CHAPTER 06

The Proposal

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

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

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6. The proposal

6.1 Scope of chapter

In conjunction with Chapter 7: Construction of the Proposal, the purpose of this chapter is to provide a consolidated description of the scope of works for the North Star to NSW/Queensland Border (NS2B) project (the proposal). Chapter 6: The Proposal and Chapter 7: Construction of the Proposal are the basis for the environmental impact assessments contained in Chapters 11 to 25.

6.1.1 Secretary's Environmental Assessment Requirements

This chapter has been prepared in response to the Secretary's Environmental Assessment Requirements (SEARs) requirements (Table 6.1).

TABLE 6.1 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS COMPLIANCE

	Item 2: Environmental Impact Statement
Desired performance outcome	The project is described in sufficient detail to enable clear understanding that the project has been developed through an iterative process of impact identification and assessment and project refinement to avoid, minimise or offset impacts so that the project, on balance, has the least adverse environmental, social and economic impact, including its cumulative impacts.
Current guidelines	EPBC Act Environment Assessment Process (Department of Sustainability, Environment, Water, Population and Communities (SEWPaC), 2010)

SEARs requirement	EIS section
Item 1 The EIS must include, but not necessarily be limited to, the following:	
(b) a description of the project, including all components and activities (including ancillary components and activities, borrow pits, construction camps and rail sidings) required to construct and operate it	Addressed throughout chapter
(i) a demonstration of how the project design has been developed to avoid or minimise likely adverse impacts	Section 6.1.2

6.1.2 Key features of the proposal

The proposal consists of the key features listed in Table 6.2. Key features of the proposal are shown in Figure 6.1, which is referred to throughout this chapter.

The construction phase of the proposal will also involve laydown areas, temporary access tracks, borrow pits and a construction camp. More information on these features of the proposal can be found in Chapter 7: Construction of the Proposal.

TABLE 6.2 KEY FEATURES OF THE PROPOSAL

Aspect	Description
New track	▸ Approximately 25 km of new track within the existing non-operational Boggabilla rail corridor ▸ Approximately 5 km of new track within a greenfield rail corridor.
Crossing loop, maintenance siding and turnouts	▸ One crossing loop, designed to accommodate trains up to 1,800 m long ▸ Turnouts will be provided on either end of the crossing loop to allow trains to be guided from one track to another ▸ A one-ended siding (approximately 250 m long) will be incorporated into the crossing loop for maintenance purposes. It will be connected to the southern end of the crossing loop via a low-speed turn out.

Aspect	Description
Bridges	▸ Eleven new bridges ▸ This includes an approximately 1.8 km long viaduct over the Macintyre River and Whalan Creek, which are major watercourses. The viaduct is located in both NSW and Queensland; therefore, potential impacts will be assessed under the *Environmental Planning and Assessment Act 1979* (NSW) via this EIS and under the *State Development and Public Works Organisation Act 1971* (Qld) via the NSW/Queensland Border to Gowrie Inland Rail project EIS.
Drainage	▸ Reinforced concrete pipe culverts and reinforced concrete box culverts ▸ Scour protection measures will generally be installed around culverts to prevent erosion ▸ Embankment and catch drains adjacent to the proposed alignment to divert surface runoff to the nearest bridge or culvert location.
Road–rail interfaces	▸ Work on new and existing non-operational level crossings (within the existing non-operational Boggabilla rail corridor) ▸ Signalling and communications infrastructure.
Road realignments	▸ Realignment of Bruxner Way near where the proposal transitions from the existing non-operational Boggabilla rail corridor to the greenfield rail corridor.
Earthworks	▸ To achieve flood immunity, the majority of the proposal is elevated on a fill embankment. The embankment height is typically less than 2 m; however, in the lead up to the Macintyre River Viaduct, the height increases to approximately 7.5 m ▸ No significant cuttings (> 10 m) are proposed.
Ancillary works	▸ Ancillary infrastructure including utilities, signalling and communications infrastructure, fencing and signage.

6.1.3 Approach to avoiding or minimising potential impacts during the design process

As detailed in Chapter 3: Alternatives and Proposal Options, during the reference design phase, an iterative process of option identification, impact assessment and design development has refined key features of the proposal. For example, three separate bridge structures were initially proposed over Whalan Creek, Tucka Tucka Road, and the Macintyre River; however, an iterative flood assessment of the design has resulted in a single viaduct structure that minimises upstream flooding impacts (refer Section 6.2.3.1).

Key features of the proposal will be further refined during the detailed design phase to ensure that the proposal has the least adverse environmental, social and economic impacts.

6.2 Descriptions of key features of the proposal

6.2.1 Permanent footprint

The proposal's permanent footprint is shown in Figure 6.1. It is generally in accordance with the following parameters:

- Aligns with the existing non-operational Boggabilla rail corridor between North Star (Ch 0.9 km) and the greenfield deviation (Ch 25.7 km)
- A strip of land at least 10 m wide has been allowed on either side of the earthworks footprint to accommodate track-side infrastructure such as fencing, drainage, etc.
- Encompasses the permanent footprint of:
  - New track and associated earthworks
  - Bridge and drainage structures, including scour protection around culverts
  - Level crossings
  - Road realignments
  - Possible upgrades to adjacent roads and infrastructure
  - Rail maintenance access roads, including access points, passing bays and turnarounds
  - Utility works
  - Fencing and signage.

As shown in Figure 6.1, the width of the permanent footprint varies along the proposed alignment depending on the shape and size of the features listed above. A general width of 40 m has been adopted for the permanent footprint; however, the width of the permanent footprint increases to approximately 200 m in the vicinity of the Bruxner Way realignment (Section 6.2.6).

During the reference design phase, several ancillary facilities were identified that fall outside the permanent footprint. These facilities are temporarily required for construction and include laydown areas, access tracks, borrow pits and a construction camp. The footprint for these facilities is captured within the construction footprint, which is discussed separately in Chapter 7: Construction of the Proposal.

6.2.2 New track

Track and other rail infrastructure within the existing non-operational Boggabilla rail corridor is considered unsuitable for reuse. Therefore, the proposal consists of:

- Approximately 25 km of new, single-line, standard-gauge track within the existing non-operational Boggabilla rail corridor, between North Star (Ch 0.9 km) and the greenfield deviation (Ch 25.7 km)
- Approximately 5 km of new, single-line, standard-gauge track within a greenfield rail corridor, between the greenfield deviation (Ch 25.7 km) and the NSW/QLD border (Ch 30.6 km).

Key features of the new track include:

- Single line—trains travelling in both directions share the same track
- Standard gauge—gauge refers to how far apart the rails on a railway track are spaced. Standard gauge indicates that the rails will be spaced 1.435 m apart
- Greenfield rail corridor—this is a section of new track within a new rail corridor.

The track structure will consist of rails, fasteners, rail pads and concrete sleepers, which are laid on a bed of ballast. Collectively, these elements are referred to as ‘permanent way’. The permanent way is supported by the underlying subgrade.

The new track is designed to support double-stacked, 21 to 25 tonne axle load intermodal (i.e. container) trains up to 1,800 m long and 6.5 m high. Tonne axle load refers to the total weight felt by the track due to passing trains. Depending on the tonne axle load, train speeds will vary between 80 kilometres per hour (km/hr) and 115 km/hr. In addition, the new track is future proofed to accommodate 30-tonne (t) axle load intermodal trains up to 6.5 m high travelling at 80 km/hr.

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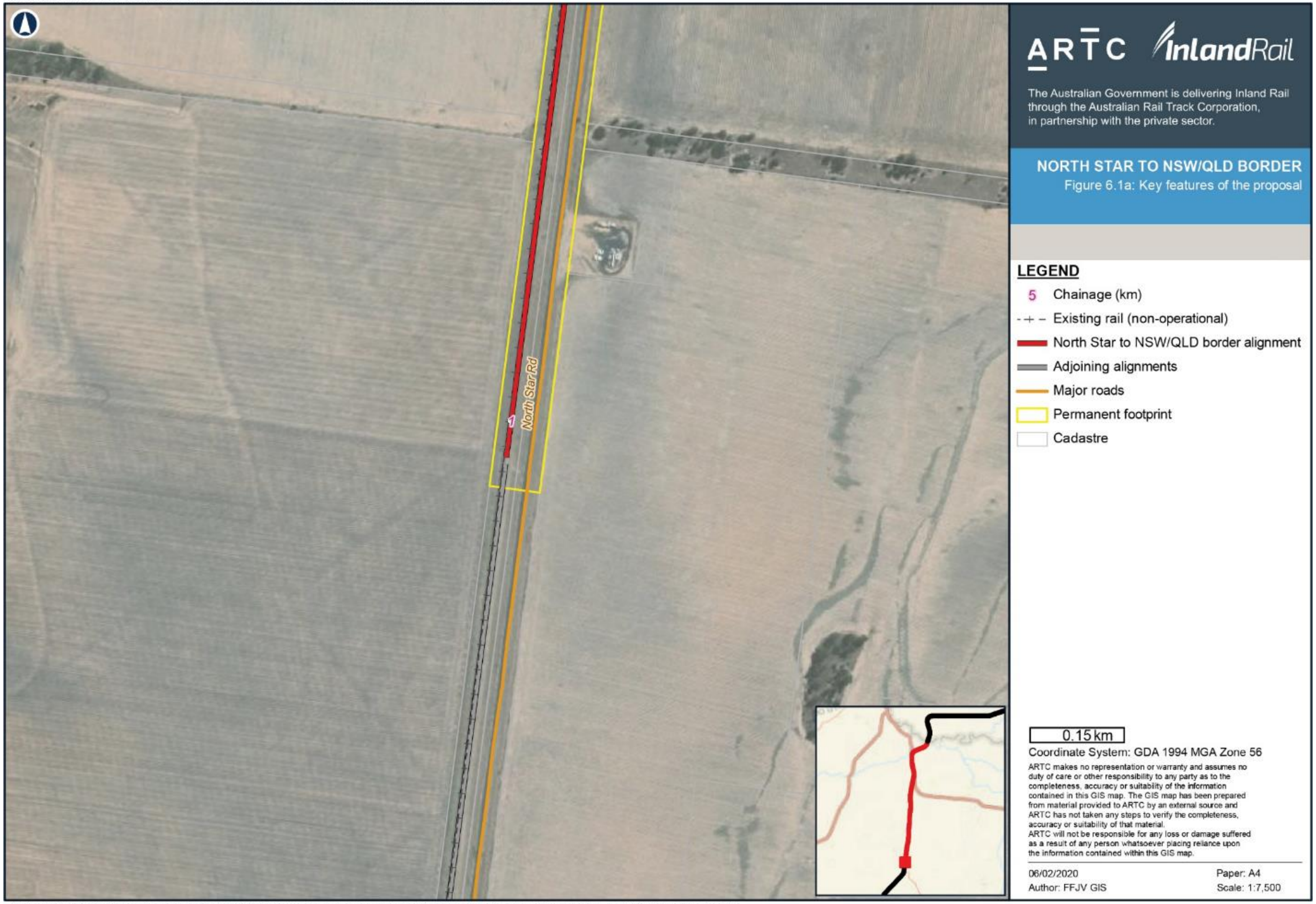

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1b: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Permanent footprint
- Cadastre

0.15 km

Coordinate System: GDA 1994 MGA Zone 56

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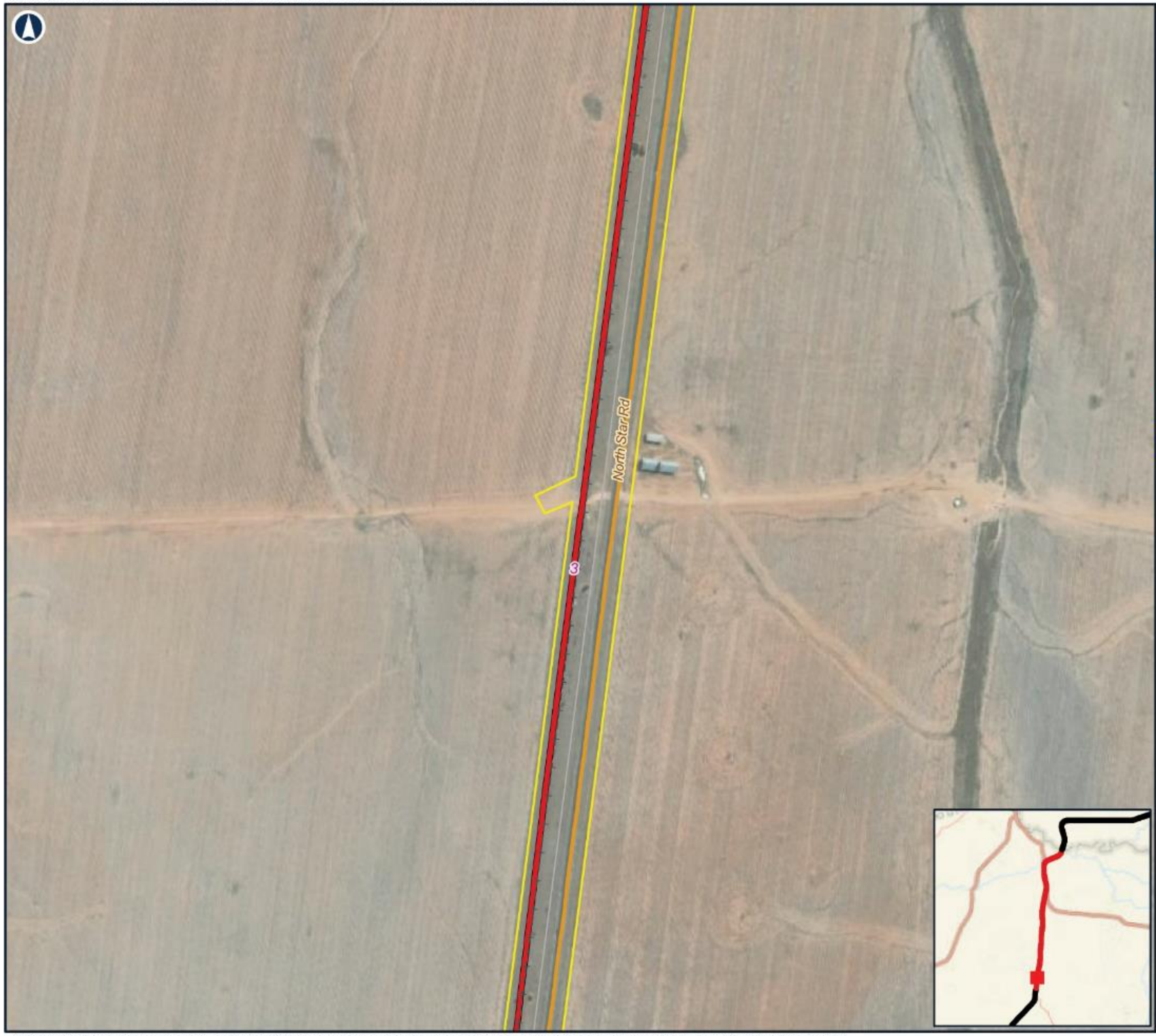

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1c: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Permanent footprint
- Cadastre

0.15 km

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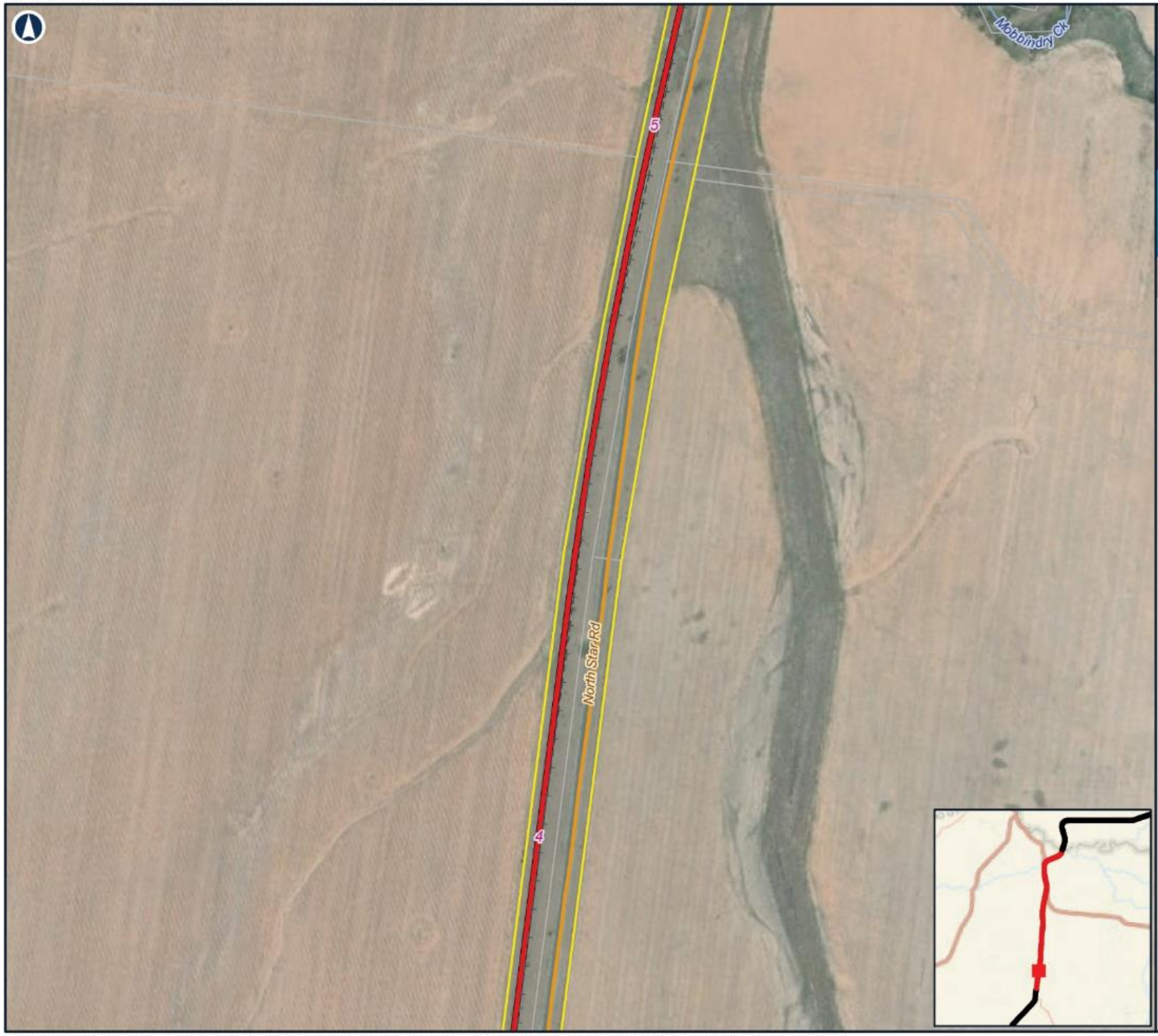

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1d: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Watercourses
- Permanent footprint
- Cadastre

0.15 km

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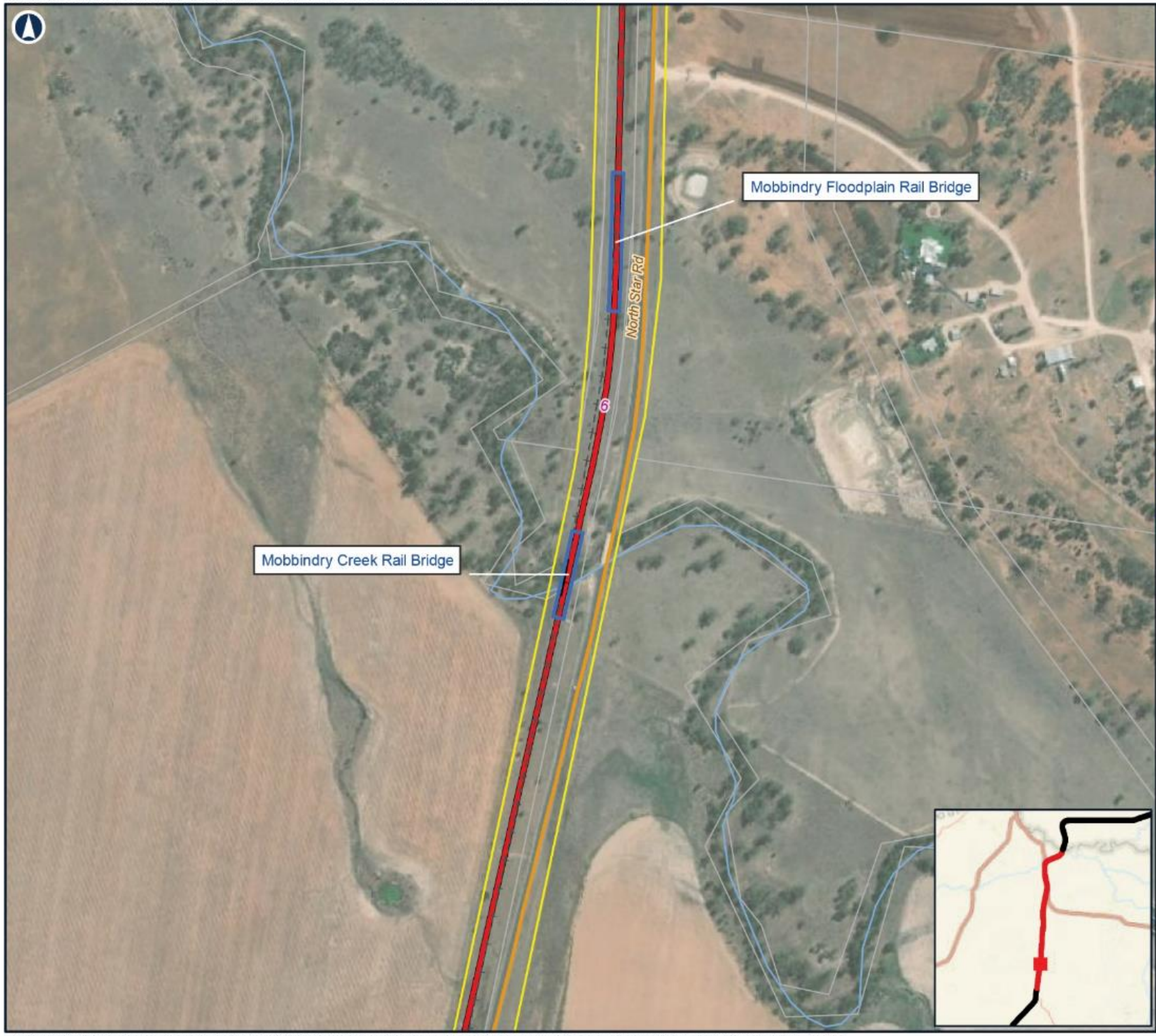

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1e: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Watercourses
- Permanent footprint
- Proposed bridge
- Cadastre

0.15 km

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1f: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Minor roads
- Watercourses
- Permanent footprint
- Cadastre

0.15 km

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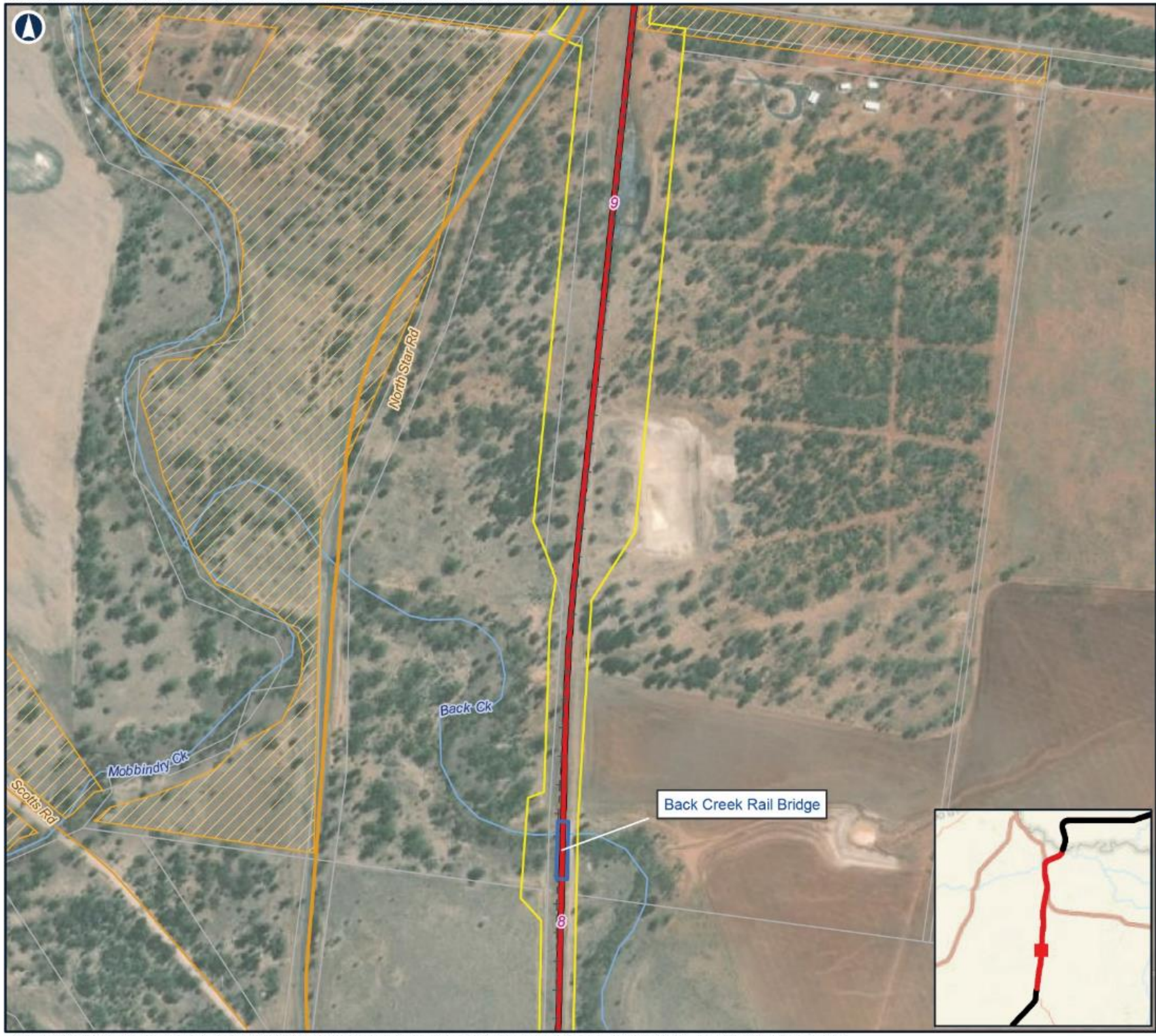

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1g: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Minor roads
- Watercourses
- Permanent footprint
- Proposed bridge
- Travelling stock reserve
- Cadastre

0.15 km

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1h: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Permanent footprint
- Travelling stock reserve
- Cadastre

0.15 km

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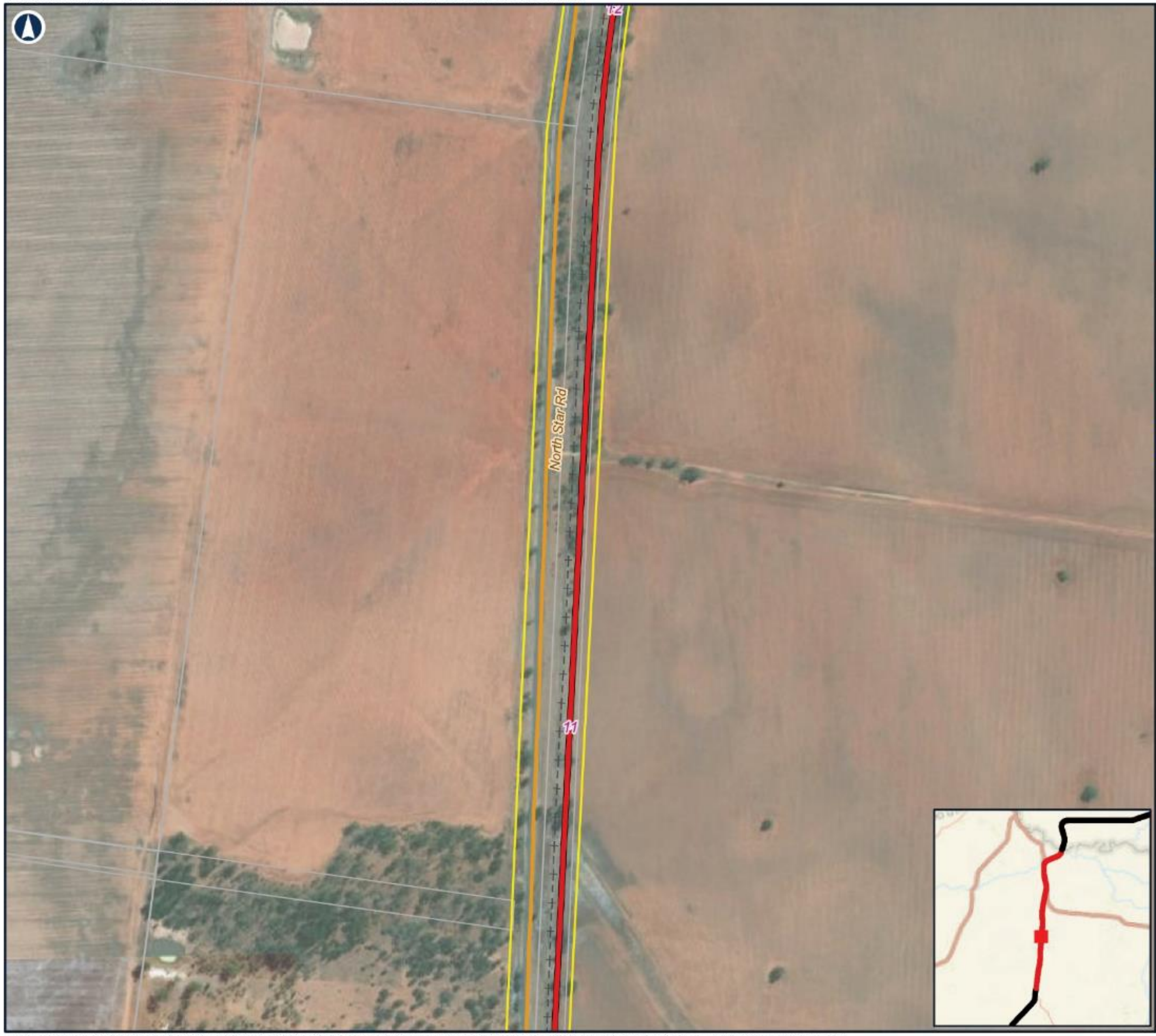

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1i: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Permanent footprint
- Cadastre

0.15 km

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NORTH STAR TO NSW/QLD BORDER
Figure 6.1j: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Minor roads
- Permanent footprint
- Cadastre

0.15 km

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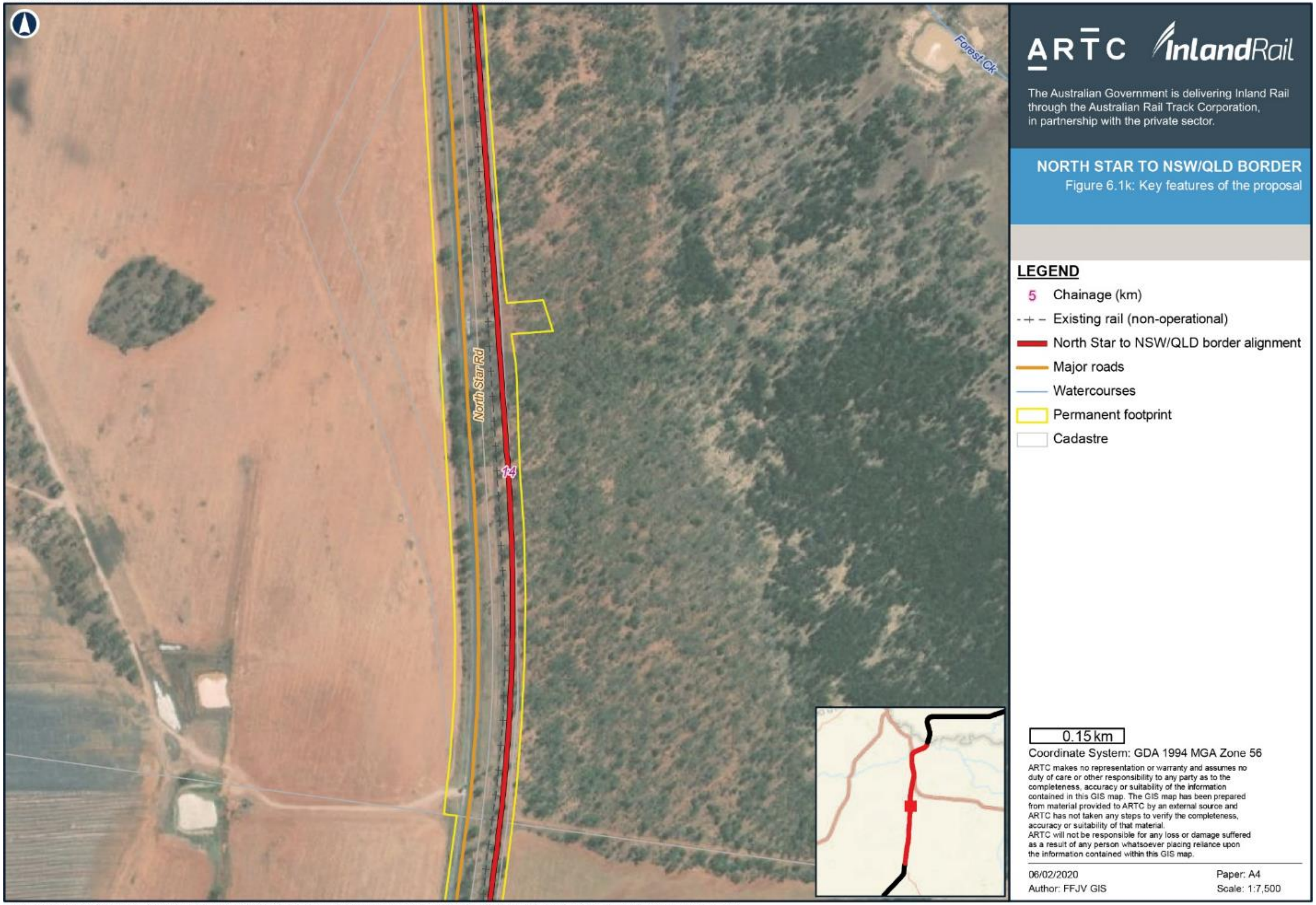

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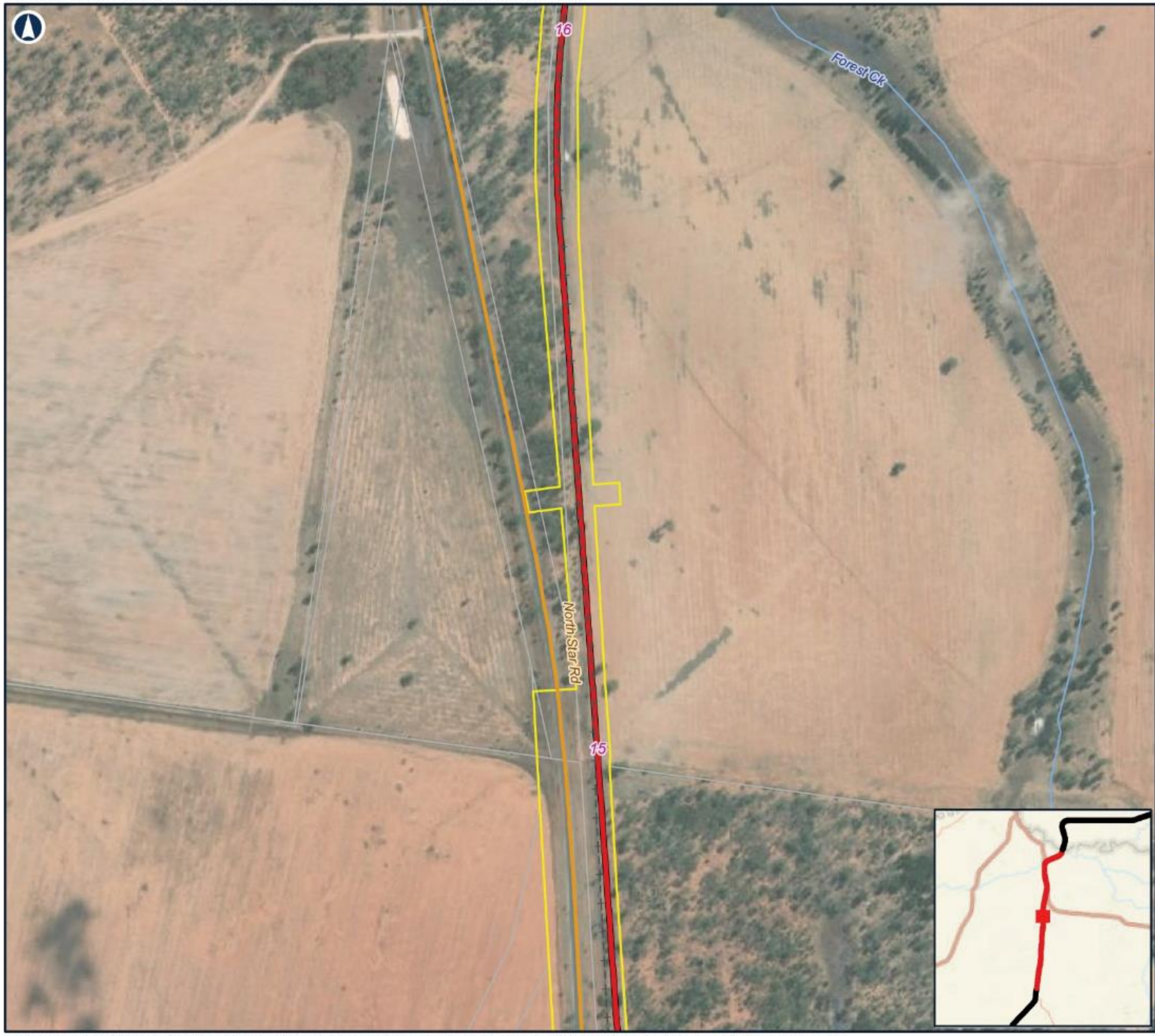

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1l: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Watercourses
- Permanent footprint
- Cadastre

0.15 km

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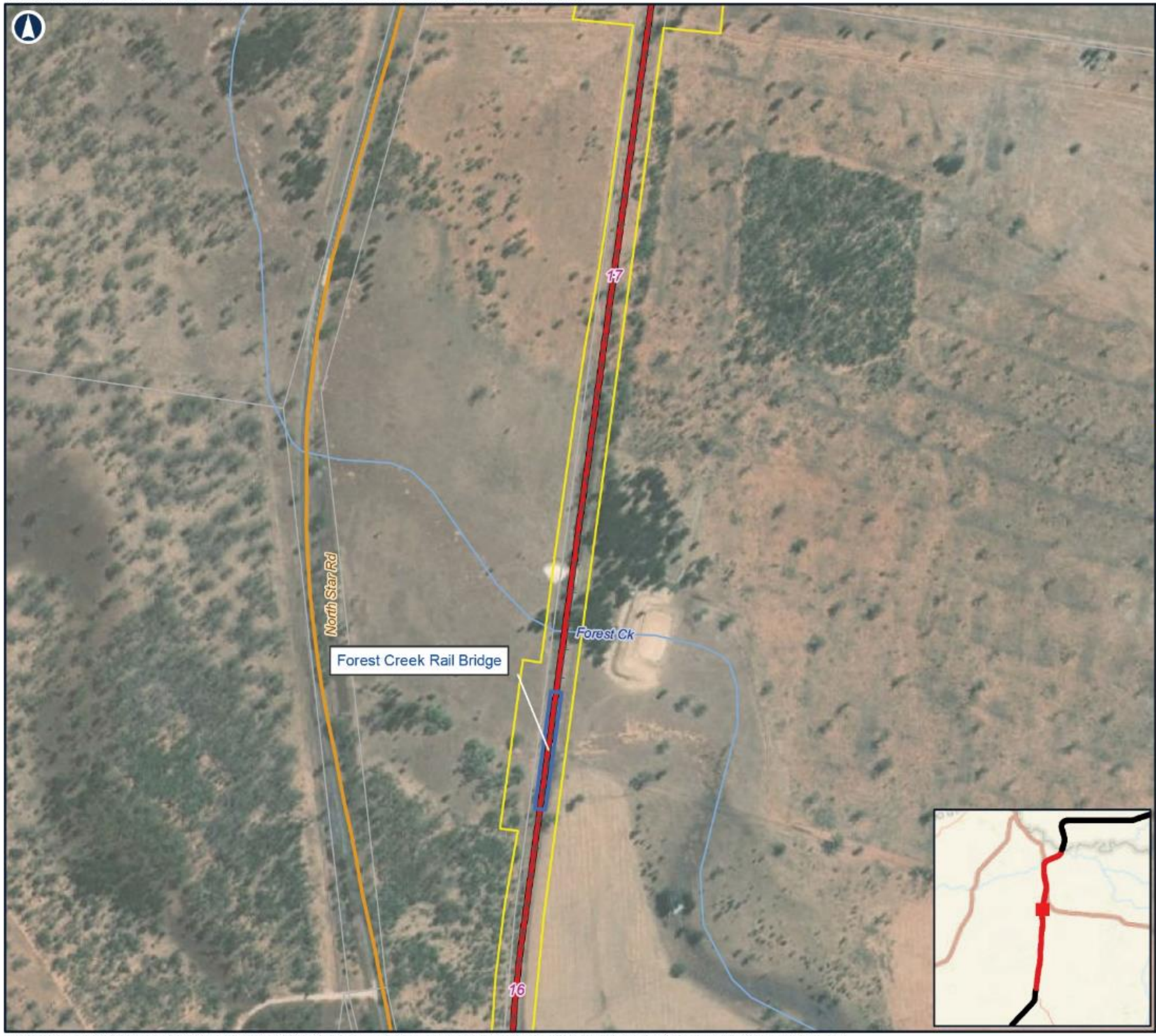

ARTC InlandRail

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NORTH STAR TO NSW/QLD BORDER
Figure 6.1m: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Watercourses
- Permanent footprint
- Proposed bridge
- Cadastre

0.15 km

Coordinate System: GDA 1994 MGA Zone 56

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Author: FFJV GIS Scale: 1:7,500

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1n: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Watercourses
- Permanent footprint
- Cadastre

0.15 km

Coordinate System: GDA 1994 MGA Zone 56

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Author: FFJV GIS Scale: 1:7,500

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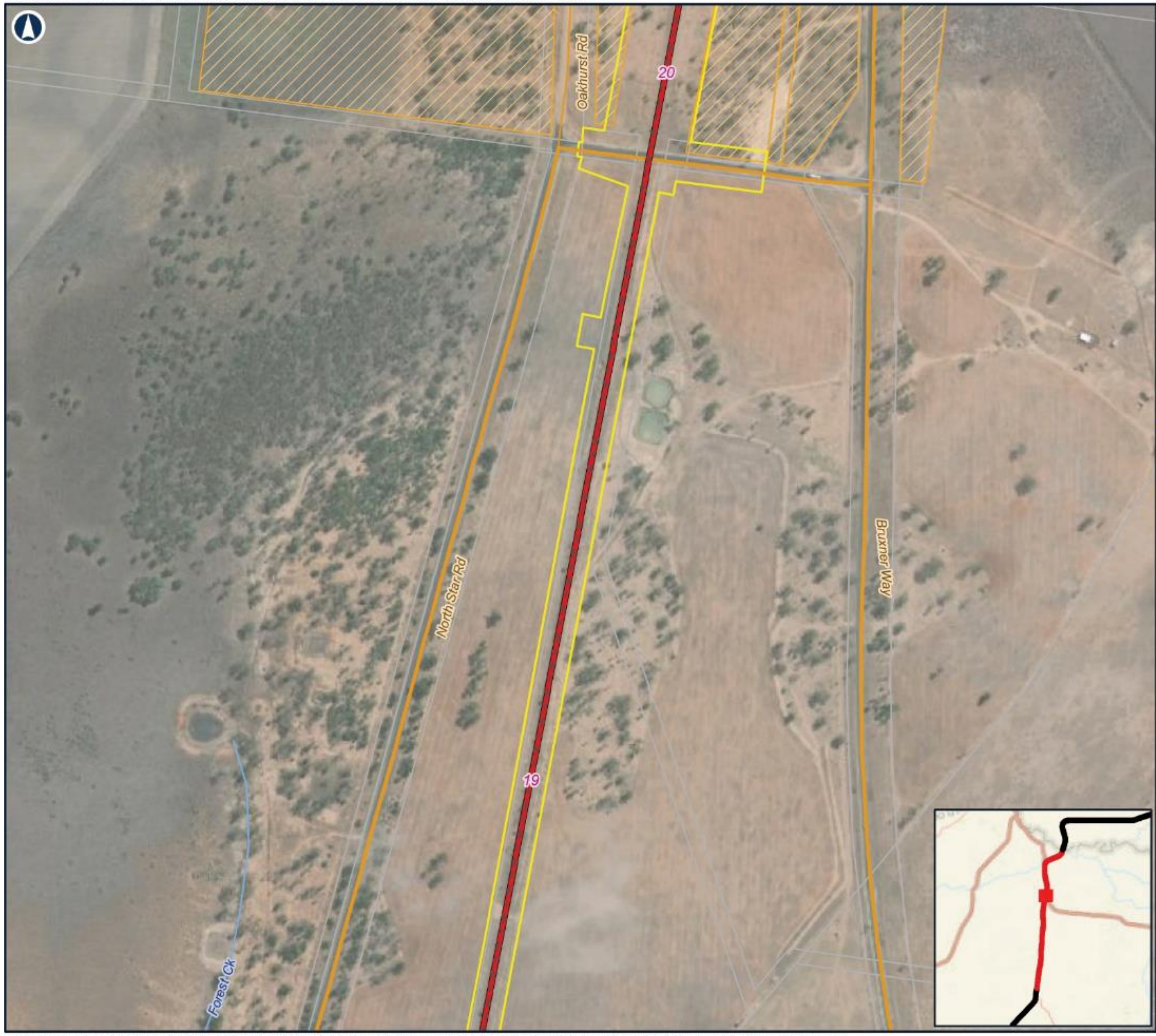

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NORTH STAR TO NSW/QLD BORDER
Figure 6.1o: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Minor roads
- Watercourses
- Permanent footprint
- Travelling stock reserve
- Cadastre

0.15 km
Coordinate System: GDA 1994 MGA Zone 56

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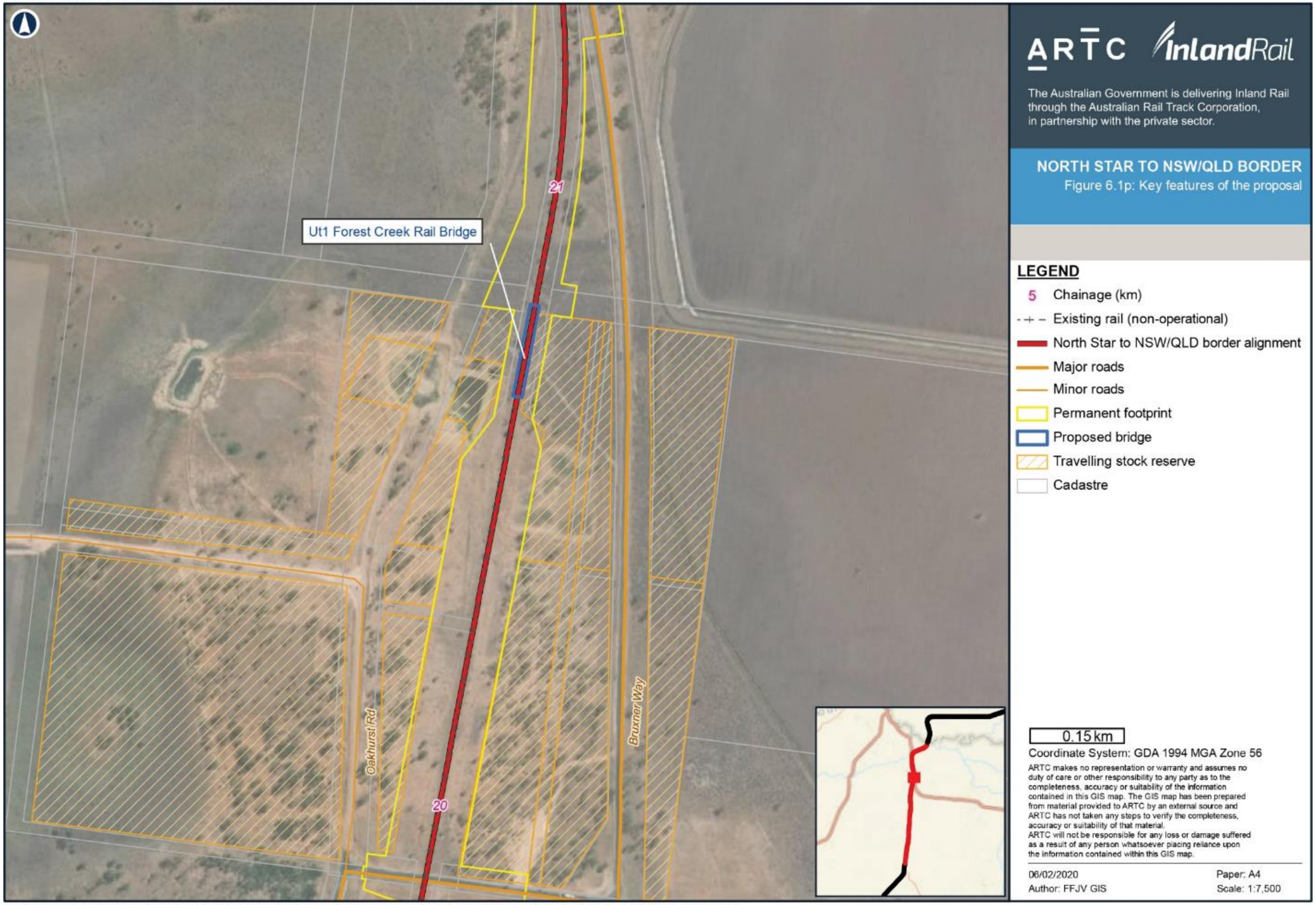

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1q: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Permanent footprint
- Cadastre

0.15 km

Coordinate System: GDA 1994 MGA Zone 56

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1r: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Permanent footprint
- Proposed crossing loop
- Cadastre

0.15 km

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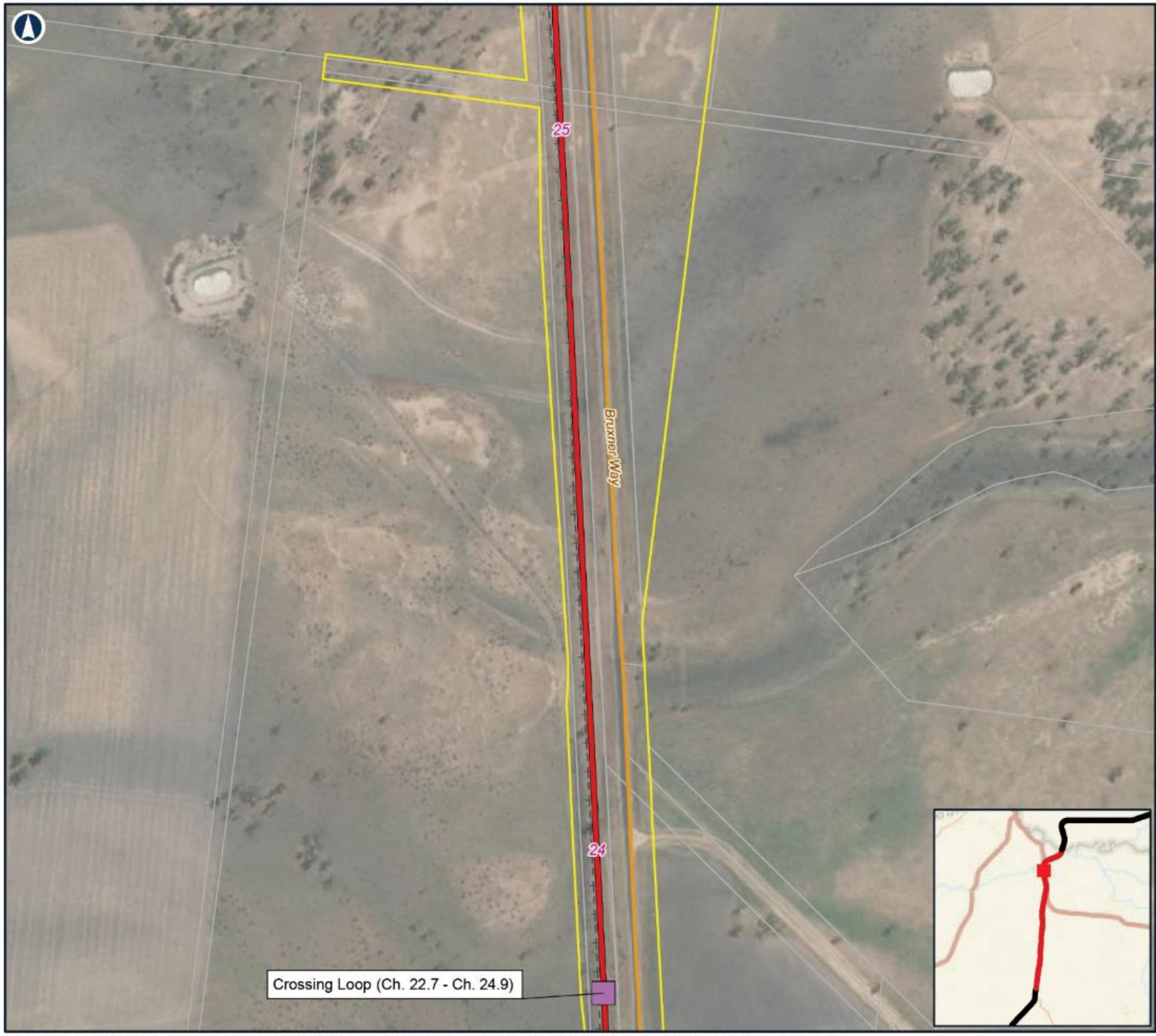

ARTC InlandRail

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NORTH STAR TO NSW/QLD BORDER

Figure 6.1s: Key features of the proposal

LEGEND

- 5 Chainage (km)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Major roads
- Permanent footprint
- Proposed crossing loop
- Cadastre

0.15 km

Coordinate System: GDA 1994 MGA Zone 56

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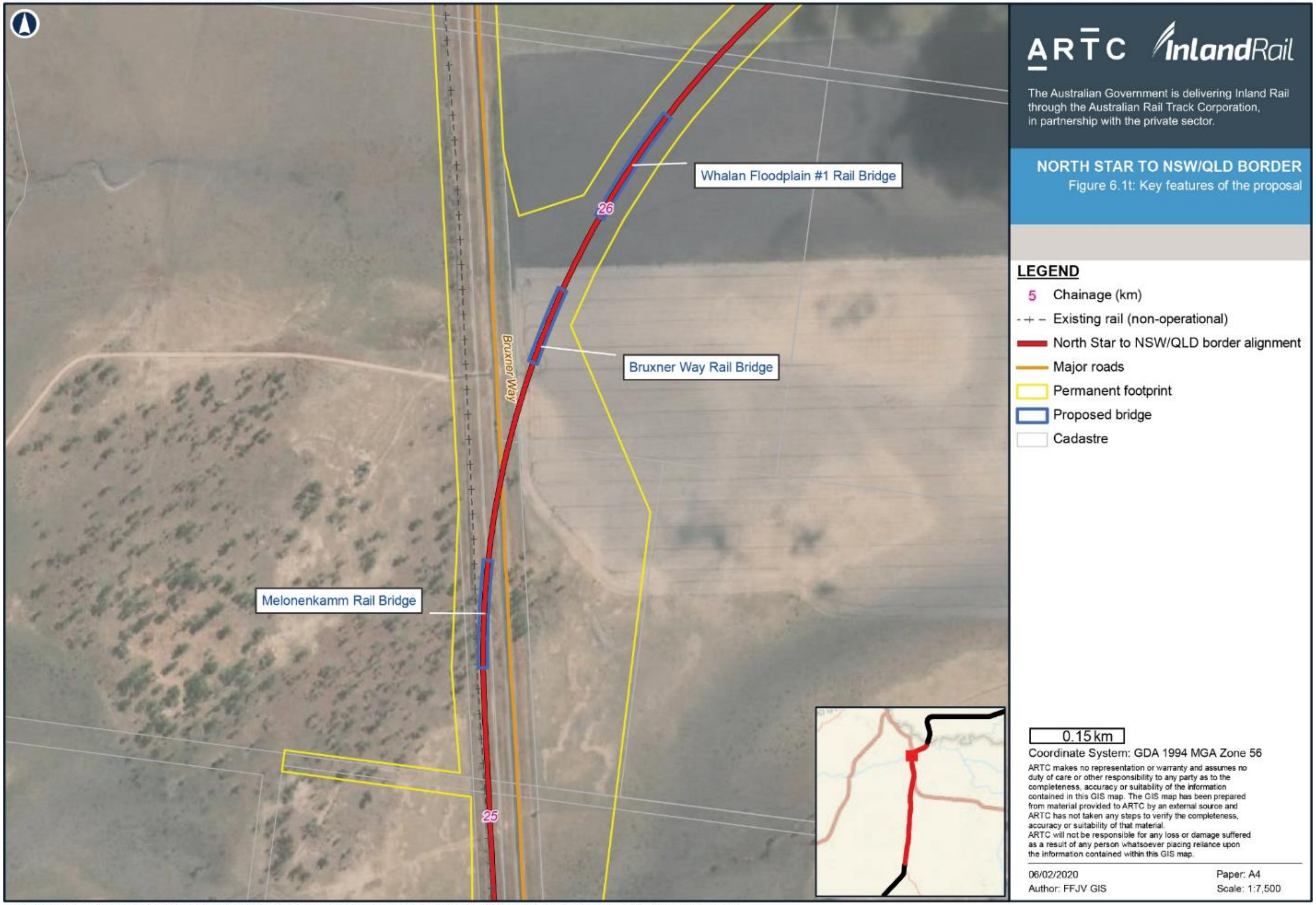

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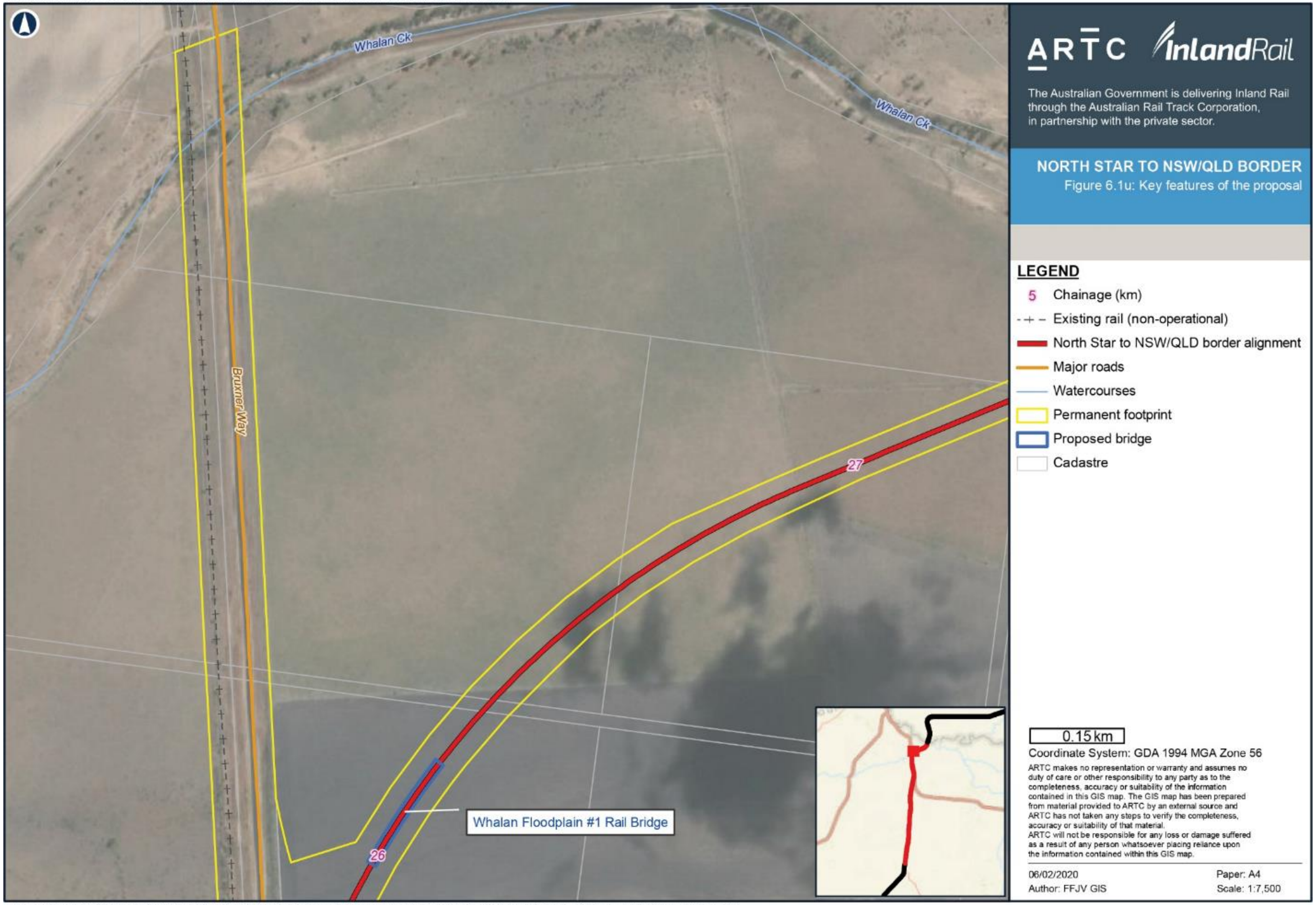

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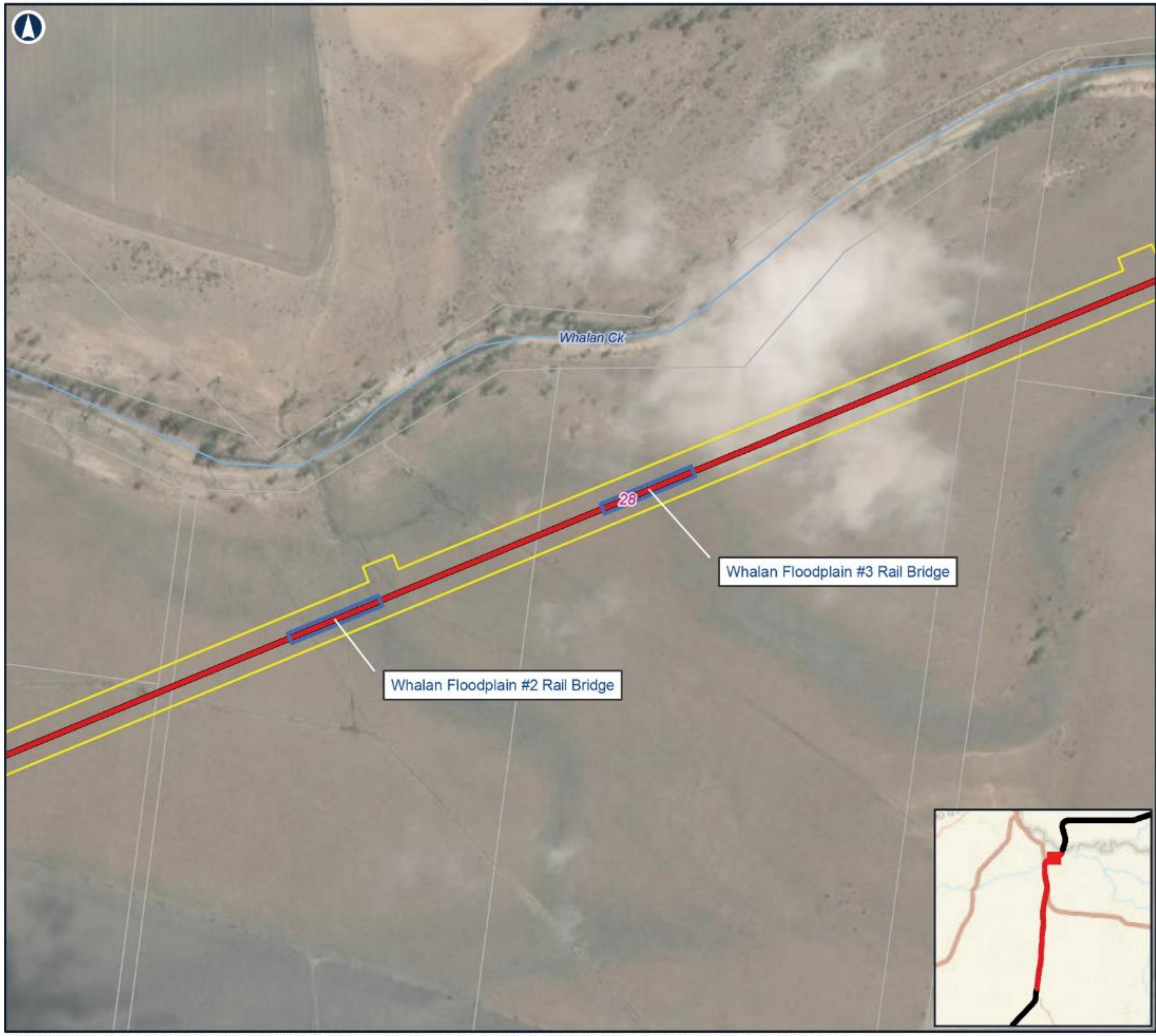

ARTC InlandRail

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NORTH STAR TO NSW/QLD BORDER
Figure 6.1v: Key features of the proposal

LEGEND

- 5 Chainage (km)
- North Star to NSW/QLD border alignment
- Watercourses
- Permanent footprint
- Proposed bridge
- Cadastre

0.15 km

Coordinate System: GDA 1994 MGA Zone 56

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Data Sources: 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
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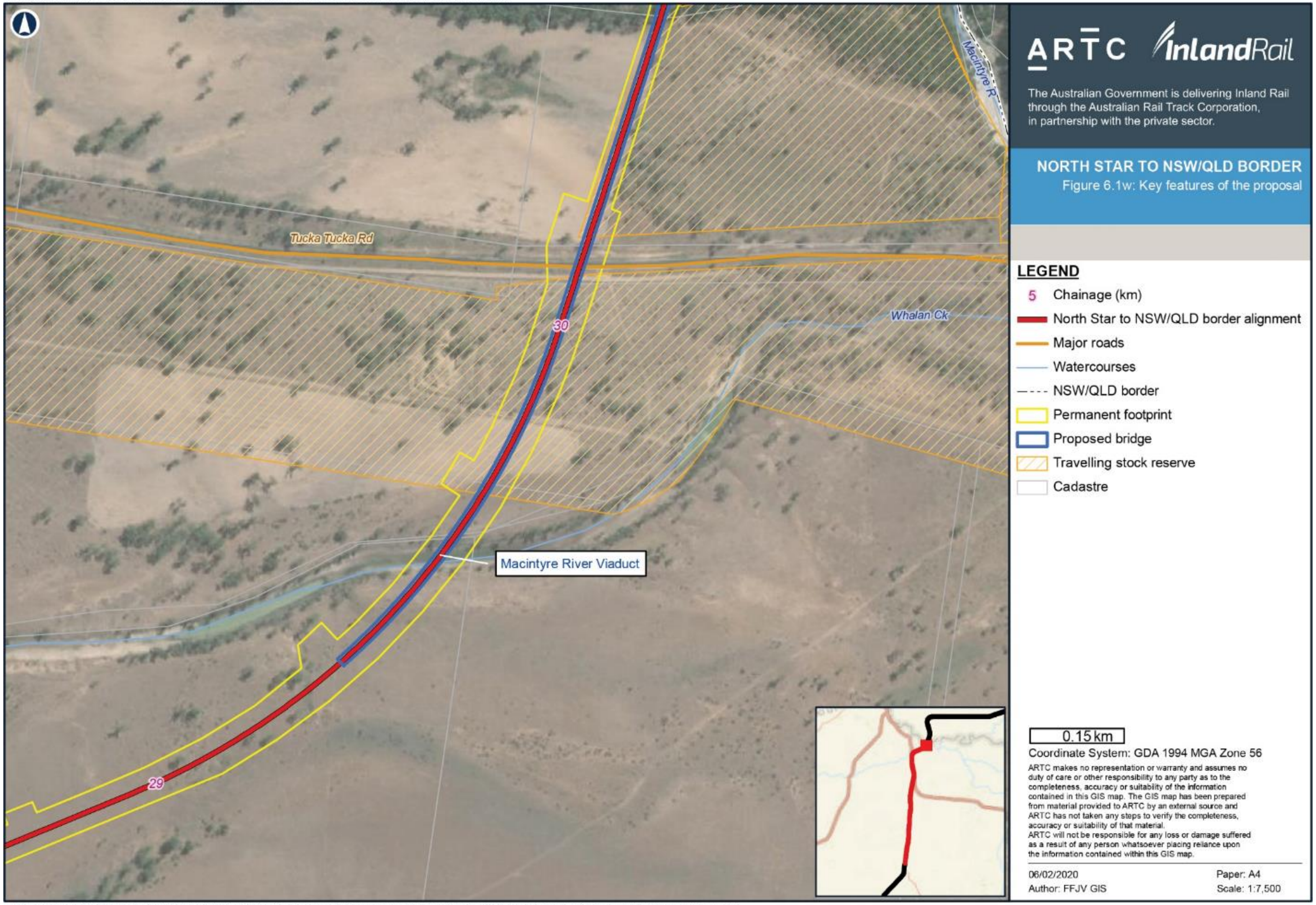

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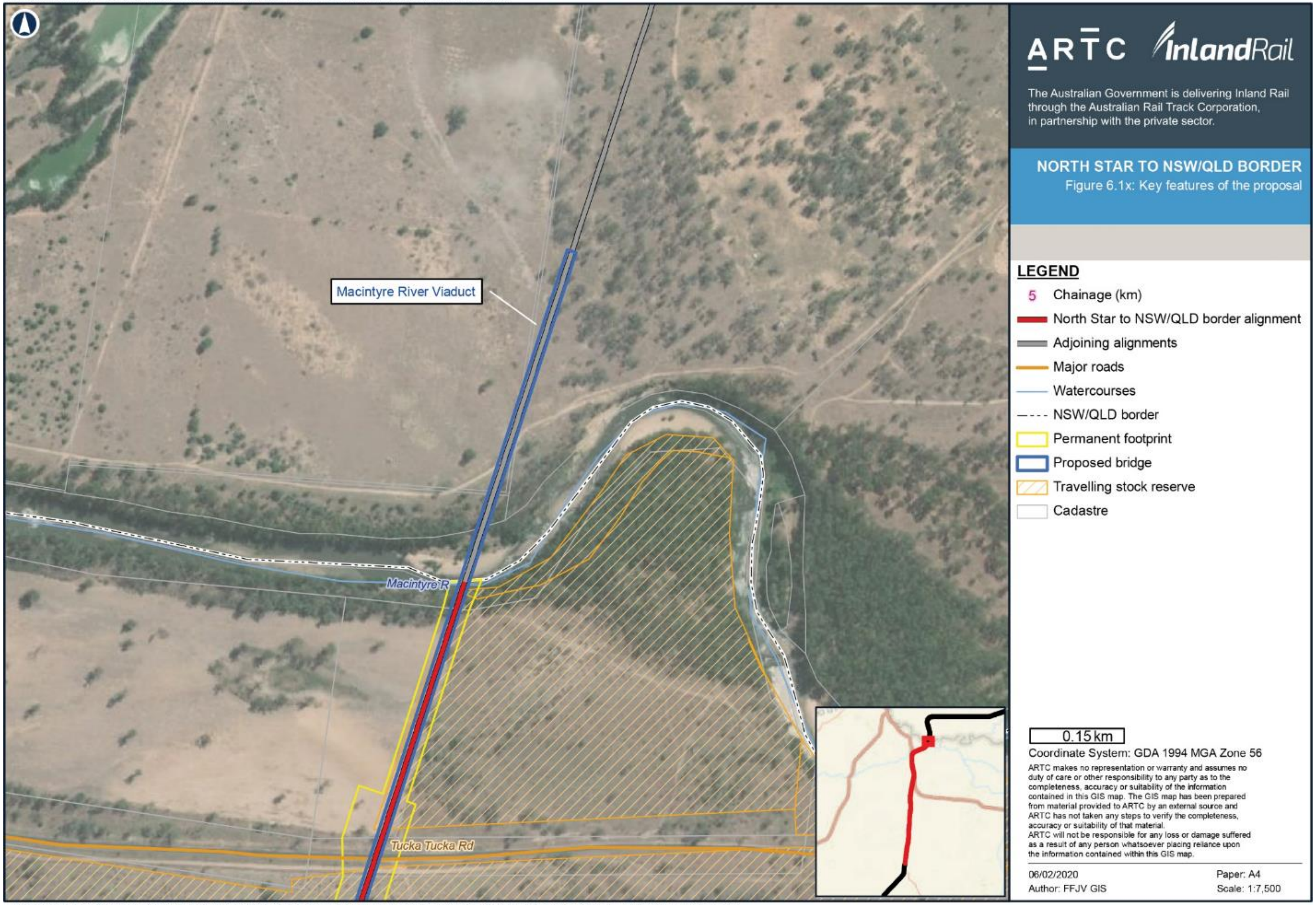

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The elements of the new track are shown in Figure 6.2 and Figure 6.3, and described in Table 6.3.

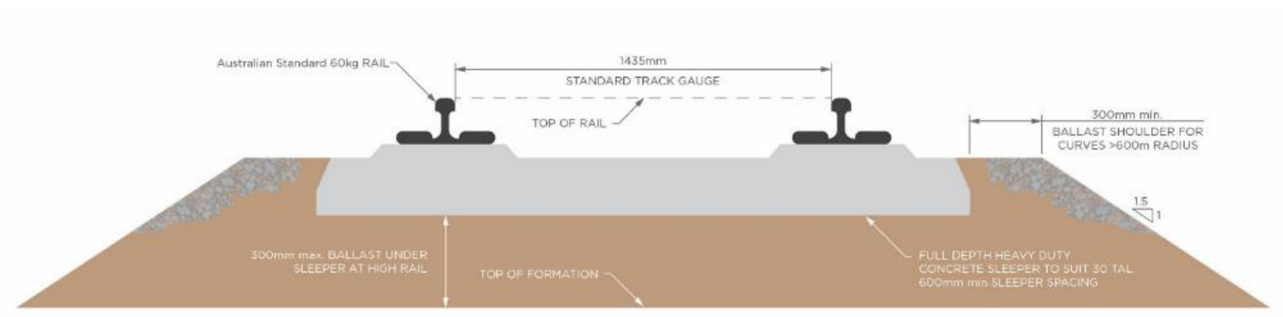

FIGURE 6.2 INDICATIVE DESIGN FOR NEW TRACK

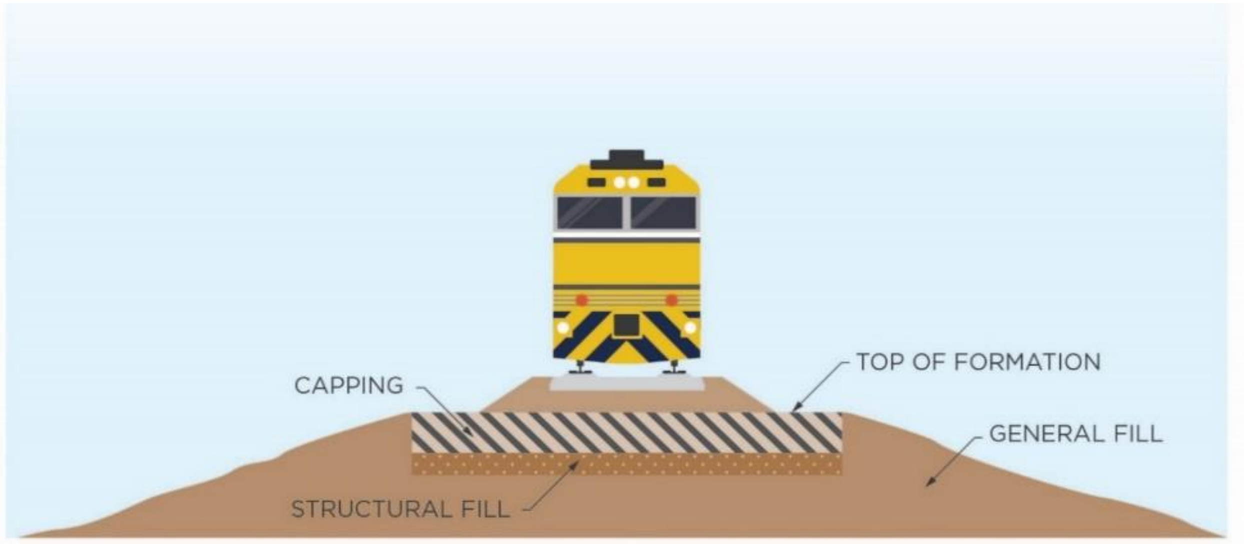

FIGURE 6.3 STRUCTURE OF THE FORMATION AND EMBANKMENT

TABLE 6.3 ELEMENTS OF THE NEW TRACK

Element	Description and purpose
Rails	▸ Continuously welded 60 kilograms per metre (kg/m) steel rails ▸ Due to there being fewer joints, trains can travel faster on continuously welded steel rails than on jointed rails. Continuously welded rails also require less maintenance and are quieter.
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 ▸ Rail pads also act to reduce noise and vibration impacts from passing trains.
Sleepers	▸ Concrete, rectangular sleepers, laid perpendicular to the rails ▸ 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
	▸ The purpose of the ballast is to:
	  ▸ Bear the load from the sleepers
	  ▸ Hold the track structure in place as trains pass by
	  ▸ Facilitate the drainage of water
	  ▸ Keep down vegetation that might interfere with trains passing by.

Formation	▸ The formation consists of a capping layer (restricts the upward migration of wet clay and silt) and a layer of structural fill.
Embankment	▸ Layer of general fill on which the formation is constructed.

In the south, the proposal will tie-in to the Narrabri to North Star Inland Rail project, which is currently being assessed by the Department of Planning, Infrastructure and Environment (DPIE).

In the north, the proposal will tie-in to the NSW/Queensland Border to Gowrie Inland Rail project, for which an EIS under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) (Qld) is currently being prepared.

6.2.2.1 Crossing loop and maintenance siding

The proposal includes one crossing loop. As the proposal is for single-line track, the crossing loop will allow trains travelling in opposite directions to pass each other.

The crossing loop is an approximately 2.2 km section of single-line, standard-gauge track, running roughly parallel to the main track. The crossing loop can accommodate trains up to 1,800 m long; however, the proposal footprint is future proofed to accommodate trains up to 3,600 m long if required. It is connected to the main track at both ends via low-speed (80 km/hr) turn outs.

A one-ended, single-line, standard-gauge siding will be incorporated into the crossing loop for maintenance purposes. It will be used to stable rail-mounted track maintenance plant and equipment (e.g. tampers, regulators, rail grinders, 'hi-rail' plant, etc.) during track-maintenance activities.

The siding is approximately 250 m long and will be connected to the southern end of the crossing loop via a low-speed (40 km/hr) turn out. Connecting to the southern end is preferred over the northern end due to the straighter, flatter alignment, and lower embankment heights.

Based on the reference design, a feasible location for the crossing loop is between Ch 22.7 km and Ch 24.9 km.

An indicative design for the crossing loop and maintenance siding is shown in Figure 6.4, while the optimised location based on the reference design is shown in Figure 6.1.

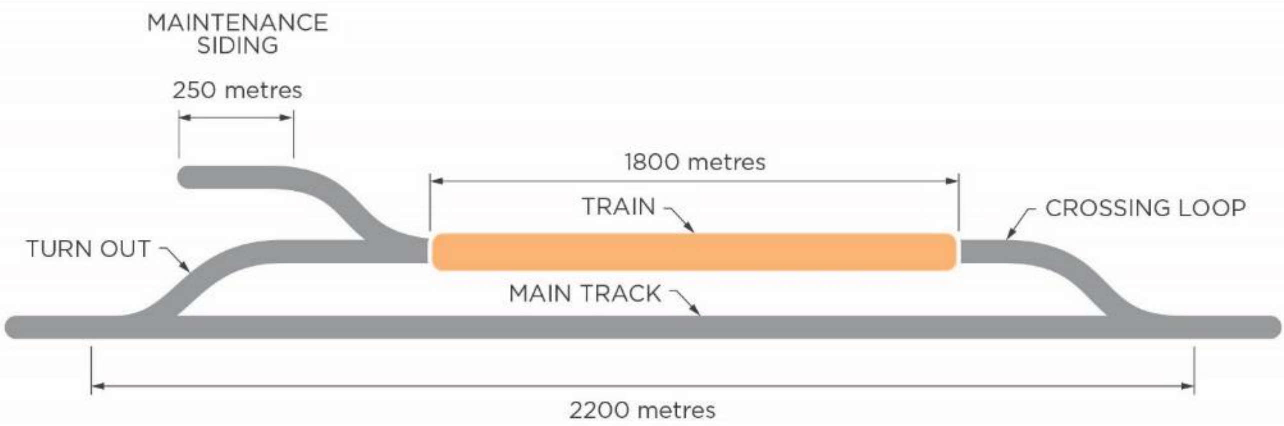

FIGURE 6.4 INDICATIVE DESIGN FOR THE CROSSING LOOP AND MAINTENANCE SIDING

On single-line track, allowing two trains travelling in opposite directions to pass each other causes at least one train to be delayed (the train that enters the crossing loop must stop to wait for the other train to pass). The length of this 'crossing delay' depends on the relative timing of the two trains' arrival at the crossing loop.

A key driver of Inland Rail is to achieve a Melbourne–Brisbane transit time of less than 24 hours with 98 per cent reliability. To achieve this target, Australian Rail Track Corporation (ARTC) is seeking to minimise crossing delays across the entire 1,700 km Inland Rail network by optimising the number and location of crossing loops. This is an iterative process, as all 13 Inland Rail projects are at different stages of design development and construction. Projects that are in the construction phase have definitive crossing loop locations; however, opportunities exist on projects that are still in the design stage (such as NS2B) to optimise the location of crossing loops.

The location of the NS2B crossing loop may change as the optimisation process progresses, driven by the design of Inland Rail projects that are still in the design phase. The location may change between Ch 16.5 km and Ch 24.9 km; however, it will remain within the permanent footprint shown in Figure 6.5. Should the location change, ARTC will assess potential impacts in line with the DPIE 'maximum parameters' approach.

Data Sources: 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
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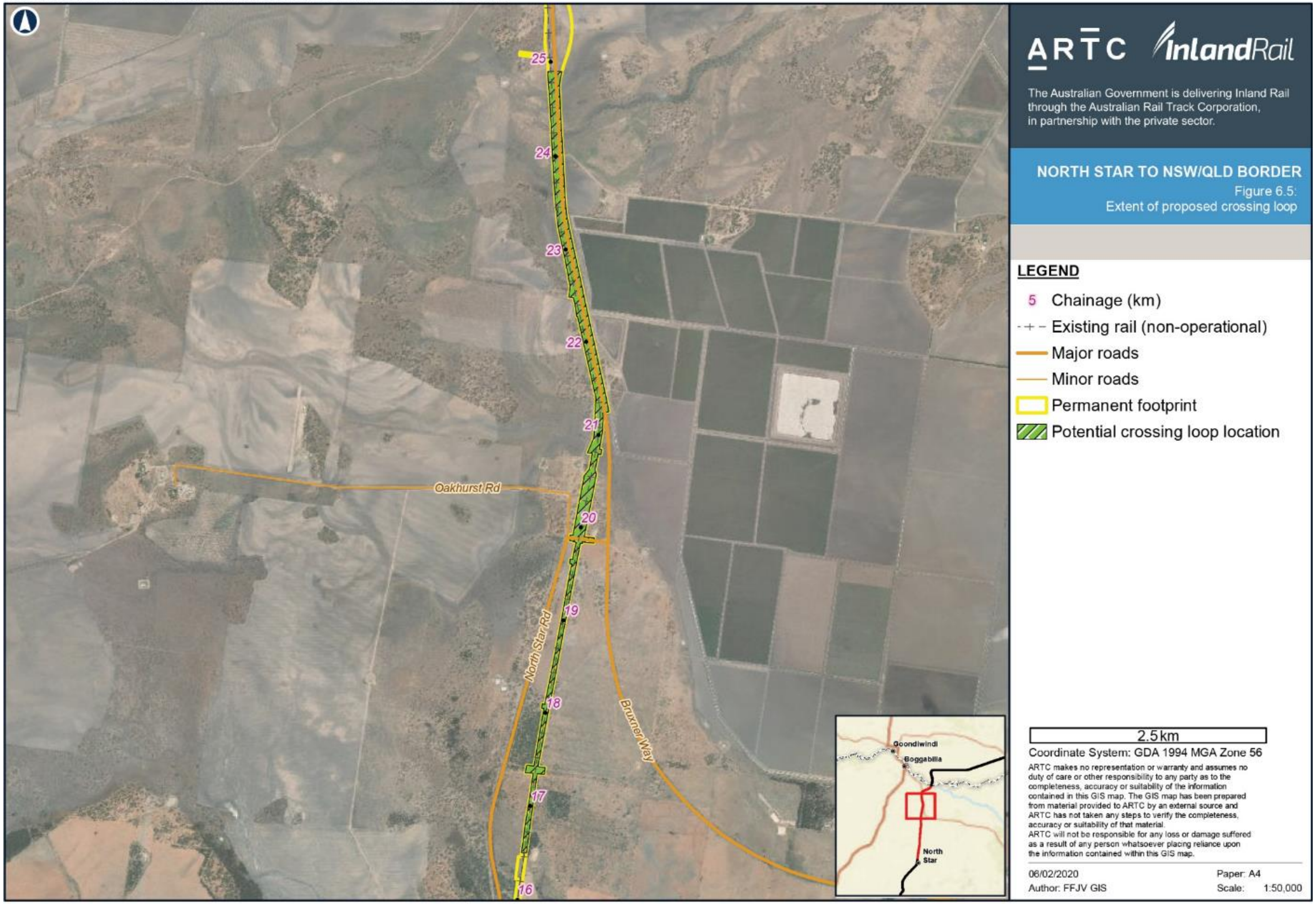

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6.2.3 Bridges

Bridges are required so that water, vehicles and, in some cases, stock and pedestrians may cross the proposed rail corridor. Two types of bridges are proposed:

- Rail over water
- Rail over road.

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

A total of 11 new bridges are proposed. Two bridges have been nominated to facilitate fauna crossing of the alignment (Back Creek Rail Bridge and Whalan Floodplain #3 Rail). The nominations are based on biodiversity assessments and the Queensland Department of Transport and Main Roads', *Fauna Sensitive Road Design Manual—Volume 2* (DTMR, 2010)[1]. Both bridges span waterways, therefore limited additional infrastructure is required to facilitate fauna crossing of the alignment.

An approximate length for each bridge is included in Table 6.4, while the location of each bridge is shown in Figure 6.1.

TABLE 6.4 PROPOSED BRIDGES

Chainage of the southern-most end of the bridge (km)	Bridge	Approximate bridge length	Fauna crossing location
Ch 5.7	Mobbindry Creek Rail Bridge	112 m	
Ch 6.1	Mobbindry Floodplain Rail Bridge	182 m	
Ch 8.1	Back Creek Rail Bridge	70 m	✓
Ch 16.3	Forest Creek Rail Bridge	154 m	
Ch 20.7	UT1 Forest Creek Rail Bridge	136 m	
Ch 25.2	Melonenkamm Rail Bridge	160 m	
Ch 25.7	Bruxner Way Rail Bridge	114 m	
Ch 26.0	Whalan Floodplain #1 Rail	183 m	
Ch 27.5	Whalan Floodplain #2 Rail	126 m	
Ch 28.0	Whalan Floodplain #3 Rail	126 m	✓
Ch 29.4	Macintyre River Viaduct	1,750 m	

6.2.3.1 Macintyre River Viaduct

The proposal includes an approximately 1.8-km long viaduct that crosses Whalan Creek, Tucka Tucka Road and the Macintyre River. Approximately 1.2 km of the viaduct is in NSW, while the remaining 0.6 km is in Queensland. An aerial view of the NSW portion of the Macintyre River Viaduct is shown in Figure 6.6, where the NSW/QLD border is defined by the centre point of the Macintyre River.

During the reference design phase, the design of the Macintyre River Viaduct was informed by geotechnical, flooding and biodiversity studies. Initially, three separate bridge structures were proposed over Whalan Creek, Tucka Tucka Road, and the Macintyre River; however, an iterative flood assessment of the design has resulted in a single viaduct structure that minimises upstream flooding impacts.

1. This manual was used in the absence of an equivalent manual for NSW. Although written in the context of road projects, the practices outlined in the *Fauna Sensitive Road Design Manual—Volume 2* (DTMR, 2010) can be applied to rail projects and rail corridor management across Australia.

FIGURE 6.6 AERIAL VIEW OF THE NSW PORTION OF THE MACINTYRE RIVER VIADUCT (SPANNING TUCKA TUCKA ROAD, LOOKING NORTH-EAST)

6.2.4 Drainage

6.2.4.1 Culverts

Culverts are structures that allow water, whether in a watercourse or drainage line, to pass under the proposed alignment. During the reference design phase, proposed designs and locations for culverts were developed based on:

- Addressing hydrologic, hydraulic and geomorphological constraints associated with the proposal
- Minimising potential flooding impacts by:
    - Locating culverts at low points along the proposed alignment in order to prevent upstream water ponding
    - Ensuring that the inside base of culverts is level with the natural surface
    - Maintaining existing patterns of flow across the floodplain so as not to divert or concentrate flows
    - Facilitating stock crossing of the alignment
    - Maintaining adequate fish passage.

Two types of culvert are currently proposed—reinforced concrete pipe culverts and reinforced concrete box culverts. Scour-protection measures will generally be installed around culverts, on disturbed stream banks, and around waterfront land to prevent erosion.

A total of 39 culvert locations were identified during the reference design phase. The number of culverts and their locations will be further refined during the detailed design phase in order to minimise potential impacts, including impacts related to flooding, water quality, fauna passage and travelling stock reserves (TSRs).

6.2.4.2 Track drainage

The purpose of 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. Without adequate track drainage, the subgrade may become saturated, leading to weakening and subsequent failure of the subgrade.

Two types of track drainage are currently proposed:

- **Embankment drains** (Figure 6.7) are proposed within the permanent footprint, adjacent to the track
- **Catch drains** (Figure 6.8) are proposed within the permanent footprint, on the uphill side of cuttings.

Both types of track drainage will be lined with grass to prevent erosion.

Due to topographic constraints, track drainage is not feasible along the entire length of the alignment; rather, track drainage is proposed at specific locations along the proposed 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 during the detail design phase to minimise potential impacts.

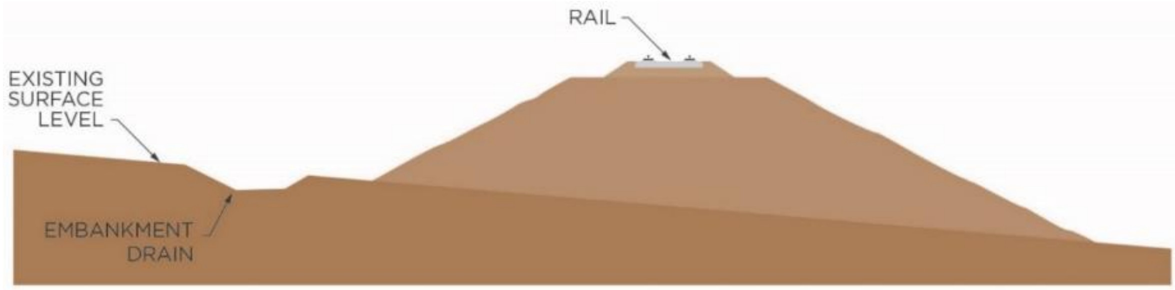

FIGURE 6.7 INDICATIVE EMBANKMENT DESIGN

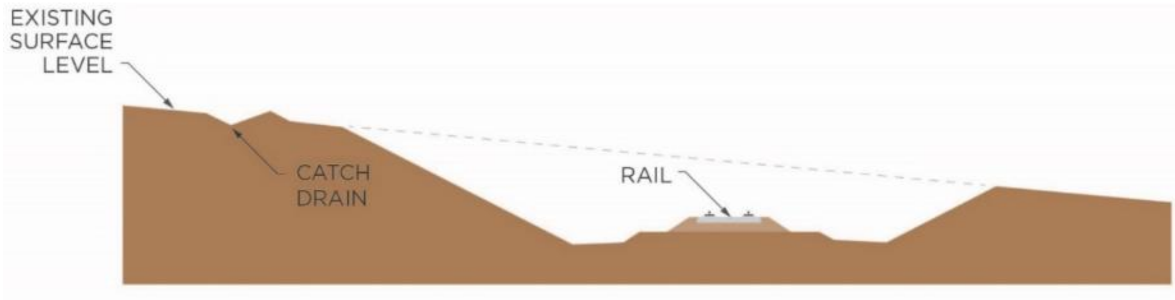

FIGURE 6.8 INDICATIVE CATCH DRAIN DESIGN

6.2.5 Road–rail interfaces

6.2.5.1 Public crossings

Public road–rail interfaces are points where the rail alignment crosses a public road. The proposal would require the crossing of local government (Gwydir Shire Council and Moree Plains Shire Council) roads. A summary of public road–rail interfaces along the proposed alignment is presented in Table 6.5.

TABLE 6.5 SUMMARY OF PUBLIC ROAD–RAIL INTERFACES FOR THE PROPOSAL

Road manager	Number of public road–rail interfaces
Gwydir Shire Council	3
Moree Plains Shire Council	11
State of NSW	4

A desktop assessment found that the proposal interfaces with ten unformed roads. ARTC will liaise with the relevant road or track manager to determine requirements to create level crossings at these locations.

For public crossings, ARTC would continue consultation with state authorities and local councils to identify preferred road–rail interface treatments are each location. Part of this process would be working with the relevant road manager to understand existing local environmental conditions and gather information on future development plans within the locality to inform the proposed design.

The appropriate road–rail interface treatment would be assessed on a case-by-case basis for design purposes, with consideration given to current and future usage of the asset, its location relative to other crossings of the rail corridor, and the road and rail geometry at the crossing location.

In the development of the proposed treatments, ARTC would take state and national guidelines and strategies into consideration. The Office of the National Railway Safety Regulator (ONRSR) and Transport for NSW (TfNSW) both have policies to avoid building new level crossings or minimising proposals to construct a public level crossing along a new rail link.

Treatments for public road–rail interfaces are 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. The signage is unchanging with no mechanical aspects or light devices.
  - **Active**—have flashing lights with or without boom barriers for motorists. 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 would only be closed where the impact of diversions or consolidations is considered acceptable, or the existing location is not considered safe and cannot be reasonably made safe. Approval for closures, where required, would be progressed in accordance with the relevant legislative requirements.

To assess potential level crossing locations, a national system called Australian Level Crossing Assessment Model (ALCAM) was used, 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 and Transport.

Public road–rail interfaces of the proposal are summarised in Table 6.6. The final number of public road–rail interfaces, and preferred treatments, will be determined during the detail design phase. Unformed roads will remain unformed as part of this proposal.

TABLE 6.6 PUBLIC ROAD–RAIL INTERFACES

Interface with public road	Approximate chainage (km)
Unnamed Road	Ch 1.5
North Star Road	Ch 7.0
Unnamed Road (TSR)	Ch 9.2
Unnamed Road (TSR)	Ch 9.3
Forest Creek Road	Ch 12.2
North Star Road	Ch 19.9
Unnamed Road (TSR)	Ch 20.7
Unnamed Road	Ch 20.8
Unnamed Road	Ch 22.4
Unnamed Road	Ch 23.4
Unnamed Road	Ch 25.0
Bruxner Way	Ch 25.5
Bruxner Way	Ch 25.8
Unnamed Road	Ch 26.3
Unnamed Road	Ch 27.3
Unnamed Road	Ch 28.6
Unnamed Road (TSR)	Ch 29.9
Tucka Tucka Road	Ch 30.1

Table note: TSR = travelling stock route

Further consultation with TfNSW, local governments and the local community would confirm the location and preferred treatment for each public road–rail interface. The consultation strategy is described in Appendix D: Consultation Summary.

6.2.5.2 Occupational (private) crossings

Based on the reference design, the proposal would impact on access to a number of private properties. The potential impacts at each individual property would differ and ARTC would continue to consult with landowners to minimise disturbance within their property.

The final number of occupational crossings within private property would be determined during the detailed design phase. ARTC has consulted with landowners potentially impacted by the final rail corridor to understand their property access requirements and provide potential private access solutions based on the proposed reference design. Each property solution would be negotiated on a case-by-case basis through ongoing consultation with landowners and further design refinement.

Where level crossings are required, ARTC would work with landowners to determine a design that suits their requirements. For example, in areas where landowners use large farm machinery, the design of the level crossing would include wider gates and suitable approach gates. Where there is stock on a property, the focus would be on putting the appropriate fencing and gates in place to prevent stock entering the rail corridor.

Both the state and national rail safety guidelines and policies are safety focused; therefore, ARTC would consult with each landowner to find solutions that minimise the number of level crossings across the proposed alignment. Consultation to identify potential occupational crossing solutions is further described in Appendix D: Consultation Summary.

The design and layout of occupational crossing solutions would be based on:

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

Typical treatments would include:

- Underpass (stock passage, multiple use vehicles)—based on suitable site topography
- At-grade level crossing
- Diversion to adjacent public road and/or public road crossing.

6.2.5.3 Travelling Stock Reserve interfaces

The proposal interfaces with state TSR networks in four locations. The state TSR network is primarily used by the pastoral industry as:

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

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

In circumstances where the proposed rail alignment has the potential to impact on existing TSRs, ARTC would consult with Local Land Services, Gwydir Shire Council and Moree Plains Shire Council to identify potential solutions for the treatment of rail and TSR interfaces. Locations of TSRs that would intersect with the proposed rail alignment are identified in Table 6.7.

TABLE 6.7 PROPOSED TREATMENTS FOR TRAVELLING STOCK RESERVES

Approximate chainage (km)	Proposed treatment	Description and treatment justification
Ch 9.2	Level crossing	A level crossing will be provided to allow for combined TSR and private road crossing. Design feature requirements for stock crossing functionality will be confirmed in consultation with the relevant stakeholders (private and TSR owners) during the detail design phase.
Ch 9.3	No crossing provided (consolidation)	This is an isolated fragment of TSR. It is severed from the balance of the TSR, which is located to the west of North Star Road. There is little value in moving stock across the rail corridor at this location; therefore, it will be consolidated with the private level crossing at Ch 9.2 km.
Ch 20.7	Grade separation (rail bridge structure)	This TSR is comprised of a series of lots on either side of the proposed alignment, covering an area of approximately 900 m^2. It is an isolated TSR, not connected to any linear TSRs that could be used for transporting stock overland. A stock underpass will be provided with the UT1 Forest Creek Rail Bridge.
Ch 29.9	Grade separation (rail over road)	This TSR is nominally 300 m wide. The adjacent landowner uses this TSR for grazing and moving stock overland. A stock underpass will be provided with the Macintyre River Viaduct.

6.2.6 Road realignments

The proposal involves a realignment of Bruxner Way. Bruxner Way is a Classified Main Road under the *Roads Act 1993* (NSW), and a regional road. It is a two-lane, two-way road with a posted speed limit of 100 km/hr.

In order to achieve flood immunity, the elevation of the proposal must be significantly higher than Bruxner Way at the point where the proposal intersects Bruxner Way; therefore, a rail-over-road grade separation with a minimum vertical clearance of 5.4 m is proposed at the point of intersection.

At the point where the proposal intersects the existing Bruxner Way, the skew angle is approximately 75 degrees. Maintaining this skew angle would involve constructing a bridge with excessively long, non-standard spans.

A more practical skew angle is 45 degrees. To achieve a 45-degree skew angle, it is proposed to realign Bruxner Way to the east, and then back to the existing Bruxner Way on a slight curve.

As part of the reconfiguration, the elevation of Bruxner Way will be maintained or slightly increased. This will maintain or improve the flood immunity of Bruxner Way at this location.

An aerial view of the proposed Bruxner Way realignment is shown in Figure 6.9. Culverts are not shown in Figure 6.9.

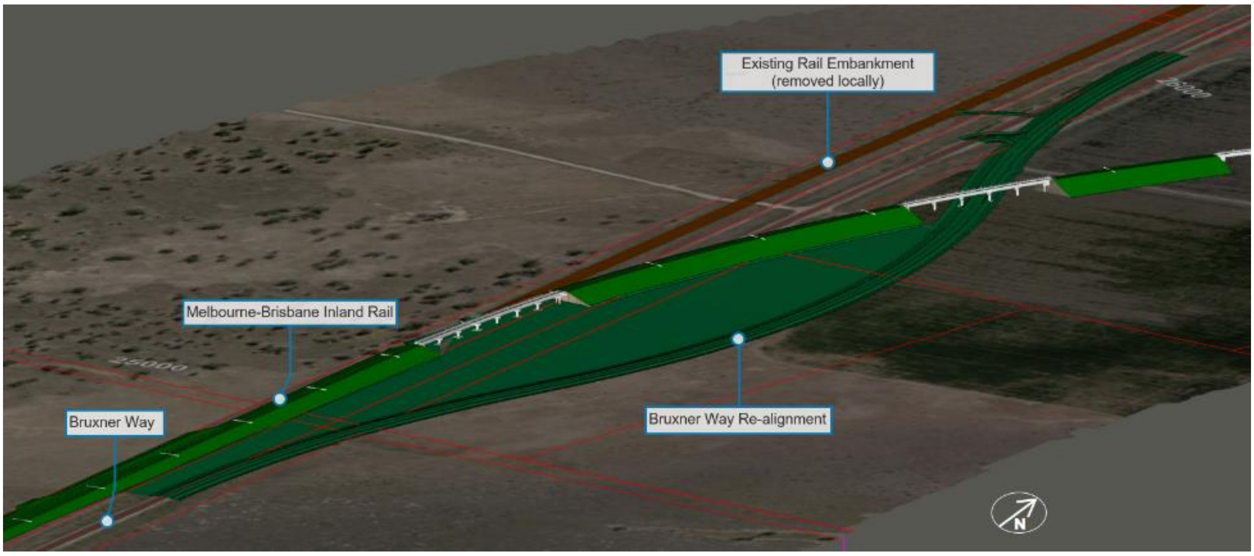

FIGURE 6.9 AERIAL VIEW OF THE PROPOSED BRUXNER WAY REALIGNMENT

6.2.7 Rail maintenance access roads

Rail maintenance access roads provide access to the rail corridor for maintenance of critical infrastructure, emergency recovery, and access to crew change and train stowage. Critical infrastructure includes bridges, culverts, the crossing loop and maintenance siding, turnouts and active level crossings.

Within the existing non-operational Boggabilla rail corridor, existing public roads (e.g. North Star Road and Bruxner Way) run parallel to much of the proposed alignment. These roads will be used as rail maintenance access roads for maintenance of critical infrastructure and emergency recovery. Access points will be provided at regular intervals between the rail corridor and these existing public roads.

Within the greenfield rail corridor, there are no public roads suitable for use as rail maintenance access roads. Therefore, new rail maintenance access roads will be constructed within the permanent footprint shown in Figure 6.1. Wherever possible, temporary access tracks established during construction will be retained to serve as rail-maintenance access roads during the operation phase of the proposal. Whether rail-maintenance access roads are positioned at ground or formation level will depend on the local topography, the location of railway infrastructure, and the criticality of accessing the infrastructure.

Key features of rail maintenance access roads include:

- Parallel to the alignment
- Situated within, or in close proximity, to the rail corridor
- Minimum width of 3.5 m
- Minimum passing bay interval of 500 m
- Minimum turnaround interval of 2,000 m or at a dead end
- Designed to accommodate vehicles weighing up to 20 tonnes and up to 12.5 m in length.

6.2.8 Earthworks

The proposed alignment traverses the Macintyre River floodplain for approximately 14 km. To achieve 1% Annual Exceedance Probability (AEP) flood immunity, the majority of the proposal is elevated on a fill embankment. The embankment height is typically less than 2 m (Figure 6.10); however, around the realigned Bruxner Way and in the lead up to the Macintyre River Viaduct, the embankment height increases to approximately 7.5 m, corresponding to a base width of approximately 52 m (Figure 6.11). A general width of 40 m has been adopted for new rail corridor with locally widened corridor sections to account for a wide base of formation, due to high embankments.

A summary of indicative earthworks values is shown in Table 6.8. The earthworks values will be subject to further refinement during the detailed design phase.

FIGURE 6.10 REPRESENTATIVE EMBANKMENT HEIGHT (2 M HIGH WITH 6 M WIDE BASE)

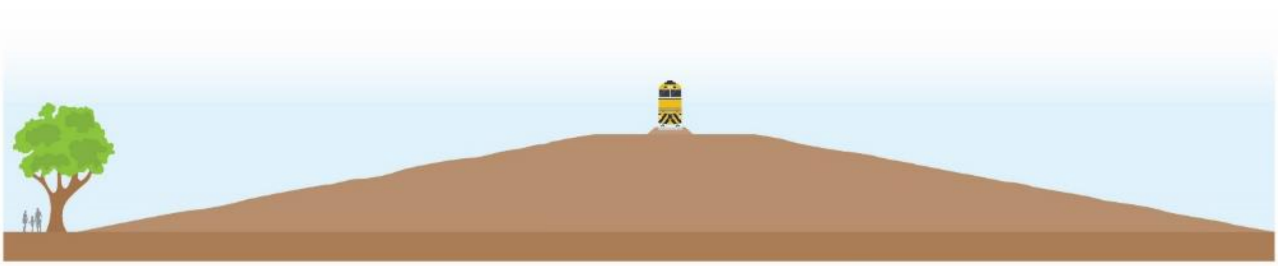

FIGURE 6.11 REPRESENTATIVE EMBANKMENT HEIGHT (7.5 M HIGH WITH 52 M BASE)

TABLE 6.8 SUMMARY OF THE PROPOSED EARTHWORKS

Feature	Indicative value	Approximate chainage
Total length of cut	0.4 km	-
Maximum depth of cut	1.1 m	Ch 11.7 km
Total length of embankment	29.6 km	-
Maximum height of embankment	7.6 m	Ch 25.8 km

Embankments have been designed and constructed to maximise safety and stability during operation and maintenance of the proposal and minimise erosion during flood events.

No significant cuttings (i.e. > 10 m deep) are proposed; however, materials won from excavations and cuttings will be assessed for re-use as embankment fill. If unsuitable for reuse and treatment is not practicable, this material may be formed into permanent spoil mounds within the rail corridor. Features of the spoil mounds include:

- Located as close as possible to the source of excavated material
- Maximum height of 2 m, and will not exceed the top height of the new rail line
- May be located on both sides of the track
- Would be stabilised as required
- Gaps in the spoil mounds would be provided to allow water to drain away from the track.

The exact location, sizing and design of spoil mounds will be determined during the detailed design phase, with consideration given to the results of hydraulic modelling and sight distances. Where practicable, mounds would not be in areas where they would impact on flooding or drainage.

6.2.9 New utility connections

The two active level crossings, as well as the crossing loop, require new electrical and communications connections to facilitate operation of flashing lights, boom barriers and turnouts, and to allow active controls to tie into the wider Inland Rail network.

During the reference design phase, supply points (i.e. existing utility infrastructure) for the new electrical and communications connections were identified. The criteria for identifying potential supply points were:

- Ease of access—supply points located on public land were preferred. This reduces or eliminates access requirements and minimises the operational interface between asset owners and ARTC.
- Shortest route with the fewest road and service crossings—this reduces the costs and time associated with new connections and minimises disruptions to residents.

Potential supply points will be refined during the detailed design phase, in consultation with the relevant utility owners.

6.2.10 Fencing and gates

The purpose of fencing is to protect the proposed alignment from trespass, prevent stock on adjoining properties from accessing the rail corridor, facilitate access to the rail corridor for maintenance and emergency recovery, and facilitate stock and fauna crossing of the alignment. Where required, standard rural fencing consistent with the rural landscape will be installed.

The design and location of fencing is being developed in consultation with affected landowners and other stakeholders. Where required, gates will be installed at suitable corridor entry/exit locations. Fauna exclusion fencing will also be considered in association with the nominated fauna crossings.

6.2.11 Land acquisition

Much of the proposal is situated within the existing non-operational Boggabilla rail corridor, which is owned by the NSW Government (TfNSW) and leased by ARTC. Where the proposal is situated outside the existing non-operational Boggabilla rail corridor, land acquisitions may be needed to ensure that all infrastructure associated with the proposal is situated within the ultimate Inland Rail corridor.

Land acquisitions will be carried out in accordance with the *Land Acquisition (Just Terms) Compensation Act 1991* (NSW). The extent of property acquisitions will be confirmed in consultation with the affected landowners.

6.3 Operation of the proposal

Subject to approval of the proposal, construction is planned to occur between 2021 and 2025. The proposal will be managed and maintained by ARTC; however, train services will be provided by a variety of operators. Trains will be double stacked (up to 6.5 m high) and operate on a 24/7 basis (Photograph 6.1).

PHOTOGRAPH 6.1 EXAMPLE OF A DOUBLE-STACKED FREIGHT TRAIN

Train services are not expected to commence until all 13 sections of Inland Rail are complete, which is planned to be in 2025.

The proposal will be trafficked by an estimated 14 trains per day in 2025, increasing to an estimated 21 trains per day in 2040. Annual freight tonnages will increase in parallel, from approximately 12 million tonnes per year in 2025 to 20 million tonnes per year in 2040.

6.4 Maintenance of the proposal

During the operation phase, standard maintenance activities will be undertaken, including:

- Bridge and culvert inspections
- Sleeper replacement
- Rail welding and grinding
- Ballast dropping and cleaning
- Track tamping and reconditioning
- Vegetation management
- Signalling systems and equipment testing and maintenance.