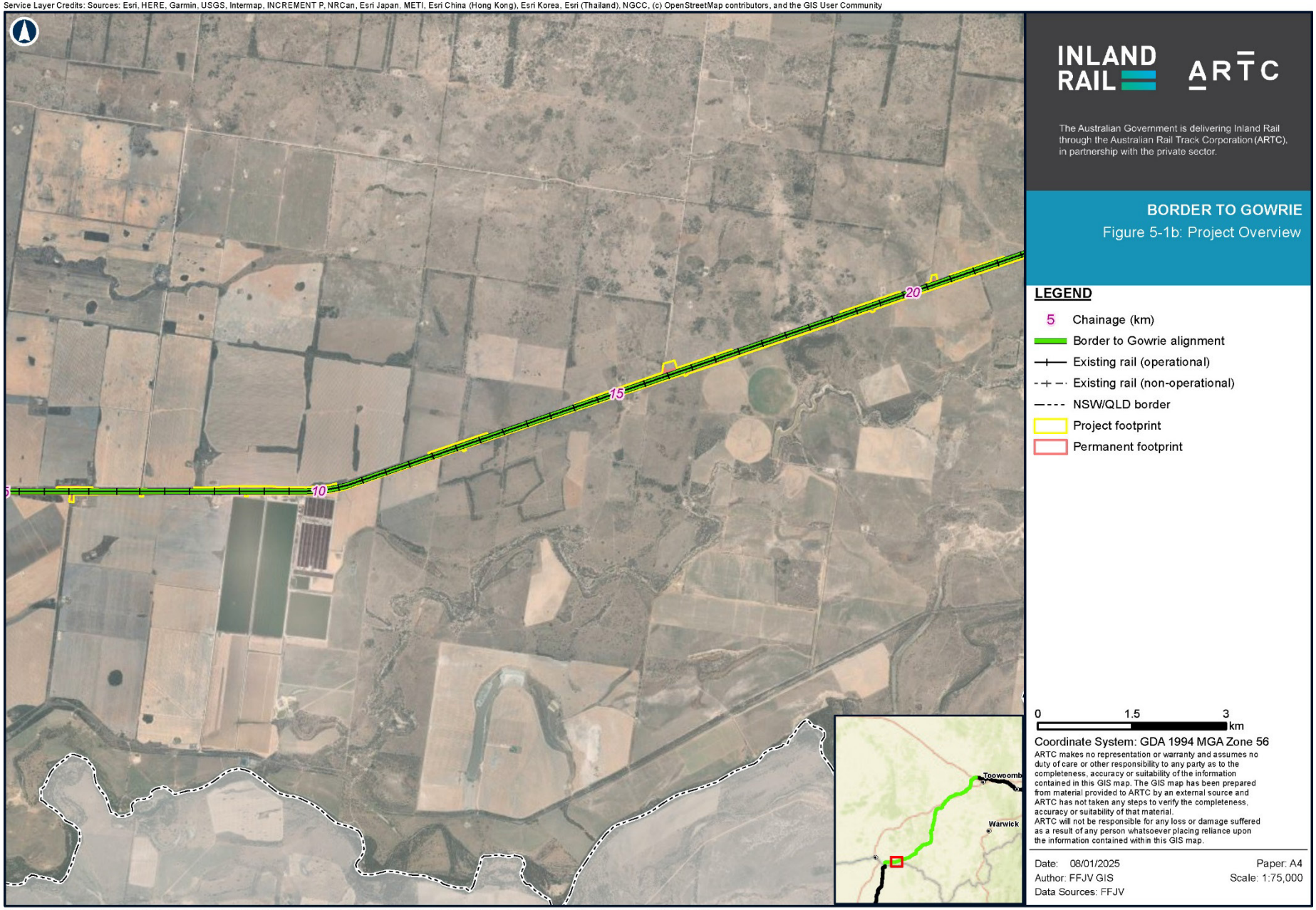


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**BORDER TO GOWRIE**

Figure 5-1b: Project Overview

**LEGEND**

- 5 Chainage (km)
- Border to Gowrie alignment
- Existing rail (operational)
- Existing rail (non-operational)
- NSW/QLD border
- Project footprint
- Permanent footprint

0 1.5 3 km

Coordinate System: GDA 1994 MGA Zone 56



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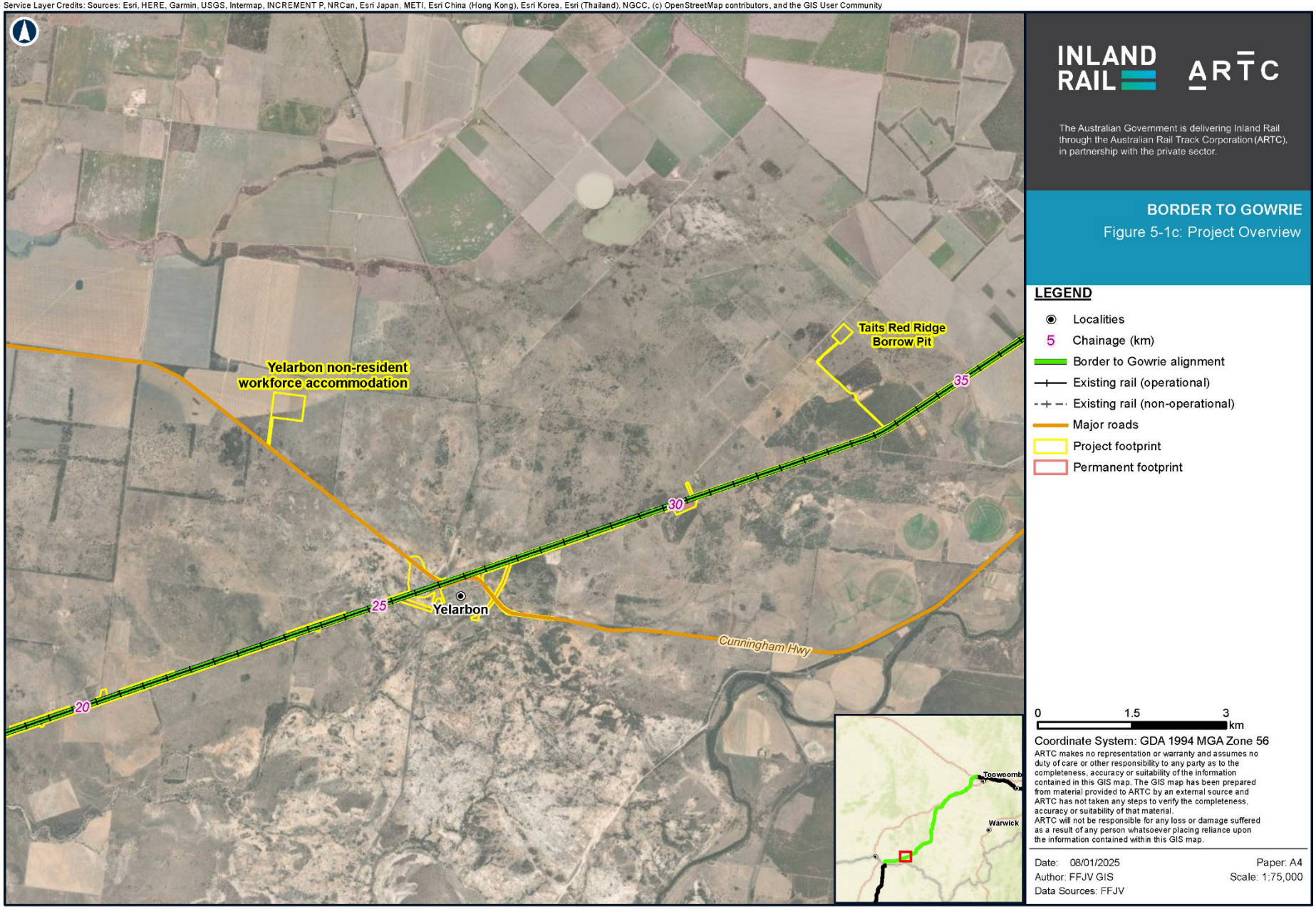
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Yelarbon non-resident workforce accommodation
Taits Red Ridge Borrow Pit
Yelarbon
Cunningham Hwy
20
25
30
35
Toowoomba
Warwick
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BORDER TO GOWRIE
Figure 5-1c: Project Overview
LEGEND
Localities
Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Project footprint
Permanent footprint
0
1.5
3
km
Coordinate System: GDA 1994 MGA Zone 56
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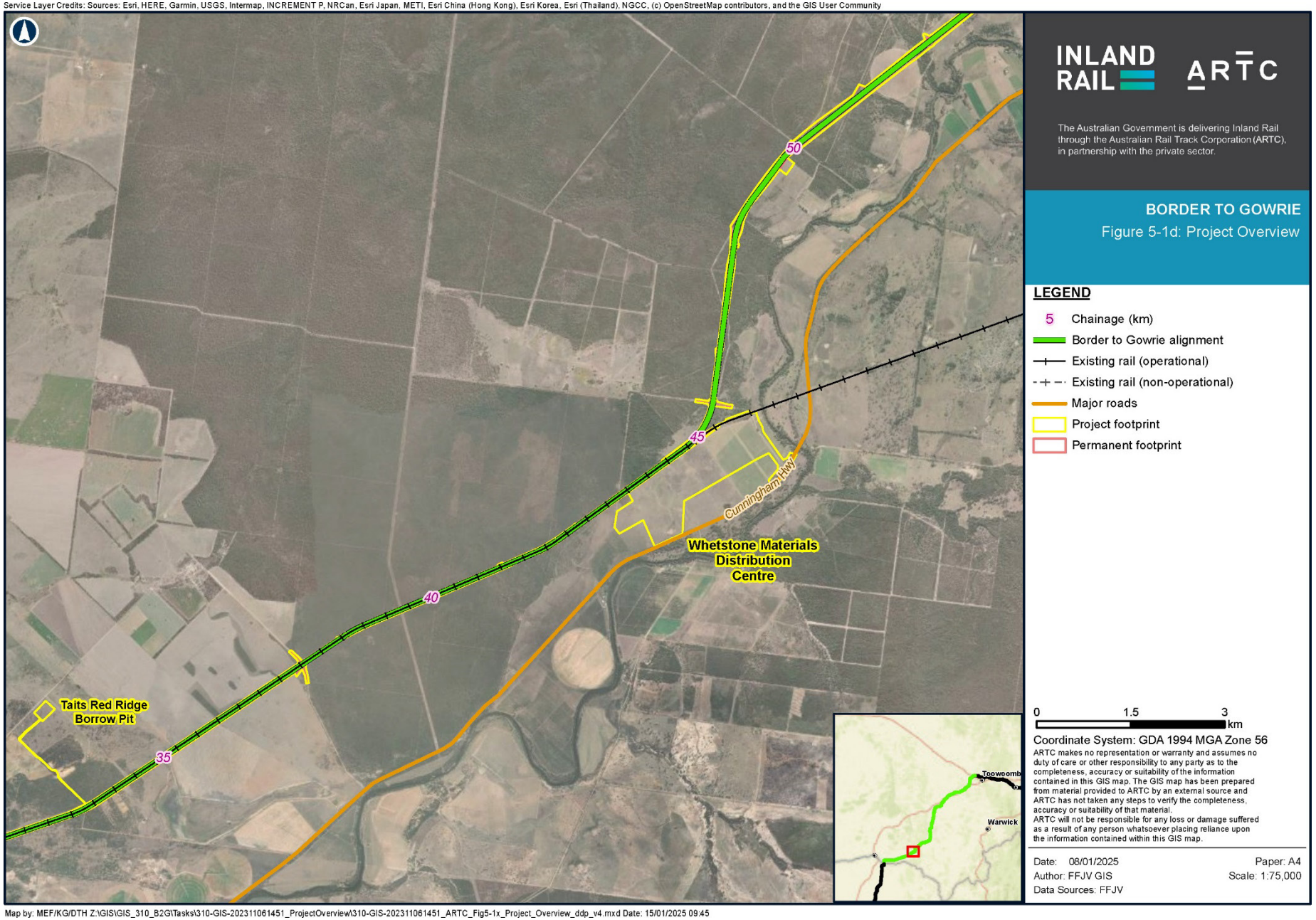
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50
45
40
35
Cunningham Hwy
Whetstone Materials Distribution Centre
Taits Red Ridge Borrow Pit
Toowoomba
Warwick
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BORDER TO GOWRIE
Figure 5-1d: Project Overview
LEGEND
5 Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Project footprint
Permanent footprint
0 1.5 3 km
Coordinate System: GDA 1994 MGA Zone 56
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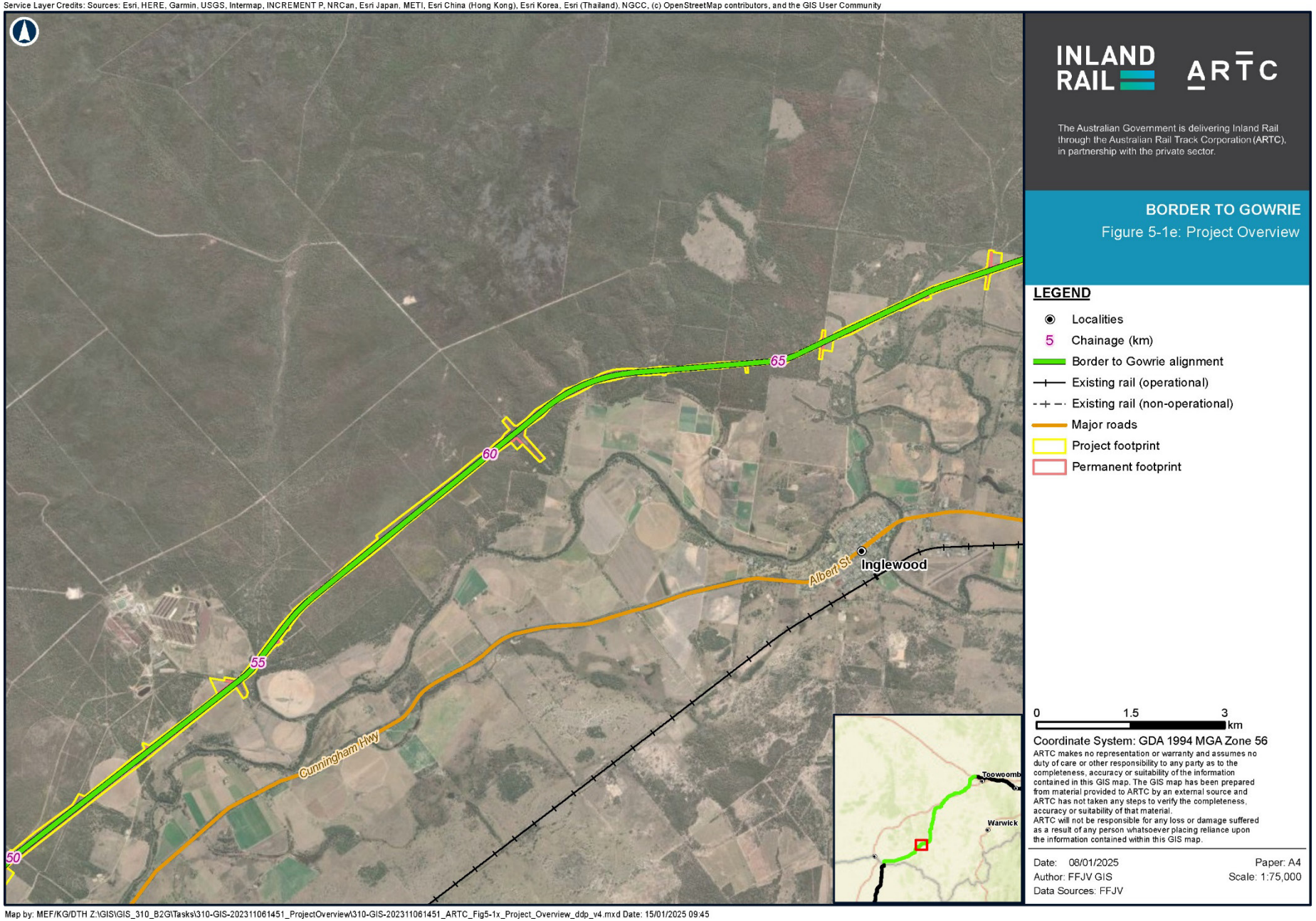
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65
60
55
50
Albert St
Inglewood
Cunningham Hwy
Toowoomba
Warwick
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BORDER TO GOWRIE
Figure 5-1e: Project Overview
LEGEND
Localities
5 Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Project footprint
Permanent footprint
0 1.5 3 km
Coordinate System: GDA 1994 MGA Zone 56
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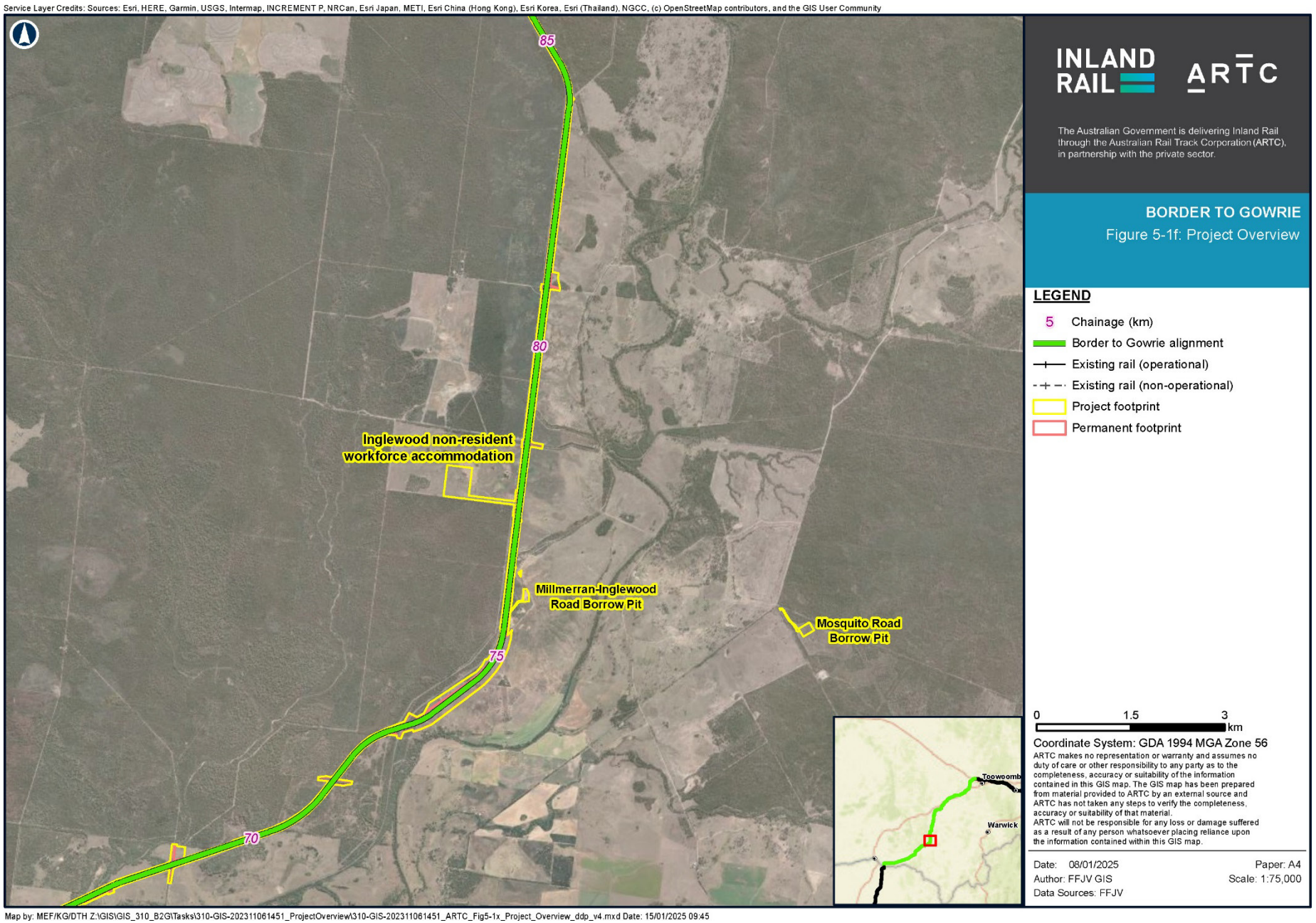
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85
80
75
70
Inglewood non-resident workforce accommodation
Millmerran-Inglewood Road Borrow Pit
Mosquito Road Borrow Pit
Toowoomba
Warwick
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BORDER TO GOWRIE
Figure 5-1f: Project Overview
LEGEND
5 Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Project footprint
Permanent footprint
0 1.5 3 km
Coordinate System: GDA 1994 MGA Zone 56
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**BORDER TO GOWRIE**

Figure 5-1g: Project Overview

**LEGEND**

- 5 Chainage (km)
- Border to Gowrie alignment
- Existing rail (operational)
- Existing rail (non-operational)
- Project footprint
- Permanent footprint

0 1.5 3 km

Coordinate System: GDA 1994 MGA Zone 56



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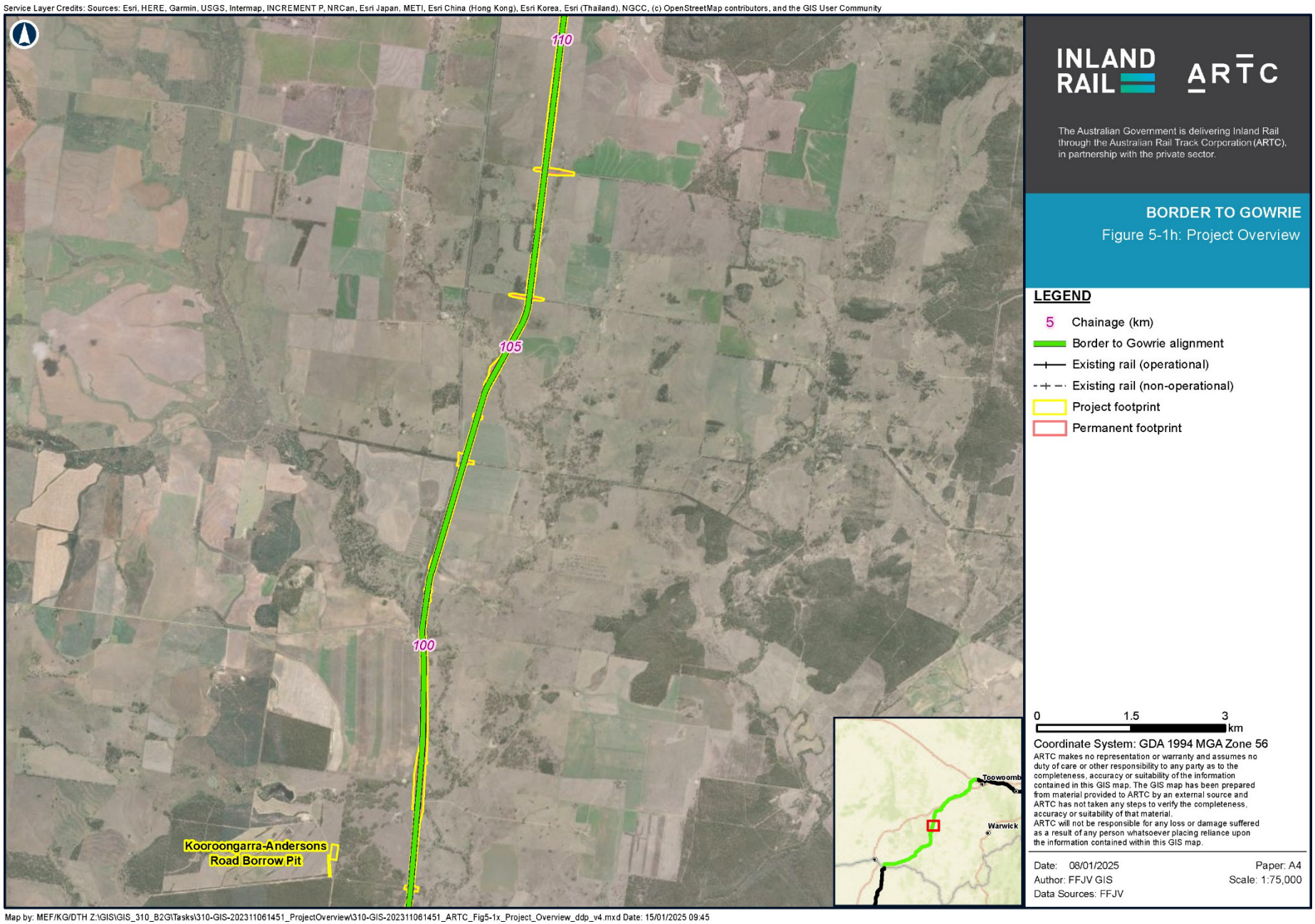
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110
105
100
Kooroongarra-Andersons
Road Borrow Pit
Toowoomba
Warwick
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BORDER TO GOWRIE
Figure 5-1h: Project Overview
LEGEND
5 Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Project footprint
Permanent footprint
0 1.5 3
km
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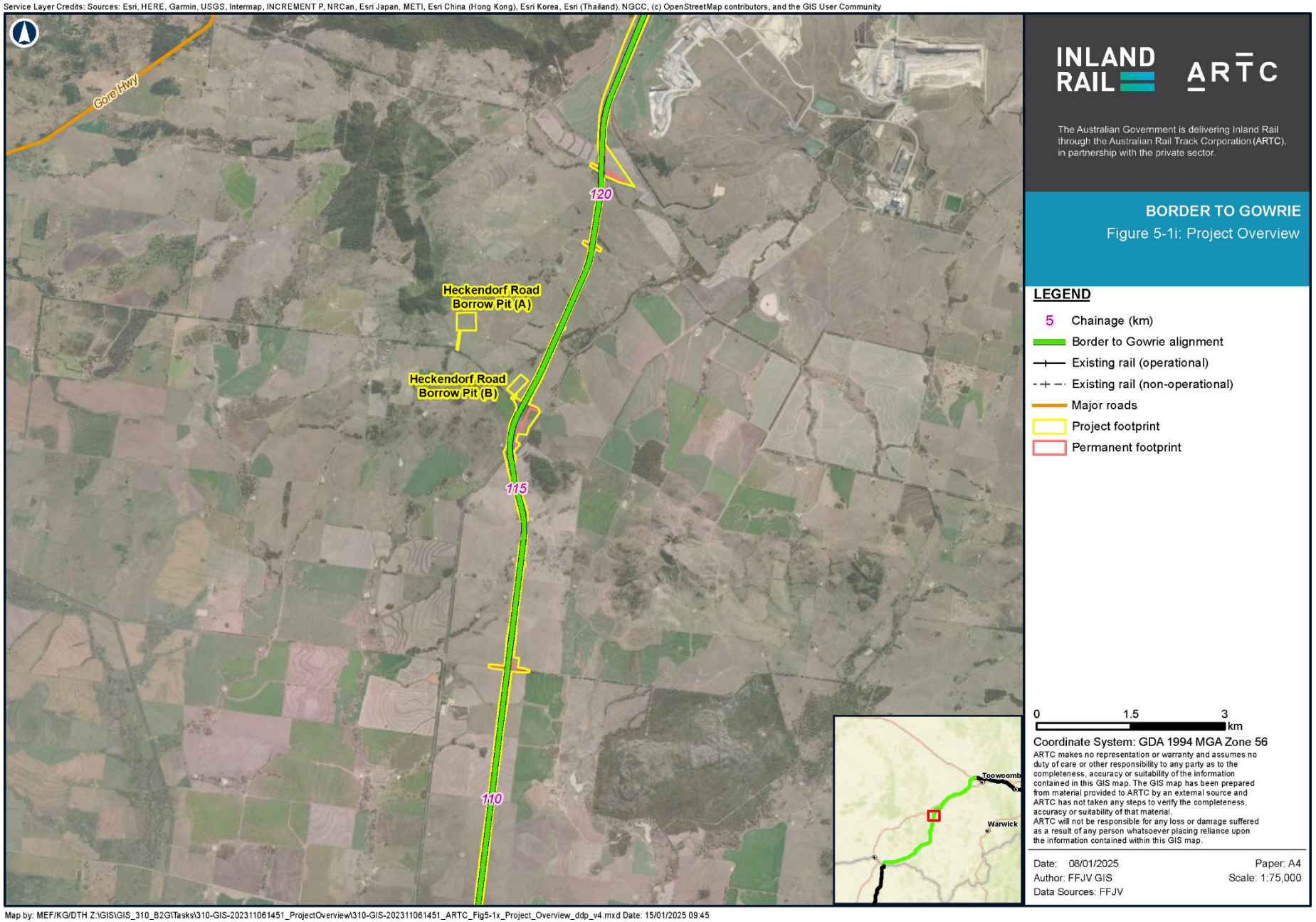
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Gore Hwy
120
Heckendorf Road Borrow Pit (A)
Heckendorf Road Borrow Pit (B)
115
110
Toowoomba
Warwick
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BORDER TO GOWRIE
Figure 5-1i: Project Overview
LEGEND
5 Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Project footprint
Permanent footprint
0 1.5 3 km
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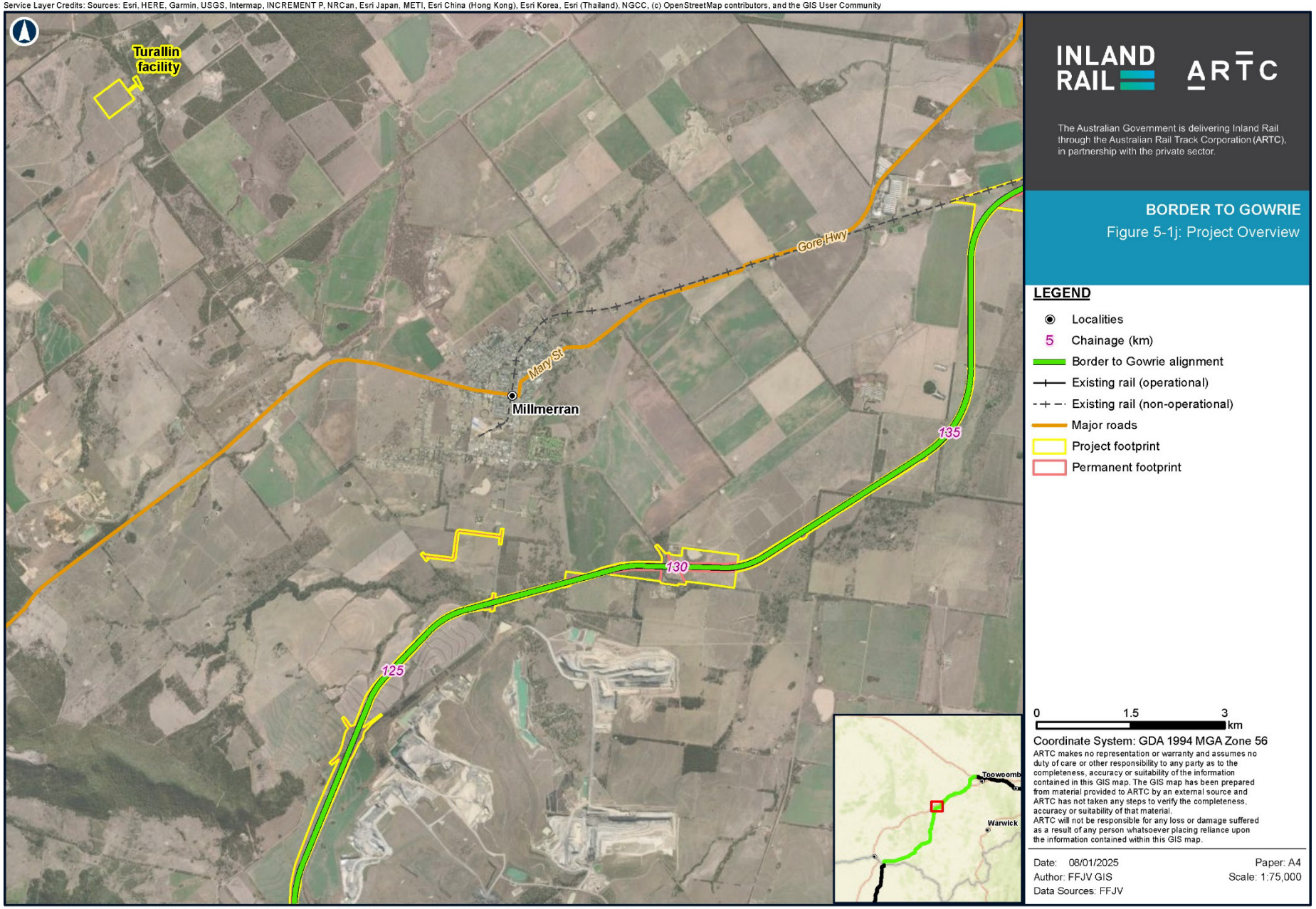
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Turallin facility
Gore Hwy
Mary St
Millmerran
135
130
125
Toowoomba
Warwick
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BORDER TO GOWRIE
Figure 5-1j: Project Overview
LEGEND
Localities
5 Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Project footprint
Permanent footprint
0 1.5 3 km
Coordinate System: GDA 1994 MGA Zone 56
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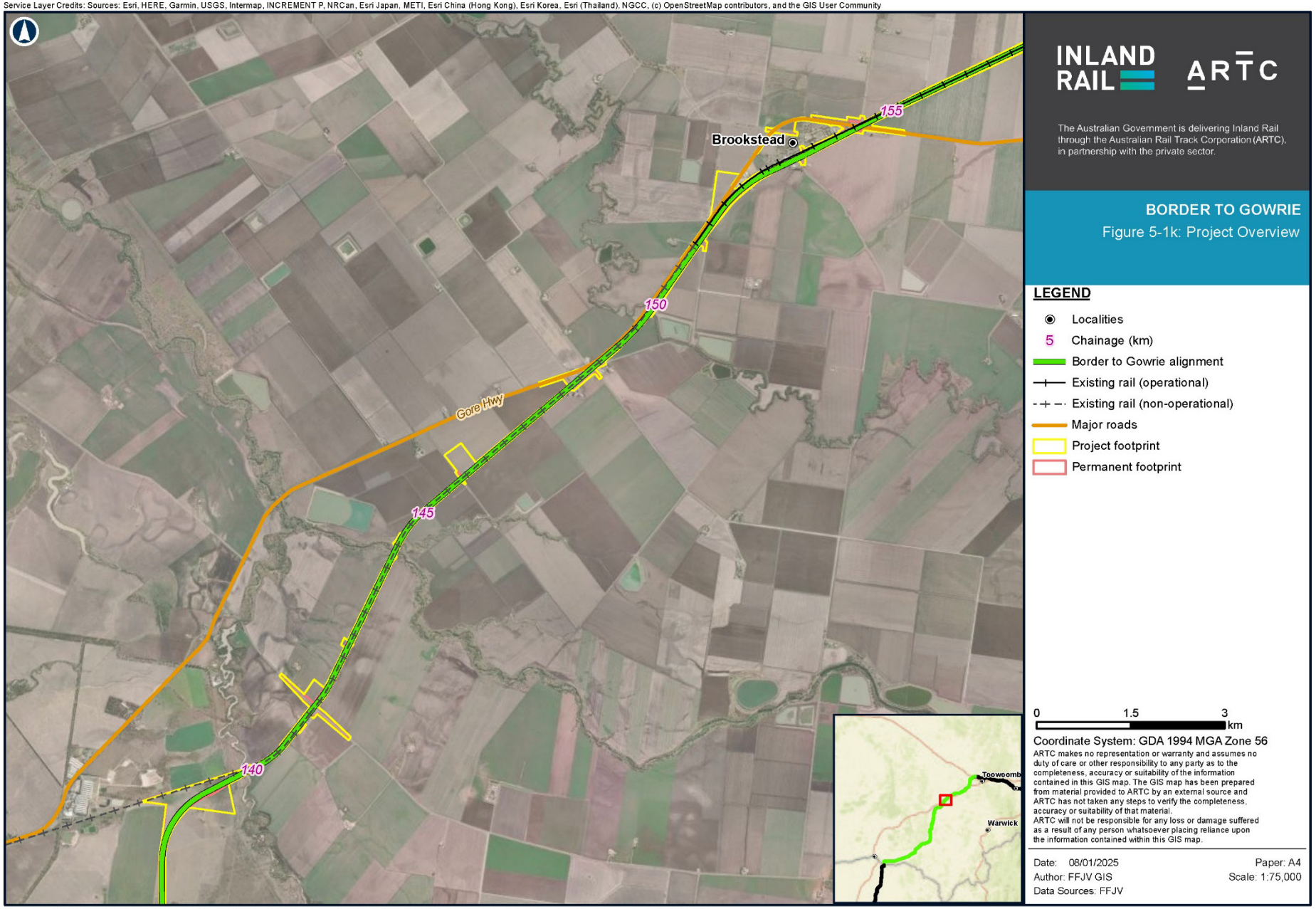
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Brookstead
155
150
145
140
Gore Hwy
Toowoomba
Warwick
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BORDER TO GOWRIE
Figure 5-1k: Project Overview
LEGEND
Localities
Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Project footprint
Permanent footprint
0
1.5
3
km
Coordinate System: GDA 1994 MGA Zone 56
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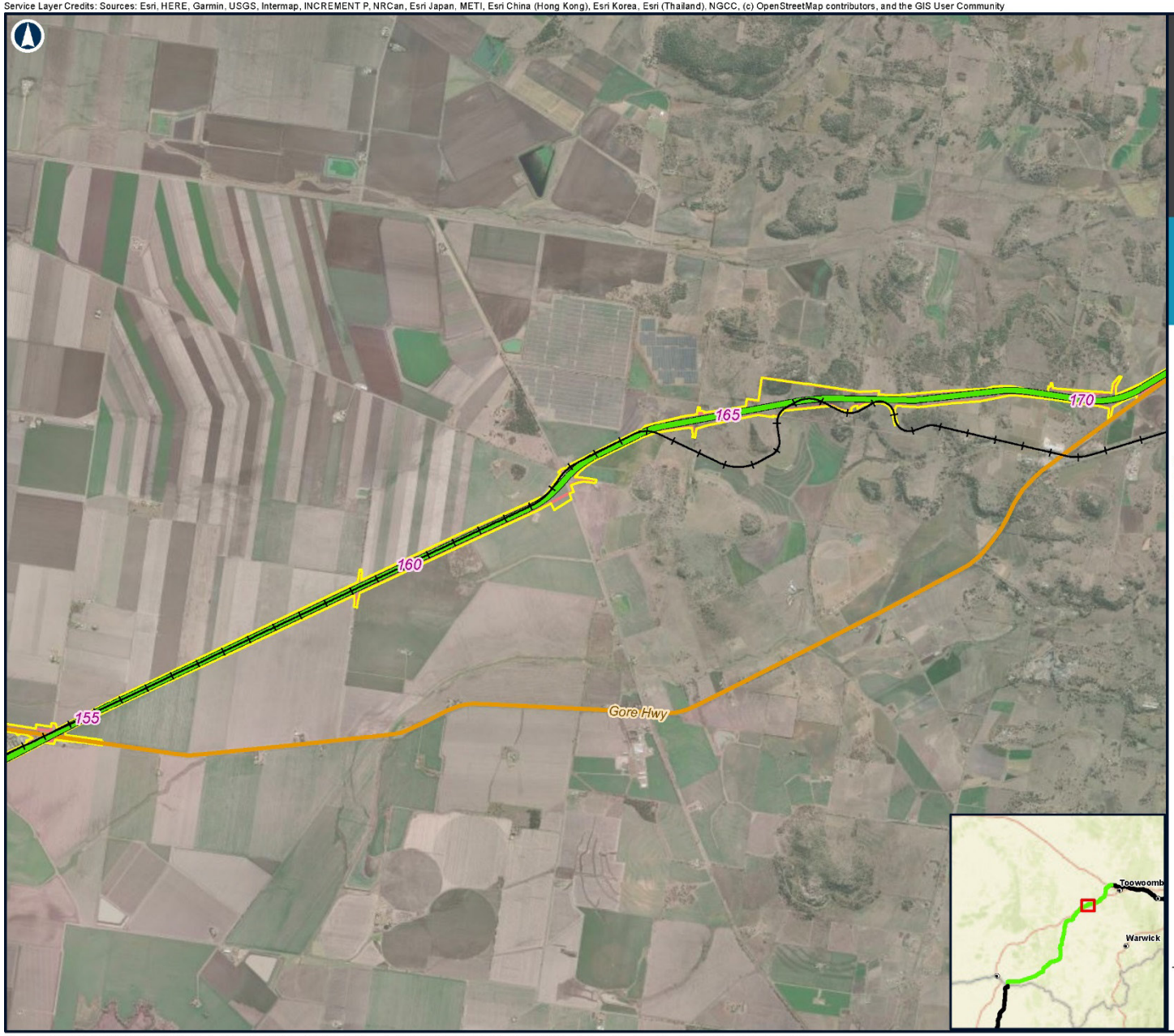


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**BORDER TO GOWRIE**

Figure 5-1l: Project Overview

**LEGEND**

- 5 Chainage (km)
- Border to Gowrie alignment
- Existing rail (operational)
- Existing rail (non-operational)
- Major roads
- Project footprint
- Permanent footprint

0 1.5 3 km

Coordinate System: GDA 1994 MGA Zone 56



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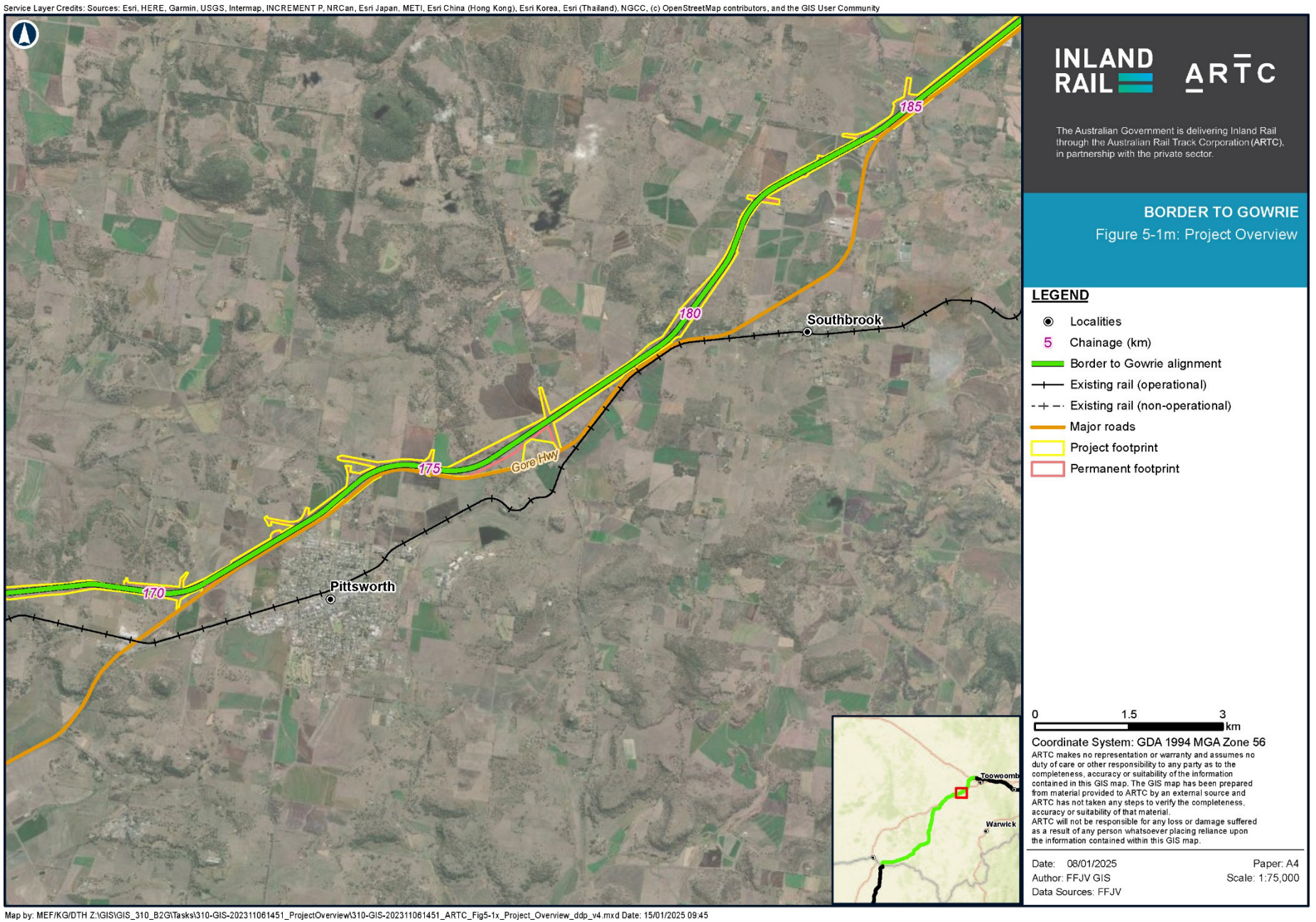
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185
180
175
170
Gore Hwy
Southbrook
Pittsworth
Toowoomba
Warwick
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BORDER TO GOWRIE
Figure 5-1m: Project Overview
LEGEND
Localities
5 Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Project footprint
Permanent footprint
0 1.5 3 km
Coordinate System: GDA 1994 MGA Zone 56
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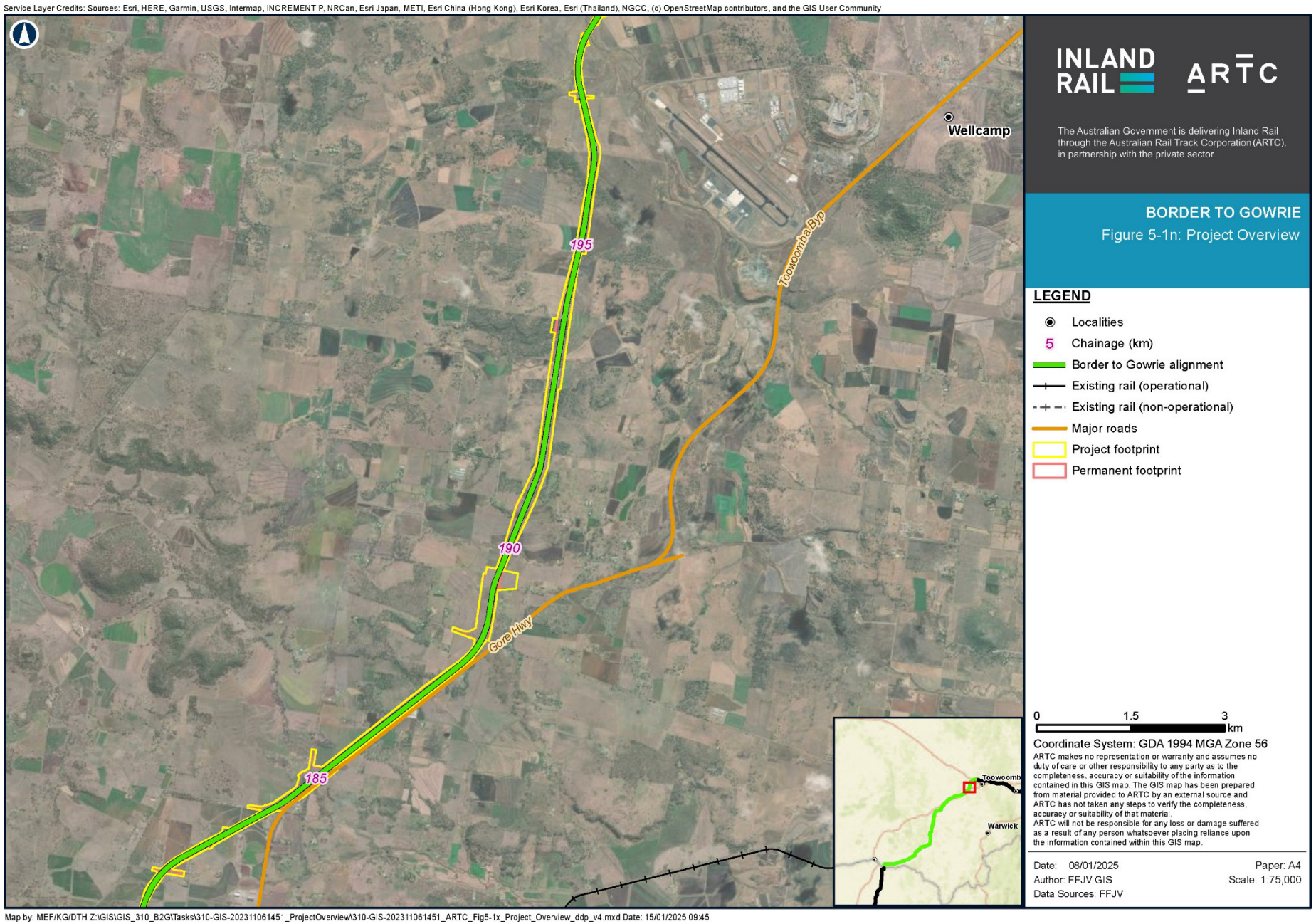
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Wellcamp
195
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Toowoomba Byp
Gore Hwy
Toowoomba
Warwick
INLAND RAIL
ARTC
The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.
BORDER TO GOWRIE
Figure 5-1n: Project Overview
LEGEND
Localities
5 Chainage (km)
Border to Gowrie alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Project footprint
Permanent footprint
0 1.5 3 km
Coordinate System: GDA 1994 MGA Zone 56
ARTC makes no representation or warranty and assumes no duty of care or other responsibility to any party as to the completeness, accuracy or suitability of the information contained in this GIS map. The GIS map has been prepared from material provided to ARTC by an external source and ARTC has not taken any steps to verify the completeness, accuracy or suitability of that material. ARTC will not be responsible for any loss or damage suffered as a result of any person whatsoever placing reliance upon the information contained within this GIS map.
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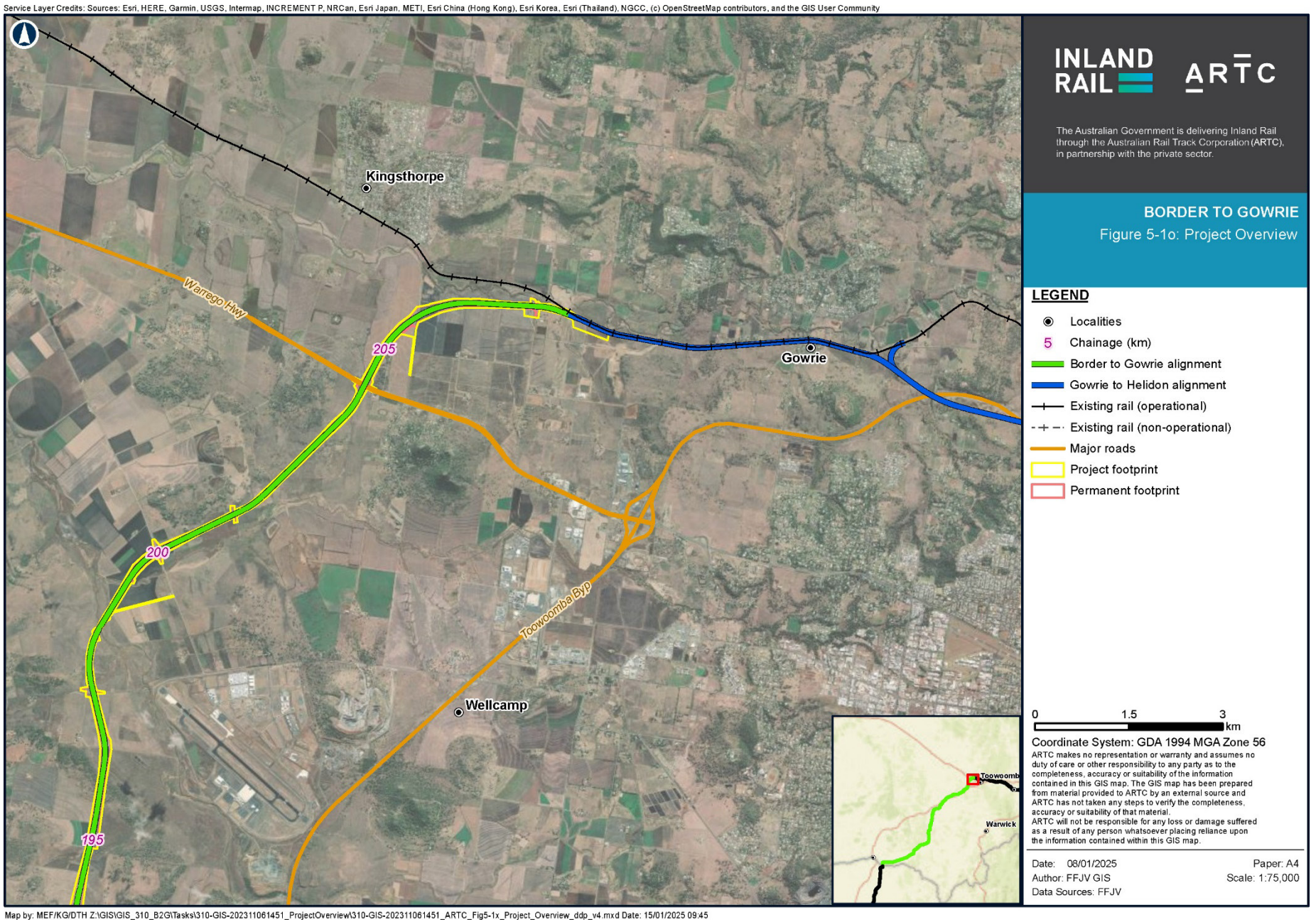
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Kingsthorpe
Warrego Hwy
205
Gowrie
200
Toowoomba Byp
Wellcamp
195
Warwick
INLAND RAIL
ARTC
The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.
BORDER TO GOWRIE
Figure 5-1o: Project Overview
LEGEND
Localities
Chainage (km)
Border to Gowrie alignment
Gowrie to Helidon alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Project footprint
Permanent footprint
0
1.5
3
km
Coordinate System: GDA 1994 MGA Zone 56
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## 5.3 Overview of the Project

### 5.3.1 Relationship to other Inland Rail projects

The Project is one of the interconnecting projects that make up the Inland Rail Program. The Project connects to the NS2B project in the south and the Gowrie to Helidon project in the north-east.

Chapter 2: Project Rationale provides discussion regarding the relationship of the Project to other projects within the Inland Rail Program. Chapter 23: Cumulative Impacts provides discussion around the potential cumulative impacts of the Project.

### 5.3.2 Key components

The key Project components are summarised in Table 5-1 and Table 5-2. The key features of the Project are shown in design drawings presented in Appendix B1: Design Drawings. Each of the key components during the construction works and operations stages are described further in Sections 5.5 to 5.8.

The Project does not include the development or operation of intermodal freight hubs. The requirement for any approvals for such facilities is the responsibility of the proponents of those developments.

A list of the watercourses crossed by the Project is provided in Chapter 13: Surface Water.

**TABLE 5-1 KEY REVISED REFERENCE DESIGN COMPONENTS (PLANNING, DESIGN AND CONSTRUCTION STAGE)**

| Component | Quantity |
|---|---|
| Non-resident workforce accommodation[1] | 2 |
| Material Distribution Centre (MDC) | 1 |
| Laydown areas | 78 |
| Cut volume (total) | 11,368,000 cubic metres ($m^3$) (rail)<br>90,700 $m^3$ (road) |
| Maximum cut depth | 21 m |
| Fill volume (total) | 11,876,000$m^3$ (rail)<br>802,300 $m^3$ (road) |
| Maximum fill depth | 21 m |
| Borrow pits | 7 pits at 6 locations (one location with dual pits) |
| Concrete batch plants and precast laydown | 2 |
| Culverts | Reinforced concrete box culverts: 1,193 cells in 133 locations<br>Reinforced concrete pipes: 2,134 pipes in 222 locations<br>Further detail regarding the proposed culvert structures is provided in Appendix T1: Hydrology and Flooding Technical Report – Volume 1 (Appendix B: Cross-Drainage Register) |
| Fuel storage | 16 sites have been identified for potential fuel storage<br>20 kilolitres (kL) may be stored per site |
| Turallin facility | 1 |

**Table notes:**
All volume calculations to support the construction stage of the Project are indicative and will continue to be refined through detailed design and construction stages.
1. The locations for two non-resident workforce accommodation sites have been identified and included in the Project footprint. The location for a third non-resident workforce accommodation has not been included in the revised draft EIS. The site selection and due diligence associated with locating a Millmerran based non-resident workforce accommodation will be undertaken during detailed design and subject to further review and approval.

**TABLE 5-2 KEY REVISED REFERENCE DESIGN COMPONENTS (OPERATIONS STAGE)**

| Component | Quantity |
|---|---|
| Rail length | 217.48 km |
| Rail length (Ch 30.60 km (NS2B) to Ch 208.22 km) | Standard gauge: 7.0 km<br>Dual gauge: 210.48 km<br>Total: 217.48 km |
| Rail corridor width | 30 m minimum; however, it is wider, as required, to accommodate the earthworks associated with large cuts and fills, drainage works, rail infrastructure, access roads and fencing. |
| Bridges | 37 |
| Bridge length (total) | 12,043 m |

| Component | Quantity |
|---|---|
| Rail interfaces (tie-ins):<br>▸ QR South Western Line:<br>  ▸ Connection at Kildonan, towards Goondiwindi<br>  ▸ Connection at Whetstone, towards Warwick<br>  ▸ Turnouts to existing sidings and loops (six locations).<br>▸ QR Millmerran Branch Line:<br>  ▸ Connection at Millmerran<br>  ▸ Connection at Yarranlea<br>  ▸ Turnouts to existing sidings (two locations) | 12 |
| State-controlled road interfaces:<br>▸ Active level crossing<br>▸ Grade separation: rail-over-road<br>▸ Grade separation: road-over-rail | 7 roads in 9 locations<br>2<br>5<br>2 |
| Local government road interface treatments:<br>▸ Goondiwindi Regional Council (GRC)<br>  ▸ Passive level crossing<br>  ▸ Active level crossing<br>  ▸ Grade separation: rail-over-road<br>  ▸ Grade separation: road-over-rail<br>▸ Toowoomba Regional Council (TRC)<br>  ▸ Passive level crossing<br>  ▸ Active level crossing<br>  ▸ Grade separation: rail-over-road<br>  ▸ Grade separation: road-over-rail | <br><br>6<br>8 (includes Yelarbon active pedestrian level crossing)<br>2<br>0<br><br>1 (stock route)<br>12<br>9<br>3 |
| Crossing loops | 5, located as follows:<br>▸ Loop 1—Yelarbon<br>▸ Loop 2—Inglewood<br>▸ Loop 3—Kooroongarra<br>▸ Loop 4—Yandilla<br>▸ Loop 5—Broxburn |

### 5.3.3 Summary of changes to the reference design since the draft Environmental Impact Statement

Since the draft EIS, the Project's reference design has been revised in response to engagement with key stakeholders (including landowners, communities, contractors, local councils and technical authorities), assessment of field-verified survey data and review of design optimisation opportunities. The design changes since the draft EIS are:

- Vertical alignment
  - The vertical alignment has been optimised using the maximum vertical alignment gradient along the Project to 1-in-80 curve compensated. These changes have sought to achieve improved Project outcomes through:
    - improved bulk earthworks in areas of challenging terrain
    - improved safety outcomes at road rail interfaces via additional grade separations.
- Horizontal alignment changes:
  - Millmerran alternative alignment (Chapter 2: Project Rationale)
  - Other minor horizontal alignment changes:
    - The Project was able to horizontally shift the alignment closer to the road corridor where level crossings were replaced with grade separations. This design change removed short-stacking constraints, as well as minimised property impacts. Short stacking refers to maintaining a minimum separation distance between the outer rail of the Project alignment and the centreline of the nearest parallel road, enabling road vehicles to store safely at a level crossing or intersection.

- Road-rail interfaces:
  - Removal of road-rail crossings through engagement:
    - McDougall's Road—alternative access provided via Cremascos Road
    - Hall Road—alternative access provided by connecting Hall Road to Bellevue Road
    - Lindenmayer Road—formed road no longer impacted due to horizontal alignment change at Millmerran.
  - Road-rail interface treatment change from level crossing to grade separation. These treatment changes were a result of 1-in-80 grade changes in areas of challenging terrain. All treatments align with the Project's level crossing treatment methodology (Appendix AA: Traffic Impact Assessment):
    - Bybera Road (rail bridge over road)
    - Heckendorf Road (road bridge over rail)—this included eliminating the detour of Heckendorf Road and the intersection upgrade of Millmerran-Inglewood Road
    - Gilgai Lane (rail bridge over road)
    - Commodore Peak Road and Scragg Road (rail over road)
    - Consolidation of both roads to grade separation location
    - Owens Scrub Road (road bridge over rail)
    - Athol School Road (rail bridge over road)
    - Consolidation of Purcell Road to Athol School Road via a new road.
  - Passive level crossings that are now active level crossings. These treatment changes were the result of updated traffic surveys undertaken in collaboration with the relevant road manager, and updated Australian Level Crossing Assessment Model (ALCAM) results:
    - Kooroongarra Road
    - Paton Road
    - Nicol Creek Road
    - Millwood Road
    - Harris Road (involves a road redesign within Pampas)
    - Mann Silo Road
    - Linthorpe Valley Road.
  - New Interface:
    - Pedestrian level crossing at Yelarbon.
  - Stock route interfaces:
    - Kildonan Road—instead of realigning the stock route to a grade-separation location, the updated proposal is to create an adjacent stock level crossing designed to avoid interaction with road vehicles.
    - South Kurumbul Road—realignment of the stock route with an adjacent stock level crossing designed to avoid interaction with road vehicles. This means Wondalli-Kurrumbul Road level crossing will not be provided. Noting there is no existing level crossing at the Wondalli-Kurrumbul Road interface on the QR line.
    - Include suitably sized holding yards at key interfaces
    - New stock route corridors will be a minimum of 60 m wide, with the exception of the new realigned Milmerran-Inglewood Road stock route which will be 100 m wide.
- Non-resident workforce accommodation
  - The two 20-hectare (ha) non-resident workforce accommodation sites have been included in the temporary footprint to accommodate the Project construction workforce requirements, one at Inglewood and another at Yelarbon. A third non-resident workforce accommodation site will be required in the Millmerran area and feasibility assessments will be undertaken to identify the optimal location for the site. The site selection and due diligence associated with locating a Millmerran-based non-resident workforce accommodation will be undertaken during detailed design.
- Turallin facility
  - Inclusion of a 20-ha site in the temporary footprint to be utilised for a laydown area, a training facility, or native plant nursery and traditional land management training facility (proposed land use subject to ongoing negotiations between the Australian Rail Track Corporation (ARTC) and landowners).

- Yelarbon levee:
  - Subject to detailed design, modification of the existing Yelarbon levee from a category 2 to a category 3 will be required due to the size of the affected population.
- Project footprints:
  - The permanent and temporary footprints have been refined based on consultation, field-validated ecology results and a rationalisation based on the revised reference design. The location and description of the revised reference design laydown areas is discussed in Section 5.6.7.
- Whetstone MDC:
  - As part of the track construction delivery strategy for the Project, ARTC is proposing to establish a temporary MDC in Whetstone, on land bounded by the QR South Western System Railway Line to the north and Cunningham Highway to the south. Further detail regarding the site is contained in Section 5.6.5.
- Borrow pits:
  - The cut-and-fill earthworks required for the Project have been optimised to reduce the reliance on imported materials. Seven borrow pits at six locations (one location with dual pits) have been identified between Goondiwindi and Millmerran to supply suitable structural fill for the Project. Further detail regarding earthworks and borrow pit locations is detailed in Section 5.6.15.2.

### 5.3.4 Cost

The estimated capital expenditure for the Project is approximately $2.2 billion (Appendix Y: Economic Impact Assessment), which is an estimate of the construction and development costs incurred over the construction stage but excluding any pre-construction costs incurred outside of the construction period. Materials and activities contributing to direct costs include:

- Delivering environmental and heritage commitments
- Earthworks and formation
- Roadworks
- Fencing
- Structures
- Track works (loops and crossings)
- Delivery works (incidentals and utilities)
- Supply of track, sleepers and connections
- Signalling and other rail componentry such as wayside monitoring equipment.

Capital expenditure also includes indirect costs, such as design services, contractor overhead and margins, and site overheads, management costs and escalation. Further detail on the economic impact assessment is provided in Chapter 18: Economics and Appendix Y: Economic Impact Assessment.

### 5.3.5 Project stages

The Project involves the remaining key stages:

- Enabling works
- Detailed design
- Project approvals and corridor acquisition
- Pre-construction and early works
- Construction works
- Commissioning
- Operations
- Decommissioning.

Project works are works subject to approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) by the Australian Minister for the Environment and the receipt of the Coordinator-General's evaluation report under the SDPWO Act. Project works include all the Project stages listed above, except for enabling works, detailed design, project approvals and corridor acquisition and decommissioning.

#### 5.3.5.1 Enabling works

Enabling works are works that are not defined as Project works and not subject to assessment in the revised draft EIS, including:

- Works to inform the ongoing development of the Project design and inputs to the EIS
- Works to existing utilities and rail infrastructure to be undertaken in advance of the construction works.

These scope items are not included in the revised draft EIS for assessment and are not subject to approval under the EPBC Act by the Australian Minister for the Environment and the receipt of the Coordinator-General's evaluation report under the SDPWO Act. Where these works have been described in the revised draft EIS, they are included to provide broader Project context.

Enabling works (existing utility and rail works) will be undertaken under a separate contract, or by the asset owner and will be required to comply with the relevant environmental or regulatory framework applicable to the works or public utility.

Enabling works include the following:

- Works to inform detailed design and EIS:
  - utility investigations and survey
  - survey and geotechnical investigations
  - baseline surveys
- Works to be undertaken in advance of construction:
  - utility treatments such as protection, relocation, and/or removal of utilities/service crossings (existing public utility/service crossings)
  - relocation or protection of QR assets
  - site compounds and laydown areas required to support enabling works, with disturbance areas limited to what is practicably required, and subject to separate approvals processes where required.

**Survey and geotechnical investigations**

The construction of Project infrastructure requires the undertaking of survey and geotechnical investigations, including adherence to survey control plans and procedures to ensure spatial correctness, understanding of existing site conditions, and quality of reporting and construction. Where necessary, separate approvals will be obtained for these works.

**Baseline surveys**

ARTC will undertake additional baseline surveys to supplement the surveys undertaken as part of the revised draft EIS. These baseline surveys will inform such matters as cultural heritage management, water quality objectives, design and environmental and planning approvals, rehabilitation requirements and performance indicators. Further information on the proposed baseline surveys required for the Project is provided in the relevant technical chapters and reports.

**Utility treatments**

Utility treatments include avoiding, protecting, modifying, diverting or realigning utility services and infrastructure which will be undertaken or overseen by a third-party asset owner or manager. The anticipated methodology for the treatment of utilities is:

- Site surveys to determine as-built locations and arrangements
- Identification of utility clashes with proposed design
- Avoiding identified clashes:
  - review/amendment of designs to avoid the utility where possible
  - apply for relaxations/derogations or departures from utility authorities to relax requirements in order to leave the utility in place with no treatment
- Protect the existing utility:
  - implement controls for construction activities to protect the existing utilities
  - maintain required clearances as required by the utility authority
  - limit vibrations
  - substitute machinery, use spotters or other controls

- Install physical protective treatments:
  - concrete protection slabs
  - bridging slabs
  - concrete encasement.
- Relocation of the existing utility:
  - lower, re-align or raise existing underground or overhead utilities
  - relocation of power poles to either raise or re-align overhead powerlines
  - trenching to lower and/or re-align existing underground utilities
  - directional drilling or tunnel boring/pipe jacking to lower and/or relocate existing underground utilities.
- Abandonment of redundant utilities:
  - disconnection and removal of utilities no longer in service where possible and practical
  - capping and/or ground filling of utilities no longer in service and/or abandoned if removal is not possible or practical.

Approvals, including asset owner approvals, will be obtained for these works.

All utility owners have been consulted by ARTC during the revised reference design process to establish potential interface impacts and to identify initial design solutions. Details of consultation are outlined in Appendix E: Consultation Report. Consultation with utility owners will continue through the detailed design stage of the Project to further verify interface impacts and to confirm appropriate interface treatments.

**Relocation or protection of Queensland Rail assets**

A survey of existing QR assets within the Project footprint will be required after an interface agreement between ARTC and QR, but prior to the commencement of construction. The purpose of this survey will be to locate all existing rail infrastructure components and determine their type, size, materials and condition. QR assets include connections, signalling systems, culverts, sleepers, rail and ballast. This survey will inform Project decisions on the ability to reuse, protect, remove or relocate existing QR assets as well as the required timing of these works. The outcomes of the survey including the nature and timing of required works will be agreed with QR.

#### 5.3.5.2 Detailed design

ARTC has progressed the design of the Project to a reference design status. While some changes could be expected as the design evolves, the general principle will be that design changes either improve the safety or performance of the Project, improve environmental outcomes, or incorporate value engineering opportunities. ARTC will be responsible for integrating any EIS conditions into the detailed design.

#### 5.3.5.3 Project approvals and corridor acquisition

Project approvals and corridor acquisition will commence following the EIS phase to support the Project's detailed design, construction works and operations stages. This Project stage will include preparation of secondary environmental and planning approvals, and corridor acquisition.

**Environmental and planning approvals**

Following approval of the Project under the SDPWO Act and EPBC Act, the Project will require additional, post-EIS secondary environmental and planning approvals, permits and licences. Approvals will be required prior to the commencement of the relevant construction or ground-disturbing activity and will be obtained, as required, throughout the construction stage.

Detailed discussion and summary of the potential post-EIS approvals, including relevant exemptions, self-assessable codes or requirements is provided in Chapter 3: Legislation and Project Approvals Process.

**Corridor acquisition**

Where possible, the Project has been intentionally aligned with existing road corridors and sections of the QR South Western Line and Millmerran Branch Line rail corridors, minimising the extent of 'new' properties to be acquired. Notwithstanding this, the acquisition of land, and interests in land, will be required for the construction and operation of the Project.

Acquisition of land will be undertaken via a combination of three methods being:

- Compulsory acquisition by the Department of Transport and Main Roads (DTMR) using acquisition powers under the *Transport Planning and Coordination Act 1994* (Qld) in accordance with the process under the *Acquisition of Land Act 1967* (Qld). ARTC will request DTMR protect the Project corridor under the appropriate legislative mechanisms following the issuing of the Coordinator-General's evaluation report.

- A private sale treaty for early voluntary negotiated acquisitions (prior to compulsory acquisition) undertaken by either ARTC or DTMR
- Applications in accordance with the *Land Act 1994* (Qld) for non-freehold tenures of unallocated state land, reserve land, roads and road reserves, perpetual leases, term leases. Certain types of state leasehold land may be able to be compulsory resumed in accordance with the *Acquisition of Land Act 1967* (Qld).

Department of Transport and Main Roads will support ARTC during consultation with affected landowners and interest holders prior to the commencement of the statutory compulsory acquisition process. Consultation will inform requirements for access for machinery and cattle, access to water assets, fencing, accommodation works or property adjustments, and unregistered interests not recorded on property titles who may be eligible for compensation.

The specific extents of land required for the Project will be determined during detailed design.

Chapter 8: Land Use and Tenure provides further details regarding the properties traversed by the Project footprint and the land acquisition process.

#### 5.3.5.4 Pre-construction and early works

Pre-construction and early works are undertaken prior to full mobilisation of the contractor. These works may be undertaken under a separate contract but will not commence until the Outline Environmental Management Plan (Chapter 24: Draft Outline Environmental Management Plan) has been approved by the Coordinator-General and the Australian Minister for the Environment, and the relevant early works Construction Environmental Management Plan (CEMP) has been endorsed by the Environmental Monitor. Pre-construction and early works include:

- Site preparation for construction
- Establishment of access roads/tracks
- Vegetation clearing and other ground disturbance activities that will be required to comply with relevant legislative requirements, approval conditions, guidelines and plans
- Additional surveys and geotechnical investigations to inform construction works
- Relocation or protection of QR assets that were not required to be undertaken well in advance as part of enabling works
- Utility/service interfaces that were not required to be undertaken well in advance as part of enabling works
- Modification of biosecurity fencing
- Installation of boundary fencing
- Establishment of site offices and initial laydown areas including the Whetstone MDC
- Establishment of non-resident workforce accommodation.

Pre-construction and early works may also include works within the local road reserves, including establishing new access points and/or to facilitate the future upgrades and road closures subject to agreement between ARTC and the relevant local council.

#### 5.3.5.5 Construction works

Construction works may commence upon the endorsement of the CEMP by the Environmental Monitor for the relevant Project works. Construction works include:

- Site set out and pegging within the Project footprint, where not completed in pre-construction and early works
- Establishment of laydown areas and compounds, including vehicle inspection/workshops, washdown facilities and temporary fencing, where not completed in pre-construction and early works
- Clearing—using dozers, chainsaws, excavators, trucks and similar equipment, where not completed in pre-construction and early works
- Establishment of erosion and sediment controls as per approved Erosion and Sediment Control Plan, where not completed during pre-construction and early works
- Rail corridor works, including track works turnouts and crossing loops
- Road and road-rail interface works
- Road realignments, grade separations and upgrades works
- Rail maintenance access roads
- Bridge construction
- Fencing

- Construction of fauna habitat connectivity measures in accordance with the Fauna Connectivity Strategy and detailed design specifications (fencing, crossing structures and fauna furniture)
- Signalling and communications
- Stockpile, and storage areas, that are not for enabling works and where not completed in pre-construction and early works
- Ballast—supply, delivery and installation
- Concrete sleepers—supply, delivery and installation
- Utilities and services to support/service the Project (that are not for enabling works)
- Bulk earthworks—major cut-to-fill operations include the winning of suitable construction material from sections of cut along the Project alignment or from borrow pits external to the site
- Permanent and temporary drainage controls, including culverts and longitudinal drainage
- Clean-up, landscaping, site restoration and rehabilitation, and any other activities necessary to complete such works
- Demobilisation of construction sites and activities.

Further discussion of the Project's construction works is provided in Section 5.6.

#### 5.3.5.6 Commissioning

Testing and commissioning (checking) of the rail line and communication/signalling systems will be undertaken to ensure that all systems and infrastructure are designed, installed, and operating according to ARTC's operational requirements. Further discussion of the Project's commissioning stage is provided in Section 5.6.26.

#### 5.3.5.7 Operations

Operations include the use of the railway for freight purposes, operation and maintenance of safety systems, signalling, and general track and infrastructure maintenance.

Operational items include, but not limited to:

- Bridge and culvert inspections and maintenance
- Sleeper replacement
- Rail replacement, welding and grinding
- Ballast replacement and cleaning
- Track tamping and reconditioning
- Vegetation management
- Signalling systems and equipment testing and maintenance
- Transportation of equipment, materials and workforce
- Other asset management in accordance with ARTC technical maintenance.

Further discussion of the Project's operations is provided in Section 5.8.

### 5.3.6 Timing

Table 5-3 shows the Project's anticipated timing of stages following the receipt of the Coordinator-General's evaluation report and EPBC Act controlled action decision. The commencement of Year 0 is marked by the receipt of the Coordinator-General's evaluation report and EPBC Act controlled action decision, and Year 1 marks the commencement of physical works in the pre-construction and early works stage.

Indicative construction dates have been adopted to enable the Project to demonstrate a conservative assessment of potential impacts and mitigation measures in response to draft EIS submissions from public notification in 2021 and subsequent requests for additional information from the Coordinator-General.

TABLE 5-3 ANTICIPATED TIMING OF THE PROJECT STAGES AND ACTIVITIES

| Year | Year 0 | | | | Year 1 | | | | Year 2 | | | | Year 3 | | | | Year 4 | | | | Year 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Duration (quarterly years)** | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Detailed design | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | |
| Project approvals and corridor acquisition | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | |
| Pre-construction and early works | | | | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | |
| Construction works | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Commissioning | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Operations | | | | | | | | | | | | | | | | | | | | | | ■ | ■ | ■ |

### 5.3.7 Property

The rail alignment uses the existing QR South Western Line and Millmerran Branch Line rail corridors where possible, minimising the land acquisition requirement. The Project footprint requires the acquisition of whole or part of a number of lots and easements. The permanent footprint for the Project traverses, in whole or in part, 495 lots. The temporary footprint traverses an additional 86 lots, in whole or in part.

The extent of the area associated with these lots and easements within the Project footprint, as well as tenure and existing land uses of these lots and easements is shown in Appendix F: Impacted Properties. Further detail on impacts to land use and tenure associated with the Project are assessed in Chapter 8: Land Use and Tenure.

## 5.4 Design

The following sections describe the key components of the revised reference design for the Project. The Project designs will continue to be further refined post-EIS, during the detailed design stage.

Design drawings for the Project are presented in Appendix B1: Design Drawings, and the changes to the reference design are captured within Appendix B3: Change to reference design since Draft EIS.

### 5.4.1 Basis of design

The key characteristics of the Inland Rail Program service offering are reliability, price, transit time and availability. To help achieve this service offering ARTC has developed a Basis of Design to provide consistent design requirements and parameters across the Inland Rail Program. The standardised design criteria provide guidance for consistent design, ensuring an asset is delivered that meets business and operational requirements.

The Basis of Design acts as a primary point of reference for the design of the Project, providing consistent design criteria and design standards. The Basis of Design comprises a series of performance specifications relating to the Project design components. Performance specifications for Inland Rail and the Project are summarised in Table 5-4.

TABLE 5-4 PERFORMANCE SPECIFICATIONS FOR INLAND RAIL AND THE PROJECT

| Attribute | Specification |
|---|---|
| **Reference train** | |
| Intermodal | ▸ 21 tonne axle load (TAL), 115 kilometres per hour (km/h) maximum speed, 1,800 m length<br>▸ 2.7 horsepower per tonne power:weight ratio |
| Bulk freight | 25 TAL (initial), 80 km/h maximum speed, length determined by customer requirements within maximum train length |
| **Operational specification** | |
| Freight train transit time (terminal to terminal)[2] | Target driven by a range of customer preferences; however, is less than 24 hours from Melbourne to Brisbane for the intermodal reference train.<br>Flexibility to provide for faster (higher power:weight ratio) and slower (lower power:weight ratio) services to meet market requirements |
| Gauge | Standard (1,435 mm) with dual standard/narrow (1,435 mm/1,067 mm) gauge in appropriate Queensland sections |
| Maximum freight operating speed | 115 km/h at 21 TAL |

| Attribute | Specification |
|---|---|
| Maximum axle loads (initial) | 21 tonnes (t) at 115 km/h<br>23 t at 90 km/h<br>25 t at 80 km/h |
| Maximum train length[1] | 1,800 m |
| **Minimum design standards** | |
| **General alignment standards (non-mountainous terrain)** | |
| Design speed | 115 km/h maximum |
| Maximum grade | ▸ 1:80 maximum (compensated)<br>▸ 1:200 maximum at arrival or departure points at loops |
| Curve radius | 1,200 m target, 800 m minimum |
| Flood immunity | Track drainage must have the capacity for a 1% Annual Exceedance Probability (AEP) without overtopping the formation |
| Corridor width | 30 m minimum (however, it is wider, as required, to accommodate the earthworks associated with large cuts and fills, drainage works, rail infrastructure, access roads and fencing). |
| Rail | Minimum 53 kilograms per metre (kg/m) on existing track; 60 kg/m on new or upgraded track |
| Concrete sleepers | Rated to 30 TAL |
| Sleeper spacing | ▸ 667 mm spacing (1,500/km)—existing track<br>▸ 600 mm (1,666/km)—new corridors/track or re-sleepering existing track |
| Turnouts | Rated at track speed on the straight and 80 km/h entry/exit on the diverging track |
| Crossing loops (initial) | ▸ 2,200 m length to accommodate 1,800 m length trains<br>▸ No level crossing across loops or within road vehicle sighting distance from loops |
| **Medium speed alignment standards (mountainous terrain)** | |
| Maximum grade | ▸ 1:50 maximum (compensated)<br>▸ 1:200 maximum at arrival or departure points at loops |
| Curve radius | 800 m target, 400 m minimum |
| **Design life** | |
| Rail Maintenance Access Road (RMAR) | 20 years |
| Track formation and earthworks, including slope protection/stabilisation | 50 years |
| Road pavement (excluding wearing course) | 20 years |
| Culverts | 100 years |
| Rail bridges and abutments | 100 years |
| Retaining structures, including reinforced soil structures and abutments | 100 years |

**Table note:**

1. Maximum train length assessed within the revised draft EIS is 1,800 m. Train lengths longer than 1,800 m are not within the Project description and revised draft EIS.

The 24-hour transit travel times have been operationally modelled using RailSys for the Inland Rail Reference Train travelling from Melbourne to Brisbane (and vice versa). The Inland Rail Reference Train is defined as being 1,800 m long with a power/weight ratio of 2.7 horsepower per tonne and 21 TAL, travelling at a maximum speed of 115 km/h. The transit time does not consider loading/unloading along the route because it is not required due to terminal-to-terminal delivery for this train type. It is also modelled by taking a 'non-stop' run time and then adding provisions for delays attributed to train crossing time and driver behaviour.

Inland Rail's 24-hour terminal-to-terminal transit time target, as stated in the Service Offering, is based on the Intermodal Reference Train operating two services per day in each direction. Further detail on expected operation and supporting activities is discussed in Section 5.8.

### 5.4.2 Rail

The Project includes the establishment of 217.48 km of new single-track railway, consisting of 7 km of standard-gauge rail and 210.48 km of dual standard/narrow-gauge rail. Figure 5-2 shows a typical section for a standard-gauge ballasted track. Figure 5-3 shows a typical section for a dual-gauge ballasted track.

The 7 km of standard-gauge rail is a continuation of track from the NS2B project and extends from the NSW/QLD border to the connection point with the QR South Western Line at Kurumbul. The remainder of railway for the Project will be dual standard/narrow-gauge to enable interoperability with the existing QR network.

The new railway will comprise approximately 149.48 km of new rail corridor (greenfield) and approximately 68.00 km of existing open access rail corridor (brownfield), that forms part of the QR South Western Line and Millmerran Branch Line. The Millmerran Branch Line is currently non-operational south of Brookstead, as a result of damage sustained in the 2010/11 flood events.

Brownfield corridor refers to locations where the Project is generally coincident with existing rail corridors. This does not mean that the railway is located wholly within the existing rail corridor. Corridor widening and/or curve easing may be required to meet the requirements of the ARTC Basis of Design, resulting in some works outside the extent of the existing rail corridors.

The locations of greenfield and brownfield sections of rail corridor for the Project are summarised by chainage in Table 5-5 and are shown in Figure 5-4. Track and corridor metrics for the Project are summarised in Table 5-6.

**TABLE 5-5 CHAINAGE RANGES OF GREENFIELD AND BROWNFIELD SECTIONS OF RAIL CORRIDOR**

| Chainage from (km) | Chainage to (km) | Length (km) | Gauge | Greenfield/Brownfield |
|---|---|---|---|---|
| 30.60 (NS2B) | 37.60 (NS2B) | 7.00 | Standard | Greenfield |
| 367.6 (NS2B) | 44.54 | 46.80 | Dual | Brownfield—South Western Line |
| 44.54 | 140.00 | 95.45 | Dual | Greenfield |
| 140.00 | 152.00 | 12.00 | Dual | Brownfield—Millmerran Branch Line |
| 152.00 | 154.66 | 2.66 | Dual | Greenfield |
| 154.66 | 163.86 | 9.20 | Dual | Brownfield—Millmerran Branch Line |
| 163.86 | 208.22 | 44.37 | Dual | Greenfield |

**TABLE 5-6 TRACK AND CORRIDOR METRICS**

| Track and corridor aspects | Length (km) |
|---|---|
| Total length of mainline track (mainline track excludes crossing loops) | 217.48 |
| Total standard-gauge track | 7.00 |
| Total dual-gauge track | 210.48 |
| Total greenfield corridor length | 149.48 |
| Total brownfield corridor length | 68.00 |
| Total length of crossing loops (five) | 11.00 |
| Total length of crossing loop emergency maintenance sidings (five) | 1.25 |

The track structure will be a ballasted track system (including bridges) consisting of continuously welded rail, resilient fasteners, rail pads and concrete full-depth sleepers.

The ballast depth below the rail will be a minimum 250 mm and will not exceed 500 mm, with minimum 300 mm shoulder width for lateral restraint (Figure 5-2 and Figure 5-3).

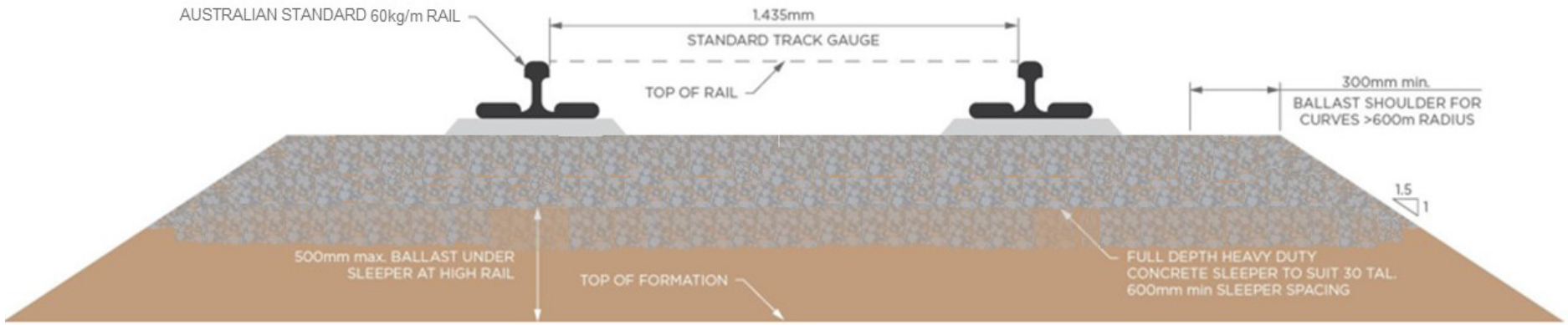



**FIGURE 5-2 TYPICAL STANDARD-GAUGE BALLASTED TRACK CROSS SECTION**

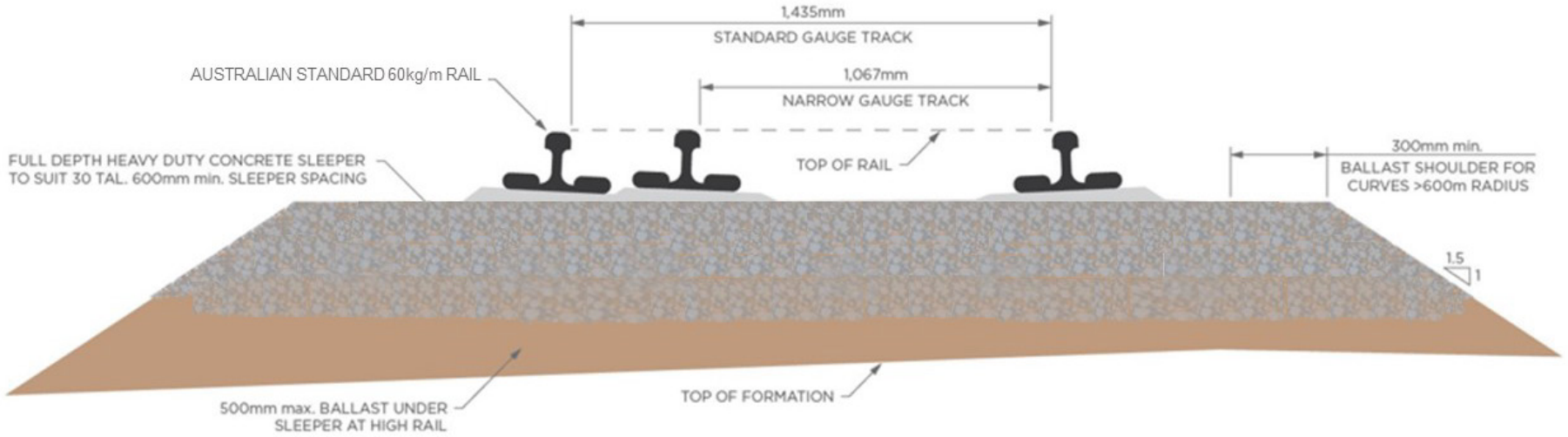
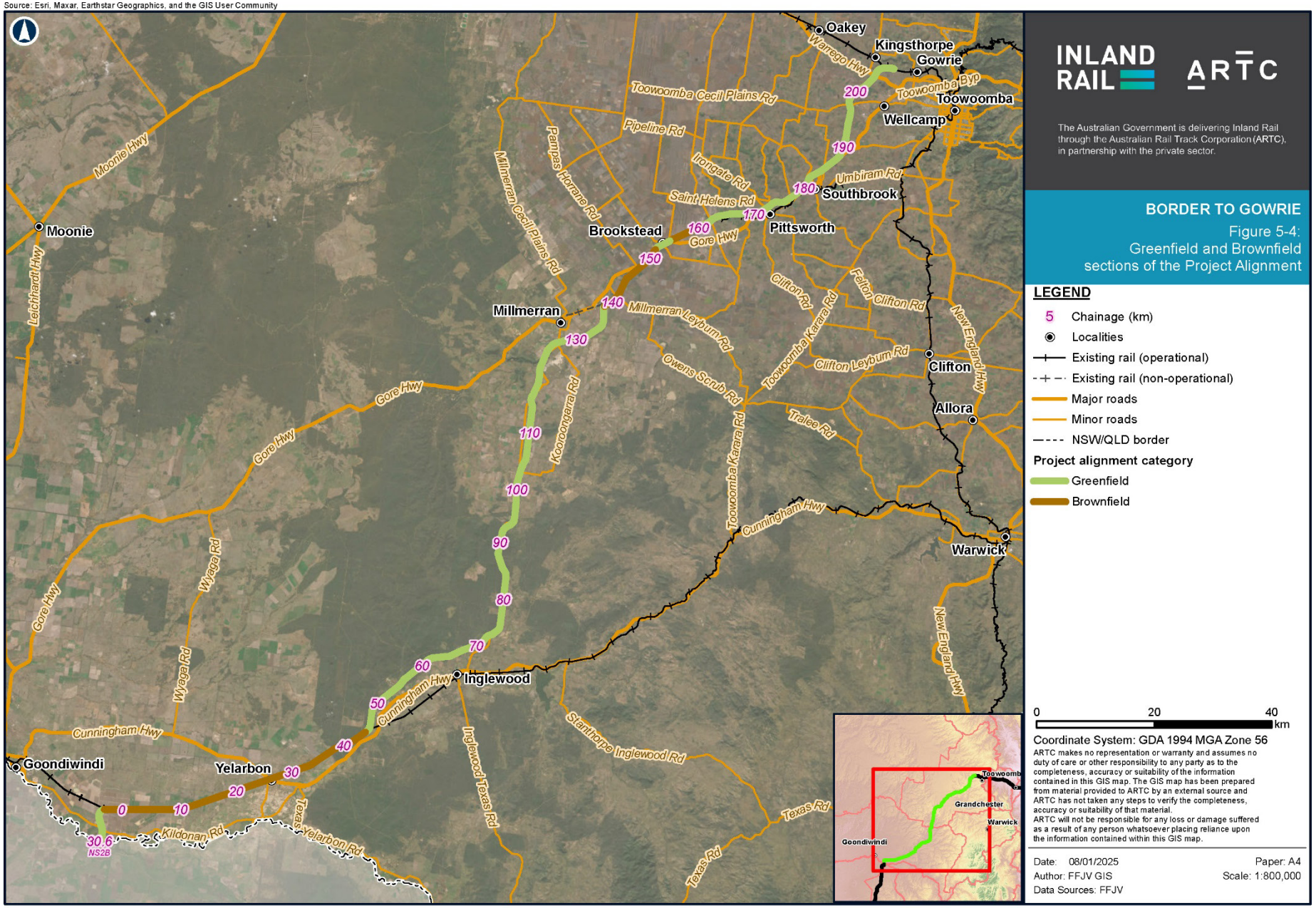



**FIGURE 5-3 TYPICAL DUAL-GAUGE BALLASTED TRACK CROSS SECTION**


Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Oakey
Kingsthorpe
Gowrie
Toowoomba
Wellcamp
Southbrook
Pittsworth
Brookstead
Millmerran
Clifton
Allora
Warwick
Inglewood
Yelarbon
Goondiwindi
Moonie
Leichhardt Hwy
Moonie Hwy
Gore Hwy
Cunningham Hwy
Warrego Hwy
Toowoomba Bypass
Toowoomba Cecil Plains Rd
Pipeline Rd
Millmerran Cecil Plains Rd
Pampas Horrane Rd
Irongate Rd
Saint Helens Rd
Umbiram Rd
Millmerran Leyburn Rd
Clifton Rd
Felton Clifton Rd
Clifton Leyburn Rd
Toowoomba Karara Rd
New England Hwy
Owens Scrub Rd
Kooroongarral Rd
Tralee Rd
Wyaga Rd
Stanthorpe Inglewood Rd
Inglewood Texas Rd
Texas Rd
Texas
Yelarbon Rd
Kildonan Rd
NS2B
200
190
180
170
160
150
140
130
110
100
90
80
70
60
50
40
30
20
10
0
30.6
Grandchester
Warwick
Goondiwindi
INLAND RAIL
ARTC
The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.
BORDER TO GOWRIE
Figure 5-4:
Greenfield and Brownfield sections of the Project Alignment
LEGEND
5 Chainage (km)
Localities
Existing rail (operational)
Existing rail (non-operational)
Major roads
Minor roads
NSW/QLD border
Project alignment category
Greenfield
Brownfield
0
20
40
km
Coordinate System: GDA 1994 MGA Zone 56
ARTC makes no representation or warranty and assumes no duty of care or other responsibility to any party as to the completeness, accuracy or suitability of the information contained in this GIS map. The GIS map has been prepared from material provided to ARTC by an external source and ARTC has not taken any steps to verify the completeness, accuracy or suitability of that material.
ARTC will not be responsible for any loss or damage suffered as a result of any person whatsoever placing reliance upon the information contained within this GIS map.
Date: 08/01/2025
Author: FFJV GIS
Data Sources: FFJV
Paper: A4
Scale: 1:800,000
Map by: JA/DTH Z:\GIS\GIS_310_B2G\Tasks\310-GIS-202202150932_Greenfield_Brownfield_UpdateAlignment\310-GIS-202202150932_ARTC_Fig5-4_GreenBrownfieldAlignment_v1.mxd Date: 8/01/2025 09:27

The various elements of the track are further described in Table 5-7.

**TABLE 5-7 ELEMENTS OF THE TRACK**

| Elements | Description and purpose |
|---|---|
| Rails | ▸ Continuously welded 60 kg/m steel rails<br>▸ Due to there being fewer joints, trains can travel faster on continuously welded steel rails, compared to jointed rails. Continuously welded rails also require less maintenance. |
| Fasteners | ▸ Fasteners are the method of fixing the rails to the sleepers. |
| Rail pads | ▸ Rail pads are plastic or rubber mats that are inserted between the rails and the sleepers. Their purpose is to evenly distribute the load from passing trains onto the sleepers.<br>▸ Rail pads also act to reduce noise and vibration impacts from passing trains. |
| Sleeper | ▸ Concrete rectangular sleepers, laid perpendicular to the rails<br>▸ Sleepers distribute the load from passing trains to the ballast and subgrade. They also function to hold the rails upright and keep them spaced to the correct gauge. |
| Ballast | ▸ Ballast typically consists of crushed stone that is packed between, below and around the sleepers<br>▸ The purpose of the ballast is to:<br>  ▸ Bear the load from the sleepers<br>  ▸ Provide stability of the track structure, allowing trains to run smoothly and safely<br>  ▸ Facilitate the drainage of water away from the track structure |
| Formation | ▸ Earthworks constructed by material, usually capping and structural fill, placed between the Subgrade Level and Formation Level below the ballast.<br>▸ Structural fill—A layer or layers of engineered fill, usually placed to provide a gradational structural support zone between the Subgrade Level and Capping Layer.<br>▸ Capping layer—A layer or layers of graded crushed rock or other engineered fill within the Formation, usually provided for the purpose of sealing the earthworks from surface water and structurally supporting the track.<br>▸ The typical structure of formation is illustrated in Figure 5-5. |
| Embankment | ▸ Earthworks constructed by placement of general fill for the purpose of constructing an overlying formation. |

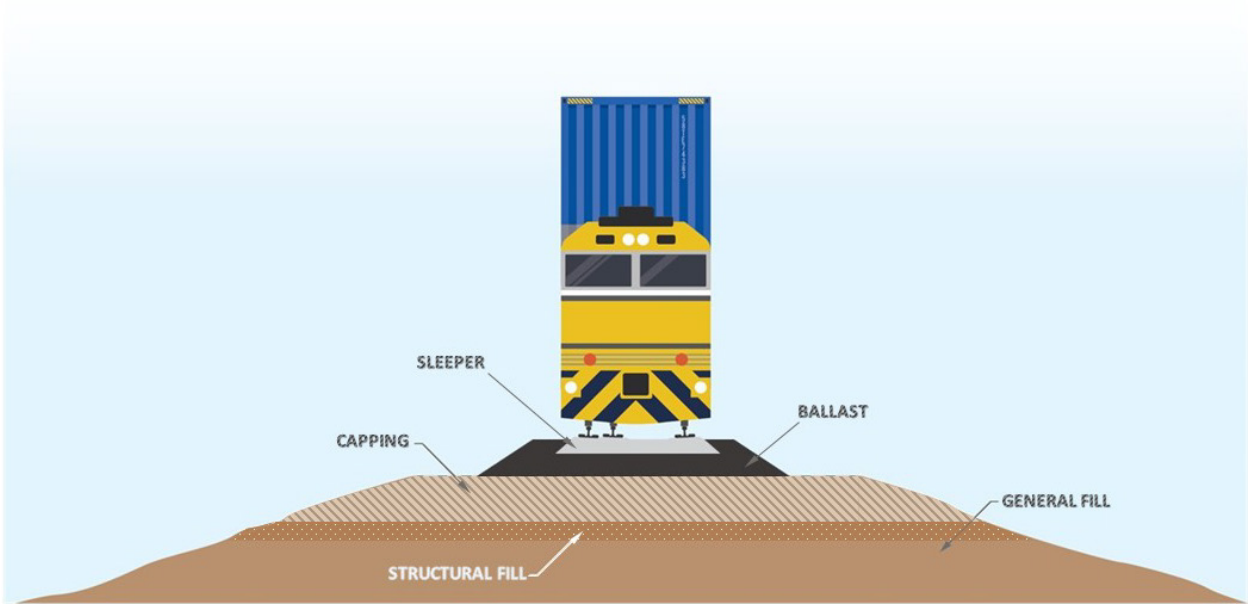



**FIGURE 5-5 ILLUSTRATION OF THE EMBANKMENT AND FORMATION**

### 5.4.2.1 Queensland Rail brownfield corridors

The Project will require connection (turnout) onto and upgrade of the QR South Western Line and Millmerran Branch Line. Upgrade works will include the removal of existing narrow-gauge track (rail and sleepers) and the construction of new formation, dual-gauge track, drainage, level crossings and other infrastructure within the existing rail corridor. Refer to Section 5.6.14.2 for the construction approach to establishing the new formation where the existing rail formation is located (brownfield segments).

By utilising the existing rail corridor and upgrading the track, environmental and land impacts, such as, severing habitat, houses, roads, utilities and townships, are minimised. This approach provides significant operational benefits to Inland Rail and QR—as the existing maintainer—and rail customers by:

- Upgrading the formation, ballast, sleepers and rail
- Enables adopting a track and formation design that facilitates increased axle loads, up to 25 t
- Eliminates existing tight radius curves and implement curve easing to a minimum 1,200 m radius
- Improves vertical gradients to a maximum of 1:80
- Provides track flood immunity to top of formation for up to 1% AEP flood events
- Provides interoperability for existing rail customers with turnout connection into existing QR network and upgrades to dual gauge track (Section 5.4.4)
- Reinstates the non-operational, red-boarded track section through the Condamine floodplain on the Millmerran Branch Line with a turnout connection to Millmerran.

The length of Project interface with the existing QR infrastructure is summarised in Table 5-8.

**TABLE 5-8 SUMMARY OF INTERFACES WITH EXISTING QUEENSLAND RAIL INFRASTRUCTURE**

| Proposed interface with the QR corridor | Approximate length (km) |
|---|---|
| Upgrade of South Western Line to a dual-gauge track | 46.81 |
| Upgrade of Millmerran Branch Line to a dual-gauge track | 21.20 |

The staging of works within existing rail corridors and the management of potential impacts will be the subject of an interface agreement between ARTC and QR. It is currently assumed that ARTC will be able to occupy sections of existing rail corridor through a temporary possession agreement for extended periods to avoid the need for constrained, short-term possession works. The construction staging within existing rail corridors will be confirmed during the detailed design stage of the Project.

As part of ARTC's ongoing engagement with QR and DTMR, the roles and responsibilities regarding the Rail Infrastructure Manager obligations during the detailed design, construction works and operations stages will be clarified. Any necessary interface agreements with QR will also be in place prior to the commencement of construction.

## 5.4.3 Crossing loops

Crossing loops are places on a single-line track where trains in opposing directions can pass each other. These are double ended and connected to the main track at both ends. Crossing loops are typically a little longer than any of the trains that might need to cross at that point. In operation, one train enters a crossing loop through one of the turnouts and idles at the other end, while the opposing train continues along the mainline track to pass the now stationary train.

The Project includes five crossing loops, which will be constructed as sections of track roughly parallel to the main track. The crossing loops are 2,200 m long to accommodate 1,800 m trains. The selection of crossing loop locations was informed by operational modelling for the Inland Rail Program, and has taken into consideration proximity to sensitive receptors and interferences with existing infrastructure. The proposed locations for the crossing loops are:

- Yelarbon—Ch 16.3 km to Ch 18.5 km
- Inglewood—Ch 50.2 km to Ch 52.4 km
- Kooroongarra—Ch 89.2 km to Ch 91.4 km
- Yandilla—Ch 132.2 km to Ch 134.4 km
- Broxburn—Ch 176.1 km to Ch 178.4 km.

Refer Appendix B1: Design Drawings for further detail on the proposed crossing loops and locations.

Crossing loop track design assumes a 4.5 m spacing from the mainline track and incorporates an additional 250 m maintenance siding. The width of the corridor at crossing loops varies depending on the surrounding topography and earthworks. The maintenance siding enables ARTC to perform emergency maintenance of rollingstock, in the event of failure or defects found during operations, without obstructing the mainline track. Each maintenance siding is orientated such that the maintenance vehicles would exit the siding on a falling grade. A typical layout of a crossing loop is shown in Figure 5-6.

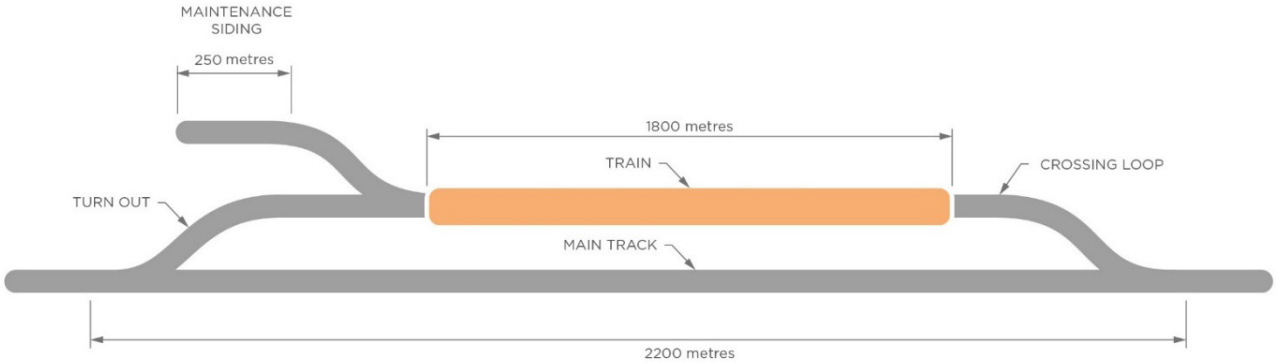



**FIGURE 5-6 TYPICAL LAYOUT OF A CROSSING LOOP**

### 5.4.4 Turnouts

Turnouts are switches that allow a train to be guided from one section of track to another. The anticipated locations for turnouts are:

- QR South Western Line connection at Kildonan, towards Goondiwindi:
  - The Project connects with the QR South Western Line at Kildonan, at approximately Ch 37.6 km (NS2B). A dual-gauge turnout with a narrow-gauge turnout leg will be constructed for the Project to connect to the existing narrow-gauge QR South Western Line in the westerly direction towards Goondiwindi. The connection to the South Western Line has been optimised to reduce the impact on adjacent agricultural land.
- QR South Western Line connection at Whetstone, towards Warwick:
  - The Project deviates from the existing QR South Western Line at Whetstone (Ch 44.5 km). A dual-gauge turnout with narrow-gauge turnout leg will be constructed for the Project to connect to the existing narrow-gauge QR South Western Line in the easterly direction towards Warwick.
- QR Millmerran Branch Line connection at Millmerran:
  - A narrow-gauge turnout will be provided to connect the Project to the QR Millmerran Branch Line at Ch 140.3 km for trains running in the Gowrie to NSW/QLD border direction. The connection of the narrow-gauge Millmerran Branch Line to the Project mainline will be achieved via a dual-gauge turnout with narrow-gauge turn-off leg.
- QR Millmerran Branch Line connection at Yarranlea:
  - A narrow-gauge turnout will be provided to connect the Project to the QR Millmerran Branch Line at Ch 167.2 km for trains running in the NSW/QLD Border to Gowrie direction. The connection of the narrow-gauge QR Millmerran Branch Line to the Project mainline will be achieved via a dual-gauge turnout with narrow-gauge turn-off leg.
- Existing QR sidings:
  - Where the Project replaces the existing QR line, connections are provided to existing sidings and an existing crossing loop. These connections will be provided with dual-gauge turnouts with a narrow-gauge turn-off leg. Turnouts to existing sidings and loops are listed in Table 5-9.

**TABLE 5-9 TURNOUTS TO EXISTING QUEENSLAND RAIL SIDINGS AND LOOPS**

| Location | Description | Turnout type |
|---|---|---|
| Ch 6.1 km | Kurumbul Loop | Dual to narrow gauge |
| Ch 6.6 km | Kurumbul Siding | Dual to narrow gauge |
| Ch 6.9 km | Kurumbul Loop | Dual to narrow gauge |
| Ch 26.1 km | Yelarbon Loop | Dual to narrow gauge |
| Ch 26.5 km | Yelarbon Siding | Dual to narrow gauge |

| Location | Description | Turnout type |
|---|---|---|
| Ch 27.0 km | Yelarbon Loop | Dual to narrow gauge |
| Ch 154.2 km | Brookstead Siding East | Not provided as this siding is not currently used for rail operations, and may cause conflict with the proposed GrainCorp access road<br>A future turnout is possible but would need to consider interaction with the GrainCorp access road (Chapter 6: Stakeholder Engagement) |
| Ch 153.0 km | Brookstead Siding West | Dual to narrow gauge |

### 5.4.5 Earthworks

#### 5.4.5.1 Cutting

Excavations in the existing ground profile will be made where the final design level is lower than the surrounding land—these are known as cuttings. The typical cutting configuration utilised across the Project encompasses:

- A slope angle of 1 Vertical (V):2 High (H)
- Bench heights of 7 m
- Bench width of 3.5 m facilitating access for a variety of construction access and maintenance works.

Cuts (and embankments) are required along multiple sections of the Project alignment. There are 23 cuts locations where the cuts are greater than 7 m in depth along the alignment to maintain the required track elevations. The total cut estimated for the Project is 11,368,000 $m^3$.

#### 5.4.5.2 Embankment

The revised reference design has been developed based on the following embankment slope and benching design:

- A maximum slope of 1V:2H (0.5 gradient) for earth-fill embankments
- A maximum slope of 1V:3H (0.3 gradient) for embankment subject to flood, to reduce the potential for scour and increase the effectiveness of rock protection (refer below)
- Benching:
  - the first bench is to be applied at 7 m height, followed by 10 m height intervals subject to site specific geotechnical conditions
  - benches to have minimum 3.5 m width to facilitate maintenance, as per ARTC maintenance specifications.

Generally, embankment fill slopes are protected against erosion through the adoption of appropriate batter geometry and material specification, as discussed above.

#### 5.4.5.3 Structural fill and capping

Structural fill and capping is required at the top of the formation to provide a solid foundation on which the railway ballast, sleepers and track can be placed.

Generally, a standard capping layer of 300 mm and a structural fill layer of 300 mm have been applied across the revised reference design; however, the structural fill layer has been reduced where the geotechnical assessment has indicated that in-situ subgrade strengths are high (in large cuttings, generally at the northern end of the Project).

An additional 300 mm layer of drainage material has been allowed below the capping layer where groundwater may be encountered in cuttings.

Materials used in the capping and structural fill layers are required to be compliant with the Inland Rail material specifications (Earthworks Materials Specification ETC-08-03 (ARTC, 2020b), available on the ARTC Extranet: **extranet.artc.com.au**).

### 5.4.6 Bridges

Bridge structures are required so that water, vehicles and, in some cases, stock and pedestrians may cross the rail corridor. Bridge structures may either be rail-over-watercourse, rail-over-road, or road-over-rail, depending on local topography and rail or road alignment requirements.

The Project involves the construction of 37 new bridge structures. These structures are summarised in Table 5-10. The Project does not involve the reinstatement or reconstruction of any existing bridge structures.

TABLE 5-10 SUMMARY OF BRIDGE STRUCTURES FOR THE PROJECT

| Crossing type | Number |
|---|---|
| Rail-over-road | 14 |
| Rail-over-watercourse | 18 |
| Road-over-rail | 5 |

The type of bridge proposed for a location depends on a range of factors, including the local topography, road use, rail and road alignments at the crossing point and access requirements. Bridges have been provided at all major watercourse crossings to minimise impacts to flow regimes and to avoid having to divert watercourses.

The new bridge structures are typically founded on piled foundations supporting in-situ reinforced concrete substructures. Bridge superstructures are typically formed from pre-stressed concrete (PSC) girders (either PSC slabs or PSC Super-T) with in-situ concrete decks incorporating walkways, guardrails and barriers as appropriate. The bridges are of various lengths and spans to suit the Project alignment and topography.

A typical section of a pier with a PSC Super-T girder is illustrated in Figure 5-7. A typical section of a pier with a PSC slab span girder is illustrated in Figure 5-8.

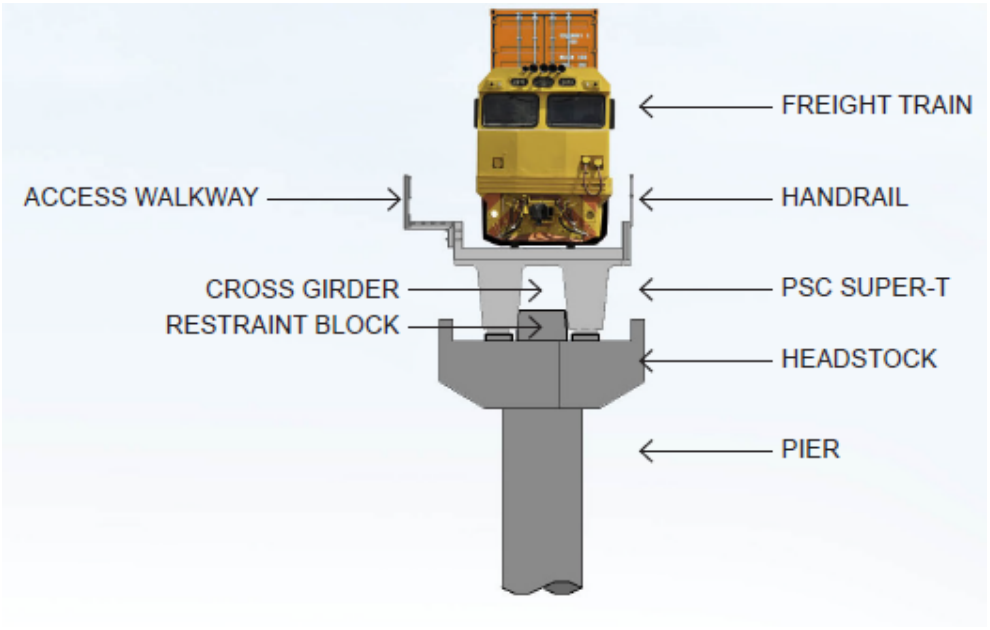



FIGURE 5-7 TYPICAL PIER WITH PRE-STRESSED CONCRETE SUPER-T GIRDER

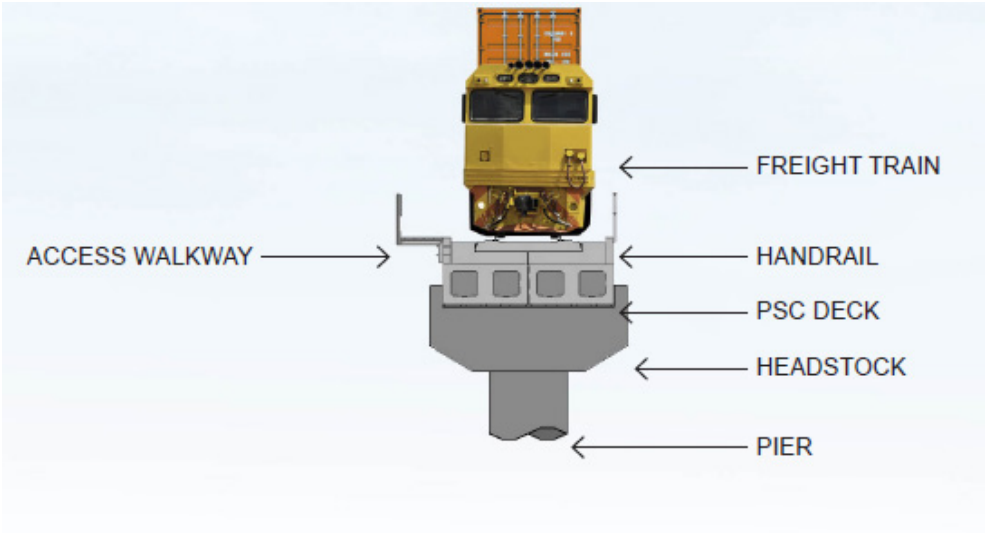



FIGURE 5-8 TYPICAL PIER WITH PRE-STRESSED CONCRETE SLAB SPAN

### 5.4.6.1 Road bridges

New road-over-rail bridges are summarised in Table 5-11. A typical section of a road-over-rail bridge structure is illustrated in Figure 5-11.The road bridges have been designed in consultation with the relevant road manager using the appropriate DTMR or Australian Standards.

**TABLE 5-11 SUMMARY OF ROAD-OVER-RAIL BRIDGES**

| Bridge name | Chainage (km) | Bridge length (m) |
|---|---|---|
| Cunningham Highway Bridge | 25.6 | 104 |
| Heckendorf Road Bridge | 116.4 | 59 |
| Owens Scrub Road Bridge | 129.8 | 72 |
| Gore Highway Bridge | 154.4 | 108 |
| Linthorpe Road Bridge | 177.1 | 66 |

### 5.4.6.2 Rail bridges

New rail bridges that are proposed to cross watercourses or roads are summarised in Table 5-12. Typical sections of rail bridges are illustrated in Figure 5-9 and Figure 5-10. Refer Appendix B1: Design Drawings for further detail regarding rail bridges along the alignment.

**TABLE 5-12 SUMMARY OF RAIL BRIDGES**

| Bridge name | Chainage start (km) | Chainage end (km) | Crossing type | Bridge length (m) |
|---|---|---|---|---|
| Macintyre River Viaduct[1] | 30.6 (NS2B) | 31.1 (NS2B) | Watercourse | 535 |
| Macintyre Floodplain #1 Rail Bridge | 31.4 (NS2B) | 31.6 (NS2B) | Watercourse | 140 |
| Macintyre Floodplain #2 Rail Bridge | 32.2 (NS2B) | 32.8 (NS2B) | Watercourse | 546 |
| Macintyre Brook Rail Bridge 1 | 52.4 | 52.7 | Watercourse | 207 |
| Macintyre Brook Rail Bridge 2 | 55.4 | 55.6 | Watercourse | 207 |
| Bybera Road Rail Bridge | 60.5 | 60.6 | Road | 75 |
| Pariagara Creek Rail Bridge | 67.2 | 67.5 | Watercourse | 345 |
| Cattle Creek Rail Bridge | 88.2 | 88.3 | Watercourse | 138 |
| Native Dog Creek Rail Bridge | 93.8 | 94.0 | Watercourse | 184 |
| Bringalily Creek 1 Rail Bridge | 97.4 | 97.7 | Watercourse | 299 |
| Bringalily Creek 3 Rail Bridge | 100.1 | 100.7 | Watercourse | 621 |
| Nicol Creek Rail Bridge | 104.3 | 104.4 | Watercourse | 92 |
| Millmerran–Inglewood Road Rail Bridge #2 | 115.5 | 115.6 | Road | 75 |
| Commodore Peak Road Bridge | 123.9 | 124 | Road | 75 |
| Millmerran–Inglewood Road Rail Bridge #3 | 126.9 | 127.1 | Road | 167 |
| Back Creek Rail Bridge | 127.9 | 128.1 | Watercourse | 230 |
| Grasstree Creek Rail Bridge | 139.0 | 140.6 | Watercourse | 1,330 |
| Condamine River South Branch Rail Bridge | 142.6 | 143.3 | Watercourse | 658 |
| Condamine River Main Branch Rail Bridge (combined rail bridge) | 143.9 | 146.4 | Watercourse | 2,577 |
| Condamine River North Branch Rail Bridge | 149.1 | 150.6 | Watercourse | 1,568 |
| Yarranlea Road Rail Bridge | 162.5 | 162.6 | Road | 69 |
| Roche Road Rail Bridge | 164.5 | 164.6 | Road | 121 |
| Oakey Pittsworth Road Rail Bridge | 172.2 | 172.3 | Road | 69 |
| Lochaber Road Rail Bridge | 173.7 | 173.8 | Road | 75 |
| Biddeston–Southbrook Road Rail Bridge | 184.8 | 185.0 | Road | 144 |
| Athol School Road Rail Bridge | 189.3 | 189.4 | Road | 75 |
| Toowoomba-Cecil Plains Road Rail Bridge | 197.3 | 197.4 | Road | 92 |
| Westbrook Creek Rail Bridge | 198.4 | 198.6 | Watercourse | 230 |
| Dry Creek Rail Bridge | 199.1 | 199.3 | Watercourse | 184 |
| Brimblecombe Road Rail Bridge | 199.9 | 200.0 | Road | 75 |
| Warrego Highway Rail Bridge | 204.3 | 204.4 | Road | 132 |
| Chamberlain Road Rail Bridge | 205.7 | 206.0 | Road | 299 |

**Table note:**
1. The Project's rail alignment commences from Ch 30.6 km (NS2B). Macintyre Viaduct length connecting south of the border beyond Ch 30.6 km (NS2B) is not included in the Project's footprint.

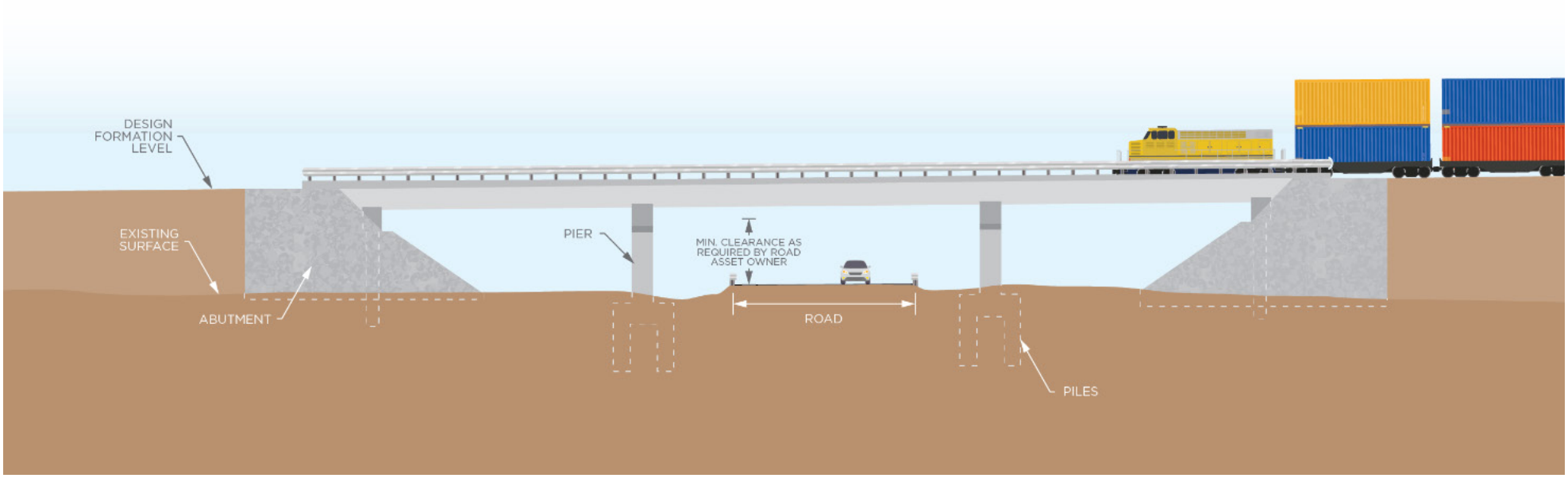



**FIGURE 5-9 TYPICAL SECTION OF RAIL-OVER-ROAD BRIDGE STRUCTURE**

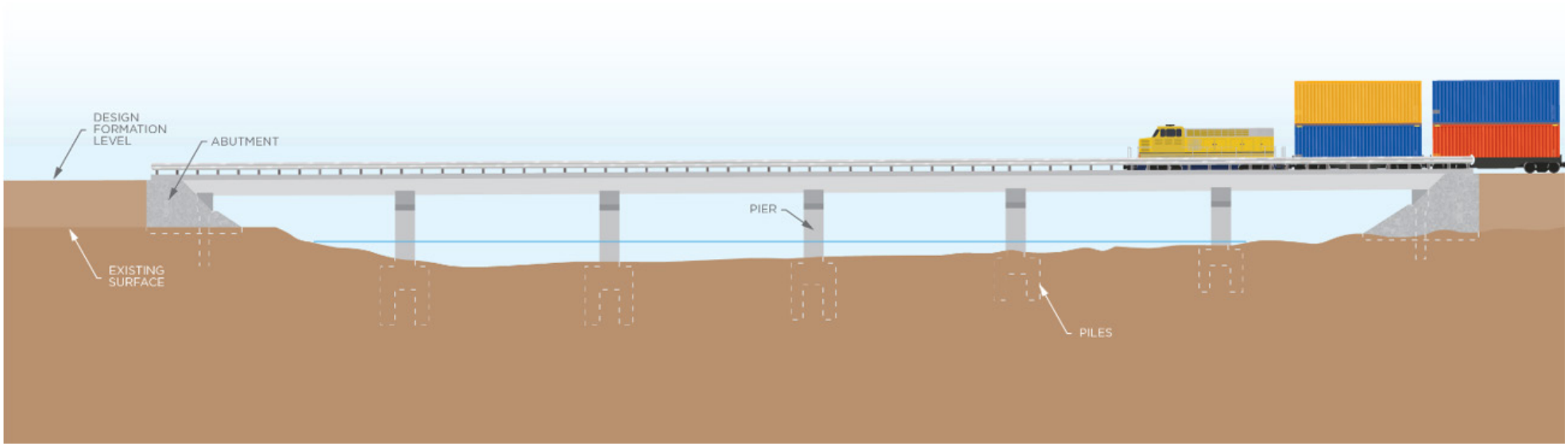



**FIGURE 5-10 TYPICAL SECTION OF RAIL-OVER-WATERCOURSE BRIDGE STRUCTURE**

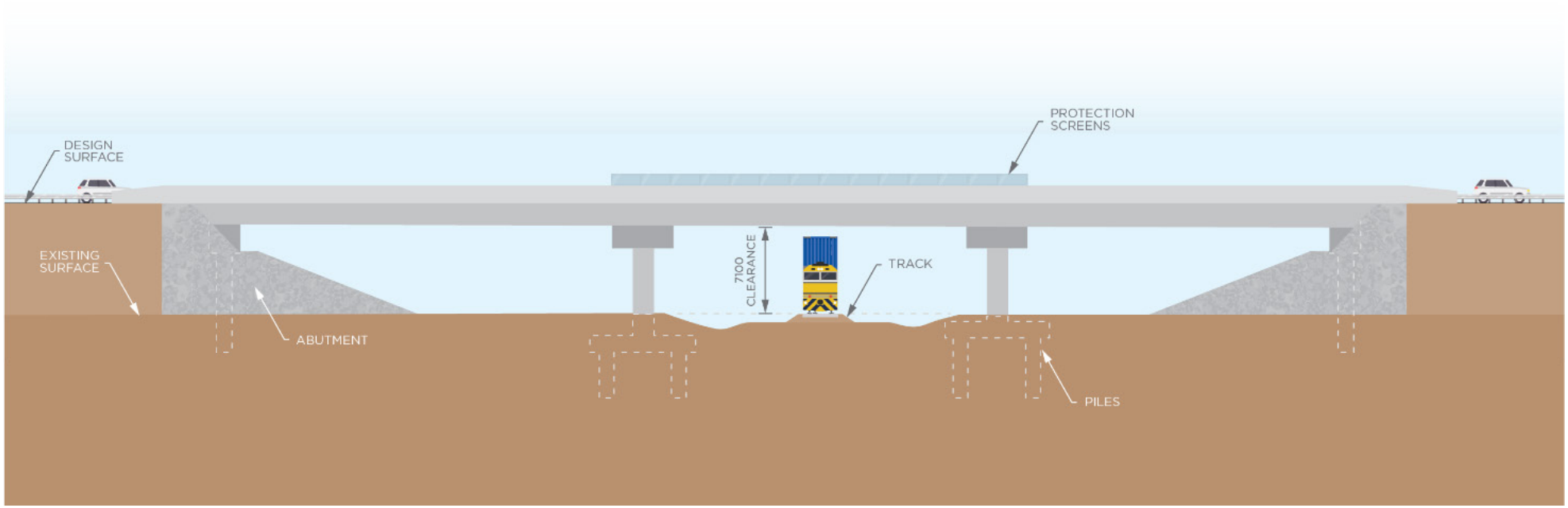



**FIGURE 5-11 TYPICAL SECTION OF ROAD-OVER-RAIL BRIDGE STRUCTURE**

### 5.4.7 Drainage infrastructure

Drainage structures are provided to maintain flows across the Project alignment, while ensuring the Project's flooding and hydraulic design criteria are met; further detail is provided in Chapter 13: Surface Water and Chapter 14: Flooding and Geomorphology. There will, however, be a requirement to infill some drainage lines, with the flows diverting longitudinally along the Project alignment to the nearest culvert and/or drainage line. The reference design was undertaken considering the *Queensland waterways for waterway barrier works mapping user guide* (Department of Agriculture and Fisheries (DAF), 2023a) and the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018a).

#### 5.4.7.1 Cross-drainage

Cross-drainage structures have been incorporated into the revised reference design where the Project intercepts existing watercourses and other drainage features. The type of cross-drainage structure included in the revised reference design depends on various factors such as the natural topography, rail formation levels, direction of flow and soil type.

Bridges are proposed at all major waterway crossings. In some instances, bridges are provided in locations that may have multiple drainage features passing under the rail corridor, such as across the Condamine River floodplain.

Cross-drainage structures, including culverts, have been incorporated into the revised reference design to enable the Project to achieve the flood immunity specified in the Basis of Design of a 1% AEP event (Table 5-4). Culverts incorporated into the design are a mix of reinforced concrete pipe culverts and reinforced concrete box culverts. The location and design of culverts will be refined, if required, during the detailed design stage to reflect design changes throughout that process.

A typical section of a cross-drainage culvert is shown in Figure 5-12.

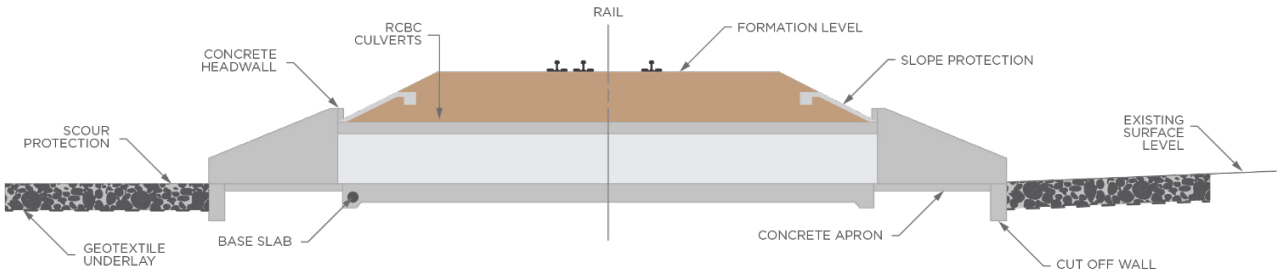



**FIGURE 5-12 TYPICAL SECTION OF A CROSS-DRAINAGE CULVERT**

Energy dissipation measures have been included around culvert entrances and exits, on disturbed stream banks and on land bound by a watercourse. Measures have been specifically designed and sized for each culvert location in accordance with Austroads *Guide to Road Design Part 5B: Drainage—Open Channels, Culverts and Floodways* (Austroads, 2013) with consideration for flow velocity, soil type and vegetation cover. Scour protection measures for culverts include:

- Concrete apron
- Concrete wingwalls
- Rock mattress scour protection, with geotextile underlay.

Scour protection measures for culvert outlets have been designed to ensure that the maximum allowable flow velocities in a 1% AEP, as specified in Table 3.1 of Austroads *Guide to Road Design* (Austroads, 2013), are not exceeded. Maximum allowable flow velocities in Table 3.1 of Austroads *Guide to Road Design* (Austroads, 2013) are specific to the soil type at each culvert location, as follows:

- Stable rock—4.5 metres per second (m/s)
- Stones 150 mm diameter or larger—3.5 m/s
- Gravel 100 mm or grass cover—2.5 m/s
- Firm loam or stiff clay—1.2 to 2 m/s
- Sandy or silty clay—1.0 to 1.5 m/s.

The scour protection length and minimum rock size (d50) have been determined from Figure 5-11 and Figure 5-12 in Austroads *Guide to Road Design* (Austroads, 2013). All required scour protection lengths were predicted to fit within the permanent footprint. Rail maintenance during operation is detailed further in Section 5.8.4.

### 5.4.7.2 Longitudinal drainage

The purpose of longitudinal or track drainage is to remove water that has percolated through the track ballast, and to divert surface runoff to the nearest bridge or culvert location before it reaches the subgrade. Figure 5-5 shows the typical structure of the subgrade. Without adequate track drainage, the subgrade may become saturated, leading to weakening and subsequent failure of the subgrade.

Embankment and catch drains will be constructed along the rail corridor where design requires their incorporation into embankments and cuts. It will be necessary to capture overland flow and transfer it to the nearest cross-drainage structures (culvert locations). As such, the sizing of the longitudinal drainage will be dependent on the hydrology and it is important that these drains are capable of efficiently moving overland flow to dedicated cross-drainage lines to reduce the likelihood of water ingress into the formation.

Two types of track drainage are proposed:

- Embankment drains—longitudinal drains that run parallel to the railway and are located within the permanent footprint, at the foot of the railway embankment (see Figure 5-13)
- Catch drains—longitudinal drains that run parallel to the railway and are located within the permanent footprint, on the up-slope side of cuttings (see Figure 5-14).

Track drainage is proposed at specific locations along the Project alignment where the gradient is steep enough to divert surface runoff to the nearest bridge or culvert location. As with culverts, the design and location of track drainage will be refined, if required, during the detailed design stage.

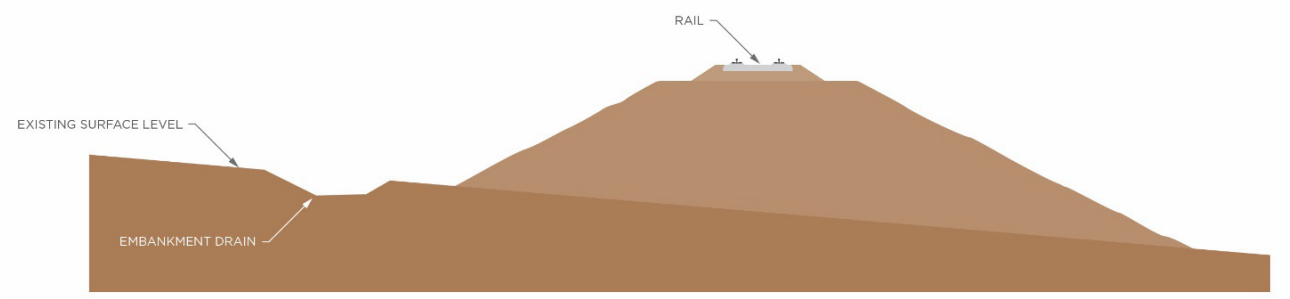



**FIGURE 5-13 TYPICAL LONGITUDINAL DRAINAGE FOR RAIL FORMATION ON TOP OF EMBANKMENT**

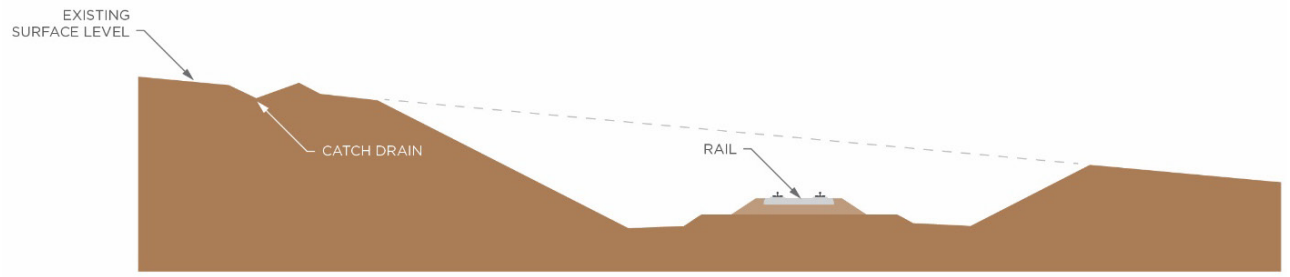



**FIGURE 5-14 TYPICAL LONGITUDINAL DRAINAGE FOR RAIL FORMATION WITHIN A CUT**

### 5.4.7.3 Yelarbon levee augmentation works

The existing Yelarbon levee is an earthen embankment levee that runs from East Sawmill Road to the Cunningham Highway where it transitions into a walking track. It is estimated that the existing levee provides the township of Yelarbon flood immunity for events up to between 5% and 10% AEP.

To mitigate flood impacts associated with the Project, augmentation works are proposed to install a combination of cross drainage under the proposed rail embankment and to raise the existing levee height in places. The objective of the Yelarbon Levee augmentation works is to maintain the current flood immunity offered by the levee, at a minimum.

In the draft EIS, the Yelarbon levee was categorised as a Category 2 levee. The Yelarbon levee has subsequently been categorised in consultation with GRC as a Category 3 levee due to the size of the affected population. This Category assignment primarily changes the assessment requirements in accordance with the *Planning Act 2016* (Qld) (Planning Act), and design criteria as outlined by the *Guideline for the construction or modification of Category 2 and 3 levees*, Version 2.01) (Department of Regional Development, Manufacturing and Water, 2022). Discussions between ARTC and GRC are ongoing with regards to the design criteria to be adopted for the Yelarbon levee augmentation works.

### 5.4.8 Road–rail interfaces

#### 5.4.8.1 Public road–rail interfaces

Road–rail interfaces are points at which the rail alignment intersects a public road. A summary of the number of interfaces with each public road type is provided in Table 5-13 and in further detail in Table 5-14 and Table 5-15.

**TABLE 5-13 SUMMARY OF PUBLIC ROAD INTERFACES IN THE REVISED REFERENCE DESIGN**

| Road type | Number of interfaces with crossing solution > level crossing or grade separation | Number of interfaces with alternative treatment > divert/realign/no crossing provided |
|---|---|---|
| State-controlled (DTMR) | 9 | 1 |
| Local (GRC) | 16 | 2 |
| Local (TRC) | 25 | 14 |
| Stock routes (Department of Resources (DoR)) | 2 | n/a |

While ARTC has sought to limit the number of new level crossings in the revised reference design, the Project includes lower-risk level crossings where the road–rail interface treatment assessment has concluded that the risk to safety has been minimised 'so far as is reasonably practicable'.

Treatments for public road–rail interfaces can be categorised as:

- Grade-separated crossings—road and rail cross each other at different heights so that traffic flow is not affected. Grade separations are either road-over-rail, or rail-over-road.
- Level crossings—road and rail cross each other at the same level. Level crossings have either passive or active controls to guide road users:
  - Passive—have static warning signs (e.g. stop and give way signs) that are visible on approach. This signage is unchanging with no mechanical aspects or light devices.
  - Active—flashing lights with or without boom barriers for motorists, and automated gates for pedestrians. These devices are activated prior to and during the passage of a train through the level crossing.
- Crossing consolidation, relocation, diversion or realignment—existing road–rail interfaces may be closed, consolidated into fewer crossing points, relocated or diverted. Roads will only be closed where the impact of diversions or consolidations is considered acceptable by the relevant road manager, or where the existing location is not considered safe and cannot reasonably be made safe. Approval for closures, where required, will be progressed in accordance with the requirements of the relevant legislation.

In the development of the proposed road–rail interface, ARTC has taken into consideration State and national guidelines and strategies. Both the Office of the National Rail Safety Regulator (ONRSR) and DTMR have policies that focus on avoiding, where possible, the installation of new level crossings. The *ONRSR Policy: Level Crossings* (ONRSR, 2019a) acknowledges that for lower-risk level crossings, operators may be able to demonstrate that alternative controls minimise the risk to safety 'so far as is reasonably practicable', as defined in *ONRSR Guideline: Meaning of duty to ensure safety so far as is reasonably practicable* (ONRSR, 2021). The process has been captured in the Appendix AA: Traffic Impact Assessment.

The appropriate road–rail interface has been assessed on a case-by-case basis for design purposes with consideration given to current and future use of the existing asset, its location relative to other crossings of the rail corridor, and the road and rail geometry at the crossing location. For the purposes of these assessments, a quantitative risk management approach has been adopted consistent with the definition of 'so far as is reasonably practicable'.

To assess potential level crossing locations, ARTC used a national system called ALCAM, which considers factors such as future road traffic numbers, vehicle types, train numbers, speeds and sighting distances. Further explanation of the methodology used in determining road–rail interface treatments is included in Chapter 20: Traffic, Transport and Access.

For public crossings, ARTC will continue to consult with DTMR and local governments in relation to the preferred road–rail interface treatments for each location. Part of this process is to work with the relevant road manager to understand the local environment and gather information on future development plans, which can be used to inform the design. Details of consultation with relevant stakeholders is outlined in Appendix E: Consultation Report.

Road–rail interfaces that are newly created by the Project and the proposed treatments included in the revised reference design for each are summarised in Table 5-14 and Table 5-15. Refer to Appendix B2: Stock Routes for further detail on interfaces at stock routes.

**TABLE 5-14 EXISTING PUBLIC ROAD–RAIL INTERSECTIONS AND PROPOSED DESIGN TREATMENTS**

| Authority/ Interface ID | Road name | Existing QR crossing type | Proposed treatment in the revised reference design |
|---|---|---|---|
| **DTMR** | | | |
| 310-11-E-1 | Cunningham Highway (Wondalli Street)<br>(Stock Route) | Active level crossing | Road realignment to enable new road-over-rail grade separation at 310-11-E-0.<br>No road crossing provided at this location.<br>Active pedestrian crossing provided. |
| 310-40-E-2 | Millmerran-Leyburn Road | Passive level crossing | Active level crossing |
| 310-44-E-2 | Gore Highway | Active level crossing | Grade separation: road-over-rail |
| **GRC** | | | |
| 310-4-E-2 | South Kurumbul Road (Stock Route) | Passive level crossing | Active level crossing |
| 310-5-E-2 | Wondalli Kurumbul Road (Stock Route) | No crossing infrastructure | No crossing provided at this location—consolidated to 310-4-E-2 (active level crossing) |
| 310-12-E-1 | Suttons Road | Passive level crossing | Passive level crossing |
| 310-14-E-1 | Springborg Road | Passive level crossing | Passive level crossing with minor road realignment to 310-14-E-0 |
| **TRC** | | | |
| 310-40-E-1 | Hall Road | Passive level crossing | No crossing provided at this location—consolidated |
| 310-41-E-6 | Gilgai Lane | Passive level crossing | Grade separation: rail-over-road |
| 310-42-E-1 | Fysh Road | Active level crossing | No crossing provided at this location—road realignment to Harris Road 310-42-E-0a (active level crossing) |
| 310-43-E-3a | Elsden Road | Passive level crossing | Active level crossing with minor road realignment to 310-43-E-3 |
| 310-45-E-1 | Longhurst Road | Passive level crossing | Active level crossing |
| 310-46-E-1a | Yarranlea Road | Passive level crossing | Grade separation: rail over road with minor road realignment to 310-46-E-1 |

**TABLE 5-15 PROPOSED PUBLIC ROAD–RAIL INTERFACES AND PROPOSED TREATMENTS INCLUDED IN THE REVISED REFERENCE DESIGN**

| Authority/ Interface ID[1] | Road name | Proposed treatment in the revised reference design |
|---|---|---|
| **DTMR** | | |
| 310-11-E-0 | Cunningham Highway (Wondalli Street) | Grade separation: road-over-rail |
| 310-24-P-2 | Millmerran–Inglewood Road | Active level crossing |
| 310-35-P-4 | Millmerran–Inglewood Road | Grade separation: rail-over-road (bridge) |
| 310-37-P-12a | Millmerran–Inglewood Road | Grade separation: rail-over-road (bridge) |
| 310-48-P-8 | Oakey–Pittsworth Road | Grade separation: rail-over-road (bridge) |
| 310-55-P-1 | Toowoomba–Cecil Plains Road | Grade separation: rail-over-road (bridge) |
| 310-56-P-2 | Warrego Highway | Grade separation: rail-over-road (bridge) |
| **GRC** | | |
| 270-12-P-1 | Kildonan Road (Stock Route) | Active level crossing |
| 310-7-E-1 | Unnamed Road | Passive level crossing to provide access to multiple properties |
| 310-10-P-1 | Unnamed Road (Stock Route) | Passive level crossing |
| 310-11-E-1 | Yelarbon (adjacent to the Cunningham Highway) | Active pedestrian level crossing |
| 310-16-P-1a | Whetstone Access Road | Active level crossing |
| 310-17-P-7a | McDougalls Road | No crossing provided at this location—alternate access via Cremascos Road |

| Authority/ Interface ID[1] | Road name | Proposed treatment in the revised reference design |
|---|---|---|
| 310-18-P-8 | Cremascos Road | Active level crossing |
| 310-20-P-12 | Bybera Road | Grade separation: rail-over-road (bridge) |
| 310-21-P-9 | Lovells Crossing Road (Stock Route) | Active level crossing |
| 310-22-P-9 | Thornton Road | Active level crossing |
| 310-25-P-3 | Grays Road | Passive level crossing |
| 310-26-P-2 | Wongavale–Yugilbar Road | Passive level crossing |
| 310-27-P-3 | Unnamed Road (Stock Route) | Grade separation: rail-over-road (culverts) |
| 310-28-P-3 | Unnamed Road | Active level crossing |
| **TRC** | | |
| 310-30-P-2 | Kooroongarra Anderson Road (Stock Route) | Passive level crossing |
| 310-31-P-7 | Kooroongarra Road | Active level crossing |
| 310-32-P-4 | Paton Road | Active level crossing |
| 310-33-P-1 | Nicol Creek Road | Active level crossing |
| 310-34-P-1 | Millwood Road | Active level crossing |
| 310-35-P-4b | Heckendorf Road | Grade separation: road-over-rail |
| 310-36-P-1 | Blackwell Road | Active level crossing |
| 310-36-P-8a | Scragg Road | No crossing provided at this location—relocated |
| 310-36-P-8b | Commodore Peak Road/Scragg Road | Grade separation: rail-over-road |
| 310-37-P-12 | Schwarten Road | No crossing provided at this location—consolidated |
| 310-38-P-3b | Owens Scrub Road | Grade separation: road-over-rail |
| 310-42-E-0a | Harris Road | Active level crossing |
| 310-43-P-8a | Mann Silo Road | Active level crossing |
| 310-46-P-3 | Roche Road | Grade separation: rail over road (bridge) |
| 310-46-P-4c | Murlaggan Road | No crossing provided at this location—road diverted/re-aligned |
| 310-47-P-1 | Kahler Road | No crossing provided at this location—consolidated |
| 310-47-P-3 | French Road | No crossing provided at this location—road diverted/re-aligned |
| 310-48-P-1 | Tip Road | Active level crossing |
| 310-48-P-9 | Quibet Road | No crossing provided at this location—road diverted/re-aligned |
| 310-48-P-10 | Dallman Road | No crossing provided at this location—road diverted/re-aligned |
| 310-49-P-2 | Lochaber Road | Grade separation: rail-over-road (bridge) |
| 310-49-P-6 | McEwan Lane | No crossing provided at this location—consolidated |
| 310-49-P-8 | Paint Mine Road | No crossing provided at this location—road diverted/re-aligned |
| 310-49-P-11 | Linthorpe Road | Grade separation: road-over-rail |
| 310-50-P-5 | Geitz Road | No crossing provided at this location—road diverted/re-aligned |
| 310-50-P-11 | Linthorpe Valley Road | Active level crossing |
| 310-51-P-8 | Bushy Lane | No crossing provided at this location—road diverted/re-aligned |
| 310-51-P-11z | Biddeston-Southbrook Road | Grade separation: rail-over-road (bridge) |
| 310-52-P-3 | Purcell Road | No crossing provided at this location—road diverted/re-aligned |
| 310-53-P-1a | Athol School Road | Grade separation: rail-over-road |
| 310-55-P-5 | Brimblecombe Road | Grade separation: rail-over-road (bridge) |

| Authority/ Interface ID[1] | Road name | Proposed treatment in the revised reference design |
|---|---|---|
| 310-57-P-1 | Chamberlain Road | Grade separation: rail-over-road (bridge) |
| 310-57-P-4 | Leesons Road | Active level crossing |
| **Stock routes (DoR)** | | |
| 310-24-P-3 | Unnamed Road (Stock Route) | No crossing provided—stock route realignment |
| 310-25-P-1 | Unnamed Road (Stock Route) | No crossing provided—stock route realignment |

**Table notes:**
1. Chainage provided to identify unnamed roads

The revised reference design has been developed to prevent short-stacking issues along the Project alignment. Short stacking has been addressed by maintaining a minimum separation distance between the outer rail of the Project alignment and the centreline of the nearest parallel road, in accordance with Section 5.4 of *Australian Standard (AS) 1742.7:2016 – Manual of uniform traffic control devices Part 7: Railway crossings* (Standards Australia, 2016a). Section 5.4 states that the minimum offset distance needs to be long enough to accommodate the design vehicle plus a factor of safety of 5 m at the intersection.

In January 2023, ONRSR undertook an audit of the *Inland Rail Road–Rail Crossing Strategy in Queensland* (ONRSR, 2020), specifically focusing on the public level crossings in the Project. The key findings included that ARTC Inland Rail have demonstrated that a consistent, systematic, and comprehensive process for the assessment of level crossings is being applied to determine adequate conforming treatments, and that the stakeholder engagement process has informed the updated reference design for the Project as part of the EIS process.

#### 5.4.8.2 Occupational (private) crossings

An occupational crossing provides access between lot(s) owned by the same landowner that will be divided by a rail corridor. The Project is estimated to intersect the following number of private access roads or tracks within the bounds of private lots and which may require an occupational crossing:

- 168 private, unformed access roads or tracks
- 74 private, formed access roads or tracks.

The final number of occupational crossings on private property will be determined during detailed design. ARTC has consulted with impacted landowners to obtain an understanding of access requirements and to present potential private access solutions based on the revised reference design. Each property solution will be designed on a case-by-case basis through ongoing consultation with directly impacted landowners and further design refinement.

Typical treatments include:

- Underpass for stock passage or vehicle and machinery use. This will be subject to topography.
- At-grade level crossing
- Diversion to adjacent public road/public road crossing.

Where level crossings are required, ARTC will consult with directly impacted landowners to determine the design that best fits their requirements. For example, in areas where directly impacted landowners use large machinery, the design of the level crossing, including gate widths, crossing surface and approach grades will need to accommodate this. Alternatively, where there is stock on a property, the focus will be on installing appropriate fencing and gates to keep stock out of the rail corridor.

ARTC will work with each directly impacted landowner to find access solutions that minimise the number of level crossings for the Project, consistent with the safety objectives of the ONRSR policies and guidelines.

Design and layout of occupational crossing solutions will be determined based on the following considerations:

- Feedback from consultation with landowners on specific property requirements
- Safety standards, including criteria for minimum sight distances for trains and vehicles
- Alternative access arrangements
- Rail design and landform
- Stock movements
- Vehicle access requirements (for example farm machinery, frequency of use).

### 5.4.8.3 Stock route interfaces

The Project interfaces with the State stock route network, which consists of stock routes and reserves in 11 locations. The State stock route area networks are primarily used by the pastoral industry as:

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

The DoR is responsible for providing policy and legislative advice, and managing asset maintenance for the State stock route network. Local government is responsible for day-to-day administration and management and network maintenance of the State stock route network. The *Stock Route Management Act 2002* (Qld) provides for the management of the stock route network in Queensland, see Chapter 3: Legislation and Project Approvals Process for further detail.

In the revised reference design, Inland Rail has updated stock route interface designs to accommodate requirements identified by DoR and local councils. The design requirements highlighted below have been developed to ensure mitigation measures at each interface facilitate a safe crossing passage for cattle and drovers in an operational context.

#### Holding yards

*Cattle yards, design, materials and construction* (Powell and Lapworth, 2006) outlines guidance for suitable yard design and construction. Holding yards should be spatially provisioned to allow an area of 2 $m^2$ per head of cattle for the maximum number of stock likely to be handled. The potential heard size ranges from small, localised movements between properties, up to a 1,200 head for the Project area, resulting in a maximum holding yard capacity requirement of 2,400 $m^2$ as agreed with DoR.

Complementing the area allocation, the yard should be designed as close to the optimal perimeter ratio (2:3) width to length for receiving large herds. The locations of these interfaces make this a challenging requirement due to existing infrastructure constraints and other associated impacts. Each holding yard was designed as close to the optimal ratio as was reasonably practical, weighing all site-based factors and practical constraints. The yard sizing ratio ensures it is deep enough to draw the mob in through a centrally located large 7.3 m wide gate, supported by a winged fence arrangement. The site-specific details have been shown in Appendix B2: Stock Routes.

#### Barriers

The DoR has identified that at-grade stock crossings present several challenges, including preventing stock from entering the rail corridor and preventing injury while attempting to moving large herds of cattle across a level crossing interface. High-volume cattle crossings pose a risk of cattle pressure at any opening in the stock proof fence. During detailed design, a barrier option assessment will be conducted in consultation with DoR. From DoR's perspective, barriers are an important visual and physical control to assist the stock movement under high-stress scenarios to prevent cattle injury.

#### Fencing and gates

Design of fencing and gates are important to achieve the following objectives:

- Keeping cattle securely contained
- Allow the safe and efficient movement of cattle
- Minimise stress and injury to cattle
- Minimise ongoing maintenance costs
- Maintain a safe working environment for users.

Overall fencing design will consist of posts, cables, top rail, belly rail and a post pot for corrosion protection. Fencing height is still to be agreed during detailed design; however, is expected to be approximately 1.7 m in height. Funnel fencing will also be required to move cattle efficiently across level crossings. The design uses a minimum 10 m wide fencing funnel with entry gates of 7.3 m wide. Fences and gates will be consistent with the 7.3 m opening requirement as set out in *Guideline: Fences on stock routes* (DoR, 2022a).

#### Controlled movements

ARTC will implement and maintain a system for the communication of train movements through level crossings to facilitate safe movement of livestock and agricultural machinery across the rail corridor. The system will be developed in consultation with landowners, stock operators and DoR, and be accessible to them prior to the commencement of operation.

#### Construction

During construction, ARTC will coordinate with GRC and DoR regarding the permitted use of the South Kurumbal Road stock route. ARTC will ensure traffic management will be in place to assist in managing stock movement around the proposed construction laydown area in a safe and efficient manner.

Locations of stock routes that intersect with the Project are identified in Table 5-16. Appendix B2: Stock Routes exhibits the stock route locations.

**TABLE 5-16 STOCK ROUTE INTERFACES**

| Location and Project interface point (approximate chainage) | Stock route ID, type, status and class | Description | Proposed treatment[1] |
|---|---|---|---|
| Kildonan Road<br>Ch 33.1 km (NS2B) | ID: 005GWND<br>Type: Road<br>Status: Open<br>Class: Primary | This stock route follows Kildonan Road.<br>The Project alignment crosses this stock route at Kurumbul. | ▸ A dedicated stock level crossing, adjacent to Kildonan Road level crossing will be provided, allowing stock to continue to move east west via the reserve to the south, which has a 40 m clear zone from the trafficable road service to the edge of the corridor, avoiding vehicular traffic interaction. The road level crossing will have flashing lights and boom barriers.<br>▸ Holding yards<br>▸ Funnel fencing<br>▸ Barrier across tracks[2]<br>▸ Communication system for controlled movement of trains and stock through level crossings. |
| Rainbow Reserve and Eukabilla Road<br>Ch 33.4 km (NS2B) | ID: RAINBOW RESERVE<br>Type: Reserve<br>Status: Open<br>Class: Primary | This stock reserve encompasses the Rainbow Reserve camping area and Eukabilla Road.<br>The Project alignment enters this stock reserve at Ch 33.15 km (NS2B) and crosses Eukabilla Road at Ch 33.4 km (NS2B). The Project alignment continues to run parallel to the western edge of the existing Eukabilla Road, within the stock reserve, to Ch 34.9 km (NS2B). At this point it exits the stock reserve. | Eukabilla Road will be realigned to run parallel to the western edge of the new rail corridor, allowing for uninterrupted stock movement from Kildonan Road onto Eukabilla Road. The stock reserve will be otherwise unaffected. |
| South Kurumbul Road<br>Ch 6.1 km<br><br>Wondalli-Kurumbul Road and Yelarbon–Kurumbul Road<br>Ch 7.2 km | ID: 081GWND<br>Type: Road<br>Status: Open<br>Class: Secondary | The stock route connects Wondalli-Kurumbul Road and South Kurumbul Road, running parallel and adjacent to the existing QR South Western Line rail corridor.<br>This stock route is aligned along Wondalli-Kurumbul Road and parallel to Yelarbon–Kurumbul Road, which runs adjacent to the existing QR South Western Line rail corridor.<br>The Project alignment crosses this stock route at the intersection of Wondalli–Kurumbul Road and Yelarbon–Kurumbul Road. | ▸ A dedicated stock level crossing, adjacent to the upgraded active level crossing at South Kurumbul Road, allowing stock movement across the railway that avoids vehicular traffic interaction.<br>▸ Holding yards<br>▸ Funnel fencing<br>▸ Barrier across tracks[2]<br>Communication system for controlled movement of trains and stock through level crossings.<br>No crossing provided at Wondalli Kurumbul Road, noting there is no existing crossing on the QR line at this location. The stock will utilise the existing drover movements via South Kurumbul Road. |

| Location and Project interface point (approximate chainage) | Stock route ID, type, status and class | Description | Proposed treatment[1] |
|---|---|---|---|
| Yelarbon<br>Ch 26.0 km | ID: 811GWND<br>Type: Road<br>Status: Open<br>Class: Tertiary – Minor and unused | This stock route is aligned with Merton Road, the Cunningham Highway and Yelarbon–Keetah Road. The stock route crosses the existing QR South Western Line at an active level crossing on the Cunningham Highway.<br>The Project will require the closure of the existing active level crossing, to be replaced by a road-over-rail crossing approximately 400 m to the west of the existing crossing point. This road reconfiguration will result in the severance of the current stock route. | Realignment of the stock route to provide continued connectivity between Merton Road and Yelarbon–Keetah Road, via a passive level crossing off Yelarbon–Kurumbul Road. The new rail crossing point would be approximately 640 m west of the existing rail level crossing.<br>▸ Holding yards<br>▸ Funnel fencing<br>▸ Barrier across tracks[2]<br>▸ Communication system for controlled movement of trains and stock through level crossings. |
| East of Sawmill Road<br>Ch 27.0 km | ID: RESERVE<br>Type: Reserve<br>Status: Open<br>Class: Tertiary – Minor and unused | This is an isolated stock reserve, with no mapped stock route linkages. The stock reserve is bound by the Cunningham Highway to the west and east of Sawmill Road to the north.<br>The Project involves curve easing east of Sawmill Road, which will encroach by up to 15 m into the north–western corner of the stock reserve.<br>The existing Yelarbon levee extends diagonally across this stock reserve. Modifications to the existing Yelarbon levee, will temporarily require works within the stock reserve. | The usability of this stock reserve is not expected to be impacted by the Project and therefore no treatment is proposed. |
| Lovells Crossing Road<br>Ch 65.8 km | ID: 813GWD<br>Type: Road<br>Status: Open<br>Class: Tertiary – Minor and unused | This stock route follows Lovells Crossing Road.<br>The Project alignment crosses this stock route approximately 3 km north of Inglewood. | An active level crossing of Lovells Crossing Road will be provided, allowing stock movement across the railway at the same location.<br>▸ Holding yards<br>▸ Funnel fencing<br>▸ Barrier across tracks[2]<br>▸ Communication system for controlled movement of trains and stock through level crossings. |
| Millmerran–Inglewood Road (Inglewood)<br>Ch 73.1 km to Ch 76.5 km | ID: 820GWD<br>Type: Road<br>Status: Open<br>Class: Tertiary – Minor and unused | This stock route follows Millmerran–Inglewood Road.<br>The Project alignment crosses this stock route between Ch 73.1km to Ch 76.5 km. | This stock route would be realigned to remain on the eastern side of the rail alignment, thus avoiding the need to provide two separate stock route crossing treatments in close proximity. This treatment approach would provide continued connectivity for stock movement parallel to Millmerran–Inglewood Road in this area.<br>DoR requires the new stock route corridor at this location to be 100 m wide. |

| Location and Project interface point (approximate chainage) | Stock route ID, type, status and class | Description | Proposed treatment[1] |
|---|---|---|---|
| Millmerran-Inglewood Road (Inglewood)<br>Ch 84.2 km | ID: 820GWD<br>Type: Road<br>Status: Open<br>Class: Tertiary – Minor and unused | This stock route follows or runs parallel to the east of Millmerran-Inglewood Road.<br>The Project alignment crosses this stock route at the point of the stock route re-joining Millmerran-Inglewood Road. | A 3 m by 3 m culvert underpass through the railway embankment will be provided to ensure continued connectivity for stock movement along Millmerran-Inglewood Road. |
| Kooroongarra-Anderson Road<br>Ch 96.1 km | ID: 856TOOW<br>Type: Road<br>Status: Open<br>Class: Tertiary – Minor and unused | This stock route branches off 820TOOW and provides an eastwest connection to Stonehenge Road.<br>The Project alignment crosses this stock route at the intersection of Koorongarra-Anderson Road and Millmerran-Inglewood Road.<br>Investigations are underway to potentially remove this interface. DOR have indicated that this stock route may not be required and will progress discussions with TRC on this matter. | A passive level crossing will be provided, allowing stock movement across the railway at the same location.<br>▸ Funnel fencing<br>▸ Barrier across tracks[2] |
| Millmerran-Inglewood Road (near Heckendorf Road)<br>Ch 115.5 km | ID: 820TOOW<br>Type: Road<br>Status: Open<br>Class: Tertiary – Minor and unused | This stock route follows Millmerran-Inglewood Road.<br>The Project alignment crosses this stock route approximately 900 m south of the intersection of Heckendorf Road and Millmerran-Inglewood Road. | A rail-over-road grade-separated crossing will be provided, allowing continuation of existing stock movements along Millmerran-Inglewood Road at this location. |
| Kooroongarra Road (Commodore Mine)<br>Ch 127.2 km | ID: 820TOOW<br>Type: Road<br>Status: Open<br>Class: Tertiary – Minor and unused | The stock route follows Millmerran-Koorongarra Road and Millmerran-Inglewood Road.<br>This Project alignment crosses this stock route approximately 550 m north of the intersection between Millmerran-Inglewood Road, Millmerran-Koorongarra Road and Schwartens Road. | A rail-over-road grade separated crossing will be provided, allowing continuation of existing stock movements along Millmerran-Koorongarra Road and Millmerran-Inglewood Road at this location. |

Table notes:
1. Refer Appendix B2: Stock Routes, for figure series detailing description of existing and proposed treatment.
2. Barrier option assessment will be conducted during detailed design in consultation with DoR to determine if there is an option that is acceptable to both road and rail managers, which adequately manages their respective risks.

### 5.4.9 Road network changes

To facilitate the Project, changes to the local road network are required to safely accommodate the railway and maintain local and regional connectivity. The road network changes have been developed in consultation with DTMR and the local councils and will be undertaken in accordance with relevant DTMR and relevant local council design standards. The road network changes consist of road realignments or diversions, consolidations, upgrades at the following locations noted below. These are ancillary works associated with a road rail interface treatments in Table 5-15:

- Yelarbon area Ch 25 km—As a result of the Cunningham Highway interface treatment: road over rail grade separation, several roads require realignment or upgrade:
  - Yelarbon Kurumbul Road and intersection with Cunningham Highway
  - railway parade realignment
  - Yelarbon Keeta Road realignment with intersection onto Cunningham Highway
  - Kera Street cul-de-sac
  - Bengalla Street connection to Yelarbon Keeta Road
  - Cunningham Highway vertical raise alongside Yelarbon levee.
- Schwartens Road realignment Ch 126.6 km—realignment
- Pampas area Ch 148.2 km—As a result of the existing short-stacking issues with Fysh Road, several roads require realignment or upgrade:
  - closure of existing Fysh Road intersection and level crossing
  - new realignment and intersection of Pampas Pit Road and Fysh Road
  - Harris Road and Gore Highway new intersection
- Brookstead area Ch 154.4 km—As a result of the Gore Highway interface treatment: road over grade separation, several roads require realignment or upgrade:
  - connection road realignment between Ware Street and Saal Road underneath the proposed grade separation
  - new road linking the Gore Highway and Saal Road with intersection.
- Yarranlea area Ch 164.4 km to Ch 166.8 km:
  - new road connecting Glen Devon Road to Murlaggan Road
  - new road connection from Roche Road to Murlaggan Road with intersection.
- Pittsworth area:
  - French Road Ch 169.6 km realignment to Tip Road Ch 170.4 km
  - Dallman Road Ch 172 km realignment to Quibet Road Ch 172.8 km with intersection upgrade on Oakey Pittsworth Road
  - Paint Mine Road Ch 175 km realignment back to McEwan Lane Ch 174.4 km and connects to Lochaber Road Ch 173.7 km grade separation (rail over road), which includes a road realignment and new intersection with the Gore Highway.
- Bushy Lane Ch 184.1 km realignment to Biddeston Southbrook Road Ch 184.9 km grade separation (rail over road). These works contain new intersections with Bushy Lane and the Gore Highway.
- Purcell Road Ch 188.5 km realignment to Athol School Road Ch 189.3 km grade separation (rail over road).

### 5.4.10 Rail maintenance access roads

Rail maintenance access roads are required to facilitate maintenance for critical infrastructure (e.g. turnouts), and to provide access for emergency recovery during operation of the railway. Formation level access has been proposed for all turnout locations and, where reasonably practical, for the full extent of crossing loops. ARTC guidelines for RMAR standards are available on the ARTC Extranet: **extranet.artc.com.au**. Two types of RMAR are included in the design: formation level and surface level.

Formation level access is provided at all critical assets, which include connections (turnouts), approaches to bridges, signalling, communications and wayside equipment, level crossings, culvert locations (with a height dimension greater than 1,200 mm) and along the length of crossing loops.

Surface level access is generally provided along the length of the rail corridor. This provides access to bridge abutments, culverts, scour and longitudinal drainage areas. It also enables the inspection and maintenance of embankment and cuttings, track elements and fencing in a safe and efficient manner. Where surface level access is provided, access to the formation level at abutments can be provided by stairs and bridge walkways.

A diagram showing the positioning of a formation level RMAR is shown in Figure 5-15.

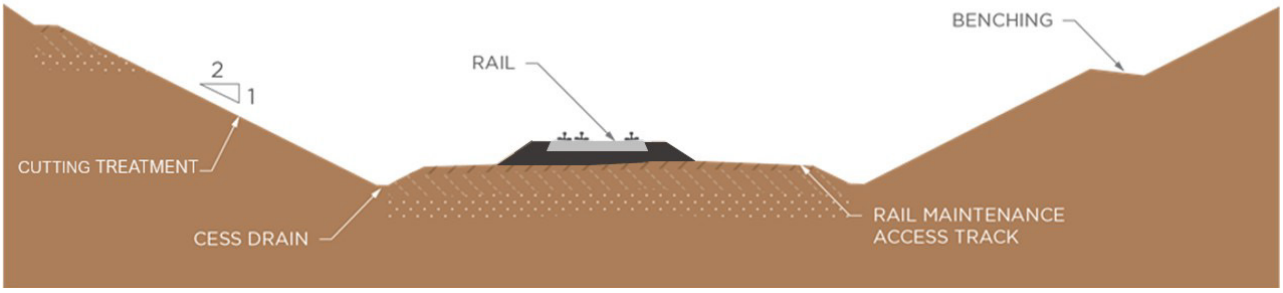



**FIGURE 5-15 TYPICAL SECTIONAL DIAGRAM OF RAIL FORMATION SHOWING RAIL MAINTENANCE ACCESS ROAD**

The standards used for earthworks and maintenance access roads have been developed based on ARTC *Earthworks Materials Specifications* (ETC-08-03) (ARTC, 2020b) and *Earthworks, Formation and Capping Materia*l Scope (ETM-08-01) (ARTC, 2010b) (available on the ARTC Extranet: **extranet.artc.com.au**) and in conjunction with Sections 3 and 4 of the Austroads *Guide to Pavement Technology Part 6: Unsealed Pavements* (AGPT06-09) (Austroads, 2009).

### 5.4.11 Utilities and services

The number of utility interfaces identified for the Project, broken down by service type and asset owner, is provided in Table 5-17.

**TABLE 5-17 SUMMARY OF IMPACTED UTILITIES BY TYPE OF SERVICE AND ASSET OWNER**

| Utility/service | APA | Energy Queensland | Essential Energy | GRC | Millmerran Operating Co. | Nextgen | Powerlink | Santos | Telstra | TRC | TPG/ PowerTel/ AAPT | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Communication | - | - | - | - | - | 71 | - | - | 471 | - | 3 | 545 |
| Electricity | - | 126 | 27 | - | - | - | 3 | - | - | - | - | 156 |
| Gas | 3 | - | - | - | - | - | - | - | - | - | - | 3 |
| Oil | - | - | - | - | - | - | - | 1 | - | - | - | 1 |
| Potable water | - | - | - | 2 | - | - | - | - | - | 3 | - | 5 |
| Raw water | - | - | - | - | - | - | - | - | - | 3 | - | 3 |
| Recycled water | - | - | - | - | 7 | - | - | - | - | - | - | 7 |
| Sewer gravity main | - | - | - | 1 | - | - | - | - | - | - | - | 1 |
| Sewer rising main | - | - | - | 1 | - | - | - | - | - | 1 | - | 2 |
| **Total** | **3** | **126** | **27** | **4** | **7** | **71** | **3** | **1** | **471** | **7** | **3** | **723** |

A preliminary review of the likely utility interface treatments has been completed. Each utility is considered to warrant one of the following general treatment types:

- **Protection**—Impacts to the utility can be avoided through the provision of additional administrative or engineered controls, temporary de-energising of power lines or additional concrete encasement of underground assets.
- **Relocation/realignment**—Impacts to the utility cannot be avoided through modification of design or construction methods. The utility will need to be realigned or relocated from its current position to avoid impact by Project activities.
- **No treatment**—The Project design can be configured to avoid direct impacts to the utility. The utility remains in place and no protection is required.
- **Abandoned**—Redundant utility services no longer required.

The potential major utility treatments are listed in Table 5-18.

**TABLE 5-18 SUMMARY OF UTILITY INTERFACE TREATMENTS BY SERVICE TYPE**

| Utility/service | Protection | Relocation/ realignment | No treatment | Abandoned | Total |
|---|---|---|---|---|---|
| Communication | 28 | 249 | 265 | 3 | 545 |
| Electricity | | 99 | 57 | | 156 |
| Gas | 3 | | | | 3 |
| Oil | 1 | | | | 1 |
| Potable water | 1 | 4 | | | 5 |
| Raw water | | | 3 | | 3 |
| Recycled water | 3 | 1 | 3 | | 7 |
| Sewer gravity main | | 1 | | | 1 |
| Sewer rising main | | 2 | | | 2 |
| **Total** | **36** | **356** | **328** | **3** | **723** |

All utility owners have been consulted by ARTC during the revised reference design process to establish potential interface impacts and to identify initial design solutions. Details of consultation are outlined in Appendix E: Consultation Report. Consultation with existing utility owners will continue through the detailed design stage of the Project to further verify interface impacts and to confirm appropriate interface treatments.

#### 5.4.11.1 Temporary connections (construction stage)

It is assumed that the utilities required to support construction of the Project will be temporary in nature. When the final locations of site offices and batch plants are confirmed through detailed design, ARTC will engage with utility providers with the objective of connecting to mains power, water, communications and sewerage. Where connection to existing infrastructure networks is not possible or practicable, temporary portable alternatives will be adopted, for example tanks (water), gen-sets (power), cellular network amplifiers (communications) and package sewage treatment plants.

#### 5.4.11.2 Permanent connections (operations stage)

Permanent electricity supply will be needed for points, signalling and other infrastructure for the operation of the railway. It is anticipated that the supply of these services will be via connection to existing infrastructure within the permanent footprint, or provided by solar power where feasible.

### 5.4.12 Fencing

#### 5.4.12.1 General approach

To prevent public access to the Project's rail corridor, fencing will be provided for the majority of the rail corridor. Fencing will act to protect adjoining lands from trespass and to prevent livestock and wildlife from gaining access to the railway. Fencing is to extend between the corridor and private lots or property adjoining the railway. Specific fencing considerations will be discussed with relevant landowners as part of the detailed design process.

As the Project comprises substantial greenfield works in rural agricultural and grazing areas, standard rural fencing will typically be provided according to ARTC guidelines, with specific considerations discussed with local landowners during the detailed design phase. Where ARTC proposes to construct within the QR corridor for all returned works (QR South Western Line and Millmerran Branch Line), ARTC will comply with QR standards; this includes for all new and replacement fencing. All existing fencing is proposed to be removed and replaced. Where ARTC is proposing to construct new railway corridor that coincides with road manager or landowner fencing, this will be replaced typically with reference to the ARTC guidelines. Where superior fencing is required, for example where tracks are in close proximity to roads and/or communities, or where trespass is anticipated to occur, a 1.8 m chain link boundary fence may be provided.

Feedback from adjacent landowners indicates that fencing on the Condamine River floodplain:

- Increases the risk of debris being trapped on the fence and causing blockage, potentially exacerbating the risk of flooding impacts and resulting in ongoing maintenance issues
- Can be washed away in flood events, causing issues to downstream properties and infrastructure and subsequently requires re-instatement.

Based on this consultation feedback, fencing of the rail corridor has not been included in the revised reference design across floodplain areas. Instead, guideposts or other alternative means of rail corridor boundary protection will be installed in order to demarcate the rail corridor and deter access to the rail corridor. The track elevation through these areas will also act as a deterrent to trespass or livestock access to the railway, where this may otherwise occur.

Gates will be provided at suitable corridor entry/exit locations to allow convenient access to infrastructure for maintenance purposes. This extends to private level crossings and stock crossings.

Fencing returns will be installed at bridge abutments and drainage or fauna crossing culverts. Fencing across small waterways will be designed to avoid storm damage and to retain effective stock control.

#### 5.4.12.2 Fauna crossings, fencing and other connectivity measures

Managing wildlife train strike risk and the provision of fauna connectivity measures of suitable design and location is an important design consideration for the Project. A Fauna Connectivity Strategy has been prepared to guide the design and construction of Project works with reference to the DTMR *Fauna Sensitive Transport Infrastructure Delivery Manual* (DTMR, 2024) (Appendix P: Fauna Connectivity Strategy).

The Strategy has identified biodiversity corridors through the landscape and describes the rationale and identification of fauna crossing structures and various other connectivity facilitation measures, such as funnel fencing, refuge poles and fauna furniture, to be incorporated in the Project's detailed design.

#### 5.4.12.3 Pest exclusion fencing

There are three types of barrier fences identified in the *Biosecurity Act 2014* (Qld) for the management of pest animals. These are the wild dog barrier fence, wild dog check fence (WDCF) and the rabbit proof fence. The Project intersects the WDCF and the rabbit proof fence.

The WDCF protects areas of grazing and cropping land in southern Queensland from wild dogs. The WDCF does not physically link up to the wild dog barrier fence; however, plays an important role in wild dog control in southern Queensland. GRC is responsible for the ongoing maintenance of approximately 283 km of the WDCF.

The Project alignment affects the WDCF from Yelarbon to Whetstone (Ch 28.9 km to Ch 43.5 km) and at two additional locations within the Goondiwindi local government area (LGA). The section of the WDCF from Yelarbon to Springborg Road (Ch 28.9 km to Ch 37.7 km) is unmaintained and proposed for decommissioning. This section of the fence provides no functional or strategic benefit to the broader fencing network in wild dog control, nor provides additional protection to animals in the adjacent cropping and grazing lands.

The Project impacts operational sections of the WDCF at three interfaces:

- From Springborg Road to Whetstone (Ch 37.7 km to Ch 43.5 km) the rail corridor runs parallel to the existing WDCF and is impacted by the necessary corridor widening works of the existing QR South Western Line
- Direct severance from McDougalls Road and Cremascos Road (Ch 50.2 km to Ch 51.2 km) requiring a realignment along the rail corridor boundary fence
- Direct severance from Cremascos Road heading northeast (Ch 54.6 km to Ch 56.0 km) requiring a realignment along the rail corridor boundary fence.
- Proposed realignment of the WDCF is summarised in Table 5-19 and illustrated in Figure 5-16.

ARTC will reinstate the WDCF at the three locations of impact on a like-for-like basis, in consultation and agreement with the with relevant stakeholders, notably the Department of Environment, Science and Innovation, impacted landowners and lessees, DAF, and GRC. DAF consultation is required before any amendments to the WDCF under Section S91(3) of the *Biosecurity Act 2014* (Qld).

The Darling Downs–Moreton Rabbit Board (DDMRB) fence is a 555 km long rabbit proof fence. The fence is managed and maintained by the DDMRB, stretching from Lamington National Park in the east, to Goombi in the south-west, where it connects to the wild dog barrier fence.

The Project intersects the DDMRB fence when traversing through the locality of Clontarf, at approximately Ch 120.2 km. The rabbit proof fence will need to be reinstated as shown in Table 5-19. In addition, a rabbit trap will be set up in this location.

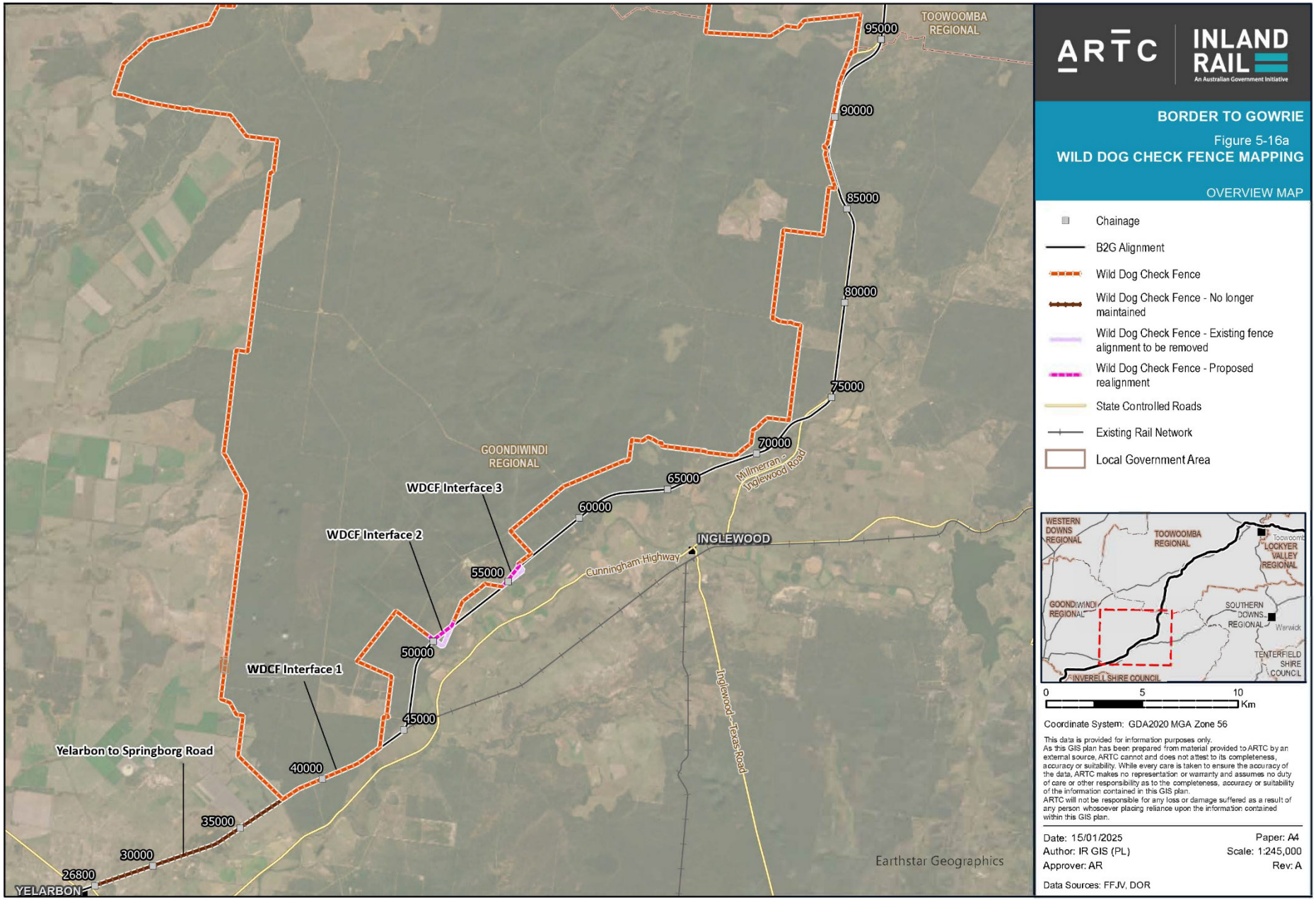
ARTC has undertaken consultation with the DDMRB to determine fencing requirements at this location. Detailed design drawings of ARTC's nominated fencing solution at Ch 120.2 km will be submitted to DDMRB for acceptance prior to construction commencing.

Table 5-19 summarises the fencing treatments by chainage and land use along the alignment.

**TABLE 5-19 FENCING STRATEGY BY CHAINAGE AND LAND USE**

| From Chainage (km) | To Chainage (km) | Land use north or west of rail | Fence type north or west of rail | Land use south or east of rail | Fence type south or east of rail |
|---|---|---|---|---|---|
| 30.6 (NS2B) | 2.9 | Agriculture and grazing | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |
| 2.9 | 25.5 | Road corridor (Yelarbon–Kurumbul Road) | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |
| 25.5 | 26.4 | Community (Yelarbon) | Standard chain link boundary fence | Community (Yelarbon) | Standard chain link boundary fence |
| 26.4 | 28.9 | GrainCorp facility | Standard chain link boundary fence | Community (Yelarbon) | Standard chain link boundary fence |
| 28.9 | 37.7 | Grazing and agriculture | Standard rural chain wire | Grazing and agriculture | Standard rural chain wire |
| 37.7 | 42.0 | Forest | WDCF | Forest | Standard rural chain wire |
| 42.0 | 43.5 | Forest | WDCF | Agriculture and grazing | Standard rural chain wire |
| 43.5 | 50.0 | Forest | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |
| 50.0 | 51.2 | Agriculture and grazing | WDCF | Agriculture and grazing | Standard rural chain wire |
| 51.2 | 54.6 | Agriculture and grazing | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |
| 54.6 | 56.0 | Agriculture and grazing | WDCF | Agriculture and grazing | Standard rural chain wire |
| 56.0 | 65.8 | Forest | Standard rural chain wire | Forest | Standard rural chain wire |
| 65.8 | 73.0 | Grazing | Standard rural chain wire | Grazing | Standard rural chain wire |
| 73.0 | 84.0 | Road corridor (Millmerran–Inglewood Road) | Standard rural chain wire | Grazing | Standard rural chain wire |
| 84.0 | 92.0 | Road corridor (Millmerran–Inglewood Road) | Standard rural chain wire | Forest | Standard rural chain wire |
| 92.0 | 95.0 | Grazing | Standard rural chain wire | Grazing | Standard rural chain wire |
| 95.0 | 102.9 | Agriculture and grazing | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |
| 102.9 | 120.2 | Agriculture and grazing | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |
| 120.2 | 120.2 | Agriculture and grazing | Rabbit trap (similar to existing rabbit trap on Millmerran–Inglewood Road) | Agriculture and grazing | Rabbit trap. Reinstatement of DDMRB rabbit proof fence also required |
| 120.2 | 121.0 | Agriculture and grazing | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |

| From Chainage (km) | To Chainage (km) | Land use north or west of rail | Fence type north or west of rail | Land use south or east of rail | Fence type south or east of rail |
|---|---|---|---|---|---|
| 121.0 | 123.7 | Road corridor | Standard rural chain wire | Commodore Mine | Standard rural chain wire |
| 123.7 | 126.2 | Road corridor | Standard rural chain wire | Commodore Mine, agriculture and grazing | Standard rural chain wire |
| 126.2 | 138.2 | Agriculture and grazing | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |
| 138.2 | 148.0 | Agriculture (Condamine River floodplain) | Guideposts only | Agriculture (Condamine River floodplain) | Guideposts only |
| 148.0 | 148.7 | Community (Pampas) | Standard chain link boundary fence | Community (Pampas) | Standard chain link boundary fence |
| 148.7 | 151.5 | Road corridor (Gore Highway) | Guideposts only | Agriculture (Condamine River floodplain) | Guideposts only |
| 151.5 | 154.0 | Road/rail corridor, GrainCorp facility, community (Brookstead) | Standard chain link boundary fence | Agriculture, some community residences | Standard chain link boundary fence |
| 154.0 | 163.3 | Agriculture | Standard rural chain wire | Agriculture | Standard rural chain wire |
| 163.3 | 170.3 | Agriculture and grazing | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |
| 170.3 | 174.7 | Agriculture and grazing | Standard rural chain wire | Road corridor (Gore Highway) | Standard rural chain wire |
| 174.7 | 184.0 | Agriculture and grazing | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |
| 184.0 | 187.5 | Agriculture and grazing | Standard rural chain wire | Road corridor (Gore Highway) | Standard rural chain wire |
| 187.5 | 207.6 | Agriculture and grazing | Standard rural chain wire | Agriculture and grazing | Standard rural chain wire |

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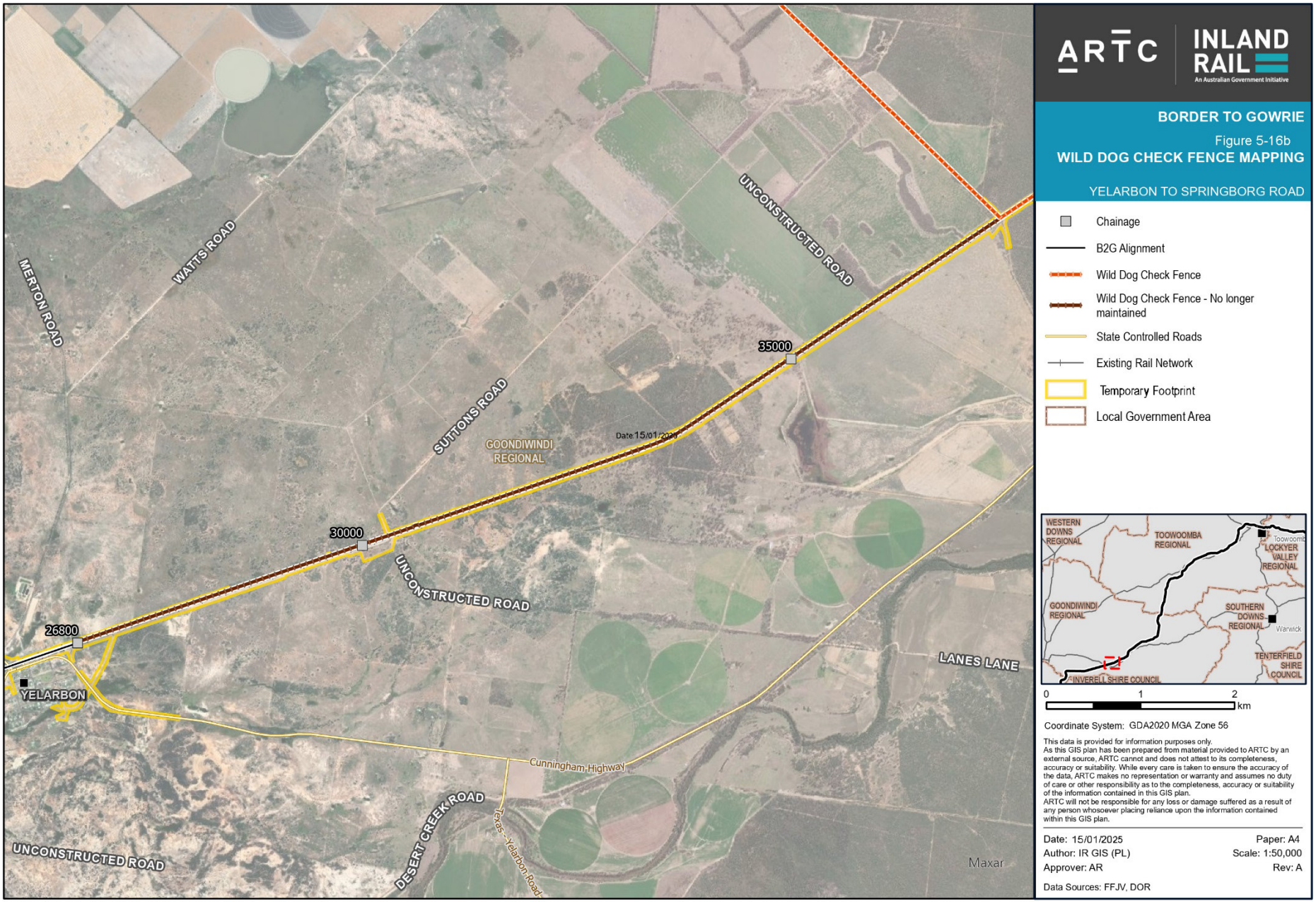


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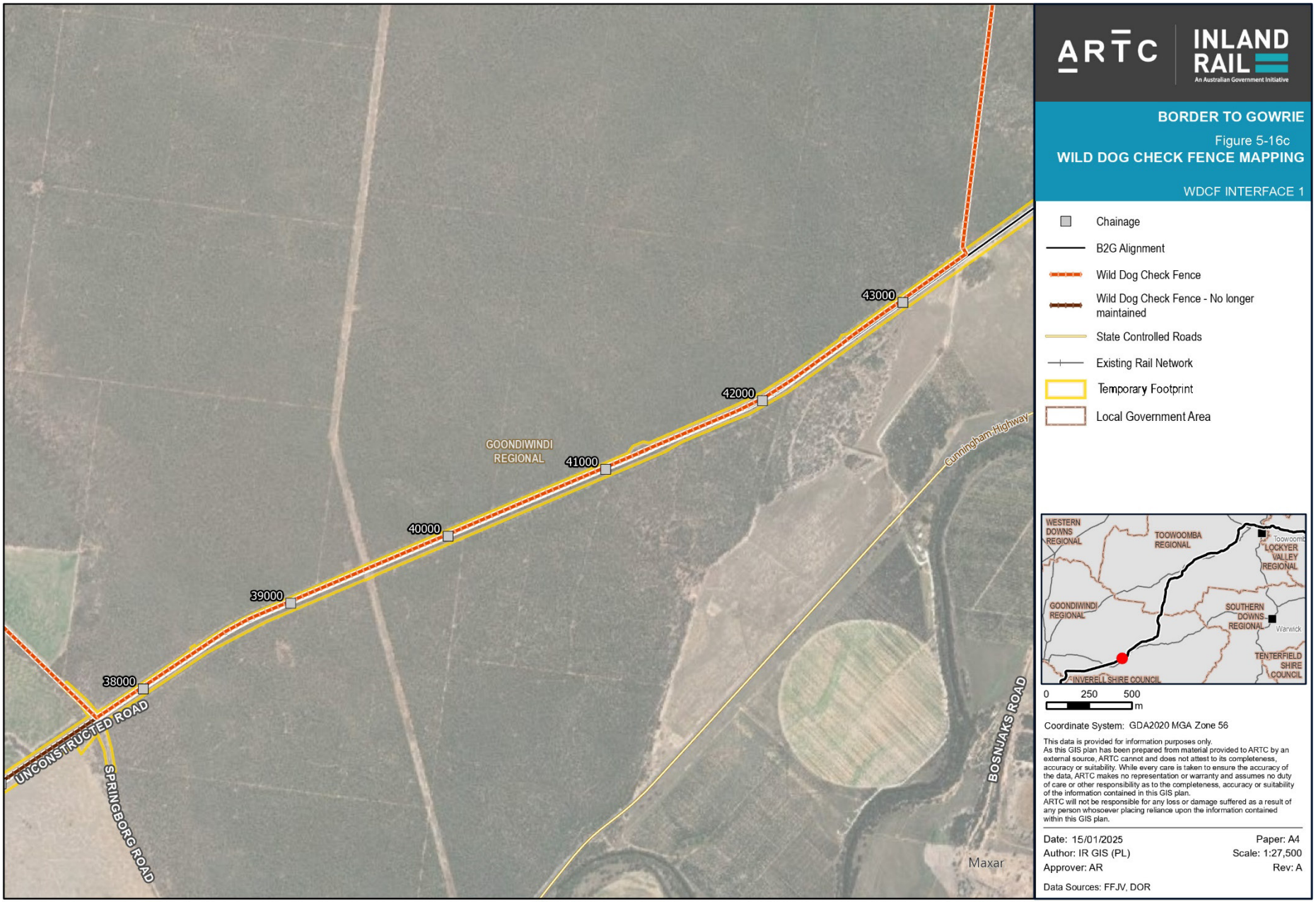


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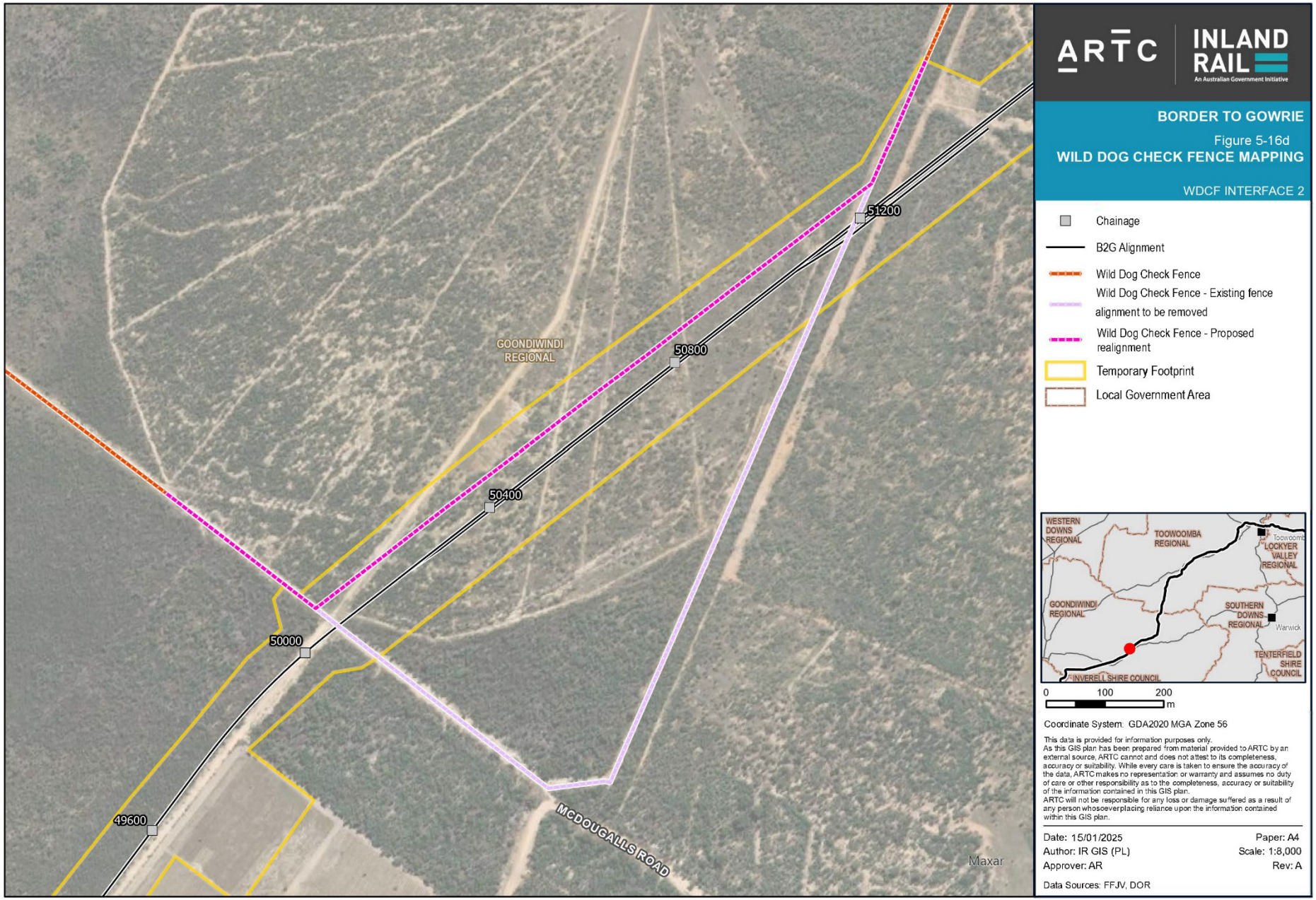
ARTC
INLAND RAIL
An Australian Government Initiative
BORDER TO GOWRIE
Figure 5-16d
WILD DOG CHECK FENCE MAPPING
WDCF INTERFACE 2
Chainage
B2G Alignment
Wild Dog Check Fence
Wild Dog Check Fence - Existing fence alignment to be removed
Wild Dog Check Fence - Proposed realignment
Temporary Footprint
Local Government Area
GOONDIWINDI REGIONAL
51200
50800
50400
50000
49600
MCDOUGALLS ROAD
Maxar
WESTERN DOWNS REGIONAL
TOOWOOMBA REGIONAL
Toowoomba
LOCKYER VALLEY REGIONAL
GOONDIWINDI REGIONAL
SOUTHERN DOWNS REGIONAL
Warwick
TENTERFIELD SHIRE COUNCIL
INVERELL SHIRE COUNCIL
0
100
200
m
Coordinate System: GDA2020 MGA Zone 56
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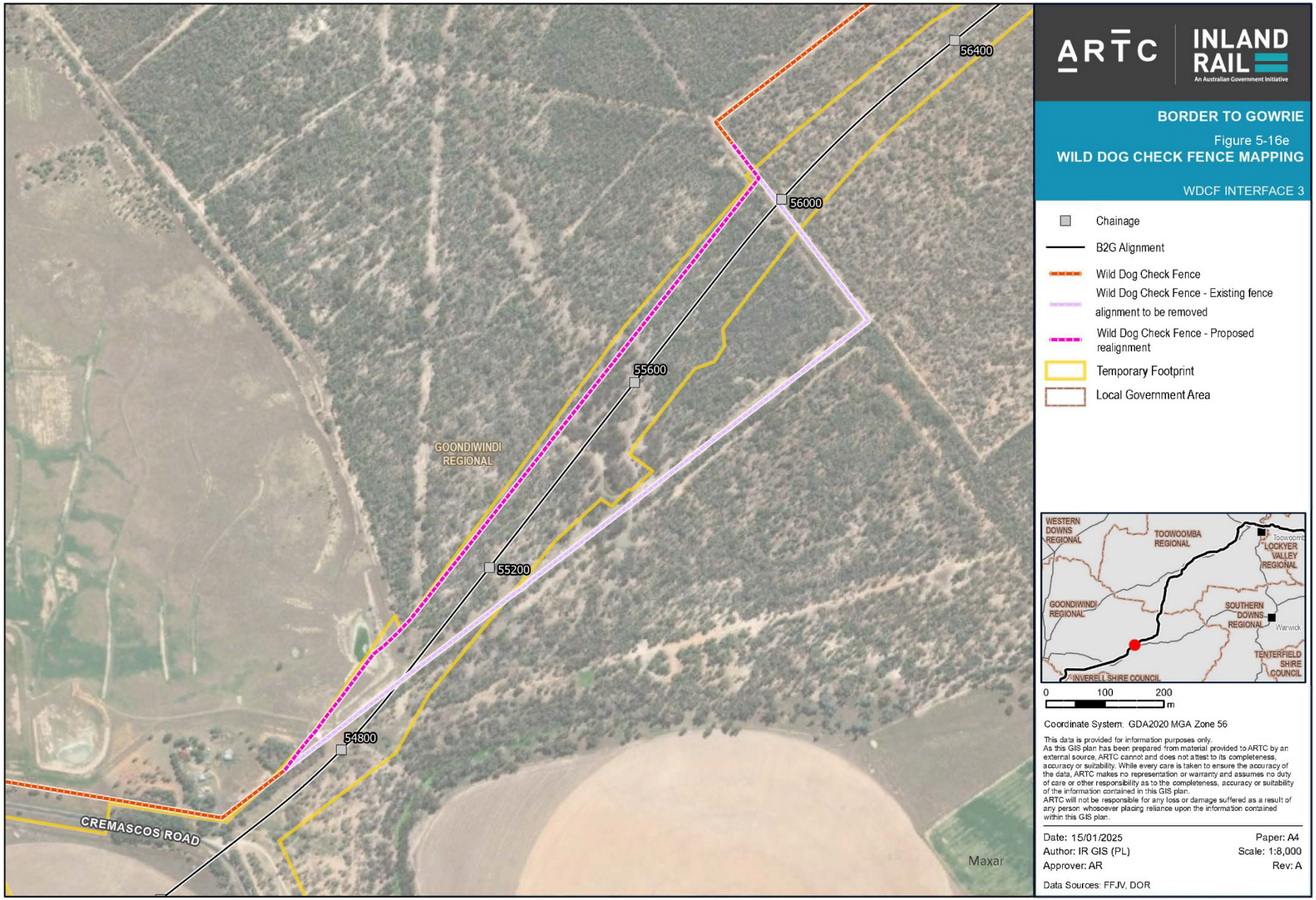


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### 5.4.13 Fish passage

Culverts, bridges (under both rail and road) and other cross-drainage structures have been designed, where practical, to accommodate fish passage requirements across waterways. The permanent footprint crosses waterways for waterway barrier works that are classified based on the potential risk of impact (low to major) on the ArcGIS data layer (2023), *Queensland waterways for waterway barrier works*, developed by DAF (2023).

Operational work that is constructing or raising temporary or permanent waterway barrier works can be either accepted or assessable development under the Planning Act and *Fisheries Act 1994* (Qld). Project design criteria for cross-drainage structures that interface with mapped waterways have been developed to meet DAF *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018a). The design of each cross-drainage and bridge structure intersecting a mapped waterway will be verified at the detailed design stage, in consultation with DAF to confirm compliance with the accepted development requirements.

Chapter 11: Flora and Fauna, Chapter 13: Surface Water and Appendix L: Terrestrial and Aquatic Ecology Technical Report provide further detail regarding aquatic environments and waterways affected by the Project. Further discussion on the approvals process for the Project under the Planning Act and *Fisheries Act 1994* is provided in Chapter 3: Legislation and Project Approvals Process.

### 5.4.14 Signalling and communications

During operations, the Project will be controlled by ARTC using Centralised Train Control (CTC), which is a method of managing the risks associated with the movement of rail traffic. The CTC system is comprised of the Human Machine Interfaces at the centralised operational control centre and within the vehicles under their control, and the integrated systems that connect them together. The Human Machine Interface within the rail vehicle can be either via lineside signals, or the use of in cab signalling following the fitment of appropriate levels of the European Train Control System.

The Project interfaces with QR's South Western System, on the South Western Line and Millmerran Branch Line, which operates under Direct Train Control, a verbal authority-based system similar to ARTC's Train Order Working. While mainline junctions will be controlled by ARTC under CTC, a CTC to Direct Train Control interface will be required at the QR interfaces. This signalling system interface and associated operational procedures is subject to ongoing discussions, development and definition between ARTC and QR now and during the Project's detailed design phase.

## 5.5 Pre-construction and early works

Pre-construction and early works include:

- Site preparation for construction
- Establishment of access roads/tracks
- Vegetation clearing and other ground disturbance activities that will be required to comply with relevant legislative requirements, approval conditions, guidelines and plans
- Additional surveys and geotechnical investigations to inform the construction works stage
- Relocation or protection of QR assets that were not required to be undertaken well in advance as part of enabling works
- Utility/service interfaces that were not required to be undertaken well in advance as part of enabling works
- Modification of biosecurity fencing
- Installation of boundary fencing
- Establishment of site offices and initial laydown areas, including the Whetstone MDC
- Establishment of non-resident workforce accommodation.

### 5.5.1 Site preparation

#### 5.5.1.1 Clearing and grubbing

Site clearing comprising removal of vegetation and debris will be undertaken sequentially commencing during the pre-construction and early works stage in accordance with necessary management plans and approvals as part of relevant Project works, including the early works Construction EMP. Clearing limits will be clearly demarcated prior to clearing activities commencing.

Where required, vegetation, turf, topsoil and other organic and unsuitable material will be stripped from the site in a manner compatible with relevant management plans and approval conditions.

Clearing and grubbing activities will occur simultaneously on multiple work-fronts in advance of primary earthworks operations with construction planning consideration of minimising sub-soil exposure. Clearing and grubbing activities actioned in accordance with the approved management plans and preceded by:

- Any required flora and fauna surveys and protocols
- Re-location of fauna by qualified fauna spotter/catcher as required
- Weed and pest surveys and biosecurity protocols
- Staged and sequential clearing protocols
- Identification of underground utilities
- Appropriate utility works (i.e. protection/re-location)
- Temporary and permanent fencing
- Any requirements under the relevant approved Cultural Heritage Management Plan developed with the relevant Aboriginal Party in accordance with the Aboriginal duty of care requirements under the *Aboriginal Cultural Heritage Act 2003* (Qld)
- Installation of erosion and sediment control measures in accordance with approved plans.

The clearing and grubbing operation will be performed within the required areas within the temporary disturbance footprint. Necessary setbacks and protective measures will be enabled at watercourses to preserve existing profiles and values. Cleared vegetation approved for mulching will be stockpiled temporarily in approved designated areas. Mulched material will be temporarily stockpiled and utilised for approved reuse opportunities in accordance with approved plans and biosecurity requirements. If weed infestations are encountered, the cleared vegetation will be disposed of in an appropriate manner to minimise risk of spread of infestation.

#### 5.5.1.2 Topsoil stripping

Topsoil stripping of laydown, stockpile and storage areas, access tracks, and haul roads will be undertaken as part of the initial site clearances. Stripping of the main alignment and road-works footprints will typically be undertaken by the bulk earthworks fleet. Stripping will proceed ahead of the earthworks at a controlled rate, to ensure that excessive areas are not stripped and left exposed to the weather for extended periods.

The stripped topsoil will be temporarily stockpiled at designated locations (see Table 5-24 for proposed laydown locations) within the Project footprint, outside flood-prone areas and, where practical, located at cut/fill transition zones where minimal bulk earthworks and material haulage are required.

### 5.5.2 Establishment of access roads

- Construction access tracks are categorised as internal or external access roads.

#### 5.5.2.1 Internal access roads

Internal access roads within the rail corridor are designed to cater for construction vehicles transporting earthwork material and concrete elements within the rail corridor. Internal access roads are co-located with the RMAR and are designed in accordance with the conditions required for various construction activities, including:

- Vehicle numbers
- Vehicle lengths
- Vehicle weights
- Location of underground services that may be affected by oversized loads or weights
- Typically 8 to 10 m wide with sufficient areas for vehicle pull over and/or overtaking
- Constructed to approximately 100 to 200 mm above existing surface level
- Safe turning zones for construction delivery
- Personnel transport to access work fronts
- Maintenance vehicles
- Material deliveries
- Servicing temporary construction facilities along the route.

### External access roads

External access roads predominantly connect laydown areas and the permanent footprint. These use a combination of local council roads and State-controlled roads with suitable access points into the permanent footprint. These locations are identified in Table 5-20. All works will be designed to minimise disruption to landowners and public infrastructure. Where a route in Table 5-20 is noted as using future RMAR, then it is within the permanent footprint.

**TABLE 5-20 TEMPORARY ACCESS ROADS**

| Location | Chainage (km) | Length (m) | Note |
|---|---|---|---|
| Kildonan Road | 31.0 (NS2B) | 2,000 | Access available off existing (sealed) Kildonan Road |
| Eukabilla Road | 37.0 (NS2B) | 1,300 | Access available off existing Eukabilla Road |
| Eukabilla Road | 39.9 (NS2B) | 4,300 | Access available off existing Eukabilla Road |
| Georges Road | 1.0 | 1,800 | ▸ A 2 km extension of Georges Road will be required<br>▸ A dirt track already exists; upgrading or regrading may only be required |
| McDougall's Crossing Road | 50.0 | 260 | ▸ Access via McDougall's Crossing Road, may need regrading to accommodate frequent construction traffic |
| Cremascos Road | 52.8 | 2,000 | ▸ Access via Cremascos Road<br>▸ Structure over Macintyre Brook may not be suitable for construction traffic and may require strengthening works<br>▸ Alternate local road may be utilised in combination with RMAR to avoid structure over the Macintyre Brook. |
| Cremascos Road | 55.0 | 900 | ▸ Access via Cremascos Road<br>▸ Structure over Macintyre Brook may not be suitable for construction traffic and may require strengthening works<br>▸ Alternate local road may be utilised in combination with RMAR to avoid structure over the Macintyre Brook. |
| Cremascos Road | 67.8 | 1,000 | ▸ Access via Thornton Road<br>▸ The access track will be using future RMAR |
| Millmerran–Inglewood Road | 73.0 | 30 | ▸ Access from the adjacent Millmerran–Inglewood Road |
| Millmerran–Inglewood Road | 73.6 | 300 | ▸ Access from the adjacent Millmerran–Inglewood Road |
| Millmerran–Inglewood Road | 74.8 | 80 | ▸ Access from the adjacent Millmerran–Inglewood Road |
| Millmerran–Inglewood Road | 93.6 | 220 | ▸ Access off Millmerran–Inglewood Road |
| Millmerran–Inglewood Road | 100.7 | 100 | ▸ Access from the adjacent Millmerran–Inglewood Road<br>▸ The access track will partly be using future RMAR |
| Nicol Creek | 105.7 | 1,000 | ▸ Access from Patons–Koorooga Road<br>▸ The access track will be using future RMAR |
| Schwartens Road | 126.9 | 240 | ▸ Access from Schwartens Road<br>▸ The access track will be using future RMAR |
| Owen Scrub Road | 129.0 | 1,400 | ▸ Access via Owens Scrub Road |
| Owen Scrub Road | 129.0 | 700 | ▸ Access from Owen Scrub Road |
| Hall Road | 140.0 | 950 | ▸ Access via LDN138.5 via LDN139.0 and cut/fill point |
| Millmerran–Leyburn Road | 140.2 | 1,050 | ▸ Access off the adjacent Millmerran–Leyburn Road |
| Condamine River Bridge | 144.2 | 1,400 | ▸ Access via the adjacent Gilgai Lane<br>▸ The access track will be utilising future RMAR |
| Fysh Road | 147.3 | 100 | ▸ Access via Fysh Road |
| Gore Highway | 148.1 | 300 | ▸ Alternative access off Gore Highway utilizing proposed road realignment |
| Construction Haul Road | 194.0 | 8,050 | ▸ Construction haul road to be developed and used from Athol School Road laydown (Ch 189.0) to Toowoomba–Cecil Plains Road (Ch 197.5)<br>▸ The access track will be using future RMAR |

| Location | Chainage (km) | Length (m) | Note |
|---|---|---|---|
| Westbrook Creek | 197.0 | 850 | ▸ New access track to be developed off existing Toowoomba–Cecil Plains Road<br>▸ The access track will be utilising future RMAR |
| Toowoomba-Cecil Plains Road | 197.4 | 140 | ▸ Access track off Toowoomba-Cecil Plains Road using existing property access |
| Brimblecombe Road | 197.5 | 1,020 | ▸ Alignment access between bridges<br>▸ Partly using existing private property access |
| Dry Creek | 198.8 | 580 | ▸ New access track to be developed off existing Brimblecombe Road<br>▸ The access track will be using future RMAR |
| Construction Haul Road | 202.5 | 4,300 | ▸ Construction haul road between Brimblecombe Road and Warrego Highway<br>▸ The access track will be using future RMAR |
| Chamberlain Road | 203.6 | 660 | ▸ Unsealed section of Chamberlain Road |

### 5.5.3 Establishment of site offices, laydowns and accommodation facilities

The Project will include five site offices within the Project footprint. Site offices will be co-located with laydown areas. Site offices will be established at the locations nominated in Table 5-23. The locations of site offices may change as detailed design and construction methodologies are refined but will be contained within the Project footprint. Establishing laydown areas will generally involve clearing, grubbing, topsoil stripping, installing environmental controls, laying hardstand material, and constructing parking areas and access tracks.

The Project will include establishment of non-resident workforce accommodation and two batch plant facilities. These facilities will be established during the pre-construction and early works stage. Establishing the accommodation facilities will generally involve site preparation, installing environmental controls, laying hardstand material, connection of services, delivery of buildings and constructing parking areas.

### 5.5.4 Fauna pest exclusion fencing

As discussed in Section 5.4.12.2, the Project intersects the wild dog check fence at three locations and the DDMRB fence at one location. Where interfacing with or severing a biosecurity fence, it is anticipated that fence realignment and reconstruction will be undertaken as early works prior to the commencement of the construction of rail infrastructure. Replacement fencing will be in accordance with detailed designs accepted by GRC or the DDMRB, as relevant.

## 5.6 Construction works

### 5.6.1 Indicative construction schedule

The construction works stage will commence once the relevant components of the Project approvals and corridor acquisition, and pre-construction and early works stages are complete, and the Environmental Monitor has endorsed the CEMP for the relevant Project works.

The indicative construction timetable for the Project is:

- Commence construction activities in the third quarter of year 1, as defined in Section 5.3.5.1, summarised in Table 5-21
- Target completion of construction by the first quarter of year 5
- Commissioning stage from first quarter of year 5.

The broad milestone dates for construction are indicative only and are subject to change during the detailed design and construction works stages as a result of a range of factors, including:

- Weather conditions
- Changes to construction methods and materials
- Unexpected finds, such as contamination, threatened biodiversity species or cultural heritage values.

Variations to the construction sequences in relation to Program optimisation, constructability, resource availability, local conditions (weather and industry) and adjacent Inland Rail projects will be investigated during the detailed design stage of the Project. The schedule of environmental controls, including traffic management and noise controls, would be adjusted accordingly.

TABLE 5-21 BREAKDOWN OF INDICATIVE CONSTRUCTION ACTIVITIES

| Year | Year 1 | | | | Year 2 | | | | Year 3 | | | | Year 4 | | | | Year 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quarter | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Civil earthworks and drainage | | | | | | | | | | | | | | | | | | | | |
| Bridge | | | | | | | | | | | | | | | | | | | | |
| Track | | | | | | | | | | | | | | | | | | | | |
| Signalling testing and commissioning | | | | | | | | | | | | | | | | | | | | |

## 5.6.2 Hours of work

### 5.6.2.1 Primary hours of construction

The majority of the construction works for the Project will be undertaken during the day. To shorten the duration of the construction period as far as practicable and minimise potential impacts to the community the following primary construction hours are proposed:

- Monday to Sunday 6.00 am to 6.00 pm
- No work on public holidays.

Blasting activities would only be undertaken during the hours of:

- Monday to Friday 9.00 am to 3.00 pm
- Saturday 9.00 am to 1.00 pm
- No blasting Sundays and public holidays.

The hours indicate the start and end times for daily construction work. Each day begins with preparation activities and mobilisation of work crews, and ends with task completion and securing the work site. Intensive construction work begins once the initial daily setup is complete and concludes as part of the end-of-day shutdown tasks.

### 5.6.2.2 Works outside the primary hours of construction

Depending on the nature of the works some activities may need to be undertaken outside of the primary construction hours. Construction works outside of the primary hours may occur throughout the duration of the construction program in the following scenarios:

- Work during rail corridor possession: where works are required within the active railway corridor of the South Western System it will be necessary to undertake works under track possessions, during which the contractor has control over an existing railway corridor. Extended work hours may be required during this time to enable works to be undertaken safely and to shorten the overall duration of disruption to the rail industry during the necessary closure of the South Western System during construction works.
- The delivery of oversized plant or structures that police or other authorities have determined requires special arrangements to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent or contain environmental harm
- Works to ensure construction personnel, road user or public safety
- In the event of significant weather approaching the construction site and protective works are required or weather sensitive works must be completed
- Delivery of ‘in time’ concrete, steel, and other construction materials and components delivered to site by heavy vehicles
- Movements of heavy plant and materials
- Transport, assembly, or decommissioning of oversized plant, equipment, components, or structures
- Works that require continuous construction support, such as continuous concrete pours, pipe-jacking or other forms of ground support necessary to avoid a failure or construction incident
- Works that cannot be undertaken during the day due to ambient daytime temperatures such as rail tamping where the stress-free temperature of the rail cannot be achieved during the primary hours of construction
- Haulage along the rail corridor
- Roadworks to local and arterial roads, including works required to maintain the safety of motorists and workers
- Traffic-control crews, including large truck mounted crash attenuator vehicles, medium rigid vehicles, and lighting towers

- Incident response including tow-trucks for light, medium and heavy vehicles
- Arrival and departure of construction staff during shift change overs
- Where a negotiated agreement is reached with sensitive receptors (owners and occupiers) to carry out works in accordance with the construction hours specified in the negotiated agreement.

Where works are required outside of the primary hours of construction, site-specific assessments, for example noise and vibration, would be undertaken to demonstrate the environmental impacts, and risks associated with the works can be managed consistent with relevant guidelines and requirements. The assessments would determine the additional measures required to mitigate the identified impacts and support the justification of construction hours at the work locations.

When work is required outside of the primary hours of construction, such as night work and material deliveries, it will be carefully planned and subject to appropriate controls, particularly to mitigate noise and vibration impacts. The planning process will include consultation with affected individuals, the local community, and stakeholders to inform them of the proposed work, any anticipated impacts, and the measures implemented to control potential impacts.

### 5.6.3 Workforce

A preliminary estimate of the workforce required to undertake the construction tasks for the Project to the nominated program is shown in Figure 5-17. Workforce onsite for the Project is estimated to peak at 900 full-time equivalents (FTE) around week 80 of construction. The average number of FTE workforce on site across the full construction works stage is approximately 383 people.

Local resident and Indigenous workforce targets will be established by ARTC and enforced and passed on to the contractor through construction contract documentation (Appendix X: Social Impact Assessment).

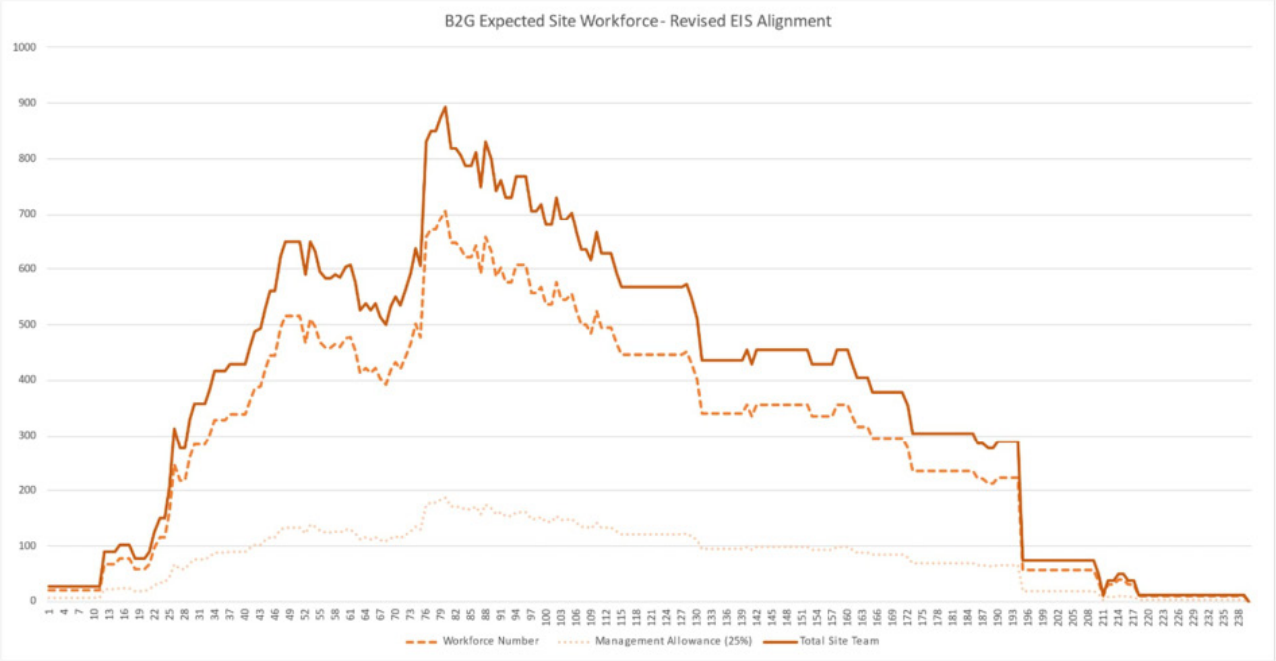



**FIGURE 5-17 EXPECTED SITE WORKFORCE**

### 5.6.4 Non-resident workforce accommodation

Each non-resident workforce accommodation will have capacity to accommodate a minimum of 300 beds. An initial assessment of workforce demand and safe commutable distances has identified a potential need for non-resident workforce accommodation in the vicinity of Yelarbon, Inglewood and Millmerran. Locations for non-resident workforce accommodations in proximity to these townships have been identified with consideration for:

- The proximity of the accommodation to likely construction sites for fatigue-management purposes
- Land tenure and ownership of each site
- Available land area
- Proximity to supporting infrastructure and services
- Likelihood of noise, demand for essential services, and traffic impacts originating from the accommodation
- To avoid areas that are within the 1% AEP floodplains where possible

- Constraints such as significant vegetation communities, threatened species or heritage sites
- Road access
- Potential for planned future developments to impact on the non-resident workforce accommodation, or vice versa.

Based on these criteria, properties within the footprint at Yelarbon and Inglewood have been identified as suitable for the establishment of non-resident workforce accommodation (Figure 5-18 and Figure 5-19). The location for a Millmerran workforce accommodation has not been included in the revised draft EIS. The site selection and due diligence associated with locating a Millmerran workforce accommodation will be undertaken during the detailed design stage and be included as part of a Project change request.

The locations of these properties are summarised in Table 5-22 and discussed in Section 5.6.4.1. ARTC has consulted with the landowners for the two proposed properties, each of whom are receptive to having a non-resident workforce accommodation being located on their property. Details of consultation are provided in Appendix E: Consultation Report. The service life of the non-resident workforce accommodation facilities are restricted to the duration of construction of the Project, (breakdown of construction schedule and activities summarised in Section 5.6.1).

**TABLE 5-22 LOCATIONS FOR NON-RESIDENT WORKFORCE ACCOMMODATIONS**

| Site location (lot/plan) | Address |
|---|---|
| Lot 30 on MH721 | Cunningham Highway, Yelarbon |
| Lot 5 on MH75 | Millmerran–Inglewood Road, Inglewood |

Stated conditions for secondary approvals for workforce accommodation are not sought through the revised draft EIS. As discussed in Chapter 3: Legislation and Project Approvals Process, secondary approvals for non-resident workforce accommodations will be sought prior to accommodation establishment works.

ARTC will fulfil its obligations under the *Workplace Health and Safety Act 2011* (Qld). This ensures the provision of adequate infrastructure, utilities, recreational facilities, health and social services for workers. At a minimum, each non-resident workforce accommodation will be largely self-contained and will include accommodation units with kitchen, dining, ablution and laundry facilities. Supporting and additional infrastructure associated with each accommodation will include:

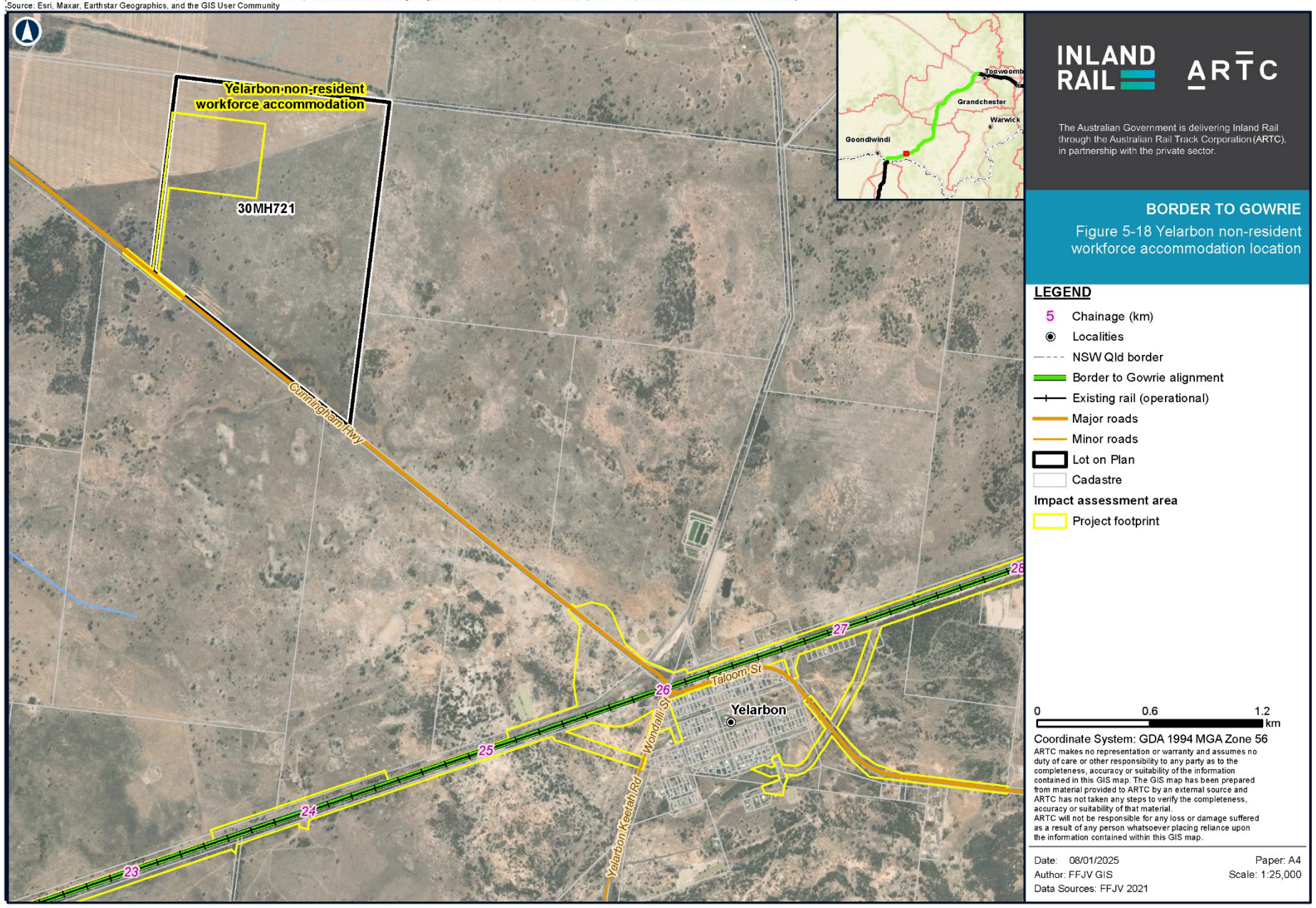
- Potable water storage—approximately 3 megalitres (ML) of water per month of operation during peak occupancy, based on average usage of 250 L per person, per day (see Section 5.6.24)
- Water and wastewater treatment and collection facilities, including temporary package sewage treatment and adequate availability of land for treated effluent irrigation/disposal (estimated capacity of 300 equivalent persons)
- Power generation (if not connected to the local electricity grid) by diesel-powered generators, in combination with solar panels, where appropriate
- Solid waste-collection facilities
- Recreational facilities such as barbecue areas and exercise areas
- Paramedic and first aid facilities
- Offices
- Car parking and gatehouse/security.

As described in further detail in Appendix X: Social Impact Assessment, health service provisions within workforce accommodation facilities would include: access to paramedic services, first aid facilities, and medical and workplace health and safety services; Mates in Construction programs to support mental health; and arrangements for medical evacuations for more serious health issues or accidents.

An example layout of an existing non-resident workforce accommodation in Queensland is shown in Figure 5-20. Other layout options are available and may be adopted for non-resident workforce accommodations for this Project.

The layout of each non-resident workforce accommodation will vary depending on site constraints and accessibility to existing services. Description and the final layout of the facilities will be determined by ARTC Water and sewage plants will be package sewage treatment plants capable of treating sewage onsite to the appropriate effluent standards for on-land irrigation with adequate exclusion areas from non-resident workforce accommodation facilities and any waterways.

Opportunities will be explored for rainwater harvesting systems to be established for each accommodation to reduce the requirement for external water supply (see Section 5.6.24). A greywater recycling system will also be explored to reuse water for activities such as toilet flushing. All potable water supplies on the Project will comply with the *Australian Drinking Water Guidelines* (National Health and Medical Research Council and National Resource Management Ministerial Council (NHMRC and NRMMC), 2011).


Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Yelarbon non-resident workforce accommodation
30MH721
Cunningham Hwy
Taloom St
Wondalli St
Yelarbon Keetah Rd
Yelarbon
23
24
25
26
27
28
Toowoomba
Grandchester
Warwick
Goondiwindi
INLAND RAIL
ARTC
The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.
BORDER TO GOWRIE
Figure 5-18 Yelarbon non-resident workforce accommodation location
LEGEND
5 Chainage (km)
Localities
NSW Qld border
Border to Gowrie alignment
Existing rail (operational)
Major roads
Minor roads
Lot on Plan
Cadastre
Impact assessment area
Project footprint
0 0.6 1.2 km
Coordinate System: GDA 1994 MGA Zone 56
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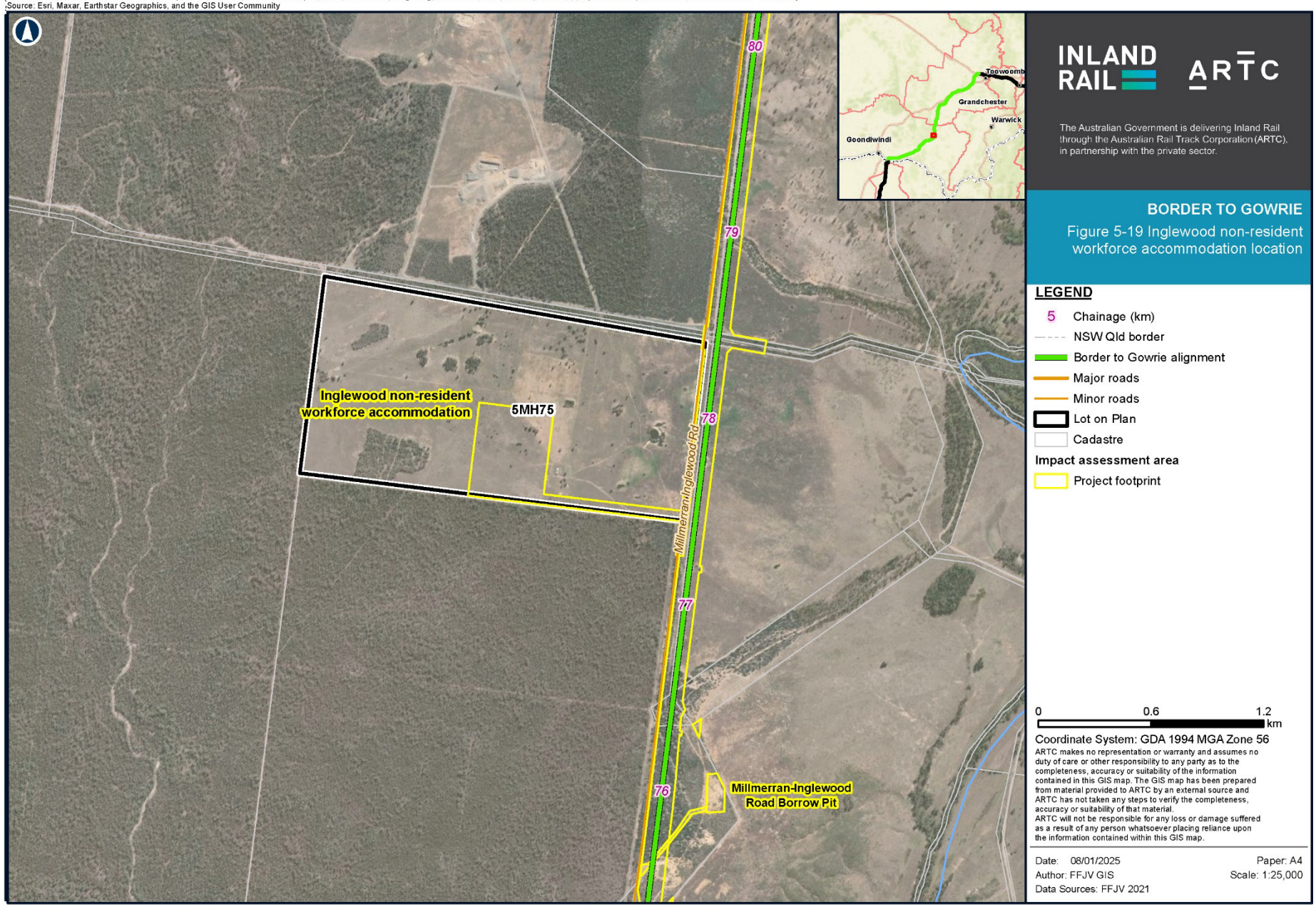
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
80
79
78
77
76
Millmerran Inglewood Rd
Inglewood non-resident workforce accommodation
5MH75
Millmerran-Inglewood Road Borrow Pit
Toowoomba
Grandchester
Warwick
Goondiwindi
INLAND RAIL
ARTC
The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.
BORDER TO GOWRIE
Figure 5-19 Inglewood non-resident workforce accommodation location
LEGEND
5 Chainage (km)
NSW Qld border
Border to Gowrie alignment
Major roads
Minor roads
Lot on Plan
Cadastre
Impact assessment area
Project footprint
0
0.6
1.2
km
Coordinate System: GDA 1994 MGA Zone 56
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**FIGURE 5-20 EXAMPLE OF A NON-RESIDENT WORKFORCE ACCOMMODATION LAYOUT. DALBY, QUEENSLAND**

### 5.6.4.1 Yelarbon and Inglewood non-resident workforce accommodation sites

The Yelarbon non-resident workforce accommodation would be located approximately 2.5 km north-west of Yelarbon with access into the accommodation off the Cunningham Highway, a State-controlled road.

The Inglewood non-resident workforce accommodation would be located approximately 12 km north-east of Inglewood with access from Millmerran–Inglewood Road, a State-controlled road.

These camps will have an approximate construction pad area of 200,000 $m^2$.

### 5.6.4.2 Workforce transport

Project personnel will travel between their homes or temporary non-resident workforce accommodation and work sites using passenger vehicles such as utilities and four-wheel drives. The contractor will consider the use of buses to transport workers between non-resident workforce accommodation facilities and worksites, depending on the number of personnel at different times and the distribution of crews between worksites.

Temporary parking facilities for construction workers will be located at construction laydown areas, within the Project footprint and within non-resident workforce accommodations facilities, with designated areas selected to minimise the potential for noise impacts. The provision of parking in each location will be sufficient to accommodate the number of vehicles associated with the maximum number of workers expected to use each area during peak occupancy. Further detail regarding workforce transport is assessed and discussed in Chapter 20: Traffic, Transport and Access, and Appendix AA: Traffic Impact Assessment.

### 5.6.5 Whetstone Material Distribution Centre

As part of the track construction delivery strategy for the Project, ARTC is proposing to construct a temporary MDC at Whetstone, Queensland, on land bounded by the QR South Western System Railway Line to the north and Cunningham Highway to the south. The land on which the Whetstone MDC is proposed is described as part of Lot 2 on MH784, Lot 4 on MH287, Lot 74 and 76 on MH313 and Lot 352 on SP116434.

The facility will include a narrow-gauge turnout to support construction activities as well as to accept and redistribute material via the QR South Western line with a 15.75 TAL limit. Rail traffic volumes on this network are subject to grain seasonal volumes. One to three trains per week are expected during off season and up to five trains a day during peak season (November and December).

The Project's construction activities comprise of delivery, stockpile, prepare, handle and distribute bulk track construction materials. Construction materials and equipment expected to be delivered to site include concrete sleepers, ballast, steel rail, precast concrete (for bridges and culverts), communications, signalling and turnout equipment and demountable site offices. The site's ability to receive and distribute material via rail will significantly reduce the need for road transportation. Onsite activities will include welding and grinding of steel rail into long welded rail strings as well as plant storage and maintenance shows the location and extent of development and the proposed arrangement of land uses within the site.

To enable activities and receipt of material and equipment, the facility will require earthworks and drainage works, internal rail track, site office and facilities, rollingstock provisioning and maintenance facilities, the provision of gantries for rail logistic management, ballast unloading facilities and rail welding facilities. Infrastructure will include State and local road intersection works, turning lanes and upgrades.

### 5.6.6 Site offices

Eleven laydown areas (including the Whetstone MDC) have been nominated for the location of site offices. Not all locations are required to have site offices; however, the locations proposed in Table 5-23 have been selected as potential locations along the Project footprint with an area large enough to contain a site office.

Site office types to be constructed comprise:

- Major site office:
  - office to suit 50 people at each site location inclusive of meeting rooms
  - crib facilities and ablutions required to suit full office size
- Secondary site office:
  - office to suit 20 people at each site location inclusive of meeting rooms
  - crib facilities and ablutions required to suit full office size.

**TABLE 5-23 PROJECT SITE OFFICE LOCATIONS**

| ID (laydown area)[1] | Location | Chainage (km) | Description |
|---|---|---|---|
| NS2B–LDN035.6 | Eukabilla Road | 35.6 (NS2B) | Major site office |
| B2G–LDN025.9 | Yelarbon–Kurumbul Road | 25.9 | Secondary site office |
| Whetstone MDC | Whetstone Access and Cunningham Highway | 44.8 | Major site office |
| B2G–LDN054.2 | Cremascos Road | 54.2 | Secondary site office |
| B2G–LDN074.0 | Millmerran–Inglewood Road | 81.00 | Secondary site office |
| B2G–LDN116.5 | Millmerran–Inglewood Road | 116.5 | Major site office |
| B2G–LDN161.0 | Pittsworth–Tummaville Road | 162.3 | Major site office |
| B2G–LDN175.5 | Linthorpe Road Bridge—Linthorpe Road | 177.0 | Secondary site office |
| B2G–LDN188.2 | Athol School Road | 189.5 | Major site office |
| B2G-LDN192.3 | Off Berghofer Road | 193.6 | Secondary site office |
| B2G–LDN206.3 | Leesons Road | 207.6 | Major site office |

**Table note:**
1. Refer to drawings in Appendix B1: Design Drawings

### 5.6.7 Laydown, stockpile and storage areas

Laydown areas are used for a variety of construction purposes, including site offices, material and equipment storage, and to facilitate bridge construction. At bridge locations there will be a dedicated laydown/work area that may include crane pads for the lifting of bridge members. Locations of laydown areas have been selected to:

- Ensure support of the construction methodology
- Ensuring major access points and locations of sites are positioned to suit haulage routes
- Channelling deliveries through dedicated major access points and as close as possible to the point of use
- Positioning site access points to ensure safe access and egress for all vehicles.

Each laydown area has been positioned to avoid or minimise potential impacts to environmental and social receptors. Laydown areas were initially selected based on investigations using aerial imagery and ground truthing to confirm general suitability and avoidance of environmental and social receptors. The draft EIS assessed these laydown areas as part of the Project and identified suitable mitigation measures. Adjustments to the laydown areas have been based on stakeholder feedback and further optimised for field validated ecology.

Seventy-eight laydown areas and one MDC at Whetstone have been allocated within the Project's temporary footprint. Establishing temporary laydown areas will involve clearing, grubbing, topsoil stripping (see Section 5.5.1), installing environmental controls, laying hardstand material (assumed to be site won and treated to geotechnical requirements), and constructing parking areas and access tracks (see Section 5.6.13 for breakdown of bulk earthworks for the Project). All temporary laydown areas are intended to be used for the Project during construction.

The locations of the laydown areas have been chosen to avoid areas that are within the 1% AEP floodplains where possible, and areas of native vegetation; however, by virtue of the requirement of laydown areas for constructing bridges, some laydown areas must be within floodplains and near watercourses or drainage features. In such instances, the following precautions will be taken:

- The site will be surveyed prior to site establishment to understand the exact extent of potential flooding impact to facilities and storage areas
- The earthworks and temporary drainage will be designed to minimise flooding impacts.

Fuel storage areas will be bunded, capacity restricted to no larger than required for reasonable operations, and preferentially stored at the furthest point away from watercourses. A full list of laydown areas and their planned uses is provided in Table 5-24.

**TABLE 5-24 LAYDOWN AREAS AND USES**

| ID[1] | Location[2] | Chainage (km) | Size ($m^2$) | Laydown Area impacted by 1% AEP Regional Flooding | Laydown uses | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ballast | Bridge | Culverts | Fuel | Site office | Other | |
| NS2B–LDN031.0 | Kildonan Road | 31.0 | 33,000 | Yes | | ✓ | | | | | General construction laydown |
| NS2B–LDN032.5 | Kildonan Road | 32.5 | 161,000 | Yes | | ✓ | | | | | Bridge laydown |
| NS2B–LDN033.2 | Kildonan Road | 33.2 | 7,000 | No | | | ✓ | | | | General construction laydown |
| NS2B–LDN035.6 | Eukabilla Road | 35.6 | 88,000 | No | ✓ | | ✓ | ✓ | ✓ | | Major construction laydown:<br>▸ Site offices<br>▸ Fuel storage (<20,000 L) |
| B2G–LDN000.9 | Georges Ln (extension) | 0.4 | 126,000 | No | ✓ | | | | | | General construction laydown |
| B2G–LDN006.3 | Yelarbon–Kurumbul Road | 6.2 | 10,000 | No | ✓ | | ✓ | ✓ | | | General construction laydown:<br>▸ Fuel storage (<10,000 L) |
| B2G–LDN016.0 | Yelarbon–Kurumbul Road | 16.0 | 26,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN020.3 | Yelarbon–Kurumbul Road | 20.4 | 8,000 | No | ✓ | | | | | | General construction laydown |
| B2G–LDN025.9 | Yelarbon (south) | 25.8 | 21,000 | Yes | ✓ | | ✓ | ✓ | ✓ | | General construction laydown:<br>▸ Fuel storage (<10,000 L) |
| B2G–LDN025.9 | Yelarbon (north) | 25.9 | 12,000 | Yes | ✓ | ✓ | ✓ | ✓ | ✓ | | General construction laydown:<br>▸ Site offices<br>▸ Bridge laydown for Cunningham Highway bridge<br>▸ Fuel storage (<10,000 L) |
| B2G–LDN030.0 | Suttons Road | 30.0 | 11,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN037.6 | Springborg Road | 37.6 | 12,000 | No | ✓ | | ✓ | | | | General construction laydown |
| Whetstone MDC | Whetstone Access and Cunningham Highway | 44.8 | 2,126,200 | Yes | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Material Distribution Centre<br>Major Site office location<br>Fuel storage (<20,000 L) |
| B2G–LDN049.8 | McDougalls Crossing Road | 49.70 | 30,000 | No | ✓ | | ✓ | | | | General construction laydown |

| ID[1] | Location[2] | Chainage (km) | Size (m²) | Laydown Area impacted by 1% AEP Regional Flooding | Laydown uses | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ballast | Bridge | Culverts | Fuel | Site office | Other | |
| B2G–LDN052.8 | Cremascos Road | 52.8 | 11,000 | Yes | | ✓ | | | | | Bridge construction laydown for UT1 Macintyre Brook bail bridge #1 |
| B2G–LDN054.2 | Cremascos Road | 54.3 | 54,000 | No | ✓ | | ✓ | ✓ | ✓ | | General construction laydown:<br>▸ Site offices<br>▸ Fuel storage (<10,000 L) |
| B2G–LDN055.4 | Cremascos Road | 55.4 | 33,000 | Yes | | | | | | | Bridge Construction Site<br>Laydown for UT2 Macintyre Brook Rail Bridge |
| B2G–LDN060.4 | Bybera Road | 60.5 | 27,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN065.8 | Lovells Crossing Road | 65.8 | 25,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN067.6 | Thornton Road | 67.6 | 10,000 | Yes | | ✓ | ✓ | | | | Bridge construction site<br>Laydown for Pariagara Creek rail bridge |
| B2G–LDN069.0 | Thornton Road | 68.8 | 41,000 | Yes | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN073.0 | Millmerran–Inglewood Road | 72.9 | 8,000 | No | | ✓ | | | | | Laydown for Millmerran–Inglewood Road rail bridge #1 |
| B2G–LDN074.0 | Millmerran–Inglewood Road | 74.2 | 148,000 | No | ✓ | | ✓ | ✓ | ✓ | | General construction laydown:<br>▸ Site offices<br>▸ Fuel storage (<10,000 L) |
| B2G–LDN081.0 | Wongavale Yugibar Road | 81.1 | 27,000 | No | ✓ | | ✓ | ✓ | ✓ | | General construction laydown:<br>▸ Fuel storage (<10,000 L) |
| B2G–LDN088.0 | Millmerran–Inglewood Road | 88.1 | 29,000 | Yes | ✓ | | ✓ | | | | Bridge construction site<br>Laydown for Cattle Tree Creek Rail Bridge |
| B2G–LDN091.8 | Site track off Millmerran–Inglewood Road | 91.9 | 15,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN093.8 | Millmerran–Inglewood Road | 93.8 | 13,000 | No | | ✓ | ✓ | | | | Bridge construction site<br>Laydown for Native Dog Creek rail bridge |
| B2G–LDN098.0 | Millmerran–Inglewood Road | 97.9 | 31,000 | Yes | | ✓ | ✓ | | | | Bridge construction site<br>Laydown for Bringalily Creek #1 rail bridge |
| B2G–LDN100.6 | Millmerran–Inglewood Road | 100.7 | 3,000 | No | | ✓ | ✓ | | | | Bridge construction site<br>Laydown for Bringalily Creek #3 rail bridge |

| ID[1] | Location[2] | Chainage (km) | Size ($m^2$) | Laydown Area impacted by 1% AEP Regional Flooding | Laydown uses | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ballast | Bridge | Culverts | Fuel | Site office | Other | |
| B2G–LDN104.5 | Partons Road | 104.6 | 26,000 | Yes | ✓ | ✓ | ✓ | ✓ | | | General construction laydown<br>Bridge construction site<br>Laydown for Nicol Creek rail bridge<br>Fuel storage (<10,000 L) |
| B2G–LDN112.1 | Millwood Road | 112.2 | 26,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN115.6 | Millmerran–Inglewood Road/ Heckendorf Road via LDN 116.00 | 115.7 | 14,000 | No | | ✓ | | | | | Bridge construction site<br>Laydown for Millmerran–Inglewood Road rail bridge |
| B2G–LDN116.0 | Heckendorf Road | 116.2 | 94,000 | No | ✓ | | ✓ | ✓ | ✓ | | General construction laydown:<br>▸ Site offices<br>▸ Fuel storage (<20,000 L) |
| B2G–LDN120.2 | Blackwell Road | 120.2 | 104,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G-LDN123.6 | Scragg Road | 123.7 | 20,000 | No | | | | | | | General construction laydown |
| B2G-LDN123.8 | Scragg Road | 123.8 | 11,000 | No | | ✓ | | | | | General construction laydown |
| B2G-LDN126.9 | Schwartens Road | 126.9 | 7,000 | Yes | | ✓ | ✓ | | | | Bridge Construction Site<br>Laydown for Millmerran-Inglewood #3 Road Bridge |
| Turallin facility | Turallin Road | 127.0 | 218,000 | N/A | ✓ | ✓ | ✓ | ✓ | ✓ | | General construction laydown:<br>▸ Fuel storage (<10,000 L) |
| B2G-LDN128.2 | Owens Scrub Road | 128.4 | 27,000 | Yes | | ✓ | | | | | Bridge Construction Site<br>Laydown for Back Creek Rail Bridge |
| B2G–LDN129.5 | Foxwood Road | 129.4 | 119,000 | No | ✓ | | | | | ✓ | General construction laydown |
| B2G-LDN130.0 | Owens Scrub Road | 130.0 | 27,000 | No | | ✓ | ✓ | | | | Laydown for Owens Scrub Road Bridge |
| B2G-LDN130.6 | Owens Scrub Road | 130.6 | 168,000 | No | | | | | | ✓ | General construction laydown |
| B2G-LDN130.4 | Owens Scrub Road | 130.7 | 89,000 | No | | | | | | ✓ | General construction laydown |
| B2G–LDN138.5 | Hall Road | 138.6 | 116,000 | Yes | | | | | | ✓ | General construction laydown:<br>▸ Precast facility<br>▸ Concrete batch plant |
| B2G–LDN139.0 | Hall Road | 139.2 | 304,000 | Yes | ✓ | ✓ | ✓ | | | | Bridge Construction Site<br>Laydown for Grasstree Creek #1 and #2 Rail Bridge |

| ID[1] | Location[2] | Chainage (km) | Size (m²) | Laydown Area impacted by 1% AEP Regional Flooding | Laydown uses | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ballast | Bridge | Culverts | Fuel | Site office | Other | |
| B2G–LDN140.2 | Millmerran Leyburn Road | 141.6 | 76,000 | Yes | | | ✓ | | | | General construction laydown |
| B2G–LDN141.3 | Millmerran Leyburn Road | 142.6 | 12,000 | Yes | | ✓ | ✓ | | | | Bridge Construction Site<br>Laydown for Condamine River South Branch Rail Bridge |
| B2G–LDN143.0 | Gilgai Lane | 144.4 | 9,000 | Yes | | ✓ | | | | | Bridge construction site<br>Laydown for Condamine River Main Rail Bridge |
| B2G–LDN144.6 | Gilgai Lane | 146.0 | 142,000 | Yes | | ✓ | ✓ | | | | Laydown for Condamine River Main Branch Rail Bridge |
| B2G–LDN147.1 | Fysh Road | 148.4 | 4,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN149.0 | Gore Highway | 150.1 | 47,000 | Yes | | ✓ | ✓ | | | | Laydown for Condamine River North Branch rail bridge |
| B2G–LDN150.5 | Dieckmann Road | 152.1 | 132,000 | No | | | | | | ✓ | Potential precast facility and concrete batch plant |
| B2G–LDN150.9 | Ware Street | 152.1 | 5,000 | No | ✓ | | | | | | General construction laydown |
| B2G-LDN152.9 | Madelaine Street | 153.3 | 6,000 | No | | | | | | | General construction laydown |
| B2G–LDN153.1 | Gore Highway | 154. 6 | 91,000 | No | | ✓ | ✓ | | | | Bridge construction site for Gore Highway bridge |
| B2G–LDN161.0 | Yarralea Road | 162.3 | 63,000 | No | ✓ | ✓ | ✓ | ✓ | ✓ | | Major construction laydown:<br>▸ Site offices<br>▸ Fuel storage (<20,000 L)<br>▸ Laydown for Yarranlea Road rail bridge |
| B2G–LDN163.3 | Roche Road | 164.7 | 5,000 | No | | ✓ | | | | | General construction laydown for Roche Road rail bridge |
| B2G–LDN164.3 | Murlaggan Road | 165.6 | 24,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN165.6 | Kahler Road | 166.9 | 7,000 | No | ✓ | | | | | | General construction laydown |
| B2G–LDN169.6 | Gore Highway | 171.0 | 30,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN171.0 | Oakey Pittsworth Road | 172.3 | 7,000 | No | | ✓ | | | | | Bridge construction site<br>Laydown for Oakey–Pittsworth Road rail bridge |
| B2G–LDN172.0 | Lochaber Road | 173.3 | 16,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN172.6 | Lochaber Road | 173.8 | 19,000 | No | | ✓ | | | | | Laydown for Lochaber Road rail bridge |
| B2G–LDN173.5 | Paint Mine Road | 174.8 | 17,000 | No | ✓ | | ✓ | | | | General construction laydown |

| ID[1] | Location[2] | Chainage (km) | Size (m²) | Laydown Area impacted by 1% AEP Regional Flooding | Laydown uses | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ballast | Bridge | Culverts | Fuel | Site office | Other | |
| B2G–LDN175.5 | Linthorpe Road | 176.9 | 69,000 | No | ✓ | | ✓ | ✓ | ✓ | | Multi-use construction laydown including:<br>▸ Satellite offices<br>▸ Fuel storage (<10,000 L)<br>▸ Road upgrade laydown |
| B2G–LDN179.0 | Geitz Road via Linthorpe Valley Road | 180.2 | 22,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN183.0 | Bushy Lane | 184.3 | 20,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN183.8 | Biddeston Sourthbrook Road | 185.1 | 16,000 | No | | ✓ | | | | | Laydown for Biddeston–Southbrook Road rail bridge |
| B2G–LDN185.0 | Gore Highway | 186.5 | 30,000 | No | ✓ | | ✓ | | | | General construction laydown |
| B2G–LDN188.2 | Athol School Road | 189.5 | 76,000 | No | ✓ | | ✓ | ✓ | ✓ | | Major construction laydown:<br>▸ Site offices<br>▸ Fuel storage (<10,000 L) |
| B2G–LDN192.3 | via Athol Road | 193.6 | 30,000 | No | ✓ | | ✓ | ✓ | ✓ | | General construction laydown:<br>▸ Fuel storage (<10,000 L) |
| B2G–LDN196.2 | Toowoomba–Cecil Plains Road via existing side road | 197.4 | 4,000 | Yes | | ✓ | ✓ | | | | Bridge construction site for Toowoomba–Cecil Plains Road rail bridge |
| B2G–LDN197.0 | Toowoomba-Cecil Plains Road | 198.3 | 4,000 | No | | ✓ | ✓ | | | | Bridge construction site for Westbrook Creek rail bridge |
| B2G–LDN198.1 | Brimblecombe Road | 199.4 | 4,000 | No | | ✓ | ✓ | | | | Bridge construction site for Dry Creek rail bridge |
| B2G–LDN198.7 | Brimblecombe Road | 200.0 | 3,000 | Yes | | ✓ | | | | | Bridge construction site for Brimblecombe Road rail bridge |
| B2G–LDN203.0 | Warrego Highway | 204.3 | 4,000 | Yes | | ✓ | | | | | Bridge construction site for Warrego Highway rail bridge |
| B2G–LDN204.2 | Chamberlain Road | 205.5 | 35,000 | No | | ✓ | ✓ | | | | Laydown for Chamberlain Road rail bridge |
| B2G–LDN206.3 | Leesons Road | 207.6 | 30,000 | No | ✓ | | ✓ | ✓ | ✓ | | General construction laydown:<br>▸ Site offices<br>▸ Fuel storage (<10,000 L) |
| B2G-FBW206.9 | Draper Road | 208.2 | 81,000 | Yes | | | | | | ✓ | General construction laydown |

**Table note:**
1. Refer to drawings in Appendix B1: Design Drawings
2. Laydown areas will be used during mobilisation and civil construction of the Project.

### 5.6.8 Fuel

Diesel is to be stored during construction at 16 nominated laydown areas as identified in Table 5-24. Diesel will be stored in self-bunded, relocatable fuel pods with a nominal capacity of about 10,000 L, with up to 20,000 L stored at two nominated laydown areas. The storage and handling of diesel will be in accordance with *AS 1940:2017 The storage and handling of flammable and combustible liquids* (Standards Australia, 2017a) and any further approval conditions.

During refilling, the fuel pods will be moved to or pre-positioned in an area with a drainage system capable of isolation from the surrounding area to contain spills. Refuelling of mobile plant will be conducted using a mobile service truck with an appropriate spill-control kit on board. The Project will not have a requirement to undertake chemical storage, including the storage of class C1 or C2 (combustible liquids such as fuel) in volumes that would trigger Environmentally Relevant Activity (ERA) 8 (chemical storage) or notifiable activity 29(3) (petroleum product or oil storage for combustible liquids) under the *Environmental Protection Act 1994* (Qld). Details regarding storage requirements, scale and intensity of use of materials is detailed Table 5-25 and Chapter 21: Hazard and Risk.

During the detailed design and pre-construction and early works stages, the Project will continue to investigate alternative opportunities for the bulk storage of fuel along the corridor, including mobile refuelling mechanisms. Specification and requirements on the storage of diesel will be in accordance with *AS 1940:2017 The storage and handling of flammable and combustible liquids* and any further approval conditions (Standards Australia, 2017a).

### 5.6.9 Other hazardous materials

During construction, laydown areas will be used for the storage and distribution of hazardous materials required for construction purposes. The non-resident workforce accommodation facilities may also have a hazardous materials storage requirement to enable self-sufficient operation.

The dangerous goods and hazardous substances likely to be required for construction activities have been determined based on usage on similar rail projects. The types and indicative quantities are identified in Table 5-25.

**TABLE 5-25 INDICATIVE LIST OF DANGEROUS GOODS AND HAZARDOUS SUBSTANCES REQUIRED DURING CONSTRUCTION**

| Chemical type | Typical chemicals | Purpose/use | Dangerous good class | Packing group | Indicative rate of use | Expected storage method |
|---|---|---|---|---|---|---|
| Fuel oil[4] | Diesel and engine oils | Fuel for mobile or fixed equipment | C1[2] | III | 20 kL/week | 20 kL bulk storage (fuel depots) |
| | Unleaded petrol | Fuel for mobile equipment | C3 | II | As required by the local construction team | 20 kL bulk storage (fuel depots) |
| Grease | Rocol rail curve grease | Lubricate plant and equipment | C2[3] | N/A | Limited | Package storage |
| | Caltex 904 grease | Lubricate plant and equipment | C2[3] | N/A | Limited | Package storage |
| | Shell GADUS gauge face curve grease | Lubricate plant and equipment | C2[3] | N/A | Limited | Package storage |
| | RS Claretech Biodegradable Grease | Lubricate plant and equipment | C2[3] | N/A | As required by cutting/borrow pit activities | Package storage |
| Blasting chemicals | Ammonium nitrate[1] | Cuttings and borrow pit operations | 5.1 | III | Limited | Not stored |
| | Blasting explosives | Cuttings and borrow pit operations | 1 | II | Limited | Not stored |
| Concreting | Concrete and concrete residue | Concreting for slab construction | N/A | N/A | As required by the local construction team | Truck deliveries |
| | Concrete curing compound | Concreting for slab construction | N/A | N/A | As required by the local construction team | Truck deliveries |

| Chemical type | Typical chemicals | Purpose/use | Dangerous good class | Packing group | Indicative rate of use | Expected storage method |
|---|---|---|---|---|---|---|
| Welding gases | Oxygen | Welding | 2.2/5.1 | N/A | Cylinders and/or manifold packs as required by the local construction team | Cylinder storage |
| | Acetylene | Welding | 2.1 | N/A | Cylinders and/or manifold packs as required by the local construction team | Cylinder storage |
| Pesticides | Australian Pesticides and Veterinary Medicines Authority Approved Pesticides | Pest and weed control | 6.1 or 9 | I, II or III | As required | Not stored in the Project footprint |
| Lime | Calcium oxide | Construction | Soil stabilisation | N/A | As required by the local construction team | Truck deliveries or intermediate bulk container if storage on site required[5] |

**Table notes:**
1. Product is a security sensitive explosive defined under Schedule 7 of the *Explosives Regulation 2017* (Qld).
2. Class C1—a combustible liquid that has a flashpoint of 150°C or less.
3. Class C2—a combustible liquid that has a flashpoint exceeding 150°C.
4. Class C3 – a combustible liquid that has a flashpoint of 60ºC or less.
5. Quicklime is a type of base under alkaline solutions or solids that will be stored in loose stockpiles to prevent water ingress in accordance with Safety Data Sheets.

Generally, low volumes of hazardous chemicals would be stored in accordance with Australian regulatory requirements at construction work fronts and laydown areas near points of use for the short duration of time it is anticipated to be needed. The quantities stored will be equivalent to the demand for construction activities within that area of the Project footprint.

As discussed in Section 5.6.7, each laydown area has been positioned to avoid or minimise potential impacts to environmental constraints and social receptors.

### 5.6.10 Concrete batching

The commercial supply and logistics of pre-cast structures requires careful consideration due to the high concrete needs for the Project bridge and culvert components and the significant distance between the Project alignment and existing commercial supply locations. The concrete needs for the Project will be met through a combination of on-site batch plant production and pre-cast structures which will require temporary storage on laydown sites. Two facilities are required during construction for the dual activities of precast concrete structure storage (laydown) and on-site concrete batching (see Table 5-26 and Figure 5-21). The proposed locations are immediately north and south of the Condamine River floodplain outside the 1% AEP flood extents. Existing commercial facilities suppling pre-cast and concrete structures are also identified on Figure 5-21.

Stated conditions for secondary approvals are not sought for the two concrete batch plant and precast concrete facilities through the revised draft EIS. Where required, secondary approvals will be obtained for the facilities following the EIS process to support the Project requirements. The Project will not trigger approval under the *Environmental Protection Act 1994* (Qld) for ERA 41 as the Project is not manufacturing cement.

**TABLE 5-26 IDENTIFIED PRECAST CONCRETE FACILITY AND CONCRETE BATCH PLANT LOCATIONS**

| ID | Location | Chainage | Description |
|---|---|---|---|
| B2G-LDN150.5 | Brookstead—Gore Highway and Dieckmann Road | Ch 152.0 km | Precast concrete facility and concrete batch plant—north |
| B2G-LDN138.5 | Millmerran—Gore Highway and Hall Road | Ch 138.5 km | Precast concrete facility and concrete batch plant—south |

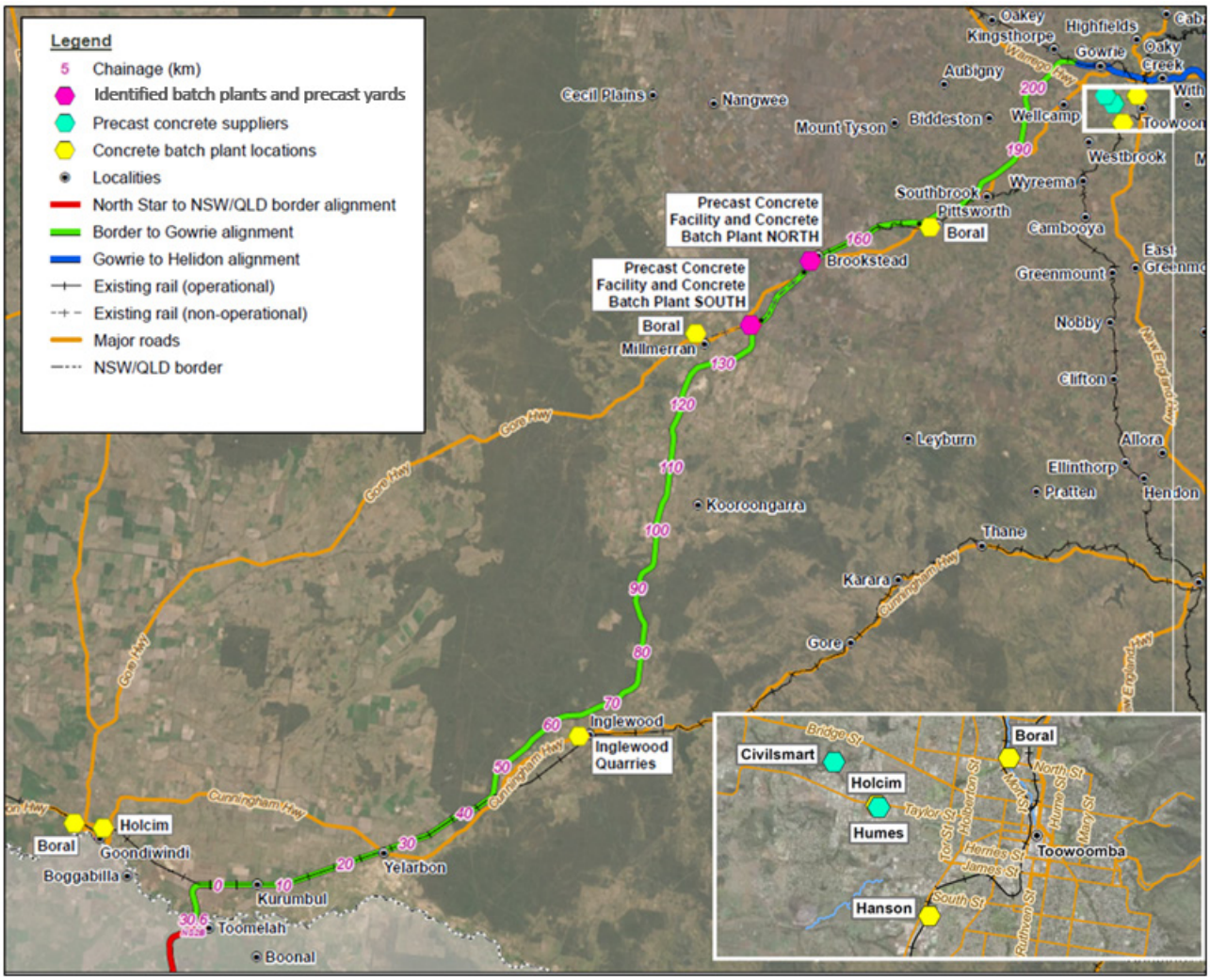



**FIGURE 5-21 ESTABLISHED CONCRETE SUPPLIERS AND LOCATIONS FOR THE IDENTIFIED PRECAST CONCRETE FACILITY AND CONCRETE BATCH PLANT**

### 5.6.11 Bridge construction

All bridge structures will be formed from precast, pre-stressed concrete and in-situ concrete with galvanised steel ancillary elements. Bridge foundations will be piled unless an alternative approach is required due to local geological conditions. It is envisaged that all materials for concrete bridge structures will be delivered by public road network to the Project footprint.

The anticipated methodology for bridge construction is as follows:

- Establishment of bridge construction laydown areas
- Construction of working platform access for piling rigs and cranes. It is assumed that temporary works solutions will allow for the staged construction of working platforms across watercourses, consistent with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018a). Where this is not feasible, temporary steel working stages will need to be constructed for access to the bridge piers.
- Ground improvement (preloading or controlled modulus columns/prefabricated vertical drains method) will be implemented before starting abutment bridge foundation works where required
- Implementing three types of piling method are anticipated to address the various geological conditions along the Project alignment, including:
  - cast-in-place—basic pile construction method applied in general field situations
  - mono pile—applied when the height of the pier is less than 10 m in height, which typically omits the need for pile cap construction and improves program
  - driven pile—used as an alternative for cast-in-place for bridges in low-lying areas, where geotechnical conditions are suitable, and the load forces are acceptable.

- Effective construction methods for the various piers will be implemented based on the site conditions, including:
  - piers of various column heights from 6 m to 20 m and hollow square columns
  - a single circular cross-section column
  - a circular column of varying cross-sections according to the height.
- According to the height of each column, the optimal construction method is used:
  - column height up to 20 m: cast in-situ with traditional formwork and staged concrete pours
  - column height above 20 m: cast in-situ with jump-form. The formwork for jump-form construction is made of steel.
- Headstock and abutment construction using re-usable forms and conventional reinforced concrete
- Bridge superstructure and deck construction:
  - deck structures are expected to be constructed via lifting precast beams into place with a conventional crawler crane.

### 5.6.12 Permanent drainage infrastructure

#### 5.6.12.1 Culverts

Reinforced concrete pipe culverts and reinforced concrete box culverts are the main cross-drainage structure provided in the revised reference design. Precast concrete culverts will be delivered to the nominated construction laydowns and then further distributed to the required installation locations via trucks, using the established construction haulage routes. Culvert installation will generally involve the following activities:

- Preparing survey control points for planned excavations
- Excavating to the required depth
- Placing and compacting the culvert bedding material
- Placing the precast culvert structures on the bedding material and fastening them together
- Proceeding with track works over the top of the culvert
- Restoring, stabilising and revegetating disturbed areas.

Once installed, either side of the culverts will be backfilled with support material. Scour protection measures will also be installed (see Section 5.4.7.1).

Construction of drainage structures will require installation crews throughout the construction period. This construction effort will be a mix of installation before and after the bulk earthworks, so as not to delay the overall earthworks program.

#### 5.6.12.2 Longitudinal drainage

The construction of longitudinal drainage will generally involve the following:

- Preparing survey control points for planned excavations
- Excavating material from the drain location
- Trimming and compacting the base and sides of the drain
- Lining the drain to prevent erosion (grass, rock or concrete are proposed to line longitudinal drainage)
- Discharge points of all drains will include appropriate scour protection.

### 5.6.13 Temporary waterway crossings

Waterway and watercourse crossings are an essential component of the Project and have been incorporated into the design of bridges, viaducts and culvert arrays associated with permanent road, railway and railway maintenance infrastructure. Temporary waterway crossings will be necessary during construction to provide uninterrupted access for plant, vehicles and machinery along the temporary footprint. In addition, temporary waterway crossings will be required to enable safe and efficient construction of permanent waterway crossing structures. Crossings have been designed to reduce impacts to riparian vegetation and the bed and banks of defined watercourses as much as possible while still meeting the performance specifications for Inland Rail, including hydraulic and structural requirements of the crossing infrastructure in terms of the structure's placement, size and design criteria.

Temporary waterway crossings typically consist of clean rock-filled embankments, with culverts providing continuity of stream flow through the embankment along with safe fish passage. Dimensions of the temporary barrier are limited to the minimum practicable for the site and purpose. The design immunity can vary from site to site based on practical factors, site constraints and access requirements; however, this is typically a 20% AEP. Culverts will be of appropriate size and number to ensure there is no impoundment of water upstream of the crossing with a minimum diameter of 300 mm and more standard sizing of 600 mm diameter pipes. The culverts will also require a minimum cover of 300 mm rock layer to satisfy loading requirements and avoid damage or structural collapse.

There will be crossing locations where temporary construction bridges and work platforms are required such as for larger perennial watercourses, contingent on factors such as the size and location of the watercourse channel, the expected construction duration and environmental considerations such as waterway flow and riparian vegetation. The temporary bridge will consist of driven steel piles and cross bracing, steel headstocks and concrete bridge slab. The bridge span would be a minimum of 6 m centres between piers, providing at least 5 m clearance width within the channel.

Potential adverse impacts to the watercourse and its surroundings will be minimised during construction by:

- Scheduling construction works in defined watercourses and drainage features during periods of lower flow, where logistically possible and safe to do so
- Reducing the duration of construction works in riparian zones of watercourses through sequencing of construction, where logistically possible and safe to do so
- Constructing each waterway crossing in accordance with relevant regulations and Project controls, including the CEMP
- Avoiding unnecessary clearing of riparian vegetation and disturbance to the bed and banks of defined watercourses by limiting construction workspaces to no greater than what is needed to support the immediate area construction works and by maintaining minimum setback distances of 30 m for laydown area construction zones where there is flexibility in their location (e.g. machinery storage)
- Adherence to a maintenance and inspection program during construction works to ensure temporary watercourse crossings remain safe, reliable, and compliant with environmental regulations and conditions of approval. Inspections will be on a weekly basis and after significant changes in stream flow. Any necessary repairs or mitigation measures should be taken immediately to prevent further damage or compromise to the crossing's stability.
- Removal of debris trapped on or upstream of the crossing following inspections
- Repair of any damage caused by construction traffic.

Temporary waterway crossings will be removed as soon as possible after they are no longer needed to support construction works in accordance with conditions of approval, waterway barrier permits, environmental regulations and best practices. This process will begin once an alternative access is achieved, or the permanent bridge or culvert structure has been complete. All materials will be removed, reused and disposed in accordance with the Project requirements and the final Outline EMP. The bed and banks of defined waterways will be restored to their original state in accordance with the approved Rehabilitation and Landscaping Management Plan.

### 5.6.14 Bulk earthworks

Construction of the Project including the foundation of the railway line will require earthworks and engineered fill to provide a stable platform designed in accordance with required performance specifications and the Earthworks Strategy and Draft Soil Management Plan in Appendix AB.

Earthwork assessment for the revised reference design confirms a material deficit associated with the various components of the Project, necessitating the sourcing of suitable fill from a number of borrow pit sites to support Project construction. In accordance with the *Waste Reduction and Recycling Act 2011* (Qld) (WRR Act) hierarchy for waste and resource management preferences, the Project's material deficit and reliance on imported material has been reduced by maximising cut-to-fill opportunities, the application of earthwork efficiencies.

Localised surplus fill will be reused for the following as appropriate:

- Excess rock material for scour protection of embankments, bridges and culverts
- Fill for construction-stage elements such as access roads and laydown areas
- For use in the RMAR at rail formation
- Rehabilitation of borrow pit sites
- Reuse by other developments near the Project.

The earthworks associated with the railway line will involve the excavation of cuttings and the construction of formation. Each of these tasks is summarised below.

### 5.6.14.1 Cuttings

Excavation will progress depending on the in-situ material types. If the material is of sufficient quality, is rippable, and does not contain oversized rocks, then dozers and scrapers will move the material along the Project footprint to locations of embankment construction. If the material contains a high percentage of rock, it may be necessary to use excavators and trucks to process this material prior to use in embankment construction. Material use will be dependent on meeting the adopted Inland Rail material specifications (Earthworks Specification ETC-08-03 (ARTC, 2020b), available on the ARTC Extranet: **extranet.artc.com.au**).

Non-rippable rock (rock that is not able to be broken down using smaller plant, e.g. excavators) will be broken via drill and blast or by hydraulic rock breakers. Broken rock will be loaded onto trucks by front-end loaders and excavators and transported along the Project footprint for temporary stockpiling or at its intended point of reuse within the Project.

The occurrence of non-rippable rock within some of the cuttings along the permanent footprint, has been identified mainly in the northern part of the Project alignment. The extent of drilling and blasting will be confirmed through further geotechnical investigations in detailed design; however, based on currently available geotechnical information, it is anticipated that drill and blast may be required for the cuttings between:

- Ch 48.9 km to Ch 51.3 km
- Ch 50.9 km to Ch 50.7 km
- Ch 114.5km to Ch 114.7km
- Ch 165.3 km to Ch 168.6 km
- Ch 176.1 km to Ch 176.6 km
- Ch 178.8 km to Ch 180.5 km
- Ch 186.5 km to Ch 186.9 km
- Ch 190.2 km to Ch 191.6 km
- Ch 193.5 km to Ch 194.6 km.

Where explosives are used during construction, the works will be undertaken by an appointed licenced blasting contractor in accordance with required legislation and controls as detailed in the approved CEMP and the *Explosives Act 1999* (Qld) and *AS 2187.2:2006—Explosives—Storage and Use, Part 2: Use of explosives* (Standards Australia, 2006a). The blasting contractor will need to maintain a Security Management System and prepare a Blast Management Plan for the task to ensure that potential impacts are properly assessed and managed.

### 5.6.14.2 Formation

The formation consists of structural fill and capping, which is then placed on top of the general fill embankment, as shown in Figure 5-5. The Basis of Design requires formation to be designed to accommodate 30 TAL at 80 km/h (Section 5.4.1).

This section provides a description of how each of these formation components is prepared and constructed.

#### Subsoil and embankment

Initially, the native subsoils underlying the Project alignment will be inspected and tested to determine if these materials comply with the adopted Inland Rail material specifications (Earthworks Specification ETC-08-03 (ARTC, 2020b), available on the ARTC Extranet: (**extranet.artc.com.au**)). Where native subsoils do not comply with the material specifications, one or more of the following broad treatment strategies may be applied to achieve compliance:

- Compaction
- Lime treatment to reduce the dispersive/reactive nature of native material. This involves the spreading of lime and mixing it into the soil with a reclaimer/stabiliser, followed by compacting and rolling of the lime-treated material
- Excavation and removal of material for treatment, such as drying, before being reused within the Project footprint, subject to suitability
- Excavation and removal, with replacement of unsuitable materials with suitable fill, which is then compacted. In this instance, unsuitable materials may still have a reuse within the Project footprint.

Once the subsoil has been prepared, the embankment can be constructed. The embankment will be constructed in layers broadly described as follows:

- Placement of material directly via scrapers or trucks, or spread from stockpiles via bulldozers and graders, to the maximum lift depths specified in ARTC specifications (Earthworks Specification ETC-08-03 (ARTC, 2020b), available on the ARTC Extranet: (**extranet.artc.com.au**)
- Compaction of material with roller compactors, and plate compactors for confined working
- Rolling and grading to final level and finish.

The moisture conditioning required for compaction will be determined by site personnel supported by moisture test results. Access ramps onto the embankment will be located at regular intervals to facilitate concurrent activities of fill placement and compaction, and continued delivery of materials.

The embankment fill operations propose to utilise site-won material from cuttings, that meet specification, to provide a suitable surface platform for subsequent layers of fill. Following preparation of fill foundations, material will be excavated from cuttings and haul to fill locations. The movement of material across the site will occur in accordance with the construction program, earthworks zone sequencing and estimated productivities.

Earthworks cut to fill operation will utilise conventional earthmoving plant selected from the indicative list of plant provided in Section 5.6.7. The major key plant will comprise of excavator and truck fleets and dozer and scraper fleets commensurate with compaction fleets that match cut productivities.

Once the material has been placed by the haulage plant, the dozers and compactors will push the material out into the desired loose layer thickness. This will form part of the compaction process with the self-weight of the machines tracking over the fill areas. Graders will be used to trim areas of fill, manage haul roads and cut hillside terracing into the existing/previously placed batter slopes.

Pad-foot and smooth drum rollers will be used purely for compaction of the fill embankments. Once the material is placed by the dozers and compactors, the rollers will progressively move through the placed material until the desired number of passes over the entire area is achieved.

Smooth drum rollers will be used at the end of each shift, or if inclement weather is approaching, to seal the top of the exposed layer to minimise surface water penetration. Fill surfaces will be graded to drain as far as practical. This will effectively manage the risk of any reworks or future embankment testing failures resulting from an excess of moisture from ponding.

**Structural fill and capping**

In the first instance, structural fill will be sourced from cuts within the Project footprint. If there is a lack of suitable structural fill material from cuts, then this material may be sourced from borrow pits or commercial quarries.

Capping material will be transported by existing road network from commercial quarries, as detailed in Section 5.6.15 and Table 5-28.

The following are the key strategies with regards to transport, handling, and placement for structural fill and capping material:

- Suitable material will be transported to the corridor and delivered directly to the Project alignment or stockpiled within the nominated laydown areas of the rail corridor
- The materials will be moisture conditioned and tipped directly onto the formation in suitable volumes to deliver the required thicknesses for compaction
- Spreading and compaction of the material will be undertaken using graders and compactors
- Final trimming and profiling will be undertaken to allow rail construction.

The general configuration of the rail formation is shown in Figure 5-5.

### 5.6.15 Quarries and borrow pits

Following the reuse of suitable structural fill material from cuts, the fill deficit for the Project will be met through the importation of appropriate material types from existing operational, licensed quarries and from seven borrow pits at six borrow pit locations established for the Project (one site with two nominated pits) as shown on Figure 5-22 and further described in Appendix AD Borrow Pits—Supporting Technical Information.

The seven borrow pits are located between Goondiwindi and Millmerran, targeting known fill requirements based on design and earthwork planning. The borrow pits will supply an estimated 298,000 cubic metres ($m^3$) of the Project's fill deficit. The borrow pit locations and configurations (including depth and area) were selected based on structural suitability, environmental constraints to avoid or minimise impacts, property considerations and proximity to fill requirements to minimise haulage.

### 5.6.15.1 Commercial quarries

In some instances, suitable ballast and capping material may be obtained through cut activities along the Project footprint; however, established quarries are expected to be the primary source for ballast and capping and other high-quality aggregates for the Project. The ballast capping and 'other' requirements for the Project are summarised in Table 5-27. These are the maximum tonnages of material that may be required from the nominated operational quarries (locations illustrated in Figure 5-22).

**TABLE 5-27 ESTIMATE OF QUARRY MATERIAL REQUIREMENT FOR BALLAST**

| Material type | Tonnes per metre of railway | Kilotonnes required |
|---|---|---|
| Bottom ballast | 2 | 431.5 |
| Top ballast | 1 | 217.3 |

**TABLE 5-28 ESTIMATE OF QUARRY MATERIAL REQUIREMENT**

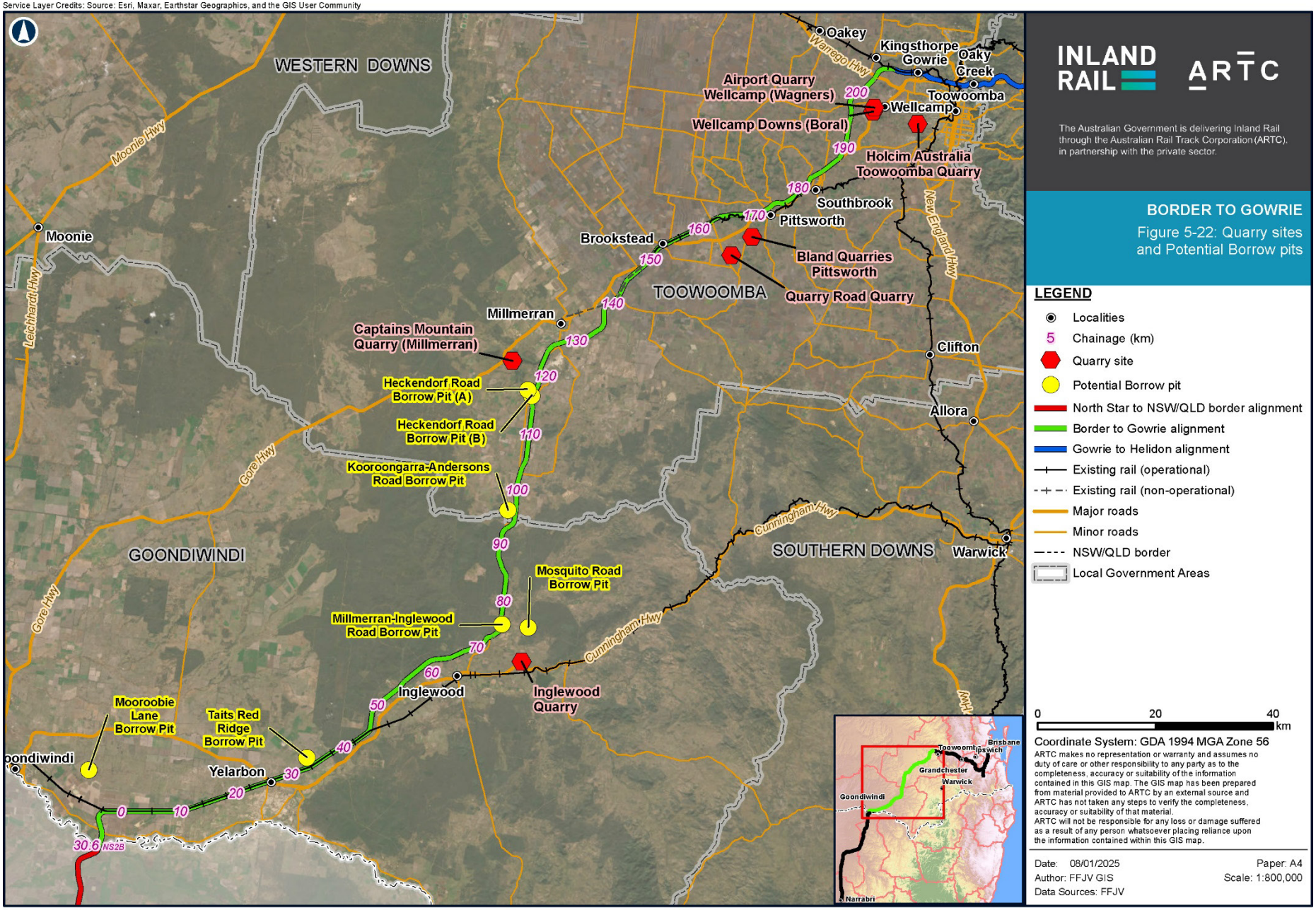
| Material type | Quantity ($m^3$) |
|---|---|
| Capping | 350,000 |
| Structural fill (rail) | 280,000 |
| General fill (rail) | 222,000 |
| Road fill | 642,000 |

### 5.6.15.2 Borrow pits

Standard earthmoving equipment such as bulldozers and trucks will be used to extract material from borrow pits. If required, mechanical screens will be used to screen and grade material. The material will then be transported to construction sites using the public road network and tipped directly onto the formation.

**TABLE 5-29 BORROW PIT DESCRIPTION SUMMARY AND ESTIMATED FILL REQUIREMENTS**

| Location | Lot/Plan | Volumes ($m^3$) | Construction traffic main road access |
|---|---|---|---|
| Mooroobie Lane | Lot 2 on SP229051 | General: n/a | Accessed off Mooroobie Lane |
| | | Structural: 33,900 | |
| Taits Red Ridge | Lot 53 on MH233 | General: n/a | Accessed off the RMAR to the site |
| | | Structural: 33,900 | |
| Mosquito Road | Lot 116 on BNT467 | General: n/a | Accessed off Mosquito-Creek Road |
| | | Structural: 38,500 | |
| Millmerran-Inglewood Road | N/A: -28.338177°, 151.160512° | General: n/a | Access off the RMAR to the site |
| | | Structural: 38,500 | |
| Kooroongarra-Andersons Road | Lot 33 on MA3499 | General: n/a | Accessed from Kooroongarra-Andersons Road |
| | | Structural 38,500 | |
| Heckendorf Road A | Lot 98 on DY182 | General: 26,900 | Accessed from Heckendorf Road |
| Heckendorf Road B | Lot 111 on DY182 | Structural: 87,844 | |


Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
WESTERN DOWNS
TOOWOOMBA
GOONDIWINDI
SOUTHERN DOWNS
Moonie
Oakey
Kingsthorpe
Gowrie
Oaky Creek
Toowoomba
Wellcamp
Airport Quarry
Wellcamp (Wagners)
Wellcamp Downs (Boral)
Holcim Australia
Toowoomba Quarry
Southbrook
Pittsworth
Brookstead
Bland Quarries
Pittsworth
Quarry Road Quarry
Millmerran
Captains Mountain
Quarry (Millmerran)
Heckendorf Road
Borrow Pit (A)
Heckendorf Road
Borrow Pit (B)
Kooroongarra-Andersons
Road Borrow Pit
Mosquito Road
Borrow Pit
Millmerran-Inglewood
Road Borrow Pit
Inglewood
Inglewood
Quarry
Clifton
Allora
Warwick
Mooroobie
Lane
Borrow Pit
Taits Red
Ridge
Borrow Pit
Yelarbon
Moonie Hwy
Leichhardt Hwy
Gore Hwy
Cunningham Hwy
Warrego Hwy
New England Hwy
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
30.6
NS2B
INLAND RAIL
ARTC
The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.
BORDER TO GOWRIE
Figure 5-22: Quarry sites and Potential Borrow pits
LEGEND
Localities
Chainage (km)
Quarry site
Potential Borrow pit
North Star to NSW/QLD border alignment
Border to Gowrie alignment
Gowrie to Helidon alignment
Existing rail (operational)
Existing rail (non-operational)
Major roads
Minor roads
NSW/QLD border
Local Government Areas
0
20
40
km
Coordinate System: GDA 1994 MGA Zone 56
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Date: 08/01/2025
Paper: A4
Author: FFJV GIS
Scale: 1:800,000
Data Sources: FFJV
Brisbane
Ipswich
Toowoomba
Grandchester
Warwick
Goondiwindi
Narrabri
Map by: TM Z:\GIS\GIS_310_B2G\Tasks\310-GIS-202201191620_QuarrySites_PotentialBorrowPits\310-GIS-202201191620_ARTC_F5-22_QuarrySites_PotentialBorrowPits_v2.mxd Date: 8/01/2025 10:22

Borrow pits established and operated to facilitate the construction of government-supported transport infrastructure (Schedule 6, Part 5, Section 26 of the Planning Regulation 2017 (Qld)), constitute development that is exempt from assessment against local government planning schemes (relevantly, the Goondiwindi Region Planning Scheme 2018 (GRC, 2018a) and Toowoomba Regional Planning Scheme 2012 (TRC, 2012). The Project is not seeking stated conditions from the Coordinator-General for secondary approvals under the Planning Act or *Environmental Protection Act 1994* (Qld),) if/where required for borrow pits, and any secondary approvals required for borrow pits will be obtained following the EIS process.

### 5.6.16 Mass haul

The bulk earthworks for rail and road components of the Project are summarised in Table 5-30. Mass haul material movement breakdown in Table 5-31.

**TABLE 5-30 SUMMARY OF BULK EARTHWORKS FOR RAIL AND ROAD COMPONENTS**

| Earthworks | Volume ($m^3$) |
|---|---|
| **Cut** | |
| Cut (rail) | 11,368,000 |
| Cut (road) | 90,700 |
| Total cut | **11,458,700** |
| **Fill** | |
| General (rail) | 10,975,000 |
| Structural (rail) | 551,000 |
| Capping (rail) | 350,000 |
| Fill requirement (rail) | 11,876,000 |
| Fill requirement (road) | 802,300 |
| Total fill requirement | **12,678,300** |

**TABLE 5-31 MASS HAUL MATERIAL MOVEMENT BREAKDOWN**

| Material | Volume $m^3$ |
|---|---|
| **Area 0 (NSW/QLD Border Ch 30.6 km NS2B to B2G 0.00 km)** | |
| Cut to fill | 4,200 |
| Cut to fill to Area 1 (export fill) | 12,900 |
| Import fill from Area 2 | 224,000 |
| Import structural fill from borrow pits | 23,000 |
| Import structural fill from quarry | 16,800 |
| Import capping from quarry | 12,500 |
| Cut to spoil | 900 |
| **Area 1 (Ch 0.0 km to Ch 40.0 km)** | |
| Cut to fill | 59,000 |
| Import fill from Area 2 | 399,000 |
| Import fill from Area 0 | 12,900 |
| Import structural fill from borrow pits | 113,000 |
| Import structural fill from quarry | 200,300 |
| Import capping from quarry | 67,000 |
| Cut to spoil | 3,000 |
| **Area 2 (Ch 40.0 km to Ch 73.1 km)** | |
| Cut to fill | 1,928,700 |
| Cut to fill to Area 0 (export fill) | 224,000 |
| Cut to fill to Area 1 (export fill) | 399,000 |
| Cut to fill to Area 3 (export fill) | 9,000 |
| Import general fill from quarry | 56,900 |
| Import structural fill from borrow pits | 71,000 |

| Material | Volume $m^3$ |
|---|---|
| Import structural fill from quarry | 80,400 |
| Import capping from quarry | 64,400 |
| Cut to spoil | 134,800 |
| **Area 3 (Ch 73.1 km to Ch 100.0 km)** | |
| Cut to fill | 234,000 |
| Import fill from Area 2 | 9,000 |
| Import fill from Area 4 | 458,000 |
| Import structural fill from borrow pits | 64,100 |
| Import structural fill from quarry | 21,000 |
| Import capping from quarry | 45,000 |
| Cut to spoil | 12,300 |
| **Area 4 (Ch 100.0 km to Ch 148.8 km)** | |
| Cut to fill | 1,488,900 |
| Cut to fill to Area 3 (export fill) | 458,000 |
| Cut to fill to Area 5B (export fill) | 93,700 |
| Import structural fill from quarry | 178,700 |
| Import capping from quarry | 68,400 |
| Cut to spoil | 107,600 |
| **Area 5A (Ch 148.8 km to 184.0 km)** | |
| Cut to fill | 2,512,200 |
| Cut to fill to Area 5B (export fill) | 671,700 |
| Cut to fill to Area 6 (export fill) | 905,700 |
| Import structural fill from quarry | 371,600 |
| Import capping from quarry | 58,500 |
| Cut to spoil | 2156,100 |
| **Area 5B (Ch 184.0 km to 203.0 km)** | |
| Cut to fill | 1,755,300 |
| Import fill from Area 4 | 93,700 |
| Import fill from Area 5A | 671,700 |
| Import general fill from borrow pits | 26,800 |
| Import general fill from quarry | 148,500 |
| Import structural fill from quarry | 41,000 |
| Import capping from quarry | 27,000 |
| Cut to spoil | 92,400 |
| **Area 6 (203.0 km to B2G end)** | |
| Cut to fill | 129,800 |
| Import fill from Area 5A | 905,700 |
| Import general fill from quarry | 17,000 |
| Import structural fill from quarry | 11,800 |
| Import capping from quarry | 7,200 |
| Cut to spoil | 6,800 |

### 5.6.17 Plant and equipment

The indicative plant and equipment required for different stages of the construction works are shown in Table 5-32. Plant and equipment requirements will be refined and confirmed with the contractor prior to construction, and in line with consultation with relevant stakeholders.

TABLE 5-32 INDICATIVE PLANT AND EQUIPMENT FOR THE CONSTRUCTION STAGE

| Activity | Week | | Indicative duration (weeks) | Plant type | Indicative number |
|---|---|---|---|---|---|
| | From | To | | | |
| **Mobilisation and site setup** | | | | | |
| Establishment of site compounds and site facilities | 13 | 18 | 6 | Grader | 2 |
| | | | | Dump truck—off road (25 t articulated) | 4 |
| | | | | Excavator—40 t | 2 |
| | | | | Water cart—35 kL | 2 |
| Construction of the precast concrete facility and concrete batch plant | 22 | 27 | 6 | Grader | 1 |
| | | | | Crane | 1 |
| | | | | Dump truck—off road (25 t articulated) | 2 |
| | | | | Excavator—40 t | 1 |
| | | | | Water cart—35 kL | 1 |
| Install construction water infrastructure | 16 | 21 | 6 | Grader | 1 |
| | | | | Dump trucks—off road (25 t articulated) | 2 |
| | | | | Excavators—40 t | 1 |
| | | | | Water cart—35 kL | 1 |
| Haul roads and access roads construction (2 crews) | 28 | 45 | 8 | Grader | 2 |
| | | | | Excavator—40 t | 1 |
| | | | | Scraper | 2 |
| | | | | Dump truck—off road (25 t articulated) | 2 |
| | | | | Water cart—35 kL | 2 |
| Haul road maintenance | 46 | 226 | 181 | Grader | 2 |
| | | | | Scraper | 1 |
| | | | | Truck—on road tandem | 2 |
| | | | | Water cart—35 kL | 2 |
| **Earthworks** | | | | | |
| Clearing and grubbing/ topsoil stripping | 27 | 113 | 86 | Bulldozer | 20 |
| | | | | Excavator—40 t | 10 |
| | | | | Truck—25 t articulated | 10 |
| | | | | Scraper | 5 |
| | | | | Water cart—35 kL | 5 |
| | | | | Mulcher | 4 |
| Cut-to-fill—scraper crew | 27 | 115 | 89 | Bulldozer D11—pushing | 2 |
| | | | | Bulldozer D10—ripping | 2 |
| | | | | Scraper—5 (for a 1.5–2 km cycle) | 10 |
| | | | | Water cart—35 kL | 4 |
| Compaction crew—scraper matched | 27 | 147 | 121 | Bulldozer | 3 |
| | | | | Padfoot roller—20 t | 3 |
| | | | | Compactor | 6 |
| | | | | Grader | 6 |
| | | | | Water cart—35 kL | 6 |
| Cut-to-fill—excavator and truck crew (peaking at 4 crews total) | 27 | 115 | 89 | Excavator—85 t | 6 |
| | | | | Excavator—50 t | 1 |
| | | | | Truck—50 t<br>To match excavator productivity, cycle time—average 6 trucks per 5 km haul | 80+ |
| | | | | Water cart—35 kL | 8 |

| Activity | Week | | Indicative duration (weeks) | Plant type | Indicative number |
|---|---|---|---|---|---|
| | From | To | | | |
| Rock blasting | 27 | 115 | Rarely | Bulldozer | 10 |
| | | | | Drill Rig | 1 |
| | | | | Excavator | 1 |
| | | | | Trucks | 2 |
| Compaction crew—excavator matched | 27 | 147 | 121 | Padfoot roller—20 t | 10 |
| | | | | Compactor | 10 |
| | | | | Grader | 18 |
| | | | | Water cart—35 kL | 18 |
| | | | | Dozer | 10 |
| Import structural fill | 77 | 149 | 72 | Loader | 2 |
| | | | | Dozer | 4 |
| | | | | Excavator—40 t | 2 |
| | | | | Water cart—35 kL | 4 |
| | | | | Trucks - on road tandem | 40 |
| Place structural fill | 77 | 149 | 72 | Padfoot roller—20 t | 3 |
| | | | | Dozer | 3 |
| | | | | Compactor | 3 |
| | | | | Grader | 4 |
| | | | | Water cart—35 kL | 4 |
| | | | | Concrete pump | 1 |
| **Structures** | | | | | |
| Substructure/foundations construction | 72 | 173 | 102 | Piling rig | 7 |
| | | | | Excavators—40 t | 7 |
| | | | | Concrete truck | As required |
| Pier construction | 74 | 177 | 104 | Excavators—40 t | 7 |
| | | | | Crane | 7 |
| | | | | Concrete truck | As required |
| Superstructure construction | 86 | 181 | 96 | Crane | 7 |
| **Drainage** | | | | | |
| Install cross drainage | 37 | 147 | 111 | Excavator—30 t | 17 |
| | | | | Work truck (Hiab) | 17 |
| | | | | Small compactor | 17 |
| | | | | Concrete truck | 17 |
| | | | | Concrete pump | 8 |
| | | | | Franna Crane | 17 |
| | | | | Backhoe—20 t | 17 |
| **Rail civil works**[1] | | | | | |
| Capping material import | 120 | 183 | 64 | Trucks - on road tandem | 10 |
| | | | | Excavator—40 t | 1 |
| | | | | Water cart—35 kL | 1 |
| | | | | Bulldozer | 1 |
| Capping material placement | 120 | 183 | 64 | Roller—15 t | 1 |
| | | | | Compactor | 1 |
| | | | | Grader | 2 |
| | | | | Water cart—35 kL | 2 |
| | | | | Dozer | 1 |

| Activity | Week | | Indicative duration (weeks) | Plant type | Indicative number |
|---|---|---|---|---|---|
| | From | To | | | |
| Bottom ballast | 167 | 192 | 25 | Bulldozer or grader | 1 |
| | | | | Front end loader | 1 |
| | | | | Excavator—20 t | 1 |
| | | | | Smooth drum roller—14 t | 1 |
| | | | | Truck—on road tandem | 6 |
| Sleeper installation | 189 | 201 | 13 | Front-end loader | 3 |
| | | | | Excavator—20 t | 3 |
| | | | | Truck—on road tandem | 2 |
| | | | | Track laying machine | 1 |
| Rail | 193 | 201 | 9 | Front-end loader | 3 |
| | | | | Excavator—20 t | 3 |
| | | | | Truck | 2 |
| | | | | Track laying machine | 1 |
| Top ballast | 198 | 205 | 8 | Front-end loader | 1 |
| | | | | Excavator—20 t | 1 |
| | | | | Ballast train | 1 |
| | | | | Water cart | 1 |
| | | | | Truck | 6 |
| Track tamping and regulating | 202 | 225 | 24 | Regulator | 1 |
| | | | | Excavator—20 t | 1 |
| | | | | Water cart—35 kL | 1 |
| | | | | Tamper 08-16 | 1 |
| | | | | Tamper 4S | 1 |
| Rail stressing | 222 | 226 | 5 | Truck—flat bed | 2 |
| **Road civil works** | | | | | |
| Road works | 59 | 208 | 150 | Excavator—30 t | 1 |
| | | | | Compactor—12 t | 2 |
| | | | | Water cart—15 kL | 2 |
| | | | | Truck—on road tandem | 5 |
| | | | | Bitumen seal sprayer/chip sealer | 1 |
| | | | | Grader | 1 |

**Table note:**
1 Specialist equipment listed in Section 5.6.21

### 5.6.18 Erosion and sediment control

Erosion sediment controls will be implemented during the construction works stage of the Project to minimise the risk of offsite and downstream impacts.

The construction works stage Erosion and Sediment Control Plan will be prepared in accordance with the International Erosion Control Association's *Best Practice Erosion and Sediment Control* document (International Erosion Control Association, 2008) and will:

- Minimise runoff and sedimentation from Project activities to existing watercourses and drainage features
- Minimise disturbance to the water quality of existing watercourses and drainage features along the Project alignment.

The revised reference design includes 20 sediment basins for stormwater treatment relevant to construction works. All the proposed sediment basins are passive, which allows surface runoff from a catchment to flow into the sediment basin without the need for pumping.

The placement and sizing of the sediment basins is nominal only and will require reassessment based on the confirmed construction methodology during the detailed design process. Sufficient allowance has been included in the Project footprint for sediment basins to be relocated and/or resized, as required, to support the construction of the Project. Therefore, the placement and sizing of sediment basins will need to be reassessed and revised, as required, as part of the detailed design process. Sufficient allowance has been included in the Project footprint for sediment basins to be relocated and/or resized, as required, to support the detailed design.

**TABLE 5-33 SEDIMENT BASINS FOR THE PROJECT**

| Sediment basin ID and chainage[1] (km) | Catchment size[2] ($m^2$) | Total volume ($m^3$) |
|---|---|---|
| Sediment basin 1 (Ch 48.4) | 50,000 | 871 |
| Sediment basin 2 (Ch 55.5) | 60,000 | 1,046 |
| Sediment basin 3 (Ch 60.4) | 48,000 | 837 |
| Sediment basin 4 (Ch 61.6) | 30,000 | 523 |
| Sediment basin 5 (Ch 63.2) | 20,000 | 349 |
| Sediment basin 6 (Ch 97.8) | 40,000 | 697 |
| Sediment basin 7 (Ch 125.5) | 55,000 | 959 |
| Sediment basin 8 (Ch 164.3) | 20,000 | 349 |
| Sediment basin 9 (Ch 171.8) | 25,000 | 436 |
| Sediment basin 10 (Ch 173.8) | 83,000 | 1,447 |
| Sediment basin 11 (Ch 181.2) | 60,000 | 1,046 |
| Sediment basin 12 (Ch 184.7) | 40,000 | 697 |
| Sediment basin 13 (Ch 187.2) | 20,000 | 349 |
| Sediment basin 14 (Ch 190.1) | 45,000 | 784 |
| Sediment basin 15 (Ch 192.1) | 27,000 | 417 |
| Sediment basin 16 (Ch 193.1) | 60,000 | 1,046 |
| Sediment basin 17 (Ch 196.9) | 45,000 | 784 |
| Sediment basin 18 (Ch 199.3) | 62,000 | 1,081 |
| Sediment basin 19 (Ch 205.7) | 63,000 | 1,098 |
| Sediment basin 20 (Ch 206.0) | 60,000 | 1,046 |

**Table notes:**
1. Refer to Appendix B1: Design Drawings.
2. Sediment basin type: Passive

### 5.6.19 Waste disposal

Waste management practices during construction will maximise the reuse or recycling of Project waste to reduce the weight of total material that will otherwise be disposed of to landfill. As part of the CEMP, a Waste Management Plan will be developed and implemented to ensure that recycling/reuse targets are achieved and to keep detailed waste-tracking records. During the preparation and implementation of the Waste Management Plan, consultation will occur with the local authority, commercial recycling organisations and community groups.

An onsite waste management area(s) for sorting and segregating wastes will be established where practicable and nominated in the Waste Management Plan. The onsite sorting area will include colour-coded and clearly marked containers for various materials. Storage facilities (bins and skips) will be provided for the storage of:

- Cardboard
- Timber
- Metal
- Soft plastic
- Polystyrene
- Concrete
- Other materials as applicable to the Project works.

Project waste, including site refuse and any solid or liquid contaminants resulting from Project work, will be disposed of in accordance with all relevant statutory and local authority requirements.

Construction of the Project is expected to result in the generation of a variety of solid wastes, as classified under the Environmental Protection Regulation 2019 (Qld).

Construction waste types and sources are listed in Table 5-34, with further discussion provided in Chapter 22: Waste and Resource Management.

**TABLE 5-34 WASTE TYPES, DESCRIPTION AND POTENTIAL PROJECT SOURCES**

| Waste type | Definition | Potential Project source |
|---|---|---|
| Commercial and industrial | Wastes that are produced by business and commerce. In the case of green waste, it includes material delivered by commercial operation. | ▸ Site offices |
| Construction and demolition | Non-putrescible waste arising from the construction or demolition activity. Construction and demolition waste includes materials such as brick, timber, concrete and steel. | ▸ Demolition/removal of existing structures<br>▸ Construction work fronts<br>▸ Demobilisation of construction activity facilities (including Project amenities, laydown areas and temporary haul/access roads) |
| General | Wastes not defined as regulated waste under legislation. General wastes comprise putrescible wastes (easily decomposed, treated by composting) and non-putrescible wastes (not easily decomposed, may be recyclable). | ▸ Site offices<br>▸ Construction work fronts<br>▸ Laydown areas<br>▸ Clean, excess spoil |
| Green | Includes grass clippings, tree, bush and shrub trimmings, branches and other similar material resulting from landscaping or maintenance activities. | ▸ Clearing and grubbing<br>▸ Site preparation works |
| Recyclables | Wastes that can be reconditioned, reprocessed or reused. Recyclables can be recovered from commercial and industrial waste, construction and demolition waste and general waste. | ▸ Site offices<br>▸ Construction work fronts<br>▸ Laydown areas |
| Regulated | Wastes that require specific controls or actions as defined by legislation. Listed hazardous, regulated, controlled or trackable wastes typically have unique handling and disposal requirements in order to manage specific hazards.<br>Includes waste that is commercial or industrial waste that is of a type or contains a constituent of a type mentioned in Schedule 9 Part 1 Column 1 of the Environmental Protection Regulation 2019 (Qld). Regulated waste includes asbestos, pesticides, a range of chemicals and other industrial wastes. | ▸ Used containers and residues of hazardous chemicals and dangerous goods<br>▸ Demolition/removal of existing structures |

In the area surrounding the Project, wastes are generated from domestic, commercial and agricultural sources. While local governments provide waste collection, recycling and disposal facilities, and services for residential properties; however, for the Project, licensed contractors will be used for the collection, treatment and disposal of wastes.

The management of waste activities associated with the Project will be underpinned by the 2018 *National Waste Policy* (Australian Government, 2018a) and the *Waste Reduction and Recycling Act 2011* (Qld) waste and resource management hierarchy, as listed below in the preferred order to be considered:

- Avoid
- Reduce
- Reuse
- Recycle
- Recover resources, including the recovery of energy
- Treat
- Dispose.

Details of the existing waste management facilities in proximity to the Project that have potential to accept waste from commercial operations are listed in Chapter 22: Waste and Resource Management. These waste management facilities have been considered based on the industry-accepted haul route distance of 50 km for bulk waste and 15 km for municipal waste.

Confirmation of the waste acceptance criteria and available/permissible annual disposal rates will be undertaken in consultation with the relevant operator once the timing for construction of the Project is determined. These investigations will consider:

- Landfill airspace
- Volume of waste generated by the Project requiring disposal
- Other project/industry needs within the surrounding area.

Further details on the potential sources, impacts, mitigation measures and management strategies (including efficiency of resource use) pertaining to Project wastes are discussed in Chapter 22: Waste and Resource Management.

Chapter 7: Sustainability provides an assessment of the Project against sustainability objectives and identifies opportunities to improve sustainable outcomes.

### 5.6.20 Works within the existing rail corridor

The Project uses 68.00 km of existing rail corridor across the QR South Western Line and Millmerran Branch Line.

The staging of the works and their associated impacts will be the subject of an interface agreement between ARTC and QR. It is assumed that ARTC can occupy sections of existing corridor to avoid the need for constrained, short-term possession works. In accordance with Section 255 of the *Transport Infrastructure Act 1994* (Qld) (TI Act), works cannot commence within the existing rail corridor without QR's written approval. Where the construction of Project components within the existing rail corridor is completed during a temporary possession of the rail corridor, then works will be undertaken in accordance with the conditions of the temporary possession and/or wayleave agreement granted to ARTC by QR.

Details of the existing railway interfaces that are present along the Project alignment are summarised in Section 5.4.8. Compliance of staging of works and requirements of the TI Act are detailed in Chapter 3: Legislation and Project Approvals Process. To comply with Section 255 of the TI Act, ARTC will seek written approval prior to commencement of relevant works.

### 5.6.21 Track works

#### 5.6.21.1 General

The proposed method of track construction will be tailored to maintain maximum flexibility, so as not to be confined to the use of dedicated plant or equipment. The focus will be to prioritise the use of readily available plant and equipment that is easy to maintain and has low establishment and operating costs.

However, given the long linear nature of the Project, there will be significant advantages in using a track-laying machine for track construction works. This will increase productivity and reduce the cost per track metre installed. This approach is discussed in Section 5.6.21.2.

#### 5.6.21.2 Track-laying machine

Materials will be based at the Whetstone MDC and will be distributed, via use of readily available plant or equipment, south of the alignment to connect the Project at Ch 30.60 km (NS2B). Once the rail line is complete south of Whetstone, a track-laying machine has the capability to continue rail construction north of Whetstone to the alignment end at Gowrie. A track-laying machine consists of highly developed track laying mechanisms, involving the ability to work with multiple rail-laying materials such as sleepers, ballasts, rail. These mechanisms provide the opportunity for the remaining sections of the alignment to be transported and constructed solely via rail.

#### 5.6.21.3 Bottom ballast

Bottom ballast (laid prior to rail and sleeper installation) may be installed by one of the following approaches:

- Delivery by road or rail to designated stockpile locations situated along the length of the corridor. Deliveries will be staged to suit the construction program and minimise disruption on roads and to the travelling public
- Directly discharged onto the formation via truck and trailer or stockpiled and locally moved via 18 t dump trucks
- Installed along with the top ballast via a works train. This means skeleton track will be constructed directly on the formation, on which the ballast dropping works train would run.

#### 5.6.21.4 Sleepers

Sleepers may be installed by one of the following approaches:

- By excavator, which will place the sleepers using an 'Octopus' sleeper grab, which can pick up to six sleepers at a time and spread them to the correct spacing
- Delivered to the Whetstone MDC to be loaded onto a material train for direct discharge onto the formation by the track-laying machine.

#### 5.6.21.5 Rail

Rail may be installed by one of the following approaches:

- Rail will be distributed by rail via the closest QR and ARTC rail networks to the Whetstone MDC. Approximately 10 per cent of rail has been allocated to be transported via road networks to various points along the alignment. Associated truck movements have been assessed in Appendix AA: Traffic Impact Assessment. This caters for complex locations and components such as turnouts for loops and track panels at level crossings.
- Delivered in short lengths (<30 m) to the Whetstone MDC situated within the construction laydown. This will allow the short rail to be welded into long welded rail and then loaded onto the material train in strings of approximately 400 m. The long welded rail can then be positioned into the Project alignment along with the sleepers through the track-laying machine.

#### 5.6.21.6 Top ballast

The most efficient method of unloading top ballast (applied post-track laying) will be via train using ballast hopper wagons, which would run on rails fastened to sleepers that are laid on the bottom ballast. Laydown areas with direct access to the rail alignment will be used to facilitate the loading of ballast onto a train with ballast hopper wagons can be designated in laydown areas that adjoin the rail alignment.

From the Whetstone MDC, ballast can be delivered along the Project alignment by train. This train would not only distribute top ballast but could also distribute bottom ballast if installing skeleton track straight onto the formation is the desired method of track construction.

The key drivers of this method are the productivity of the key rail-bound equipment and matching this to the earthworks delivery program. Productivity depends on the number of ballast wagons used and the cycle time of the ballast train against the various ballast loading locations, as well as the productivity of the following rail surfacing fleet.

#### 5.6.21.7 Tamping

Tamping machines operate by lifting the track to the required level, shifting the rails and sleepers laterally to the correct alignment, and then compacting the ballast beneath the sleepers. Compaction is achieved by the use of vibrating rods, which are inserted into the ballast on each side of the sleeper and squeezed together. Plain line tamping will be undertaken by a high-output tamper fitted with guidance software, to implement the correct target track geometry. Turnout tampers will be used for the tamping of turnouts and will also be equipped with guidance software.

Depending on the required track construction tolerances and quality of constructed track, tamping operations could take anywhere from three to six passes. Correctly installed bottom ballast levels, adequately compacted bottom ballast and high-quality track installation dramatically reduces tamping operations and follow-up tamp requirements.

#### 5.6.21.8 Turnouts

All crossing loop turnouts and sidings can be constructed in-situ to reduce lifting of switch and crossing panels. All turnout construction will be undertaken early enough in the construction schedule to ensure that any issues caused by incorrect or missing components can be rectified prior to the commissioning of the turnout.

All turnouts connecting to existing operational infrastructure will be pre-built and installed if the rail corridor possession window approved by QR does not provide enough time to construct in-situ. The pre-building and panelling-in method will also ensure that turnout componentry is complete and allows for some welding to happen prior to the rail corridor possession.

### 5.6.22 Road works

Road–rail interfaces for the Project are identified in Table 5-13. Construction works on these interfaces will be required to comply with the asset owners' approved safety requirements and temporary works procedures. In most instances, this will be achieved through adherence to the *Queensland Manual of Uniform Traffic Control Devices* (DTMR, 2023).

The scope of roadwork activities will vary depending on location, however, will typically involve:

- For new builds/realignments:
  - complete the land take
  - road corridor gazettal
  - earthworks
  - pavements
  - drainage works
  - lighting
  - line marking and centre line treatments
  - protective barriers.
- For minor upgrades:
  - seal/pavement upgrades
  - line marking and centre line treatments
  - safety barriers.

For works on, over or adjacent to State-controlled roads would be subject to approvals from DTMR under the TI Act.

Construction stage controls for works within road reserves are specified in Chapter 20: Traffic, Transport and Access and Appendix AA: Traffic Impact Assessment.

### 5.6.23 Utilities and services

Utilities and services such as water, sewerage, electricity and telecommunications will need to be supplied to laydown areas, the non-resident workforce accommodation sites and compounds for use in site offices and amenities as required. Where these utilities are already located close to construction sites, the contractor will engage with utility providers, with the objective of connecting to mains power, water, communications and sewerage. Where connection to existing infrastructure networks is not possible or practicable, temporary portable alternatives will be adopted, for example tanks (water), gen-sets and solar panels (power), cellular network amplifiers (communications), package sewage treatment plants and portaloos.

The utilities and services connections for the Project will be planned to avoid impacts to the supply of services to existing residential and commercial users.

### 5.6.24 Construction water

#### 5.6.24.1 Estimated water volumes

Significant volumes of water will be required for various activities associated with construction of the Project, including for earthworks, track works, concrete production, revegetation and the operation of non-resident workforce accommodations. The following sections provide a discussion on the estimated water demand for each of these purposes. Actual water usage may vary, dependent on earthworks and revegetation quantities following detailed design, climatic conditions and construction methodologies. A more detailed discussion of construction water requirements is provided in Appendix B5: Construction Water.

The estimated construction water requirements for civil earthworks, track works and revegetation are shown for each of the chainage ranges in Table 5-35. The daily and total cumulative water requirements for the Project over the construction period are shown in Figure 5-23.

**Earthworks**

The greatest water demand for the Project will be for civil earthworks, which predominately includes conditioning of fill material, haul road and laydown pad maintenance, and dust suppression. The rates of water application for earthworks activities have been adopted based on the rates used during earthworks for a recent transport infrastructure project in the region and are as follows:

- Material conditioning 100 L/m$^3$ (litres per cubic metre) of fill, however this is variable, dependent on material properties
- General dust suppression during rail and road formation works—50 L/m$^3$
- Maintenance of rail and road embankment—40 L/m$^3$

Fill and water volumes for civil earthworks will be confirmed during the detailed design process.

### Track works

Water is required for dust suppression during track works including ballast dropping and tamping. A conservative allowance of 6 L per track metre has been assumed during ballast dropping, and 4 L per track metre during tamping and regulating activities.

### Concrete batching

The Project will involve the production of concrete structures at two precast concrete facilities and concrete batch plants. A water requirement of 180 L/$m^3$ of concrete production has been estimated for the onsite batching of concrete (wet and precast). Using this rate, the water requirement for onsite concrete batching activities is estimated to be 13.5 ML.

### Revegetation

Water will be required for ground preparation and for establishment of vegetation during reinstatement and rehabilitation of the Project footprint. During the vegetation establishment period watering will:

- Be 'misted' or conducted in a manner that does not cause damage, run-off or subsequent erosion or displacement of treated areas
- Not spray onto, flow across or pond on paved areas including roadways
- Be in general accordance with the watering schedule and rates presented in Table 5-35, which are based on those adopted by DTMR in *Technical Specification MRTS16: Landscape and Revegetation Works* (DTMR, 2017a).
- For the purpose of estimating water requirements for revegetation, it has been assumed that all embankments will be revegetated. This is a conservative estimate, as some embankments will be stabilised using alternative treatments (e.g. shotcrete or rock scour protection). The areas to be revegetated, by chainage range, are presented in Table 5-35.

**TABLE 5-35 SUMMARY OF CONSTRUCTION WATER REQUIREMENT, SCHEDULE FOR DEMAND, AND POTENTIAL SOURCES OF WATER TO MEET DEMAND**

| Purpose | Start location/ Chainage (km) | End location/ Chainage (km) | Duration | Total volume (ML) | Potential sources | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Non-potable surface water (including estimated annual tradeableallocations) | Non-potable groundwater | Recycled | Potable |
| Civil earthworks, track works and revegetation | NSW/QLD Border 30.60 NS2B | Kurumbul 0.00 | 20 months | 67 | Tradeable allocations in the:<br>▸ Macintyre Brook Water Supply Scheme (WSS) (up to 790 ML)<br>▸ Upper Weir River Water Management Area (WMA) (up to 2,805 ML)<br>▸ Border Rivers WMA (up to 489 ML) | Registered bores with available water entitlement—received offers to sell >200 ML/yr in the Goondiwindi LGA | Coal Seam Gas (CSG) production water | N/A |
| | Kurumbul 0.00 | Whetstone 45.00 | 21 months | 278 | Tradeable allocations in the:<br>▸ Macintyre Brook WSS (up to 790 ML)<br>▸ Upper Weir River WMA (up to 2,805 ML)<br>▸ Border Rivers WMA (up to 489 ML) | Registered bores with available water entitlement—received offers to sell >200 ML/yr in the Goondiwindi LGA | CSG production water | N/A |
| | Whetstone 45.00 | Canning Creek 94.50 | 27 months | 551 | Tradeable allocations in the:<br>▸ Macintyre Brook WSS (up to 790 ML)<br>▸ Upper Weir River WMA (up to 2,805 ML)<br>▸ Border Rivers WMA (up to 489 ML) | Registered bores with available water entitlement—received offers to sell >200 ML/yr in the Goondiwindi LGA | Millmerran Power Station (up to 600 ML/yr)<br>CSG production water | N/A |
| | Canning Creek 94.45 | Millmerran 137.00 | 32 months | 372 | Tradeable allocations in the:<br>▸ Upper Condamine WSS (up to 18,531 ML)<br>▸ Upper Condamine WMA (up to 17,435 ML)<br>▸ Condamine and Balonne Tributaries WMA (up to 6,100 ML) | Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in the Toowoomba LGA | Millmerran Power Station (up to 600 ML/yr)<br>CSG production water | N/A |
| | Millmerran 137.00 | Brookstead 151.00 | 30 months | 76 | Tradeable allocations in the:<br>▸ Upper Condamine WSS (up to 18,531 ML)<br>▸ Upper Condamine WMA (up to 17,435 ML)<br>▸ Condamine and Balonne Tributaries WMA (up to 6,100 ML) | Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in the Toowoomba LGA | Millmerran Power Station (up to 600 ML/yr)<br>CSG production water | N/A |

| Purpose | Start location/ Chainage (km) | End location/ Chainage (km) | Duration | Total volume (ML) | Potential sources | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Non-potable surface water (including estimated annual tradeableallocations) | Non-potable groundwater | Recycled | Potable |
| | Brookstead 151.00 | Pittsworth 171.00 | 32 months | 302 | Tradeable allocations in the:<br>▸ Upper Condamine WSS (up to 18,531 ML)<br>▸ Upper Condamine WMA (up to 17,435 ML)<br>▸ Condamine and Balonne Tributaries WMA (up to 6,100 ML) | Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in the Toowoomba LGA | Millmerran Power Station (up to 600 ML/yr) | N/A |
| | Pittsworth 171.00 | Southbrook 180.00 | 28 months | 198 | Tradeable allocations in the Gowrie and Oakey Creek WMA (up to 2,010 ML) | Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in the Toowoomba LGA | Millmerran Power Station (up to 600 ML/yr)<br>Wetalla Water Reclamation Facility | N/A |
| | Southbrook 180.00 | Athol 191.00 | 32 months | 260 | Tradeable allocations in the Gowrie and Oakey Creek WMA (up to 2,010 ML) | Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in the Toowoomba LGA | Wetalla Water Reclamation Facility | N/A |
| | Athol 191.00 | Gowrie 206.95 | 27 months | | Tradeable allocations in the Gowrie and Oakey Creek WMA (up to 2,010 ML) | Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in the Toowoomba LGA | Wetalla Water Reclamation Facility | N/A |

| Purpose | Start location/ Chainage (km) | End location/ Chainage (km) | Duration | Total volume (ML) | Potential sources | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Non-potable surface water (including estimated annual tradeableallocations) | Non-potable groundwater | Recycled | Potable |
| Non-resident workforce accommodations | Inglewood | 34 months | 70.7 | Tradeable allocations in the:<br>▸ Upper Weir River WMA (up to 2,805 ML)<br>▸ Border Rivers WMA (up to 489 ML) | Registered bores with available water entitlement—received offers to sell >200 ML/yr in the Goondiwindi LGA | Onsite recycling. 50% targeted. | Treated un-supplemented supply<br>Tanker delivery | |
| | Yelarbon | 27 months | 75.3 | Tradeable allocations in the:<br>▸ Upper Weir River WMA (up to 2,805 ML)<br>▸ Border Rivers WMA (up to 489 ML) | Registered bores with available water entitlement—received offers to sell >200 ML/yr in the Goondiwindi LGA | Onsite recycling. 50% targeted. | Treated un-supplemented supply<br>Tanker delivery | |
| | Millmerran | 30 months | 61.7 | N/A | N/A | N/A | Treated un-supplemented supply<br>Tanker delivery | |

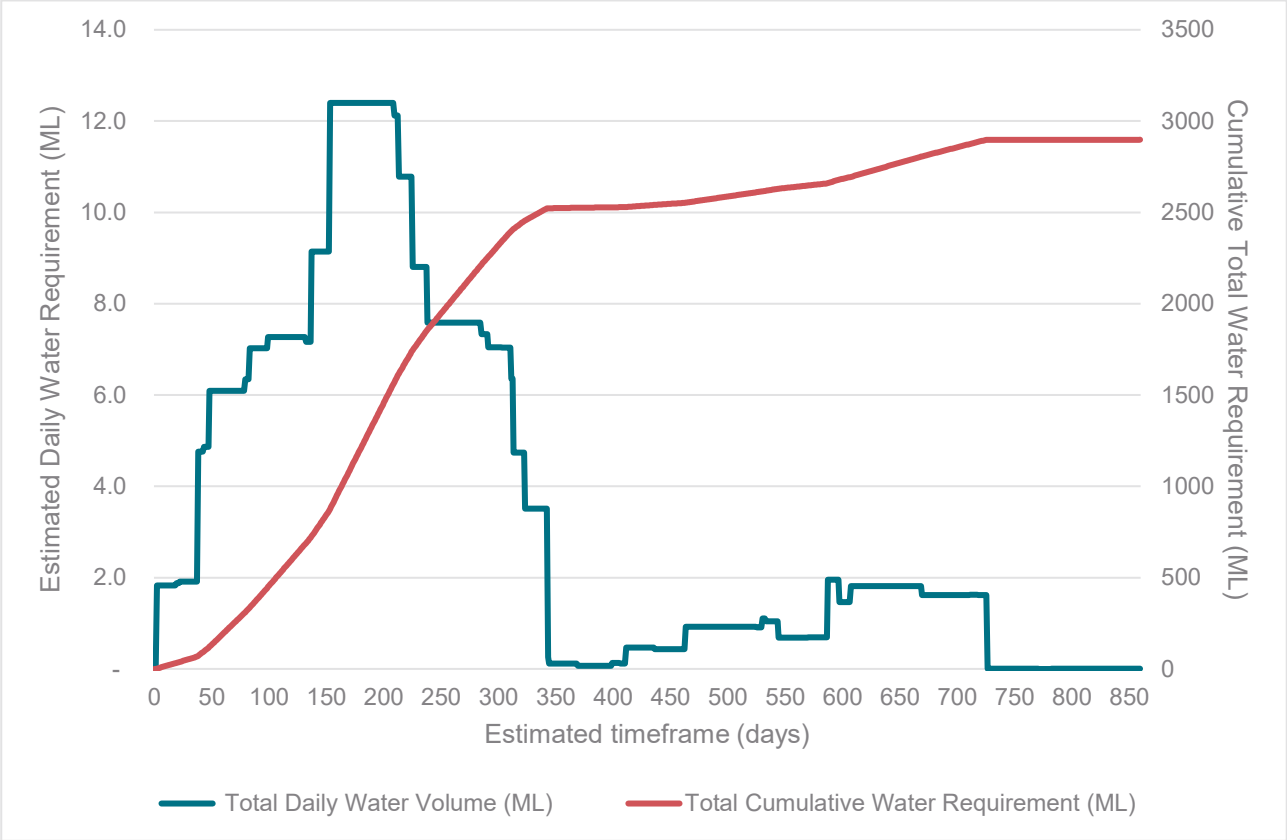


**FIGURE 5-23 ESTIMATED WATER REQUIREMENT DURING CONSTRUCTION**

#### Non-resident workforce accommodations and site offices

The total daily water usage for non-resident workforce accommodations is largely determined by occupancy numbers and includes water used for domestic purposes.

ARTC has consulted with a non-resident workforce accommodation service provider to determine the typical daily water requirement for a non-resident workforce accommodation. An average daily volume of 250 L/person/day has been applied to estimate the water usage for non-resident workforce accommodations. As a comparison, the daily water use per person recorded in Millmerran in February 2022 was 163 L/person/day (TRC, 2022a).

The daily water usage for a single non-resident workforce accommodation will fluctuate with occupancy throughout the construction period. Based on a usage rate of 250 L/person/day, a 300-bed non-resident workforce accommodation will operate on average at 90 per cent capacity (270 occupants), requiring 67.5 kL of water per day.

Onsite package wastewater treatment plants are proposed for the non-resident workforce accommodation facilities. Water for reuse will be treated in accordance with the *National Water Quality Management Strategy: Australian Guidelines for Sewerage Systems – Effluent Management* (Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council, 1997) to a standard appropriate for the intended use, so that the treated water has the potential to be used for irrigation or dust suppression. Wastewater will be used onsite for these water demands so as to minimise the volumes of water that must be imported, and to minimise the volumes of wastewater requiring disposal. Any wastewater not re-used onsite and/or by-products of treatment not suitable for reuse will be taken offsite for lawful disposal by a licenced waste contractor.

### 5.6.24.2 Water quality requirements

This section provides details on the water types, and quality requirements for each anticipated end use. All water sources that are identified for construction water supply will be subject to testing prior to first use to establish the quality at source, the appropriate end use and any intermediate treatment that may be required.

#### Earthworks, track works and revegetation

Non-potable water will be used for earthworks, track works and revegetation activities.

**Concrete batching**

Concrete batching has specific water-quality requirements in order to achieve structural integrity and asset life objectives. The water requirements for use in the supply of concrete are specified in:

- AS 1379–2007: Specification and supply of concrete (Standards Australia, 2007)
- AS 2159–2009: Piling – Design and installation (Standards Australia, 2009a)
- AS 3600–2018: Concrete structures (Standards Australia, 2018b)
- Scaling and aggressivity potential (Langelier, 1946; Ryznar, 1944).

The concrete batching and precast plant will require a water source of guaranteed quality. The concrete batching and precast plant facilities will have onsite water storage tanks, which would be filled by water trucks drawing water from either a potable or recycled source. Dependent on quality of supplied water, recycled water may require further treatment prior to being suitable for use in concrete batching.

**Non-resident workforce accommodation facilities and site offices**

Potable water will be required for drinking, cooking and showering. For all other non-resident workforce accommodation water uses (e.g. toilets, laundry, non-resident workforce accommodation maintenance), non-potable water may be used.

Water for potable use will typically be trucked in from mains standpipes or non-potable sources, treated onsite via package treatment plant, and filtered. Any non-potable water will need to be tested pre and post treatment to ensure that the quality requirements specified in the *Australian Drinking Water Guidelines* (NHMRC and NRMMC, 2011) are being achieved.

The supply of non-potable water may include recycled water. All recycled water providers are obliged to supply recycled water that is:

- 'Fit for use' and does not represent a 'public health risk', as defined in the *Public Health Act 2005* (Qld)
- Consistent with the quality requirements of:
  - *The Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)* (Environment Protection and Heritage Council (EPHC), 2006)
  - For augmentation of drinking water supplies, the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) – Augmentation of Drinking Water Supplies* (EPHC, 2008)
  - For harvesting and reuse of stormwater, the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) – Stormwater Harvesting and Reuse* (EPHC, 2009).

### 5.6.24.3 Water sources

The Australian Rail Track Corporation recognises that water sourcing and availability is critical to supporting the construction of the Project. Sources of construction water will be finalised as the construction approach is refined during the detailed design. Through this process, refined water demand planning will be undertaken, including detailed contingency options, if protracted dry seasonal conditions prevail and water supply options become unavailable.

The ultimate water sourcing strategy for the Project will be documented in a Construction Water Plan.

Water source types are grouped into the following classifications:

- Potable
- non-potable—non-potable water will be sourced from dams, rivers, creeks and groundwater that are subject to the provisions of the relevant Water Plans, and may include the following water types:
  - supplemented sources: refers to water delivered from infrastructure, e.g. dams. Supplemented supplies are managed by water supply scheme operators
  - un-supplemented sources: surface water or groundwater that is not reliant on infrastructure to store or distribute water
  - recycled sources: in Queensland, recycled water is regulated differently depending on how the recycled water is used. For example, irrigation and dust suppression are regarded as low exposure uses, while uses such as toilet-flushing, cold water laundry and outdoor irrigation, and for augmenting a supply of drinking water, are all considered high-exposure uses of recycled water.

A summary of the considerations for accessing water from each potential surface water source is presented in the following sections.

ARTC has consulted with each of the potential water suppliers identified in the following sections. Details of consultation are provided in Appendix E: Consultation Report.

**Potable water**

Potable water for non-resident workforce accommodations and concrete batching will be sourced from the following:

- Commercial businesses that sell potable water in tanks with volumes up to 30 kL
- Non-potable source and subjected to further offsite treatment. For example, one registered private bore owner has expressed an interest in selling up to 50 ML of licenced groundwater entitlement to the Project either as raw water, or after treatment to a potable standard.
- Non-potable source and subjected to further onsite treatment. For example, various systems and technologies are available that can be established within the footprint of a non-resident workforce accommodation to enable treatment of water to a potable standard.
- Potable networks within other LGAs. For example, Queensland Urban Utilities administers the water within the Lockyer Valley LGA and operates tanker filling stations that cater for commercial use. The closest Queensland Urban Utilities tanker filling station to the Project is located at Postman's Ridge. Cost of water from these standpipes is variable and can be up to $5/kL.

In all instances, water will be subjected to testing prior to commencement of use for potable purposes.

Both TRC and GRC maintain a network of smart (automated) standpipes for potable water across their respective LGAs; however, both councils have advised that potable water from their networks is not available for use by the Project. Consequently, there is no intention to obtain potable water from TRC or GRC sources.

**Other sources**

While not considered to be primary sources of construction water, the following smaller volume sources could be used, if required:

- Water that accumulates in sediment basins that are located within the Project footprint for erosion and sediment control (volumes dependent on surface area and rainfall)
- Water that accumulates in rainwater tanks located on non-resident workforce accommodation facilities and attached to construction office structures (volumes dependent on surface area and rainfall)
- Water from private storages (e.g. ring dams, rainwater tanks) on properties that are acquired for the Project.

**Monitoring and record keeping**

Construction water will only be obtained from existing licenced and/or lawful sources, within the limits of applicable allocations or entitlements. No water will be sourced from potable networks or supplemented surface water sources that are managed by TRC or GRC. ARTC will ensure that any existing commercial arrangements for the access to and/or sale of water to other end users can be honoured by water entitlement holders.

Prior to taking water from existing licenced source points, ARTC will obtain all necessary permits and licences and will enter into an agreement with the water entitlement holder to purchase water at a negotiated rate.

### 5.6.25 Signalling installation

The design and installation of the telecommunications and signalling infrastructure systems will be completed in parallel with the design and construction of the track and civil structures of the Project. The construction, procurement and testing program will be integrated into the track and civil programs to ensure both activities are carried out so commissioning activities can be undertaken at the same time.

### 5.6.26 Landscaping and rehabilitation

A Rehabilitation and Landscaping Management Plan will be developed during the detailed design stage and implemented during the construction and commissioning stages of the Project. The Plan will be developed based on the Inland Rail Landscape and Rehabilitation Strategy and establish requirements for:

- Progressive and post construction installation of the Project landscape design
- Establishment, and ongoing maintenance and monitoring, requirements
- Construction contract completion criteria for areas defined in the landscape design.

Monitoring for a specified period will be required to ensure that the Project landscaping is successfully established. Additional maintenance or intervention works may be required if monitoring demonstrates that the landscape and rehabilitation completion criteria are not being achieved.

Inspections of reinstated, landscaped or revegetated areas will occur for a period specified in the CEMP.

### 5.6.27 Demobilisation

All construction sites, compounds and access routes will be reinstated or rehabilitated progressively once available. Reinstatement and rehabilitation activities will include:

- Demobilising temporary site offices, laydown and stockpile areas and associated facilities (e.g. water supply, sewerage, power, telecoms and hardstands)
- Removing all materials, waste and redundant structures from the works sites
- Decontaminating any impacted areas (e.g. around fuel transfer locations)
- Stabilising of landforms, where required
- Decommissioning of all temporary work-site signs
- Removal of temporary fencing
- Progressive establishment of permanent fencing in coordination with rehabilitation and landscaping activities
- Decommissioning of site access roads that are no longer required
- Restoration of disturbed areas as required, including revegetation where required.

Following the above, retained topsoil and, where available, retained mulch will be used as part of the rehabilitation activities in addition to other appropriate treatments in accordance with the Rehabilitation and Landscaping Management Plan.

During the reinstatement and rehabilitation activities, sediment and erosion control measures will be left in place, monitored and maintained until the relevant Erosion and Sediment Control Plan catchment areas are stabilised.

## 5.7 Commissioning

All construction works will be subject to approved testing and commissioning plans, as required, and appropriate inspection and test plans. Final testing and commissioning of the track and systems is programmed for approximately six months after completion of construction works.

Activities during this stage will support commissioning of the Project works (excluding returned works), with the overarching objective of moving from a built asset to an operating railway. There are a number of acceptance requirements that need to be met prior to commencement of train operations that will include the following:

- Testing of the fire safety system (including *AS 4824:2021 Protective clothing for firefighters* (Standards Australia, 2021))
- Testing of the cyber security system
- Running of representative test trains
- Drills and debriefs with stakeholders including the contractors, ARTC, DTMR, Queensland Fire and Emergency Services, Queensland Police Service and relevant authorities.
- Testing and commissioning (checking) of the rail line and communication/signalling systems will be undertaken to ensure that all systems and infrastructure are designed, installed and operating according to ARTC's operational requirements. All rail system commissioning activities will be undertaken in accordance with an approved Testing and Commissioning Plan. The Testing and Commissioning Plan will also address the existing QR and ARTC signalling system for the connections to the existing QR and ARTC networks.
- Commissioning of the track works will require completed inspection and test plans, clearance reports, weld certification, rail-stressing records, as-built documentation and track geometry reports. The commissioning period will also be used for driver training and test trains.

## 5.8 Operations

The Department of Transport and Main Roads will be the owner of the land (i.e. holder of the perpetual lease) subject to the railway corridor under the TI Act, with ARTC sub-leasing the railway corridor from DTMR. As the railway manager for the Project alignment, ARTC will be responsible for railway operations and for managing the railway infrastructure, along with a 'duty of care' for the land. ARTC does not operate trains but provides the infrastructure and systems for customers to do so safely.

Operations stage activities will include the use of the railway for freight purposes, signalling, and general track and infrastructure maintenance.

Road network changes as a result of the Project will be managed and maintained by the relevant road authority (i.e. DTMR or local council).

### 5.8.1 Hours of operation

The railway will be operational 24 hours a day, 365 days a year, on a variable schedule.

### 5.8.2 Workforce

It is anticipated that the ongoing operation and maintenance of the Project will require a workforce of approximately 10 to 15 FTE. The operational workforce will be based at provisioning centres outside the immediate vicinity of the Project.

### 5.8.3 Train operations

The Inland Rail Program as a whole will be operational when all sections are complete; however, existing QR Network traffic may use the Project alignment, subject to relevant infrastructure agreements, if the alignment is completed prior to the other sections of the Inland Rail Program.

Train control will be managed via ARTC's existing control centres. Train services will be provided by a variety of operators. Trains will be a mix of grain, bulk freight and other general transport.

The Project will involve operation of a single track with crossing loops to accommodate double-stacked freight trains 1,800 m long and 6.5 m high. Train speeds will vary according to axle loads and track geometry, and range from 80 to 115 km/h.

It is estimated that, once operational, the Project will involve an annual average of approximately 14 train services per day during the initial years of operation. This is likely to increase to an average of 20 trains per day after 15 years, and up to 25 per day during peak operational periods. Annual freight tonnages will increase in parallel, from approximately 14.2 million tonnes per year in year one of operations to 21.8 million tonnes per year in peak operations.

ARTC will manage the Border to Gowrie section of the Inland Rail network to allow for the transportation of dangerous goods and explosives as nominated by the haulage provider and Explosive Competent Authority. There are no tunnels along this section of the network. Hazardous chemicals (dangerous goods) will likely make up a significant portion of freight because they include many widely used commodities and products. Products potentially categorised as dangerous goods that are likely to be transported include medical supplies and fuel. These goods are commonly moved on all forms of transport (not limited specifically to rail freight). ARTC cannot provide an exhaustive list of the types and quantities of dangerous goods that will be transported on the network.

In Queensland, rail operators must comply with the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2024) in addition to various Australian Standards. This Code details the technical specifications, requirements and recommendations applicable to the transportation of dangerous goods in Australia by road and rail. It must be noted that ARTC does not own or operate the rollingstock; however, the transportation of dangerous goods on the Project by independent operators will require authorisation by ARTC. The quantities and types of dangerous goods that may be present as freight, and the allowance of bulk and packaged dangerous goods, will be managed in accordance with the requirements of the Australian Dangerous Goods Code.

### 5.8.4 Operational maintenance

Standard ARTC maintenance activities will be undertaken during operations in accordance with task-specific ARTC work method statements (available on the ARTC Extranet: **extranet.artc.com.au**). Typically, these activities include:

- Minor maintenance works, such as:
  - bridge inspections
  - culvert cleanout
  - sleeper replacement
  - rail welding
  - rail grinding
  - ballast profile management
  - track tamping
  - clearing/slashing vegetation within the permanent footprint except where allocated fauna crossing infrastructure and elements are located, including vegetated habitat linkages
- Major periodic maintenance, such as:
  - ballast cleaning
  - formation work
  - reconditioning of track
  - adjustment
  - turnout replacement
  - correction of track level and line
  - maintenance of structures including waterproofing, jointing.

These activities will occur on a scheduled basis, in addition to being in response to unplanned requirements (e.g. maintenance following adverse weather events). Rail maintenance activities will be managed according to the volume of works required:

- Track maintenance—minor:
  - Day-to-day track maintenance is managed between the ARTC network assets/maintenance teams and network controllers to ensure no major impacts on the daily train plan and train operations are incurred. These works are often short in nature and will be scheduled into vacant train paths (where no trains are scheduled) to prevent impact to train travel time.
- Track maintenance—major:
  - Major track maintenance is managed via the ARTC possessions planning process, with any major track closures communicated to customers 6 to 12 months in advance.

### 5.8.5 Rollingstock maintenance and provisioning

No provisioning or rollingstock maintenance facilities are proposed to be provided within the proposed Border to Gowrie section of Inland Rail. Noting for emergency maintenance of rollingstock due to unforeseen failure or defects, the crossing loop and maintenance siding will be utilised as required.

### 5.8.6 Fuel

No permanent refuelling facilities are proposed within the Project.

### 5.8.7 Other hazardous materials

Dangerous goods and hazardous chemicals that may be required during operation and maintenance of the Project are listed in Table 5-36 and have been determined based on usage on similar rail projects.

Operational usage of chemicals is expected to be on an 'as required' basis and will typically involve limited quantities during specific maintenance activities (e.g. application of pesticides in accordance with ARTC rail corridor maintenance protocols). There will be no permanent storage of dangerous goods or hazardous substances within the permanent footprint. All substances will be transported to site by maintenance crews, as required.

**TABLE 5-36 INDICATIVE LIST OF DANGEROUS GOODS AND HAZARDOUS SUBSTANCES DURING OPERATION**

| Chemical type | Typical chemicals | Purpose/use | Dangerous good class | Packing group |
|---|---|---|---|---|
| Fuel oil | Diesel and engine oil | Fuel for mobile equipment | 9 (C1)[1] | III |
| Grease | RS Claretech Biodegradable Grease | Lubricate plant and equipment | C2[2] | N/A |
| | Caltex 904 Grease | Lubricate plant and equipment | C2[2] | N/A |
| Pesticides | Australian Pesticides and Veterinary Medicines Authority Approved Pesticides | Pests and weeds control | 6.1 or 9 | I, II or III |

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

### 5.8.8 Electricity

Electricity supply will be needed for points, signalling and other infrastructure. It is anticipated that the supply of these services will be delivered by relevant providers under the terms of their respective approvals and/or assessment exemptions.

### 5.8.9 Telecommunications

The Project involves new telecommunications and signalling infrastructure, initially using Centralised Train Control with the infrastructure installed upgradable to accommodate future deployment of the ATMS.

ATMS will be a digital train management solution with real-time monitoring of trains with GPS and mobile technology, and will support ARTC's objectives of improving rail network capacity, operational flexibility, train service availability, transit times, rail safety and system reliability. Interfaces between the ARTC and QR Network, including signalling systems are subject to ongoing discussions between ARTC and QR now and during the Project's detailed design stage.

### 5.8.10 Operational water supply and management

The Project's operational water requirements are anticipated to be minor, relative to the construction works stage requirements. Water may be required to support localised maintenance activities, such as high-pressure cleaning of culverts. The volumes required will be dependent on the specific activities and frequency of undertaking, and supplied via external sources.

Vegetation planted as part of the landscaping design for the Project will be self-sustaining and will not require watering once established.

An assessment of the suitability of each source will need to be made for each maintenance activity requiring water, based on the following considerations:

- Legal access
- Volumetric requirement for the activity
- Water quality requirement for the activity
- Source location relative to the location of need.

### 5.8.11 Operational stormwater management

Stormwater will be managed through the drainage structures incorporated into the Project design, as discussed in Section 5.4.7.

### 5.8.12 Road transport

The existing road network will be used by maintenance crews to travel to the rail corridor. Once in the permanent footprint, the RMAR incorporated into the design of the Project will be used in preference to the existing road network for Project maintenance activities. The RMAR is discussed in Section 5.4.9.

### 5.8.13 Waste management

Site maintenance activities during operations will generate small quantities of waste. Quantities of waste would depend on operational frequencies of maintenance regimes, which are not currently available. As such, quantities of operations stage waste have not been estimated.

The wastes anticipated to be generated during the operations stage of the Project are shown in Table 5-37.

**TABLE 5-37 OPERATIONAL AND MAINTENANCE WASTE QUANTITIES**

| Activity | Waste description | Waste type |
|---|---|---|
| Vegetation management | Green waste | General waste (non-putrescible) |
| Re-profiling of landforms, e.g. embankments | Potentially contaminated solid waste | Regulated waste |
| General upkeep | Debris, litter/rubbish | General waste (non-putrescible) |
| Rail track replacement/upgrade | Scrap metal | General waste (non-putrescible) |
| | Potentially contaminated solid waste | Regulated waste |
| Infrastructure maintenance | Waste paints and solvents | Regulated waste |
| General maintenance of permanent footprint | Empty chemical containers | Regulated waste |
| Maintenance of erosion and control devices and culverts | Silt and sediment | General waste (non-putrescible) |
| | Vegetation debris | General waste (non-putrescible) |

Wastes generated during the operation of the Project would be removed offsite for disposal at an appropriately licenced facility, in accordance with relevant legislation.

### 5.8.14 Landscaping and rehabilitation

Ongoing monitoring is required to ensure that the Project landscaping continues to be successful. Additional maintenance or intervention works may be required if monitoring demonstrates that landscape and rehabilitation completion criteria established in the Rehabilitation and Landscaping Plan are not being achieved.

The ongoing maintenance of the rail corridor will include management of weeds, pests and vegetation (e.g. for bushfire and safe access), fauna connectivity infrastructure and elements such as crossing infrastructure, fauna furniture and fencing, and other infrastructure. These works will be managed in accordance with operational environmental management documentation consistent with the Inland Rail Environment and Sustainability Policy and the Inland Rail Landscape and Rehabilitation Strategy.

## 5.9 Decommissioning

The Project is expected to be operational for more than 100 years. The design life of structures is up to 100 years to support this operational objective. A decommissioning date has not been determined and the likely timing would be too far in the future to allow effective planning to occur at present and is therefore not assessed as a Project stage in this revised draft EIS.

If the Project, or elements of it, were subject to plans for decommissioning, it is envisaged that the works would be undertaken in accordance with a Decommissioning Environmental Management Plan, or similar, which would be developed in consultation with relevant stakeholders and regulatory authorities.