10. Other environmental issues

10.1 Soils and water quality

10.1.1 Assessment approach

The assessment of soils and water quality included the following:

- A desk-based soils assessment to gain an understanding of the soil conditions, the erosion and sedimentation potential of the soil and to identify appropriate erosion and sedimentation control.
- Surface water quality sampling for turbidity, suspended solids, major dissolved cations and anions, dissolved and total metals, nutrients, BTEX and total petroleum hydrocarbons (TPH). The results of water quality sampling were compared to the *ANZECC Guidelines for Marine and Freshwater Quality* (ANZECC 2000) (ANZECC guidelines) for the three key water uses in the area (aquatic ecosystems, irrigation and livestock water supply).
- Groundwater borehole sampling for temperature, electrical conductivity (EC, salinity), pH, dissolved oxygen, total dissolved solids and redox potential. The results of water quality sampling were compared to the ANZECC Guidelines and the *Australian Drinking Water Guidelines* (ADWG) (NHMRC 2004).

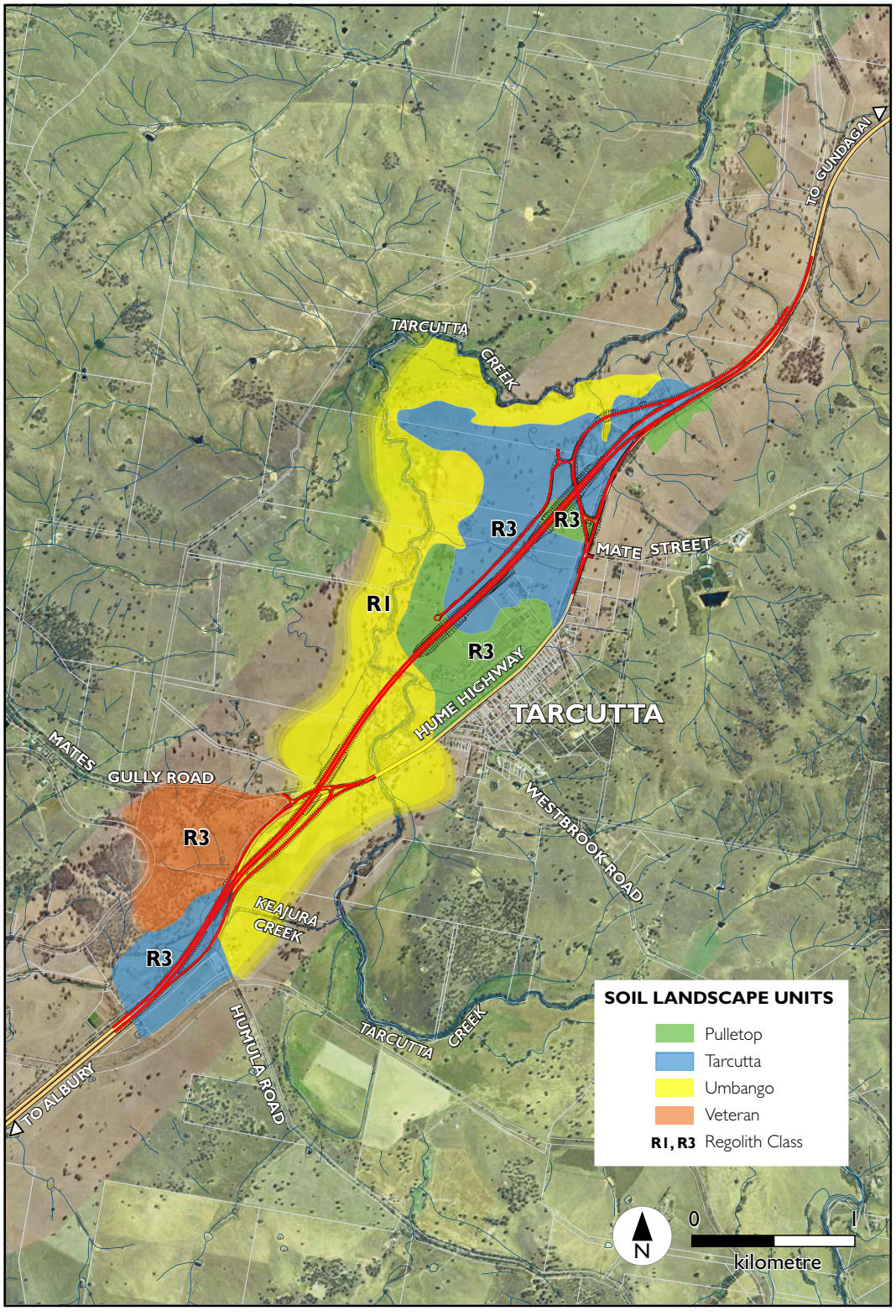
10.1.2 Existing environment

Soils

Three soil landscape units (Wild and Jenkins 2003) were identified in the assessment area (shown in Figure 10-1):

- Tarcutta soil landscape unit.
- Pulletop soil landscape unit.
- Umbango soil landscape unit.

Table 10-1 provides a summary of the geology, soil type and soil characteristics of the three soil landscape units.



Source: Transposed mapping from the Department of Environment and Climate Change soil landscape mapping program (unpublished data 2003)

Figure 10-1 **Distribution of soil landscape units in the assessment area**

Table 10-1 Summary of soil landscape units in the assessment area

Geology	Soil types[1]	Soil characteristics[2,3]
Tarcutta soil landscape unit		
Slopewash colluvium originating from Ordovician age metasediments: slate, greywacke, phyllites, schists and hornfels with quartz vein intrusions.	▪ Upper slopes: Orthic Tenosols (moderately shallow Lithosols). ▪ Mid and lower slopes: Red Kandosols (Red Earth), Red Dermosols, and Mottled Red Kurosols and Chromosols (Red Podzolics). ▪ Open drainage depressions: Bleached Mottled Brown and Yellow Sodosols (Yellow Solodics and Solodized Solonetz soils).	▪ High clay content (highly dispersible 'Type D' soils). ▪ Highly erodible (K-factor 0.06). ▪ Soil texture: fine sandy clay loams. ▪ Soil hydrologic group: Class D — very high run-off potential.
Pulletop soil landscape unit		
Slopewash colluvium originating from Ordovician age metasediments: slate, greywacke, phyllites, schists and hornfels with quartz vein intrusions.	▪ Crests, ridges and upper slopes: shallow (to 20 centimetres) Rudosols (Lithosols) to moderately deep (40 to 100 centimetres) Mesotrophic Red Chromosols (Red Podzolic soils). ▪ Mid and lower slopes: moderately deep (50 to 80 centimetres) Bleached and Haplic Red Chromosols (Red Podzolic soils) and Dermosols (Red Earths). ▪ Drainage lines: moderately deep (80 to 150 centimetres) Mottled Subnatric Brown Sodosols (Brown Solodic soils). ▪ Soils are formed *in situ* from the underlying country rock with localised small contribution of colluvium from the same source of lower slopes and drainage lines.	▪ High clay content (highly dispersible 'Type D' soils). ▪ Moderately erodible (K-factor 0.02). ▪ Soil texture: light sandy clay loams. ▪ Soil hydrologic group: Class D — very high run-off potential.
Umbango soil landscape unit		
Unconsolidated Cainozoic and Holocene (Quaternary) alluvium derived from a range of Ordovician and Silurian metasediments originating upstream in the Tarcutta Creek catchment.	▪ Deep Stratic and Arenic Rudosols, Grey and Black Vertosols and occasional Bleached Mottled Brown Sodosols.	▪ High silt and clay content (dispersible 'Type F' soils). ▪ Highly erodible (K-factor 0.06). ▪ Soil texture: fine sandy loams to heavy clay. ▪ Soil hydrologic group: Class D — very high run-off potential.

Source: Wild and Jenkins (2003), Soil profile data contained in the NSW Natural Resource Atlas, Department of Primary Industries (1966).

Notes: 1. Australian Soil Classification System (Great Soil Groups).

2. K-factor is a measure of the susceptibility of soil particles to detachment and transport by rainfall and run-off. K-factor ranges from 0.005 to 0.075, where anything above 0.04 can be considered highly erodible. The K values identified in the table relate to the top of the B horizon (assuming that topsoil is stripped and stockpiled), as this will be the soil profile most exposed to rainfall.

3. Refer to *Soils and Construction: Managing Urban Stormwater* (Landcom 2006) and *Managing Urban Stormwater: Soils and Construction, Volume 2D, Main Road Construction* (DECC 2008b).

Water quality

Surface water

As there are no long-term detailed water quality records for the Tarcutta Creek catchment, a one-off sampling event was undertaken to provide a snapshot of water quality. Further details are provided in Section 4.2.2 of Technical Paper 4 (Volume 2). The results indicate that surface water within the Tarcutta Creek catchment is generally within ANZECC guidelines, with a few exceptions. Tarcutta Creek indicated elevated nutrient and zinc levels. Elevated nutrients are typical of catchments where grazing and cropping land uses are dominant, due to the fertilisers that are applied to improve pastures. The elevated zinc levels exceeded the guideline value for ecosystem protection, but were within guideline levels for irrigation and livestock water supply. Elevated EC values were noted in Keajura Creek, potentially indicating a salinity issue in this area.

A sediment slug has been noted within the Tarcutta Creek channel downstream of the confluence of Tarcutta Creek and Umbango Creek (the confluence being upstream of the assessment area) as reported in *The Ecological Health of Tarcutta Creek* (DLWC 2001). This sediment slug is due to an increased sediment supply to the creek resulting from historic soil erosion in the upper and mid Tarcutta Creek catchment due to clearing for agricultural development.

Groundwater

Groundwater bores were sampled for water quality field parameters to establish baseline values of water quality in the Tarcutta Creek catchment. The results of the groundwater water quality sampling are detailed in Table 7-1 of Technical Paper 5 (Volume 2). The results indicated groundwater quality generally within ANZECC guidelines and ADWG.

The water type was calculated for the Tarcutta Creek catchment and indicated a dominance of chloride in the chemical composition. This indicates that there is possible recharge from freshwater sources, including rainfall recharge and possibly surface water. A bicarbonate component was also present, indicating that the chemistry of the water is being affected by the surrounding geology.

Dryland salinity is known to occur in the locality and is generally associated with the Ordovician metasediments. The following was identified with regard to salinity within the locality:

- An area to the south of Tarcutta has been recognised as a salinity hazard.
- Shallow groundwater levels to the west of Tarcutta make this area vulnerable to salinity.
- Areas of contact between the metasediments and alluvium sediments are prone to dryland salinity (PB 2008).

No salinity scalds were identified within the assessment area during the field investigations. This may be due to extended drought conditions in the area and the likely reduction in groundwater levels across the fractured rock aquifers.

10.1.3 Construction impacts

Soils and surface water

Table 10-1 identifies that the soils in all three soil landscape units have a very high erosion potential. Water moves into and through these soils very slowly when thoroughly wetted. They shed run-off from most rainfall events. This, in combination with the moderate to high erosion potential, could result in sediment and construction materials and pollutants being transported into dams and watercourses, affecting surface water quality. The dispersible nature of fine-particle silts and clays present in the soils means that the particles would remain in suspension for longer periods of time. Accordingly, there is a greater risk of sediment loads spreading considerable distances downstream. Increased sedimentation of waterways can smother benthic habitat and organisms, and can increase levels of nutrients, metals and other potential toxicants that attach to the sediment particles.

Considerable construction works would need to be undertaken close to the main flow paths of Tarcutta and Keajura creeks (eg bridges, culverts). This work would have potential short-term impacts on surface water quality.

Other pollutants that could potentially impact surface water quality during construction include:

- Hydrocarbons and chemicals as a result of spills and leaks from construction vehicles or fuels/chemical stores on construction sites.
- Oils and greases from construction equipment.
- Nutrients attached to sediment particles and from fertilisers used in landscaping works.
- Waste water generated from construction sites.
- Gross pollutants/general litter from construction sites.

Groundwater

Accidental spills or leakage from construction vehicles and equipment have the potential to contaminate groundwater aquifers if appropriate controls are not put in place. The town water supply bores obtain drinking water supplies from the alluvial aquifer. Groundwater could potentially become contaminated with road construction materials, such as fuels, lubricants and hydraulic oils.

10.1.4 Operational impacts

The project would result in a number of cut batters and fill embankments as the project passes through low hills and the Tarcutta Creek floodplain (refer Section 5.3.5). Given the high erosion potential of soils affected by the project, these slopes would require effective stabilisation.

The operation of the project may facilitate the movement of polluted stormwater run-off into the adjacent environment. The primary stormwater pollutants associated with the operation of freeways and rural roads include:

- Gross pollutants and litter.
- Sediment (eg pavement wear, vehicles, maintenance activities).
- Nutrients (eg fertiliser applied to landscaping).
- Heavy metals from vehicle wear and tear.
- Petroleum hydrocarbons from vehicle spills and leaks.

The pollutants identified above would have the greatest impact during small rainfall events following prolonged dry periods. Such situations allow pollutants to accumulate on the road surface during dry weather with the small rainfall event washing a concentrated 'first flush' of pollutants to receiving waterways while stream flow is low. It is noted that typical flows in the Tarcutta Creek catchment are small. This indicates a higher risk of pollutants generated from road run-off impacting local waterways as small flows result in less dilution within the waterways.

Crashes involving vehicles transporting chemicals and/or other dangerous goods may result in spills, which may impact the quality of the surrounding waterways.

There is potential for sedimentation impacts to occur during operation of the project at bridges across Tarcutta and Keajura creeks, and at culvert crossings. Piers on these bridges would provide potential locations for local sedimentation and scour. Sedimentation and scour is also likely to occur at the entrance and exit of culvert structures. As with the construction impacts, the fine-particle silts and clays present in the soils affected by the project would have the potential to spread further downstream as suspended sediments transported via flow.

10.1.5 Management of impacts

Table 10-2 identifies mitigation and management measures that would be implemented for soils and water quality. These measures have been incorporated into the draft statement of commitments in Chapter 11. Measures associated with the management of hazardous materials are provided in Section 10.4.3.

Table 10-2 Soils and water quality mitigation and management measures

Potential impact	Mitigation and management measure
Construction	
Erosion of soils	▪ Stabilise exposed areas progressively.
Reduction in surface water quality	▪ Develop and implement primary and progressive erosion and sediment control plans through the CEMP for the project in accordance with *Soils and Construction: Managing Urban Stormwater* (Landcom 2006) and *Managing Urban Stormwater: Soils and Construction*, *Volume 2D, Main Road Construction* (DECC 2008b). ▪ Contain spills immediately. Use bunded areas for storage of potentially hazardous and/or contaminating materials and activities.
Operation	
Reduction in surface water quality	▪ Install structural and non-structural measures to control road run-off into environmentally sensitive areas (Tarcutta and Keajura creeks). ▪ Implement scour protection works at proposed bridge abutments and piers, and watercourse crossings.

10.2 Visual amenity and landscape

A visual amenity and landscape assessment has been undertaken for the project as presented below.

10.2.1 Assessment approach

The visual amenity and landscape assessment built on the *Hume Highway Tarcutta Bypass Preliminary Urban/Landscape Design and Visual Issues Investigation* (RTA 2008f) prepared as part of the preliminary environmental investigations for the project. The assessment was undertaken in accordance with the objectives, principles and recommendations of the *Hume Highway Urban Design Framework, Prestons (WM7) to Albury* (RTA 2009b) (refer Section 5.2.2), and the RTA's urban and regional design practice notes, *Beyond the Pavement* (RTA 1999b) and *Guidelines for Landscape Character and Visual Impact Assessment* (RTA 2009c). The assessment included:

- The objectives of the *Hume Highway Urban Design Framework* were adopted and used as the primary basis for evaluating the project.
- The visual impact assessment area extended one kilometre from the outside boundary of the construction site boundary. This was considered the most sensitive area for visual change to both the existing landscape character and viewpoints. The main viewpoints within this one kilometre boundary were identified.
  - The 'sensitivity' and 'magnitude of change' was assessed for each identified viewpoint, and was ranked either low, low to moderate, moderate, moderate to high or high.
- The visual catchment for the project was divided into three landscape character units: the northern rural landscape unit, the central creek line landscape unit and the southern rural landscape unit.
  - The 'sensitivity' and 'magnitude of change' was assessed for each identified landscape unit and combining these to provide an overall ranking of the impact to the landscape character.

10.2.2 Existing landscape and views

Landform, land use and scenic quality

The Hume Highway is the primary vehicle route between Sydney and Melbourne. It passes through rural landscapes characterised by sheep and cattle grazing, bushland and cropping areas. The landform along the section of highway that includes Tarcutta is predominantly undulating with low lying hills and is dominated by cleared agricultural land with scattered paddock trees.

The existing highway provides a wide streetscape in the centre of Tarcutta village with few street trees. Tarcutta's identity as the halfway truck stop between Sydney and Melbourne is reflected in the large truck exchange facility on the highway. This expansive, open area of concrete visually dominates the western edge of the village.

The scenic quality of the landscape around Tarcutta is moderate and is typical of the landscape along much of the Hume Highway. There are no major landscape landmarks immediately around Tarcutta. The most visually sensitive areas along this section of the highway are those close to existing houses and the immediate main residential area, and Tarcutta Creek, particularly where it is close to the village.

Key viewpoints

A total of 14 key viewpoints were identified within one kilometre of the construction site boundary. These viewpoints are identified in the visual environment analysis plan shown in Figure 10-2 and Figure 10-3. These are explained further in Section 10.2.4.

Northern rural landscape unit

This landscape unit is situated to the north of Tarcutta Creek. The landform within this unit is undulating, consisting of cleared rural paddocks and clumps of trees, and is mostly used for sheep and cattle grazing. The northern part of this landscape unit includes a number of rural homes. The western outer edge of Tarcutta is located in the southern part of the unit and includes the Tarcutta General Cemetery. Views from this unit are quite open to the west, allowing views over open pastoral land towards low ranges.

This landscape unit has low visual sensitivity as it is a common landscape type and is not dominated by vegetation. There are no dramatic landscape features or landform changes.

Central creekline landscape unit

This landscape unit is defined by the band of large River Red Gums lining Tarcutta Creek. Within this landscape unit, the creek consists of a series of separate channels situated along a flat landform. Breadon Sportsground, Tarcutta's main park, is located directly east of the creek. The beer garden of the Tarcutta Hotel overlooks the park toward the trees lining Tarcutta Creek.

This landscape unit is the most visually sensitive area potentially impacted by the project. It has a high to moderate sensitivity to change, mainly due to the impact that vegetation removal would have.

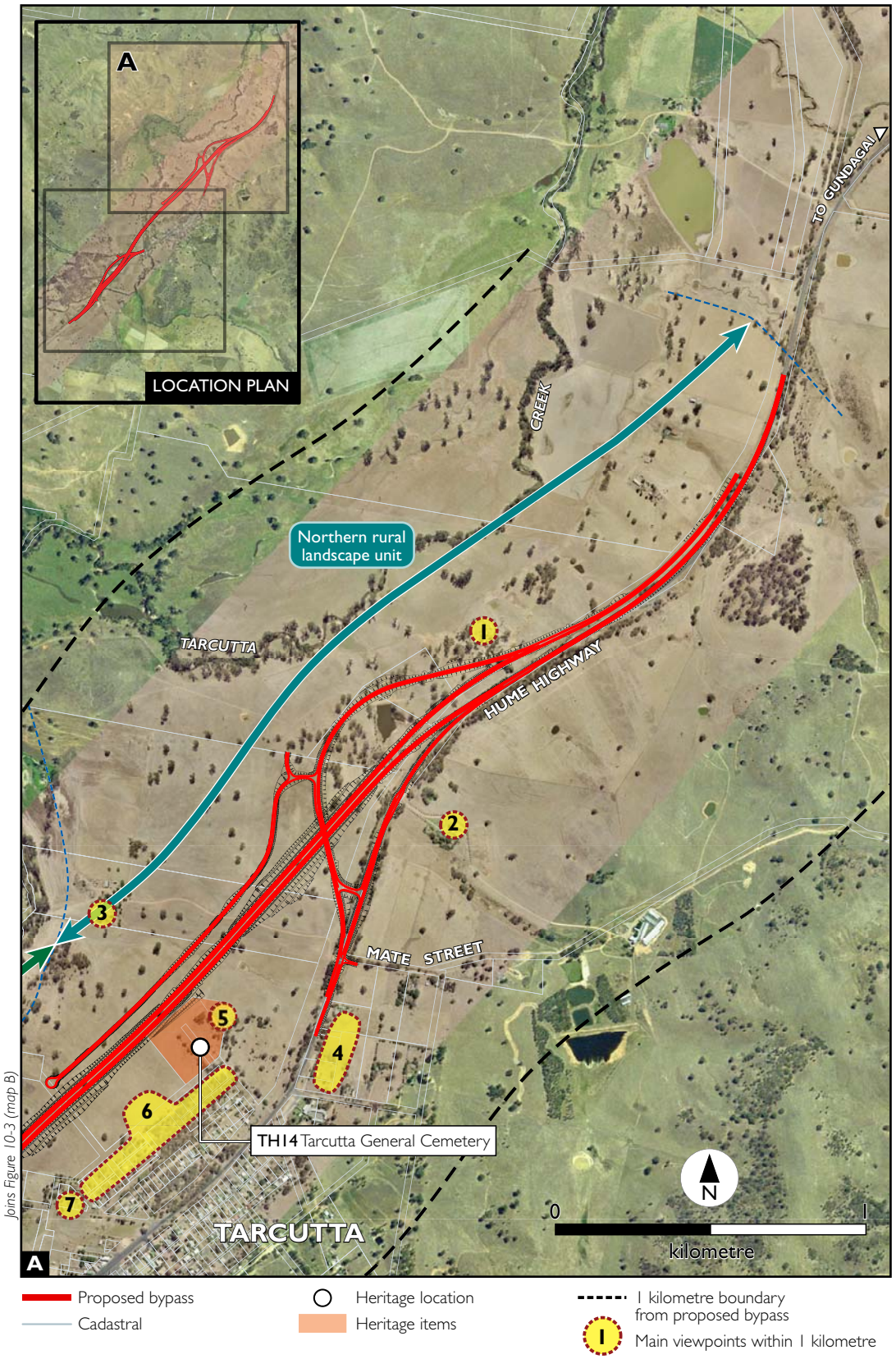


Figure 10-2 **Visual environment analysis plan (northern section)**

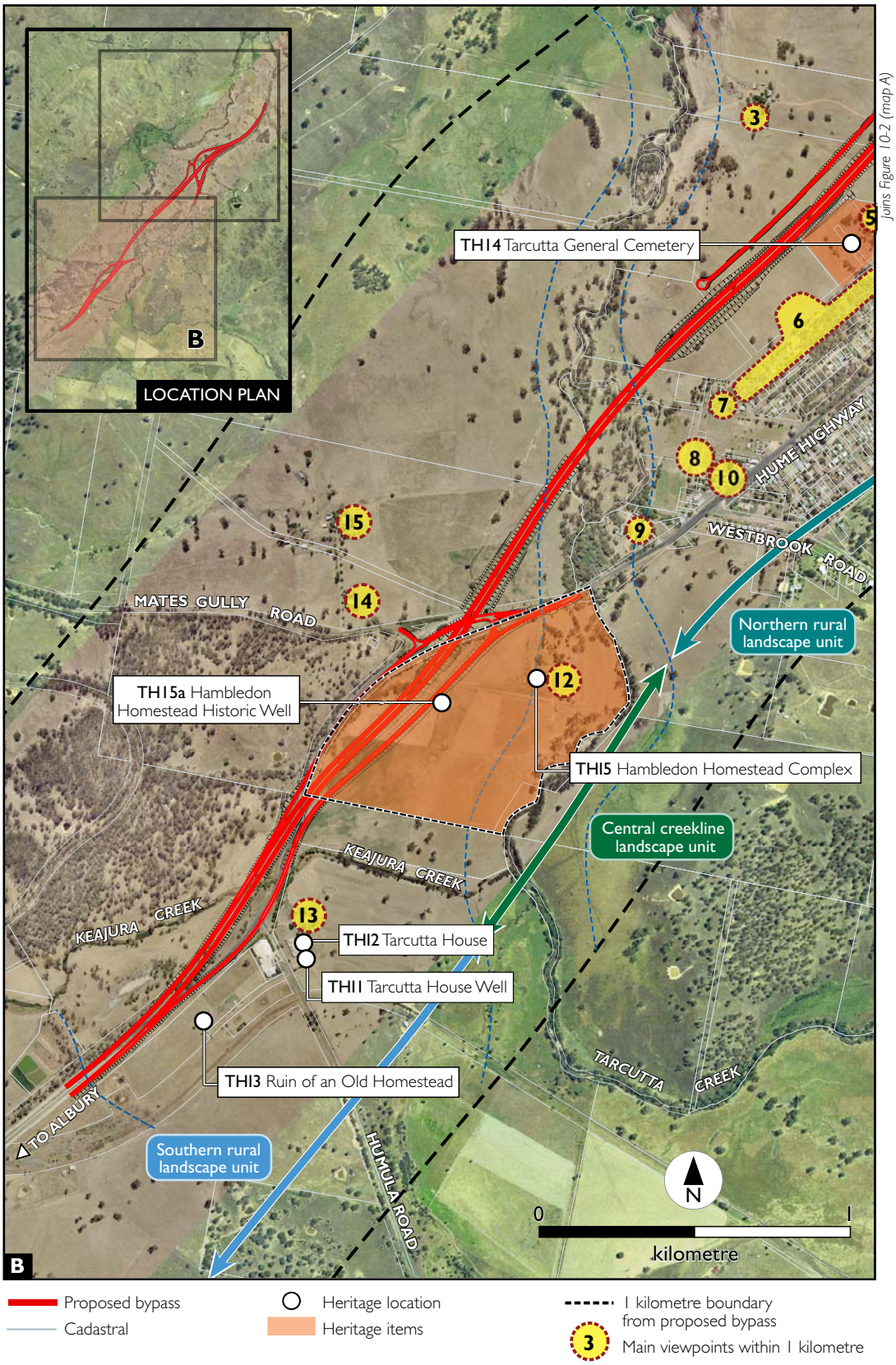


Figure 10-3 **Visual environment analysis plan (southern section)**

Southern rural landscape unit

The southern rural landscape unit extends from the central creek line landscape unit to the southern edge of the project area just south of Humula Road. Two sites of non-Aboriginal heritage significance are located within this unit — the Hambledon Homestead Complex and Tarcutta House (refer Section 9.3). There would be no views of the village from the project as it is separated by dense vegetation along Tarcutta Creek.

At the far south of the landscape unit is a large travelling stock reserve that is part of the travelling stock route (refer Section 9.7.3). A small watercourse, Keajura Creek, runs along the east of the travelling stock reserve.

This landscape unit has a generally low sensitivity as it is a common landscape and is not dominated by vegetation. A high to moderate sensitivity should apply to the parts of the landscape surrounding the Hambledon Homestead Complex and Tarcutta House.

10.2.3 Construction visual impacts

Potential visual impacts during the construction phase of the project would result from the following:

- Operation of plant and equipment.
- Temporary construction compounds and ancillary facilities.
- Temporary stockpiles.
- Removal of vegetation.

With the exception of the vegetation removal, these impacts would be short term and minor in nature. Adjacent residents would likely be most affected. The loss of vegetation would be a medium-term impact, but would be mitigated over time as re-established vegetation grows and matures.

10.2.4 Operational visual and landscape impacts

The project would have potential impacts on the 14 identified viewpoints. The visual impact rating of the project for each of the 14 identified viewpoints is summarised in Table 10-3. Measures would be provided to mitigate impacts on those viewpoints assessed as having a high, or moderate to high potential impact (see Section 10.2.6).

Table 10-3 Summary of visual impacts of the project for the identified viewpoints

Viewpoint[1]	Overall visual impact rating
1 (rural residential property)	High
2 (rural residential property)	Moderate
3 (rural residential property)	High
4 (motel)	Moderate
5 (Tarcutta General Cemetery)	High
6 (residential area)	High
7 (residential property)	High
8 (Breadon Sportsground)	High to moderate
9 (residential property)	Moderate
10 (Tarcutta Hotel)	Moderate

Viewpoint[1]	Overall visual impact rating
11(rural residential property)	High to moderate
12 (Hambledon Homestead)	High
13 (Tarcutta House)	High
14 (rural residential property)	High to moderate

Note: 1. Refer to Figures 10-2 and 10-3 for viewpoint locations.

The visual changes and landscape character impacts associated with the project for the identified landscape units are summarised in Table 10-4.