5. Project description

This chapter and Chapter 6 provide a detailed description of the project.

DGRs	Where addressed
Detailed description:	
Include a detailed description of the project, including:	Chapters 5, 6
▪ Route alignment and corridor width.	Section 5.3.2
▪ Design elements (eg construction of temporary crossings, bridges, culverts, creek diversions, pedestrian and cyclists facilities etc).	Sections 5.3.3 to 5.3.11, 6.6.3
▪ Potential staging.	Section 6.2.1
▪ Ancillary facilities (eg compound site, batching plants etc).	Section 6.6
▪ Resourcing (eg construction material needs, spoil disposal, natural resource consumption including water etc).	Section 6.3

The chainages referred to throughout this chapter refer to those along the southbound carriageway of the project.

5.1 Project overview

The project would include the following key components:

- Approximately seven kilometres of dual carriageway.
- An interchange in the vicinity of Mate Street (north of the village).
- Twin bridges over Tarcutta Creek.
- An interchange in the vicinity of Humula and Mates Gully roads (south of the village).
- Twin bridges over Keajura Creek.

The project would have a predominantly flat curvilinear alignment. At its northern extent, it would adjoin the Hume Highway duplication works, which are under construction to the north of Tarcutta. The project would then head south, generally retaining the existing Hume Highway carriageway as the southbound carriageway, where appropriate. An interchange would be constructed on farmland to the west of the existing highway in the vicinity of Mate Street incorporating northbound on-load and southbound off-load ramps.

The project would deviate to the west of the existing highway and the Tarcutta General Cemetery, parallel to the existing highway south to Tarcutta Creek. Twin bridges would be required over Tarcutta Creek downstream of the existing highway bridge. South of these bridges, the project would cross the existing highway to the north-east of the Mates Gully Road intersection. It would then continue in a south-westerly direction on the eastern side of the highway for approximately one kilometre, where it would again cross the existing highway from east to west, just north of the existing Humula Road intersection. An interchange would be constructed in this area, with northbound off-load and southbound on-load ramps.

South of the interchange, the project would cross over Keajura Creek on twin bridges and would adjoin the existing duplicated highway south of Humula Road.

Figure 5-1 provides an overview of the project.

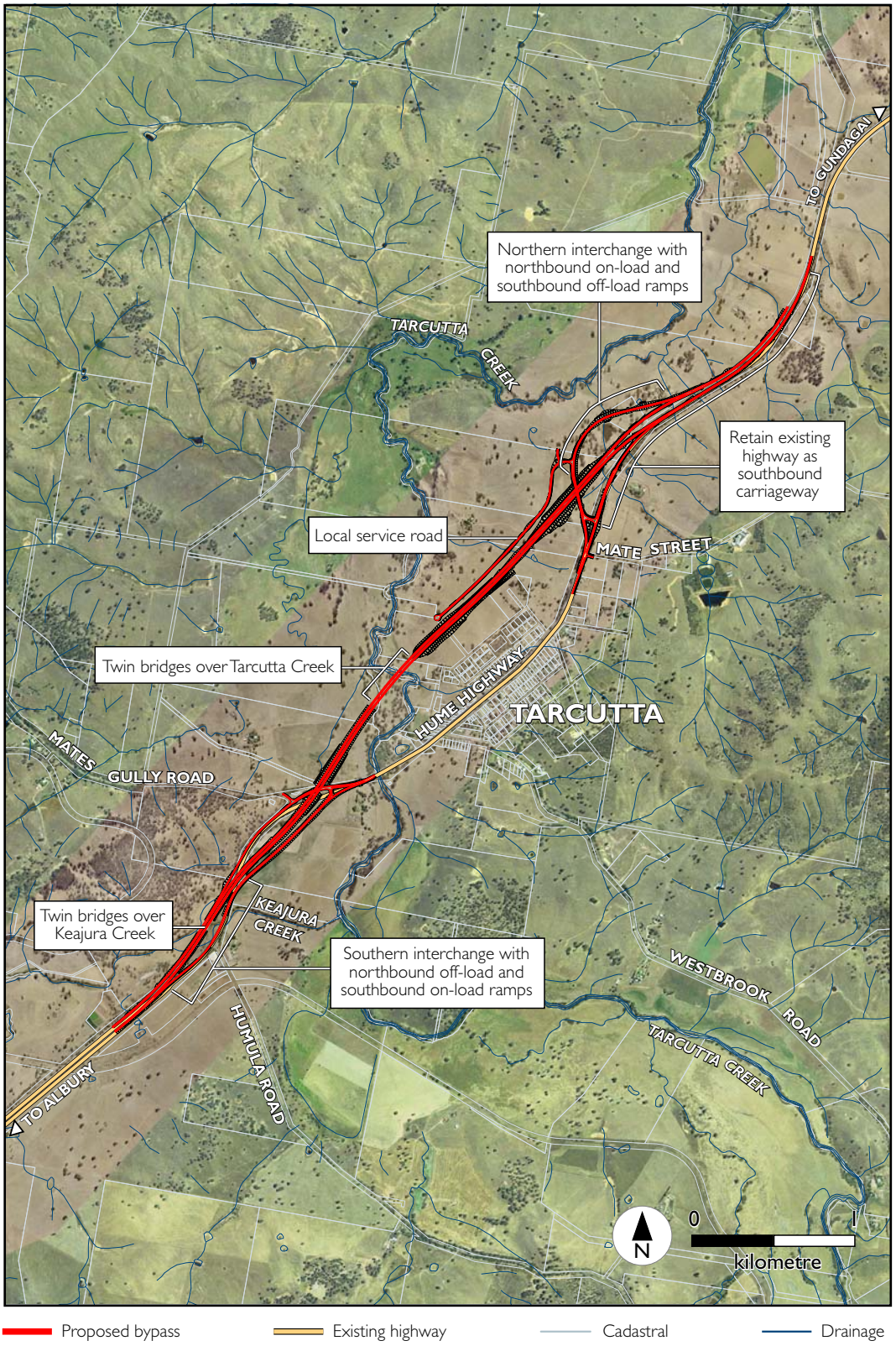


Figure 5-1 **Overview of the project**

5.2 Design criteria

5.2.1 Design parameters

Table 5-1 summarises the design parameters for the project.

Some at-grade intersections may be provided for local roads and private properties, consistent with road safety considerations. The design criteria of private property or local road access to the project would be determined during the detailed design phase (and in accordance with relevant standards). Such access would be minimised and only provided where essential.

Table 5-1 Summary of design parameters for the project

Design parameter	Recommended criteria
Design speed	▪ 110 kilometres per hour horizontal alignment. ▪ 110 kilometres per hour vertical alignment.
Sight distance	▪ 110 kilometres per hour sight stopping distance (2.5 second reaction time).
Horizontal alignment	▪ 1000 metres minimum desirable radius.
Grade	▪ 4.5 per cent desirable maximum. ▪ 6.0 per cent absolute maximum.
Cross section (mainline typical)	▪ Basic configuration of dual carriageways, with new carriageways providing two travel lanes in each direction. ▪ Traffic lane width: ▸ 3.5 metres. ▪ Outside (verge) shoulder width: ▸ 2.5 metres (where barrier is required there would be a 3.0 metre offset from the edge of trafficable lane). ▪ Inside (median) shoulder width: ▸ 1.0 metre (where barrier is required there would be a 2.0 metre offset from the edge of trafficable lane). ▪ Median width: ▸ Generally provide a 12.0 metre depressed median with landscaping. Consideration to be given to the provision of safety barriers at critical locations. ▸ Consider a 5.0 metre median with safety barriers and landscaping at locations where design provides a major cost saving (eg deep cuts) and where sight lines permit. ▪ All median breaks and crossovers with at-grade intersections should accommodate turning of an articulated vehicle of up to 26 metres long (ie a B-double).
Interchanges and road crossings	▪ Major junctions/intersections with main roads would generally be grade separated. ▪ Intersections with minor roads would be at grade, dependent on traffic volumes. Local road crossings not requiring access to the highway would be grade separated.
Cuttings/embankments	▪ Batter slopes would generally be 2H:1V to 3H:1V depending on material type and with consideration given to flatter fill batters, where appropriate, and control of soil erosion.

Design parameter	Recommended criteria
Road reserve corridor widths	▪ Generally, to provide a minimum 10 metre width from tops of cuts and toes of fills to Controlled Access Road boundary.
Property access	▪ Access control would apply on all sections of work when new boundaries are being established. On these sections, the number of access points would be kept to a minimum.
Bridges	▪ Width and length as per the Austroads *Bridge Design Guide*.
Pavement	▪ Design life: ▸ Dual carriageway and ramps — 40 years.
Signposting	▪ Signposting to follow the format provided in the RTA's *Guide Signposting* (RTA 2007a) and *Tourist Signposting Manual* (RTA 2009a).

5.2.2 Urban design objectives

The *Hume Highway Urban Design Framework, Preston (WM7) to Albury* (RTA 2009b) identifies six overall urban design objectives for the highway. These objectives seek to highlight the positive characteristics of the surrounding area while minimising any potential negative impacts. The six objectives, which have been adopted for this project, are as follows:

- Objective 1: A highway that flows with the landscape — provide a flowing highway alignment that is responsive to, and best fits with, the landscape.
- Objective 2: A safe and memorable drive through NSW — provide a safe, enjoyable and memorable motoring experience that engages with the landscape of NSW, and makes best use of views and vistas.
- Objective 3: Well vegetated and responsive to natural systems — provide a well-vegetated, natural road corridor that protects and enhances the natural systems and ecology of the corridor.
- Objective 4: Town bypasses as an integral part of the towns' planning — create new town bypasses as an integral part of the towns' planning, clearly defining the relationship to each town for the motorist.
- Objective 5: Respond to the communities, history and culture — respect and respond to the communities along the corridor, and the historically and culturally significant aspects of the corridor.
- Objective 6: A simple and unified palette of details, and elements, which minimise maintenance — achieve a simple palette of highway details, elements and components consistent throughout the corridor, which meet safety requirements and minimise ongoing maintenance costs.

Urban and landscape design issues have been integral to the development of the concept design. The project minimises impact on areas of ecological and Aboriginal heritage significance in both the northern and southern sections. The concept design developed in response to these constraints also offers benefits in terms of landscape and urban design integration as the impact on the adjoining landform is reduced. Section 10.2.6 presents the draft urban design and landscape strategy that has been developed for the project. This strategy has been based on ongoing refinement of the design, the above-mentioned urban design objectives, and the assessment of the visual amenity and landscape impacts of the project. It would be finalised during detailed design.

5.3 Design elements

5.3.1 Detailed design development

The concept design addresses and responds to the constraints and principles identified during the investigations undertaken to date. The concept design is intended to define a buildable concept that provides:

- A definition of property acquisition requirements sufficient to allow acquisition to proceed.
- A clear description of the design principles, extent of impacts and impact management requirements.
- A sound and clear basis for later development of the detailed design to a standard required to support project delivery.

The design of the project would continue to be refined during the detailed design phase and would be guided by the key principles developed during the concept design and environmental assessment phase. The development of the detailed design would:

- Be consistent with key design parameters as described in this environmental assessment and any subsequent RTA response to submissions or preferred project report.
- Address any unresolved issues associated with the development of the concept design proposed in this environmental assessment and any subsequent RTA response to submissions or preferred project report.
- Meet any conditions of approval arising from the approval process under Part 3A of the *Environmental Planning and Assessment Act 1979*.
- Incorporate community and government agency requirements by implementing a consultation plan to identify and resolve further concerns raised by the community and other stakeholders.
- Avoid identified environmentally sensitive areas, and significant species and communities, wherever possible.
- Further develop and refine mitigation measures.
- Appropriately develop and incorporate the urban design and landscape strategy.
- Establish detailed proposals for construction delivery method, addressing buildability, traffic capacity and safety during construction, geotechnical issues, all relevant RTA specifications and design requirements, current guidelines and policies, and practicality/cost effectiveness.
- Address risk management during construction and operation.
- Provide a level of definition sufficient to support a construction contract that will meet all of the RTA's requirements for the completed project.
- Ensure that the detailed design allows for safe and cost-effective maintenance of the project during operation in accordance with occupational health and safety requirements and relevant RTA specifications.

5.3.2 Route alignment and corridor width

The corridor width would generally be 90 metres wide and up to 300 metres wide at each of the interchanges.

For ease of identification, the project has been divided into three sections: northern, middle and southern. This division separates three of the key elements of the project: the northern interchange, the Tarcutta Creek floodplain bridge and section adjacent to Tarcutta village, and the southern interchange and Keajura Creek crossing. The division of the three sections is shown in Figure 5-2. The horizontal and vertical alignments of the project are described below from north to south and are shown in Figures 5-3 to 5-5.

Northern section

This section would extend from the northern tie-in with the existing Hume Highway to the Tarcutta General Cemetery (approximately three kilometres long).

The terrain in this northern section is gently undulating, with two high points at approximate chainages 41700 and 43300. The difference between the highest and lowest points is approximately 25 metres. This section would be located outside the Tarcutta Creek floodplain. The design of this section has been influenced by environmental constraints and the requirement to provide a high-standard road access in and out of Tarcutta village.

The horizontal alignment of the proposed northbound and southbound carriageways would match that of the existing highway for the first approximately 700 metres before starting to shift west to form a split carriageway. The two carriageways would form a median again in the vicinity of chainage 42500. The project would then continue south-west running parallel with, and west of, Tarcutta village.

The vertical alignment of the main carriageway would consist of large-sized vertical curves and gentle grades consistent with the design parameters listed in Table 5-1.

An interchange with a southbound off-load ramp a northbound on-load ramp would be provided in the northern section.

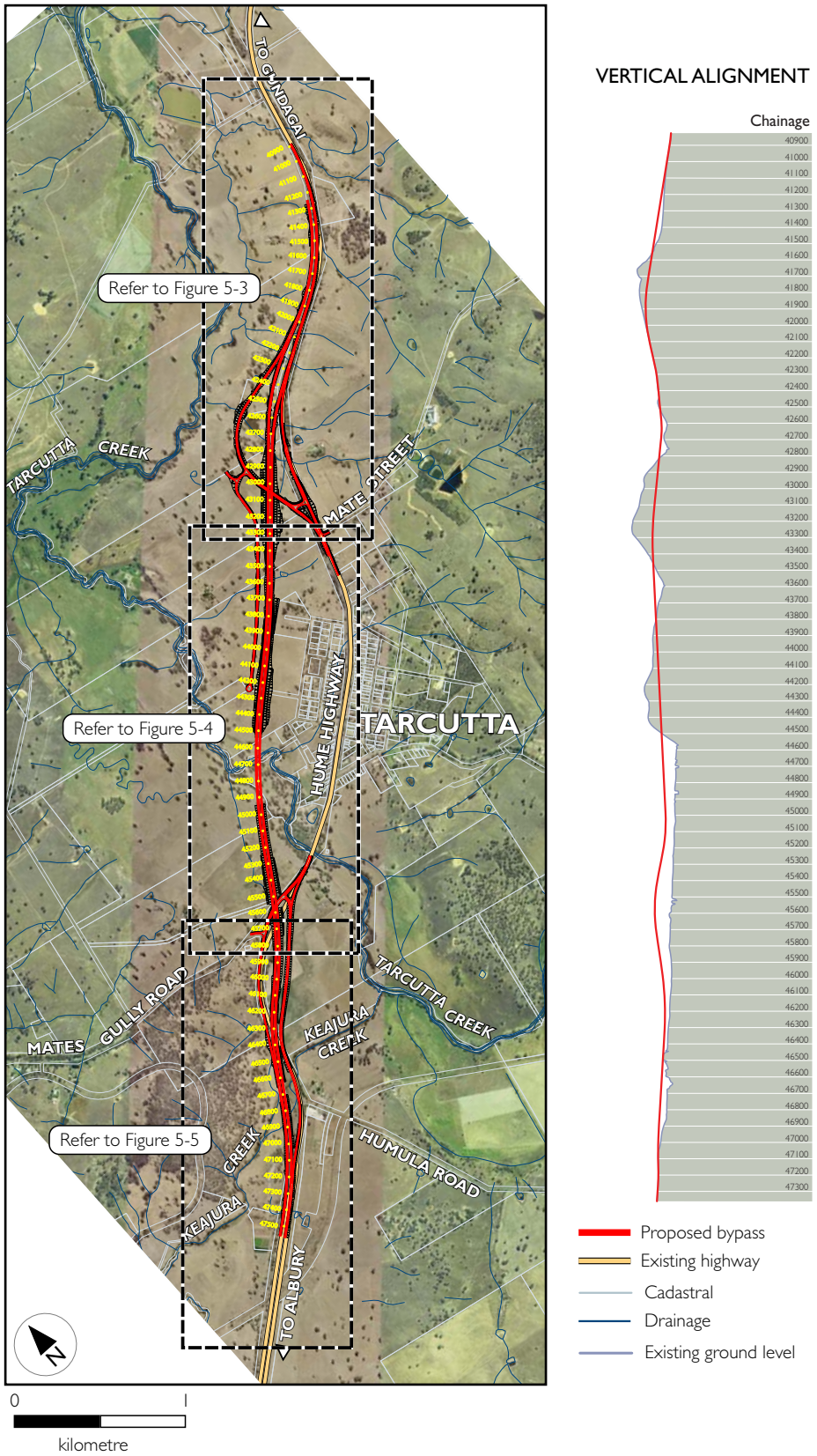


Figure 5-2 **Concept design – key plan**

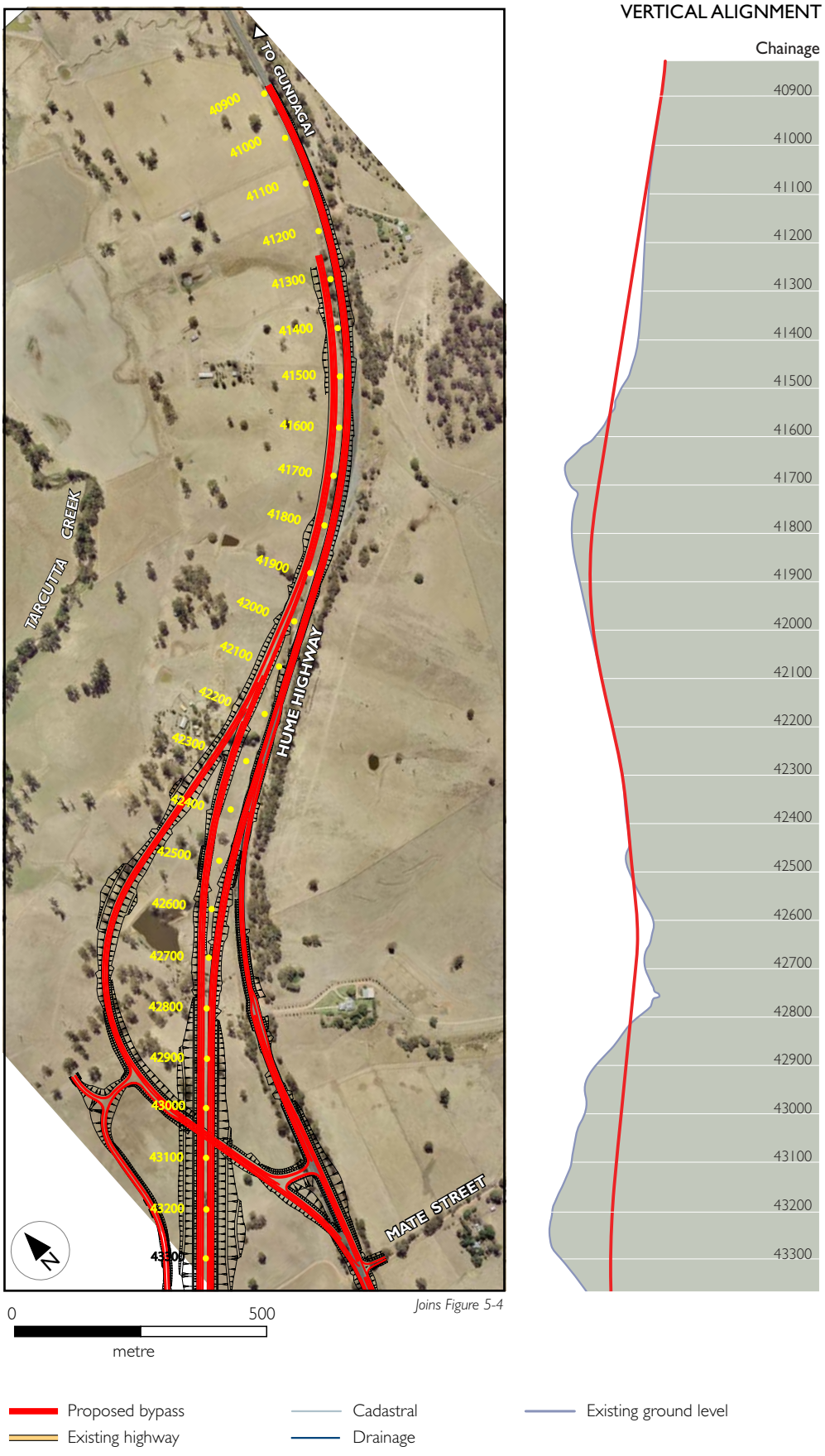


Figure 5-3 **Concept design horizontal and vertical alignment (northern section)**

Middle section

This section would extend from south of the Tarcutta General Cemetery to north of Mates Gully Road (approximately two kilometres).

The existing terrain includes Tarcutta Creek and its associated floodplain, and contains segments of Crown land (NSW Department of Lands). Environmental constraints that have influenced the design in this section include flooding (afflux and velocity) and biodiversity (particularly to maintain important fauna corridors).

The horizontal alignment would be relatively straight and would continue south running parallel with, and west of, Tarcutta village. Large waterway openings, comprising bridge and/or culvert structures, would be provided across the Tarcutta Creek floodplain. The total overall width of the waterway opening is likely to be in the range of 400 to 600 metres. The final configuration of bridge and culvert structure details would be confirmed during detailed design. Design of the width and type of structure is ongoing in order to ensure that any flooding impacts are minimised. Potential flooding impacts of the project and measures to manage these impacts are discussed in Section 9.4.

The vertical alignment of the main carriageway in the middle section would comprise a mix of flat grades consistent with the design parameters listed in Table 5-1.

Southern section

The southern section would extend from Mates Gully Road past Humula Road to the connection with the existing dual carriageway to the south (approximately two kilometres).

The existing terrain includes Keajura Creek and its associated floodplain. The design of this section has been influenced by aims to minimise impacts on property, minimise impacts on biodiversity and heritage, and manage both highway and local traffic at Mates Gully and Humula roads.

The horizontal alignment of the main carriageway comprises a series of curves ranging from 1000 to 3400 metres broken up by short straights.

The vertical alignment would comprise a series of crests and sags. The project would cross over the existing Hume Highway with twin bridges approximately 200 metres north of the intersection with Mates Gully Road and reach a vertical crest in the vicinity of chainage 45500 before sloping downhill. The project would cross the existing highway again and then cross over Keajura Creek. Twin bridges would also be provided at this location. The project would then tie into the existing dual carriageway.

An interchange with northbound off-load and southbound on-load ramps would also be provided in the southern section (see Section 5.3.3). The existing Keajura Creek bridge would likely be retained, subject to a structural investigation. The treatment of this bridge would continue to be explored during design development.

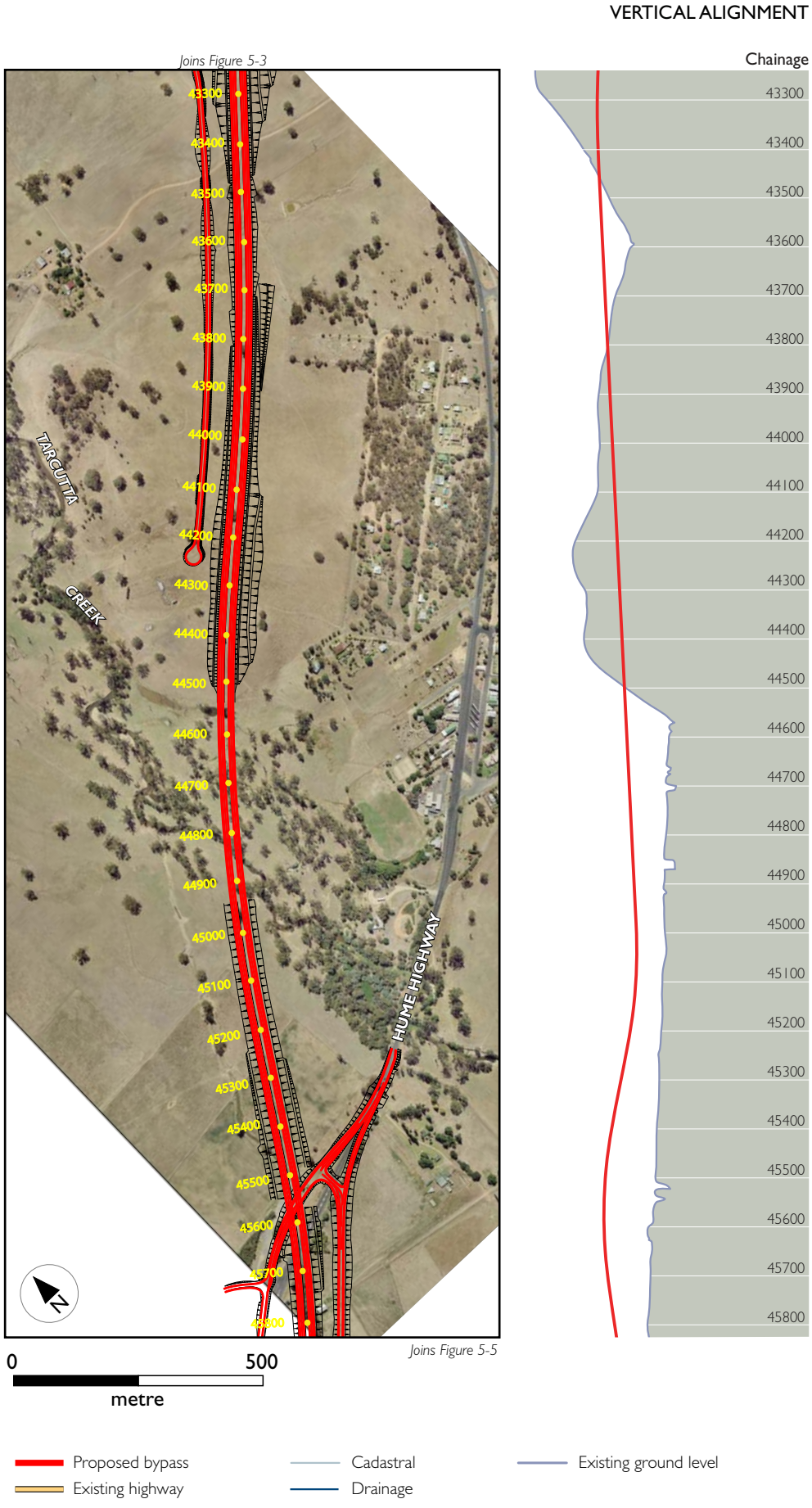


Figure 5-4 **Concept design horizontal and vertical alignment (middle section)**

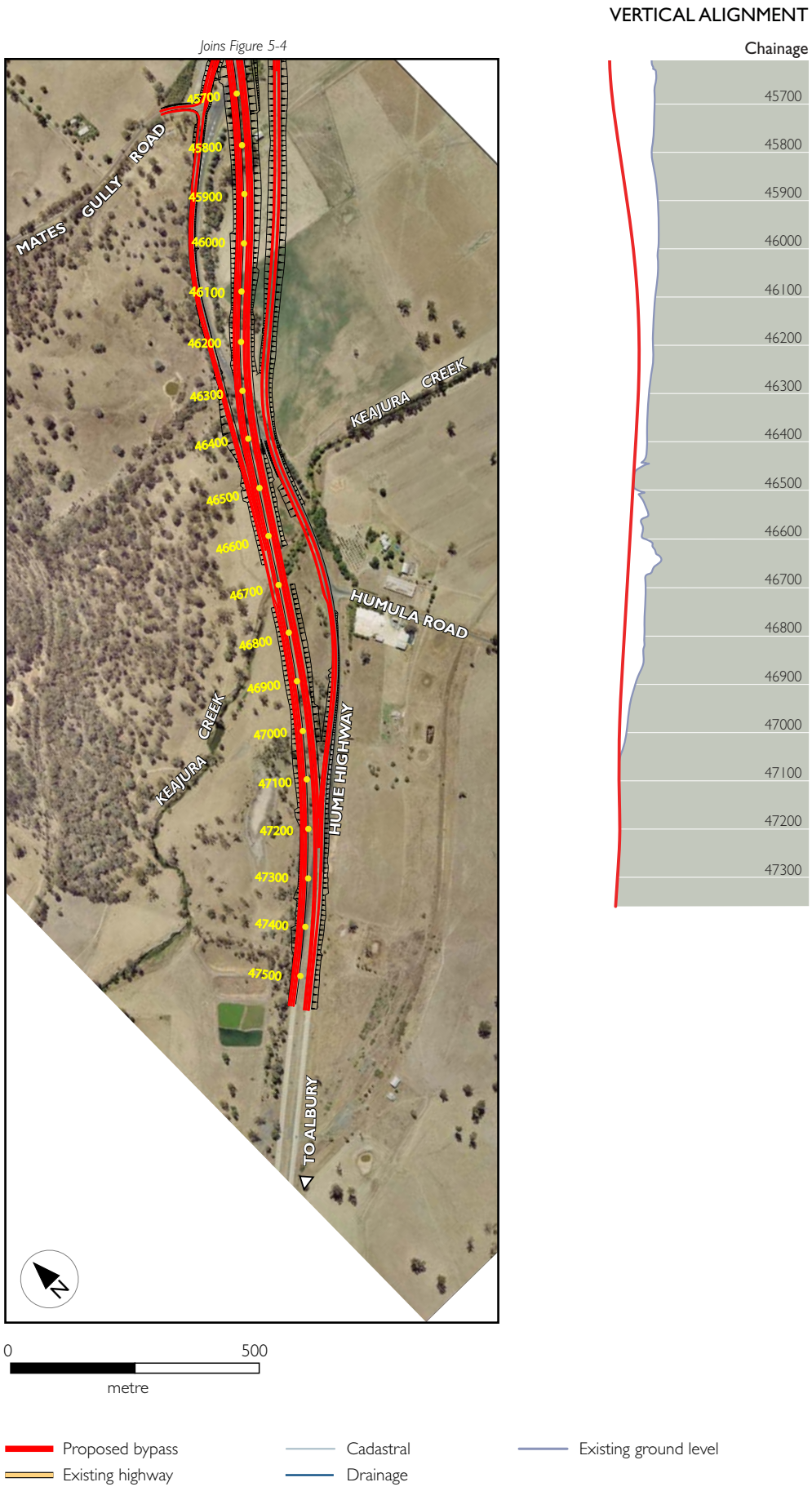


Figure 5-5 **Concept design horizontal and vertical alignment (southern section)**

5.3.3 Interchanges and local road connections

Interchange design objectives

The northern and southern interchanges have been designed with consideration to the following objectives:

- Maintaining a high standard of heavy vehicle access to and from Tarcutta village.
- Avoiding impact on significant Aboriginal areas.
- Minimising impact on native vegetation.
- Minimising impact on properties.
- Minimising the bridge skew of the overpass.
- Facilitating nearby property access.

Northern interchange

The proposed interchange in the northern section would include a northbound on-load ramp from the existing Hume Highway (providing access from the village via the northbound carriageway). The on-load ramp would pass over the main carriageway, curve out to the west, and then tie into the proposed northbound carriageway at-grade from the western side. Connection to a local service road would be provided along the northbound on-load ramp from the connection to the existing highway. Functionality of the on-load ramp would change from northbound traffic only to two-way traffic flow between the local service road (see below) and the existing highway, facilitating nearby property access to the existing highway. Access arrangements to properties impacted by the project would be clarified through ongoing discussions between the RTA and the landowner(s).

The southbound off-load ramp would provide access to the village via the southbound carriageway. It would follow the vertical and horizontal alignment of the existing highway, east of the proposed main carriageway.

Local service road

In the middle section (north of Tarcutta Creek), a two-way local service road is proposed west of, and parallel to, the project (refer Figure 5-4), which would connect to the northbound on-load ramp. At its southern end, the local service road is proposed to terminate with a cul-de-sac turnaround facility north of Tarcutta Creek. This local service road would provide access to the road network for properties north-east of Tarcutta Creek on the western side of the project.

Southern interchange (including Mates Gully Road and Humula Road)

The proposed southern interchange has been designed to accommodate access between the project, existing highway, Mates Gully Road and Humula Road.

A northbound off-load ramp would be provided around Humula and Mates Gully roads (providing access to the village via the northbound carriageway). It would run parallel to the existing highway. North of the intersection with Mates Gully Road, the off-load ramp would change to a two-way link road, facilitating local traffic turning into and out of Mates Gully Road. The off-load ramp would then shift east and connect back into the existing highway. Left-in/left-out and right-in turns would be provided from the link road onto Mates Gully Road.

A link road to Humula Road would be provided exiting the existing highway to the north of Mates Gully Road. This link road would accommodate two-way traffic flow to the intersection with Humula Road. The function would then become a one-way southbound on-load ramp

(providing access from the village via the southbound carriageway). The on-load ramp would tie into the southbound carriageway south of Humula Road. Left-in/left-out and right-out turns would be provided from Humula Road onto the link road.

The intersection at the existing highway would provide full access between Mates Gully Road and Humula Road, and access from Mates Gully Road to the new southbound carriageway.

5.3.4 Bridges

This section describes the bridges required for the project. Their approximate locations are shown in Figure 5-6 and conceptual cross-sections are shown in Figure 5-7.

Northern interchange bridge

The northern interchange bridge would provide a crossing for the northbound on-load ramp over the main carriageway. The bridge would likely be a multi-span structure with an overall length of about 90 metres. The bridge would be on a skew of approximately 35 degrees relative to the main carriageway.

The bridge would comprise two 3.5 metre wide traffic lanes with shoulders. Safety screens approximately three metres high are proposed along each side of the bridge. The bridge would span the main carriageway with around six metres vertical clearance.

Twin bridges over Tarcutta Creek

Twin bridges are proposed over Tarcutta Creek. Each bridge would likely be a multi-span structure about 500 metres long. The bridges would be designed to minimise the impact of flood flows.

The bridges would comprise two 3.5 metre wide traffic lanes with narrow shoulders, and would have varying vertical clearance of four to eight metres.

Twin bridges over the Hume Highway at Mates Gully Road

Twin bridges are proposed over the Hume Highway at Mates Gully Road. Each bridge would likely be a multi-span structure about 90 metres long.

The bridges would comprise two 3.5 metre wide traffic lanes with narrow shoulders, and would span the Hume Highway with around six metres vertical clearance.

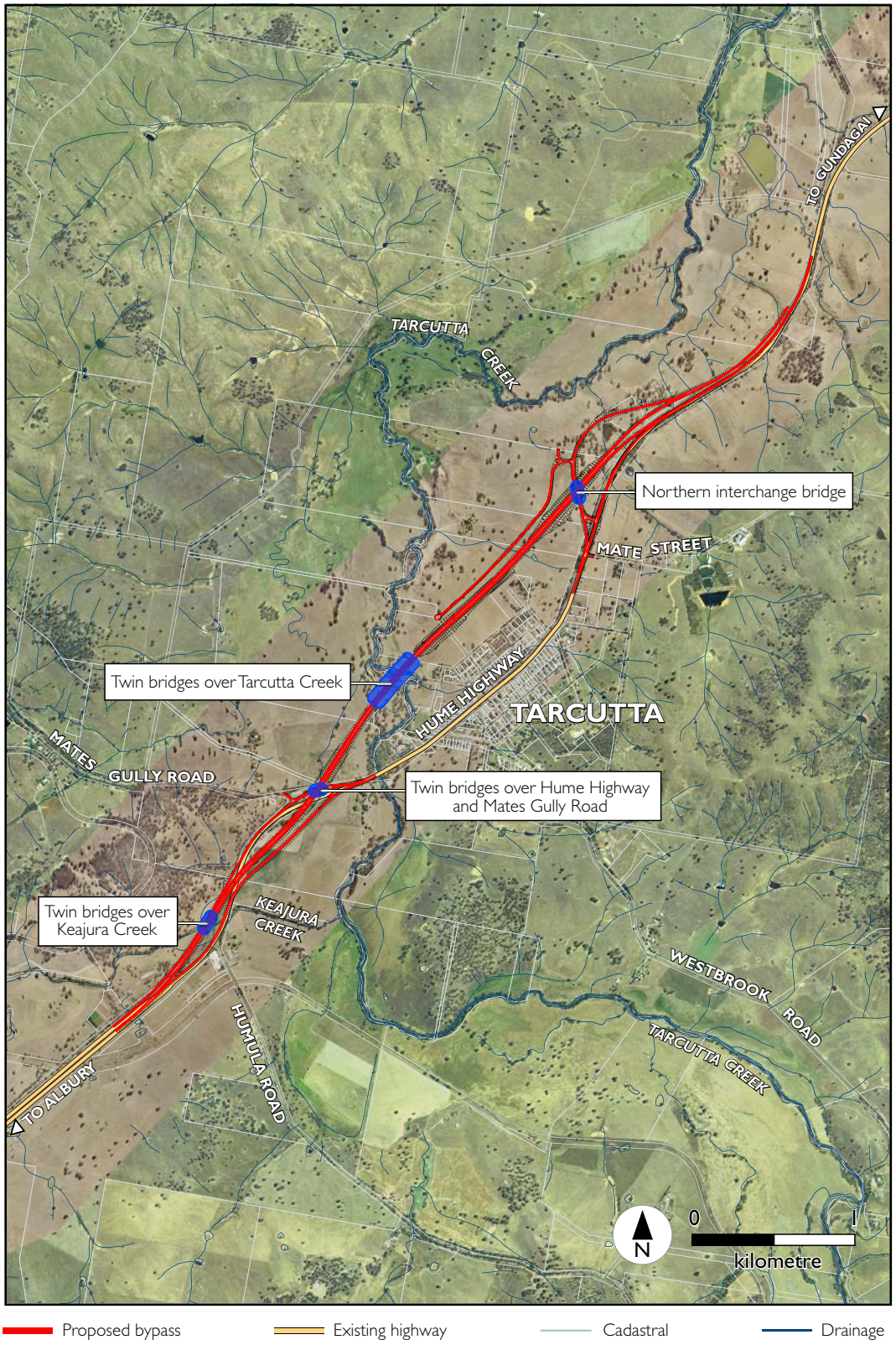


Figure 5-6 **Approximate bridge locations along the project**

Twin bridges over Keajura Creek

Twin bridges are proposed over Keajura Creek. Each bridge would likely be a multi-span structure about 80 metres long.

The bridges would comprise two 3.5 metre wide traffic lanes with narrow shoulders. The northbound bridge would also include an off-load ramp widening. The bridges would span Keajura Creek with around three metres vertical clearance.

Existing bridge over Keajura Creek

There is an existing multi-span bridge over Keajura Creek. It is around 70 metres long and comprises two traffic lanes and shoulders. This bridge may be retained or replaced as part of the project, subject to detailed design.

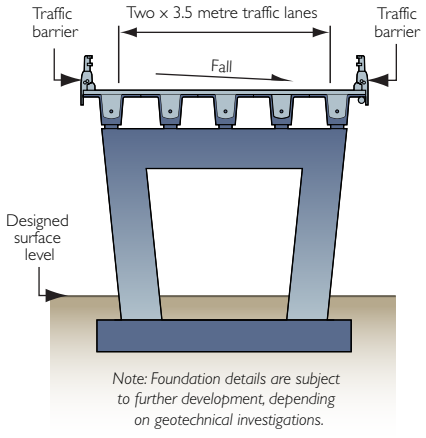
5.3.5 Earthworks

The project would require a number of cuttings and embankments. The main cuttings are located north of Tarcutta Creek. A number of high fill embankments (higher than three to four metres) would be required, including at the northern interchange and south of Tarcutta Creek to the southern tie-in.

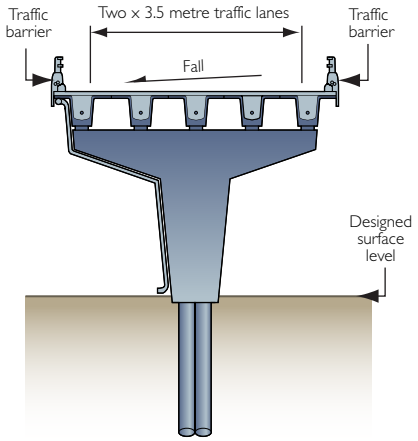
The slopes of the cut and embankment batter angles are likely to be angles of around 60 degrees, with steeper or flatter batters where conditions dictate. Shelves would be required for deep cuttings and high embankments to improve slope stability. Relevant geotechnical, urban design and environmental criteria and constraints would be considered when selecting batter slopes.

Indicative cross-sections are shown in Figures 5-8 and 5-9.

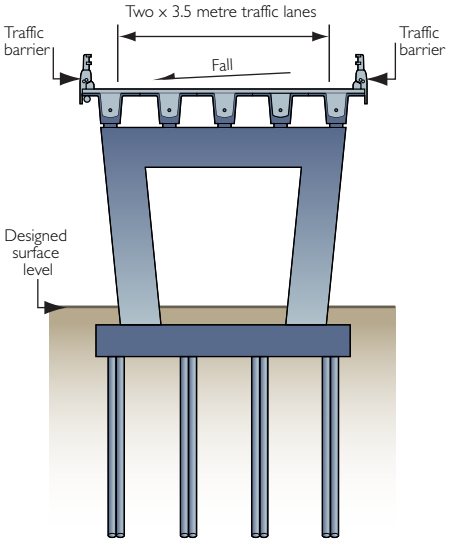
NORTHERN INTERCHANGE BRIDGE



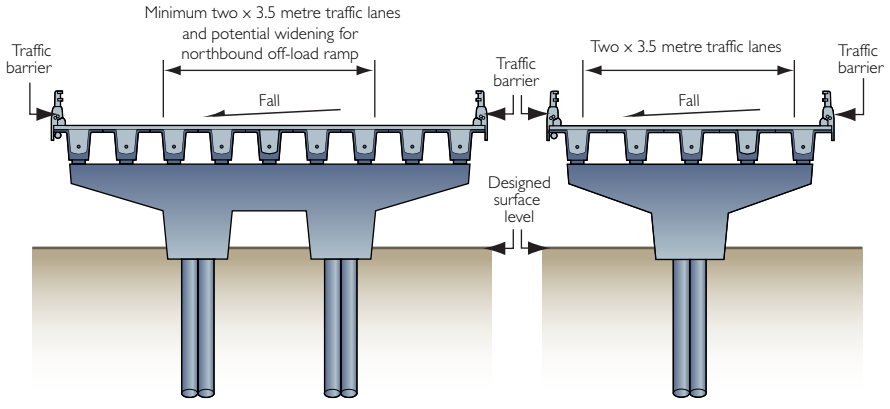
TWIN BRIDGES OVER TARCUTTA CREEK
(northbound and southbound carriageway similar)



TWIN BRIDGES OVER HUME HIGHWAY
AT MATES GULLY ROAD
(northbound and southbound carriageway identical)



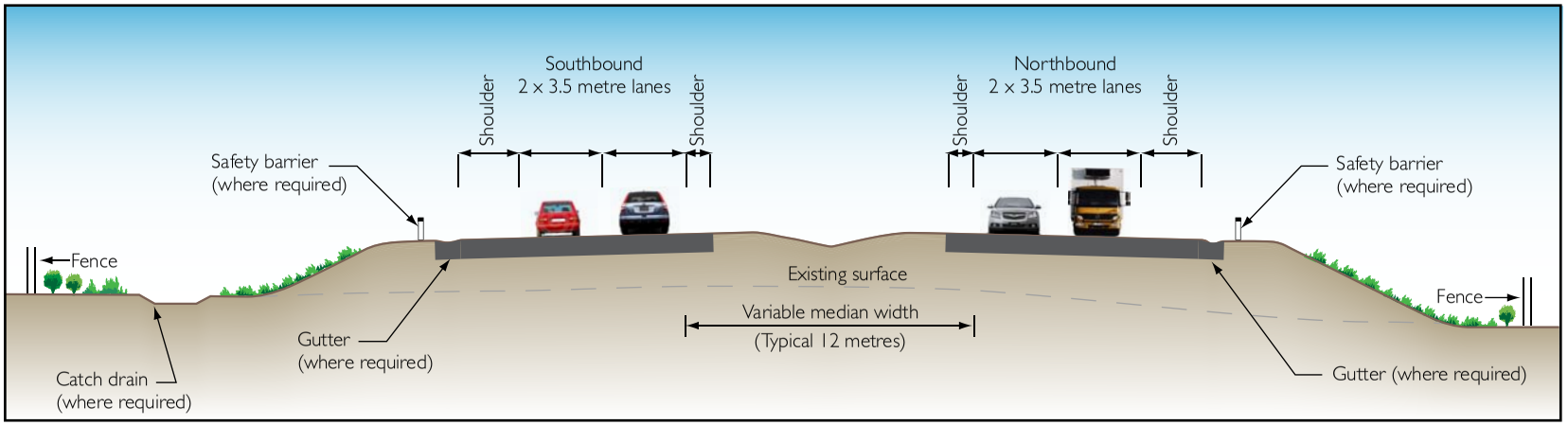
TWIN BRIDGES OVER KEAJURA CREEK



Northbound Southbound

Figure 5-7 **Indicative cross-sections – bridges**

MAIN CARRIAGEWAY EMBANKMENT



MAIN CARRIAGEWAY CUT

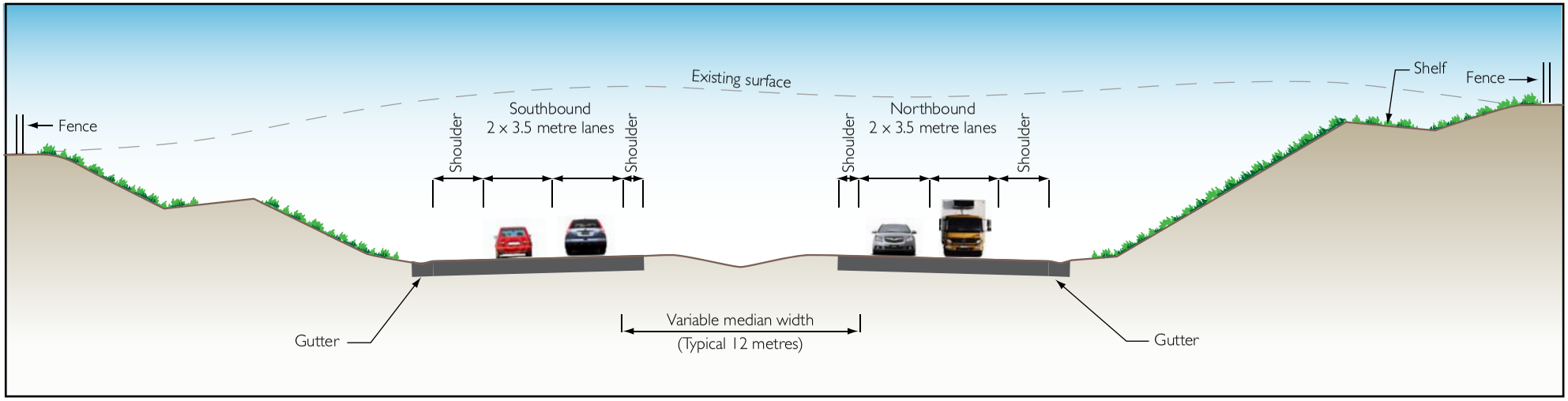
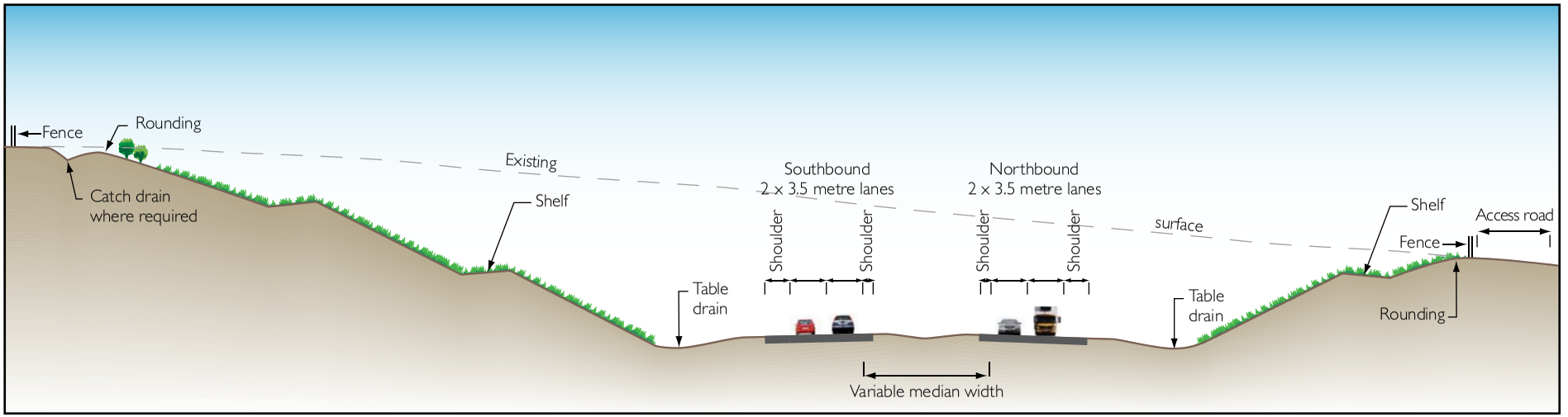


Figure 5-8 **Indicative cross-sections – embankment and cut**

MAIN CARRIAGEWAY CUT WITH TABLE DRAIN



INTERCHANGE RAMP

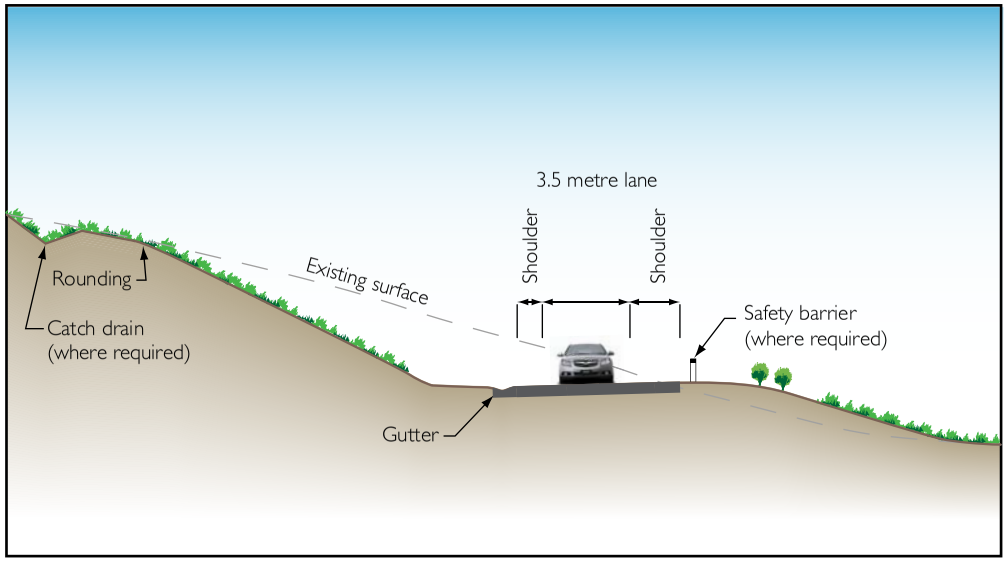


Figure 5-9 **Indicative cross-sections – cut with table drain and interchange ramp**

5.3.6 Pavement

New sections of the main carriageway would have a design life of 40 years with either a concrete or asphalt wearing surface.

Ramps would most likely consist of deep-lift asphalt (thick asphalt over heavily bound sub-base) with a design life of 40 years. It is likely that bridge decks would be surfaced with asphalt surface layers in accordance with RTA specifications.

Local roads would comprise full depth asphalt, asphalt overlays or sealed granular pavements, depending on traffic loadings.

Where existing roads are being retained, existing pavements may require reconstruction or upgrading depending on the intended use of the road and its current condition. Depending on surface levels, overlays with varying thicknesses may be required. The pavement type used at connections to existing pavements would depend on expected traffic volumes and existing conditions, and would be subject to authority acceptance of appropriate materials.

All pavement designs would be undertaken in accordance with RTA specifications and Austroads guidelines.

5.3.7 Emergency and rest area facilities

Two emergency median crossings with U-turn facilities would be provided at either end of the project. Temporary construction traffic switches would be converted to formal emergency crossovers and would remain post-construction.

A shoulder about three metres wide would generally be provided along the main carriageway of the project, allowing vehicles to pull over to the left in the event of sudden breakdowns and emergencies.

The project would not provide separate rest area facilities due to the short length of the project and the desire to encourage drivers to stop, rest and revive in Tarcutta village.

5.3.8 Pedestrian and cyclist facilities

While cyclists could potentially use the project, it is considered likely that most would choose to use the existing highway through Tarcutta. Cyclists would be directed to use the off-load ramps at each end of the project.

There would be no provision for pedestrians as part of the project.

5.3.9 Lighting, fencing and signage

Road lighting for the project would be limited to interchanges and local road intersections. This would be confirmed during detailed design and would be in accordance with RTA requirements.

The project would be fenced to identify property boundaries and maintenance access routes.

Permanent road signage for the project would provide clear guidance to local and through traffic. It would be considered further during detailed design in consultation with Wagga Wagga City Council. All road signage for the project would be in accordance with RTA requirements.

5.3.10 Drainage (including culverts and creek diversions)

The project would cross Tarcutta and Keajura creeks and their tributaries. Culverts would be located at existing watercourse crossings to convey run-off across the project. Culverts would be located and aligned to follow natural depressions to ensure minimal changes to existing flowpaths, and minimal structural excavation and channel work at the inlet and outlet of the culverts. Culverts crossing the project would be designed to accommodate a 1 in 100 year flood (ie the edge line on the pavement surface would be above the 1 in 100 year flood level).

The locations of these proposed culverts are shown in Figure 5-10.

In a number of locations, channels or catch drains would be provided to direct flows from the culvert outlet to an existing natural watercourse. Where flow velocities within this channel are high, the channel would be protected against scour using a rock or concrete channel lining, or other suitable measure.

Drainage and/or flood overflow channels may require minor realignment. The need for any realignments would be determined during detailed design and in consultation with the Department of Environment, Climate Change and Water (formerly the Department of Water and Energy), the Department of Industry and Investment (formerly the Department of Primary Industries) and other relevant stakeholders.

Some excavation or reclamation works would likely be required in Tarcutta and Keajura creeks. Excavation or reclamation would be related to the construction of temporary creek crossings and bridge and/or culvert works (including the provision of scour protection) in both Tarcutta and Keajura creeks. Excavation or reclamation works would be minimised as far as practical and areas would be rehabilitated upon completion of construction works. The Department of Industry and Investment would be notified of any excavation or reclamation works.

Structural and non-structural measures would be used to ensure that the waterways of Tarcutta and Keajura creeks are protected. This may include swales and spill containment basins.

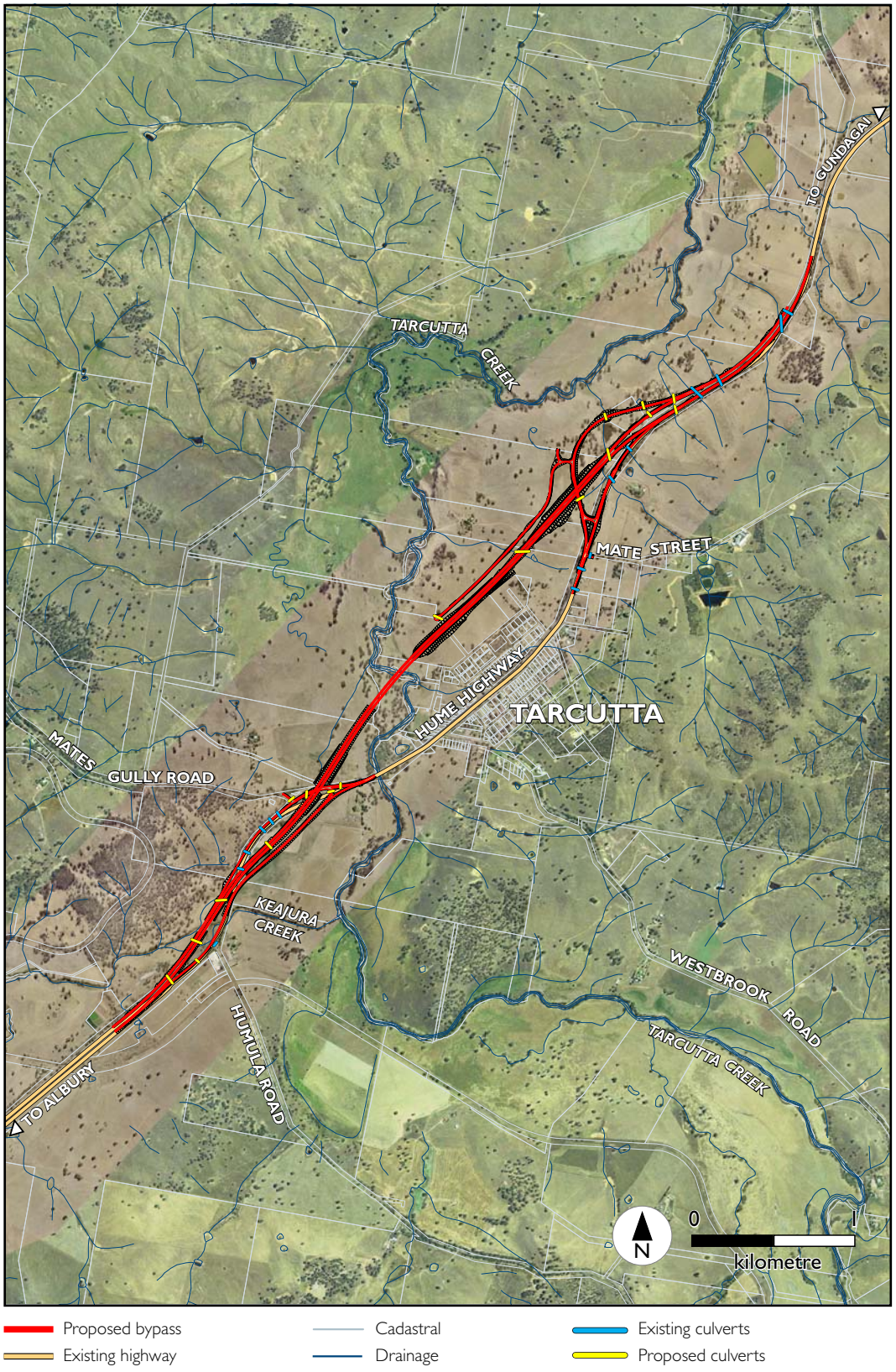


Figure 5-10 **Proposed culverts for the project**

5.3.11 Utilities and services

The project would affect a number of existing utilities and services:

- Fibre optic cable (at the southern portion of the project) — Nextgen.
- Telecommunications — Telstra.
- Electricity (domestic supply) — Country Energy.
- Sewer — Wagga Wagga City Council.

No gas mains would be affected by the project. Riverina Water County Council's town water supply to Tarcutta is pumped from bores to the south of Tarcutta, near Tarcutta Creek, and would not be impacted by the project.

In consultation with service providers, a review of the existing overhead and underground utilities was undertaken to identify any potential adjustments required for the project. Table 5-2 identifies the existing utilities and services, describes how these interact with the project and identifies the proposed relocation treatments.

Table 5-2 Summary of existing utilities and services and proposed relocations for the project

Chainage[1]	Utility	Provider	Proposed treatment
41300, 41500 to 43400, 43300, 43600 to 45750, 46000 to 46300	Overhead electricity cable	Country Energy	Relocate poles and divert across the project.
40800 to 43400, 43400 to 43500, 45300 to 46550	Underground copper cable	Telstra	Realign and replace existing cable via a combination of trenching and directional drilling.
43300 to 46800	Underground fibre optic cable	Nextgen	Relocate cable between Mate Street and Humula Road via a combination of ploughing and trenching.
45300 to 45700, 46000 to 46200, 46300 to 46550	Underground rising main (sewer)	Wagga Wagga City Council	Realign and replace existing sewer easement

Note: 1. Refer to Figure 5-2 for chainages along the project.

The nature and extent of utility relocations would be finalised in consultation with relevant authorities, organisations and landowners through the detailed design and construction of the project.

Services required for operation of the project would include power for lighting (refer Section 5.3.9) and communications cabling. The conduits for these services would be located within the road reserve of the project.