3. Description of the study area

This Chapter describes the study area and locality in terms of the existing environment, including vegetation communities, terrestrial flora and fauna and aquatic habitats and fauna, based on the results of the desk-based and field assessments.

3.1 Landscape context

The Proposal lies within the NSW South-western Slopes bioregion (Thackway & Cresswell 1995). This bioregion consists of 8,070,608 hectares of foothills and ranges, comprising the western fall of the Great Dividing Range to the edge of the Riverina Bioregion. It has hot summers, with summer and winter rainfall. Remaining native vegetation is dominated by Eucalypt woodlands, Callitris forests and woodlands, and Eucalypt tall open forests. Patches of low closed forests and closed shrublands, eucalypt open woodlands, grasslands and Acacia forests and woodlands occur (NSW National Parks and Wildlife Service 2003).

Major land uses are grazing of native and modified pastures, native forests and nature conservation (NSW National Parks and Wildlife Service 2003).

The region has been largely cleared of Eucalypt woodlands for grazing and dryland agriculture, with the larger remaining areas of vegetation now occurring on the rockier, hilly areas, or as roadside vegetation.

Two conservation reserves occur within the local area. Ellerslie Nature Reserve is located approximately 13 kilometres to the east of the Proposal (refer Figure 3-1). This park is the largest protected area in proximity to the Proposal, and occurrences of White Box, Red Box and Blakely's Red Gum in the reserve are regarded as a component of the White Box, Yellow Box, Blakely's Red Gum Woodland association listed under the *Threatened Species Conservation Act 1995* (Department of Environment and Climate Change 2008). The habitat value of the reserve is considered high (Department of Environment and Climate Change 2008) with Threatened species such as, Brown Treecreeper, Black-chinned Honeyeater, Turquoise Parrot, Squirrel Glider and Eastern Bentwing-Bat recorded within (refer Table 3-1). Tarcutta Hills (owned and managed by Australian Bush Heritage Trust) occurs approximately 15 kilometres to the south of the Proposal and covers an area of 432 hectares.

Both reserves play an important role in the landscape as fragmented vegetated links between the forest country to the east and south (including Woomargama and Livingstone National Park's) and the open woodland country to the north (including Ulandra Nature Reserve).

In addition to the formal reserve system, travelling stock reserves occur in the locality and within the study area. Travelling stock reserves were developed in NSW over 160 years ago, allowing graziers to move stock along certain roadsides and camp them in these reserves overnight (Davidson *et al.* 2005). In many areas where vegetation in the wider region has been cleared for agricultural purposes, travelling stock reserves contain important remnant vegetation.

The Proposal would cross Tarcutta Creek and Keajura Creek. Tarcutta Creek begins approximately eight kilometres from Laurel Hill near Tumbarumba. It flows in a northerly direction, past Tarcutta, until it joins the Murrumbidgee River at Borambola, 25 kilometres east of Wagga Wagga. Keajura Creek is a tributary of Tarcutta Creek, joining it near the intersection of the existing Hume Highway and Humula Road. The total catchment area of Tarcutta Creek is approximately 1,733 square kilometres. The catchment has been highly modified by agricultural land use practices since the mid-1800s.

The Murrumbidgee Stressed Rivers Report (Department of Land and Water Conservation 2001) describes Tarcutta Creek as a waterway under a high level of environmental stress. Tarcutta Creek is currently under high levels of hydrological stress owing to recent drought conditions and extraction for the purposes of stock watering, domestic uses and irrigation.

Table 3-1 Threatened species previously recorded in surrounding conservation reserves

Scientific name	Common name	TSC[1]	EPBC[2]	Ellerslie Nature Reserve
Callocephalon fimbriatum	Gang-gang Cockatoo	V		X
Climacteris picumnus victoriae	Brown Treecreeper	V		X
Melithreptus gularis gularis	Black-chinned Honeyeater	V		X
Neophema pulchella	Turquoise Parrot	V		X
Stagonopleura guttata	Diamond Firetail	V		X
Petaurus australis	Yellow-bellied Glider	V		X
Petaurus norfolcensis	Squirrel Glider	V		X

Notes: Data from BioNet (Department of Environment and Climate Change 2008b)

1. V= Vulnerable, E1 = Endangered - *Threatened Species Conservation Act 1995*.
2. V = Vulnerable - *Environment Protection and Biodiversity Conservation Act 1999*.

3.1.1 Mitchell Landscapes

Mitchell Landscapes are a system of ecosystem classification mapped at the 1:250,000 scale, based on a combination of soils, topography and vegetation (NSW National Parks and Wildlife Service 2002b)

The Tarcutta Proposal lies predominately within the Murrumbidgee - Tarcutta Channels and Floodplains landscape, with additional small areas of Adrah Hills and Ranges and Carabost Hills and Ranges (refer Figure 3-1). These landscapes are described below based on the descriptions by the NSW National Parks and Wildlife Service (2002b)., including an estimation of clearing across the landscape. Clearing estimates are derived from the Mitchell landscapes percentage cleared estimates for CMA database. Under the vegetation assessment tool (BioMetric version 2.0) (NSW Department of Environment and Climate Change 2008), a landscape that is greater than 70 per cent cleared is considered to be over-cleared.

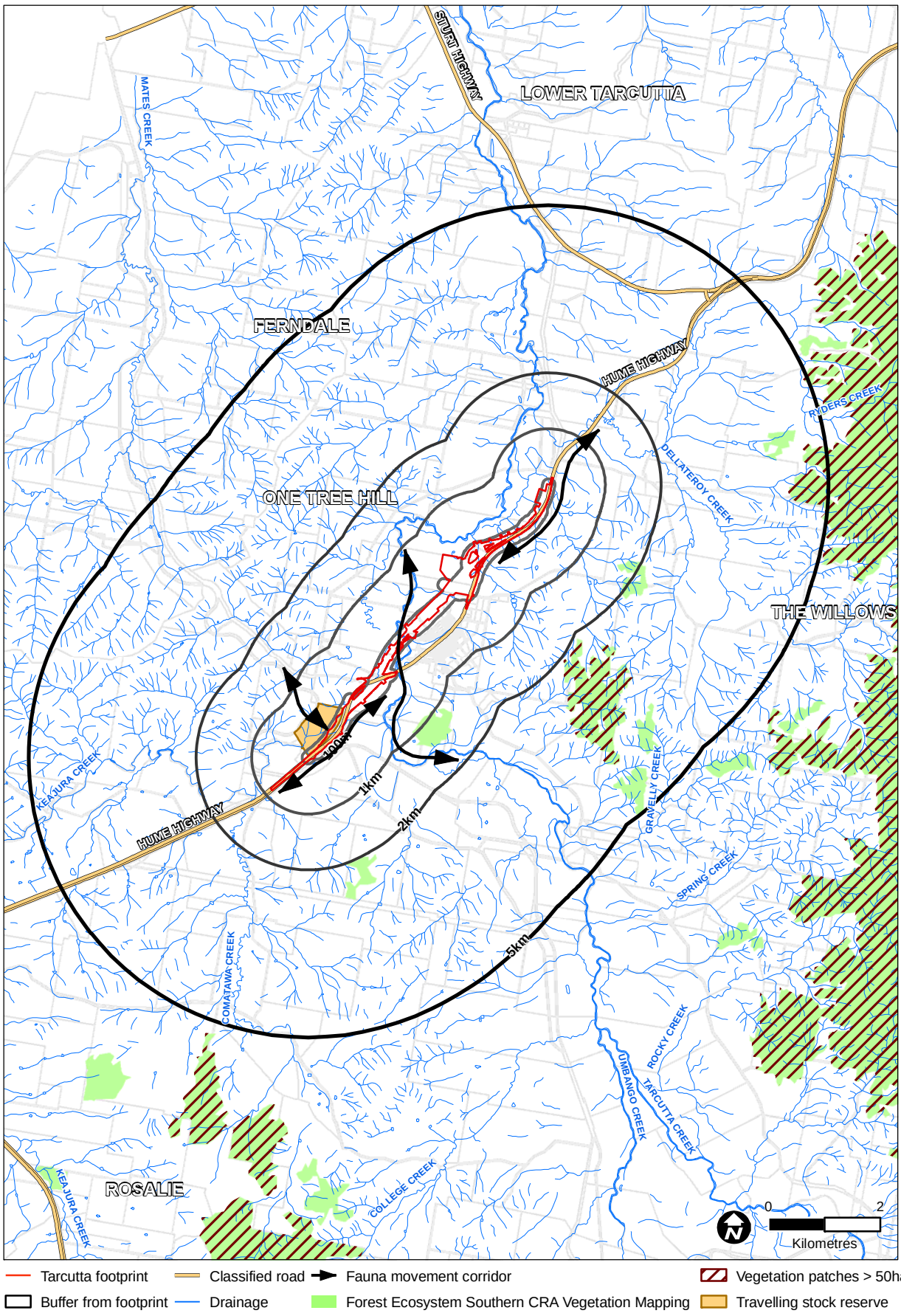

Figure 3-1 Landscape Context Method

Adrah Hills and Ranges – 77 per cent cleared

This landscape consists of rolling hills, low ranges and peaks on Ordovician quartzose greywacke, slate, phyllite and schist, generally at elevations of 250 to 700 metres, with a local relief of 200 metres. It contains stony, thin red and brown texture-contrast soils merging to yellow harsh texture-contrast soils on valley floors. Vegetation is dominated by woodland of *Eucalyptus dealbata*, *E. macrorhyncha*, *E. sideroxylon*, *E. polyanthemos*, *E. microcarpa*, *E. bridgesiana* and *E. caliginosa* on slopes and *E. melliodora*, *E. albens* and occasional *E. blakelyi* on flats.

Murrumbidgee - Tarcutta Channels and Floodplains – 91 per cent cleared

This landscape consists of channels, floodplains and terraces of Murrumbidgee tributaries on Quaternary alluvium, generally at elevations of 200 to 400 metres, with a local relief of 25 metres. It contains undifferentiated organic sand and loam on the floodplain, brown gradational loam and yellow texture-contrast soils on higher terraces. The vegetation consists of *E. camaldulensis* gallery woodland on banks, *E. melliodora* and *E. microcarpa* open woodland on floodplains and terraces.

Carabost Hills and Ranges – 71 per cent cleared

This landscape consists of steep dipping Lower Ordovician chert, slate, lithic sandstone, shale, phyllite schist and minor basic volcanic rocks, generally at elevations of 250 to 700 metres, with a local relief of 250 metres. It contains stony gradational red brown earth and red-yellow texture-contrast soils. The vegetation consists of dry forest of *E. macrorhyncha* and *E. dives*.

3.1.2 Patch sizes

The size of a remnant patch of vegetation can play an important role in its long-term viability (Gilfedder & Kirkpatrick 1998; Lonsdale 1999; Parkes *et al.* 2003), with larger patches generally having a better prognosis for long-term survival than smaller remnants more susceptible to disturbances (Drayton & Primack 1996; Renjifo 1999). A number of factors are thought to contribute to this, including:

- 'Edge effects', both biotic and abiotic (i.e. the ratio of patch perimeter to patch interior area is higher in fragmented landscapes (Saunders *et al.* 1991).
- Species-area relationships (i.e. large areas tend to support more species than smaller ones (Burbidge *et al.* 1997).
- Size of resident populations, which decreases with decreasing patch size (Zanette *et al.* 2000).
- Larger areas are more likely to retain refuges for susceptible species in or after disturbances, such as fires, floods or droughts (Lindenmayer & Burgman 2005).

Patches of vegetation in the study area are relatively small. This is a similar pattern to that seen in the wider region. In the Tarcutta area, 54 per cent of the remnant White Box Yellow Box Blakely's Red Gum Woodlands tree-cover occurs as patches of less than one hectare (Gibbons & Boak 2002).

Based on the detailed mapping for this study, only one mapped patch greater than 40 hectares exists within the study area, sized at approximately 79 hectares (refer Figure 3-2). Remnants within the study area are, however, generally small (less than five hectares) (refer Figure 3-2).

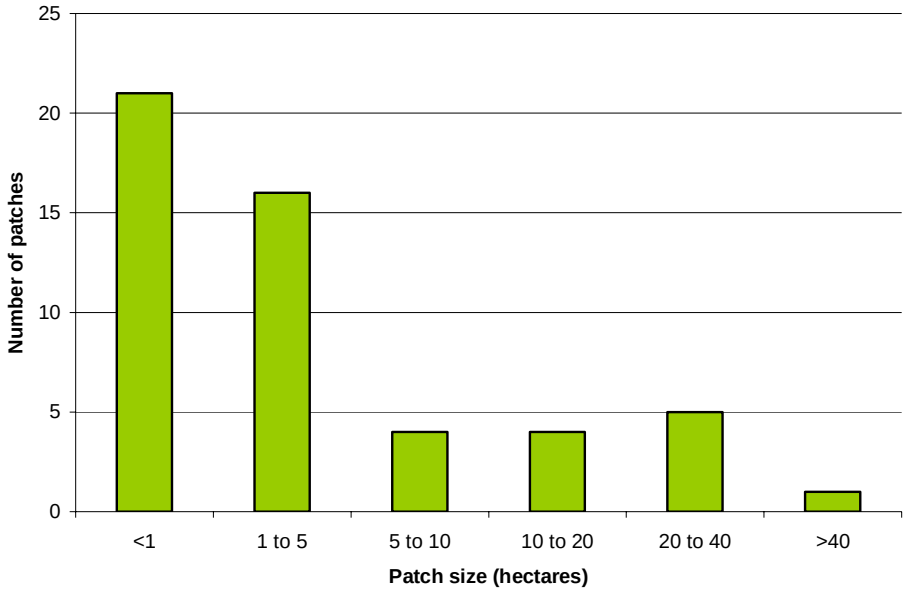

Figure 3-2 Distribution of vegetation patch sizes within the Tarcutta study area

Generally, patch sizes within the study area are small, indicating that in isolation each patch is likely to be significantly edge-affected and with a reduced capacity to maintain viable populations. However, in combination they may provide significant habitat and connectivity within the landscape (refer below).

The size of patches can, by themselves, be misleading, since the shape can also play an important role in determining species composition. Linear strips, such as roadside and creek-side vegetation, can become 'edge' habitats that may be unsuitable for species dependent on forests (Bennett 1993). Many of the species recorded in the study area are species that forage in open farmlands (e.g. Eastern Rosella and Red-rumped Parrot), and the majority of true woodland species were found within the larger patches.

3.1.3 Neighbourhood

The degree to which remnant vegetation is connected to other areas of native vegetation often influences the regenerative capacity of a site, and therefore, its long-term viability. In the longer term, populations may 'move' across the landscape, taking advantage of short-term changes that provide suitable habitat, at the same time as other local changes decrease their ability to survive at sites of current occupation (Morgan 1998). Their ability to occupy newly-suitable sites depends on the ability of individuals, or their propagules, to arrive at the newly-suitable site, and hence, depends on the connectivity between sites (Parkes *et al.* 2003).

Connections through the landscape may be physical linkages, such as with adjacent blocks of vegetation, or more narrow links, such as corridors. Alternatively, connections may not be through physical linkages, but may be due to dispersal of both plants and animals between blocks of native vegetation that are separated from one another (Parkes *et al.* 2003).

A number of studies have shown that woodland species of animal require a certain level of vegetation cover within the landscape. For example, Reid (2000) suggests that declining woodland birds drop out when native cover in the landscape falls below 30 per cent. Similarly, McIntyre et al (2000) suggest a minimum 30 per cent woodland cover is required to maintain ecological sustainability on grazed properties. Bennett and Radford (2004) suggest that there is a sharp decline in the species richness of woodland birds in landscapes with a habitat cover less than 10 per cent.

Although the degree of cover has not been calculated at the landscape scale, other studies in the region have shown values of less than 10 per cent vegetation cover (at a spatial resolution of 10 hectares) (Parsons Brinckerhoff 2009). Within the current study area the level of vegetation cover is low at approximately 20 per cent, with the majority of cover occurring in small patches (refer Figure 3-2). This will clearly be reduced with the development of the bypass.

This pattern of significantly reduced vegetation cover places an upper limit on the size that populations can achieve, regardless of the distribution of the vegetation. The fragmented nature of the remaining vegetation can only reduce the population sizes in the region for woodland-dependent species. Conversely, the loss of vegetation in the region has meant that species able to use farmland and grassland environments have increased amounts of habitat available. Based on the threshold limit for woodland birds suggested by Bennett and Radford (2004), the study area is currently only just capable of maintaining viable populations of woodland birds.

3.1.4 Distance to core

The survival of a population within a small remnant patch of vegetation may be supported by the nearby location of a larger patch of habitat, through what is known as metapopulation dynamics. A metapopulation is defined as a set of local populations that interact via individuals moving between local populations (Hanski 1999). Within a landscape, larger patches in which larger populations are secure and only rarely become extinct, can act as a source of individuals for smaller patches in which extinctions are regular, thereby maintaining the presence of a species in the smaller patches (Arnold *et al.* 1993; Hanski 1999; Lindenmayer & Burgman 2005).

Although a full assessment of distance to core areas has not been completed for the Proposal, a large patch (approximately 79 hectares) of remnant vegetation is located in the south of the study area. This area will largely be avoided by the Proposal.

3.1.5 Corridors and connectivity

Wildlife corridors can be defined as 'retained and/or restored systems of (linear) habitat which, at a minimum enhance connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation' (Wilson & Lindenmayer 1995). Corridors can assist ecological functioning at a variety of spatial and temporal scales, from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions.

Corridors serve a number of different functions in terms of biodiversity conservation including:

- Providing increased foraging area for wide-ranging species.
- Providing cover for movement between habitat patches, particularly for cover-dependent species and species with poor dispersal ability and enhancing the movement of animals through sub-optimal habitats.
- Reducing genetic isolation.
- Facilitating access to a mix of habitats and successional stages to those species that require them for different activities (for example, foraging or breeding).
- Providing refuge from disturbances such as fire.
- Providing habitat in itself.
- Linking wildlife populations and maintaining immigration and recolonisation between otherwise isolated patches. This in turn may help reduce the risk of population extinction (Wilson & Lindenmayer 1995).

How species use a corridor network depends largely on the home and activity ranges of the species, their habitat requirements and the ecological characteristics of the corridor. For example, some large or mobile species may make direct movements through a corridor network, moving from one patch of habitat to another. These direct movements may be on the scale of a foraging expedition or a migration (Bennett 1990). Other species may have movements by single individuals punctuated by pauses in the corridor, which can last anything from a small foraging or resting bout to weeks and even months. If the corridor contains sufficient resources to maintain a population, then continuity through the corridor may be through gene flow through the resident population (Bennett 1990; Wilson & Lindenmayer 1995).

Vegetation within the region of the Proposal is highly fragmented, with large expanses of cleared land surrounding. Although some vegetation in patches is of sufficient size to maintain viable populations, in many cases there may be only limited connectivity among the patches, given the extent of clearing and the distance to core areas. Even small patches may, however, provide stepping stones within the wider landscapes (Bennett 1993).

In such a modified landscape, vegetation within roadside reserves can play an important role in the connectivity of remnant patches of vegetation and is often used by species that will not move across the more open surrounding matrix (refer Figure 3-3). For example, it has been shown that at Barmah Forest in Victoria, the Superb Parrot nests in large River Red Gums in the forest and feeds in remnant Box Woodlands in nearby farmland. These birds regularly use forested roadside corridors as a pathway for flight between habitats, instead of flying across open paddocks (Webster 1988 cited in Bennett 1990, 1993).

The roadside reserve corridors will be affected by the Proposal to the north and south of Tarcutta, where the existing Hume Highway is upgraded and bypass diversions are created.

Given the width and condition of the vegetation within the road reserve and the presence of a number of nodes, or larger patches of vegetation adjacent to the road reserve, it is likely that these areas are used by a range of species as part of a wider corridor network.

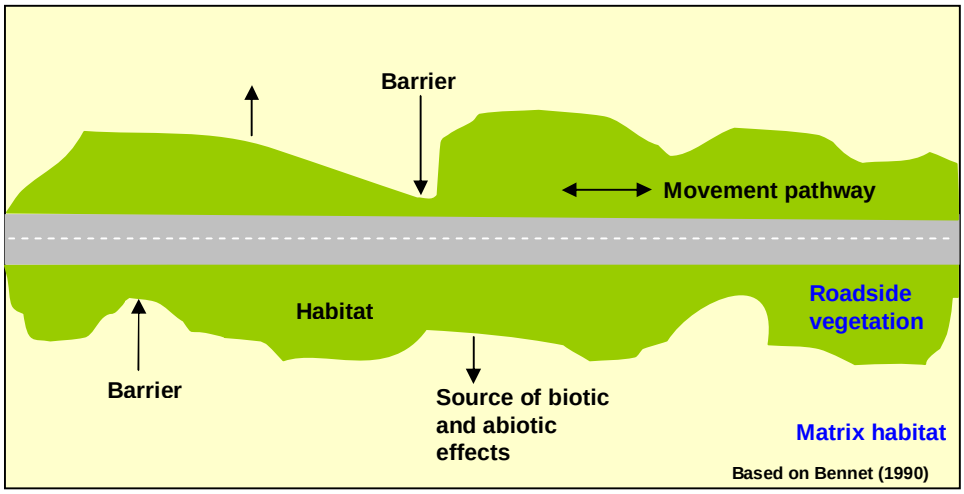

Figure 3-3 Diagrammatic representation of roadside vegetation and the main functions of the corridor

3.1.6 Summary of landscape context

The analysis of the landscape context presented above indicates that the study area lies within a landscape that has been modified significantly through anthropogenic disturbance, including cropping, grazing and other developments. The remaining vegetation is highly fragmented, occurring mainly as small remnant patches spread across the landscape. Larger patches of vegetation do remain in the landscape, but these are generally distant from the study area.

The pattern of vegetation clearing has reduced the condition of vegetation remaining within the study area, but at the same time has increased its significance both in terms of its conservation value (the majority of the vegetation within the study area is listed as an Endangered Ecological Community) and its role in the broad-scale corridor network. In such a modified landscape, vegetation within the study area can play an important role in the connectivity of remnant patches of vegetation and in the broader landscape.

3.2 Vegetation communities

3.2.1 Existing broad scale vegetation mapping

The study area is located on the edge of the existing broad scale vegetation mapping *Forest Ecosystem Classification and Mapping of the Southern Comprehensive Regional Assessment Region* (Thomas *et al.* 2000). This mapping, however, covers the majority of the eastern half of the locality and region. Four vegetation communities occur within the study area, generally located as isolated patches. A summary of these communities is provided in Table 3-2.

Table 3-2 Southern Comprehensive Regional Assessment Region broad vegetation communities mapped in the study area

Vegetation community name	Description	Corresponding Threatened ecological community
Forest Ecosystem 43: Western Slopes Riparian Moist Sedge Woodland	An open forest up to 25 metres tall, dominated by *E. camaldulensis* that occurs on alluvial soils along the watercourses of major rivers. The understorey is dominated mainly by sedges and a range of small herbs including *Carex inversa* and *C. appressa*, *Cyperus* sp., *Eleocharis* sp.	-
Forest Ecosystem 117: Western Slopes Dry Grass Woodland	Woodland up to 20 metres in height dominated by *E. albens* with occasional *E. blakelyi* and *E. melliodora*. The shrub layer is virtually absent with rare occurrences. The groundcover is made up of diverse range of grasses intermingled with a range of forbs.	White Box, Yellow Box, Blakely's Red Gum Woodland (TSC Act and EPBC Act)
Forest Ecosystem 119: Western Tablelands Dry Shrub/Grass Forest	A medium forest up to 15 metres tall dominated by *E. macrorhyncha* and *E. polyanthemos*. Other eucalypts that are recorded within this community included *E. nortonii, E. albens* and *E. bridgesiana.* The shrub layer is a sparse cover of tall shrubs, such as *Acacia dealbata*, and a medium shrub layer of *Hibbertia obtusifolia, Senecio tenuifolia*, and *Melichrus urceolatus*. The groundcover comprised a sparse cover of herbs, including *Gonocarpus tetragynus*, *Hydrocotyle laxiflora*, *Daucus glochidiatus, Luzula flaccida, Microtis unifolia*, and *Drosera auriculata*, together with a sparse cover of grasses such as *Danthonia pilosa* ssp. *pilosa* and *Elymus scaber*.	White Box, Yellow Box, Blakely's Red Gum Woodland (TSC Act and EPBC Act)
Forest Ecosystem 120: Western Slopes Shrub/Herb/Grass Dry Forest	Western Slopes Shrub/Herb/Grass Dry Forest is a medium forest up to 15 metres tall, dominated by *E. macrorhyncha*, with *E. albens* and *E. polyanthemos*. The shrub layer is virtually absent on most sites. The groundcover is a sparse cover of grasses, graminoids (other grass-like plants) and forbs including tussock grass *Poa sieberiana* var *sieberiana*, *Elymus scaber, Lomandra filiformis* ssp. *filiformis*, and *Lomandra multiflora* ssp. *multiflora*, G*onocarpus tetragynus, Hibbertia obtusifolia, Daucus glochidiatus, Hypericum gramineum* and *Goodenia hederacea* var *hederacea*.	White Box, Yellow Box, Blakely's Red Gum Woodland (TSC Act and EPBC Act)

Ground-truthing of the existing vegetation mapping and aerial photograph interpretation identified additional areas of native vegetation that were not mapped by Thomas et al (2000) due to their small size. In some instances remnant patches could not be reliably assigned to a mapped vegetation type due to their poor condition and low species diversity.

Given the relatively broad vegetation descriptions and poor resolution of this existing mapping, detailed field identification of the study area's vegetation in accordance with the vegetation types described by Benson 2008 was completed. This also allowed for direct comparison with the vegetation descriptions currently used by the BioMetric (version 2.0) for offset calculations within the South-western Slopes bioregion.

Figure 3-4 Broad-scale vegetation mapping

3.2.2 Identified vegetation communities

The detailed field surveys identified that the majority of the study area is dominated by highly modified and/or artificial grassland vegetation communities associated with past intensive agricultural land uses, while the remnant vegetation is characterised by seven distinct communities described by Benson (2008)(refer Figure 3-5).

Detailed summaries of the species recorded in each vegetation community are provided in Table 3-3 and Sections 3.2.3 to 3.2.9. Two Threatened ecological communities, White Box, Yellow Box, Blakely's Red Gum Woodlands and Inland Grey Box Woodland were identified as being commensurate with four of the vegetation associations observed within the study area.

3.2.3 River Red Gum Open Forest of the NSW South Western Slopes Bioregion

River Red Gum Open Forest of the NSW South Western Slopes bioregion is an open forest up to 25 metres high dominated by *E. camaldulensis* (River Red Gum). It occurs on alluvial soils along river banks and floodplain depressions of major watercourses (Benson 2008). This community's extent has been significantly reduced with an estimated 85 per cent of its original distribution cleared (Benson 2008).

Two distinct variations of this community were observed in the study area. These comprised a typical riparian association associated with Tarcutta and Keajura Creeks and a more disturbed open variation associated with the floodplain depressions and dry billabongs surrounding these creeks (refer Photograph 3-1, and Figure 3-5).

Photograph 3-1 River Red Gum very tall open forest of the NSW South Western Slopes (floodplain variation) west of Tarcutta

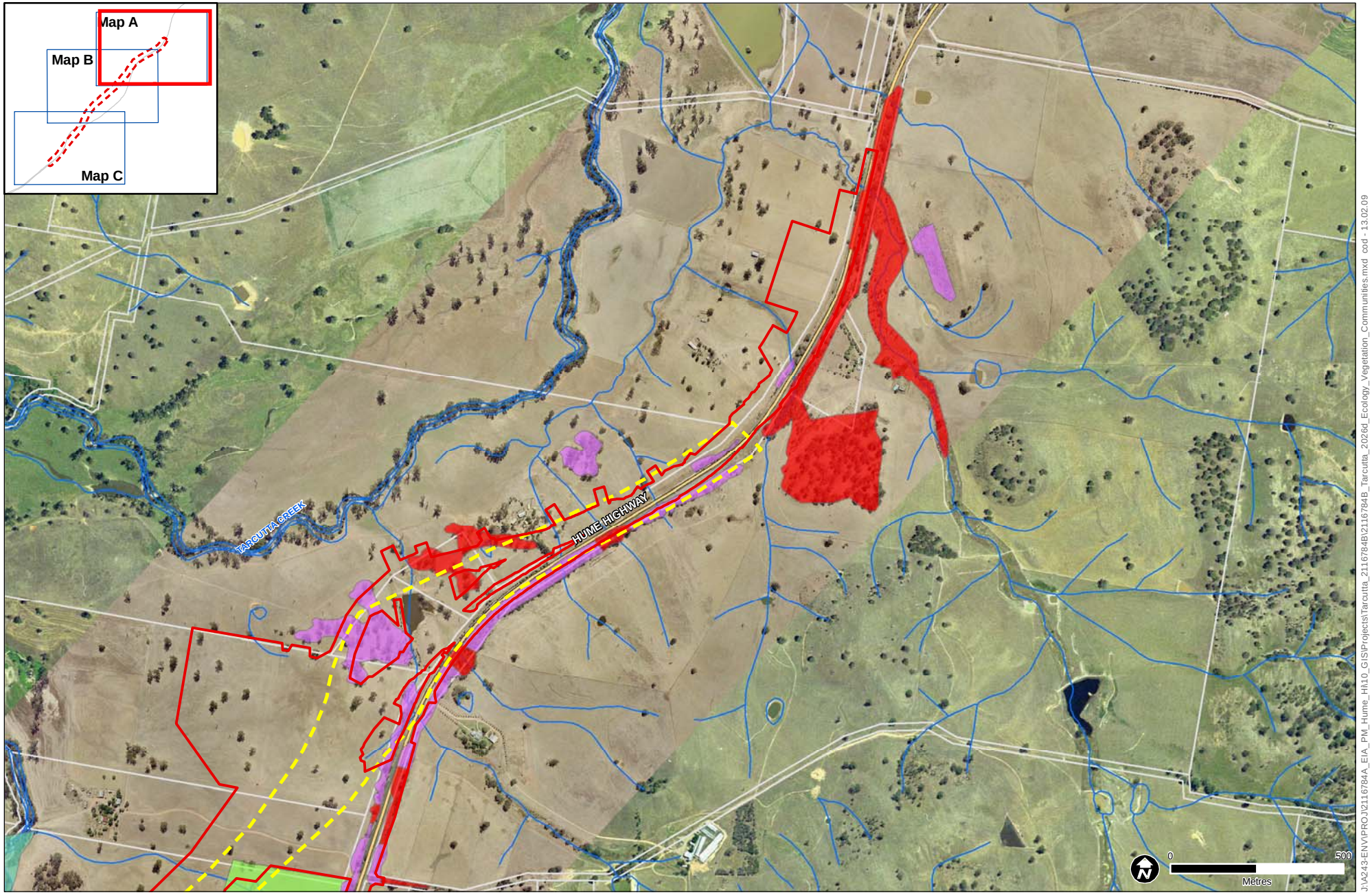

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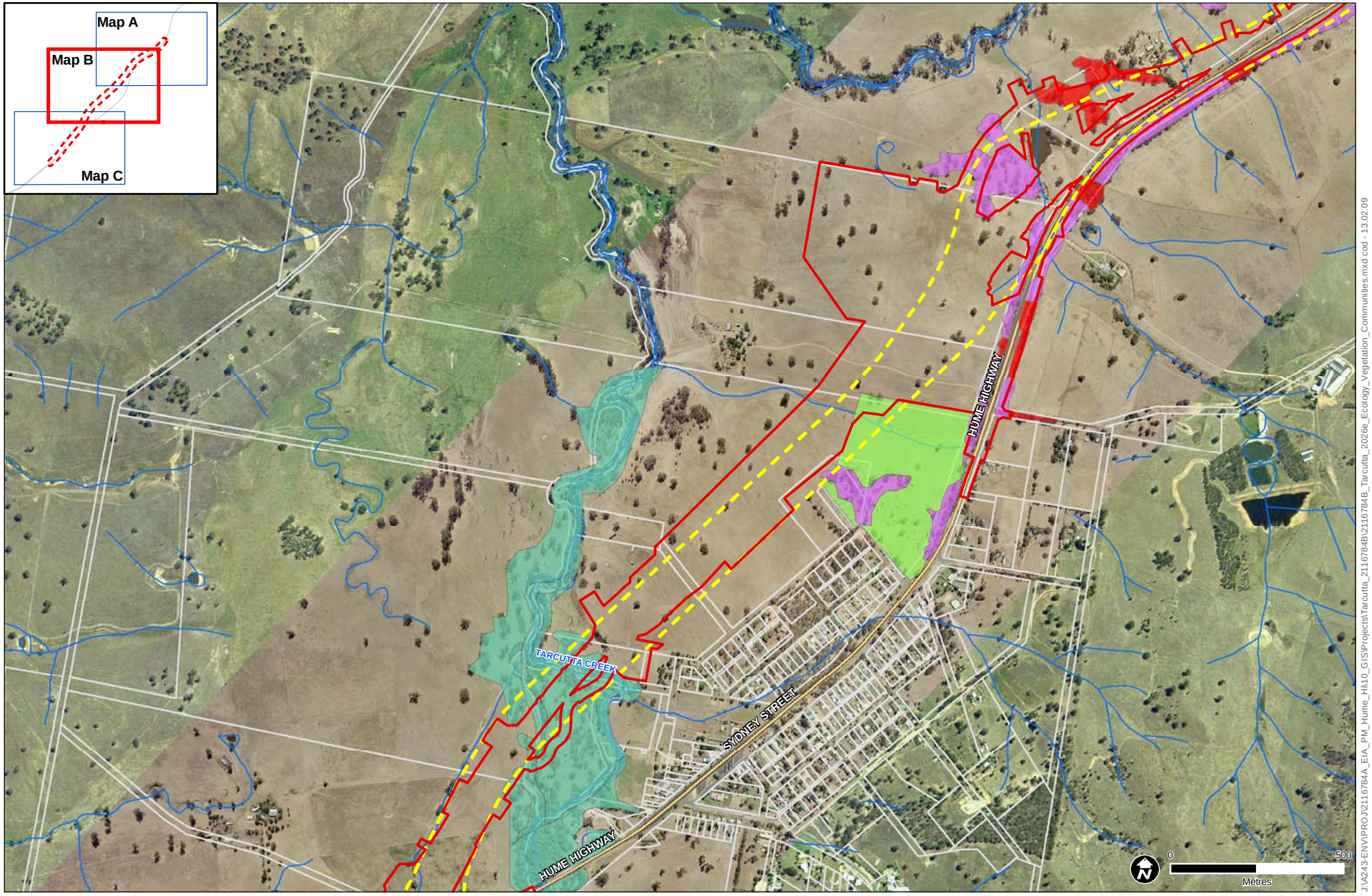
Figure 3-5 Identified vegetation communities - Tarcutta (A)



Subject site
Tarcutta study corridor
Classified road
Drainage

Vegetation communities

Apple Box moist gully grass-forb open forest
Blakely's Red Gum - Yellow Box grassy woodland
Red Stringbark Blakely's Red Gum herbaceous valley open forest
Derived Native Grassland
Inland Grey Box tall grassy woodland
Mugga Ironbark - Scribbly Gum - Red Gum Graminoid open forest
River Red Gum very tall open forest

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Figure 3-5 Identified vegetation communities - Tarcutta (B)

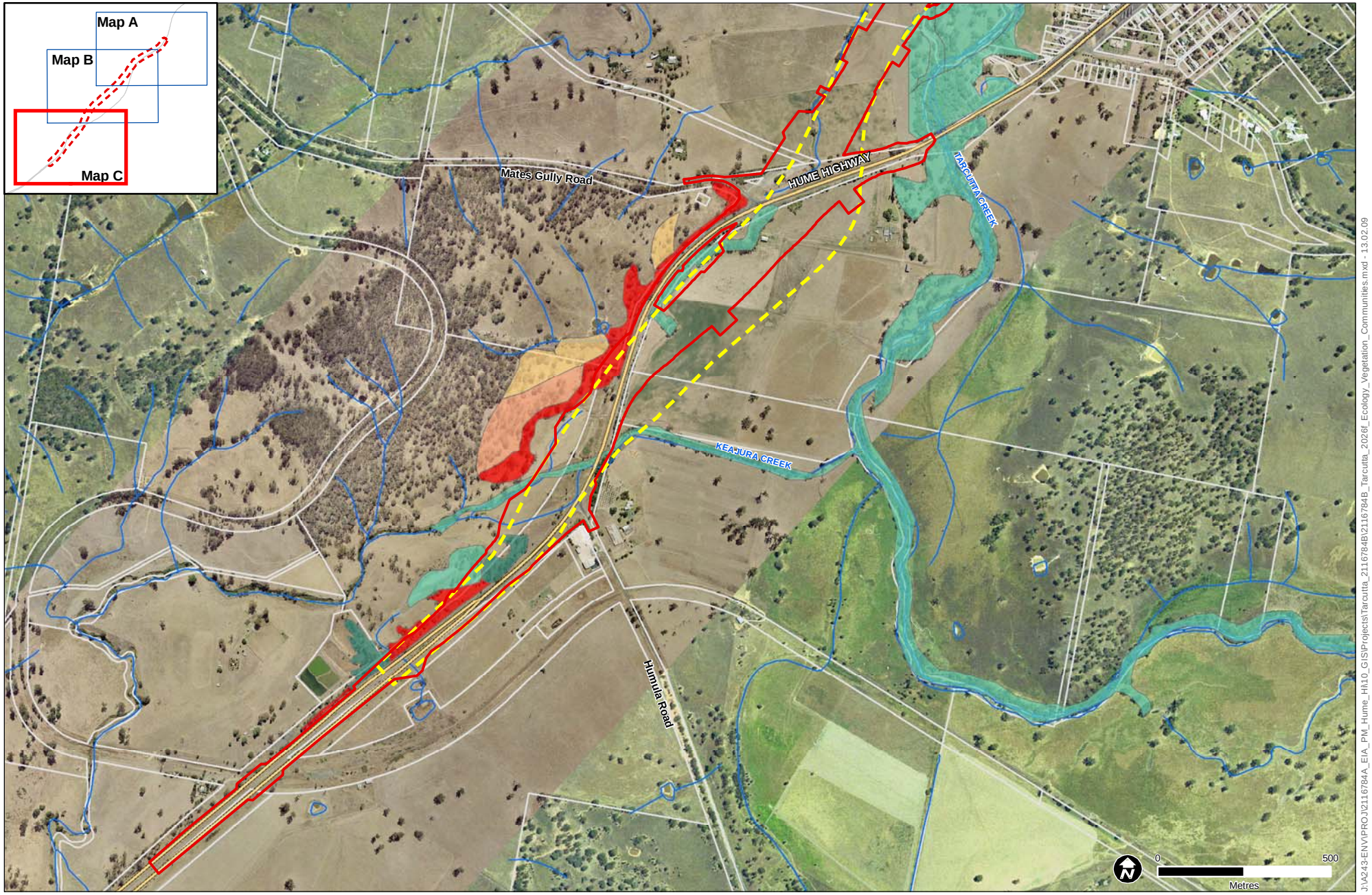

Figure 3-5 Identified vegetation communities - Tarcutta (C)

Table 3-3 Vegetation communities identified within the study area

Vegetation community name (Benson 2008 map unit)	Description	Corresponding Threatened ecological community[1]	Corresponding broad vegetation community (Thomas et al. 2000)
Blakely's Red Gum - Yellow Box grassy woodland (Benson 277)	Grassy Woodland up to 20 metres in height dominated by *E. blakelyi* with occasional *E. melliodora* on flats and on gentle slopes. The shrub layer was virtually absent with rare occurrences. The groundcover was made up of diverse range of grasses intermingled with a range of forbs and sedges including *Austrodanthonia*, *Austrostipa* and *Lomandra filiformis*. Occurs on fertile, deep loam or clay soils derived from a range of substrates including fine-grained sedimentary and metamorphic rocks but also volcanics and fine-grained granite.	White Box, Yellow Box, Blakely's Red Gum Woodland (TSC Act and EPBC Act)	Forest Ecosystem 117: Western Slopes Dry Grass Woodland
Apple Box moist gully grass-forb open forest of the NSW South Western Slopes and South Eastern Highlands Bioregions (Benson 283)	Grassy woodland, dominated by *E. bridgesiana, and occasionally E. melliodora* on footslopes gullies and flats. The native understorey was dominated mainly by *Cassinia aculeate* and *Acacia spp.* over a mixture of grasses, sedges and a range of small herbs including *Elymus scaber, Austrodanthonia* and *Austrostipa.* Occurs on silty loam clay soils derived from colluvium or sedimentary, metamorphic or igneous substrates on flats adjoining creeks.	White Box, Yellow Box, Blakely's Red Gum Woodland (TSC Act and EPBC Act)	Forest Ecosystem 117: Western Slopes Dry Grass Woodland
Mugga Ironbark - Scribbly Gum - red gum graminoid open forest on hillcrests in the NSW South Western Slopes Bioregion (Benson 289)	Graminoid open forest, dominated by *E. sideroxylon,* and occasionally *E. polyanthemos subsp. polyanthemos,* on hillcrests or upper hillslopes. The native understorey was dominated mainly by *Cassinia aculeate* and *Acacia spp.* over a mixture of grasses, sedges and a range of small herbs including *Elymus scaber, Austrodanthonia* and *Austrostipa.* Occurs on shallow, loamy clay soils derived from metamorphic substrates such as phyllite or arkose.	-	Forest Ecosystem 119: Western Tablelands Dry Shrub/Grass Forest

Vegetation community name (Benson 2008 map unit)	Description	Corresponding Threatened ecological community[1]	Corresponding broad vegetation community (Thomas et al. 2000)
Red Stringybark - Red Box - Long-leaved Box - Scribbly Gum shrub - tussock grass open forest of the southern section of the NSW South Western Slopes Bioregion (Benson 290)	Open forest, dominated by *E. macrorhyncha,* and occasionally *E. polyanthemos subsp. polyanthemos,* on dry slopes and sometimes crests of steep hills. The native understorey was dominated mainly by *Dillwynia phylicoides* and *Acacia spp.* over a mixture of grasses, sedges and a range of small herbs including *Elymus scaber, Austrodanthonia* and *Austrostipa.* Occurs on shallow red to brown to yellow loamy podsolic clay soils derived from siliceous metamorphic, sedimentary and igneous substrates.	-	Forest Ecosystem 119: Western Tablelands Dry Shrub/Grass Forest
Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	Grassy woodland, dominated by *E. microcarpa* on undulating alluvial plains. The native understorey was dominated mainly by *Acacia dealbata* over a mixture of grasses, sedges and a range of small herbs including *Einadia nutans subsp. nutans, Austrostipa scabra, Elymus scaber, Austrodanthonia.* Occurs on texture contrast red or brown earths or grey clay soils.	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (TSC Act) Inland grey box woodland ecological community (Preliminary listing – EPBC Act)	Forest Ecosystem 117: Western Slopes Dry Grass Woodland
River Red Gum very tall open forest of the NSW South Western Slopes Bioregion (Benson 79)	Grassy woodland, dominated by *E. camaldulensis and occasionally E. bridgesiana* on river banks and adjacent flats along major watercourses. The native understorey was dominated mainly by *Acacia dealbata* over a mixture of grasses, sedges and a range of small herbs including *Carex inversa* and *C. appressa*, *Cyperus* sp., *Eleocharis* sp. Shrubs may be absent in heavily grazed and eroded areas. Occurs on alluvial sandy loam soils.	-	Forest Ecosystem 43: Western Slopes Riparian Moist Sedge Woodland

Vegetation community name (Benson 2008 map unit)	Description	Corresponding Threatened ecological community[1]	Corresponding broad vegetation community (Thomas et al. 2000)
Derived Native Grassland	Derived Native Grassland would have once been Inland Grey Box tall grassy woodland. The native understorey was dominated mainly by a mixture of grasses, sedges and a range of small herbs including *Einadia nutans subsp. nutans, Austrostipa scabra, Elymus scaber, Austrodanthonia.* Occurs on texture contrast red or brown earths or grey clay soils.	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (TSC Act) Inland grey box woodland ecological community (Preliminary listing – EPBC Act)	-

Note: 1: The Critically Endangered Ecological Community, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland as described under the *Environment Protection and Biodiversity Conservation Act 1999* has condition criteria as described in Section 4

Within the riparian variation, a range of age classes of *E. camaldulensis* occurred in the study area, including large hollow-bearing trees as well as patches of *E. camaldulensis* regrowth within the creek channel. A dense sub canopy of juvenile *E. camaldulensis* and patches of the exotic *Salix babylonica* were also present.

The shrub layer contained dense thickets of regrowth *Salix babylonica* and *Acacia dealbata* along the creek banks. The groundcover on the creek banks and floodplains was dominated by a mixture of native and exotic rushes and sedges and pasture improvement species and weeds, including *Carex appressa, Microlaena stipoides* var*. stipoides, Echium plantagineum, Hordeum leporinum, Vulpia myuros, Lythrum hyssopifolia, Lolium perenne, Amphibromus nervosus, Phalaris aquatica* and *Bromus* spp. The average number of native species sampled per 400 metre square quadrat was moderate at nine species. While exotics typically made up between 50 per cent and 70 per cent of the diversity with an average of 12 species per quadrat.

Pools and sediment deposits within the active creek channel were dominated by sedges, rushes and aquatic species, including *Persicaria decipiens, Typha australis, Phragmites australis, Carex appressa, Juncus usitatus* and *Triglochin procera.*

The riparian variation of this community was affected by a range of disturbances, including grazing livestock and past clearing for pasture improvements. The condition of the riparian variation of this community was typically medium (refer Figure 3-6).

The disturbed floodplain variant of this community was characterised by a single age class of mature *E. camaldulensis* trees to 30 metres high over a groundcover dominated by the exotic pasture species *Hordeum leporinum, Vulpia myuros, Lolium perenne, Bromus* spp., *Echium plantagineum* and *Brassica rapa*. This variation was considered to be in moderate to poor condition, with the canopy of *E. camaldulensis* the principal native species recorded.

3.2.4 Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion

Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion was a woodland community up to 25 metres in height dominated by *E. blakelyi* and occasionally *E. melliodora*.

The community consisted of small, narrow pocket remnants of semi-continuous canopy within the existing Hume Highway road corridor and adjoining paddocks (refer Figure 3-5), typically associated with minor ephemeral creek lines and fertile soils on lower slopes and plains (refer Photograph 3-2). An additional large remnant patch (Patch 5 in Figure 4-2) of this community is located within the Southern Travelling Stock Reserve as semi-continuous canopy trees over a mixture of native and exotic groundcovers.

The dominant eucalypts ranged in age from older hollow-bearing (habitat) trees to young regrowth. The shrub stratum was generally absent with the exception of several patches of regrowth eucalypt and *Acacia genistifolia, Acacia pycnantha* and *Acacia dealbata* understoreys. The groundcover was the most diverse stratum within this community, being comprised of a variety of native and exotic grasses sedges and herbs. The average number of native species sampled per 400 metre square quadrat was moderate with nine species. Exotics typically made up greater than 70 per cent of the diversity, with an average of 16 species per quadrat.

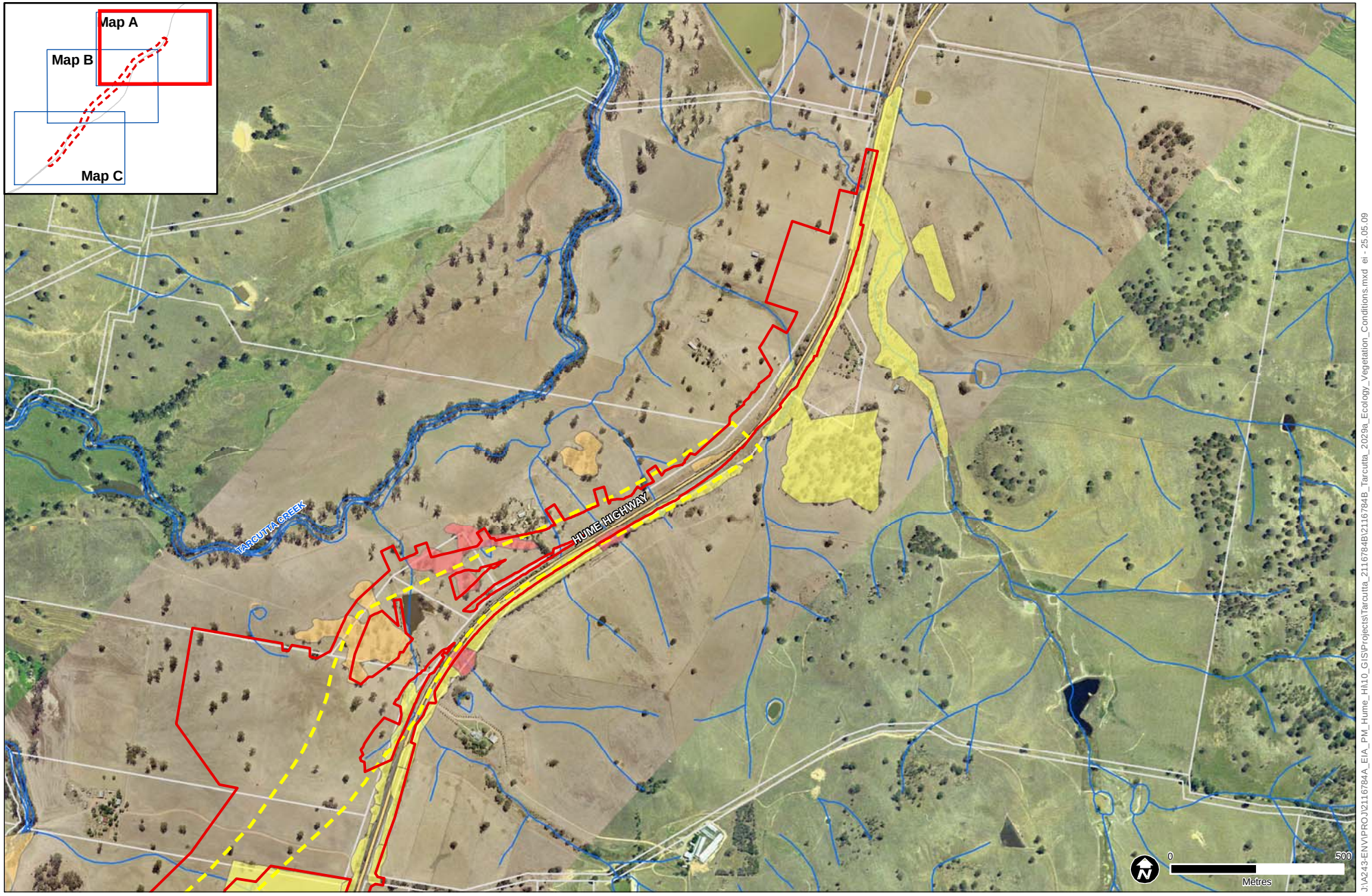

Figure 3-6 Vegetation condition - Tarcutta (A)

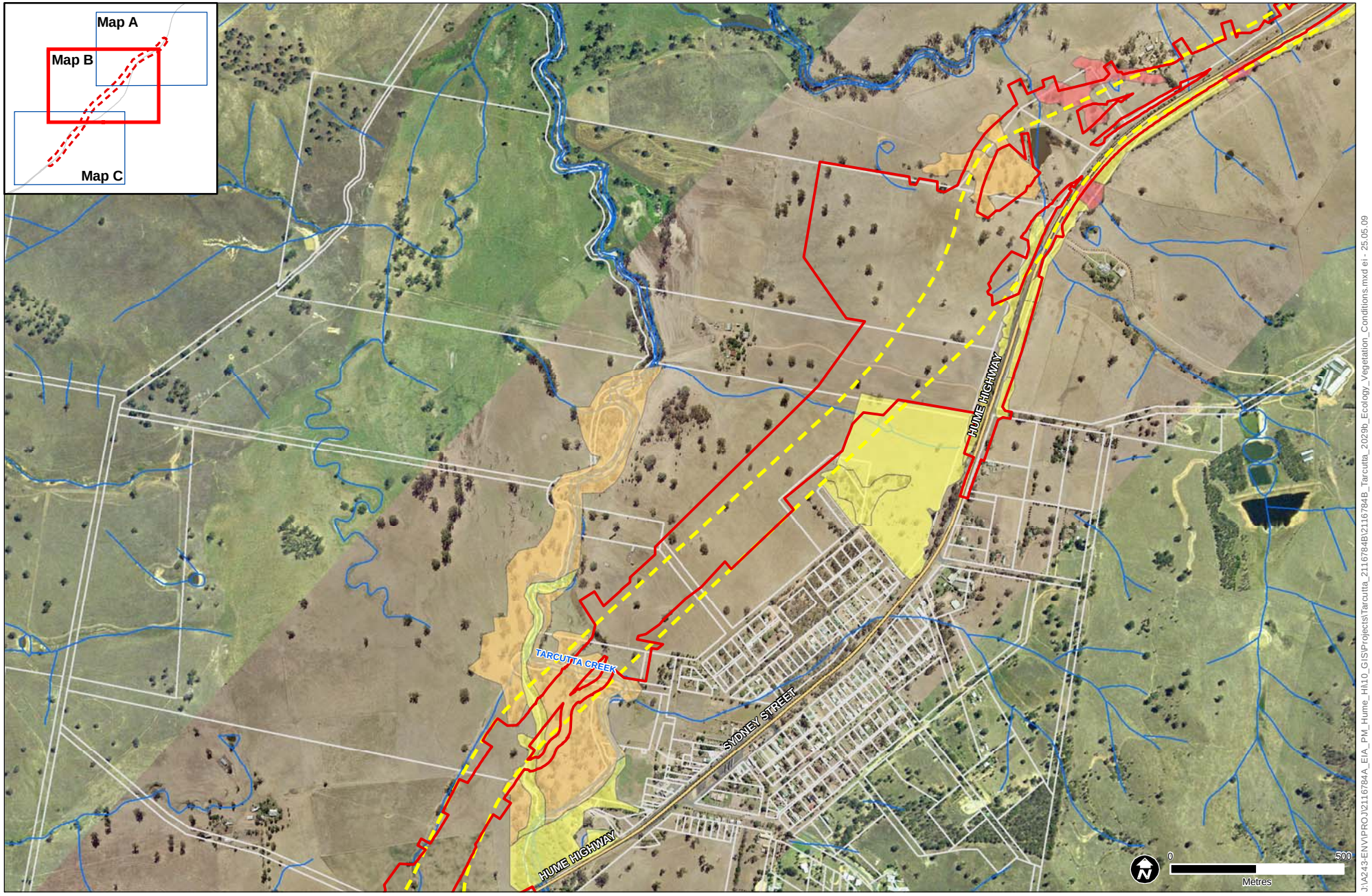

Figure 3-6 Vegetation condition - Tarcutta (B)

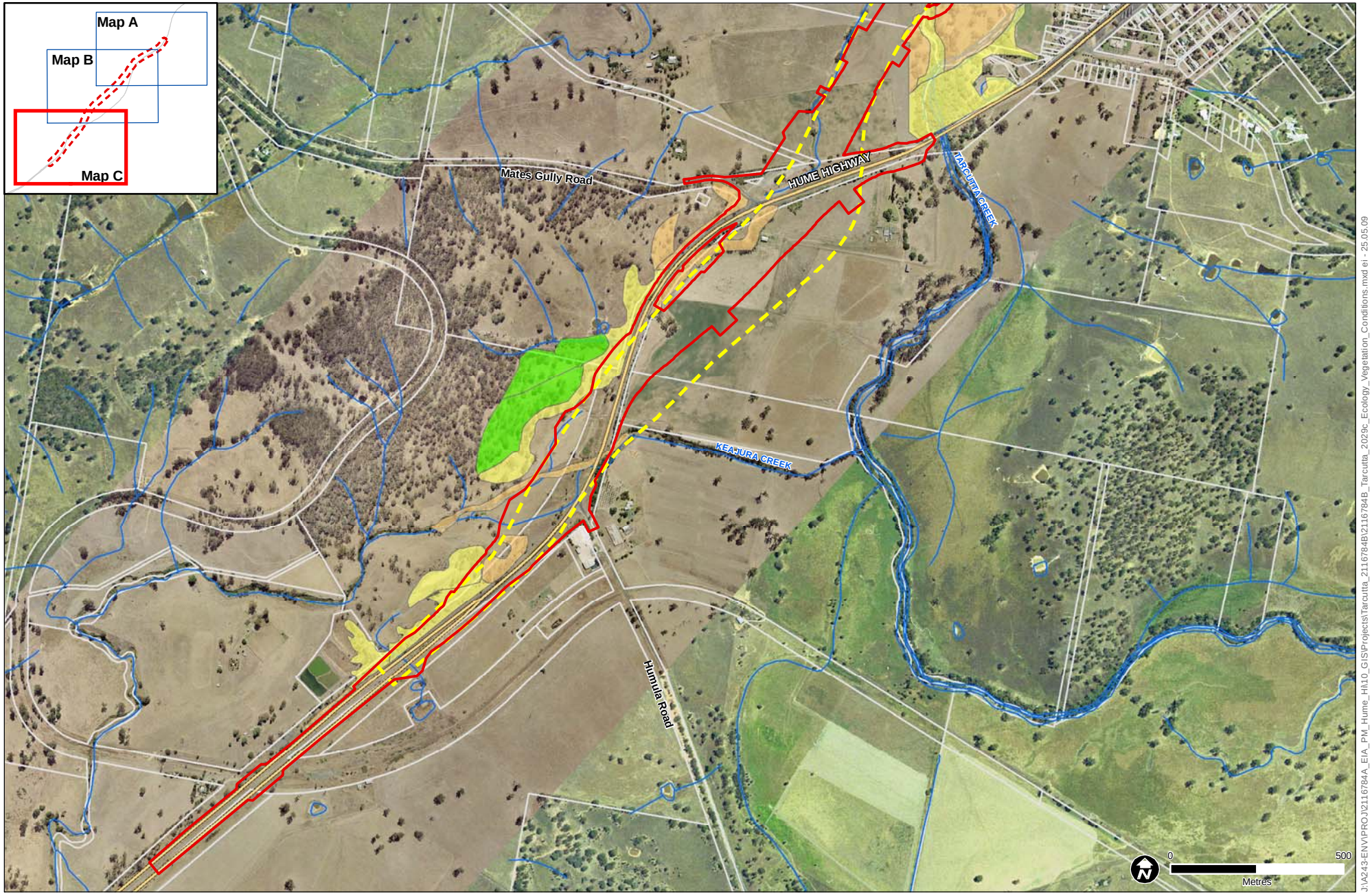

Figure 3-6 Vegetation condition - Tarcutta (C)