

NAMOI MINING PTY LTD

ABN: 24 071 158 373

Sunnyside Coal Project

via Gunnedah



Flora Assessment

Prepared by

**Geoff Cunningham Natural Resource Consultants
Pty Ltd**

October, 2007

**Specialist Consultant Studies Compendium
Part 8**

Flora Assessment

of the Sunnyside Coal Project via Gunnedah

Prepared for: Olsen Environmental Consulting Pty Ltd
6/25 Victoria Street
WOLLONGONG NSW 2500
PO Box 101
FIGTREE NSW 2525

Tel: 02 4228 3144
Fax: 02 4294 1948
Email: olsen@oeconsulting.com.au

On behalf of: Namoi Mining Pty Ltd
PO Box 600
GUNNEDAH NSW 2380

Tel: 02 6742 4337
Fax: 02 6742 3607
Email: CBurgess@whitehaven.net.au

Prepared by: Geoff Cunningham Natural Resource Consultants Pty Ltd
9 The Crest
KILLARA NSW 2071

Tel: 02 9416 1995
Fax: 02 9416 6626
Email: geoffcun@bigpond.net.au

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EXECUTIVE SUMMARY

Nine vegetation communities have been identified within the Study Area that includes both the Project Site and adjacent areas potentially affected by the proposed mine and facilities as well as the proposed transport route along a re-aligned Coochooboonah Lane to the Oxley Highway.

On the basis of:

- the flora surveys conducted over the Study Area in October and December , 2006;
- the assessment of the data obtained from the National Parks and Wildlife Service and Commonwealth EPBC Act databases; and
- the details of Endangered Ecological Communities provided by the Scientific Committee,

it is concluded that no threatened flora species or endangered flora populations exist within the Study Area.

A remnant of the White Box Yellow Box Blakely's Red Gum Woodland endangered ecological community occurs within the Study Area but would not be affected in any significant manner by the Project.

A remnant of the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community occurs within the Study Area. A small section of this would be temporarily affected by the proposed Coochooboonah Lane re-alignment but the community would be rehabilitated and enhanced following rehabilitation after mining ceases. It has been assessed that this action, due to its temporary impact and final environmental enhancement does not require approval under the Commonwealth EPBC Act.

Much of the Study Area has been cleared in the past and most of this cleared area has been cultivated. The vegetation on the cleared areas is relatively heavily invaded by introduced plants

Completion of the 7-Part Test indicates that there would be no significant impact on any threatened flora species, endangered flora populations, endangered ecological communities or Critical Habitat resulting from development of the proposed coal mine.

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1 INTRODUCTION AND DESCRIPTION OF THE STUDY AREA

This flora assessment was undertaken for Olsen Environmental Consulting Pty Ltd on behalf of Namoi Mining Pty Ltd [NMPL]. It covers the proposed Sunnyside Coal Mine site and the proposed coal transport route through 'Plain View' property to the east of, and parallel to, Coocooboonah Lane. The Study Area for this flora assessment is located approximately 15km west of Gunnedah to the north of the Oxley Highway [and the old Gunnedah No. 5 Colliery surface facilities] and east and west of the Coocooboonah Lane [see **Figure 1**].

The flora assessment Study Area covers approximately 160ha of the 'Sunnyside' property along with a proposed coal transport route corridor through "Plain View" property and as shown in **Figure 2**. In the north, the Study Area comprises open, cleared gently sloping to almost level country. Almost all of this area has been or is presently being used for cropping and pasture.

The southern section of the 'Sunnyside' property comprises a rocky scarp leading to a more hilly area that slopes to the south. This section comprises a mosaic of remnant native vegetation, cleared [previously farmed] land that is regenerating to native trees and shrubs and a bare eroded area that appears to have been used as a gravel quarry or for some similar purpose in the past.

Field sampling of the area was carried out on the 2nd, 3rd and 4th October and 19th December, 2006.

2 PROJECT DESCRIPTION

NMPL proposes to establish an open cut mine on the 'Sunnyside' property capable of producing up to 1.0Mtpa. The location of the proposed mine is shown in **Figure 1**. **Figure 2** shows the Project Site which covers approximately 231ha.

Figure 3 displays the Project Site layout for the proposed Sunnyside Coal Mine.

The Project Site would contain the open cut area, the out-of-pit emplacement, run-of-mine (ROM) coal pad, site facilities, various roads and tracks. There is also a proposed coal transport route to the east of Coocooboonah Lane immediately adjacent to the Project Site.

The Project Site is located on a north-facing area of sloping ground that has been extensively cleared for agriculture. The area has previously been used for cropping and grazing purposes and has been subject to rotational agricultural practices.

The open cut area is located upslope from the out-of-pit emplacement.

Surface runoff water from the catchment above the open cut area would be directed around the open cut pit in a series of diversion drains, dams and waterways. This water would pass through the Project Site in a series of waterways and sedimentation dams. Some of the water would be used to augment the water supply for site operations.

It is proposed to construct an amenity bund along the northern and western boundaries of the ROM coal pad and truck loading bin.

The out-of-pit emplacement would be located downslope and immediately to the north of the open cut pit. Once there is adequate capacity in the open cut pit, overburden would be backfilled within the pit. This would result in creation of a permanent out-of-pit emplacement, a recontoured area across the open cut area and a final void which represents the general shape of the pit at the completion of mining. It is proposed to shape the final void at the completion of mining. The maximum slope planned for the out-of-pit emplacement and the final void is 10 degrees.

During open cut operations, the potential to undertake some highwall auger mining would be assessed.

There would be a small area immediately downslope of the out-of-pit emplacement on which soil would be temporarily stockpiled. This soil would be prestripped from the area prior to commencing dumping on the out-of-pit emplacement and segregated into topsoil and subsoil components. It would be sequentially placed over the surface of the out-of-pit emplacement to promote better rehabilitation and revegetation.

The proposed site access road would enter the Project Site from the 'Plain View' property to the north of Coccooboonah Lane and would cross the Coccooboonah Lane at the northeast corner of the 'Sunnyside' property. This road would provide access to the site facilities.

The site facilities would consist of transportable offices, bath-house, crib room, fuel and lubricants storage facility, stores and first aid buildings, enclosed workshop facility, equipment laydown and park up area and a light vehicle car park for the projected workforce of 24 full-time and 7 part-time employees.

Power to the Project Site would be provide by on site diesel-powered generators. Bath-house and potable water would be provided from off-site. An existing rural power supply to the 'Sunnyside' homestead would be re-located to service the proposed mine office and associated buildings.

Dust suppression water would be provided and stored on site in appropriately located dams. This water would be derived from both run-off harvesting and from in-pit groundwater seepage and runoff capture. When required, these water sources would be augmented by water pumped via a bore from the Gunnedah Coal Mine No 5 Entry underground workings.

ROM coal would be removed from the open cut pit in trucks and deposited on the ROM coal pad. Coal would be crushed and blended on the ROM coal pad. There may be occasional need to undertake secondary blending at the Whitehaven Coal Handling and Preparation Plant (CHPP) and Rail Loading Facility.

Blended and crushed ROM coal would be loaded onto coal trucks via a bin located over a loop in the access road. A front-end loader would load coal onto an elevator conveyor via a hopper. The conveyor would deliver the coal into the load out bin from where it would be loaded into road trucks for delivery to the Whitehaven CHPP and RLF.

Coal trucks of nominal 28t or 40t capacity would be loaded at Sunnyside under the bin adjacent to the ROM coal pad. They would leave the property and cross over the existing Coochoonah Lane via an at-grade crossing and proceed along the re-aligned Coochoonah Lane approximately 100m north of and parallel to Coochoonah Lane.

Approximately 450m before the existing intersection of Coochoonah Lane with the Oxley Highway, the transport corridor would rejoin Coochoonah Lane.

Trucks would turn left out of Coochoonah Lane and proceed along the Oxley Highway before turning left into Blackjack Road. Blackjack Road was used in the past to transport coal from the Gunnedah Colliery to the old Gunnedah Mine rail siding opposite the Whitehaven CHPP. At the end of Blackjack Road, trucks would turn right into Quia Road. They would then turn left and pass under a rail overpass, then immediately turn left again into Torrens Road and proceed directly to the Whitehaven CHPP.

The trucks would unload at this site and would return to the Sunnyside Mine along the same route. Unloaded Sunnyside coal would be blended and prepared for loading onto trains through the Whitehaven Rail Loading Facility.

3 SURVEY METHODOLOGY

The Study Area was subjected to stereoscopic interpretation of 1: 25,000 scale colour airphotos prior to, and during, the field survey to determine vegetation community features and boundaries.

The photographs used were those produced by the Department of Lands. The prints used in the stereoscopic interpretation were Boggabri Run 13, Print Nos. 181, 182 and 183. flown 3rd May, 2005.

The different landforms and vegetation communities identified through stereoscopic airphoto interpretation were then sampled in the field to ascertain the variation in species density and composition within these communities.

A total of 46 sample sites were described within the Study Area [see **Figure 4**]. At each of these sites, the species composition data was recorded. At these selected sites, quadrats 40m X 40 m in area were examined to record the occurrence of all ground cover species present.

4 VEGETATION OF THE STUDY AREA

4.1 Previous Botanical Studies

4.1.1 General Information

The Study Area is situated in a region that generally has received little detailed attention in terms of botanical surveys in the past. However, there are some published sources of information on the vegetation of the region.

The information provided by these publications is summarized in the following sections.

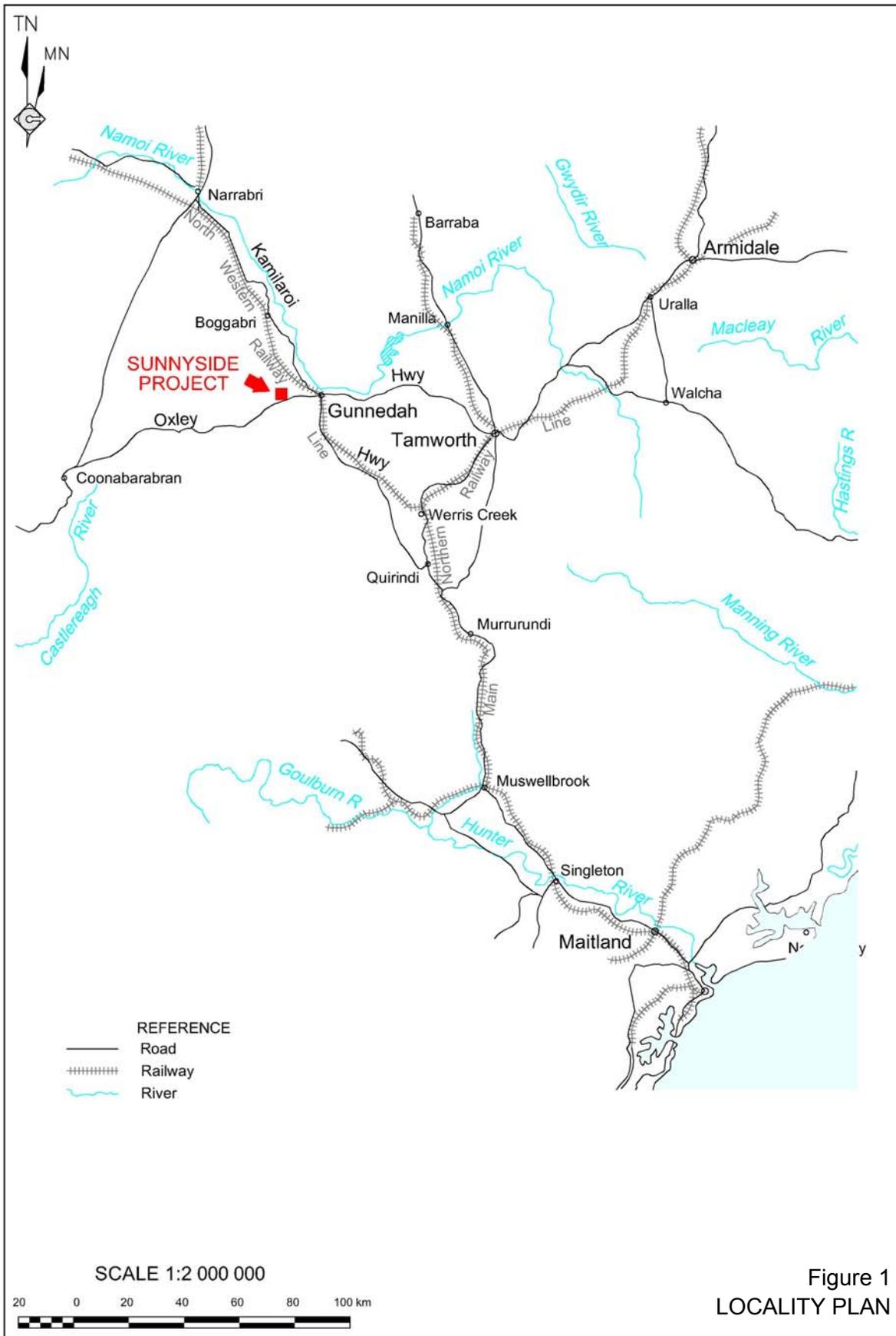
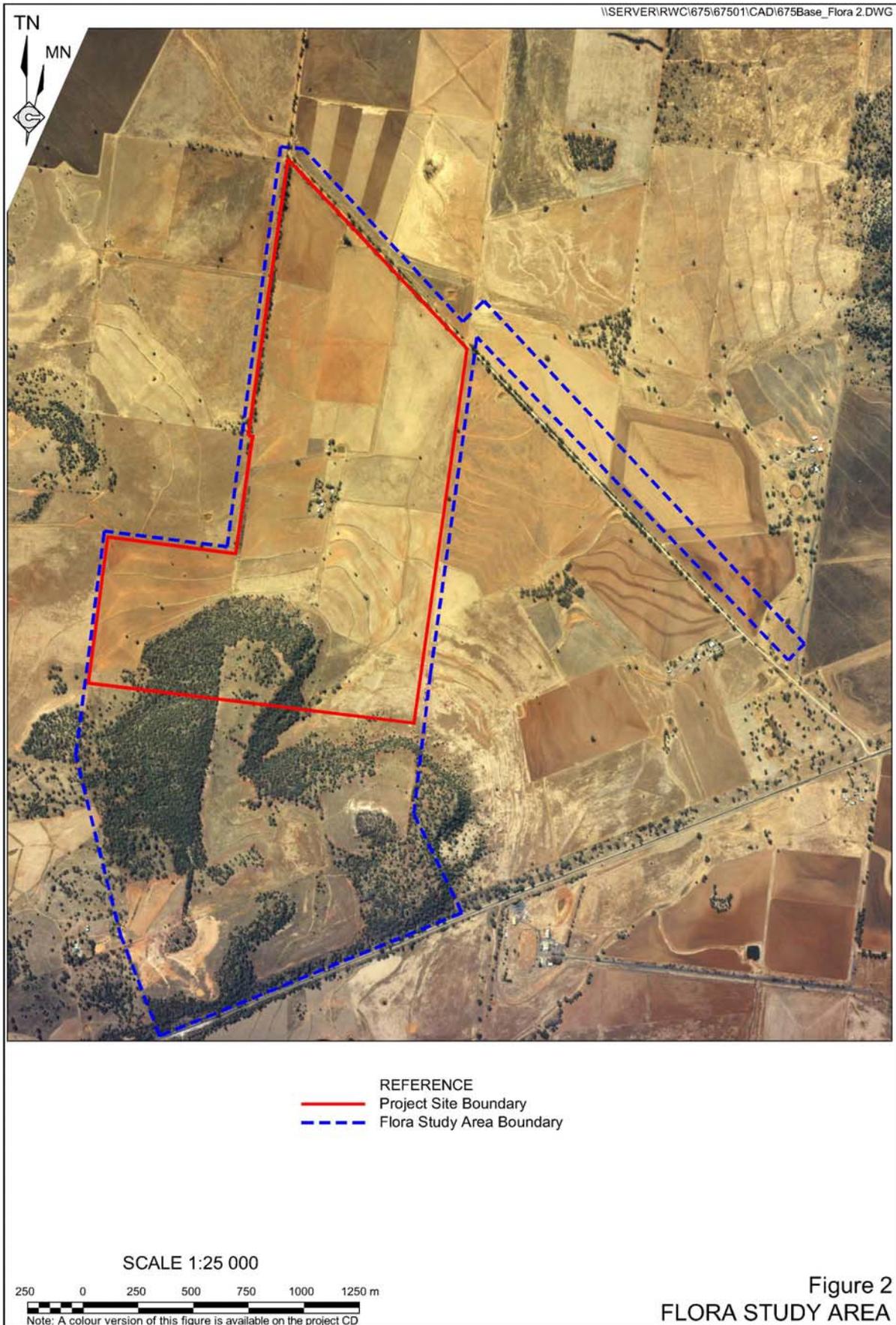
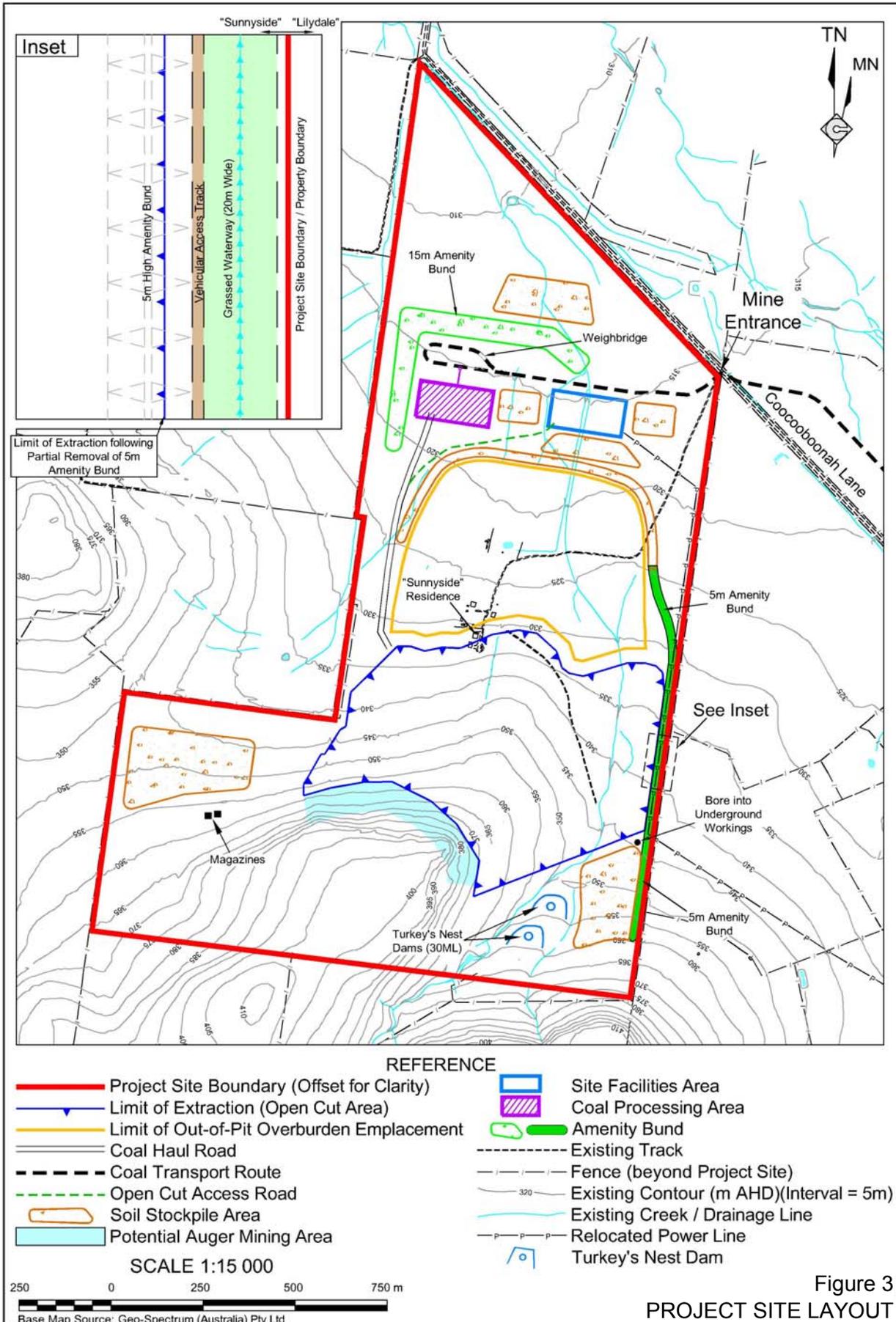


Figure 1
 LOCALITY PLAN

Figure Prepared by R.W. Corkery & Co. Pty Ltd
 Note: A colour version of this figure is presented on the Project CD



Note: A colour version of this figure is presented on the Project CD



4.1.2 Soil Conservation Service Gunnedah District Technical Manual

The Study Area lies within the area covered by the Gunnedah District Technical Manual published by the former Soil Conservation Service of New South Wales [Anon, 1976].

The Gunnedah District Technical Manual indicates that the Study Area lies near the boundary between two mapped communities – the White Cypress Pine [*Callitris glaucophylla*] Tall Woodland / Shrub Woodland and the Yellow Box [*Eucalyptus melliodora*] White Box [*Eucalyptus albens*] Bimble Box [*Eucalyptus populnea* subsp. *bimbil*] Tall Woodland / Savannah Woodland. Details of these two communities are provided in sections 4.1.2.1 and 4.1.2.2.

4.1.2.1 White Cypress Pine [*Callitris glaucophylla*] Tall Woodland / Shrub Woodland Community

The dominant species is *Callitris glaucophylla* [White Cypress Pine] with subdominants including *Eucalyptus crebra* [Narrow-leaf Ironbark], *Eucalyptus albens* [White Box], *Eucalyptus melliodora* [Yellow Box], *Eucalyptus blakelyi* [Blakely's Red Gum], *Eucalyptus dealbata* [Tumbledown Gum], *Acacia cheelii* [Motherumbah] . *Brachychiton populneus* [Kurrajong] and *Casuarina cristata* [Belah].

The grass flora within this community is composed mainly of *Aristida* spp. [Wire Grasses] , *Austrostipa* spp. [Spear Grasses], *Cymbopogon refractus* [Barbed-wire Grass], *Eragrostis* spp. [Lovegrasses] and *Bothriochloa decipiens* [Pitted Bluegrass].

4.1.2.2 Yellow Box [*Eucalyptus melliodora*] White Box [*Eucalyptus albens*] Bimble Box [*Eucalyptus populnea* subsp. *bimbil*] Tall Woodland / Savannah Woodland Community

The dominant species are *Eucalyptus melliodora* [Yellow Box], *Eucalyptus albens* [White Box] and *Eucalyptus populnea* ssp. *bimbil* [Bimble Box].

Subdominant tree species that occur within this community include *Casuarina cristata* [Belah], *Eucalyptus camaldulensis* [River Red Gum], *Eucalyptus blakelyi* [Blakely's Red Gum], *Alectryon oleifolius* [Rosewood], *Acacia aneura* [Mulga], *Geijera parviflora* [Wilga], *Angophora floribunda* [Rough-barked Apple], *Casuarina cristata* [Belah], *Eucalyptus blakelyi* [Blakely's Red Gum], *Brachychiton populneus* [Kurrajong], *Acacia pendula* [Myall] and *Eucalyptus camaldulensis* [near present and prior streams].

The grass flora within this community is composed mainly of *Aristida* spp. [Wire Grasses], *Austrostipa* spp. [Plains Grass], *Bothriochloa macra* [Red Grass], *Eragrostis* spp. [Lovegrasses], *Panicum* spp. [Panics] and *Dichanthium sericeum* [Queensland Bluegrass].

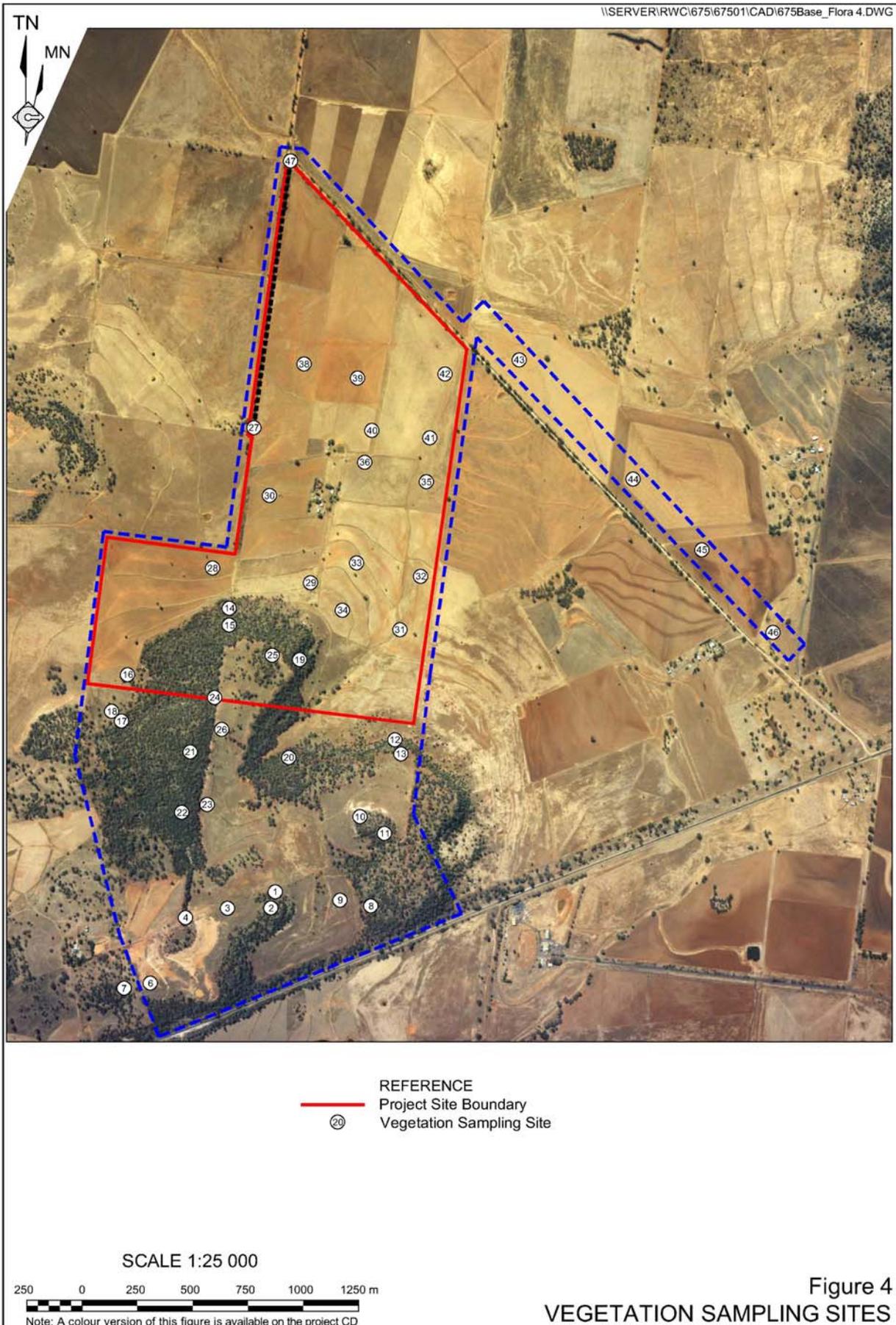


Figure Prepared by R.W. Corkery & Co. Pty Ltd

Note: A colour version of this figure is presented on the Project CD

Geoff Cunningham Natural Resource Consultants Pty Ltd

4.1.3 Department of Land and Water Conservation [now Department of Natural Resources [DNR]] Mapping

In 2003, the Department of Land and Water Conservation published a vegetation survey report and map [Cannon *et al*, 2003] covering the Bellata, Gravesend, Horton and Boggabri 1: 100 000 scale map sheet areas.

This report covers the present Study Area, albeit at the rather broad scale of 1: 100 000 and identifies two vegetation communities within the Study Area boundaries.

These are:

- White Cypress [*Callitris glaucophylla*] and Ironbark [*Eucalyptus crebra*] Forest: [Community 1b]; and
- Non-Native Vegetation [Community 5a].

4.1.3.1 White Cypress [*Callitris glaucophylla*] and Ironbark [*Eucalyptus crebra*] Forest

Cannon *et al* [2003] note that the canopy species within this community include *Callitris glaucophylla* [White Cypress Pine], *Eucalyptus crebra* [Narrow-leaf Ironbark], *Eucalyptus albens* [White Box], *Eucalyptus dealbata* [Tumbledown Gum], *Eucalyptus melanophloia* [Silver-leaf Ironbark] and *Brachychiton populneus* [Kurrajong].

The shrub layer includes *Notelaea microcarpa* [Native Olive], *Geijera parviflora* [Wilga], *Acacia cheelii* [Motherumbah], *Acacia leiocalyx*, *Alphitonia excelsa* [Red Ash], *Pittosporum angustifolium* [Butterbush], *Pimelea neo-anglica*, *Beyeria viscosa* [Sticky Wallaby Bush], *Leucopogon muticus*, *Acacia deanei* [Deane's Wattle], *Acacia buxifolia* [Box-leaved Wattle], *Olearia elliptica* [Sticky Daisy Bush], *Cassinia laevis* [Cough Bush], *Dodonaea viscosa* [Broad-leaf Hopbush], *Melichrus urceolatus* [Urn Heath] and *Hibbertia obtusifolia* [Hoary Guinea-flower].

Two vines, *Parsonsia eucalyptophylla* [Gargaloo] and *Pandorea pandorana* [Inland Wonga Vine] were also recorded.

The ground layer species *Austrostipa scabra* [Rough Speargrass], *Austrodanthonia racemosa* [Wallaby Grass], *Cymbopogon refractus* [Barbed Wire Grass], *Paspalidium gracile* [Slender Panic], *Dichelachne micrantha* [Short-haired Plume Grass], *Aristida gracilipes*, *Aristida ramosa* [Purple Wiregrass], *Enneapogon gracilis* [Slender Bottlewashers], *Bothriochloa decipiens* [Pitted Bluegrass], *Notodanthonia longifolia*, *Leptochloa ciliolata* [Fine Canegrass], *Poa sieberana* [Fine-leaf Tussock Grass], *Cyperus gracilis*, *Lomandra filiformis* [Matrush], *Desmodium brachypodum* [Large Tick-trefoil], *Desmodium varians* [Slender Tick-trefoil], *Dichondra* sp. A [Kidney Weed], *Glycine tabacina* [Variable Glycine], *Rostellularia adscendens* [Pink Tongues], *Oxalis perennans* [Wood Sorrel], *Vittadinia muelleri* [Fuzzweed], *Vittadinia dissecta* [Fuzzweed], *Boerhavia dominii* [Tar Vine], *Calotis lappulacea* [Yellow Burr-daisy], *Brunoniella australis* [Blue Trumpets], *Stackhousia muricata* [Western Stackhousia], *Phyllanthus virgatus*, *Wahlenbergia communis* [Tufted Bluebell], *Wahlenbergia planiflora* [Bluebell], *Glossogyne tannensis*, *Sida corrugata* [Corrugated Sida], *Scutellaria humilis*, *Plantago debilis* [Shade Plantain], *Cheilanthes sieberi* [Rock Fern] and *Cheilanthes distans* [Bristly Cloak Fern].

4.1.3.2 Non-Native Vegetation Community

These lands are those that have been cleared of native vegetation usually for the growing of crops and improved pastures.

4.2 The Present Study

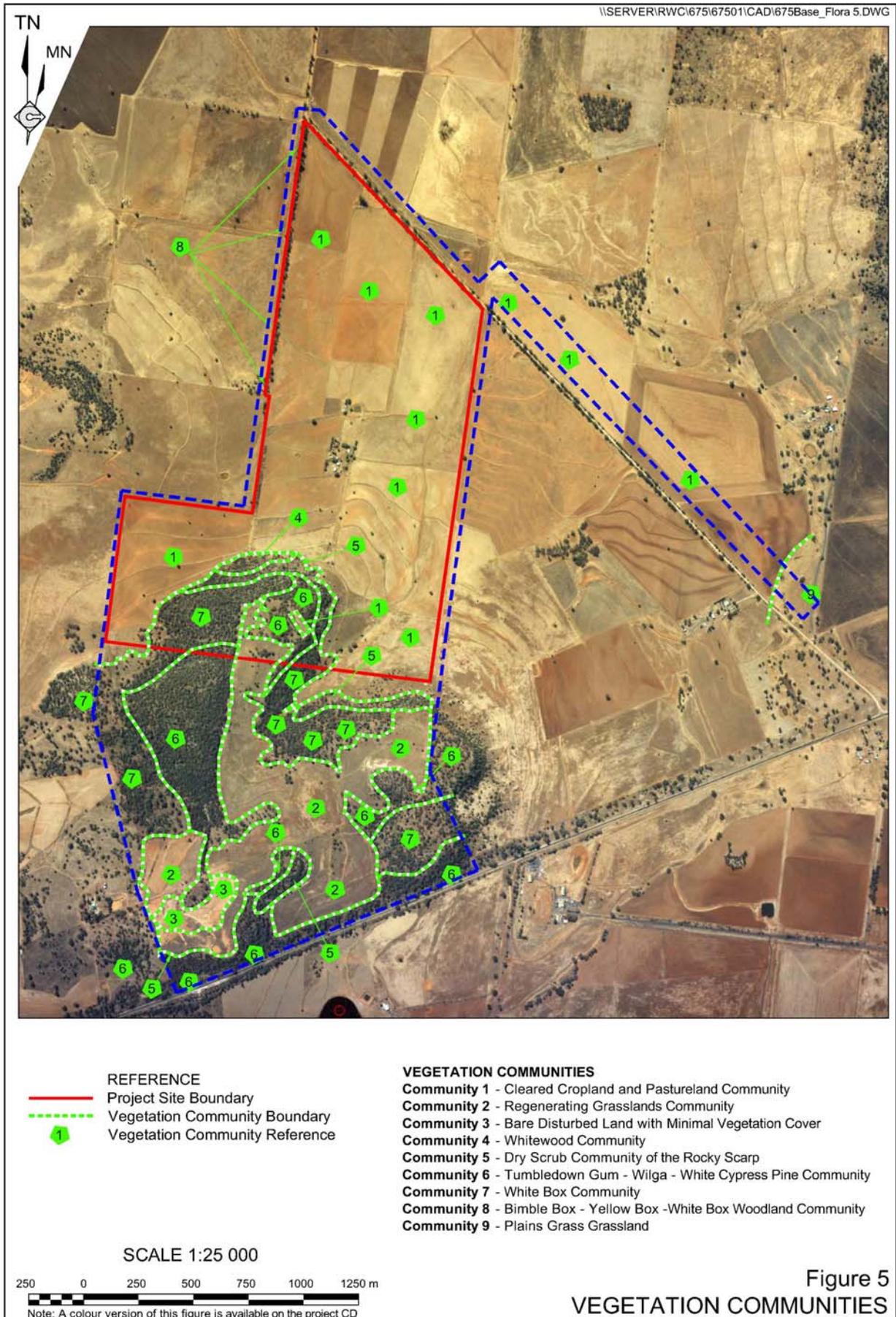
The present field study identified nine separate vegetation communities within the Study Area. The boundaries of each of these communities is shown on **Figure 5**.

These vegetation communities are:

- **Community 1** – Cleared Cropland and Pastureland Community
- **Community 2** – Regenerating Grasslands Community
- **Community 3** – Bare Disturbed Land with Minimal Vegetation Cover
- **Community 4** – *Atalaya hemiglauca* [Whitewood] Community
- **Community 5** – Dry Scrub Community of the Rocky Scarp
- **Community 6** – *Eucalyptus dealbata* [Tumbledown Gum] – *Geijera parviflora* [Wilga] – *Callitris glaucophylla* [White Cypress Pine] Community
- **Community 7** – *Eucalyptus albens* [White Box] Community
- **Community 8** – *Eucalyptus populnea* subsp. *bimbil* [Bimble Box] – *Eucalyptus melliodora* [Yellow Box] - *Eucalyptus albens* [White Box] Woodland Community
- **Community 9** - Degraded *Austrostipa aristiglumis* [Plains Grass] Grassland

Details of the location of each quadrat [GPS easting / northing] and the tree and shrub species present at each quadrat are contained in **Table 1**. A complete list of all species [trees, shrubs, vines, parasites, ground covers] recorded at the Study Area is contained in *Appendix 1*.

NOTE: * denotes an introduced species



4.2.1 Community 1 – Cleared Cropland and Pastureland

[Quadrats 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45]

This community is almost completely cleared of trees and shrubs and has been cropped in the past. Some of the area was under crop at the time of inspection while the remainder supported sown and naturalized pasture.

Scattered *Brachychiton populneus* [Kurrajong] and *Callitris glaucophylla* [White Cypress Pine] trees are present on some sections. Near the homestead and sheds *Schinus ariera* [Pepper Tree]* and *Melia azedarach* [White Cedar] trees have been planted. *Maireana microphylla* [Eastern Cottonbush] shrubs occur on the areas that have not been cropped for some time

The main ground cover species include *Avena* sp. [Oats], *Carthamus lanatus* [Saffron Thistle]*, *Chondrilla juncea* [Skeleton Weed]*, *Heliotropium europaeum* [Common Heliotrope]*, *Hordeum leporinum* [Barley Grass]*, *Lamarckia aurea* [Golden Top]*, *Lepidium africanum* [Peppergrass]*, *Lolium rigidum* [Annual Ryegrass]*, *Medicago minima* [Small Woolly Burr Medic]*, *Medicago sativa* [Lucerne]*, *Sisymbrium* sp. [Mustard Weed]*, *Vittadinia* spp. [New Holland Daisy / Fuzzweed], *Aristida ramosa* [Purple Wiregrass], *Arctotheca calendula* [Capeweed]*, *Einadia hastata* [Saloop]. and *Wahlenbergia communis* [Tufted Bluebell].

A complete listing of the species recorded in the quadrats within this community is contained in **Table 2**.

4.2.2 Community 2 – Regenerating Grasslands

[Quadrats 3, 6, 9, 13, 18, 23, 26]

This community comprises land that has been cleared for grazing and cropping in the past and which is presently supporting a cover of regenerating native tree and shrub species.

Some scattered trees are present including *Brachychiton populneus* [Kurrajong], *Eucalyptus dealbata* [Tumbledown Gum], *Callitris glaucophylla* [White Cypress Pine], *Eucalyptus albens* [White Box] and *Geijera parviflora* [Wilga]. Regeneration of White Cypress Pine is common and on more elevated land near the ridge tops regeneration of *Acacia cheelii* [Motherumbah] is present.

Shrub cover is variable and includes *Myoporum montanum* [Western Boobialla], *Maireana microphylla* [Eastern Cottonbush], *Acacia decora* [Western Golden Wattle], *Senna* form taxon 'filifolia' [Punty Bush]

The main ground cover species include *Aristida ramosa* [Purple Wiregrass], *Austrostipa nitida* [Corkscrew Grass], *Austrodanthonia richardsonii* [Wallaby Grass], *Austrodanthonia setacea* [Small-flowered Wallaby Grass], *Bromus molliformis* [Silky Brome]*, *Carthamus lanatus* [Saffron Thistle]*, *Cymbopogon refractus* [Barbed-wire Grass], *Elymus scaber* [Common Wheatgrass], *Wahlenbergia communis* [Tufted Bluebell], *Bracteantha bracteata* [Golden Everlastings], *Calotis lappulacea* [Yellow Burr-daisy], *Lepidium africanum* [Peppergrass]*, *Opuntia* sp. [Prickly Pear]*, *Sida* sp. A [Scrambling Sida], *Hedypnois rhagadioloides* subsp. *cretica* [Cretan Weed]*, *Medicago minima* [Small Woolly Burr Medic]*, *Vittadinia muelleri* [Fuzzweed] and *Vulpia muralis** [Silver Grass].

A complete listing of the species recorded in the quadrats within this community is contained in **Table 2**.

4.2.3 Community 3 – Bare Disturbed Land with Minimal Vegetation Cover [No quadrats]

This area appears to have been used as a gravel source in the past and is almost completely bare. The area is eroded even though soil conservation banks have been constructed.

Volunteer ground cover plants of the species found in surrounding communities were occasionally noted in this generally bare area.

4.2.4 Community 4 – *Atalaya hemiglauca* [Whitewood] Community [Quadrat 14]

This community is confined to a single elongated area below the rocky scarp of the elevated area in the central section of the property.

Trees are spaced <1 to 5m apart and are dominated by *Atalaya hemiglauca* [Whitewood] trees that show evidence of having been lopped for fodder at some time in the past. Other tree species present include *Alectryon oleifolius* [Rosewood], *Geijera parviflora* [Wilga], *Capparis mitchellii* [Wild Orange] and *Alphitonia excelsa* [Red Ash]; Shrubs are spaced 1 to 3m apart and include *Maireana microphylla* [Eastern Cottonbush], *Eremophila mitchellii* [Budda], *Myoporum montanum* [Western Boobialla], *Notelaea microphylla* [Native Olive], *Beyeria viscosa* [Sticky Wallaby-bush] and *Croton phebalioides*.

The main ground cover species are *Austrostipa nitida* [Corkscrew Grass], *Austrostipa verticillata* [Slender Bamboo Grass], *Enteropogon acicularis* [Curly Windmill Grass], *Rhagodia* sp., *Sisymbrium orientale* [Hedge Mustard]*, *Solanum ferocissimum* [Spiny Potato-bush] and *Vittadinia* sp. [New Holland Daisy].

A complete listing of the species recorded in Quadrat 14 within this community is contained in **Table 2**.

4.2.5 Community 5 – Dry Scrub Community of the Rocky Scarp [Quadrats 2, 12, 19]

Trees are usually spaced from 1 to 5m apart, occasionally 5 to 10m. Species include *Acacia doratoxylon* [Currawang], *Acacia cheelii* [Motherumbah], *Alectryon oleifolius* [Rosewood], *Alphitonia excelsa* [Red Ash], *Capparis mitchellii* [Wild Orange], *Eucalyptus albens* [White Box], GUM, *Brachychiton populneus* [Kurrajong], *Callitris glaucophylla* [White Cypress Pine], *Capparis mitchellii* [Wild Orange] and *Geijera parviflora* [Wilga].

Shrubs are generally spaced from 1 to 2m apart. Species include *Alstonia constricta* [Quinine Bush], *Beyeria viscosa* [Sticky Wallaby-bush], *Dodonaea viscosa* subsp. *spatulata* [Broad-leaf Hopbush], *Canthium odoratum* [Iamboto], *Cassinia laevis* [Cough Bush], *Croton phebalioides*, *Ehretia membranifolia* [Peach Bush], *Eremophila mitchellii* [Budda], *Maytenus cunninghamii* [Yellow-berry Bush], *Myoporum montanum* [Western Boobialla], *Notelaea microphylla* [Native Olive], *Indigofera* sp., *Olearia elliptica* [Sticky Daisy-bush], *Pimelea neo-anglica* [Poison Pimelea] and *Beyeria viscosa* [Sticky Wallaby Bush],

Vines include *Parsonsia eucalyptophylla* [Gargaloo] and *Clematis microphylla* [Old Man's Beard].

The main ground cover species are *Austrostipa nitida* [Corkscrew Grass], *Calotis lappulacea* [Yellow Burr-daisy], *Bracteantha viscosa* [Sticky Everlasting], *Austrostipa verticillata* [Slender Bamboo Grass], *Lepidium africanum* [Peppercress]*, *Sida* sp. A [Scrambling Sida], *Cheilanthes sieberi* [Rock Fern], *Carthamus lanatus* [Saffron Thistle]*, *Einadia nutans* [Climbing Saltbush], *Sida subspicata* [Spiked Sida], *Solanum ferocissimum* [Spiny Potato-bush], *Oncinocalyx betchei*, *Vittadinia sulcata* [Fuzzweed], *Ancistrachne uncinulata* [Hooky Grass] and *Vulpia muralis* [Silver Grass].

A complete listing of the species recorded in the quadrats within this community is contained in **Table 2**.

4.2.6 Community 6 – *Eucalyptus dealbata* [Tumbledown Gum] – *Geijera parviflora* [Wilga] – *Callitris glaucophylla* [White Cypress Pine] Community [Quadrats 1, 5, 7, 10, 11, 21, 22, 24, 25]

This community occurs generally on ridge tops with rock outcrops and shallow soils although a variation occurs on a midslope area near the Oxley Highway in the south of 'Sunnyside'.

Trees are spaced from <1 to 10m apart [often less than 5m]. Species recorded include *Acacia doratoxylon* [Currawang], *Brachychiton populneus* [Kurrajong], *Eucalyptus* sp., *Geijera parviflora* [Wilga], *Alphitonia excelsa* [Red Ash], *Callitris glaucophylla* [White Cypress Pine] [and regeneration], *Acacia cheelii* [Motherumbah] and *Eucalyptus albens* [White Box] usually on the periphery where Community 7 [White Box] occurs or used to occur.

Shrubs are spaced <1 to 5m apart [usually <1 to 3m]. Species recorded include *Notelaea microcarpa* [Native Olive], *Myoporum montanum* [Western Boobialla], *Maireana microphylla* [Eastern Cottonbush], *Dodonaea viscosa* subsp. *spatulata* [Broad-leaf Hopbush], *Cassinia laevis* [Cough Bush], *Pittosporum angustifolium* [Butterbush], *Croton phebaloides*, *Bursaria spinosa* [Native Blackthorn], *Pimelea neo-anglica* [Poison Pimelea], *Canthium odoratum* [Iamboto], *Beyeria viscosa* [Sticky Wallaby-bush] and *Maytenus cunninghamii* [Yellow-berry Bush] and *Spartothamnella juncea* [Bead Bush].

Vines include *Parsonsia eucalyptophylla* [Gargaloo], *Jasminum lineare* [Native Jasmine] and *Clematis microphylla* [Old Man's Beard]

The main ground cover species are *Aristida* sp. [Wiregrass], *Austrostipa setacea* [Corkscrew Grass], *Austrostipa verticillata* [Slender Bamboo Grass], *Carthamus lanatus* [Saffron Thistle]*, *Cheilanthes sieberi* [Rock Fern], *Elymus scaber* [Common Wheatgrass], *Hordeum leporinum* [Barley Grass]*, *Opuntia* sp. [Prickly Pear]*, *Oncinocalyx betchei*, *Enteropogon acicularis* [Curly Windmill Grass], *Einadia hastata* [Saloop], *Ancistrachne uncinulata* [Hooky Grass], *Vittadinia muelleri*. [Fuzzweed], *Aristida ramosa* [Purple Wiregrass], *Austrostipa nitida* [Corkscrew Grass], *Sida* sp. A [Scrambling Sida], *Sida subspicata* [Spiked Sida] and *Vittadinia muelleri* [Fuzzweed].

A complete listing of the species recorded in the quadrats within this community is contained in **Table 2**.

4.2.7 Community 7 - White Box [*Eucalyptus albens*] Community [Quadrats 4, 8, 15, 16, 17, 20]

Trees are spaced from <1 to 15m apart but in many areas the spacing is in the <1 to 5m range. Species recorded include *Eucalyptus albens* [White Box] [dominant], *Acacia homalophylla* [Yarran], *Acacia* sp., Tumbledown Gum, *Alphitonia excelsa* [Red Ash], *Alectryon oleifolius* [Rosewood], *Callitris glaucophylla* [White Cypress Pine] [and regeneration], *Capparis mitchellii* [Wild Orange] and *Geijera parviflora* [Wilga].

Shrub spacings varied from <1 to 5m but in general the spacing was mostly in the <1 to 3m range. Occasional sites supported only scattered shrubs. Species recorded were *Dodonaea viscosa* subsp. *spatulata* [Broad-leaf Hopbush], *Bursaria spinosa* [Native Blackthorn]; *Canthium odoratum*. [Lamboto], *Cassinia laevis* [Cough Bush], *Croton phebaloides*, *Maireana microphylla* [Eastern Cottonbush], *Notelaea microphylla* [Native Olive], *Pimelia neo-anglica* [Poison Pimelea], *Spartothamnella juncea* [Bead Bush], *Beyeria viscosa* [Sticky Wallaby-bush], *Myoporum montanum* [Western Boobialla], *Capparis mitchellii* [Wild Orange] and *Maytenus cunninghamii* [Yellow-berry Bush].

Vines noted in the community were *Clematis microphylla* [Old Man's Beard] and *Parsonsia eucalyptophylla* [Gargaloo].

Mistletoe [*Amyema* sp.] infestations on White Box were noted.

The main ground layer species include *Carthamus lanatus* [Saffron Thistle], *Cymbopogon refractus* [Barbed-wire Grass], *Sida* sp. A [Scrambling Sida], *Wahlenbergia communis* [Tufted Bluebell], *Aristida ramosa* [Purple Wiregrass] and *Lepidium africanum* [Peppergrass]*.

A complete listing of the species recorded in the quadrats within this community is contained in **Table 2**

This community differs from the White Box [*Eucalyptus albens*] Yellow Box [*Eucalyptus melliorora*] Blakely's Red Gum [*Eucalyptus blakelyi*] Woodland endangered ecological community discussed in **Section 7** in that it has a relatively dense shrub layer present rather than having an understorey characterised generally by grass and herbaceous species with shrubs being much less prevalent.

It is a moot point whether or not this community qualifies as being representative of the Critically Endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and the Derived Native Grasslands [Commonwealth EPBC Act] [previously described, in part, as the Grassy White Box Woodlands endangered ecological community]. It is most probably not [because of the predominance of shrubs [rather than grasses and herbs] in the understorey] – a situation noted in the description of the former community and specifically excluded from the listing of the latter community on page 4 of the publication 'White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands' [DEH, 2006].

4.2.8 Community 8 – *Eucalyptus populnea* subsp. *bimbil* [Bimble Box] – *Eucalyptus melliodora* [Yellow Box] - *Eucalyptus albens* [White Box] Woodland Community [Quadrat 27]

This community occurs along what appears to be a reserved road that is currently being used as a waterway to dispose of runoff water. Trees are spaced from 1m to 8m apart. Tree cover is dominated by *Eucalyptus populnea* subsp. *bimbil* [Bimble Box] and *Eucalyptus melliodora* [Yellow Box] with some trees of *Eucalyptus albens* [White Box] present. *Callitris glaucophylla* [White Cypress Pine] is present along with *Geijera parviflora* [Wilga], *Alectryon oleifolius* [Rosewood], *Acacia homalophylla* [Yarran] and *Capparis mitchellii* [Wild Orange].

Shrubs are spaced from <1 to 5m apart. Species present include *Dodonaea viscosa* var. *spatulata* [Broad-leaf Hopbush], *Alstonia constricta* [Quinine Bush], *Senna* form taxon '*filifolia*' [Punty Bush] and *Maireana microphylla* [Eastern Cottonbush], *Pimelea*, *Eremophila mitchellii* [Budda]

Vines present included *Parsonsia eucalyptophylla* [Gargaloo] and *Clematis microphylla* [Old Man's Beard].

The main groundcover species include *Austrostipa verticillata* [Slender Bamboo Grass], *Bracteantha bracteata* [Golden Everlastings], *Carthamus lanatus* [Saffron Thistle]*, *Einadia nutans* [Climbing Saltbush], *Lepidium africanum* [Peppercress]*, *Lomandra* sp. [Matrush], *Opuntia* sp. [Prickly Pear]*, *Einadia hastata* [Saloop], *Solanum esuriale* [Quena], *Sisymbrium orientale* [Mustard Weed]* and *Wahlenbergia communis* [Tufted Bluebell].

A complete listing of the species recorded in Quadrat 27 within this community is contained in **Table 2**.

This community is considered to be representative of the White Box [*Eucalyptus albens*] Yellow Box [*Eucalyptus melliorora*] Blakely's Red Gum [*Eucalyptus blakelyi*] Woodland endangered ecological community [NSW TSC Act] and the Critically Endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands. [Commonwealth EPBC Act] ecological community discussed in **Section 7**.

Community 9 – Degraded *Austrostipa aristiglumis* [Plains Grass] Community [Quadrat 46]

This community occurs in a drainage depression on the eastern end of the proposed transport route on 'Plain View' property.

Tree cover is scattered and comprised of clumps and individuals of *Eucalyptus populnea* subsp. *bimbil* [Bimble Box].

Scattered *Maireana microphylla* [Eastern Cottonbush] shrubs area also present.

Ground cover species comprise mainly *Austrostipa aristiglumis* [Plains Grass] although the community is degraded in its grass density. Other species recorded include *Juncus* sp. {rush}, *Carthamus lanatus** [Saffron Thistle], *Ammi majus** [Queen Anne's Lace], *Rumex brownii* [Slender Dock], *Cucumis myriocarpus** [Paddy Melon], *Cirsium vulgare** [Spear Thistle] and *Medicago scutellata** [Snail Medic].

A complete listing of the species recorded in Quadrat 46 within this community is contained in **Table 2**.

This community is considered to be representative of the 'Native vegetation on Cracking Clay Soils of the Liverpool Plains' endangered ecological community.

Table 1
Tree and Shrub Species Recorded in the Vegetation Communities within the Study Area

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QUADRAT	EASTING / NORTHING	SPECIES RECORDED
1	224239E 6566838N Rocky knob	Trees T1-8: <i>Geijera parviflora</i> [Wilga], <i>Brachychiton populneus</i> [Kurrajong], <i>Eucalyptus dealbata</i> [Tumbledown Gum], regenerating <i>Callitris glaucophylla</i> [White Cypress Pine]; Shrubs S1-5: <i>Notelaea microcarpa</i> [Native Olive], <i>Myoporum montanum</i> [Western Boobialla], <i>Maireana microphylla</i> [Eastern Cottonbush], <i>Dodonaea viscosa</i> subsp. <i>spatulata</i> [Broad-leaf Hopbush], <i>Cassinia laevis</i> [Cough Bush], <i>Clematis microphylla</i> [Old Man's Beard], <i>Pittosporum angustifolium</i> [Butterbush]; Vines: <i>Parsonsia eucalyptophylla</i> [Gargaloo], <i>Jasminum lineare</i> [Native Jasmine]
2	224220E 6566764N Scarp	Trees T1-5: White Cypress Pine, Tumbledown Gum, <i>Eucalyptus albens</i> [White Box], Wilga; <i>Acacia cheelii</i> [Motherumbah], <i>Acacia doratoxylon</i> [Currawang], Kurrajong, <i>Alphitonia excelsa</i> [Red Ash]; Shrubs: <i>Beyeria viscosa</i> [Sticky Wallaby-bush], Broad-leaf Hopbush, Cough Bush, <i>Olearia elliptica</i> [Sticky Daisy-bush], Native Olive, <i>Myoporum montanum</i> [Western Boobialla], <i>Alstonia constricta</i> [Quinine Bush] <i>Pimelea neo-anglica</i> [Poison Pimelea], <i>Canthium odoratum</i> [Iamboto], <i>Indigofera</i> sp.; Vines: Gargaloo
3	224023E 6566763N Ridge top	Open Grassland; T10-20 regeneration of White Cypress Pine; scattered Eastern Cottonbush
4	223834E 6566720N Midslope	Trees T5-15; Wilga, White Box [and regeneration], Small White Cypress Pine; Shrubs Scattered Western Boobialla, <i>Bursaria spinosa</i> [Native Blackthorn]; Vines: Old Man's Beard
5	223675E 6566421N Lower slope	Trees T<1: White Cypress Pine Regeneration, Tumbledown Gum, Wilga; Shrubs S<1-10 Broad-leaf Hopbush, Poison Pimelea, Native Olive, Western Boobialla, Native Blackthorn; Vines: Old Man's Beard
6	223675E 6566421N Lower slope	Open grassland [adjacent to site 5] with T<1-4 White Cypress Pine regeneration Shrubs S1-4: Western Boobialla, Eastern Cottonbush, <i>Acacia decora</i> [Western Golden Wattle], <i>Senna</i> form taxon ' <i>filifolia</i> ' [Punty Bush]
7	223556E 6566398N Midslope	Trees T5-15: Wilga, White Cypress Pine, Tumbledown Gum, Shrubs S<1-2: Native Olive, Native Blackthorn, Poison Pimelea, Broad-leaf Hopbush; Vines: Old Man's Beard
8	224672E 6566773N Mid- to lower slope	Trees T<1-4: White Box, Wilga, Tumbledown Gum, White Cypress Pine, Open areas with White Cypress Pine regeneration; Shrubs S<1-3: Iamboto, Native Blackthorn, Cough Bush, Broad-leaf Hopbush, Sticky Wallaby-bush, Wild Orange; Mistletoe [<i>Amyema</i> sp. on White Box]
9	224532E 6566800N Midslope	Open grassland; trees absent; Shrubs scattered: Western Boobialla, Native Olive, Butterbush, Native Blackthorn
10	224622E 6567180N Ridge top	Trees T1-5: Tumbledown Gum, Wilga, Currawang, White Cypress Pine; Shrubs S1-5: Broad-leaf Hopbush, Native Olive, Western Boobialla, Iamboto; Vines: Gargaloo, Old Man's Beard
11	224733E 6567104N Midslope	Trees T2-10: White Box, Wilga, Tumbledown Gum, White Cypress Pine [and regeneration]; Shrubs S1-5: Native Olive, Sticky Wallaby-bush; Vines: Old Man's Beard

NOTE - numbers after the symbols 'S' and 'T' denote the spacings [in metres] of shrubs and trees respectively at each site

* denotes and introduced species

Table 1 [cont]
Tree and Shrub Species Recorded in the Vegetation Communities within the Study Area

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QUADRAT	EASTING / NORTHING	SPECIES RECORDED
12	224780E 6567531N Scarp	Trees T5-10: <i>Alectryon oliefolius</i> [Rosewood], <i>Alphitonia excelsa</i> [Red Ash], Wild Orange, White Cypress Pine, Western Boobialla, <i>Ehretia membranifolia</i> [Peach Bush], ; Shrubs S1-2: <i>Eremophila mitchellii</i> [Budda], Native Olive, Sticky Wallaby Bush, Quinine Bush, <i>Maytenus cunninghamii</i> [Yellow-berry Bush] and <i>Croton phebalioides</i> ; Vines: Old Man's Beard
13	224788E 6567501N Ridge top	Open grassland; Trees T15-20: Wilga; Shrubs absent
14	224032E 6568131N Footslope of scarp	Trees T<1-5: Whitewood, Rosewood, Wilga, Wild Orange, Red Ash; Shrubs S1-3: Eastern Cottonbush, Budda, Western Boobialla, Native Olive, Sticky Wallaby-bush and <i>Croton phebalioides</i> .
15	224032E 6568054N Top of scarp	Trees T<1-10: White Box mainly, Tumbledown Gum, Wilga; Shrubs 1-5: Sticky Wallaby-bush, Yellow-berry Bush, Cough Bush, Western Boobialla; Vines: Gargaloo
16	223572E 6567828N Upper slope	Trees T2-15: White Box, Wilga, Rosewood, <i>Acacia homalophylla</i> [Yarran] Shrubs scattered Eastern Cottonbush, Western Boobialla
17	223545E 6567616N Upper slope	Trees T<1-5: White Cypress Pine, White Box, <i>Eucalyptus</i> sp., Wilga, <i>Acacia</i> sp. [grey leaf]; Shrubs S1-2: Cough Bush, Western Boobialla, Sticky Wallaby-bush, Native Olive, Wild Lemon, Poison Pimelia, Broad-leaf Hopbush
18	223500E 6567661N Midslope	Open grassland: Trees scattered, <i>Eucalyptus</i> sp., White Box, Wilga, White Cypress Pine regeneration; Shrubs scattered, Eastern Cottonbush.
19	224349E 6567896N Scarp	Trees T1-5: White Box, Wilga, Rosewood, Wild Orange, Red Ash, <i>Eucalyptus</i> sp; Shrubs S1-2: Poison Pimelea, Sticky Wallaby-bush, Western Boobialla, Cough Bush, Native Olive.; Vines: Gargaloo, Old Man's Beard
20	224300E 6567450N Hillslope	Trees T2-5: White Box, Tumbledown Gum, Wilga, Rosewood, Wild Orange, Red Ash, Shrubs S1-3: Croton, Western Boobialla, Native Olive, Sticky Wallaby-bush, Cough Bush, Broad-leaf Hopbush and <i>Spartothamnella juncea</i> [Bead Bush]
21	223855E 6567476N Ridge top	Trees T1-3: Tumbledown Gum, Motherumbah, [White Cypress Pine on perimeter]; Shrubs <1-3: Cough Bush, <i>Croton phebalioides</i> , Broad-leaf Hopbush, Sticky Wallaby-bush, Native Olive and Poison Pimelea
22	223817E 6567200N Ridge top	Trees T1-5: Motherumbah, Tumbledown Gum, White Cypress Pine, Wilga, Red Ash, Kurrajong, occasional White Box; Shrubs S1-2: Western Boobialla, Native olive, Butterbush, Yellow-berry Bush, Broad-leaf Hopbush, Cough Bush, Native Blackthorn, lamboto and Sticky Wallaby-bush; Vines: Gargaloo
23	223931E 6567236N Upper slope	Trees T<1-5: White Cypress Pine and Motherumbah, scattered Kurrajong; Shrubs S5: Eastern Cottonbush and Western Boobialla
24	223966E 6567724N Ridge top	Trees T<1-5: Gum, Motherumbah, Wilga, scattered White Box on periphery; Shrubs S1-2: Broad-leaf Hopbush, Western Boobialla, Sticky Wallaby-bush and Cough Bush; Vines: Old Man's Beard
25	224226E 6567917N Ridge top	Trees T1-10: White Box, Tumbledown Gum, Wilga, Motherumbah; Shrubs S1-3: Western Boobialla, Broad-leaf Hopbush, Cough Bush, Eastern Cottonbush, Native Olive, Poison Pimelea, Vines: Gargaloo

NOTE - numbers after the symbols 'S' and 'T' denote the spacings
[in metres] of shrubs and trees respectively at each site

* denotes and introduced species

Table 1 [Cont'd]
Tree and Shrub Species Recorded in the Vegetation Communities within the Study Area

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QUADRAT	EASTING / NORTHING	SPECIES RECORDED
26	223997E 6567578N Upper slope	Trees largely absent, some regenerating White Cypress Pine, Wilga; Shrubs S1-10 : Eastern Cottonbush, Western Boobialla
27	Walk 224143E 6568955N to 224308E 6570171N	Trees T1-8 : White Box, <i>Eucalyptus melliodora</i> [Yellow Box], <i>Eucalyptus populnea</i> subsp. <i>bimbil</i> [Bimble Box], White Cypress Pine, <i>Acacia homalophylla</i> [Yarran], Wilga, Rosewood, Wild Orange; Shrubs S<1-5 : Quinine Bush, Broad-leaf Hopbush, Puntly Bush, Budda, Eastern Cottonbush and Poison Pimelea; Vines : Old Man's Beard, Gargaloo
28	223956E 6568314N	Cleared
29	224399E 6568248N	Cleared; Kurrajong tree 3m distant
30	224213E 6568645N	Cleared
31	224803E 6568033N	Cleared; Kurrajong 30m distant
32	224897E 6568277N	Cleared
33	224607E 6568338N	Cleared; Kurrajong 40m distant
34	224543E 6568122N	Cleared
35	224922E 6568708N	Cleared
36	224643E 6568797N	Cleared
37	224296E 6568982N	Cleared; Shrubs S<1-5-8 : Eastern Cottonbush
38	224369E 6569245N	Cleared; Shrubs S1-5 : Eastern Cottonbush
39	224611E 6569181N	Cleared
40	224676E 6566942N	Cleared
41	224938E 6568906N	Cleared
42	225006E 6569200N	Cleared
43	225342E 6569264N	Cleared
44	225857E 6568720N	Cleared
45	226167E 6568398N	Cleared
46	226489E 6568021N	Trees : Scattered individuals and clumps of Bimble Box; Shrubs : S20-30 Eastern Cottonbush
NOTE - numbers after the symbols 'S' and 'T' denote the spacings [in metres] of shrubs and trees respectively at each site		* denotes and introduced species

Table 2[a]
Ground Cover Species Recorded In Quadrats 1 to 9 within the Study Area

Page 1 of 3

SPECIES	QUADRAT								
	1	2	3	4	5	6	7	8	9
<i>Alternanthera pungens</i> [Khaki Weed]*	-	-	-	-	-	-	-	-	-
<i>Ammi majus</i> [Queen Anne's Lace]*	-	-	-	-	-	-	-	-	-
<i>Anagallis arvensis</i> [Scarlet Pimpernell]*	-	-	P	P	-	-	-	-	-
<i>Ancistrachne uncinulatum</i> [Hooky Grass]	-	-	-	-	-	-	-	-	-
<i>Arthropodium</i> sp. B [Vanilla Lily]	-	-	-	-	-	-	-	-	-
<i>Arctotheca calendula</i> [Capeweed]*	-	-	-	-	-	-	-	-	-
<i>Aristida ramosa</i> [Purple Wiregrass]	P	P	-	P	P	P	P	P	P
<i>Austrodanthonia richardsonii</i> [Wallaby Grass]	-	-	P	-	-	P	P	-	-
<i>Austrostipa aristiglumis</i> [Plains Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa nitida</i> [Corkscrew Grass]	-	-	-	-	-	-	P	-	-
<i>Austrostipa setacea</i> [Corkscrew Grass]	P	P	-	-	-	-	P	-	-
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	P	P	-	-	P	-	P	P	-
<i>Avena</i> sp. [Oats] *	-	-	-	-	-	-	-	-	P
<i>Boerhavia dominii</i> [Tah Vine]	P	-	-	-	-	-	-	-	-
<i>Bracteantha bracteata</i> [Golden Everlastings]	-	-	-	P	-	-	P	-	P
<i>Bracteantha viscosa</i> [Sticky Everlasting]	P	P	-	-	-	-	-	-	-
<i>Bromus molliformis</i> [Silky Brome]*	-	-	-	-	-	P	P	-	P
<i>Bulbine semibarbata</i> [Leek Lily]	-	-	-	-	-	-	-	-	-
<i>Calandrinia</i> sp.	P	-	-	-	-	-	-	-	-
<i>Calotis cuneifolia</i> [Purple Burr-daisy]	-	-	-	-	-	-	-	-	-
<i>Calotis hispidula</i> [Bogan Flea]	-	-	-	-	-	-	-	-	-
<i>Calotis lappulacea</i> [Yellow Burr-daisy]	P	P	-	-	-	-	-	-	-
<i>Carthamus lanatus</i> [Saffron Thistle]*	P	P	P	P	-	-	P	P	P
<i>Centaurea melitensis</i> [Maltese Cockspur]*	P	-	-	-	-	-	-	-	-
Cereal Crop Stubble	-	-	-	-	-	-	-	-	-
<i>Chamaesyce drummondii</i> [Caustic Weed]	-	-	-	-	-	-	-	-	-
<i>Cheilanthes sieberi</i> [Rock Fern]	P	P	-	-	-	P	-	P	-
<i>Cheilanthes distans</i> [Bristly Cloak Fern]	-	-	-	-	-	-	-	-	-
<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i> [Desert Goosefoot]	-	-	-	-	-	-	-	-	-
<i>Chloris ventricosa</i> [Tall Chloris]	-	-	-	-	-	-	P	P	-
<i>Chondrilla juncea</i> [Skeleton Weed]*	-	-	-	-	-	-	-	-	-
<i>Chrysocephalum apiculatum</i> [Yellow Buttons]	P	-	-	-	-	-	-	-	-
<i>Cirsium vulgare</i> [Spear Thistle]*	-	-	-	-	-	-	-	-	-
<i>Conyza</i> sp. [Fleabane]*	-	-	-	-	-	-	-	-	-
<i>Crassula colorata</i> var. <i>acuminata</i> [Dense Stonecrop]	-	-	-	-	-	-	p	p	-
<i>Cucumis myriocarpus</i> [Paddy Melon]*	-	-	-	-	-	-	-	-	-
<i>Cymbopogon refractus</i> [Barbed-wire Grass]	-	-	P	P	P	P	-	P	P
<i>Daucus glochidiatus</i> [Australian Carrot]	-	-	-	-	-	-	P	P	-
<i>Dianella</i> sp.	-	-	-	-	P	-	-	-	-
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	-	-	P	-	-	-	-	-	-
<i>Digitaria brownii</i> [Cotton Panic]	-	-	-	-	-	-	p	-	-
<i>Echium plantagineum</i> [Paterson's Curse]*	-	-	-	-	-	-	-	-	p
<i>Einadia nutans</i> [Climbing Saltbush]	-	p	-	-	-	-	-	-	-
<i>Einadia hastata</i> [Saloop]	P	-	-	-	-	-	-	-	-
<i>Elymus scaber</i> [Common Wheatgrass]	P	-	P	P	-	P	P	-	-
<i>Emex australis</i> [Spiny Emex]*	-	-	-	-	-	-	-	-	-
<i>Enneapogon</i> sp [Bottlewashers]	-	-	P	-	-	-	-	-	-

Table 2[a] [Cont'd]
Ground Cover Species Recorded In Quadrats 1 to 9 within the Study Area

Page 2 of 3

SPECIES	QUADRAT								
	1	2	3	4	5	6	7	8	9
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	P	-	P	-	-	-	-	-	-
<i>Eragrostis falcata</i> [Sickle Lovegrass]	-	-	-	-	-	-	-	-	-
<i>Eragrostis lacunaria</i> [Purple Lovegrass]	-	-	-	-	-	-	-	-	-
<i>Hedypnois rhagadioloides</i> ssp. <i>cretica</i> [Cretan Weed]*	-	-	-	-	-	-	-	-	-
<i>Heliotropium europaeum</i> [Common Heliotrope]*	-	-	-	-	-	-	-	-	-
<i>Hordeum leporinum</i> [Barley Grass]*	P	-	-	-	-	-	P	-	P
<i>Hypochaeris glauca</i> [Smooth Catsear]*,	-	-	-	-	-	-	-	-	P
<i>Juncus</i> sp. [Rush]	-	-	-	-	-	-	-	-	-
<i>Lamarckia aurea</i> [Golden-top]*	P	-	-	-	-	-	-	-	P
<i>Lepidium africanum</i> [Peppergrass]*	-	-	-	P	-	P	-	-	-
<i>Lolium rigidum</i> [Annual Ryegrass]*	P	-	-	-	-	P	-	-	-
<i>Lomandra filiformis</i> subsp. <i>flavior</i> [Matrush]	-	-	-	-	-	-	-	P	-
<i>Malva parviflora</i> [Small-flowered Mallow]*	-	-	-	-	-	-	-	-	-
<i>Marrubium vulgare</i> [Horehound]*	P	-	-	-	-	-	-	-	-
<i>Medicago laciniata</i> [Cutleaf Medic]*	-	-	-	P	-	-	-	-	-
<i>Medicago minima</i> [Small Woolly Burr Medic]*	-	-	-	-	-	-	-	-	-
<i>Medicago sativa</i> [Lucerne]*	-	-	-	-	-	-	-	-	-
<i>Medicago scutellata</i> [Snail Medic]*	-	-	-	-	-	-	-	-	-
<i>Oncinocalyx betchei</i>	P	P	-	-	-	-	P	P	-
<i>Opuntia</i> sp. [Prickly Pear]*	P	-	-	P	-	-	P	-	-
<i>Oxalis</i> sp [Wood Sorrel]*	P	-	-	-	-	-	-	-	-
<i>Paspalidium constrictum</i> [Box Grass]	P	-	-	P	-	-	-	-	-
<i>Rapistrum rugosum</i> [Turnip Weed]*	-	-	-	P	-	-	-	-	P
<i>Rumex brownii</i> [Slender Dock]	-	-	-	-	-	-	-	-	-
<i>Salsola kali</i> [Buckbush]	-	P	-	-	-	-	-	-	-
<i>Sclerolaena birchii</i> [Galvanised Burr]	-	-	-	P	-	-	-	-	-
<i>Senecio quadridentatus</i> [Cotton Fireweed]	-	-	P	-	-	-	-	-	-
<i>Sida corrugata</i> [Corrugated Sida]	-	P	-	P	-	-	-	-	-
<i>Sida cunninghamii</i> [Ridge Sida]	-	-	-	-	-	-	-	P	-
<i>Sida</i> sp.	-	-	-	P	-	-	-	P	-
<i>Sida rhombifolia</i> [Paddy's Lucerne]*	-	-	-	-	-	-	-	-	P
<i>Sida</i> sp. A [Scrambling Sida]	-	-	-	-	P	-	-	-	P
<i>Sida subspicata</i> [Spiked Sida]	-	P	-	P	-	-	-	-	-
<i>Silybum marianum</i> [Variegated Thistle]*	P	-	-	-	-	-	-	-	P
<i>Sisymbrium orientale</i> [Hedge Mustard]*	-	-	-	P	P	-	-	-	P
<i>Solanum esuriale</i> [Quena]	-	-	-	-	-	-	-	-	-
<i>Solanum ferocissimum</i> [Spiny Potato-bush]	P	P	-	-	-	-	-	P	-
<i>Spartothamnella juncea</i> [Bead Bush]	-	-	-	-	-	-	-	-	-
<i>Swainsona sericea</i> [Swainson-pea]	-	-	-	-	-	-	-	-	P
<i>Thyridolepis mitchelliana</i> [Mulga Grass]	-	-	-	-	-	-	-	-	-
<i>Trifolium campestre</i> [Hop Clover]*	-	-	P	-	-	-	-	-	-
<i>Triptilodiscus pygmaeus</i> [Common Sunray]	P	-	-	-	-	-	P	-	-
<i>Triticum aestivum</i> [Wheat]*	-	-	-	-	-	-	-	-	-
<i>Urtica incisa</i> [Scrub Nettle]	-	-	-	-	-	-	-	-	P
<i>Vittadinia cervicularis</i> var. <i>cervicularis</i> [Fuzzweed]	P	-	-	-	-	-	-	-	-

Table 2[a] [Cont'd]
Ground Cover Species Recorded In Quadrats 1 to 9 within the Study Area

Page 3 of 3

SPECIES	QUADRAT								
	1	2	3	4	5	6	7	8	9
<i>Vittadinia cuneata</i> var. <i>cuneata</i> [Fuzzweed]	-	-	-	P	-	-	-	-	-
<i>Vittadinia cuneata</i> var. <i>hirsuta</i> [Fuzzweed]	-	-	-	P	-	-	-	-	-
<i>Vittadinia muelleri</i> [Fuzzweed]	-	-	P	-	-	-	P	-	-
<i>Vittadinia sulcata</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-
<i>Vittadinia</i> sp. [New Holland Daisy]	-	-	-	P	-	P	P	P	-
<i>Vulpia muralis</i> [Silver Grass]	-	P	P	-	P	-	-	P	-
<i>Wahlenbergia communis</i> [Tufted Bluebell]	P	-	P	P	P	P	-	P	P
<i>Wahlenbergia luteola</i> [Bluebell]	P	-	-	-	-	-	-	-	-

Table 2[b]
Ground Cover Species Recorded In Quadrats 10 to 18 within the Study Area

Page 1 of 3

SPECIES	QUADRAT								
	10	11	12	13	14	15	16	17	18
<i>Alternanthera pungens</i> [Khaki Weed]*	-	-	-	-	-	-	-	-	-
<i>Ammi majus</i> [Queen Anne's Lace]*	-	-	-	-	-	-	-	-	-
<i>Anagallis arvensis</i> [Scarlet Pimpernell]*	-	-	-	-	-	-	-	-	-
<i>Ancistrachne uncinulatum</i> [Hooky Grass]	P	P	P	-	-	P	-	P	-
<i>Arthropodium</i> sp. B [Vanilla Lily]	P	-	-	-	-	-	-	-	-
<i>Arctotheca calendula</i> [Capeweed]*	-	-	-	-	-	-	-	-	-
<i>Aristida ramosa</i> [Purple Wiregrass]	P	-	-	-	-	-	-	P	P
<i>Austroanthonia richardsonii</i> [Wallaby Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa aristiglumis</i> [Plains Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa nitida</i> [Corkscrew Grass]	P	-	-	-	P	P	P	-	P
<i>Austrostipa setacea</i> [Corkscrew Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	-	P	-	-	P	P	P	-	P
<i>Avena</i> sp. [Oats] *	-	-	-	-	-	-	-	-	-
<i>Boerhavia dominii</i> [Tah Vine]	-	-	-	-	-	-	-	-	-
<i>Bracteantha bracteata</i> [Golden Everlastings]	-	-	-	P	-	-	-	-	P
<i>Bracteantha viscosa</i> [Sticky Everlasting]	-	-	-	-	-	-	-	-	-
<i>Bromus molliformis</i> [Silky Brome]*	-	-	-	-	-	-	-	-	-
<i>Bulbine semibarbata</i> [Leek Lily]	-	-	-	-	-	-	-	-	-
<i>Calandrinia</i> sp.	-	-	-	-	-	-	-	-	-
<i>Calotis cuneifolia</i> [Purple Burr-daisy]	-	-	-	-	-	-	-	-	-
<i>Calotis hispidula</i> [Bogan Flea]	-	-	-	-	-	-	-	-	-
<i>Calotis lappulacea</i> [Yellow Burr-daisy],	-	-	-	P	-	P	-	-	P
<i>Carthamus lanatus</i> [Saffron Thistle]*	-	P	-	-	-	P	-	-	P
<i>Centaurea melitensis</i> [Maltese Cockspur]*	-	P	-	-	-	-	-	-	P
Cereal Crop Stubble	-	-	-	-	-	-	-	-	-
<i>Chamaesyce drummondii</i> [Caustic Weed]	-	-	-	-	-	-	-	-	-
<i>Cheilanthes distans</i> [Bristly Cloak Fern]	-	-	-	P	P	-	-	-	-
<i>Cheilanthes sieberi</i> [Rock Fern]	-	-	-	-	-	P	-	-	-
<i>Chenopodium desertorum</i> subsp. <i>nicrophyllum</i> [Desert Goosefoot]	-	-	-	-	-	P	-	-	-
<i>Chloris ventricosa</i> [Tall Chloris]	-	-	-	-	-	-	-	-	-
<i>Chondrilla juncea</i> [Skeleton Weed]*	-	-	-	-	-	-	-	-	-
<i>Chrysocephalum apiculatum</i> [Yellow Buttons]	-	-	-	-	-	-	-	-	-
<i>Cirsium vulgare</i> [Spear Thistle]*	-	-	-	-	-	-	-	-	-

Table 2[b] [Cont'd]
Ground Cover Species Recorded In Quadrats 10 to 18 within the Study Area

Page 2 of 3

SPECIES	QUADRAT								
	10	11	12	13	14	15	16	17	18
<i>Conyza</i> sp. [Fleabane]*	-	-	-	-	-	-	-	-	-
<i>Crassula colorata</i> var. <i>acuminata</i> [Dense Stonecrop]	P	-	-	-	-	-	-	-	-
<i>Cucumis myriocarpus</i> [Paddy Melon]*	-	-	-	-	-	-	-	-	P
<i>Cymbopogon refractus</i> [Barbed-wire Grass]	-	-	-	-	-	-	-	-	-
<i>Daucus glochidiatus</i> [Australian Carrot]	-	-	-	-	-	-	-	-	-
<i>Dianella</i> sp.	-	-	-	-	-	-	-	-	-
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	-	-	-	-	-	-	-	-	-
<i>Digitaria brownii</i> [Cotton Panic]	-	-	-	-	-	-	-	-	-
<i>Echium plantagineum</i> [Paterson's Curse]*	-	-	-	-	-	-	-	-	-
<i>Einadia hastata</i> [Saloop]	-	P	P	P	P	-	-	-	-
<i>Einadia nutans</i> [Climbing Saltbush]	-	-	-	-	-	-	-	-	-
<i>Elymus scaber</i> [Common Wheatgrass]	P	-	-	-	-	-	-	-	-
<i>Emex australis</i> [Spiny Emex]*	-	-	-	-	-	-	-	-	-
<i>Enneapogon</i> sp. [Bottlewashers]	-	-	-	-	-	-	-	-	-
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	P	P	-	-	P	-	-	-	-
<i>Eragrostis falcata</i> [Sickle Lovegrass]	P	P	-	-	-	-	-	-	-
<i>Eragrostis lacunaria</i> [Purple Lovegrass]	P	-	-	-	-	-	-	-	-
<i>Hedypnois rhagadioloides</i> ssp. <i>cretica</i> [Cretan Weed]*	-	-	-	-	-	-	-	-	-
<i>Heliotropium europaeum</i> [Common Heliotrope]*	-	-	-	-	-	-	-	-	-
<i>Hordeum leporinum</i> [Barley Grass]*	-	-	-	P	-	-	-	-	-
<i>Hypochaeris glauca</i> [Smooth Catsear]*	-	-	-	-	-	-	-	-	-
<i>Juncus</i> sp. [Rush]	-	-	-	-	-	-	-	-	-
<i>Lamarckia aurea</i> [Golden-top]*	-	-	-	-	-	-	-	-	-
<i>Lepidium africanum</i> [Peppergrass]*	-	-	-	P	-	P	-	-	-
<i>Lolium rigidum</i> [Annual Ryegrass]*	-	-	-	-	-	-	-	-	-
<i>Lomandra filiformis</i> subsp. <i>flavior</i> [Matrush]	-	-	-	-	-	-	-	-	-
<i>Malva parviflora</i> [Small-flowered Mallow]*	-	-	-	-	-	-	-	-	-
<i>Marrubium vulgare</i> [Horehound]*	-	-	-	-	-	-	-	-	-
<i>Medicago laciniata</i> [Cutleaf Medic]*	-	-	-	-	-	-	-	-	-
<i>Medicago minima</i> [Small Woolly Burr Medic]*	-	-	-	-	-	-	-	-	-
<i>Medicago sativa</i> [Lucerne]*	-	-	-	-	-	-	-	-	-
<i>Medicago scutellata</i> [Snail Medic]*	-	-	-	-	-	-	-	-	-
<i>Oncinocalyx betchei</i>	-	-	-	-	-	-	-	-	-
<i>Opuntia</i> sp. [Prickly Pear]	-	-	-	P	-	P	-	P	P
<i>Oxalis</i> sp [Wood Sorrel]*	P	-	-	-	-	-	-	-	-
<i>Paspalidium constrictum</i> [Box Grass]	-	-	-	-	-	-	-	-	-
<i>Rapistrum rugosum</i> [Turnip Weed]*	-	-	-	-	-	-	-	-	-
<i>Rumex brownii</i> [Slender Dock]	-	-	-	-	-	-	-	-	-
<i>Salsola kali</i> [Buckbush]	-	-	-	-	P	-	-	-	-
<i>Sclerolaena birchii</i> [Galvanised Burr]	-	-	-	-	-	-	-	-	-
<i>Senecio quadridentatus</i> [Cotton Fireweed]	-	-	-	-	-	-	-	-	P
<i>Sida corrugata</i> [Corrugated Sida]	P	-	-	-	-	-	-	-	-
<i>Sida cunninghamii</i> [Ridge Sida]	-	-	-	-	-	-	-	P	-
<i>Sida</i> sp.	-	-	-	-	-	-	-	-	-
<i>Sida rhombifolia</i> [Paddy's Lucerne]*	-	-	-	-	-	-	-	-	-

Table 2[b] [Cont'd]
Ground Cover Species Recorded In Quadrats 10 to 18 within the Study Area

Page 3 of 3

SPECIES	QUADRAT								
	10	11	12	13	14	15	16	17	18
<i>Sida</i> sp. A [Scrambling Sida]	-	-	-	P	-	P	P	-	P
<i>Sida subspicata</i> [Spiked Sida]	-	-	-	-	-	P	-	-	P
<i>Silybum marianum</i> [Variegated Thistle]*	-	-	-	-	-	-	-	-	-
<i>Sisymbrium orientale</i> [Hedge Mustard]*	-	-	P	P	P	-	-	-	-
<i>Solanum esuriale</i> [Quena]	-	-	-	-	-	-	-	-	-
<i>Solanum ferocissimum</i> [Spiny Potato-bush]	P	-	-	-	P	P	-	P	-
<i>Spartothamnella juncea</i> [Bead Bush]	-	-	-	-	-	-	-	-	-
<i>Swainsona sericea</i> [Swainson-pea]	-	-	-	-	-	-	-	-	-
<i>Thyridolepis mitchelliana</i> [Mulga Grass]	-	-	-	-	-	-	-	-	-
<i>Trifolium campestre</i> [Hop Clover]*	-	-	-	-	-	-	-	-	-
<i>Triptilodiscus pygmaeus</i> [Common Sunray]	-	-	-	-	-	-	-	-	-
<i>Triticum aestivum</i> [Wheat]*	-	-	-	-	-	-	-	-	-
<i>Urtica incisa</i> [Scrub Nettle]	-	-	-	-	-	-	-	-	P
<i>Vittadinia cervicularis</i> var. <i>cervicularis</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-
<i>Vittadinia cuneata</i> var. <i>cuneata</i> [Fuzzweed]	-	-	-	-	-	-	-	-	P
<i>Vittadinia cuneata</i> var. <i>hirsuta</i> [Fuzzweed]	P	-	-	-	-	-	-	-	-
<i>Vittadinia</i> sp. New Holland Daisy]	P	P	P	P	P	P	P	-	-
<i>Vittadinia muelleri</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-
<i>Vittadinia sulcata</i> [Fuzzweed]	-	P	P	-	-	-	-	-	-
<i>Vulpia mnuralis</i> [Silver Grass]	-	-	-	-	-	-	-	-	-
<i>Wahlenbergia communis</i> [Tufted Bluebell]	-	-	-	-	-	-	-	-	-
<i>Wahlenbergia luteola</i> . [Bluebell]	-	-	-	-	-	-	-	-	-

Table 2[c]
Ground Cover Species Recorded In Quadrats 19 to 27 within the Study Area

Page 1 of 3

SPECIES	QUADRAT								
	19	20	21	22	23	24	25	26	27
<i>Alternanthera pungens</i> [Khaki Weed]*	-	-	-	-	-	-	-	-	-
<i>Ammi majus</i> [Queen Anne's Lace]*	-	-	-	-	-	-	-	-	-
<i>Anagallis arvensis</i> [Scarlet Pimpernell]*	-	-	-	-	P	-	-	-	-
<i>Ancistrachne uncinulatum</i> [Hooky Grass]	-	-	-	P	-	P	-	-	-
<i>Arthropodium</i> sp. B [Vanilla Lily]	-	-	-	-	-	-	-	-	-
<i>Arctotheca calendula</i> [Capeweed]*	-	-	-	-	-	-	-	-	-
<i>Aristida ramose</i> [Purple Wiregrass]	-	P	P	P	P	-	-	P	-
<i>Austrodanthonia richardsonii</i> [Wallaby Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa aristiglumis</i> [Plains Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa nitida</i> [Corkscrew Grass]	P	-	P	-	P	P	P	P	-
<i>Austrostipa setacea</i> [Corkscrew Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	P	-	-	-	-	P	-	P	P
<i>Avena</i> sp.[Oats] *	-	-	-	-	-	-	-	-	P
<i>Boerhavia dominii</i> [Tah Vine]	-	-	-	-	-	-	-	-	-
<i>Bracteantha bracteata</i> [Golden Everlastings]	-	-	-	P	-	-	-	-	P
<i>Bracteantha viscosa</i> [Sticky Everlasting]	-	-	-	P	-	-	-	-	-
<i>Bromus molliformis</i> [Silky Brome]*	-	-	-	-	P	-	-	-	-

Table 2[c] [Cont'd]
Ground Cover Species Recorded In Quadrats 19 to 27 within the Study Area

Page 2 of 3

SPECIES	QUADRAT								
	19	20	21	22	23	24	25	26	27
<i>Bulbine semibarbata</i> [Leek Lily]	-	-	-	-	-	-	-	-	-
<i>Calandrinia</i> sp.	-	-	-	-	-	-	-	-	-
<i>Calotis cuneifolia</i> [Purple Burr-daisy]	P	-	-	-	-	-	-	-	-
<i>Calotis hispidula</i> [Bogan Flea]	-	-	-	-	-	-	-	-	-
<i>Calotis lappulacea</i> [Yellow Burr-daisy]	P	-	-	-	-	-	-	P	-
<i>Carthamus lanatus</i> [Saffron Thistle]*	-	-	-	-	P	-	-	P	P
<i>Centaurea melitensis</i> [Maltese Cockspur]*	-	-	-	-	-	-	-	-	-
Cereal Crop Stubble	-	-	-	-	-	-	-	-	-
<i>Chamaesyce drummondii</i> [Caustic Weed]	-	-	-	-	-	-	-	-	-
<i>Cheilanthes sieberi</i> [Rock Fern]	P	-	-	P	-	-	P	-	-
<i>Cheilanthes distans</i> [Bristly Cloak Fern]	-	-	-	-	-	-	-	-	-
<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i> [Desert Goosefoot]	-	-	-	-	-	-	-	-	-
<i>Chloris ventricosa</i> [Tall Chloris]	-	-	-	-	-	-	-	-	-
<i>Chondrilla juncea</i> [Skeleton Weed]*	-	-	-	-	-	-	-	-	-
<i>Chrysocephalum apiculatum</i> [Yellow Buttons]	-	-	-	-	-	-	-	-	-
<i>Cirsium vulgare</i> [Spear Thistle]*	-	-	-	-	-	-	-	-	-
<i>Conyza</i> sp. [Fleabane]*	-	-	-	-	-	-	-	-	-
<i>Crassula colorata</i> var. <i>acuminata</i> [Dense Stonecrop]	-	-	-	-	-	-	-	-	-
<i>Cucumis myriocarpus</i> [Paddy Melon]*	-	-	-	-	-	-	-	-	-
<i>Cymbopogon refractus</i> [Barbed-wire Grass]	-	-	-	-	P	-	-	P	-
<i>Daucus glochidiatus</i> [Australian Carrot]	-	-	-	-	-	-	-	-	-
<i>Dianella</i> sp.	-	-	-	-	-	-	-	-	-
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	-	-	-	-	-	-	-	-	-
<i>Digitaria brownii</i> [Cotton Panic]	-	-	-	-	-	-	-	-	-
<i>Echium plantagineum</i> [Paterson's Curse]*	-	-	-	-	-	-	-	-	-
<i>Einadia hastata</i> [Saloop]	P	-	-	P	-	-	-	-	P
<i>Einadia nutans</i> [Climbing Saltbush]	-	-	-	-	-	-	-	-	P
<i>Elymus scaber</i> [Common Wheatgrass]	-	-	-	-	-	-	-	-	-
<i>Emex australis</i> [Spiny Emex]*	-	-	-	-	-	-	-	-	-
<i>Enneapogon</i> sp. [Bottlewashers]	-	-	-	-	-	-	-	-	-
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	-	-	-	-	-	-	-	-	-
<i>Eragrostis falcata</i> [Sickle Lovegrass]	-	-	-	-	-	-	-	-	-
<i>Eragrostis lacunaria</i> [Purple Lovegrass]	-	-	-	-	P	-	P	-	-
<i>Hedypnois rhagadioloides</i> ssp. <i>cretica</i> [Cretan Weed]*	-	-	-	-	P	-	-	P	-
<i>Heliotropium europaeum</i> [Common Heliotrope]*	-	-	-	-	-	-	-	-	-
<i>Hordeum leporinum</i> [Barley Grass]*	-	-	-	-	-	-	-	P	-
<i>Hypochaeris glauca</i> [Smooth Catsear]*	-	-	-	P	-	-	-	-	-
<i>Juncus</i> sp. [Rush]	-	-	-	-	-	-	-	-	-
<i>Lamarckia aurea</i> [Golden-top]*	-	-	-	-	-	-	-	-	-
<i>Lepidium africanum</i> [Peppergrass]*	P	-	-	-	P	-	P	P	P
<i>Lolium rigidum</i> [Annual Ryegrass]*	-	-	-	-	-	-	-	-	-
<i>Lomandra filiformis</i> subsp. <i>flavior</i> [Matrush]	-	-	-	-	-	-	-	-	P
<i>Malva parviflora</i> [Small-flowered Mallow]*	-	-	-	-	-	-	-	-	-
<i>Marrubium vulgare</i> [Horehound]*	P	-	-	-	-	-	-	-	P
<i>Medicago laciniata</i> [Cutleaf Medic]*	-	-	-	-	-	-	-	-	-

Table 2[c] [Cont'd]
Ground Cover Species Recorded In Quadrats 19 to 27 within the Study Area

Page 3 of 3

SPECIES	QUADRAT								
	19	20	21	22	23	24	25	26	27
<i>Medicago minima</i> [Small Woolly Burr Medic]*	-	-	-	-	P	-	-	P	-
<i>Medicago sativa</i> [Lucerne]*	-	-	-	-	-	-	-	-	-
<i>Medicago scutellata</i> [Snail Medic]*	-	-	-	-	-	-	-	-	-
<i>Oncinocalyx betchei</i>	P	-	-	P	P	-	-	P	-
<i>Opuntia</i> sp. [Prickly Pear]*	-	P	-	-	-	P	P	P	P
<i>Oxalis</i> sp [Wood Sorrel]*	-	-	-	-	-	-	-	-	-
<i>Paspalidium constrictum</i> [Box Grass]	-	-	-	-	-	-	-	-	-
<i>Rapistrum rugosum</i> [Turnip Weed]	-	-	-	-	-	-	-	-	-
<i>Rumex brownii</i> [Slender Dock]	-	-	-	-	P	-	-	-	-
<i>Salsola kali</i> [Buckbush]	-	-	-	-	-	-	-	-	-
<i>Sclerolaena birchii</i> [Galvanised Burr]	-	-	-	-	-	-	-	-	-
<i>Senecio quadridentatus</i> [Cotton Fireweed]	-	-	-	-	-	-	-	-	-
<i>Sida corrugata</i> [Corrugated Sida]	-	-	-	-	P	-	P	-	-
<i>Sida cunninghamii</i> [Ridge Sida]	-	-	-	-	P	-	-	-	-
<i>Sida</i> sp.	-	-	-	-	-	-	-	-	-
<i>Sida rhombifolia</i> [Paddy's Lucerne]*	-	-	-	-	-	-	-	-	-
<i>Sida</i> sp. A [Scrambling Sida]	P	P	-	P	P	-	P	-	-
<i>Sida subspicata</i> [Spiked Sida]	-	-	-	P	-	P	P	-	-
<i>Silybum marianum</i> [Variegated Thistle]*	-	-	-	-	P	-	-	-	P
<i>Sisymbrium orientale</i> [Hedge Mustard]*	P	-	-	-	-	-	-	-	P
<i>Solanum esuriale</i> [Quena]	-	-	-	-	-	-	-	-	P
<i>Solanum ferocissimum</i> [Spiny Potato-bush]	-	-	-	P	-	P	-	-	-
<i>Spartothamnella juncea</i> [Bead Bush]	-	-	-	-	-	P	-	-	-
<i>Swainsona sericea</i> [Swainson-pea]	-	-	-	-	-	-	-	-	-
<i>Thyridolepis mitchelliana</i> [Mulga Grass]	-	-	-	-	P	-	-	-	-
<i>Trifolium campestre</i> [Hop Clover]*	-	-	-	-	-	-	-	-	-
<i>Triptilodiscus pygmaeus</i> [Common Sunray]	-	-	-	-	-	-	-	-	-
<i>Triticum aestivum</i> [Wheat]*	-	-	-	-	-	-	-	-	-
<i>Urtica incisa</i> [Scrub Nettle]	-	-	-	-	-	-	-	-	-
<i>Vittadinia cervicularis</i> var. <i>cervicularis</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-
<i>Vittadinia cuneata</i> var. <i>cuneata</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-
<i>Vittadinia cuneata</i> var. <i>hirsutta</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-
<i>Vittadinia muelleri</i> [Fuzzweed]	-	-	-	-	P	-	P	P	-
<i>Vittadinia</i> sp. New Holland Daisy]	P	-	-	-	P	P	P	-	-
<i>Vittadinia sulcata</i> [Fuzzweed]	-	-	-	-	-	P	-	-	-
<i>Vulpia muralis</i> [Silver Grass]*	-	-	-	P	P	-	-	P	-
<i>Wahlenbergia communis</i> [Tufted Bluebell]	-	-	-	-	P	-	-	-	P
<i>Wahlenbergia luteola</i> [Bluebell]	-	-	-	-	-	-	-	-	-

Table 2[d]
Ground Cover Species Recorded In Quadrats 28 to 36 within the Study Area

Page 1 of 3

SPECIES	QUADRAT								
	28	29	30	31	32	33	34	35	36
<i>Alternanthera pungens</i> [Khaki Weed]*	-	-	-	-	-	P	-	-	-
<i>Ammi majus</i> [Queen Anne's Lace]*	-	-	-	-	-	-	-	-	-
<i>Anagallis arvensis</i> [Scarlet Pimpernell]*	-	-	-	-	-	-	-	-	-
<i>Ancistrachne uncinulatum</i> [Hooky Grass]	-	-	-	-	-	-	-	-	-
<i>Arctotheca calendula</i> [Capeweed]*	-	-	-	-	-	-	-	-	-
<i>Arthropodium</i> sp. B [Vanilla Lily]	-	-	-	-	-	-	-	-	-
<i>Aristida ramosa</i> [Purple Wiregrass]	-	-	-	-	-	P	-	-	-
<i>Austrodanthonia richardsonii</i> [Wallaby Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa aristiglumis</i> [Plains Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa nitida</i> [Corkscrew Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa setacea</i> [Corkscrew Grass]	-	-	-	-	-	-	-	-	-
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	-	-	-	-	-	-	-	-	-
<i>Avena</i> sp.[Oats]*	-	-	-	P	-	P	-	P	P
<i>Boerhavia dominii</i> [Tah Vine]	-	-	-	-	-	-	-	-	-
<i>Bracteantha bracteata</i> [Golden Everlastings]	-	-	-	-	-	-	-	-	-
<i>Bracteantha viscosa</i> [Sticky Everlasting]	-	-	-	-	-	-	-	-	-
<i>Bromus molliformis</i> [Silky Brome]*	-	-	-	-	-	-	-	-	-
<i>Bulbine semibarbata</i> [Leek Lily]	-	-	-	-	-	-	-	-	-
<i>Calandrinia</i> sp.	-	-	-	-	-	-	-	-	-
<i>Calotis cuneifolia</i> [Purple Burr-daisy]	-	-	-	-	-	-	-	-	-
<i>Calotis hispidula</i> [Bogan Flea]	-	-	-	-	-	-	-	-	-
<i>Calotis lappulacea</i> [Yellow Burr-daisy]	-	-	-	-	-	-	-	-	-
<i>Carthamus lanatus</i> [Saffron Thistle]*	P	-	-	P	P	P	P	P	P
<i>Centaurea melitensis</i> [Maltese Cockspur]*	-	-	-	-	-	-	-	-	-
Cereal Crop Stubble	P	-	-	-	-	-	-	-	-
<i>Chamaesyce drummondii</i> [Caustic Weed]	-	-	-	-	-	-	-	-	-
<i>Cheilanthes sieberi</i> [Rock Fern]	-	-	-	-	-	-	-	-	-
<i>Cheilanthes distans</i> [Bristly Cloak Fern]	-	-	-	-	-	-	-	-	-
<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i> [Desert Goosefoot]	-	-	-	-	-	-	-	-	-
<i>Chloris ventricosa</i> [Tall Chloris]	-	-	-	-	-	-	-	-	-
<i>Chondrilla juncea</i> [Skeleton Weed]*	-	-	P	P	P	-	-	P	P
<i>Chrysocephalum apiculatum</i> [Yellow Buttons]	-	-	-	-	-	-	-	-	-
<i>Cirsium vulgare</i> [Spear Thistle]*	-	-	-	-	-	-	-	-	-
<i>Conyza</i> sp. [Fleabane]*	-	-	-	-	-	-	-	-	-
<i>Crassula colorata</i> var. <i>acuminata</i> [Dense Stonecrop]	-	-	-	-	-	-	-	-	-
<i>Cucumis myriocarpus</i> [Paddy Melon]*	-	-	-	-	-	-	-	-	-
<i>Cymbopogon refractus</i> [Barbed-wire Grass]	-	-	-	-	-	-	-	-	-
<i>Daucus glochidiatus</i> [Australian Carrot]	-	-	-	-	-	-	-	-	-
<i>Dianella</i> sp.	-	-	-	-	-	-	-	-	-
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	-	-	-	-	-	-	-	-	-
<i>Digitaria brownii</i> [Cotton Panic]	-	-	-	-	-	-	-	-	-
<i>Echium plantagineum</i> [Paterson's Curse]*	-	-	-	-	-	-	-	-	-
<i>Einadia nutans</i> [Climbing Saltbush]	-	-	P	-	-	-	-	-	-
<i>Einadia hastata</i> [Saloop]	-	-	P	-	-	-	-	-	-
<i>Elymus scaber</i> [Common Wheatgrass]	-	-	-	-	-	-	-	-	-
<i>Emex australis</i> [Spiny Emex]*	P	-	-	-	-	-	-	-	-
<i>Enneapogon</i> sp. [Bottlewashers]	-	-	-	-	-	-	-	-	-

Table 2[d] [Cont'd]
Ground Cover Species Recorded In Quadrats 28 to 36 within the Study Area

Page 2 of 3

SPECIES	QUADRAT								
	28	29	30	31	32	33	34	35	36
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	-	-	-	-	-	-	-	-	--
<i>Eragrostis falcata</i> [Sickle Lovegrass]	-	-	-	-	-	-	-	-	-
<i>Eragrostis lacunaria</i> [Purple Lovegrass]	-	-	-	-	-	-	-	-	-
<i>Hedynois rhagadioloides</i> ssp. <i>cretica</i> [Cretan Weed]*	-	-	-	-	-	-	-	-	-
<i>Heliotropium europaeum</i> [Common Heliotrope]*	P	-	-	-	-	-	-	P	-
<i>Hordeum leporinum</i> [Barley Grass]*	-	-	P	-	-	-	P	-	-
<i>Hypochaeris glauca</i> [Smooth Catsear]*	-	-	P	-	-	-	-	-	-
<i>Juncus</i> sp. [Rush]	-	-	-	-	-	-	-	-	-
<i>Lamarckia aurea</i> [Golden-top]*	-	P	-	-	P	P	-	-	-
<i>Lepidium africanum</i> [Peppercress]*	-	-	-	P	-	-	P	-	-
<i>Lolium rigidum</i> [Annual Ryegrass]*	-	-	-	-	P	-	P	-	P
<i>Lomandra filiformis</i> subsp. <i>flavior</i> [Matrush]	-	-	-	-	-	-	-	-	-
<i>Malva parviflora</i> [Small-flowered Mallow]*	-	-	-	-	-	-	-	-	-
<i>Marrubium vulgare</i> [Horehound]*	-	P	-	-	-	-	-	-	-
<i>Medicago laciniata</i> [Cutleaf Medic]*	-	-	-	-	-	-	P	-	-
<i>Medicago minima</i> [Small Woolly Burr Medic]*	P	P	-	-	P	P	P	-	-
<i>Medicago sativa</i> [Lucerne]*	-	-	P	P	-	P	-	-	-
<i>Medicago scutellata</i> [Snail Medic]*	-	-	-	-	-	-	-	-	-
<i>Oncinocalyx betchei</i>	-	-	-	-	-	-	-	-	-
<i>Opuntia</i> sp. [Prickly Pear]*	-	-	-	-	-	-	-	-	-
<i>Oxalis</i> sp. [Wood Sorrel]*	-	-	-	-	-	-	-	-	-
<i>Paspalidium constrictum</i> [Box Grass]	-	-	-	-	-	-	-	-	-
<i>Rapistrum rugosum</i> [Turnip Weed]*	-	-	-	-	-	-	-	-	-
<i>Rumex brownii</i> [Slender Dock]	-	-	-	-	-	-	-	-	-
<i>Salsola kali</i> [Buckbush]	-	-	-	-	P	-	-	-	-
<i>Sclerolaena birchii</i> [Galvanised Burr]	-	-	-	-	-	-	-	-	-
<i>Senecio quadridentatus</i> [Cotton Fireweed]	-	-	-	-	-	-	-	-	-
<i>Sida corrugata</i> [Corrugated Sida]	-	-	-	-	-	-	-	P	-
<i>Sida cunninghamii</i> [Ridge Sida]	-	-	-	-	-	-	-	-	-
<i>Sida</i> sp.	-	-	-	-	-	-	-	-	-
<i>Sida rhombifolia</i> [Paddy's Lucerne]*	-	-	-	-	-	-	-	-	-
<i>Sida</i> sp. A [Scrambling Sida]	=	=	=	P	-	-	-	-	-
<i>Sida subspicata</i> [Spiked Sida]	-	-	-	-	-	-	-	-	-
<i>Silybum marianum</i> [Variegated Thistle]*	-	-	-	-	-	-	-	-	-
<i>Sisymbrium orientale</i> [Hedge Mustard]*	-	P	-	P	-	P	-	P	-
<i>Solanum esuriale</i> [Quena]	-	-	-	-	-	-	-	-	-
<i>Solanum ferocissimum</i> [Spiny Potato-bush]	-	-	-	-	-	-	-	-	-
<i>Spartothamnella juncea</i> [Bead Bush]	-	-	-	-	-	-	-	-	-
<i>Swainsona sericea</i> [Swainson-pea]	-	-	-	-	-	-	-	-	-
<i>Thyridolepis mitchelliana</i> [Mulga Grass]	-	-	-	-	-	-	-	-	-
<i>Trifolium campestre</i> [Hop Clover]*	-	-	-	-	-	-	-	-	-
<i>Triptilodiscus pygmaeus</i> [Common Sunray]	-	-	-	-	-	-	-	-	-
<i>Triticum aestivum</i> [Wheat]*	-	-	-	-	-	-	-	-	-
<i>Urtica incisa</i> [Scrub Nettle]	-	-	-	-	-	-	-	-	-
<i>Vittadinia cervicularis</i> var. <i>cervicularis</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-

Table 2[d] [Cont'd]
Ground Cover Species Recorded In Quadrats 28 to 36 within the Study Area

Page 3 of 3

SPECIES	QUADRAT									
	28	29	30	31	32	33	34	35	36	
<i>Vittadinia cuneata</i> var. <i>cuneta</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-	-
<i>Vittadinia cuneata</i> var. <i>hirsuta</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-	-
<i>Vittadinia muelleri</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-	-
<i>Vittadinia</i> sp. New Holland Daisy]	-	-	-	P	-	P	-	P	-	-
<i>Vittadinia sulcata</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-	-
<i>Vulpia muralis</i> [Silver Grass]*	-	-	-	-	-	-	-	-	-	-
<i>Wahlenbergia communis</i> [Tufted Bluebell]	-	-	-	-	-	-	P	-	P	-
<i>Wahlenbergia luteola</i> [Bluebell]	-	-	-	-	-	-	-	-	-	-

Table 2[e]
Ground Cover Species Recorded In Quadrats 37 to 46 within the Study Area

Page 1 of 3

SPECIES	QUADRAT									
	37	38	39	40	41	42	43	44	45	46
<i>Alternanthera pungens</i> [Khaki Weed]*	-	-	-	-	-	-	-	-	-	-
<i>Ammi majus</i> [Queen Anne's Lace]	-	-	-	-	-	-	-	-	-	P
<i>Anagallis arvensis</i> [Scarlet Pimpernell]*	-	-	P	-	-	-	-	-	-	-
<i>Ancistrachne uncinulatum</i> [Hooky Grass]	-	-	-	-	-	-	-	-	-	-
<i>Arthropodium</i> sp. B [Vanilla Lily]	-	-	-	-	-	-	-	-	-	-
<i>Arctotheca calendula</i> [Capeweed]*	-	-	P	-	-	P	-	-	-	-
<i>Aristida ramosa</i> [Purple Wiregrass]	P	P	-	-	P	P	-	-	-	-
<i>Austrodanthonia richardsonii</i> [Wallaby Grass]	-	-	-	-	-	-	-	-	-	-
<i>Austrostipa aristiglumis</i> [Plains Grass]	-	-	-	-	-	-	-	-	-	P
<i>Austrostipa nitida</i> [Corkscrew Grass]	-	P	-	-	-	-	-	-	-	-
<i>Austrostipa setacea</i> [Corkscrew Grass]	-	-	-	-	-	-	-	-	-	-
<i>Austrostipa verticillata</i> [Slender Bamboo Grass]	-	-	-	-	-	-	-	-	-	-
<i>Avena</i> sp. [Oats]*	-	-	P	-	P	P	-	P	-	-
<i>Boerhavia dominii</i> [Tah Vine]	-	-	-	-	-	-	-	-	-	-
<i>Bracteantha bracteata</i> [Golden Everlastings]	-	-	-	-	-	-	-	-	-	-
<i>Bracteantha viscosa</i> [Sticky Everlasting]	-	-	-	-	-	-	-	-	-	-
<i>Bromus molliformis</i> [Silky Brome]*	-	-	-	-	-	-	-	-	-	-
<i>Bulbine semibarbata</i> [Leek Lily]	-	-	-	-	-	-	-	-	-	-
<i>Calandrinia</i> sp.	-	-	-	-	-	-	-	-	-	-
<i>Calotis cuneifolia</i> [Purple Burr-daisy]	-	-	-	-	-	-	-	-	-	-
<i>Calotis hispidula</i> [Bogan Flea]	-	-	P	-	-	-	-	-	-	-
<i>Calotis lappulacea</i> [Yellow Burr-daisy]	-	-	-	-	-	-	-	-	-	-
<i>Carthamus lanatus</i> [Saffron Thistle]*	P	P	-	P	-	P	P	-	P	-
<i>Centaurea melitensis</i> [Maltese Cockspur]*	-	-	-	-	-	-	P	-	-	-
Cereal Crop Stubble	-	-	-	-	-	-	-	-	-	-
<i>Chamaesyce drummondii</i> [Caustic Weed]	-	-	-	-	-	-	P	-	-	-

Table 2[e] [Cont'd]
Ground Cover Species Recorded In Quadrats 37 to 46 within the Study Area

Page 2 of 3

SPECIES	QUADRAT									
	37	38	39	40	41	42	43	44	45	46
<i>Cheilanthes seeberi</i> [Rock Fern]	-	-	-	-	-	-	-	-	-	-
<i>Cheilanthes distans</i> [Bristly Cloak Fern]	-	-	-	-	-	-	-	-	-	-
<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i> [Desert Goosefoot]	-	-	-	-	-	-	-	-	-	-
<i>Chloris ventricosa</i> [Tall Chloris]	-	-	-	-	-	-	-	-	-	-
<i>Chondrilla juncea</i> [SkeletonWeed]*	-	P	P	-	-	-	-	-	P	-
<i>Chrysocephalum apiculatum</i> [Yellow Buttons]	-	-	-	-	-	-	-	-	-	-
<i>Cirsium vulgare</i> [Spear Thistle]	-	-	-	-	-	-	-	-	-	P
<i>Conyza</i> sp. [Fleabane]*	-	-	-	-	-	P	-	-	-	-
<i>Crassula colorata</i> var. <i>acuminata</i> [Dense Stonecrop]	-	-	-	-	-	-	-	-	-	-
<i>Cucumis myriocarpus</i> [Paddy Melon]*	-	-	-	-	-	-	-	-	-	P
<i>Cymbopogon refractus</i> [Barbed-wire Grass]	-	-	-	-	-	-	-	-	-	-
<i>Daucus glochidiatus</i> [Australian Carrot]	-	-	-	-	-	-	-	-	-	-
<i>Dianella</i> sp.	-	-	-	-	-	-	-	-	-	-
<i>Dichanthium sericeum</i> [Queensland Bluegrass]	-	-	-	-	-	-	-	-	-	-
<i>Digitaria brownii</i> [Cotton Panic]	-	-	-	-	-	-	-	-	-	-
<i>Echium plantagineum</i> [Paterson's Curse]*	-	-	-	-	-	-	-	-	-	-
<i>Einadia nutans</i> [Climbing Saltbush]	-	-	-	-	-	-	-	-	-	-
<i>Einadia hastata</i> [Saloop]	P	P	-	-	-	-	-	-	-	-
<i>Elymus scaber</i> [Common Wheatgrass]	-	-	-	-	-	-	-	-	-	-
<i>Emex australis</i> [Spiny Emex]*	-	-	-	-	-	-	-	-	-	-
<i>Enneapogon</i> sp. [Bottlewashers]	-	-	-	-	-	-	-	-	-	-
<i>Enteropogon acicularis</i> [Curly Windmill Grass]	-	P	-	-	-	-	-	-	-	-
<i>Eragrostis falcata</i> [Sickle Lovegrass]	-	-	-	-	-	-	-	-	-	-
<i>Eragrostis lacunaria</i> [Purple Lovegrass]	-	-	-	-	-	-	-	-	-	-
<i>Hedypnois rhagadioloides</i> ssp. <i>cretica</i> [Cretan Weed]*	-	-	-	-	-	-	-	-	-	-
<i>Heliotropium europaeum</i> [Common Heliotrope]*	-	-	-	-	-	P	-	-	-	-
<i>Hordeum leporinum</i> [Barley Grass]*	-	-	P	P	P	-	-	-	P	-
<i>Hypochaeris glauca</i> [Smooth Catsear]*	-	-	-	-	-	-	-	-	-	-
<i>Juncus</i> sp. [Rush]	-	-	-	-	-	-	-	-	-	P
<i>Lamarckia aurea</i> [Golden-top]*	-	-	-	P	-	P	-	-	-	-
<i>Lepidium africanum</i> [Peppercress]*	P	P	-	-	-	P	-	-	-	-
<i>Lolium rigidum</i> [Annual Ryegrass]*	P	P	-	-	P	P	-	-	-	-
<i>Lomandra filiformis</i> subsp. <i>flavior</i> [Matrush]	-	-	-	-	-	-	-	-	-	-
<i>Malva parviflora</i> [Small-flowered Mallow]*	-	-	-	-	-	-	-	-	-	-
<i>Marrubium vulgare</i> [Horehound]*	-	-	-	-	-	-	-	-	-	-

Table 2[e] [Cont'd]
Ground Cover Species Recorded In Quadrats 37 to 46 within the Study Area

Page 3 of 3

SPECIES	QUADRAT									
	37	38	39	40	41	42	43	44	45	46
<i>Medicago laciniata</i> [Cutleaf Medic]*	-	-	P	-	-	-	-	-	-	-
<i>Medicago minima</i> [Small Woolly Burr Medic]*	P	P	-	-	-	P	-	-	-	-
<i>Medicago sativa</i> [Lucerne]*	P	P	P	P	-	-	-	P	-	-
<i>Medicago scutellata</i> [Snail Medic]*	-	-	P	-	-	-	-	-	-	P
<i>Oncinocalyx betchei</i>	-	-	-	-	-	-	-	-	-	-
<i>Opuntia</i> sp. [Prickly Pear]*	-	-	-	-	-	-	-	-	-	-
<i>Oxalis</i> sp [Wood Sorrel]*	-	-	-	-	-	-	-	-	-	-
<i>Paspalidium constrictum</i> [Box Grass]	-	-	-	-	-	-	-	-	-	-
<i>Rapistrum rugosum</i> [Turnip Weed]*	-	-	-	-	-	-	-	-	-	-
<i>Rumex browni</i> [Slender Dock]	-	-	-	-	-	-	-	-	-	P
<i>Salsola kali</i> [Buckbush]	-	-	-	-	-	-	-	-	-	-
<i>Sclerolaena birchii</i> [Galvanised Burr]	-	-	-	-	-	-	-	-	-	-
<i>Senecio quadridentatus</i> [Cotton Fireweed]	-	-	-	-	-	-	-	-	-	-
<i>Sida corrugata</i> [Corrugated Sida]	-	-	-	-	-	-	-	-	-	-
<i>Sida cunninghamii</i> [Ridge Sida]	-	-	-	-	-	-	-	-	-	-
<i>Sida rhombifolia</i> [Paddy's Lucerne]*	-	-	-	-	-	-	-	-	-	-
<i>Sida</i> sp. A [Scrambling Sida]	-	-	-	-	-	-	-	-	-	-
<i>Sida</i> sp.	-	-	-	-	-	-	P	-	-	-
<i>Sida subspicata</i> [Spiked Sida]	-	-	-	-	-	-	-	-	-	-
<i>Silybum marianum</i> [Variegated Thistle]*	-	-	-	-	-	-	-	-	-	-
<i>Sisymbrium orientale</i> [Hedge Mustard]*	-	P	P	-	-	P	-	-	-	-
<i>Solanum esuriale</i> [Quena]	-	-	-	-	-	-	-	-	-	-
<i>Solanum ferocissimum</i> [Spiny Potato-bush]	-	-	-	-	-	-	-	-	-	-
<i>Spartothamnella juncea</i> [Bead Bush]	-	-	-	-	-	-	-	-	-	-
<i>Swainsona sericea</i> [Swainson pea]	-	-	-	-	-	-	-	-	-	-
<i>Thyridolepis mitchelliana</i> [Mulga Grass]	-	-	-	-	-	-	-	-	-	-
<i>Trifolium campestre</i> [Hop Clover]*	-	-	-	-	-	-	-	-	-	-
<i>Triptilodiscus pygmaeus</i> [Common Sunray]	-	-	-	-	-	-	-	-	-	-
<i>Triticum aestivum</i> [Wheat]*	-	P	-	-	-	-	-	P	-	-
<i>Urtica incisa</i> [Scrub Nettle]	-	-	-	-	-	-	-	-	-	-
<i>Vittadinia cervicalis</i> var <i>circularis</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-	-
<i>Vittadinia cuneata</i> var. <i>cuneata</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-	-
<i>Vittadinia cuneata</i> var. <i>hirsuta</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-	-
<i>Vittadinia muelleri</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-	-
<i>Vittadinia</i> sp. {New Holland Daisy}	P	-	P	-	-	-	-	-	-	-
<i>Vittadinia sulcata</i> [Fuzzweed]	-	-	-	-	-	-	-	-	-	-
<i>Vulpia muralis</i> [Silver Grass]*	-	-	-	-	-	P	-	-	-	-
<i>Wahlenbergia communis</i> [Tufted Bluebell]	-	-	-	-	-	-	-	-	-	-
<i>Wahlenbergia luteola</i> [Bluebell]	-	P	P	-	-	-	-	-	-	-

5 PROJECT MANAGEMENT

The Project Site is located in an area extensively cleared for agriculture and does not affect major areas of native vegetation.

However, NMPL would also consider fauna issues in planning and operating the Sunnyside Coal Project. These aspects are discussed in the following sections.

5.1 Design Features

In order to minimise impact on areas of remnant native vegetation, the following design principles would be incorporated into the Project.

- All activities on the Project Site would be located in areas previously disturbed for agricultural use, wherever practicable.
- Koala habitat would be avoided wherever possible
- Tree species for use in revegetation would include a significant proportion of Koala feed trees.
- The revegetation plan for the small section of the Coochoonah Lane re-alignment supporting the vegetation community identified as a remnant of the Native Vegetation on Cracking Clay soils of the Liverpool Plains may need to provide for reseeded of the dominant grassland species at the conclusion of coal transport.

5.2 Operational Safeguards

NMPL would consider adopting the following operational safeguards in order to minimise any potential adverse impacts on the local flora within the Project Site.

- The extent of clearing undertaken would be minimised and consistent with operational requirements.
- All areas to be cleared would be clearly defined.
- All clearing and topsoil stripping would be undertaken in campaigns on an as-needed basis.
- Soil material and biomass removed beyond the first 18 to 24 months of mining would be directly transferred to an active rehabilitation area, where practicable.
- Progressive rehabilitation of all disturbed surfaces would be undertaken
- Noxious weeds would be controlled at all times.

5.3 Habitat Establishment

The majority of the area to be affected by the Project is already cleared and farmed land that would for the most part be returned to grazing/farming land use. However, operation of the Project would recognise the presence of a healthy Koala population on, and adjacent to, the Project Site.

NMPL is committed to implementing the Koala Management Plan developed by Kevin Mills and Associates. This Plan involves managing 112ha of existing native vegetation for Koala habitat, planting and maintenance of 9ha of new vegetation of Koala feed trees to create Koala corridors and the planting 9.8ha of Koala feed trees to enhance existing Koala corridors.

Consequently, rehabilitation would establish valuable areas of new Koala habitat and enhance existing Koala habitat and movement corridors to link remnant areas of native vegetation.

Livestock would be excluded from the Koala habitat / movement corridors, although the corridor trees and other vegetation would provide windbreaks and sun shade for nearby grazing animals. The increase in trees would also have a positive effect in reducing / preventing ground water table rise and related soil salinity issues. They would also add to the visual amenity at the Project Site.

5.4 Noxious Weeds

Two species recorded within the Study Area are listed as Noxious Weeds for Gunnedah Shire. These species are:

- Paterson's Curse* [*Echium plantagineum*] [Class 4]
- Prickly Pears* [*Opuntia* sp.] [Class 4]

The code in brackets after each species shows the weed category in terms of the *Noxious Weeds Act 1993* classifications as indicated below.

Class 4, Locally Controlled Weeds - Class 4 noxious weeds are plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.

These weeds would require continuous monitoring of infestations and control of any plants that appear with appropriate herbicides.

6 KOALA HABITAT CONSIDERATIONS

Circular B35 issued to Councils by the Department of Urban Affairs and Planning provides information on State Environmental Planning Policy No 44 - Koala Habitat Protection [SEPP 44].

The Study Area is situated within Gunnedah Shire and Schedule 1 of the Policy lists the Gunnedah Shire as a local government area 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.'

Two of the species listed in Schedule 2 of SEPP 44 are found within the Study Area. These are *Eucalyptus albens* [White Box] and *Eucalyptus populnea* ssp. *bimbil* [Bimble Box].

The Bimble Box trees occur in a corridor along the waterway [reserved road] in the northwest corner of 'Sunnyside' property and in a small area near the eastern extremity of the proposed transport route on 'Plain View' property. It is understood that they would not be affected by the Project.

A few White Box [*Eucalyptus albens*] trees occur in the corridor along the waterway on ' the western boundary of 'Sunnyside' property. Many White Box trees occur in a number of other locations on the southern half of 'Sunnyside' property.

The communities in which this species occur are:

- **Community 2** – Regenerating Grasslands Community – **scattered White Box trees**
- **Community 6** – *Eucalyptus dealbata* [Tumbledown Gum] – *Geijera parviflora* [Wilga] – *Callitris glaucophylla* [White Cypress Pine] Community – **scattered White Box trees**
- **Community 7** - White Box [*Eucalyptus albens*] Community – **White Box trees common**
- **Community 8** – *Eucalyptus populnea* subsp. *bimbil* [Bimble Box] – *Eucalyptus melliodora* [Yellow Box] - *Eucalyptus albens* [White Box] Woodland Community – **some White Box trees; Bimble Box trees common**

White Box is relatively common within these individual communities but does not constitute a large proportion of the tree cover over the entire Study Area.

Because of the high number of 'Koala feed trees' present in these particular communities on the Study Area and the presence of Koalas in the Coccooboonah Lane road reserve it is very likely the area can be regarded as 'potential Koala habitat' as described in SEPP 44.

The Project would result in the removal of up to three Koala feed trees given the RTA's requirement to provide priority to vehicles travelling on Coccooboonah Lane rather than from the Project Site.

7 THREATENED SPECIES ISSUES

Prior to the field survey, a request was made to the NSW Department of Environment and Conservation's [DEC] 'Atlas of NSW Wildlife' database for details of the occurrence, within a 20km x 20km square surrounding the centre of the Study Area, of any Threatened Flora Species listed in Schedules 1 and 2 of the *Threatened Species Conservation Act 1995*, any endangered ecological communities, any endangered flora populations and any critical habitat. [date of search 27th September, 2006]

7.1 The 'Atlas of NSW Wildlife' Database

The database search yielded details of a single collection of a Threatened flora species within the 400km² area, namely, *Cadellia pentastylis* [Ooline] - a single collection in 1907 from Blackjack State Forest about 13km east-southeast of the Study Area and adjacent to the town of Gunnedah.

This species is discussed in **Table 3**.

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

Page 1 of 3

SPECIES	ASSESSMENT
<i>Cadellia pentastylis</i>	A possible occurrence In the region [EPBC Act database]. 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: Warialda: Mole River: Tenterfield Creek. [Benson, 1993]. Conserved in Gamilaraay Nature Reserve near Terry Hie Hie and Scrub Myrtle Flora Reserve in Deriah State Forest. It is recorded also from the Maules Creek area and near Gunnedah town. The species is distinctive in appearance and was not recorded during field inspection even though suitable habitat possibly occurs at the Project Site. 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>Calotis glandulosa</i>	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. A POSSIBLE OCCURENCE AT THE PROJECT SITE 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 and it would be outside its normal range if it occurred at the Study Area. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Dichanthium setosum</i>	A grass that 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 Project Site. A POSSIBLE OCCURENCE AT THE PROJECT SITE 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.

Table 3 [Cont'd]
Assessment of the Likelihood of Occurrence of Threatened Flora Species

Page 2 of 3

SPECIES	ASSESSMENT
<i>Digitaria porrecta</i>	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 Project Site. A POSSIBLE OCCURRENCE AT THE PROJECT SITE 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 tricolor</i> <i>[sheaffiana]</i>	This species was listed on the Schedules of the Threatened Species Conservation Act as <i>Diuris sheaffiana</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 POSSIBLY PRESENT AT THE PROJECT SITE. The species was not recorded during field inspection and there are no records of its presence at the Project Site in the past. Suitable habitat does not occur at the Project Site. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT AT THE PROJECT SITE.
<i>Goodenia macbarronii</i>	Harden [1992] notes that this grows in damp sandy soils south from the Guyra and Inverell districts. SUITABLE HABITAT IS NOT PRESENT AT THE PROJECT SITE. 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>Hakea pulvinifera</i>	A root suckering shrub to about 4 m high with thick tessellated bark and hairy young branches. Confined to a single population on a hard rocky hillside below Keepit Dam near Gunnedah. [Harden, 1991]. The species is distinctive and not known away from the Keepit Dam site. It 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>Homoranthus darwinioides</i>	A spreading shrub usually 1 to 1.5 m high [Harden, 2002]. This species flowers in spring and grows in dry sclerophyll forest or woodland; usually on sandstone outcrops or ridges; rare; recorded from the Putty district to Dubbo. SUITABLE HABITAT IS PRESENT AT THE PROJECT SITE. 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>Philothea ericifolia</i>	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]. SUITABLE HABITAT IS NOT PRESENT AT THE PROJECT SITE. 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>Pterostylis cobarensis</i>	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>]. SUITABLE HABITAT IS PRESENT AT THE PROJECT SITE. 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.

Table 3 [Cont'd]
Assessment of the Likelihood of Occurrence of Threatened Flora Species

Page 3 of 3

SPECIES	ASSESSMENT
<i>Swainsona murrayana</i>	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 Project Site. A POSSIBLE, BUT UNLIKELY, OCCURRENCE AT THE PROJECT SITE BUT AWAY FROM ITS NORMAL HABITAT NICHE. 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>	Recorded from the Central-west Slopes Botanical Subdivision [Harden, 1992]. This species flowers spring - summer and grows in grassland or woodland, often in damp sites. SUITABLE HABITAT IS NOT PRESENT AT THE PROJECT SITE. 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>	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. SUITABLE HABITAT IS PROBABLY PRESENT AT THE PROJECT SITE. 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.

7.2 BIOCLIM Model Predictions

In addition to the detailed records of species occurrence, DECC has provided a list of threatened flora species predicted to occur within the boundaries of the Boggabri and Curlewis 1:100 000 map sheet areas using the BIOCLIM model. The predictions for both map sheets were provided as the Study Area is located close to the boundary between the two.

The species predicted to occur are:

Cadellia pentastylis
Calotis glandulosa
Dichanthium setosum
Goodenia macbarronii
Philothea ericifolia
Hakea pulvinifera
Homoranthus darwinioides
Swainsona murrayana
Thesium australe

The likelihood of the occurrence of these species is assessed, in **Table 3**.

The BIOCLIM prediction list for both map sheets contained an additional species – *Bothriochloa biloba* – that has had its listing as a threatened species revoked. Consequently, this species was not considered in the present study.

7.3 Commonwealth Environment Protection and Biodiversity Conservation Act 1999 [EPBC Act] Online Database Threatened Species Listing

A search of the Commonwealth *Environment Protection and Biodiversity Conservation Act* Online Database [Protected Matters Report] revealed that eight plant species listed as threatened species under this Act were likely to occur within a 20km radius of the centre of the Study Area. [date of search 28th September, 2006]

These species are:

Diuris sheaffiana [now *Diuris tricolor*]
Digitaria porrecta
Goodenia macbarronii
Philothea ericifolia
Pterostylis cobarensis
Swainsona murrayana
Thesium australe
Tylophora linearis

These species are also discussed in **Table 3**.

7.4 Endangered Ecological Communities and Populations

7.4.1 New South Wales Threatened Species Conservation Act 1995

The 'Atlas of NSW Wildlife' Database report indicates that the following endangered ecological communities may potentially occur within the boundaries of the Boggabri and Curlewis 1:100 000 scale map sheet areas.

- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, 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 Riverine Plains and Brigalow Belt South Bioregions
- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions
- Howell Shrublands in the Northern Tablelands and Nandewar Bioregions
- McKies Stringybark / Blackbutt Open Forest in the Nandewar and New England Tableland Bioregions.
- Semi-evergreen Vine Thicket 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

7.4.2 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Protected Matters report generated on 28th September, 2006 indicates that only one EPBC Act-listed threatened ecological community is likely to occur within the vicinity of the Study Area.

This is the Critically Endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands – previously described, in part, as the Grassy White Box Woodlands endangered ecological community.

7.5 Field Survey Data

7.5.1 Threatened Plant Species

The threatened plant species likely to occur in the general region of the Study Area were targeted during the field survey.

No threatened plant species were recorded within the Study Area.

7.5.2 Endangered Ecological Communities and Populations

After considering the structure and composition of the vegetation communities present it has been determined that the Study Area contains remnants of the White Box [*Eucalyptus albens*] Yellow Box [*Eucalyptus melliorora*] Blakely's Red Gum [*Eucalyptus blakelyi*] Woodland endangered ecological community [NSW TSC Act] and the Critically Endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands. [Commonwealth EPBC Act] ecological community. This community was recorded on the western boundary of 'Sunnyside' property and is present along Coocooboonah Lane

There is also another community dominated by White Box present within the Study Area [**Community 7**]. This community differs from the White Box [*Eucalyptus albens*] Yellow Box [*Eucalyptus melliodora*] Blakely's Red Gum [*Eucalyptus blakelyi*] Woodland endangered ecological community and the Critically Endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and the Derived Native Grasslands [Commonwealth EPBC Act] [previously described, in part, as the Grassy White Box Woodlands endangered ecological community]. This difference is as a result of the predominance of shrubs [rather than grasses and herbs] in the understorey – a situation noted in the description of the former community and specifically excluded from the listing of the latter community on page 4 of the publication 'White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands' [DEH, 2006].

A small area of the Native vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community was recorded on the eastern extremity of the proposed re-aligned Coocooboonah Lane, on 'Plain View' property near where the route joins Coocooboonah Lane close to the Oxley Highway.

7.5.3 Critical Habitat

There are no areas of critical habitat listed for the Study Area or its environs.

7.5.4 Introduced Plant Species

Of a total of 140 plant species recorded within the Study Area, thirty seven [37] are introduced. The percentage of introduced plants is 26.4% of the total plant number, however, many these plants are very numerous – particularly on the open crop and grazing land.

Of the 104 ground cover [pasture] species recorded within the Study Area, some 37 [or 35.6%] are introduced.

The proportion of the cover provided by introduced species on most sections of the Study Area is quite significant. This situation would further exacerbated in the cooler months when the introduced annuals are more prevalent.

7.6 Cumulative Impacts

As there would be no permanent impact of the Project on threatened flora species, populations, endangered or critically endangered ecological communities or critical habitat there would be no permanent cumulative impact on remnant native vegetation resulting from undertaking the Project.

7.7 Possible Impacts on Fish Habitat

The Project is not located near any areas of fish habitat and so would not cause any impact on such habitat.

7.8 Seven-Part Test

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

Portion of the Study Area has been highly modified from its original condition and habitat values as a consequence of previous agricultural use including thinning of the tree cover and complete clearing for grazing and cropping. However, areas of remnant native vegetation occur with the Study Area.

There is no suitable habitat present at the Project 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 Project Site.

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 Gunnedah occurs at the Project Site.

For the purposes of the *Environmental Planning and Assessment Act 1979* N^o. 203 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 affect from the Project 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 effect from the Project 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.

The Study Area contains remnants of the White Box [*Eucalyptus albens*] Yellow Box [*Eucalyptus melliodora*] Blakely's Red Gum [*Eucalyptus blakelyi*] Woodland endangered ecological community [NSW TSC Act] and the Critically Endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands. [Commonwealth EPBC Act] ecological community. This community was recorded on the western boundary of 'Sunnyside' property and is present along Coochoonah Lane

A small area of the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community was recorded on the eastern extremity of the proposed transport route, on Plain View property near where the route joins Coochoonah Lane close to the Oxley Highway.

The Project would not impact in any significant manner on the White Box [*Eucalyptus albens*] Yellow Box [*Eucalyptus melliodora*] Blakely's Red Gum [*Eucalyptus blakelyi*] Woodland endangered ecological community [NSW TSC Act] / Critically Endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands. [Commonwealth EPBC Act] ecological community as the areas supporting these communities would not be disturbed.

The small area of the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community that is present along a small section of the proposed transport route would be temporarily disturbed by the construction of the road. However, only the topsoil would be removed from this area. This topsoil that contains seeds of the species that form this community would be stockpiled separately and then respread after the roadbase material is removed at the cessation of mining.

It is considered that this temporary disturbance would not constitute a significant impact on this endangered ecological community as it is already degraded and with sympathetic management after the rehabilitation works are complete, including resowing of the dominant groundcover species [if required], its post mining condition would be enhanced.

Consequently it is considered that the Project:

[i] is not 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; nor

[ii] is it 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.

[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.

The Project would not impact in any significant manner on the White Box [*Eucalyptus albens*] Yellow Box [*Eucalyptus melliodora*] Blakely's Red Gum [*Eucalyptus blakelyi*] Woodland endangered ecological community [NSW TSC Act] / Critically Endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands. [Commonwealth EPBC Act] ecological community as the areas supporting these communities would not be disturbed.

The area of the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community that is present along a small section of the proposed transport route [approx 1ha] would be temporarily disturbed by the construction of the road. However, only the topsoil would be removed from this area. This topsoil that contains seeds of the species that form this community would be stockpiled separately and then respread after the roadbase material is removed at the cessation of mining.

It is considered that this temporary disturbance would not:

- constitute a significant long term modification of this endangered ecological community or its habitat;
- result in the fragmentation of this habitat in the long term; nor
- have any significant detrimental impact on the long term survival of the endangered ecological community.

In fact, with sympathetic management after the rehabilitation works are complete, including resowing of the dominant groundcover species [if required], its post mining condition would be enhanced.

[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 Project 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 is no species recovery plan in existence for the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community and there are no threat abatement plans that have been finalised and that are relevant to the Study Area

[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.

The temporary removal of the topsoil within the area of the area occupied by the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community would be regarded as clearing of Native Vegetation [NSW TSC Act] and Land Clearance [Commonwealth EPBC Act] because of the presence, in particular, of the native *Austrostipa aristiglumis* [Plains Grass]. However, it is not envisaged that any trees would be removed and the native groundcover species would be replaced, and enhanced, on the cessation of mining during the rehabilitation process.

Consequently while a key threatening process would have a temporary impact, the long term view is one of the process ceasing to exist and of endangered ecological community enhancement.

7.9 Threatened Species Overview

- (i) There are no past records of threatened flora species contained in the 'Atlas of NSW Wildlife' database for the Study Area.
- (ii) No threatened flora species were recorded from Study Area during field survey, despite predictions and records that indicated that a number of threatened flora species might be likely to occur at the Project Site. The likely occurrence of these species has been assessed in **Table 3**.
- (iii) Much of the Study Area has been cleared for many years; some is covered in regrowth native vegetation; and some areas have been cultivated and cropped or sown to introduced pasture species. All of the Study Area has been grazed by domestic livestock for many years.

Much of the Study Area has been invaded [often heavily] by introduced and native weed species.

- (iv) Two endangered ecological communities occur within the Study Area. These are the White Box [*Eucalyptus albens*] Yellow Box [*Eucalyptus melliodora*] Blakely's Red Gum [*Eucalyptus blakelyi*] Woodland endangered ecological community [NSW TSC Act] / Critically Endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands. [Commonwealth EPBC Act] ecological community and the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community. The former community would not be significantly affected by the Project and the latter would experience a temporary impact that would be redressed and the community enhanced after mining ceases.
- (v) There are no endangered flora populations listed for the Study Area in the Schedules of the Threatened Species Conservation Act or the Commonwealth Environment Protection and Biodiversity Conservation Act.
- (vi) There is no critical habitat listed for the Study Area or its environs.
- (vii) 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 Project. .

8 OVERVIEW

Nine vegetation communities have been identified within the Study Area.

On the basis of:

- the flora surveys conducted over the Study Area in October and December , 2006;

- the assessment of the data obtained from the National Parks and Wildlife Service and Commonwealth EPBC Act databases; and
- the details of endangered ecological communities provided by the Scientific Committee,

it is concluded that no threatened flora species or endangered flora populations exist within the Study Area.

A remnant of the White Box Yellow Box Blakely's Red Gum Woodland endangered ecological community occurs within the Study Area but would not be affected in any significant manner by the Project.

A remnant of the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community occurs within the Study Area. A small section of this his would be temporarily affected by the proposed transport route but the community would be rehabilitated and enhanced following rehabilitation after mining ceases.

Much of the Study Area has been cleared in the past and most of this cleared area has been cultivated. The vegetation on the cleared areas is relatively heavily invaded by introduced plants.

Completion of the 7-Part Test indicates that there would be no significant impact on any threatened flora species, endangered flora populations, endangered ecological communities or critical habitat resulting from development of the proposed coal mine. In view of the temporary impact of the Project on the small area of the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community, it has been assessed that approval is not required under the Commonwealth EPBC Act.

The Project is not located near any areas of fish habitat and so would not cause any impact on such habitat.

9 NEED FOR BIODIVERSITY OFFSETS

As the majority of the area to be affected by the Project is already cleared and farmed land that would for the most part be returned to grazing / farming land use it is not considered that any biodiversity offsets would be required.

The small area of the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community that would be temporarily affected would be returned to its original, or better, condition on the cessation of mining.

10 ADDRESSING DIRECTOR-GENERAL'S REQUIREMENTS

A number of issues relating to soils and land capability have been raised in the Director-General's Requirements.

Table 4 lists the issues and indicates the section of this study where each issue is addressed.

Table 4
Director-General's Requirements

ORGANISATION	PARAPHRASED ISSUE	SECTION WHERE ADDRESSED
Dept of Planning covering letter	Any Requirement for Approval under the EPBC Act	Sections 7, 8
	Need for Biodiversity Offsets	Section 9
Director-General's Requirements [Section 75F]	Threatened Species Assessment	Sections 7, 8, 9
Department of Environment and Conservation covering letter	Impact on Threatened Species, Communities, Populations, Critical Habitat	Sections 7, 8, 9
Department of Environment and Conservation Attachment A	Survey Methodology – DECC Guidelines Step 3	Sections 3, 4.2, 7.5
	Impact Assessment DECC Guidelines Step 5 including Cumulative Impacts	Sections 7 generally, 7.6 in particular, 9
	Offset Requirements	Section 9
Department of Environment and Conservation Attachment B	Threatened Species and Biodiversity Assessment	Sections 7, 9
Department of Natural Resources covering letter	Flora Survey, Threatened Species Assessment [TSC Act and EPBC Act]	Sections 3, 4, 7, 8, 9
Department of Primary Industries	Impact on Fish Habitat	Section 7.7
	Maintenance of Biodiversity	Sections 4, 7, 9

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Geoff Cunningham B.Sc.Agr.[Hons]; FAIAST.
Managing Director and Principal Ecologist.
5th January, 2007

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APPENDICES

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Appendix 1 List of Flora Species Recorded at the Study Area

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Appendix 1

List of Flora Species Recorded at the Study Area

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List of Flora Species Recorded at the Study Area

Acacia cheelii [Motherumbah],
Acacia decora [Western Golden Wattle],
Acacia doratoxylon [Currawang], Kurrajong,
Acacia homalophylla [Yarran]
Alectryon oliefolius [Rosewood]
Alphitonia excelsa [Red Ash]
Alstonia constricta [Quinine Bush]
Alternanthera pungens [Khaki Weed]*
Ammi majus [Queen Anne's Lace]*
Amyema sp. [Mistletoe]
Anagallis arvensis [Scarlet Pimpernell]*
Ancistrachne uncinulatum [Hooky Grass]
Arctotheca calendula [Capeweed]*
Aristida ramosa [Purple Wiregrass]
Arthropodium sp. B [Vanilla Lily]
Austrodanthonia richardsonii [Wallaby Grass]
Austrodanthonia setacea
Austrostipa aristiglumis [Plains Grass]
Austrostipa nitida [Corkscrew Grass]
Austrostipa verticillata [Slender Bamboo Grass]
Avena sp. [Oats]*
Beyeria viscosa [Sticky Wallaby-bush]
Boerhavia dominii [Tah Vine]
Brachychiton populneus [Kurrajong]
Bracteantha bracteata [Golden Everlastings]
Bracteantha viscosa [Sticky Everlasting]
Bromus molliformis [Silky Brome]*
Bulbine semibarbata [Leek Lily]
Bursaria spinosa [Native Blackthorn]
Calandrinia sp.
Callitris glaucophylla [White Cypress Pine]
Calotis cuneifolia [Purple Burr-daisy]
Calotis hispidula [Bogan Flea]
Calotis lappulacea [Yellow Burr-daisy]
Canthium odoratum [Iamboto]
Carthamus lanatus [Saffron Thistle]*
Cassinia laevis [Cough Bush]
Centaurea melitensis [Maltese Cockspur]*
Cereal Crop Stubble
Chamaesyce drummondii [Caustic Weed]
Cheilanthes distans [Bristly Cloak Fern]
Cheilanthes sieberi [Rock Fern]
Chenopodium desertorum subsp. *microphyllum* [Desert Goosefoot]
Chenopodium pumilio
Chloris ventricosa [Tall Chloris]
Chondrilla juncea [Skeleton Weed]*

Chrysocephalum apiculatum [Yellow Buttons]
Cirsium vulgare [Spear Thistle]*
Clematis microphylla [Old Man's Beard]
Conyza sp. [Fleabane]*
Crassula colorata var. *acuminata* [Dense Stonecrop]
Croton phebalioides
Cucumis myriocarpus [Paddy Melon]*
Cymbopogon refractus [Barbed-wire Grass]
Daucus glochidiatus [Australian Carrot]
Dianella sp.
Dichanthium sericeum [Queensland Bluegrass]
Digitaria brownii [Cotton Panic]
Dodonaea viscosa subsp. *spatulata* [Broad-leaf Hopbush]
Echium plantagineum [Paterson's Curse]*
Ehretia membranifolia [Peach Bush]
Einadia hastata [Saloop]
Einadia nutans [Climbing Saltbush]
Elymus scaber [Common Wheatgrass]
Emex australis [Spiny Emex]*
Enneapogon sp. [Bottlewashers]
Enteropogon acicularis [Curly Windmill Grass]
Eragrostis falcata [Sickle Lovegrass]
Eragrostis lacunaria [Purple Lovegrass]
Eremophila mitchellii [Budda]
Eucalyptus albens [White Box]
Eucalyptus dealbata [Tumbledown Gum]
Eucalyptus melliodora [Yellow Box]
Eucalyptus populnea subsp. *bimbil* [Bimble Box]
Geijera parviflora [Wilga]
Hedychnois rhagadioloides ssp. *cretica* [Cretan Weed]*
Heliotropium europaeum [Common Heliotrope]*
Hordeum leporinum [Barley Grass]*
Hypochaeris glauca [Smooth Catsear]*
Indigofera sp.
Jasminum lineare [Native Jasmine]
Juncus sp. [Rush]
Lamarckia aurea [Golden-top]*
Lepidium africanum [Peppercress]*
Lolium rigidum [Annual Ryegrass]*
Lomandra filiformis subsp. *flavior* [Matrush]
Maireana microphylla [Eastern Cottonbush]
Malva parviflora [Small-flowered Mallow]*
Marrubium vulgare [Horehound]*
Maytenus cunninghamii [Yellow-berry Bush]
Medicago laciniata [Cutleaf Medic]*
Medicago minima [Small Woolly Burr Medic]*
Medicago sativa [Lucerne]*
Medicago scutellata [Snail Medic]*
Myoporum montanum [Western Boobialla]

Notelaea microcarpa [Native Olive]
Olearia elliptica [Sticky Daisy-bush]
Oncinocalyx betchei
Opuntia sp. [Prickly Pear]*
Oxalis sp [Wood Sorrel]*
Parsonsia eucalyptophylla [Gargaloo]
Paspalidium constrictum [Box Grass]
Pimelea neo-anglica [Poison Pimelea]
Pittosporum angustifolium [Butterbush]
Rapistrum rugosum [Turnip Weed]*
Rumex browni [Slender Dock]
Salsola kali [Buckbush]
Scirpus sp.
Sclerolaena birchii [Galvanised Burr]
Senecio quadridentatus [Cotton Fireweed]
Senna form taxon '*filifolia*' [Punty Bush]
Sida corrugata [Corrugated Sida]
Sida cunninghamii [Ridge Sida]
Sida rhombifolia [Paddy's Lucerne]*
Sida sp.
Sida sp. A [Scrambling Sida]
Sida spinosa
Sida subspicata [Spiked Sida]
Silybum marianum [Variegated Thistle]*
Sisymbrium orientale [Hedge Mustard]*
Solanum esuriale [Quena]
Solanum ferocissimum [Spiny Potato-bush]
Spartothamnella juncea [Bead Bush]
Swainsona sericea [Swainson pea]
Thyridolepis mitchelliana [Mulga Grass]
Trifolium campestre [Hop Clover]*
Triptilodiscus pygmaeus [Common Sunray]
Triticum aestivum [Wheat]*
Urtica incisa [Scrub Nettle]
Vittadinia cervicularis var cervicularis [Fuzzweed]
Vittadinia cuneata var. cuneata [Fuzzweed]
Vittadinia cuneata var. hirsuta [Fuzzweed]
Vittadinia muelleri [Fuzzweed]
Vittadinia sp. [New Holland Daisy]
Vittadinia sulcata [Fuzzweed]
Vulpia muralis [Silver Grass]*
Wahlenbergia communis [Tufted Bluebell]
Wahlenbergia luteola [Bluebell]