



# **Proposed Modification to the Werris Creek Coal Mine**

## **Flora Impact Assessment**

**Prepared by**

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**March, 2009**

**Specialist Consultant Studies Compendium:  
Part 4**



# Flora Impact Assessment

of the

## Proposed Modification to the Werris Creek Coal Mine

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## 1 INTRODUCTION

This flora assessment was carried out for R.W. Corkery & Co. Pty. Limited on behalf of Werris Creek Coal Pty Limited (WCC). The Werris Creek Coal Mine Site is located west of the Werris Creek - Quirindi Road, approximately 4km south of Werris Creek [Figure 1].

A modification to the layout of the open cut area of the mine, and associated overburden emplacement, has been proposed by WCC as the existing mine design creates a narrowing highwall face (from which the coal is mined) which would eventually reduce the production rate as the area of exposed coal is reduced. The modified open cut area layout provides for a continued widening of the advancing highwall, which maximises the area of exposed coal allowing for the current production rate to be maintained. The modified open cut area would also better accommodate a possible continuation of mining to the north (the Werris Creek Coal resource extends beyond the currently approved northern limit of the mine) should this be proposed and approved.

This report focuses upon the 22ha of land that is proposed to be disturbed as a result of the modified mining operation. Throughout this report, this area of land is referred to as the "subject site".

A field inspection of the subject site was carried out on 19<sup>th</sup> November, 2008.

This assessment has been completed to support a Statement of Environmental Effects being prepared to accompany the application for the proposed modification, sought under Section 96(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

## 2 DESCRIPTION OF THE SUBJECT SITE, STUDY AREA AND THE PROPOSAL

The subject site comprises a ridge area and its eastern and western slopes located adjacent to and to the north of the approved extent of the current Werris Creek Coal Mine. Some of the land has been cleared for cultivation and grazing but much of it retains a remnant woodland cover.

The area assessed in this study is somewhat greater in extent than the area of the subject site. The additional field survey work was undertaken to gain an overview of the current state and composition of the vegetation communities present on this section of the lands owned by WCC. As a consequence, the community descriptions contained in this report refer not only to the area for which an extension of mining is being sought but to the vegetation occurring on additional land to the north.

The proposed modification to the existing operations includes the following.

- Widening the advancing northern highwall of the open cut area to an alignment corresponding with the eastern extent of the sub-cropping G Seam. The modified open cut area would involve open cut mining through sections of the underground workings of the former Werris Creek Colliery, which are currently saturated with water.

- Dewatering the underground workings, with the extracted groundwater to be stored in four dams to the southwest of the open cut area.
- Extending the out-of-pit overburden emplacement which is located along the eastern perimeter of the approved open cut area to the north (adjoining the northerly extension of the open cut area created to accommodate the widening of the advancing northerly mining face).
- Constructing an additional train loading bin and conveyor at the rail load-out facility to facilitate the separation of product coal for specific markets and therefore increase the efficiency of train loading.

**Figure 2** displays the modified site layout.

### 3 PREVIOUS FLORA STUDY OF THE SITE

#### 3.1 Summary of the Original Flora Study

A flora study of 679 hectares of the area surrounding the present Werris Creek Coal Mine was undertaken in 2004 by Geoff Cunningham Natural Resource Consultants Pty Ltd [GCNRC, 2004] as part of the specialist studies required for the original Environmental Impact Statement for the mine. **Figure 3** records the vegetation communities recorded in 2004.

At that time, it was noted that much of the original study area had been cleared for farming and grazing with some remnant communities remaining although these were noted to be modified to some degree.

The flora study revealed that the ground cover on many sections of the Project Site was invaded by introduced weed and pasture species.

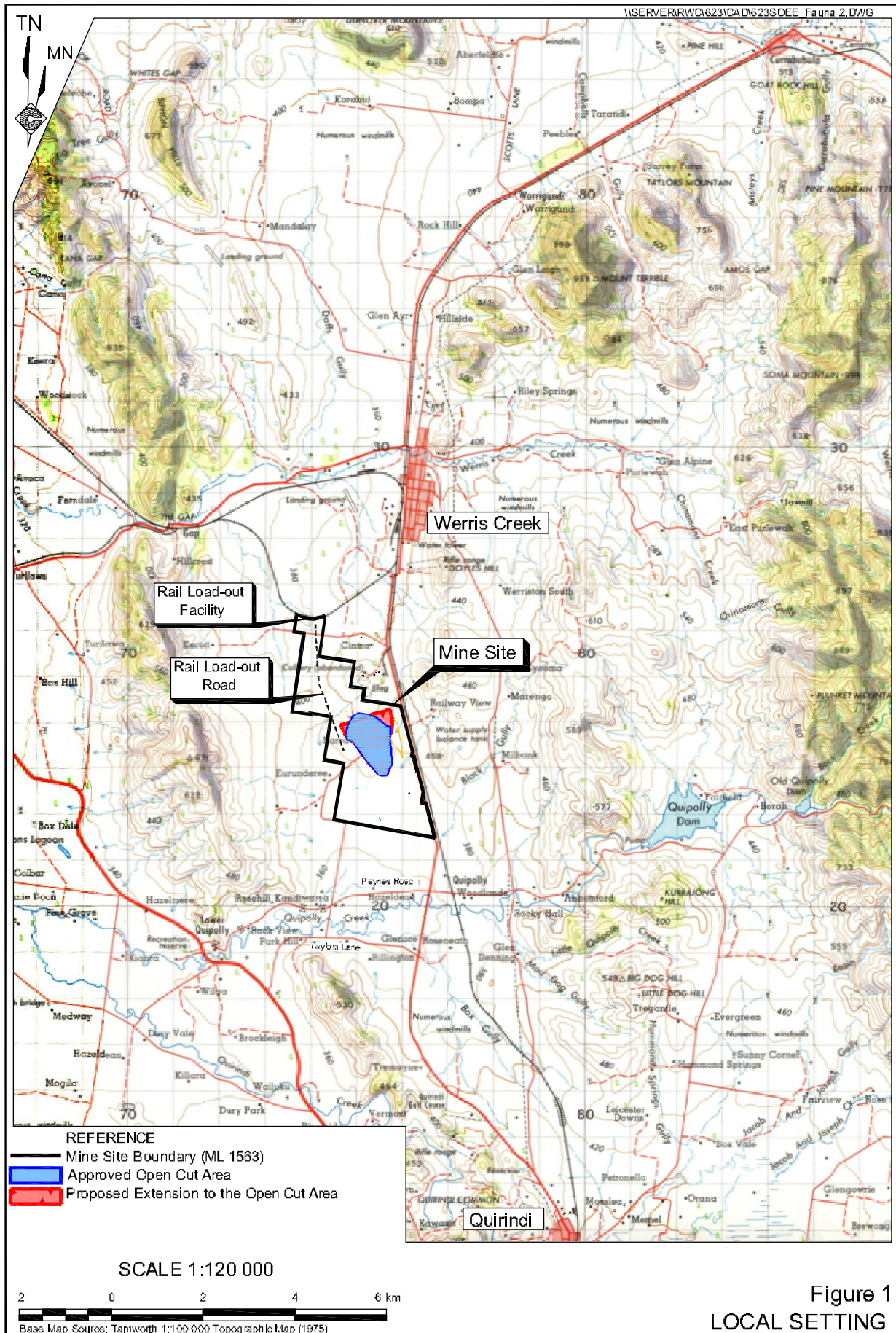
It was also noted that no threatened flora species, endangered flora populations or critical habitat have been recorded in the past or during the original study.

Remnants of two endangered ecological communities were found to occur within the study area. These were:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions; and
- White Box Yellow Box Blakely's Red Gum Woodland.

[Note that the White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community [NSW Threatened Species Conservation Act, 1997 [TSC Act]] equates with the White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands [Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 [EPBC Act]].

The 2004 mine proposal did not result in any clearing of the Brigalow Community and so there was no significant impact on this endangered ecological community.



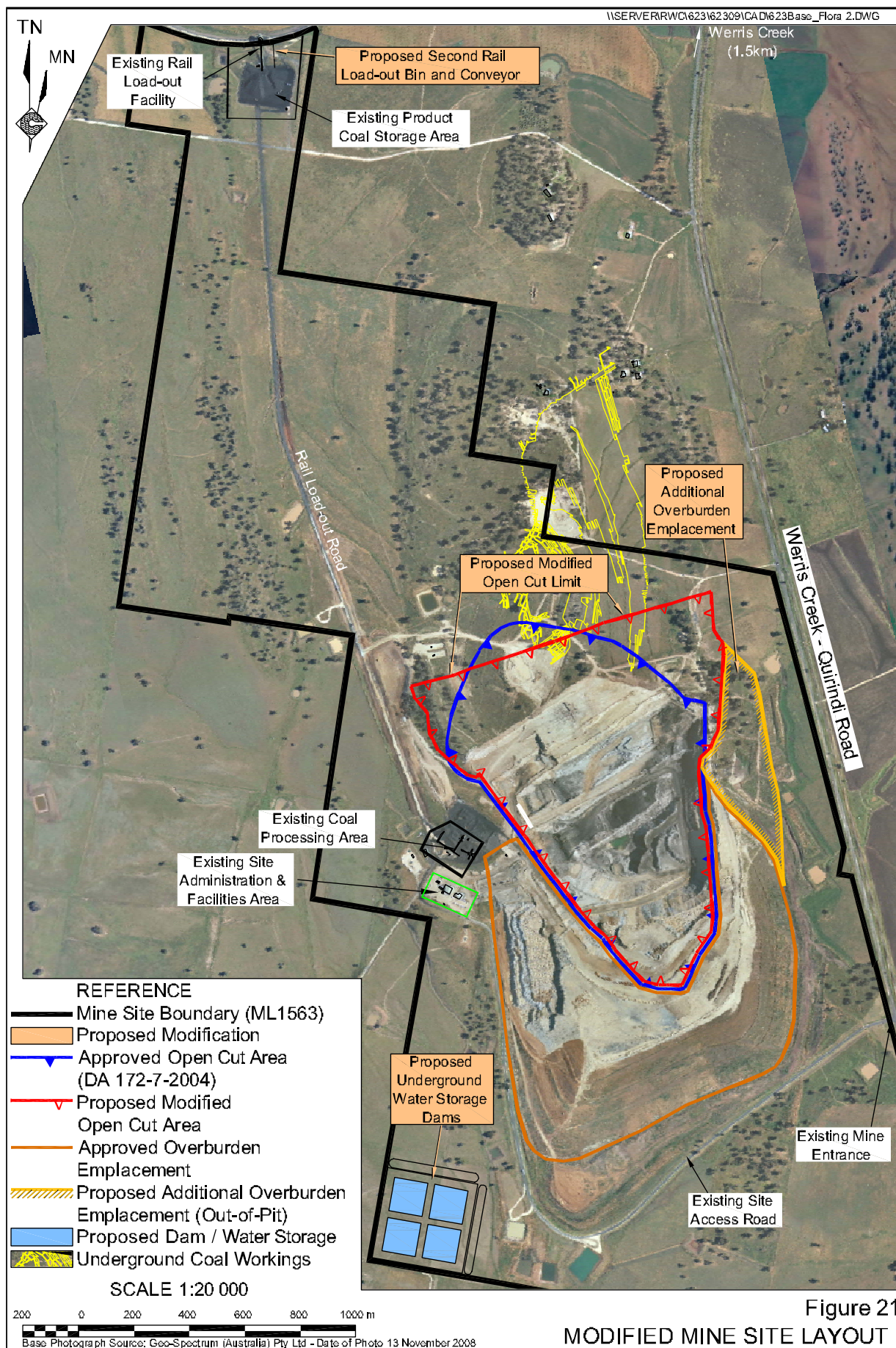


Figure 21  
MODIFIED MINE SITE LAYOUT

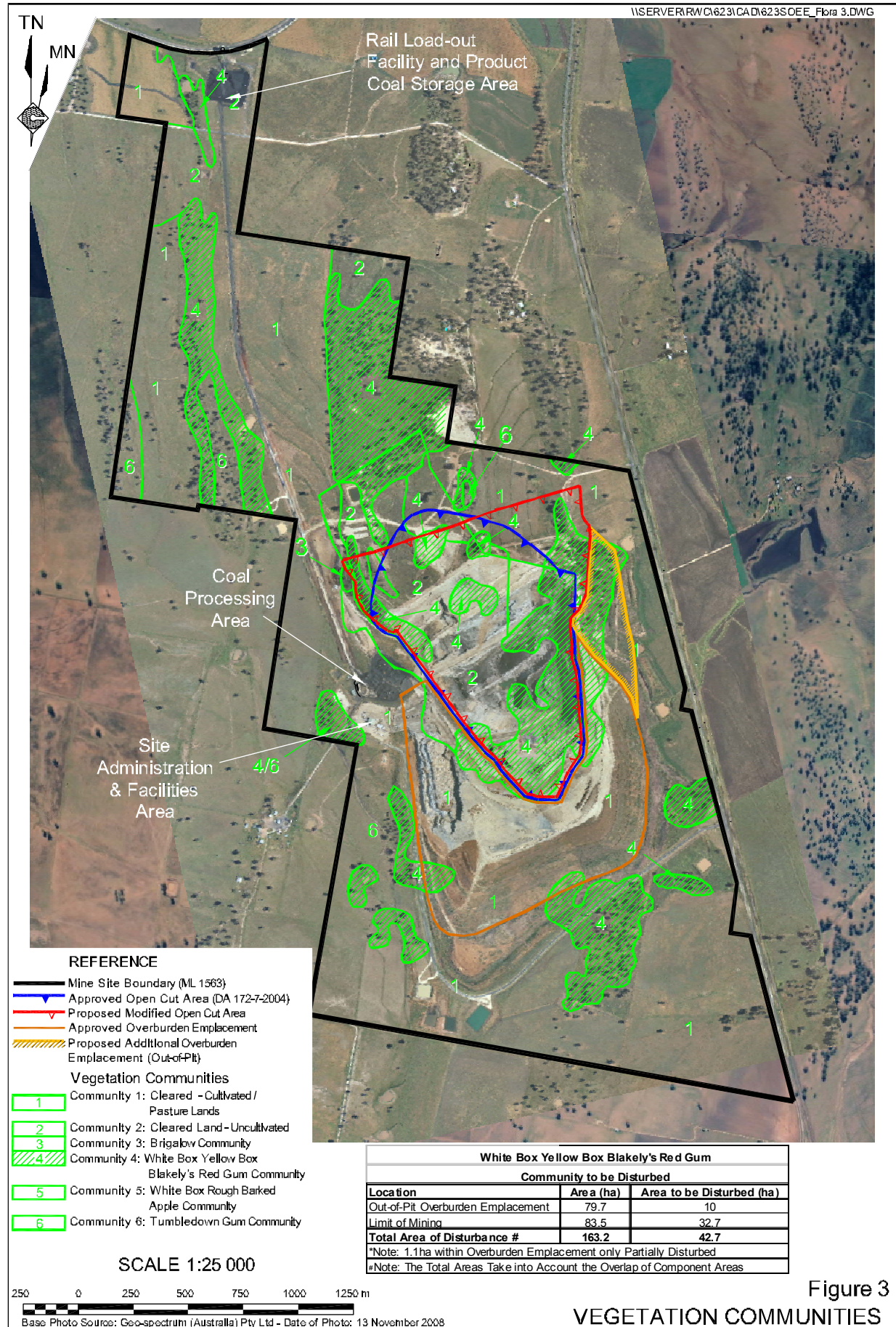


Figure 3

## VEGETATION COMMUNITIES

However, the mine development has resulted in the removal of 43 hectares of the White Box Yellow Box Blakely's Red Gum Community. A survey of the occurrences of this Endangered Ecological Community in a 9 400 hectare area in the vicinity of the study area, that was undertaken at the time of the original flora study, indicated that remnants of this community cover 1 800 hectares. In addition, there are large areas of this Community that occur beyond the boundaries of the survey area.

The removal of 43 hectares [or 2.4%] of this community within the local survey area was considered not to constitute a significant impact locally, regionally or nationally and so Species Impact Statement was not required under the TSC Act nor was a Referral under the EPBC Act required.

### 3.2 Details of the Flora Communities at the Werris Creek Coal Mine Site

The field study identified six vegetation communities within the study area. These are:

- **Community 1** - Cleared - Cultivated / Pasture Lands
- **Community 2** - Cleared Land - Uncultivated
- **Community 3** - *Acacia harpophylla* [Brigalow] Community
- **Community 4** - *Eucalyptus albens* [White Box] - *Eucalyptus melliodora* [Yellow Box] - *Eucalyptus blakelyi* [Blakely's Red Gum] Community
- **Community 5** - *Eucalyptus albens* [White Box] - *Angophora floribunda* [Rough-barked Apple] Community
- **Community 6** - *Eucalyptus dealbata* [Tumbledown Gum] Community

The descriptions of these communities are summarized in **Sections 3.2.1.to 3.2.6**

#### 3.2.1 Community 1 - Cleared - Cultivated / Pasture Lands

This community comprises cleared and cultivated land. Scattered individual *Eucalyptus albens* [White Box] and *Eucalyptus melliodora* [Yellow Box] trees remain. Shrubs are absent.

Ground cover is absent or dominated by crop stubbles, volunteer weeds, sown pasture species and native groundcover species. The main species recorded are *Aristida ramosa* [Purple Wiregrass], *Austrostipa* sp. [Speargrass], *Austrodanthonia* sp. [Wallaby Grasses], *Bromus molliformis*\* [Silky Brome], *Capsella bursa-pastoris*\* [Shepherd's Purse], *Dichanthium sericeum* [Queensland Bluegrass], *Echium plantagineum*\* [Paterson's Curse], *Lolium rigidum*\* [Annual Ryegrass], *Petrorhagia* sp.\* [Pinks], *Polygonum* sp.\* [Wireweed], *Trifolium subterraneum*\* [Subterranean Clover] and *Medicago sativa*\* [Lucerne].

#### 3.2.2 Community 2 - Cleared Land - Uncultivated

The main tree species are scattered *Eucalyptus albens* [White Box], *Eucalyptus melliodora* [Yellow Box], *Eucalyptus blakelyi* [Blakely's Red Gum] and *Brachychiton populneus* [Kurrajong].

*Maireana microphylla* [Eastern Cottonbush] is usually the only shrub present.

The main groundcover species recorded were *Aristida ramosa* [Purple Wiregrass], *Austrodanthonia* spp. [Wallaby Grasses], *Austrostipa* sp. [Speargrass], *Capsella bursa-pastoris*\* [Shepherd's Purse], *Carthamus lanatus*\* [Saffron Thistle], *Dichopogon* sp. [Chocoalate Lily], *Crassula sieberiana* [Australian Stonecrop], *Echium plantagineum*\* [Paterson's Curse], *Hordeum leporinum*\* [Barley Grass], *Eragrostis cilianensis*\* [Stinking Lovegrass], *Goodenia* sp. [Goodenia], *Lepidium africanum*\* [Peppercress], *Hypochaeris radicata*\* [Flatweed], *Lolium rigidum*\* [Annual Ryegrass], *Malva parviflora*\* [Small-flowered Mallow], *Rapistrum rugosum*\* [Turnip Weed], *Petrorhagia* sp.\* [Pink], *Rostraria cristata*\* [Annual Cat's-tail], *Rumex brownii* [Slender Dock], *Sonchus oleraceus*\* [Sowthistle] and *Trifolium arvense*\* [Haresfoot Clover],

### 3.2.3 Community 3 - *Acacia harpophylla* [Brigalow] Community

This community occurs as a single remnant near the western boundary of the Project Site. It comprises a clump of between 50 and 60 *Acacia harpophylla* [Brigalow] trees. Some *Callitris glaucochylla* [White Cypress Pine] trees were recorded around the exterior of the clump. The only shrub recorded was a single bush of *Maytenus cunninghamii* [Yellow-berry Bush].

Groundcover is relatively sparse. Species recorded include *Austrostipa verticillata* [Slender Bamboo Grass], *Einadia nutans* [Climbing Saltbush], *Aristida* spp. [Wiregrasses], *Eragrostis cilianensis*\* [Stinking Lovegrass] and *Schkuhria pinnata* var. *abrotanoides*\* [Dwarf Marigold].

### 3.2.4 Community 4 - *Eucalyptus albens* [White Box] - *Eucalyptus melliodora* [Yellow Box] - *Eucalyptus blakelyi* [Blakely's Red Gum] Community

The main tree species are *Eucalyptus albens* [White Box], *Eucalyptus melliodora* [Yellow Box], *Eucalyptus blakelyi* [Blakely's Red Gum] and *Brachychiton populneus* [Kurrajong].

Shrub cover is mainly provided by *Maireana microphylla* [Eastern Cottonbush] but some *Pittosporum angustifolium* [Butterbush], *Acacia decora* [Western Golden Wattle] and *Lycium ferocissimum*\* [African Boxthorn] are present.

The main groundcover species include *Aristida ramosa* [Purple Wiregrass], *Austrostipa* sp. [Speargrass], *Austrostipa verticillata* [Slender Bamboo Grass], *Lolium rigidum*\* [Annual Ryegrass], *Anagallis arvensis*\* [Scarlet Pimpernell], *Bothriochloa macra* [Red Grass], *Bromus molliformis*\* [Silky Brome], *Carthamus lanatus*\* [Saffron Thistle], *Chondrilla juncea*\* [Skeleton Weed], *Dichanthium sericeum* [Queensland Bluegrass], *Dichondra repens* [Kidney Weed], *Goodenia* sp. [Goodenia], *Hedypnois rhagadioloides* ssp. *cretica*\* [Cretan Weed], *Oxalis* sp. [Yellow Wood Sorrel], *Petrorhagia* sp.\* [Pink], *Rostraria cristata*\* [Annual Cat's-tail], *Rumex brownii* [Slender Dock], *Salvia verbenaca*\* [Wid Sage], *Trifolium campestre*\* [Hop Clover], *Trifolium glomeratum*\* [Cluster Clover] and *Wahlenbergia* sp. [Bluebell]

### 3.2.5 Community 5 - *Eucalyptus albens* [White Box] - *Angophora floribunda* [Rough-barked Apple] Community

The main tree species are *Eucalyptus albens* [White Box], *Eucalyptus blakelyi* [Blakely's Red Gum], *Brachychiton populneus* [Kurrajong], *Alectryon oleifolius* [Rosewood], *Angophora floribunda* [Rough-barked Apple] and *Callitris glaucophylla* [White Cypress Pine].

Shrubs are scattered and include *Acacia implexa*? [Hickory], *Notelaea microcarpa* var. *microcarpa* [Native Olive], *Maytenus cunninghamii* [Yellow-berry Bush], *Maireana microcarpa* [Eastern Cottonbush], *Bursaria spinosa* [Native Blackthorn] and *Olearia elliptica* [Sticky Daisy Bush].

The main groundcover species include *Austrostipa verticillata* [Slender Bamboo Grass], *Cheilanthes sieberi* [Rock Fern], *Silybum marianum*\* [Variegated Thistle], *Austrodanthonia* spp. [Wallaby Grasses], *Dianella revoluta* [Spreading Flax-lily], *Einadia nutans* [Climbing Saltbush], *Urtica incisa* [Scrub Nettle], *Aristida* sp. [Wiregrass], *Austrostipa* sp. [Speargrass], *Bromus catharticus*\* [Prairie Grass], *Carthamus lanatus*\* [Safron Thistle], *Trifolium glomeratum*\* [Cluster Clover], *Erodium crinitum* [Blue Crowfoot], *Lamarckia aurea*\* [Goldentop] and *Trifolium arvense*\* [Haresfoot Clover].

### 3.2.6 Community 6 - *Eucalyptus dealbata* [Tumbledown Gum] Community

The main tree species in this ridgetop community is *Eucalyptus dealbata* [Tumbledown Gum] with what appear to be hybrids between this species and *Eucalyptus blakelyi* [Blakely's Red Gum] also present. Saplings and seedlings of Tumbledown Gum are present in some areas. This community usually has a *Eucalyptus albens* [White Box] community - sometimes with *Eucalyptus melliodora* [Yellow Box], *Angophora floribunda* [Rough-barked Apple] and *Brachychiton populneus* [Kurrajong] - below it in the landscape.

Shrubs are uncommon and include *Maytenus cunninghamii* [Yellow-berry Bush] and *Notelaea microcarpa* var. *microcarpa* [Native Olive],

Recorded groundcover species include *Austrodanthonia* spp. [Wallaby Grasses], *Bothriochloa macra* [Red Grass], *Austrostipa* sp. [Speargrass], *Dichanthium sericeum* [Queensland Bluegrass], *Vittadinia* spp. [Fuzzweeds], *Calotis lappulacea* [Yellow Burr-daisy], *Chloris ventricosa* [Tall Chloris], *Portulaca oleracea* [Munyeroo], *Austrostipa aristiglumis* [Plains Grass] and *Aristida* sp. [Wiregrass].

## 4 THE PRESENT STUDY

As previously noted, the study area is larger than the area that is included in the subject site being considered by WCC.

### 4.1 Plant Community Data Collection

The study area was subjected to stereoscopic airphoto interpretation prior to field survey and a series of quadrat sites were selected for field investigation. At each site (see **Figure 4**), a 20m x 20m quadrat was examined and the species present were recorded.

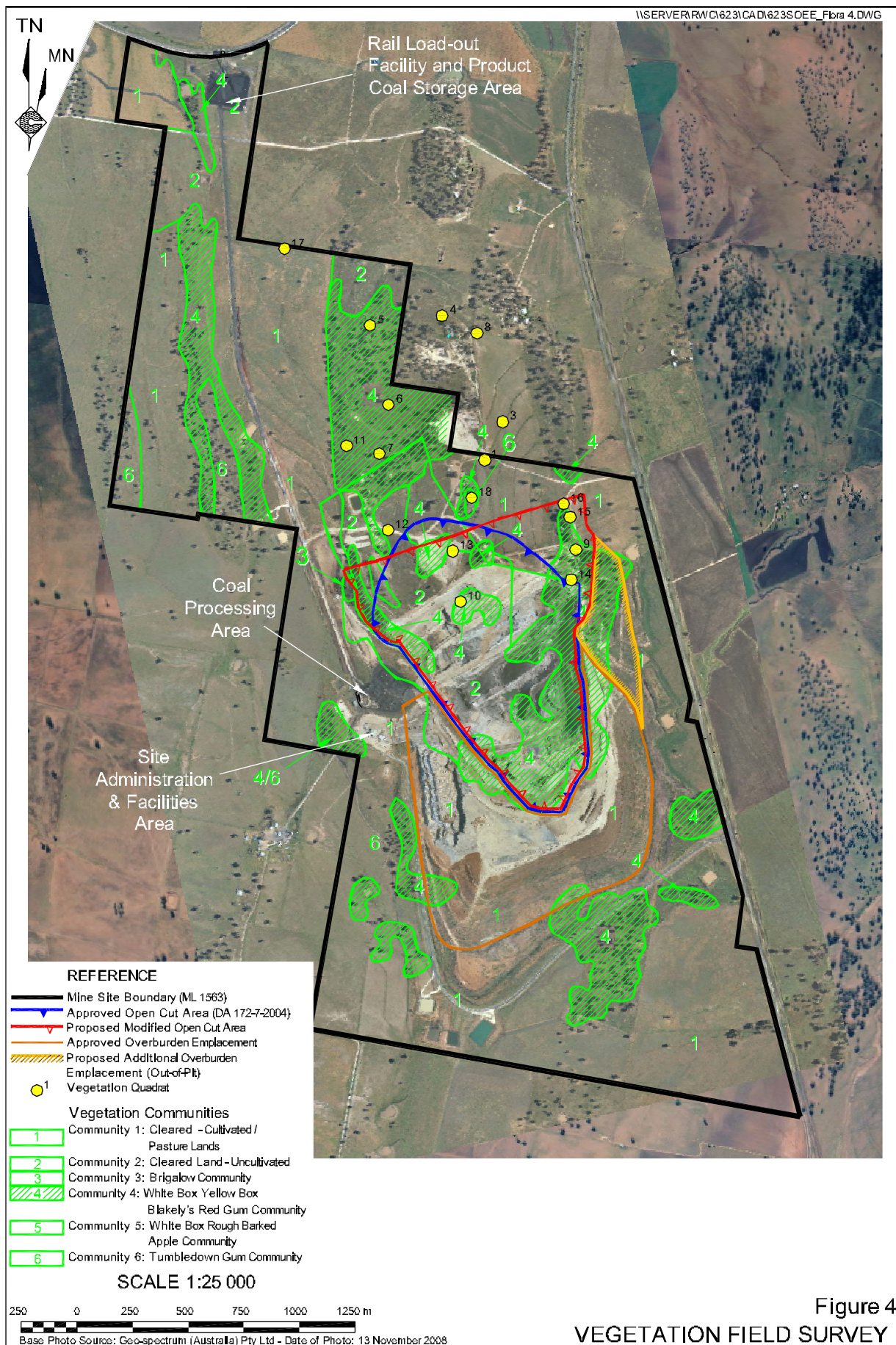
The tree and shrub species recorded at each record site are listed in **Table 1** while the ground layer species are shown in **Tables 2a and 2b**.

**Table 1**  
**Tree and Shrub Species Occurring at the Individual Quadrat Sites**

**[AMG Coordinates]**

**T and S symbols followed by a number indicate the average spacing of Trees and Shrubs at individual record sites**

QUADRAT	EASTING	NORTHING	TREES / SHRUBS PRESENT
1	275338E	6524460N	<b>Trees and Shrubs:</b> absent
2	275338E	6524460n	<b>Trees:</b> <i>Eucalyptus albens</i> [White Box] trees and seedlings, <i>Brachychiton populneus</i> [Kurrajong] <b>Shrubs:</b> <i>Maireana microphylla</i> [Eastern Cottonbush]
3	275418E	6524632N	<b>Trees and Shrubs:</b> absent
4	275145E	6525109N	<b>Trees:</b> T10-20 White Box <b>Shrubs:</b> absent
5	274821E	6525067N	<b>Trees:</b> T10-20 White Box , some <i>Alectryon oleifolium</i> [Rosewood] <b>Shrubs:</b> scattered Eastern Cottonbush
6	274903E	6524710N	<b>Trees:</b> scattered White Box <b>Shrubs:</b> absent
7	274863E	6524488N	<b>Trees:</b> T 10-20 White Box <b>Shrubs:</b> S2-3 Eastern Cottonbush
8	275303E	6525032N	<b>Trees:</b> T2-40 White Box <b>Shrubs:</b> S1-4 Eastern Cottonbush
9	275748E	6524057N	<b>Trees:</b> <i>Eucalyptus melliodora</i> [Yellow Box], <i>Eucalyptus blakelyi</i> [Blakely's Red Gum] <b>Shrubs:</b> Eastern Cottonbush
10	275229E	6523823N	<b>Trees:</b> T20 White Box <b>Shrubs:</b> scattered Eastern Cottonbush
11	274716E	6524524N	<b>Trees:</b> T5-30 White Box, Rosewood, Kurrajong <b>Shrubs:</b> <i>Acacia decora</i> [Western Golden Wattle]
12	274902E	6524145N	<b>Trees and Shrubs:</b> absent
13	275193E	6524050N	<b>Trees in paddock to north:</b> scattered Blakely's Red Gum and White Box
14	275727E	6523921N	<b>Trees:</b> T<5-50 White Box, Yellow Box, some saplings to 2m high <b>Shrubs:</b> absent
15	275722E	6524203N	<b>Trees and Shrubs:</b> absent
16	275693E	6524262N	<b>Trees:</b> T1-15 Yellow Box [large trees], <b>Shrubs:</b> Eastern Cottonbush
17	274437E	6525412N	<b>Trees and Shrubs:</b> absent
18	275279E	6524290N	<b>Trees:</b> T<1-20 White Box [some], Tumbledown Gum; many seedlings and saplings <b>Shrubs:</b> absent



**Table 2a**  
**Ground Cover Species Recorded In Quadrats 1 to 9**

Page 1 of 3

SPECIES	QUADRAT								
	1	2	3	4	5	6	7	8	9
<i>Alternanthera repens</i> * [Khaki Weed]	-	-	-	-	-	-	P	-	-
<i>Amaranthus mitchellii</i> [Boggabri]	-	-	-	-	-	-	-	-	P
<i>Arctotheca calendula</i> * [Capeweed]	-	-	-	-	-	-	-	-	-
<i>Aristida ramosa</i> [Purple Wire Grass]	P	P	-	-	-	P	-	-	P
<i>Aristida</i> sp. [Wiregrass]	-	-	-	-	P	-	-	P	-
<i>Atriplex spinibractea</i> [Spiny-fruit Saltbush]	-	-	-	-	-	-	-	P	-
<i>Austrodanthonia richardsonii</i> [Wallaby Grass]	-	P	-	-	-	-	p	P	-
<i>Austrodanthonia</i> sp. [Wallaby Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa</i> sp. [Speargrass]	-	P	-	-	P	-	-	P	P
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	-	P	-	P	P	P	P	P	P
<i>Avena</i> sp.* [Wild Oats]	-	-	P	-	-	P	-	-	-
<i>Bidens subalternans</i> * [Greater Beggar's Ticks]	-	-	-	-	-	-	-	-	P
<i>Boerhavia dominii</i> [Tah Vine]	-	-	-	-	-	-	-	-	P
<i>Bothriochloa macra</i> [Red Grass]	P	P	P	-	-	-	-	-	P
<i>Bromus catharticus</i> * [Prairie Grass]	-	-	-	-	-	-	-	P	-
<i>Bromus molliformis</i> * [Silky Brome]	-	-	-	P	-	P	P	-	-
<i>Bulbine bulbosa</i> [Native Leek]	-	-	-	-	-	-	-	-	-
<i>Calotis lappulacea</i> [Yellow Burr-daisy]	P	P	-	-	P	-	-	P	P
<i>Capsella bursa-pastoris</i> * [Shepherd's Purse]	-	-	-	-	-	-	-	-	-
<i>Carthamus lanatus</i> * [Saffron Thistle]	P	P	P	-	-	-	-	-	P
<i>Cenchrus incertus</i> * [Spiny Burrgrass]	P	-	-	-	-	-	-	-	-
<i>Centaurea solstitialis</i> * [St. Barnaby's Thistle]	P	-	P	-	-	-	-	-	P
<i>Chamaesyce drummondii</i> [Caustic Weed]	-	P	P	-	-	-	-	P	P
<i>Cheilanthes sieberi</i> [Rock Fern]	-	P	-	-	-	-	-	-	-
<i>Chenopodium</i> sp. [Crumbweed]	-	-	-	-	-	-	-	-	P
<i>Chloris truncata</i> [Windmill Grass]	P	-	-	-	-	-	-	P	-
<i>Chloris ventricosa</i> [Tall Chloris]	-	P	-	-	-	-	-	-	P
<i>Chondrilla juncea</i> * [Skeleton Weed]	P	-	-	P	-	-	P	-	-
<i>Cirsium vulgare</i> * [Spear Thistle]	-	P	-	-	-	-	-	-	-
<i>Convolvulus erubescens</i> [Australian Bindweed]	-	P	-	-	P	-	-	-	P
<i>Conyza bonariense</i> * [Flaxleaf Fleabane]	P	P	-	-	-	-	-	P	P
<i>Crassula sieberiana</i> [Australian Stonecrop]	-	-	-	-	-	-	-	-	-
<i>Cynodon dactylon</i> * [Couch Grass]	P	-	-	-	-	-	-	P	-
<i>Desmodium varians</i> [Slender Tick-trefoil]	-	-	-	-	-	-	-	-	-
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	P	-	-	-	-	-	-	-	-
<i>Dichelachne</i> sp. [Plume Grass]	-	-	-	P	-	-	-	-	-
<i>Dichondra repens</i> [Kidney Weed]	-	-	-	-	P	-	P	P	P
<i>Dichopogon</i> sp. [Chocolate Lily]	-	-	-	-	-	-	-	-	-
<i>Digitaria brownii</i> [Cotton Panic]	-	P	-	-	-	-	-	-	-
<i>Digitaria divaricatissima</i> [Umbrella Grass]	P	P	-	-	-	-	-	-	P
<i>Dittrichia graveolens</i> * [Stinkwort]	P	-	-	-	-	-	-	-	-
<i>Echinochloa colonum</i> * [Barnyard Grass]	P	-	-	-	-	-	-	-	-
<i>Echium plantagineum</i> [Paterson's Curse]	-	-	P	P	-	-	P	-	-
<i>Einadia hastata</i> [Saloop]	-	-	-	-	P	-	-	-	-
<i>Einadia nutans</i> [Climbing Saltbush]	-	-	-	-	-	-	-	P	P
<i>Elymus scaber</i> [Common Wheatgrass]	-	-	-	P	P	P	-	-	-
<i>Enneapogon gracilis</i> [Slender Bottlewashers]	P	-	-	-	-	-	-	-	-
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	-	-	-	-	-	-	-	P	-
<i>Eragrostis cilianensis</i> * [Stinking Lovegrass]	P	-	-	-	-	-	-	-	P
<i>Eragrostis molybdea</i> [Granite Lovegrass]	-	-	-	-	-	-	-	-	-
<i>Erodium crinitum</i> [Blue Crowfoot]	-	-	-	-	-	-	-	-	-
<i>Foeniculum vulgare</i> * [Fennel]	-	-	-	-	-	-	-	-	-

**Table 2a (Cont)**  
**Ground Cover Species Recorded In Quadrats 1 to 9**

Page 2 of 3

SPECIES	QUADRAT								
	1	2	3	4	5	6	7	8	9
<i>Geranium</i> sp. [Storksbill]	-	-	-	-	-	-	-	-	P
<i>Glycine stenophylla</i>	-	P	-	P	P	-	-	-	P
<i>Gomphocarpus fruticosus</i> * [Swan Plant]	-	-	-	-	-	-	P	-	-
<i>Goodenia</i> sp.	-	-	-	-	-	-	-	-	-
<i>Hedypnois rhagadioloides</i> subsp. <i>cretica</i> * [Cretan Weed]	-	-	-	-	-	-	-	-	-
<i>Hordeum leporinum</i> * [Barley Grass]	-	-	-	-	-	-	P	P	-
<i>Hypericum perforatum</i> * [St John's Wort]	-	-	-	-	-	-	P	-	-
<i>Hypochaeris radicata</i> * [Flatweed]	P	-	P	-	-	-	-	-	-
<i>Lactuca serriola</i> * [Prickly Lettuce]	-	-	-	-	-	P	-	-	P
<i>Lepidium africanum</i> * [Peppercress]	-	-	-	P	P	-	P	P	P
<i>Linum marginale</i> [Native Flax]	-	P	-	-	-	-	-	-	-
<i>Lolium rigidum</i> [Annual Ryegrass]	-	-	P	-	P	-	P	-	-
<i>Lomandra</i> sp. [Matrush]	-	P	-	-	-	-	-	-	-
<i>Malva parviflora</i> * [Small-flowered Mallow]	-	-	-	-	-	-	-	P	-
<i>Marrubium vulgare</i> * [Horehound]	-	-	-	-	-	-	P	P	P
<i>Medicago sativa</i> * [Lucerne]	-	-	-	-	-	-	-	-	P
<i>Medicago scutellata</i> * [Snail Medic]	-	-	-	-	-	-	-	-	-
<i>Medicago truncatula</i> * [Barrrel Medic]	-	-	-	-	-	-	-	-	-
<i>Oxalis</i> sp.* [Wood Sorrel]	-	-	-	P	-	-	-	P	-
<i>Paspalum dilatatum</i> * [Paspalum]	P	-	P	-	-	-	-	-	-
Perennial Grass	-	P	-	-	-	-	-	-	P
<i>Paspalidium constrictum</i> [Box Grass]	-	-	-	-	P	-	-	-	-
<i>Petrorhagia nanteuillii</i> * [Proliferous Pink]	-	-	-	P	-	P	P	-	-
<i>Physalis</i> sp.* [Ground Cherry]	-	-	-	-	-	-	-	-	-
<i>Plantago lanceolata</i> * [Ribwort]	-	-	P	-	-	-	-	-	P
<i>Polygonum</i> sp. [Wireweed]	-	-	-	-	-	-	P	-	-
<i>Portulaca oleracea</i> [Munyeroo]	-	-	-	-	-	-	-	P	-
<i>Rapistrum rugosum</i> * [Wild Turnip]	-	-	-	-	-	-	P	-	-
<i>Rostraria cristata</i> * [Annual Cat's Tail]	-	-	-	-	-	-	-	-	-
<i>Rumex brownii</i> [Slender Dock]	-	-	-	P	P	-	P	P	-
<i>Salvia verbenaca</i> [Wild Sage]	-	P	-	-	-	-	-	P	-
<i>Schkuhria pinnata</i> var. <i>abrotanoides</i> * [Dwarf Marigold]	P	-	-	-	-	-	-	-	-
<i>Scirous</i> sp. [Club-rush]	-	-	-	-	-	-	P	-	P
<i>Sida rhombifolia</i> * [Paddys Lucerne]	-	-	P	-	P	-	P	-	-
<i>Sida spicata</i>	-	P	-	-	-	-	-	-	-
<i>Sida spinosa</i>	P	-	-	-	-	-	-	-	-
<i>Silybum marianum</i> * [Variegated Thistle]	-	-	-	-	-	-	P	P	-
<i>Sisymbrium</i> sp.* [Wild Mustard]	-	-	-	-	-	-	P	-	-
<i>Solanum cieri</i> [Narrawa Burr]	-	-	-	-	-	-	-	-	-
<i>Solanum nigrum</i> * [Black Nightshade]	-	-	-	-	-	-	-	-	P
<i>Sonchus oleraceus</i> * [Common Sowthistle]	-	-	P	-	-	-	-	-	-
<i>Sporobolus elongatus</i> [Western Ratstail Grass]	P	P	-	-	-	-	-	P	P
<i>Tribulus terrestris</i> [Cathead]	-	-	-	-	-	-	-	-	-
<i>Trifolium angustifolium</i> * [Narrow-leaf Clover]	-	-	P	-	-	-	-	-	-
<i>Trifolium arvense</i> * [Haresfoot Clover]	-	-	-	P	-	P	-	-	-
<i>Trifolium dubium</i> * [Yellow Suckling Clover]	-	-	P	-	-	-	-	-	-
<i>Trifolium glomeratum</i> [Cluster Clover]	-	-	P	-	-	-	-	-	-
<i>Urtica incisa</i> [Scrub Nettle]	-	-	-	-	-	-	-	-	-
<i>Verbena bonariensis</i> * [Wild Statice]	-	-	-	-	-	-	-	-	P
<i>Verbena</i> sp.* [Verbena]	-	-	-	-	-	-	P	-	-

Table 2a 1 to 9 (Cont)  
Ground Cover Species Recorded In Quadrats

Page 3 of 3

SPECIES	QUADRAT								
	1	2	3	4	5	6	7	8	9
<i>Vittadinia cecicularis</i> var. <i>cervicularis</i> [New Holland Daisy]	-	-	-	-	-	-	-	-	-
<i>Vittadinia muelleri</i> [New Holland Daisy]	-	-	-	-	-	-	-	-	-
<i>Vittadinia</i> sp. [New Holland Daisy]	-	-	-	-	-	-	-	P	-
<i>Vittadinia sulcata</i> [Fuzzweed]	-	-	-	-	-	-	-	-	P
<i>Wahlenbergia communis</i> [Tufted Bluebell]	-	-	P	-	-	-	-	P	P
<i>Xanthium spinosum</i> * [Bathurst Burr]	-	-	-	-	-	-	-	-	P

Table 2b  
Ground Cover Species Recorded In Quadrats

Page 1 of 3

SPECIES	QUADRAT								
	10	11	12	13	14	15	16	17	18
<i>Alternanthera repens</i> * [Khaki Weed]	-	-	-	-	-	-	-	-	-
<i>Amaranthus mitchellii</i> [Boggabri]	-	-	-	-	-	-	-	-	-
<i>Anagallis arvensis</i> * [Scarlet Pimpernell]	-	P	P	-	-	P	P	-	P
<i>Arctotheca calendula</i> * [Capeweed]	-	-	P	-	P	P	-	-	-
<i>Aristida ramosa</i> [Purple Wire Grass]	-	-	P	-	-	-	-	P	P
<i>Aristida</i> sp. [Wiregrass]	-	-	-	-	-	-	-	-	-
<i>Atriplex spinibractea</i> [Spiny-fruit Saltbush]	-	-	-	-	-	P	-	-	-
<i>Austrodanthonia duttoniana</i> [Wallab Grass]	-	-	-	-	-	-	-	P	-
<i>Austrodanthonia richardsonii</i> [Wallaby Grass]	-	-	-	-	-	-	-	-	-
<i>Austrodanthonia</i> sp. [Wallaby Grass]	-	P	P	-	-	-	-	-	-
<i>Austrostipa aristiglumis</i> . [Plains Grass]	-	-	P	-	-	-	-	-	-
<i>Austrostipa</i> sp. [Speargrass]	P	-	-	-	P	-	P	-	-
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	P	-	-	-	P	-	P	-	-
<i>Avena sativa</i> * [Oats]	-	-	-	-	-	P	-	-	-
<i>Avena</i> sp.* [Wild Oats]	-	P	-	-	-	-	P	-	-
<i>Bidens subalternans</i> * [Greater Beggar's Ticks]	-	-	-	-	-	-	-	-	-
<i>Boerhavia dominii</i> [Tah Vine]	-	-	-	-	-	-	-	-	-
<i>Bothriochloa macra</i> [Red Grass]	-	-	-	-	-	-	-	P	P
<i>Bromus catharticus</i> * [Prairie Grass]	P	-	-	-	-	-	P	-	-
<i>Bromus molliformis</i> * [Silky Brome]	P	-	P	P	P	-	-	-	-
<i>Bulbine bulbosa</i> [Native Leek]	-	P	-	-	-	-	-	-	-
<i>Calotis lappulacea</i> [Yellow Burr-daisy]	P	-	-	-	-	-	-	-	P
<i>Capsella bursa-pastoris</i> * [Shepherd's Purse]	P	-	P	P	-	-	-	-	-
<i>Carthamus lanatus</i> * [Saffron Thistle]	P	P	P	P	P	-	-	-	P
<i>Cenchrus incertus</i> * [Spiny Burrgrass]	-	-	-	-	-	-	-	-	-
<i>Centaurea solstitialis</i> * [St. Barnaby's Thistle]	-	-	-	-	-	-	-	-	P
<i>Chamaesyce drummondii</i> [Caustic Weed]	-	-	P	-	-	-	-	-	-
<i>Cheilanthes sieberi</i> [Rock Fern]	-	-	-	-	-	-	-	-	-
<i>Chenopodium</i> sp. [Crumbweed].	-	-	-	-	-	-	-	-	-
<i>Chloris truncata</i> [Windmill Grass]	-	-	-	-	-	-	-	P	P
<i>Chloris ventricosa</i> [Tall Chloris]	-	-	-	-	-	-	-	-	P
<i>Chondrilla juncea</i> * [Skeleton Weed]	-	P	-	-	-	P	-	-	-
<i>Cirsium vulgare</i> * [Spear Thistle]	-	-	-	-	-	-	-	-	-
<i>Convolvulus erubescens</i> [Australian Bindweed]	-	P	-	-	-	-	-	-	-
<i>Conyza bonariense</i> * [Flaxleaf Fleabane]	-	-	-	-	-	-	-	-	P
<i>Crassula sieberiana</i> [Australian Stonecrop]	P	-	P	-	P	-	-	-	-
<i>Cynodon dactylon</i> * [Couch Grass]	p	-	-	-	-	-	-	-	-
<i>Desmodium varians</i> [Slender Tick-trefoil]	-	-	P	-	-	-	-	-	-

Table 2b (Cont)  
Ground Cover Species Recorded In Quadrats

Page 2 of 3

SPECIES	QUADRAT								
	10	11	12	13	14	15	16	17	18
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	-	-	-	-	-	-	-	-	P
<i>Dichelachne</i> sp. [Plume Grass]	-	-	-	-	-	-	-	-	-
<i>Dichondra repens</i> [Kidney Weed]	-	P	-	-	P	-	P	-	-
<i>Dichopogon</i> sp. [Chocolate Lily]	-	P	P	-	-	-	-	-	-
<i>Digitaria brownii</i> [Cotton Panic]	-	-	-	-	-	-	-	-	-
<i>Digitaria divaricatissima</i> [Umbrella Grass]	-	-	-	-	-	-	-	-	P
<i>Dittrichia graveolens</i> * [Stinkwort]	-	-	-	-	-	-	-	-	-
<i>Echinochloa colonum</i> * [Barnyard Grass]	-	-	-	-	-	-	-	-	-
<i>Echium plantagineum</i> [Paterson's Curse]	P	P	P	P	P	-	P	-	-
<i>Einadia hastata</i> [Saloop]	-	-	-	-	-	-	-	-	-
<i>Einadia nutans</i> [Climbing Saltbush]	-	-	-	-	P	P	-	-	-
<i>Elymus scaber</i> [Common Wheatgrass]	-	-	-	-	-	-	-	-	-
<i>Enneapogon gracilis</i> [Slender Bottlewashers]	-	-	-	-	-	-	-	-	P
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	-	-	-	-	-	-	-	-	-
<i>Eragrostis cilianensis</i> * [Stinking Lovegrass]	-	-	-	-	-	-	-	-	-
<i>Eragrostis molybdea</i> [Granite Lovegrass]	-	P	P	-	-	-	-	-	-
<i>Erodium crinitum</i> [Blue Crowfoot]	P	-	-	-	-	-	-	-	-
<i>Foeniculum vulgare</i> * [Fennel]	-	-	-	P	-	-	P	-	-
<i>Geranium</i> sp. [Storksbill]	-	-	-	-	-	-	-	-	-
<i>Glycine stenophylla</i>	-	-	-	-	-	-	-	-	-
<i>Gomphocarpus fruticosus</i> * [Swan Plant]	-	-	-	-	-	-	-	-	-
<i>Goodenia</i> sp.	-	P	-	-	P	-	-	-	-
<i>Hedypnois rhagadioloides</i> subsp. <i>cretica</i> * [Cretan Weed]	P	P	P	-	-	-	-	-	-
<i>Hordeum leporinum</i> * [Barley Grass]	P	-	-	-	-	P	-	-	-
<i>Hydrocotyle laxiflora</i> [Stinking Pennywort]	-	P	-	-	-	-	-	-	-
<i>Hypericum perforatum</i> * [St John's Wort]	-	-	-	-	-	-	-	-	-
<i>Hypochaeris radicata</i> * [Flatweed]	-	-	-	P	-	-	-	-	-
<i>Juncus</i> sp. [Rush]	-	-	-	-	-	-	P	-	-
<i>Lactuca serriola</i> * [Prickly Lettuce]	-	-	-	-	-	-	-	-	-
<i>Lamarckia aurea</i> * [Golden Top]	-	-	-	-	-	-	-	-	-
<i>Lepidium africanum</i> * [Peppercress]	P	-	-	P	P	-	-	-	-
<i>Linum marginale</i> [Native Flax]	-	-	-	-	-	-	-	-	-
<i>Lolium rigidum</i> [Annual Ryegrass]	P	P	P	P	P	-	P	-	-
<i>Lomandra</i> sp. [Matrush]	-	P	-	-	-	-	-	-	-
<i>Malva parviflora</i> * [Small-flowered Mallow]	P	-	-	-	-	P	-	P	-
<i>Marrubium vulgare</i> * [Horehound]	-	-	-	-	-	P	-	-	-
<i>Mdeicago minima</i> * [Small Woolly Borr Medic]	-	-	-	-	P	-	-	-	-
<i>Medicago sativa</i> * [Lucerne]	-	-	-	-	-	P	-	-	-
<i>Medicago scutellata</i> * [Snail Medic]	P	-	-	-	P	-	-	-	-
<i>Medicago truncatula</i> * [Barrel Medic]	-	-	-	-	P	-	-	-	-
<i>Oxalis</i> sp.* [Wood Sorrel]	-	P	-	-	P	P	P	-	-
<i>Paspalum dilatatum</i> * [Paspalum]	-	-	-	-	-	-	-	-	-
Perennial Grass	-	-	-	-	-	-	-	-	-
<i>Paspalidium constrictum</i> [Box Grass]	-	P	-	-	-	-	-	-	-
<i>Petrorhagia nanteuillii</i> * [Proliferous Pink]	-	P	P	P	-	-	-	-	-
<i>Physalis</i> sp.* [Ground Cherry]	-	P	-	-	-	-	-	-	-
<i>Plantago lanceolata</i> * [Ribwort]	-	-	-	-	-	P	-	-	-
<i>Polygonum</i> sp. [Wireweed]	P	-	-	-	-	P	P	-	-
<i>Portulaca oleracea</i> [Munyeroot]	-	-	-	-	-	-	-	P	-
<i>Rapistrum rugosum</i> * [Wild Turnip]	-	-	P	-	-	-	P	-	-
<i>Rostraria cristata</i> * [Annual Cat's Tail]	P	P	-	-	-	-	-	-	-

**Table 2b (Cont)**  
**Ground Cover Species Recorded In Quadrats**

Page 3 of 3

SPECIES	QUADRAT								
	10	11	12	13	14	15	16	17	18
<i>Rumex brownii</i> [Slender Dock]	P	P	-	-	P	P	-	-	-
<i>Salvia verbenaca</i> [Wild Sage]	-	P	-	-	-		-	-	-
<i>Schkuhria pinnata</i> var. <i>abrotanoides</i> * [Dwarf Marigold]	-	-	-	-	-	-	-	-	-
<i>Scirous</i> sp. [Club-rush]	-	-	-	-	-	-	-	-	-
<i>Sida corrugata</i> [Corrugated Sida]	-	-	P	-	-	-	-	-	-
<i>Sida rhombifolia</i> * [Paddys Lucerne]	-	-	-	-	-	-	-	-	-
<i>Sida spicata</i>	-	-	-	-	-	-	-	-	-
<i>Sida spinosa</i>	-	-	-	-	-	-	-	-	P
<i>Silybum marianum</i> * [Variegated Thistle]	-	-	-	-	-	-	-	-	-
<i>Sisymbrium</i> sp.* [Wild Mustard]	-	P	-	-	-	-	P	-	-
<i>Solanum ciereum</i> [Narrawa Burr]	-	-	P	-	-	-	-	-	-
<i>Solanum nigrum</i> * [Black Nightshade]	-	-	-	-	-	-	-	-	-
<i>Sonchus oleraceus</i> * [Common Sowthistle]	-	-	-	-	-	-	-	-	-
<i>Sporobolus elongatus</i> [Western Ratstail Grass]	-	-	-	-	-	-	-	-	P
<i>Tragus australianus</i> [Small Burr Grass]	-	-	-	-	-	-	-	P	-
<i>Tribulus terrestris</i> [Cathead]	-	-	-	-	-	-	-	P	-
<i>Trifolium angustifolium</i> * [Narrow-leaf Clover]	-	-	-	-	-	-	-	-	-
<i>Trifolium arvense</i> * [Haresfoot Clover]	-	-	P	-	-	P	-	-	-
<i>Trifolium campestre</i> * [Hop Clover]	-	P	P	P	-	-	-	-	-
<i>Trifolium dubium</i> * [Yellow Suckling Clover]	-	-	-	-	-	-	-	-	-
<i>Trifolium glomeratum</i> [Cluster Clover]	P	P	P	-	-	P	-	-	-
<i>Urtica incisa</i> [Scrub Nettle]	P	-	-	-	-	P	-	-	-
<i>Verbena bonariensis</i> * [Wild Stattice]	-	P	-	-	-	-	-	-	-
<i>Verbena</i> sp.* [Verbena]	-	-	-	-	-	-	-	-	-
<i>Vittadinia cecicularis</i> var. <i>cervicularis</i> [New Holland Daisy]	P	-	-	-	P	P	P	-	-
<i>Vittadinia muelleri</i> [New Holland Daisy]	-	-	-	-	P	-	-	-	-
<i>Vittadinia</i> sp. [New Holland Daisy]	-	-	-	-	-	-	-	-	-
<i>Wahlenbergia communis</i> [Tufted Bluebell]	-	P	-	-	P	-	-	-	-
<i>Xanthium spinosum</i> * [Bathurst Burr]	-	-	-	-	-	-	-	-	-

## 4.2 Vegetation Communities within the Subject Site

Four vegetation communities were identified within the subject site. These corresponded to the communities identified by GCNRC (2004) and are:

- **Community 1** - Cleared - Cultivated / Pasture Lands
- **Community 2** - Cleared Land - Uncultivated
- **Community 4** - *Eucalyptus albens* [White Box] - *Eucalyptus melliodora* [Yellow Box] - *Eucalyptus blakelyi* [Blakely's Red Gum] Community
- **Community 6** - *Eucalyptus dealbata* [Tumbledown Gum] Community

Descriptions of these communities are presented below.

#### 4.2.1 Community 1 - Cleared - Cultivated / Pasture Lands

Trees are generally absent from this community although some areas have *Eucalyptus albens* [White Box] trees at scattered locations.

Shrubs are generally absent although *Maireana microphylla* [Eastern Cottonbush] occurs on some areas.

The main groundcover species are *Aristida ramosa* [Purple Wiregrass], *Bothriochloa macra* [Red Grass], *Carthamus lanatus*\* [Saffron Thistle], *Centaurea solstitialis*\* [St Barnaby's Thistle], *Chloris truncata* [Windmill Grass], *Chondrilla juncea*\* [Skeleton Weed], *Conyza bonariense*\* [Flaxleaf Fleabane], *Digitaria divaricatissima* [Umbrella Grass], *Echinochloa colonum*\* [Barnyard Grass], *Eragrostis cilianensis*\* [Stinking Lovegrass], *Sonchus oleraceus*\* [Common Sowthistle] and *Trifolium glomeratum*\* [Cluster Clover].

A complete species list for this community is contained in **Table 2b**

#### 4.2.2 Community 2 - Cleared Land – Uncultivated

Trees are generally absent from this community although some areas have *Eucalyptus albens* [White Box] and *Eucalyptus melliodora* [Yellow Box] trees at scattered locations.

Shrubs are generally absent although *Maireana microphylla* [Eastern Cottonbush] occurs on some areas.

The main groundcover species include *Aristida ramosa* [Purple Wiregrass], *Austrostipa verticillata* [Slender Bamboo Grass], *Elymus scaber* [Common Wheatgrass], *Petrorhagia nanteuillii*\* [Proliferous Pink], *Anagallis arvensis*\* [Scarlet Pimpernell], *Austrodanthonia* sp. [Wallaby Grass], *Austrostipa aristiglumis* [Plains Grass], *Bromus molliiformis*\* [Silky Brome], *Carthamus lanatus*\* [Saffron Thistle], *Lolium rigidum*\* [Annual Ryegrass] and *Trifolium campestre*\* [Hop Clover].

A complete species list for this community is contained in **Table 2b**

#### 4.2.3 Community 4 - *Eucalyptus albens* [White Box] - *Eucalyptus melliodora* [Yellow Box] - *Eucalyptus blakelyi* [Blakely's Red Gum] Community

*Eucalyptus albens* [White Box] is the dominant tree species although other species such as *Eucalyptus melliodora* [Yellow Box], *Eucalyptus blakelyi* [Blakely's Red Gum], *Brachychiton populneus* [Kurrajong] and *Alectryon oleifolius* [Rosewood] are present in lesser numbers.

Shrub cover is comprised mainly of *Maireana microphylla* [Eastern Cottonbush] that may occur in relatively dense patches or as scattered plants. The other shrub species recorded was *Acacia decora* [Western Golden Wattle].

Groundcover species include *Aristida ramosa* [Purple Wiregrass], *Austrodanthonia richardsonii* [Wallaby Grass], *Austrostipa verticillata* [Slender Bamboo Grass], *Bromus molliiformis*\* [Silky Brome], *Chondrilla juncea*\* [Skeleton Weed], *Dichondra repens* [Kidney Weed], *Elymus scaber* [Common Wheatgrass], *Glycine stenophylla*, *Hordeum leporinum*\* [Barley Grass], *Lepidium*

*africanum*\* [Peppercress], *Rumex brownii* [Slender Dock], *Sida rhombifolia*\* [Paddy's Lucerne], *Anagallis arvensis*\* [Scarlet Pimpernell], *Austrostipa* sp. [Speargrass], *Echium plantagineum*\* [Paterson's Curse], *Oxalis* sp.\* [Wood Sorrel], *Urtica incisa* [Scrub Nettle] and *Lolium rigidum*\* [Annual Ryegrass].

A complete species list for this community is contained in **Table 2b**

#### 4.2.4 Community 6 - *Eucalyptus dealbata* [Tumbledown Gum] Community

The main tree species in this community is *Eucalyptus dealbata* [Tumbledown Gum] with some hybrids between this species and *Eucalyptus blakeleyi* [Blakely's Red Gum]. *Eucalyptus albens* [White Box] trees surround the occurrences. Many seedlings and saplings of Tumbledown Gum / hybrid were evident.

Shrubs are absent.

The main groundcover species include *Aristida ramosa* [Purple Wiregrass], *Bothriochloa macra* [Red Grass], *Calotis lappulacea* [Yellow Burr-daisy], *Centaurea solstitialis*\* [St Barnaby's Thistle], *Chloris truncata* [Windmill Grass], *Chloris ventricosa* [Tall Chloris], *Dichanthium sericeum* [Queensland Bluegrass], *Digitaria divaricatissima* [Umbrella Grass] and *Carthamus lanatus*\* [Saffron Thistle].

A complete species list for this community is contained in **Table 2b**

## 5 NOXIOUS WEED CONSIDERATIONS

Ground cover within the study area is invaded by introduced weed and pasture species, both in cropped areas and areas of remnant native vegetation. Of these, Bathurst Burr\* [*Xanthium spinosum*], Paterson's Curse [*Echium plantagineum*]\* and Spiny Burrgrass [*Cenchrus incertus*]\* were present on some sites.

All of these species are listed as being noxious for Liverpool Plains Shire on the NSW Department of Primary Industries [Agriculture Website]. [search date 6<sup>th</sup> February, 2009]. These species will need to be controlled.

## 6 KOALA HABITAT CONSIDERATIONS

Circular B35 issued to Councils by the Department of Planning provides information on State Environmental Planning Policy No 44 - Koala Habitat Protection (SEPP 44).

The Project Site is now situated within Liverpool Plains Shire but was formerly located partly in Quirindi Shire and partly in Parry Shire.

Schedule 1 of the Policy lists the both Quirindi and Parry Shires as local government areas to which the Policy applies.

SEPP 44 requires the identification of any “potential Koala habitat” within the study area.

However in section 1.5 of the ‘Explanation of the Policy’ it is noted that ... “In relation to affected DAs it is the intention of the policy that investigations for ‘potential’ and ‘core’ Koala habitats be limited to those areas in which it is proposed to disturb habitat”.

Potential Koala habitat is an area “...of native vegetation where trees of the types listed in Schedule 2 [of SEPP 44] constitute at least 15% of the total number of trees in the upper and lower components of the tree component.”

One of the species listed in Schedule 2 of SEPP 44 is found within the study area. This is *Eucalyptus albens* [White Box] - a species that is dominant within many of the remnants of native vegetation present within the subject site.

More than 15% of the trees present within the remnant native vegetation areas within the study area Site are White Box trees and so these areas can be regarded as "potential Koala habitat".

A fauna survey of the original study area [CES, 2004] indicated there were no signs of Koala habitation of the area. A survey of the subject site by Ecotone Ecological Consultants (Ecotone, 2009) again did not record any signs of Koalas on the subject site.

## **7 THREATENED SPECIES ISSUES**

### **7.1 NSW Threatened Species Conservation Act [TSC Act]**

#### **7.1.1 Method of Assessment**

A listing of Vulnerable and Endangered Flora Species, Endangered Ecological Communities, Endangered Populations and Critical Habitat was obtained from the Department of Environment and Climate Change's [DECC] 'Atlas of NSW Wildlife ' to identify threatened species and communities that have been recorded, or are predicted to occur, within the Curlewis [8935] and Tamworth [9035] 1: 100 000 map sheet areas.

The predicted occurrences are those obtained using DECC's BIOCLIM model.

#### **7.1.2 Threatened Species**

There are **no records** of Threatened flora species contained in the 'Atlas of NSW Wildlife' within the Curlewis [8935] and Tamworth [9035] 1: 100 000 map sheet areas.

#### **7.1.3 BIOCLIM Model Predictions [for the Curlewis [8935] and Tamworth [9035] 1:100 000 Scale Map Sheet Areas]**

BIOCLIM predicted the presence of the following species within the Curlewis [8935] and Tamworth [9035] 1: 100 000 map sheet areas.

*Bothriochloa biloba* [no longer listed]  
*Cadellia pentastylis*  
*Calotis glandulosa*

*Dichanthium setosum*  
*Goodenia macbarronii* [no longer listed]  
*Homorantus darwinioides*  
*Philotheca ericifolia*  
*Pilularia novae-hollandiae*  
*Swainsona murrayana*  
*Thesium australe*

The likelihood of occurrence of these species within the subject site is discussed in **Table 3**.

#### **7.1.4 Endangered Ecological Communities**

The endangered ecological communities recorded or predicted to occur within the area covered by the Curlewis [8935] and Tamworth [9035] 1: 100 000 map sheet areas are:

- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray - Darling Depression, Riverina and NSW South Western Slopes Bioregions
- Fuzzy Box Woodland on Alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions
- Coolibah – Black Box Woodland of the Northern Riverine Plains in the Darling River Plains and Brigalow Belt South Bioregions
- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions
- McKies Stringybark / Blackbutt Open Forest in the Nandewar and New England Tableland Bioregions
- Semi-evergreen Vine Ticket in the Brigalow Belt South and Nandewar Bioregions
- Native Vegetation on Cracking Clay Soils of the Liverpool Plains
- White Box Yellow Box Blakely's Red Gum Woodland
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

#### **7.1.5 Endangered Flora Populations**

There are no Endangered Flora Populations recorded or predicted to occur in the vicinity of the study area or within the Tamworth [9035] and Curlewis [8935] 1: 100 000 scale map sheet areas.

#### **7.1.6 Critical Habitat**

There is no Critical Habitat recorded from the Project Site or within the Tamworth [9035] and Curlewis [8935] 1: 100 000 scale map sheet areas.

## **7.2 Commonwealth Environment Protection and Biodiversity Conservation Act [EPBC Act]**

### **7.2.1 Method of Assessment**

A listing of Threatened flora species and Threatened Ecological Communities likely to occur within a 10km radius of the site was obtained from the Environment Australia Database in an EPBC Act Protected Matters Report.

In addition, details of any World Heritage Properties or Wetlands of International Significance with the vicinity were obtained. The Protected Matters Report indicates that the following Threatened Species and Ecological Communities have been recorded in the region around the study area or are predicted to occur there.

### **7.2.2 Threatened Flora Species**

The following species were predicted as having the potential to occur on or in the vicinity of the study area.

*Digitaria porrecta*  
*Diuris shaeffiana*  
*Philothea ericifolia*  
*Pterostylis cobarensis*  
*Thesium australe*  
*Tylophora linearis*

The likelihood of occurrence of these species within the study area is discussed in **Table 3**.

### **7.2.3 Threatened Ecological Communities**

Three Threatened Ecological Communities are recorded or predicted to occur within the area surrounding the study area. These are

- Natural Grasslands on Basalt and Fine Textured Alluvial Plains of Northern New south Wales and Southern Queensland
- Weeping Myall Woodlands
- White Box – Yellow Box Blakely's Red Gum Grassy Woodlands and Derived Native Grassland

### **7.2.4 Nearby World Heritage Properties**

Nil present so no impact likely.

### **7.2.5 Associated Wetlands of International Significance**

Nil present so no impact likely.

## 8 RESULTS OF THE PRESENT SURVEY

### 8.1 Threatened Flora Species

Records obtained from the DECC 'Atlas of NSW Wildlife' indicated that six threatened flora species have been recorded from within the boundaries of the Curlewis [8935] and Tamworth [9035] 1:100 000 map sheet areas in the past. These are

- *Cadellia pentastylis* - two records from Blackjack State Forest adjacent to Gunnedah
- *Dichanthium setosum* - recorded from 15km south of Tamworth; northeast and adjacent to Tamworth City; Calala near Tamworth; two records from Tamworth City
- *Digitaria porrecta* - recorded from near Pine Ridge; 6km west of Tamarang; 16km southwest of Werris Creek; southwest of Gunnedah; near The Gap west of Werris Creek; near Werris Creek Station at Werris Creek.
- *Euphrasia ruptura* – EXTINCT - recorded from 7km north of Tamworth City in 1904.
- *Swainsona murrayana* - recorded from Goran Lake
- *Syzgium paniculatum* - recorded from near Tamworth;

None of the species listed under the TSC Act, or the EPBC Act, and noted as being collected from the region surrounding the study area [or predicted to occur there] was recorded during the survey.

### 8.2 Endangered / Threatened Ecological Communities

Remnants of two Endangered Ecological Communities area present within the subject site. These are:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions; and
- White Box Yellow Box Blakely's Red Gum Woodland [Note that the White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community [TSC Act] equates with the White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands [EPBC Act].]

The Brigalow community was identified in the flora study for the original Environmental Impact Statement for the Werris Creek Coal Mine [GCNRC, 2004] and is located outside the boundaries of the subject site.

The White Box Yellow Box Blakely's Red Gum Woodland [White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands] Endangered Ecological Community occurs over an area of 8.8 hectares within the subject site.

The proposed extension to the Werris Creek Coal mine, if approved, would result in the removal of 8.8 hectares of this endangered ecological community.

As a consequence, WCC proposes to establish a Biodiversity Offset area comprising some 20 hectares of this community on the property 'Railway View' that is located almost adjacent to the mine site – being separated from it by the Werris Creek – Quirindi Road and the Main Northwestern Railway.

A description of the proposed Biodiversity Offset area is contained in **Section 10** of this study report.

### 8.3 Critical Habitat

There is no Critical Habitat present at the study area.

**Table 3**  
**Assessment of the Likelihood of Occurrence of Threatened Flora Species**

Page 1 of 2

SPECIES	ASSESSMENT
<i>Cadellia pentastylis</i> VULNERABLE	A small tree to 10m high that grows in thickets, west from Tenterfield and north from Terry Hie Hie [Harden, 1991]. Forms closed or open canopied communities in which it may dominate or mix with <i>Eucalyptus albens</i> , <i>Eucalyptus chloroclada</i> , <i>Eucalyptus pilligaensis</i> and <i>Callitris glaucophylla</i> . Recorded from Turkey Ridge, Deriah State Forest and Eulah Creek east of Narrabri, Terry Hie Hie, Gravesend: 'Tara', Warialda: 'Taronga', Mole River: Tenterfield Creek. [Benson, 1993]. Conserved in Gamilaraay Nature Reserve near Terry Hie Hie and Scrub Myrtle Flora Reserve in Deriah State Forest. <b>The species is distinctive in appearance and was not recorded during field inspection</b> even though suitable habitat probably occurs at the Project Site. There are no records of its presence at the site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Calotis glandulosa</i> VULNERABLE	This species is an erect or ascending branched herb to 35cm high, +/- woody at the base. Harden [1992] notes that it grows in grasslands and sclerophyll forest at higher altitudes, from Eden to the Dubbo area. <b>A POSSIBLE OCCURRENCE</b> as suitable general habitat is present. The species was not recorded during field inspection and there are no records of its presence at the Project Site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Dichanthium setosum</i> VULNERABLE	Predicted by Ayers et al [1996] to occur in the region. Occurs chiefly in woodlands and grasslands on the Northern Tablelands and more rarely on the North-western Slopes and Plains and Central Western Slopes [Vickery, 1981; Harden, 1993]. Suitable habitat occurs at the site. <b>A POSSIBLE OCCURRENCE</b> but was not recorded during field inspection and there are no records of its presence at the Project Site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Digitaria porrecta</i> ENDANGERED	A possible occurrence in the region [EPBC Act database]. A loosely caespitose, erect or geniculate-ascending greyish pubescent perennial grass that grows in grassland on better soils [Harden, 1993]. Suitable habitat occurs at the site]. <b>A POSSIBLE OCCURRENCE</b> but was not recorded during field inspection and there are no records of its presence at the Project Site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Diuris shaeffiana</i> VULNERABLE	This species was listed on the Schedules of the <i>Threatened Species Conservation Act 1995</i> as <i>Diuris shaeffiana</i> but further taxonomic research indicates that the original species is really <i>Diuris tricolor</i> – a widespread orchid that occurs throughout the western slopes from Narrandera north. Its preferred habitat is sandy soils in <i>Callitris</i> communities [Bishop, 1996]. Suitable habitat is not present at the study area. The species was not recorded during field inspection and there are no previous records of its occurrence at the site. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE SITE.

**Table 3 (Cont)**  
**Assessment of the Likelihood of Occurrence of Threatened Flora Species**

Page 2 of 2

SPECIES	ASSESSMENT
<i>Euphrasia rupture</i> EXTINCT	This species was collected at Werris Creek Station in 1904 but is now considered to be EXTINCT. The species was not recorded during field inspection and there are no previous records of its occurrence at the site. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE SITE.
<i>Homoranthus darwinioides</i> VULNERABLE	This species grows in dry sclerophyll forest or woodland; usually on sandstone outcrops or ridges, from the Putty district to Dubbo. <b>SUITABLE HABITAT IS NOT PRESENT.</b> The species was not recorded during field inspection and there are no records of its presence at the Project Site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Philotheca ericifolia</i> VULNERABLE	Grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies, in the upper Hunter Valley and Pilliga to Peak Hill district [Harden, 1991]. <b>SUITABLE HABITAT IS NOT PRESENT AT THE SITE.</b> The species was not recorded during field inspection and there are no records of its presence at the site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE SITE.
<i>Pilularia novae-hollandiae</i> ENDANGERED	Semi aquatic fern, resembling a fine grass; often growing with grasses and sedges [DECC Threatened Species Website]; widespread but not common in seasonally dry depressions and margins of swamps and marshes; may grow submerged [Harden, 2000]; <b>SUITABLE HABITAT MAY BE PRESENT AT THE SITE.</b> The species was not recorded during field inspection and there are no records of its presence at the site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE SITE.
<i>Pterostylis cobarensis</i> VULNERABLE	Harden [1993] notes that this species grows among rocks on low hills and on slopes above streams, chiefly from Nyngan to Bourke district. Bishop [1996] notes that this species occurs mainly in the Nyngan - Cobar - Bourke region and favours stony ridges, often growing under grey mallee [ <i>Eucalyptus morrisii</i> ]. <b>SUITABLE HABITAT IS NOT PRESENT.</b> The species was not recorded during field inspection and there are no records of its presence at the Project Site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Swainsona murrayana</i> VULNERABLE	Harden[1991] notes that this species often grows with <i>Maireana</i> species on heavy soil, especially in depressions. Thompson [1993] records that it occurs on the western slopes and plains of NSW and in equivalent areas of northern and western Victoria and southern Queensland, with an outlying population in SA west of Broken Hill and that it occurs on heavy soils, often in depressions, frequently associated with <i>Maireana</i> spp. Suitable habitat possibly occurs at the site. <b>A POSSIBLE OCCURRENCE.</b> The species was not recorded during field inspection and there are no records of its presence at the Project Site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Syzygium paniculatum</i> VULNERABLE	Recorded from coastal rainforests from Cojola to Bulahdelah; a small to medium sized rainforest tree; flowers between November and February; fruits are deep magenta in colour [DECC Threatened Species Website]; <b>SUITABLE HABITAT IS NOT PRESENT.</b> The species was not recorded during field inspection and there are no records of its presence at the Project Site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Thesium australe</i> VULNERABLE	Recorded from the North West Slopes Botanical Subdivision [Harden, 1992]. It flowers spring - summer and grows in grassland or woodland, often in damp sites. . The species was not recorded during field inspection and there are no records of its presence at the Project Site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Tylophora linearis</i> VULNERABLE	Grows in dry scrub in the Barraba, Mendooran, Temora and West Wyalong districts [Harden, 1991]. Also recorded in the vicinity of the Hervey Range, some 9 - 10km east of Peak Hill. The species was not recorded during field inspection and there are no records of its presence at the Project Site in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.

## 9 SEVEN PART TEST

The likelihood of the occurrence of threatened flora species within the study area has been assessed in **Table 3**.

Some of the study area has been highly modified from its original condition and habitat values as a consequence of previous agricultural and grazing use including removal of some of the tree cover and complete clearing for grazing, cultivation and gravel quarrying.

There is no suitable habitat present at the site for many of the threatened flora species likely / predicted to occur there.

Field observations have failed to record any threatened flora species and there are no past records of any threatened flora species at the site. There are no endangered flora populations or occurrences of critical habitat within the study area.

However, there is a remnant of the White Box Yellow Box Blakely's Red Gum Woodland [White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands] Endangered Ecological Community that would be removed if the proposed mine extension is approved.

**The outcome of the assessments and field survey observations has been the conclusion that none of the Threatened flora species recorded or predicted to occur in the wider region around Werris Creek occurs at the site.**

For the purposes of the Environmental Planning and Assessment Act 1979, the following must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

[a] each of the factors listed in the following paragraph and

[b] any assessment guidelines.

The following factors must be taken into account in making a determination of the likely significance of an action on threatened species, populations or communities or their habitats.

**[a] in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:**

No threatened flora species have been recorded from the study area in the past and none were recorded during field survey. Consequently it is concluded that there would be no adverse effect from the proposed development on the life cycle of any threatened flora species such that a viable local population of the species is likely to be placed at risk of extinction.

**[b] in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction:**

No endangered flora populations have been recorded from the study area in the past and none were recorded during field survey. Consequently it is concluded that there would be no adverse affect from the proposed development on the life cycle of any flora species that constitutes an endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

**[c] in the case of an endangered ecological community or critically endangered ecological community , whether the action proposed:**

**[i] is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**

**[ii] is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

A remnant of the White Box Yellow Box Blakely's Red Gum Woodland [White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands] endangered / critically endangered ecological community occurs within the area proposed for the extension of the Werris Creek Coal Mine.

The area of the endangered / critically endangered ecological community that would be cleared if the extension proposal is approved would be 8.8 hectares. Given the extent of the occurrence of this community in the region surrounding the Werris Creek Coal Mine, it is considered that the clearing of 8.8 hectares of this endangered ecological community will not have any adverse effect on the community such that its local occurrence is likely to be placed at risk of extinction.

The proposed action involves the complete clearing of a remnant of the endangered ecological community. This would be balanced by the permanent conservation / reservation of a Biodiversity Offset area of this community over twice the size of the area proposed to be cleared.

It is considered that the proposed action is not likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. There is a considerable presence of the community in the Werris Creek – Quirindi area and the area proposed to be cleared is small.

**[d] in relation to the habitat of a threatened species, population or ecological community:**

**[i] the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and**

**[ii] whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

**[iii] the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

There are no threatened flora species or populations present at the study area and there would be no removal, fragmentation, isolation or modification of the habitat of such species or populations proposed. Consequently it is concluded that there will be no significant impact on the habitat of any threatened flora species or population.

The area of the White Box Yellow Box Blakely's Red Gum Woodland [White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands] endangered / critically endangered ecological community that would be cleared if the extension proposal is approved would be 8.8 hectares.

Apart from being a remnant of this endangered / critically endangered ecological community, the area proposed for clearing has no special importance in terms of its habitat values than other occurrences in the vicinity – of which there are a number.

Given the extent of the occurrence of this community in the region surrounding the Werris Creek Coal Mine, it is considered that the clearing of 8.8 hectares of this endangered critically endangered ecological community will not result in isolation of the habitat of this community nor will it have any adverse effect on the survival of the community within the Werris Creek – Quirindi area. There is a considerable presence of the community in the Werris Creek – Quirindi area and the area proposed to be cleared is small.

The proposed action would be balanced by the permanent reservation / conservation of a Biodiversity Offset area of this same community over twice the size of the area proposed to be cleared. .

**[e] whether the action proposed is likely to have an effect on critical habitat [either directly or indirectly].**

No critical habitat is present within the study area. Consequently, it is concluded that the proposed development would not have any effect on any critical habitat.

**[f] whether the action proposed is consistent with the objectives or actions of a species recovery plan or threat abatement plan.**

There are no threatened species recorded for the study area and so there are no actions specified in a species recovery plan that must be considered in relation to the proposed development.

There are no threat abatement plans relating to the proposed clearing at the study area and so there is no requirement to further consider this issue

**[g] whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.**

Clearing of Native Vegetation is listed as a key threatening process under the NSW TSC Act and land clearing is similarly listed under the Commonwealth EPBC Act.

It is proposed to clear 8.8 hectares of the White Box Yellow Box Blakely's Red Gum Woodland [White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands] endangered / critically endangered ecological community.

At the same time it is proposed to permanently reserve / conserve 20 hectares of a similar remnant of this same community on a nearby [basically adjacent] property

Permanent conservation and destocking of this 20 hectare area along with an associated 4.5 hectare area of Tumbledown Gum community will result in an improvement in community structure through regeneration of native trees and shrubs, and in native groundcover species abundance, that would not have occurred on the area proposed for clearing as it could still be used for domestic livestock grazing.

While the proposed clearing constitutes a key threatening process, it is considered that the positive biodiversity offset outcomes linked with the proposed clearing will in fact outweigh any detrimental impact of the clearing.

## **10 THE PROPOSED BIODIVERSITY OFFSET**

### **10.1 Overview**

The current extension proposal for the Werris Creek Coal Mine involves the clearing of 8.8 hectares of White Box Yellow Box Blakely's Red Gum Woodland [White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands] Endangered Ecological Community.

If the proposed extension is approved, then a Biodiversity Offset Area will need to be created to offset by a new Biodiversity Offset Area that is of sufficient size to provide an offset for the clearing of an area of 8.8 hectares of White Box Yellow Box Blakely's Red Gum Woodland vegetation.

### **10.2 The Impact of the Proposed Clearing in Perspective**

#### **10.2.1 The Regional 'White Box' Survey in 2004**

The 2004 Werris Creek Coal Mine proposal detailed in the Environmental Impact Statement prepared in 2004 noted that **43 hectares** of the White Box Yellow Box Blakely's Red Gum Woodland [White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands] Endangered / Critically Endangered Ecological Community would be cleared if the proposal was approved.

In order to place the significance of this clearing in a regional perspective, WCC commissioned a survey of the occurrence of the Grassy White Box Yellow Box Blakely's Red Gum Woodland community [as it was then known] in a target area between Werris Creek and Quirindi. Details of the survey outcomes are contained in the flora study presented in the original Environmental Impact Statement for the Werris Creek Coal Mine [GCNRC, 2004]

In order to ascertain the degree of impact of the original proposed coal mine development on the local [regional] distribution of the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands [EPBC Act] Endangered Ecological Community a field survey was undertaken by Geoff Cunningham Natural Resource Consultants Pty Ltd after stereoscopic examination of 1: 25 000 scale colour airphotos of the area around the project site.

The airphotos used were flown in August, 1998. The prints used were:

Tamworth Run 10; Prints 146, 147, 148, 149, 150, 151

Tamworth Run 11; Prints 88, 89, 90, 91, 92

Tamworth Run 12; Prints 53, 54, 55

To verify airphoto interpreted occurrences of the endangered / critically endangered ecological community, field traverses were undertaken by four wheel drive vehicle along formed roads, farm access roads and farm tracks. In difficult [*steep, rocky, heavily timbered*] terrain the survey was carried out on foot.

At each of 100 observation points, the coordinates of the point were recorded using a hand-held GPS receiver. Details of the vegetation community at each point were also recorded.

The size of the target area was some 9 400 hectares. It extended from in a north-south direction from Werris Creek township south to near the Quirindi Golf Club. In an east-west direction, the target area extended in the north from a point about 3km east of Werris Creek township west to The Gap where Werris Creek [stream] flows out to the plains. In the southern part, the area extends from the vicinity of Quipolly location to Lower Quipolly and the Kamilaroi Highway via Paynes Lane and Taylors Lane.

During the field survey [*and travel to and from the Target Area*] it was noted that there were extensive additional occurrences of the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands [EPBC Act] Endangered / Critically Endangered Ecological Community within the Werris Creek - Quirindi area. This was particularly so in the vicinity of Quirindi and on the western footslopes of the hills that formed the western boundary of the Target Area.

The additional areas on the eastern side of the Target Area to the north of Quipolly Dam are also quite extensive.

The aim of this survey was to quantify the local and regional extent of occurrence of the Endangered / Critically Endangered Ecological Community so that the significance of the impact of removal of an area of the community within the area to be mined could be gauged.

The survey determined that, within the Target Area, remnants of this Endangered Ecological Community cover some **1 800 hectares** of the total of 9 400 hectares surveyed. **The community thus occupies over 19% of the total survey area.**

**The area of the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box - Yellow Box - Blakely's Red Gum Woodlands and Derived Native Grasslands [EPBC Act] Endangered / Critically Endangered Ecological Communities within the original 'area of disturbance' associated with the original Werris Creek Coal Mine proposal amounted to 43 hectares.**

The area of this community proposed to be cleared under the current proposal is 8.8 ha, or an additional 0.49% of the total area of this community present in the region surrounding the proposed mine extension in 2004.

In addition, it has been noted, in the survey area, that since 2004, there has been regeneration of this community in some areas where land has been destocked, where stocking rates are low or where sheep have been replaced by cattle.

**The conclusion from the 2004 'White Box' Survey** was that, on the basis of the extent of occurrence of the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box – Yellow Box – Blakely's Red Gum Woodlands and Derived Native Grasslands [EPBC Act] Endangered / Critically Endangered Ecological Communities within the Target Area and the additional occurrences of the community noted outside the Target Area, the removal of 43 hectares of this Endangered Ecological Community at the mine site would not result in a significant impact on this Endangered Ecological Community locally, regionally or nationally.

As a consequence, it was concluded that there would be no requirement for the preparation of a Species Impact Statement [TSC Act] or a Referral to the Commonwealth Department of Environment and Heritage [EPBC Act] in relation to this proposed development.

### **10.2.2 Impact of the Proposed 2009 Mine Extension**

The proposed extension of the open cut mine area and overburden emplacement would result in the removal of a further 8.8 hectares of the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box – Yellow Box – Blakely's Red Gum Woodlands and Derived Native Grasslands [EPBC Act] Endangered / Critically Endangered Ecological Community.

Based on the findings of the 2004 'White Box Survey' this amount to the removal of a further **0.49%** of the area of the community within the immediate vicinity of the mine site.

If the proposed mine extension is approved, the total area of the endangered ecological community that would have been removed is 51.8 hectares, or, 2.9% of the remnant of this community that occurred within the immediate region of the Werris Creek Coal Mine in 2004.

As a consequence of this additional impact, it is again concluded that the impact on the community would not be significant and that there would be no requirement for the preparation of a Species Impact Statement [TSC Act] or a Referral to the Commonwealth Department of Environment and Heritage [EPBC Act] in relation to this proposed development.

However, there is a need for WCC to provide a permanent Biodiversity Offset to compensate for the loss of the area of this endangered ecological / critically endangered community that would be removed if the proposed extension is approved.

The Company's proposal is detailed in **Section 10.2.3**.

### **10.2.3 Biodiversity Offset Proposal**

The area that is the subject of the 2009 mine extension proposal was originally part of the Biodiversity Offset area associated with the 2004 Werris Creek Coal Mine proposal. A larger area of White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box – Yellow Box – Blakely's Red Gum Woodlands and Derived Native Grasslands [EPBC Act] Endangered / Critically Endangered Ecological Community to the north of the current limit of mining was also part of this original Biodiversity Offset area.

The nature and location of the Biodiversity Offset area for the original mine has recently been altered, with the approval of the Department of Planning to satisfy the Biodiversity Offset requirements associated with the original approval by reserving / conserving the following areas of remnant native vegetation.

- 124ha of Liverpool Plains Grassland [Vegetation of the Cracking Clay Soils of the Liverpool Plains Endangered Ecological Community [EEC]. This reserve includes, as well, 22ha of White Box Yellow Box Blakely's Red Gum Woodland EEC. The area is located to the south of the mine.

In addition to this Biodiversity Offset, the Company proposes to re-establish 115ha of the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box – Yellow Box – Blakely's Red Gum Woodlands and Derived Native Grasslands [EPBC Act] endangered / critically endangered ecological community on the rehabilitated final landform and maintain a corridor of land between these two areas which would be allowed to naturally regenerate and provide a habitat/wildlife corridor.

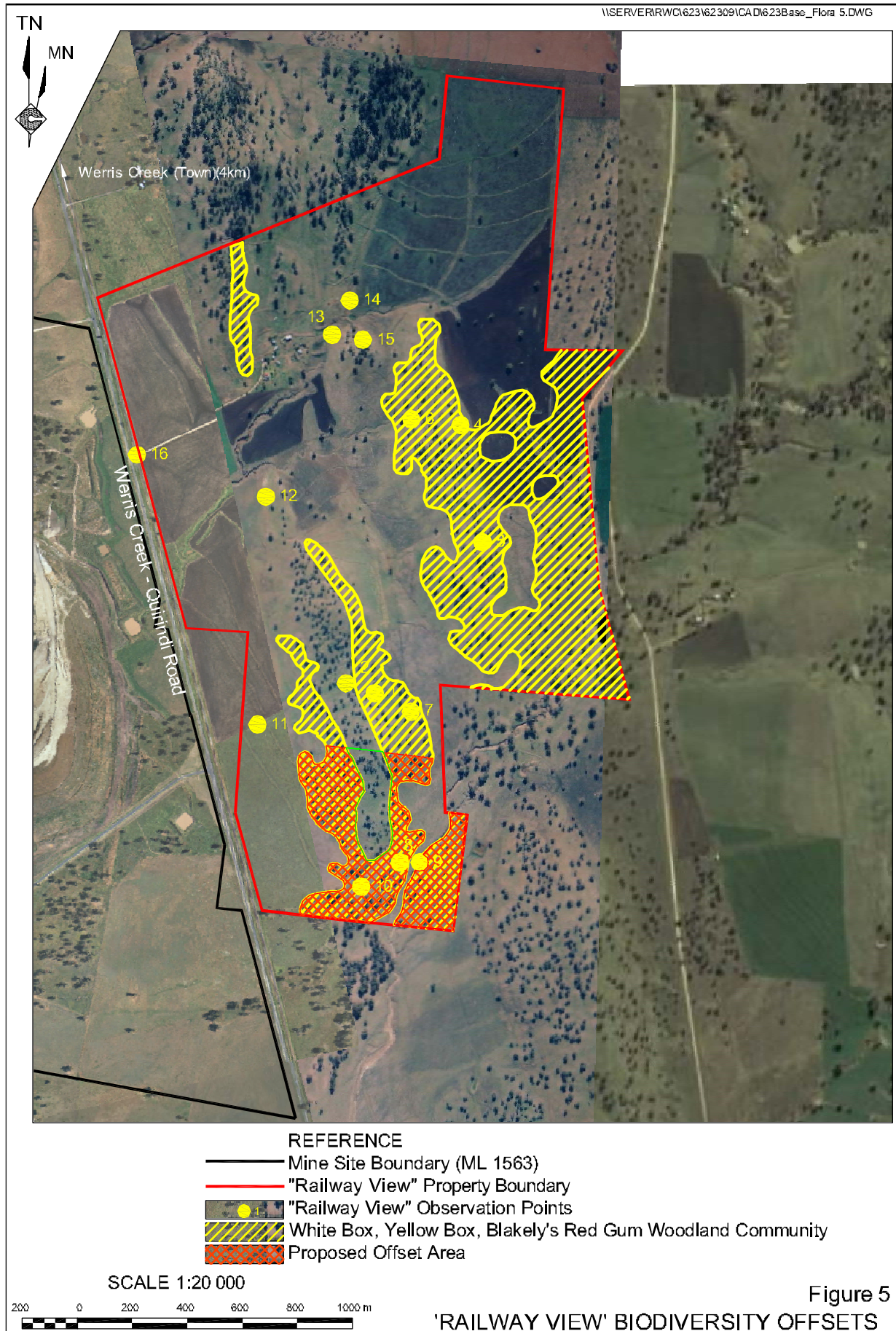
The area of White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box – Yellow Box – Blakely's Red Gum Woodlands and Derived Native Grasslands [EPBC Act] endangered ecological community within the property boundaries is shown in **Figure 5**.

The Biodiversity Offset proposed for the clearing associated with the 2009 open cut modification application would involve the conservation / reservation of a 20ha remnant of the White Box Yellow Box Blakely's Red Gum Woodland EEC and 4.5ha of remnant Tumbledown Gum Woodland [not listed as endangered] on 'Railway View' property which is located immediately to the east of the current mine site (see **Figure 5**).

Since commencing the Werris Creek Coal Mine, has purchased a number of neighbouring properties, including "Railway View" which, based on the regional survey of vegetation, contains significant areas of the White Box Yellow Box Blakely's Red Gum Woodland EEC. As part of this study, 16 20m x 20m quadrats were surveyed to determine the type and extent of the vegetation on the "Railway View" property. **Figure 5** identifies the location of the 16 survey points. **Figure 5** also identifies the extent of the White Box Yellow Box Blakely's Red Gum Woodland EEC on the "Railway View" property.

The Biodiversity Offset proposal now offered by the Company to offset the impact of the proposed clearing of 8.8 hectares of the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box – Yellow Box – Blakely's Red Gum Woodlands and Derived Native Grasslands [EPBC Act] endangered / critically endangered ecological community that is the subject of the current proposal **is to conserve 20 hectares of the same community on 'Railway View' property** [plus an additional 4.5ha of Tumbledown Gum Woodland community].

**Figure 5** shows the location of the proposed Biodiversity Offset area. It comprises a mix of undulating and level country with White Box [*Eucalyptus albens*] dominant on the undulating country and Yellow Box [*Eucalyptus melliodora*] and some White Cypress Pine [*Callitris glaucophylla*] more common on the level country near the watercourse that flows through the area.



It is proposed that the Biodiversity Offset area of 20 hectares would be securely fenced using a combination of the existing fence lines and some new fences and that all domestic livestock would be removed.

Within the proposed Biodiversity Offset area there are a considerable number of trees exhibiting hollows suitable for native fauna to use and some logs on the ground.

The area has a generally good cover of native perennial grasses and herbs such as Plains Grass [*Austrostipa aristiglumis*], Queensland Bluegrass [*Dichanthium sericeum*], Purple Wiregrass [*Aristida ramosa*], Slender Bamboo Grass [*Austrostipa verticillata*], Wallaby Grass [*Austrodanthonia* spp.], Cotton Panic [*Digitaria brownii*], Spear grass [*Austrostipa* sp.], Bottlewashers [*Enneapogon* sp.], Australian Bindweed [*Convolvulus erubescens*], Windmill Grass [*Chloris truncata*], Tall Chloris [*Chloris ventricosa*], Woolly Cloak Fern [*Cheilanthes lasiophylla*], Bluebell [*Wahlenbergia* sp.] and Joyweed [*Alternanthera* sp.].

Some regeneration of the dominant tree species is evident and it is anticipated that regeneration of White Box, Yellow Box and White Cypress Pine will further increase with the removal of domestic livestock

A full description of the community is contained in **Appendix 1**.

## 11 THREATENED SPECIES OVERVIEW

With reference to threatened species, this assessment makes the following conclusions.

- [i] There are no records of threatened plant species contained in the 'Atlas of NSW Wildlife' database for study area.
- [ii] No Threatened [TSC Act] plant species have been previously recorded from the study area and none were recorded during the field survey
- [iii] No Threatened [EPBC Act] plant species have been previously recorded from the study area and none were recorded during the field survey
- [iv] Despite predictions and records that indicated that a number of threatened flora species might be likely to occur at the site, none of these was recorded. The likelihood of occurrence of these species has been assessed in Table 3.
- [iv] Prior to the mine establishment, most of the project site had been cleared for grain production while the remainder had been grazed. Much of the study area supports a ground cover that is invaded by introduced species.
- [v] There are no occurrences within the study area of endangered flora populations listed in the Schedules of the TSC Act or under the EPBC Act.
- [vi] Two Endangered Ecological Communities occur within the study area. These are the Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions Endangered Ecological Community and White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box – Yellow Box – Blakely's Red Gum Woodlands and Derived Native Grasslands [EPBC Act] endangered / critically endangered ecological community

The Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions Endangered Ecological Community would not be significantly affected by the proposed development.

A small area of the White Box Yellow Box Blakely's Red Gum Woodland [TSC Act] / White Box – Yellow Box – Blakely's Red Gum Woodlands and Derived Native Grasslands [EPBC Act] endangered / critically endangered ecological community would be cleared but the amount is not significant in a local regional, State or national sense. Conservation of a 20ha Biodiversity Offset area of this community along with the additional plantings of this community on the rehabilitated final landform will more than adequately compensate for the loss due to clearing.

- [vii] There is no critical habitat listed for the Project Site or its environs.
- [viii] It is concluded that there would be no significant impact on threatened flora species, endangered ecological communities, endangered flora populations or critical habitat as a consequence of the proposed development.
- [ix] In view of the lack of any significant impact on Threatened flora species, Endangered Ecological Communities, Endangered Flora Populations, a Species Impact Statement [TSC Act] or Referral [EBBC Act] would not be required.

## 12 REFERENCES

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# **Appendix 1**

## **Werris Creek Coal Mine Extension Assessment of a Proposed Biodiversity Offset Area on 'Railway View ' Property, Werris Creek**

(No. of pages excluding this page = 3)

## INTRODUCTION

At the request of Werris Creek Coal Pty Ltd the property, 'Railway View', that is located immediately to the east of the Werris Creek Coal Mine was inspected to determine the extent of the endangered White Box Yellow Box Blakely's Red Gum woodland community present on the property.

The property is owned by Werris Creek Coal Pty Ltd.

The reason for the survey was to determine the extent and condition of remnants of this community present on 'Railway View' that could be used as biodiversity offsets when the Company applies for approval of an extension of the current mine.

Prior to the field inspection, airphoto contact prints covering the property were stereoscopically examined to determine the extent of tree cover, and in particular the extent of the endangered / critically endangered White Box Yellow Box Blakely's Red Gum woodland community.

The vegetation on 'Railway View' had previously been examined during a reconnaissance survey in 2004 that determined the extent of endangered / critically endangered White Box Yellow Box Blakely's Red Gum woodland community present in the region of the [then] proposed Werris Creek Coal Mine. The results of this study were contained in the original EIS for the proposed mine [GCNRC, 2004].

As the earlier survey was carried out over a much larger area it was considered prudent to more closely survey the occurrences of the community on 'Railway View'.

The property was inspected on 4<sup>th</sup> January, 2009 and all remnant tree communities were examined.

## SURVEY RESULTS

During the inspection, areas of remnant native tree vegetation were described in detail and additional brief notes taken on the areas between the sites described in detail.

Details of the described sites are contained in **Table 1**.

**Table 1**  
**Descriptions of Remnant Woodland Site on 'Railway View', Werris Creek.**

SITE	EASTING	NORTHING	DETAILS OF COMMUNITY
1	277043E	6523046N	T15-50 White Box [ <i>Eucalyptus albens</i> ]; Shrubs absent; excellent pasture cover of Plains Grass [ <i>Austrostipa aristiglumis</i> ], Purple Wiregrass [ <i>Aristida ramosa</i> ], Red Grass [ <i>Bothriochloa macra</i> ], Tah Vine [ <i>Boerhavia dominii</i> ], Slender Dock [ <i>Rumex brownii</i> ]; some weeds including Saffron Thistle [ <i>Carthamus lanatus</i> *], Barley Grass [ <i>Hordeum leporinum</i> ]*, Couch Grass [ <i>Cynodon dactylon</i> ]*
2	276939E	6523082N	T5 – 10 Tumbledown Gum [ <i>Eucalyptus dealbata</i> ], Shrubs – occasional Native Blackthorn [ <i>Bursaria spinosa</i> ]; excellent pasture cover of Purple Wiregrass, Wallaby Grass [ <i>Austrodanthonia</i> spp.], Cotton Panic [ <i>Digitaria brownii</i> ], Spear grass [ <i>Austrostipa</i> sp.], Bottlewashers [ <i>Enneapogon</i> sp.], Australian Bindweed [ <i>Convolvulus erubescens</i> ], Windmill Grass [ <i>Chloris truncata</i> ], Tall Chloris [ <i>Chloris ventricosa</i> ], Woolly Cloak Fern [ <i>Cheilanthes lasiophylla</i> ], Bluebell [ <i>Wahlenbergia</i> sp.], Joyweed [ <i>Alternanthera</i> sp.]; weeds include Paddys Lucerne [ <i>Sida rhombifolia</i> ]*
3	277434E	6523594N	All White Box; Shrubs absent; excellent cover of pasture species – same as for site 2.
4	277355E	6524019N	All White Box; Shrubs absent; excellent cover of pasture species – same as for site 2; occasional Bathurst Burrs [ <i>Xanthium spinosum</i> ]*
5	277434E	6523594N	Looking east into cultivation paddock to the east; T10-20 White Box; Shrubs absent; native pasture ploughed out, mainly weeds including Queen Anne's Lace [ <i>Ammi majus</i> ]*, Thornapple [ <i>Datura</i> sp.]*, Sowthistle [ <i>Sonchus oleraceus</i> ]*, Prickly Lettuce [ <i>Lactuca serriola</i> ]*, Mintweed [ <i>Salvia reflexa</i> ]*, Turnip Weed [ <i>Rapistrum rugosum</i> ]*, St. Barnaby's Thistle [ <i>Centaurea solstitialis</i> ]*, Bathurst Burr*
6	277176E	6524039N	T5-100 White Box plus some regeneration to 50cm high; Shrubs absent; excellent cover of pasture species – same as for site 2 plus Slender Bamboo Grass [ <i>Austrostipa verticillata</i> ], Tufted Bluebell [ <i>Wahlenbergia communis</i> ];
7	277175E	6522979N	T<5-50 White Box; Shrubs absent; excellent cover of pasture species – same as for site 2 plus Scrub Nettle [ <i>Urtica incisa</i> ];
8	277136E	6522432N	White Box surrounding a patch of Tumbledown Gum on the crest of a rocky knob; excellent cover of pasture species – same as for site 2; some weeds present including Spear Thistle [ <i>Cirsium vulgare</i> ]* and St. Barnaby's Thistle*.
<p>'T' followed by a number – denotes average spacing in metres between trees * - denotes introduced species</p>			

**Table 1 [cont]**  
**Descriptions of Remnant Woodland Site on 'Railway View', Werris Creek.**

SITE	EASTING	NORTHING	DETAILS OF COMMUNITY
9	277208E	6522432N	White Box and Yellow Box [ <i>Eucalyptus melliodora</i> ] mainly in drainage flat, occasional White Cypress Pine [ <i>Callitris glaucophylla</i> ]; Occasional Miljee [ <i>Acacia oswaldii</i> ]; good pasture cover of Plains Grass, Slender Bamboo Grass, Queensland Bluegrass [ <i>Dichanthium sericeum</i> ], Red Grass, Scrub Nettle, Purple Wiregrass, Club-rush [ <i>Scirpus</i> sp.]; weeds include St Barnaby's Thistle*.
10	276995E	6522344N	Yellow Box trees and much regeneration of Yellow Box [50cm to 10m high]; Shrubs absent; patches of Plains Grass and Queensland Bluegrass; odd patches of previously recorded weeds present
11	276618E	6522932N	Trees and shrubs absent I cultivation paddock; pasture species mainly weeds including, Sorghum sp., Queen Anne's Lace,* Mintweed*, Bathurst Burr*, St Barnaby's Thistle*, Turnip Weed*, Swan Plant [ <i>Gomphocarpus fruticosus</i> ]*
12	276648E	6523759N	Tumbledown Gum on low rocky areas just south of this point.
13	276889E	6524347N	Tumbledown Gum on rocky knob just south of this gate.
14	276953E	6524471N	Tumbledown Gun in a tongue extending south of boundary fence to northeast of this point; scattered White Box in open areas around base of ridge; good pasture cover of Purple Wiregrass, Red Grass, Queensland Bluegrass, Bottlewashers, Wallaby Grass, and Plains Grass; weeds include Mintweed*, Proliferous Pink [ <i>Petrorhagia nantueillii</i> ]*, Saffron Thistle*
15	277000E	6524328N	Rocky knob with Kurrajong [ <i>Brachchiton populneus</i> ]; Inland Wonga Vine [ <i>Pandorea pandorana</i> ], <i>Pimelea novae-anglica</i> .; White Box on hill to the east of this point
16	276181E	6523911N	'Railway View' front gate at railway line.
'T' followed by a number – denotes average spacing in metres between trees * - denotes introduced species			

# Appendix 2

## List of Flora Species Recorded

(No. of pages excluding this page = 3)

*Acacia decora* [Western Golden Wattle]  
*Alectryon oleifolium* [Rosewood]  
*Alternanthera repens*\* [Khaki Weed]  
*Amaranthus mitchellii* [Boggabri]  
*Anagallis arvensis*\* [Scarlet Pimpernell]  
*Arctotheca calendula*\* [Capeweed]  
*Aristida ramosa* [Purple Wire Grass]  
*Aristida* sp. [Wiregrass]  
*Atriplex spinibractea* [Spiny-fruit Saltbush]  
*Austrodanthonia duttoniana* [Wallab Grass]  
*Austrodanthonia richardsonii* [Wallaby Grass]  
*Austrodanthonia* sp. [Wallaby Grass]  
*Austrostipa aristiglumis*. [Plains Grass]  
*Austrostipa* sp. [Speargrass]  
*Austrostipa verticillata* [Slender Bamboo Grass]  
*Avena sativa*\* [Oats]  
*Avena* sp.\* [Wild Oats]  
*Bidens subalternans*\* [Greater Beggar's Ticks]  
*Boerhavia dominii* [Tah Vine]  
*Bothriochloa macra* [Red Grass]  
*Brachychiton populneus* [Kurrajong]  
*Bromus catharticus*\* [Prairie Grass]  
*Bromus molliformis*\* [Silky Brome]  
*Bulbine bulbosa*[Native Leek]  
*Calotis lappulacea* [Yellow Burr-daisy]  
*Capsella bursa-pastoris*\* [Shepherd's Purse]  
*Carthamus lanatus*\* [Saffron Thistle]  
*Cenchrus incertus*\* [Spiny Burrgrass]  
*Centaurea solstitialis*\* [St. Barnaby's Thistle]  
*Chamaesyce drummondii* [Caustic Weed]  
*Cheilanthes sieberi* [Rock Fern]  
*Chenopodium* sp. [Crumbweed].  
*Chloris truncata* [Windmill Grass]  
*Chloris ventricosa* [Tall Chloris]  
*Chondrilla juncea*\* [Skeleton Weed]  
*Cirsium vulgare*\* [Spear Thistle]  
*Convolvulus erubescens* [Australian Bindweed]  
*Conyza bonariense*\* [Flaxleaf Fleabane]  
*Crassula sieberiana* [Australian Stonecrop]  
*Cynodon dactylon*\* [Couch Grass]  
*Desmodium varians*[Slender Tick-trefoil]  
*Dichanthium sericeum* [Queensland Bluegrass]  
*Dichelachne* sp. [Plume Grass]  
*Dichondra repens* [Kidney Weed]  
*Dichopogon* sp. [Chocolate Lily]  
*Digitaria brownii* [Cotton Panic]  
*Digitaria divaricatissima* [Umbrella Grass]  
*Dittrichia graveolens*\* [Stinkwort]  
*Echinochloa colonum*\* [Barnyard Grass]  
*Echium plantagineum*[Paterson's Curse]  
*Einadia hastata* [Saloop]  
*Einadia nutans* [Climbing Saltbush]  
*Elymus scaber* [Common Wheatgrass]  
*Enneapogon gracilis* [Slender Bottlewashers]

*Enteropogon acicularis* [Curly Windmill Grass]  
*Eragrostis cilianensis*\* [Stinking Lovegrass]  
*Eragrostis molybdea* [Granite Lovegrass]  
*Erodium crinitum* [Blue Crowfoot]  
*Eucalyptus albens* [White Box]  
*Eucalyptus blakelyi* [Blakely's Red Gum]  
*Eucalyptus melliodora* [Yellow Box],  
*Foeniculum vulgare*\* [Fennel]  
*Geranium* sp. [Storksbill]  
*Glycine stenophylla*  
*Gomphocarpus fruticosus*\* [Swan Plant]  
*Goodenia* sp.  
*Hedypnois rhagadioloides* subsp. *cretica*\* [Cretan Weed]  
*Hordeum leporinum*\* [Barley Grass]  
*Hydrocotyle laxiflora* [Stinking Pennywort]  
*Hypericum perforatum*\* [St John's Wort]  
*Hypochaeris radicata*\* [Flatweed]  
*Juncus* sp. [Rush]  
*Lactuca serriola*\* [Prickly Lettuce]  
*Lamarckia aurea*\* [Golden Top]  
*Lepidium africanum*\* [Peppercress]  
*Linum marginale* [Native Flax]  
*Lolium rigidum* [Annual Ryegrass]  
*Lomandra* sp. [Matrush]  
*Maireana microphylla* [Eastern Cottonbush]  
*Malva parviflora*\* [Small-flowered Mallow]  
*Marrubium vulgare*\* [Horehound]  
*Medicago minima*\* [Small Woolly Borr Medic]  
*Medicago sativa*\* [Lucerne]  
*Medicago scutellata*\* [Snail Medic]  
*Medicago truncatula*\* [Barrel Medic]  
*Oxalis* sp.\* [Wood Sorrel]  
*Paspalidium constrictum* [Box Grass]  
*Paspalum dilatatum*\* [Paspalum]  
 Perennial Grass  
*Petrorhagia nanteuillii*\* [Proliferous Pink]  
*Physalis* sp.\* [Ground Cherry]  
*Plantago lanceolata*\* [Ribwort]  
*Polygonum* sp. [Wireweed]  
*Portulaca oleracea* [Munyeroo]  
*Rapistrum rugosum*\* [Wild Turnip]  
*Rostraria cristata*\* [Annual Cat's Tail]  
*Rumex brownii* [Slender Dock]  
*Salvia verbenaca* [Wild Sage]  
*Schkuhria pinnata* var. *abrotanoides*\* [Dwarf Marigold]  
*Scirous* sp. [Club-rush]  
*Sida corrugata* [Corrugated Sida]  
*Sida rhombifolia*\* [Paddys Lucerne]  
*Sida spicata*  
*Sida spinosa*  
*Silybum marianum*\* [Variegated Thistle]  
*Sisymbrium* sp.\* [Wild Mustard]  
*Solanum ciereum* [Narrawa Burr]  
*Solanum nigrum*\* [Black Nightshade]

*Sonchus oleraceus*\* [Common Sowthistle]  
*Sporobolus elongatus* [Western Ratstail Grass]  
*Tragus australianus* [Small Burr Grass]  
*Tribulus terrestris* [Cathead]  
*Trifolium angustifolium*\* [Narrow-leaf Clover]  
*Trifolium arvense*\* [Haresfoot Clover]  
*Trifolium campestre*\* [Hop Clover]  
*Trifolium dubium*\* [Yellow Suckling Clover]  
*Trifolium glomeratum* [Cluster Clover]  
*Urtica incisa* [Scrub Nettle]  
*Verbena bonariensis*\* [Wild Stattice]  
*Verbena* sp.\* [Verbena]  
*Vittadinia cecularis* var. *cervicularis* [New Holland Daisy]  
*Vittadinia muelleri* [New Holland Daisy]  
*Vittadinia* sp. [New Holland Daisy]  
*Wahlenbergia communis* [Tufted Bluebell]  
*Xanthium spinosum*\* [Bathurst Burr]