

Flora and Fauna Impact Assessment (RPS 2010a)



APPENDIX K



**Flora and Fauna Assessment
For
Proposed Rocglen Coal Mine Extension Project**

Prepared by:

RPS

241 Denison Street,
Broadmeadow NSW 2292
PO Box 428, HAMILTON NSW 2303

T: 612 4961 6500
F: 612 4961 6794
E: enquiries@rpsgroup.com.au
W: www.rpsgroup.com.au

Prepared for:

GSS Environmental

Attn: Eryn Bath
PO Box 907
Hamilton NSW 2303

Job No: 26230
Date: December 2010

Document Status

<i>Version</i>	<i>Purpose of Document</i>	<i>Orig</i>	<i>Review</i>	<i>Review Date</i>	<i>Format Review</i>	<i>Approval</i>	<i>Issue Date</i>
<i>Draft 1</i>	<i>Draft for Client Review</i>	SC					
<i>Draft 2</i>	<i>Draft for Client Review</i>	SC	CA	29/3/10	WJ 29/3/10	SC	30/3/10
<i>Final</i>	<i>Final Report</i>	SC	CA	13/4/10	JH 13/4/10	SC	13/4/10
<i>Final 2</i>	<i>Final Report</i>	SC/RS	CA	5/5/10	JH 11/5/10	SC	11/5/10
<i>Final 3</i>	<i>Final Report</i>	SC	CA	15/6/10	WJ 24/6/10	SC	21/6/10
<i>Final 4</i>	<i>Draft Final Report for client review</i>	SC	MD	1-12-10		MD	1-12-10
<i>Final 4</i>	<i>Final Report</i>	SC	MD	8-12-10		MD	8-12-10

Disclaimers

This document is and shall remain the property of RPS. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised copying or use of this document in any form whatsoever is prohibited.

EXECUTIVE SUMMARY

RPS Harper Somers O'Sullivan (RPS) was engaged by Whitehaven Coal Limited to undertake a Flora and Fauna Assessment to support an application for a new Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the proposed expansion of the Rocglen open cut coal mine (Rocglen Extension Project).

Two Endangered Ecological Communities (EECs) were recorded within the subject site. These EECs were "White Box Yellow Box Blakely's Red Gum Woodland" and "Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions" as listed in the *Threatened Species Conservation Act 1995* (TSC Act).

The White Box Yellow Box Blakely's Red Gum Woodland EEC corresponds to the federally listed EEC under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) known as "White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland".

The Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions corresponds to vegetation community 5 – Brigalow as described and mapped within this report. This community also corresponds to the federally listed EEC (EPBC Act) known as "Brigalow (*Acacia harpophylla* dominant and co-dominant)". The Brigalow EEC is comprised of a stand of 38 old age Brigalow trees in a 0.14 hectare area. No other tree species were recorded and only a single species (Slender Bamboo Grass, *Austrostipa verticillata*) was recorded in the understorey. Given the depauperate state of the Brigalow patch, it is not considered as a viable ecological community into the future.

A detailed Biodiversity Offset Strategy has been prepared by Eco Logical Australia Pty Ltd (ELA 2010) to provide a 'maintain or improve' outcome for the removal of vegetation communities, including the loss of Brigalow on a "like for like or better" basis, as part of the Proposal.

No threatened flora species were observed on site during previous flora surveys by Geoff Cunningham Natural Resource Consultants (2007) or by recent flora surveys by RPS undertaken for this report.

The previous fauna survey within the Rocglen study area undertaken by Countrywide Ecological Service (2007) found or detected the following threatened species on-site:

- Grey Falcon (*Falco hypoleucos*),
- Gilbert's Whistler (*Pachycephala inornata*),
- Grey-crowned Babbler, (*Pomatostomus temporalis*),
- Turquoise Parrot (*Neophema pulchella*),
- Hooded Robin (*Melanodryas cucullata*),

- Beccaris Mastiff-bat (*Mormopterus beccarii*), and
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).

Three threatened fauna species listed within the TSC Act were identified on the subject site during recent surveys undertaken by RPS. These were Grey-crowned Babbler, Speckled Warbler and Yellow-bellied Sheathtail-bat. A further two threatened fauna species were identified on a neighbouring property (Diamond Firetail and Varied Sittella). Potential habitat exists on the subject site for a further 13 threatened fauna species listed on the TSC Act. Of the 14 threatened species and 10 migratory species listed on the EPBC Act protected matters database search results, none were identified on the subject site. Potential habitat exists on the subject site for two of the threatened species and seven of the migratory species. Assessment of level of likely impact on each of the above fauna species found that the Proposal would be unlikely to significantly impact on any of the identified threatened or migratory fauna species.

TERMS AND ABBREVIATIONS

Abbreviation	Meaning
API	Aerial Photograph Interpretation
DEC	NSW Department of Environment and Conservation – now known as DECCW
DECCW	NSW Department of Environment, Climate Change and Water
DEWHA	Commonwealth Department of Environment, Water, Heritage and Arts
D-GPS	Differential Global Positioning System
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
TEC	Threatened Ecological Community
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GIS	Geographic Information System
GPS	Global Positioning System
KTP	Key Threatening Process
LGA	Local Government Area
NES	National Environmental Significance
PFC	Projected Foliage Cover
ROTAP	Rare or Threatened Australian Plants
RPS HSO	RPS Harper Somers O'Sullivan
SEPP	State Environmental Planning Policy
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities (formally the Department of Environment, Water, Heritage and the Arts)
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>

TABLE OF CONTENTS

Page

1.0	INTRODUCTION.....	7
1.1	Project History	7
1.1.1	Previous Flora Survey.....	7
1.1.2	Previous Fauna Survey.....	8
1.1.3	New Proposal	9
1.2	Site Particulars	10
1.3	Description of the Proposal.....	13
1.4	Scope of the Study	14
2.0	QUALIFICATIONS AND LICENSING	16
2.1	Qualifications.....	16
2.2	Licensing	16
2.3	Certification	17
3.0	METHODOLOGY	18
3.1	Literature Review	18
3.2	Flora Survey.....	19
3.2.1	Vegetation Mapping	19
3.2.2	Significant Flora Survey	22
3.3	Fauna Survey	22
3.3.1	Habitat Assessment	22
3.3.2	Fauna Survey	23
3.4	Survey Limitations	28
3.4.1	Flora Species / Communities	28
3.4.2	Fauna Species.....	29
3.4.3	Data Availability and Accuracy	29
4.0	RESULTS	31
4.1	Literature Review	31
4.1.1	Database Searches	31
4.1.2	Previous Ecological Assessments.....	34
4.1.3	Summary of Threatened Flora and Fauna Species Previously Recorded.....	35
4.2	Flora Survey.....	36
4.2.1	Vegetation Community Comparisons and Mapping.....	36
4.2.2	Significant Flora	46
4.3	Habitat Survey.....	46
4.3.1	Terrestrial Habitats.....	46
4.3.2	Corridors and Habitat Linkages.....	49
4.4	Fauna Survey	50

4.4.1	Terrestrial Mammals	50
4.4.2	Arboreal Mammals	50
4.4.3	Bats	50
4.4.4	Birds	51
4.4.5	Reptiles	51
4.4.6	Frogs	51
4.4.7	Weather Conditions During the Survey Periods	51
5.0	THREATENED SPECIES AND COMMUNITIES ASSESSMENT	53
5.1	Identification of Subject Species and Communities	53
6.0	KEY THREATENING PROCESSES	77
7.0	OTHER LEGISLATIVE CONSIDERATIONS	80
7.1	Considerations under the State Environmental Planning Policy No. 44 – Koala Habitat Protection	80
7.1.1	First Consideration – Does SEPP 44 Apply in this Local Government Area?	80
7.1.2	Second Consideration - Is the Land 'Potential Koala Habitat'?	80
7.1.3	Third Consideration – Is the Land 'Core Koala Habitat'?	80
7.2	Considerations under the EPBC Act	80
8.0	EXPECTED IMPACTS	83
8.1	Flora	83
8.1.1	White Box Yellow Box Blakely's Red Gum Woodland EEC	83
8.1.2	Brigalow EEC	84
8.2	Fauna	87
9.0	KEY THRESHOLDS ASSESSMENT (PART 3A)	89
10.0	CONCLUSION AND RECOMMENDATIONS	90
10.1	Conclusion	90
10.2	Recommendations	91
11.0	REFERENCES	93

TABLES

Page

Table 3-1: Trap Night Effort Across the Two Trapping Sites.	25
Table 3-2: Survey Effort of Non-trapping Methods	28
Table 4-1: Atlas of NSW Wildlife Database Search Results of Threatened Fauna Species Records within 40 Kilometres of the Subject Site	32
Table 4-2: EPBC Protected Matters Database Search Results for a 40 kilometre Radius around the Subject Site	33
Table 4-3: Threatened Species Identified During Field Surveys.....	50
Table 4-4: Weather Conditions ¹ during the Survey Period.	51
Table 5-1: Assessment of Likelihood of Occurrence of Threatened Species and Communities and Assessment of Potential Impacts	54

FIGURES

Page

Figure 1-1: Site Location Map.....	11
Figure 1-2: Subject Site and Proposed Mine Extension	12
Figure 3-1: Flora Survey Effort.....	21
Figure 3-2: Fauna Survey Effort.....	24
Figure 4-1: Vegetation Communities.....	38

APPENDICES

APPENDIX 1

Flora Species List

APPENDIX 2

Fauna Species List

APPENDIX 3

Staff Qualifications

1.0 INTRODUCTION

RPS Harper Somers O'Sullivan (RPS HSO) was engaged by Whitehaven Coal Limited to undertake ecological works for a new application to extend the existing Rocglen Coal Mine (Rocglen Extension Project) under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Hereafter the Rocglen Extension Project is referred to as the "Proposal". Hereafter the study area for the Proposal is referred to as the "Subject Site".

Within this report reference is given to the relevant parts of the *Threatened Species Conservation Act 1995* (TSC Act), EP&A Act and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and subsequent amendments to these.

1.1 Project History

The Rocglen Coal Mine (formally known as Belmont Coal Project) was originally approved by the Minister on the 15 April 2008 under Project Approval (PA) 06_0198. It was classified as a Major Project in accordance with the State Environmental Planning Policy (Major Projects) 2005 and, subsequently, was determined under Part 3A of the EP&A Act.

1.1.1 Previous Flora Survey

The flora survey and assessment for the existing Rocglen Coal Mine was undertaken by Geoff Cunningham Natural Resource Consultants (Cunningham 2007). Cunningham (2007) determined the vegetation communities within the potential Rocglen Coal Mine site and also generated a flora species list, vegetation mapping and vegetation community descriptions. A search of the available data for the locality generated a predictive list of flora species, populations or ecological communities likely to be present.

Cunningham (2007) found that the study area contained the following vegetation communities:

- Narrow-leaf Ironbark, Pilliga Grey Box;
- Pilliga Grey Box, White Cypress;
- Pilliga Grey Box, White Box, Yellow Box, White Cypress Pine;
- Pilliga Grey Box, Belah, Bull-oak;
- Bimble Box;
- Brigalow;
- Regenerating White Cypress Pine; and
- Cleared Lands – used for grazing and/or cultivation.

The Cunningham (2007) study area included areas to the south and east of the current site boundary. Also, the current subject site includes an area to the north that was not part of Cunningham's study area. As a result of the differing study area boundaries, the vegetation community *Pilliga Grey Box, Belah, Bull Oak* identified by Cunningham (2007) does not occur within the current subject site boundary.

Cunningham (2007) found that a small stand of Brigalow was present within the site. This stand was assessed as *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions*, an Endangered Ecological Community (EEC) listed in the Schedules of the TSC Act. It was found that the proposed mine would not detrimentally impact on the stand of Brigalow as it was to be wholly retained within the Rocglen Coal Mine site.

Cunningham (2007) found no threatened flora species and only one EEC (*Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions*) to occur within the proposed Rocglen Coal Mine site.

1.1.2 Previous Fauna Survey

The fauna survey and assessment for the existing Rocglen Coal Mine was undertaken by Countrywide Ecological Service (2007). Several threatened fauna species were observed or detected within the proposed Rocglen Coal Mine site, including:

- Grey Falcon (*Falco hypoleucos*);
- Gilbert's Whistler (*Pachycephala inornata*);
- Grey-crowned Babbler, (*Pomatostomus temporalis*);
- Turquoise Parrot (*Neophema pulchella*);
- Hooded Robin (*Melanodryas cucullata*);
- Beccaris Mastiff-bat (*Mormopterus beccarii*); and
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*).

The assessment for these fauna species found that there was no significant impact likely to occur as a result of the proposed Rocglen Coal Mine (Countrywide Ecological Services 2007). This report concluded that the proposal was;

- unlikely to significantly affect any of the listed threatened species, fauna populations or communities;
- unlikely to augment or significantly contribute to any of the Commonwealth or State listed key threatening processes in the long term;
- unlikely to significantly affect any Ramsar wetland or any China-Australia Migratory Bird Agreement (CAMBA) or Japan-Australia Migratory Bird Agreement (JAMBA) listed species;
- unlikely to affect any core or potential Koala habitat;

- is consistent with Ecologically Sustainable Development (ESD) principles with regards to fauna and will not adversely affect the local biodiversity; and
- unlikely to cause any perceivable or significant changes to habitat that would directly affect the local fauna community as a consequence of climate change.

After due process, including the creation of an on-site biodiversity offset area, coal production at Rocglen commenced in late 2008.

1.1.3 New Proposal

Following further drilling and definition of the local geological features, as well as additional reviews of the mine plan, Whitehaven now propose to expand operations at Rocglen in order to maximise coal recovery and allow for improved mine progression. This includes, but is not limited to an expansion of the open cut pit and the provision of additional out-of-pit emplacement space and volume by expanding the Northern Emplacement Area.

Small patches of the existing biodiversity offset areas within the subject site will need to be cleared to cater for the expansion. Whitehaven seeks to remove the area's status as 'offset' to increase flexibility for operational and management requirements including vehicle manoeuvring and surface water management. A significant component of the proposal is therefore the development of a revised Biodiversity Offset Strategy (prepared by ELA (2010)). The Biodiversity Offset Strategy (ELA 2010) has been conservatively prepared on the basis of all of the current biodiversity offset area within the subject site being removed. This area totals 47.9 hectares.

While not all vegetation within the subject site is likely to be cleared, the flora and fauna impact assessment (this report) and Biodiversity Offset Strategy (ELA 2010) have been prepared on the assumption that all remaining vegetation will be cleared with the exception of approximately 30 hectares in the north-eastern corner of the subject site encompassing a small area of Poplar Box Grassy Woodland. This approach has been adopted, regardless of whether the clearing/disturbance occurs, in order to allow more flexibility, if required, to site associated infrastructure and undertake site management in peripheral areas (for example, vehicle access and manoeuvring, surface water management and stockpiles). This approach will also provide flexibility if future geological exploration and economic modelling determine recoverable coal reserves within these peripheral areas, which, if approval was granted for extraction, would enable Whitehaven to further maximise coal recovery using existing infrastructure at an approved operation and also maintain the on-going socio-economic benefits of the mine for a longer period of time.

1.2 Site Particulars

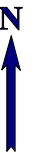
- Locality –** Rocglen Coal Mine is located on Wean Road approximately 25km north of the town of Gunnedah and 23km south-east of Boggabri in the Gunnedah Coalfields of NSW (**Figure 1-1**).
- Subject Site -** The area of investigation (subject site) is shown in **Figure 1-2**, and comprises the proposed expanded Northern Emplacement Area (green hatching) and the proposed expanded open cut pit limit (brown hatching) and all nearby areas within the Rocglen Mine Lease (ML) boundary.
- LGA –** Gunnedah.
- Lot / DP -** Subject site – Lot 1 in DP 787417 and Lots 1 & 4 in DP 1120601.
- Zoning -** 1(a) Rural (Agricultural Protection). Mining is a permissible land use within this zone with development consent.
- Area –** The Subject Site encompasses a total area of approximately 460 hectares. Note that of this area, 366 hectares is within the original Rocglen Coal Mine development project site approved under PA 06_0198 and the existing Mining Lease (ML 1620).
- Current Land Use –** Subject site – Mining.
- Topography –** The subject site is located on plains ranging from 275 to 315m AHD. The subject site is accessible by established farm and mine tracks / access roads.
- Soils -** The soils of the plains are generally deep, fine-grained clayey Black Soils commonly found in the area. The soils on the rises and hills are a metasediment producing shallow, rocky soils with a moderate fertility.

WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from RPS Newcastle.

LEGEND



Study Area



SCALE: 1:100174.94 AT A4 SIZE

Copyright
"This document and the information shown shall remain the property of
RPS Australia East Pty Ltd. The document may only be used for the purpose
for which it was supplied and in accordance with the terms of engagement for
the commission. Unauthorised use of this document in any way is prohibited."

TITLE: FIGURE 1-1 SITE LOCATION

LOCATION: ROCGLLEN COAL MINE

DATUM: DATUM
PROJECTION: MGA ZONE 56 (GDA 94)

DATE: 29/3/2010
PURPOSE: REPORT FIGURE

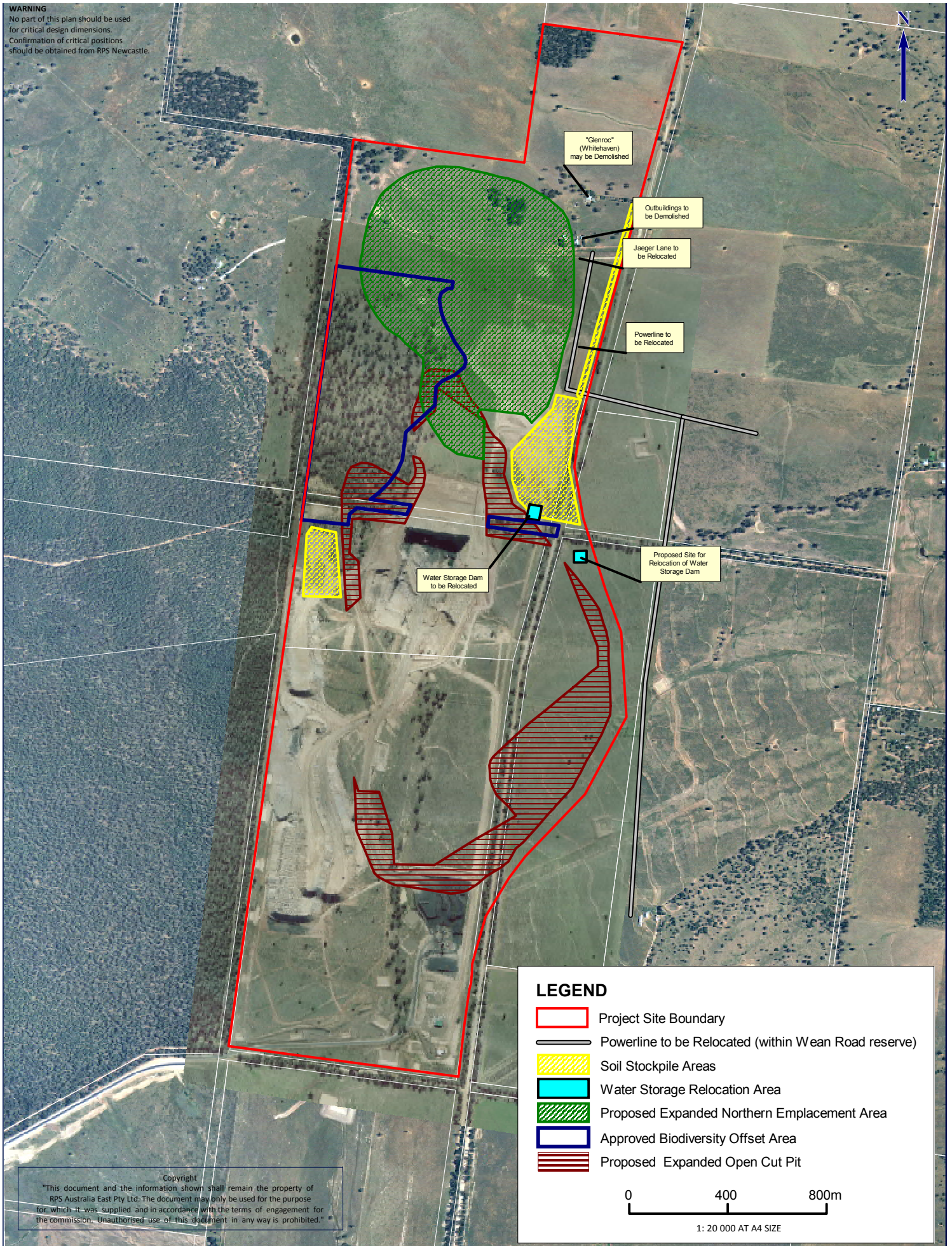
26230\DRAWING\WORK\26230
LAYOUT REF: FIG 1-1 SITE LOC A4
VERSION (PLAN BY): A (A.P-S.C)

CLIENT: GSS ENVIRONMENTAL
JOB REF: 26230

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from RPS Newcastle.



TITLE: FIGURE 1-2 SUBJECT SITE

LOCATION: ROCGLEN COAL MINE

DATUM: DATUM
PROJECTION: MGA ZONE 56 (GDA 94)

DATE: 24/5/2010
PURPOSE: REPORT FIGURE

LAYOUT REF:
VERSION (PLAN BY): C (S.C)

CLIENT: GSS ENVIRONMENTAL
JOB REF: 26230

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

1.3 Description of the Proposal

Coal production at Rocglen commenced in late 2008. Following further drilling and definition of the local geological features, as well as additional reviews of the mine plan, Whitehaven now propose to expand operations at Rocglen in order to maximise coal recovery and allow for improved mine progression. This includes, but is not limited to an expansion of the open cut pit and the provision of additional out-of-pit emplacement space and volume by expanding the Northern Emplacement Area.

The proposed expansion of the approved open cut pit and the expansion of the approved Northern Emplacement Area will result in the removal of:

- Parts of the existing biodiversity offset areas (see below for further details);
- Areas of grassland between the existing open cut limit and the approved relocation of Wean Road;
- A 0.14 hectare remnant of the Endangered Ecological Community (EEC) "Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions Endangered Ecological Community", currently present as a very small isolated stand of trees surrounded by mining operations;
- A 2.6 hectare area set aside for 'habitat enhancement through replanting' along the northern boundary of the mining lease area;
- Areas of cleared land and derived native grassland to the north of the existing approved Northern Emplacement Area; and
- Two small patches of grassy woodland to the north of the existing approved Northern Emplacement Area.

While not all vegetation within the subject site is likely to be cleared, the flora and fauna impact assessment (this report) and Biodiversity Offset Strategy (ELA 2010) have been prepared on the assumption that all remaining vegetation will be cleared with the exception of approximately 30 hectares in the north-eastern corner of the subject site encompassing a small area of Poplar Box Grassy Woodland. This approach has been adopted, regardless of whether the clearing/disturbance occurs, in order to allow more flexibility, if required, to site associated infrastructure and undertake site management in peripheral areas (for example, vehicle access and manoeuvring, surface water management and stockpiles). This approach will also provide flexibility if future geological exploration and economic modelling determine recoverable coal reserves within these peripheral areas, which, if approval was granted for extraction, would enable Whitehaven to further maximise coal recovery using existing infrastructure at an approved operation and also maintain the on-going socio-economic benefits of the

mine for a longer period of time. **Figure 1-2** shows both the existing approved areas and the proposed new impact areas.

1.4 Scope of the Study

The scope of this flora and fauna assessment report is to:

- identify the dominant vascular plant species and identify and ground truth the location and extent of vegetation communities previously mapped and described within the subject site;
- identify and map existing vegetation communities within the subject site;
- assess the status of identified plant species, fauna species and vegetation communities under relevant legislation;
- identify existing habitat types on the subject site and assess the habitat potential for threatened species, populations, or ecological communities known from the proximate area;
- identify threatened flora and fauna, and potential for threatened flora and fauna within the subject site;
- assess the potential of the Proposal to have a significant impact on any threatened species, populations or ecological communities identified during field surveys or as having potential habitat on the subject site;
- undertake an inspection of the previously identified stand of Brigalow (*Acacia harpophylla*) to confirm its significance and viability and to assess the possible impact of the Proposal.

Whilst survey work has been undertaken predominately within the bounds of the subject site, consideration has been afforded to areas outside of the sites in order to appreciate the environmental context of the sites.

The purpose of this report is to:

- ensure planning, management and development decisions are based on sound scientific information and advice by documenting the presence of any biodiversity components or potential significant impacts that may exist on the site; and

- provide information to enable compliance with applicable assessment requirements contained within the TSC Act, EP&A Act, the EPBC Act, and any other relevant state, regional and local environmental planning instruments.

2.0 QUALIFICATIONS AND LICENSING

2.1 Qualifications

This report was written by Steven Cox B.App.Sc. (Hons.), Robert Sansom B.Sc. (Hons.) and Craig Anderson B.App.Sc. (EAM) of RPS Australia East Pty Ltd. The academic qualifications and professional experience of all RPS HSO consultants involved with the Proposal are documented in **Appendix 3**.

2.2 Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence S10300 (Valid 30 November 2010– currently awaiting approval of renewal application);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2011);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2011); and
- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 26 May 2011).

2.3 Certification

As the principal author, I, Steven Cox, make the following certification:

- The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the site;

Principal Author and Certifier:

Steven Cox
Project Manager \ Senior Ecologist
RPS Australia East Pty Ltd
December 2010

3.0 METHODOLOGY

A variety of field survey techniques were employed over the course of fieldwork for this assessment to record a representative sample of flora and fauna species across the site. Surveys were undertaken from 8th to 12th February 2010. The surveys included a site inspection, flora surveys and various fauna survey methods including trapping, spotlighting and habitat assessments. Targeted searches for threatened flora and fauna species were also undertaken.

The methodology was designed on previous ecological works undertaken on the subject site, and to satisfy the Threatened Biodiversity Survey and Assessment Guidelines (DEC, 2004).

3.1 Literature Review

A literature review was undertaken to assist in identifying distributions, suitable habitats and known records of threatened species so that field investigations could more efficiently focus survey effort. Information sources included:

- Aerial Photograph Interpretation (API) and literature reviews to determine the broad categorisation of vegetation within the site;
- Review of fauna and flora records contained in the Department of Environment, Climate Change and Water (DECCW) Atlas of NSW Wildlife (accessed 3rd January 2010) within a 40 km radius of the site;
- Department of the Environment, Water, Heritage and the Arts (DEWHA) EPBC Act Protected Matters Search (accessed 3rd January 2010) within a 40km radius of the site;
- DECCW Threatened Species, Populations and Ecological Communities website (<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/>);
- Review of the Belmont Coal Project via Gunnedah Flora Assessment prepared by Geoff Cunningham Natural Resource Consultants Pty Ltd (2007);
- Review of the Whitehaven Coal Regional Biodiversity Offset; Canyon and Rocglen Mines. Prepared by Eco Logical Australia P/L (2009);
- Review of the Whitehaven Coal Limited, Rocglen Coal Mine Project; Part 3A of the EP&A Act 1979 – Project Briefing Paper produced by GSS Environmental (2009); and

A review of Geographic Information System (GIS) data including (but not limited to) aerial photography, topographic maps, State Environmental Planning Policy (SEPP) 14 Wetland Mapping, Soil Landscapes and Acid Sulphate Soil Potential.

3.2 Flora Survey

3.2.1 Vegetation Mapping

Flora surveys and vegetation mapping were undertaken as follows;

- Review of the Vegetation of the Native Vegetation Map, Report Series No. 3 Boggabri 8936, Scale 1:100,000;
- Review of the Flora Assessment undertaken by Geoff Cunningham Natural Resource Consultants for the Belmont Coal Project via Gunnedah August 2007;
- Ground truthing Cunningham's (2007) flora vegetation community mapping within the subject site by undertaking quadrats and transects within the vegetation communities likely to be impacted by the new proposal;
- More detailed inspections in areas likely to be commensurate with the vegetation found within the proposed impact area were undertaken to determine the dominant species composition and associated vegetation community, these more detailed inspections were accomplished using foot transects;
- Confirmation of the community type(s) present (dominant species) via undertaking on-site inspections and ground truthing transects, flora species identification and biometric vegetation community mapping;
- During all phases of the fieldwork any threatened flora species encountered were counted and plotted using a Differential – Global Positioning System (D-GPS);
- Consideration was given to the potential for the vegetation communities to constitute 'Endangered Ecological Communities' (EECs) as listed under the TSC Act and/or EPBC Act; and
- Mapping the type and general extent of the communities present into definable map units where appropriate using a combination of Air Photo Interpretation (API) and ground truthing surveys.

A total of two flora quadrats (each 20m x 20m), numerous walking transects and a couple vehicular traverses were undertaken within the subject site as shown in **Figure 3-1**. These surveys were undertaken by suitably qualified personnel between the 8th and 12th February 2010. The vegetation surveys were undertaken to identify flora species within the subject site, define and map vegetation communities and to search for threatened flora species. Additionally, further flora inspections, vegetation delineation and threatened flora searches were undertaken according to the random meander methodology described by Cropper (1993). Other opportunistic flora observations were undertaken during all other survey activities and while otherwise traversing throughout the subject site on foot or within a vehicle.

WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from RPS Newcastle.

LEGEND

 Subject Site

Survey Type

 20x20m Vegetation Quadrat

 Meander Vegetation Community
Survey (Foot & Vehicle)



Vickery
State Forest

0 500 1,000m

SCALE: 1:25,000 AT A4 SIZE

Wean Road

Copyright
"This document and the information shown shall remain the property of
RPS Australia East Pty Ltd. The document may only be used for the purpose
for which it was supplied and in accordance with the terms of engagement for
the commission. Unauthorised use of this document in any way is prohibited."

TITLE:
FIGURE 3-1FLORA SURVEY EFFORT

LOCATION: ROCGLLEN COAL MINE

DATUM: N/A
PROJECTION: MGA ZONE 56 (GDA 94)

DATE: 30/11/2010
PURPOSE: REPORT FIGURE

LAYOUT REF: z:\JOBS\26K\26230 Rocglen Mine\10- Drafting\
Eco Report Work\26230 Fig 3-1 Flora Survey Effort B A4
VERSION (PLAN BY): B A4 (A.P.-S.C.-N.W)

CLIENT: GSS ENVIRONMENTAL
JOB REF: 26230

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

3.2.2 Significant Flora Survey

A list of potentially occurring significant flora species from the locality (40km radius) was compiled, which included threatened species (Endangered or Vulnerable) and EEC's listed under the TSC Act and EPBC Act (see Section 4.1.1). A total of 12 threatened flora species were identified as being recorded or as having potential habitat within the locality.

A single ecologist undertook targeted flora searches on 8, 9, 10, 11 and 12 February 2010 in accordance with survey guidelines (DEC, 2004). Methodology such as the "Random Meander Technique" described by Cropper (1993) was also used within the site. Targeted searches within suitable habitat for threatened flora species were also undertaken throughout the subject site.

The locations of all threatened flora species (if found) were to be recorded by the use of Trimble D-GPS units with sub-metre accuracy (no threatened flora species were observed).

3.3 Fauna Survey

A habitat assessment and fauna survey were undertaken across the subject site from the 8th to the 12th of February 2010. As part of preliminary offset strategy development, fauna survey was also undertaken on the neighbouring 'Yarrowonga' property. After the completion of field surveys and later following discussions with DECCW the 'Yarrowonga' property was excluded as a potential offset site. However, the fauna survey results of 'Yarrowonga' provide additional species distribution information on the local area and are thus included as part of the fauna survey methodology and results within this report.

3.3.1 Habitat Assessment

During the fauna survey the type and condition of potential habitats for fauna species were recorded. Habitat features investigated during targeted and general habitat assessments included:

- Topographic features (such as slope, aspect & landscape position);
- Dominant vegetation community composition, structure and condition at all strata levels (i.e. from ground to canopy cover);
- Ground cover type and percentage cover;
- Form, quality and location of water sources;
- Location, type and size of tree hollows;
- The presence, number and condition of unique habitat features (such as caves, crevices, loose tree bark, rocks on rock and mistletoe); and
- The level of disturbance.

During the habitat assessment all opportunistic observations of fauna or faunal activity were recorded, including visual and auditory recognition of fauna species and identification of evidence of faunal activity (e.g. nests, diggings, scratch marks, droppings).

3.3.2 Fauna Survey

Targeted fauna survey was undertaken from the 8th to the 12th of February 2010. Surveys included Elliott trap lines, cage trap lines, harp trapping, bird transects, reptile searches, amphibian searches, spotlighting, nocturnal owl and mammal call playback, and Anabat micro-bat echolocation survey.

The level of survey and methods undertaken were designed using the Department of Environment and Conservation (now DECCW) Threatened Biodiversity Survey and Assessment Guidelines (DEC 2004). The methods employed were tailored to the habitat types, site characteristics and target species of the subject site.

3.3.2.1 Trapping Sites

Two trapping sites were established. The first trapping site was established across the two dominant vegetation communities within the proposed existing offset impact area of the subject site (**Figure 3-2**). The second trapping site was established on Yarrawonga (**Figure 3-2**).

WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from RPS Newcastle.

LEGEND

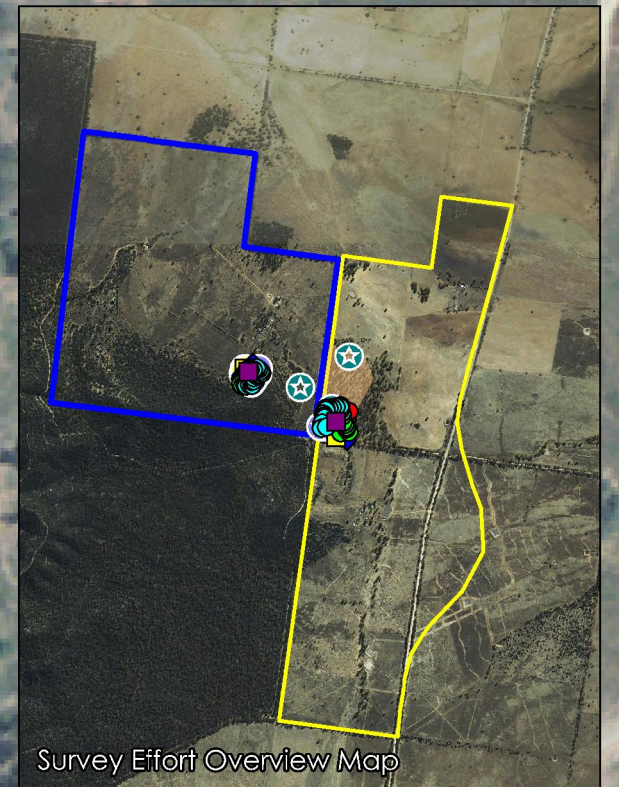
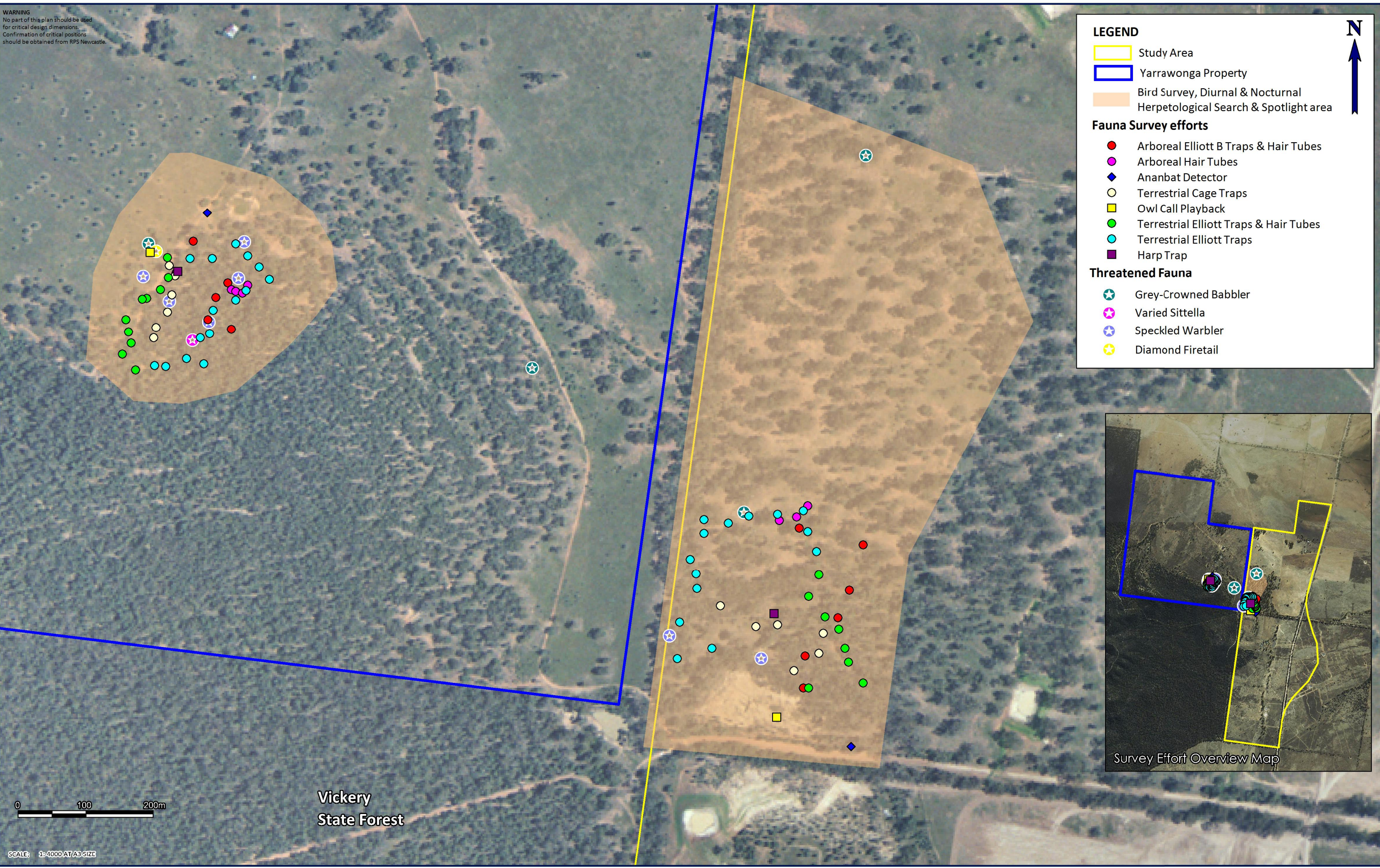
- Study Area
- Yarrawonga Property
- Bird Survey, Diurnal & Nocturnal
Herpetological Search & Spotlight area

Fauna Survey efforts

- Arboreal Elliott B Traps & Hair Tubes
- Arboreal Hair Tubes
- Ananbat Detector
- Terrestrial Cage Traps
- Owl Call Playback
- Terrestrial Elliott Traps & Hair Tubes
- Terrestrial Elliott Traps
- Harp Trap

Threatened Fauna

- Grey-Crowned Babbler
- Varied Sittella
- Speckled Warbler
- Diamond Firetail



3.3.2.2 Trapping Effort

At each of the two trapping sites the following trapping effort was undertaken:

- 25 terrestrial Elliott A traps;
- 25 terrestrial Elliott B traps;
- Six arboreal Elliott B traps;
- Six terrestrial double-ended cage traps;
- 10 terrestrial hair funnels;
- 10 arboreal hair funnels; and
- One harp trap.

Terrestrial and arboreal Elliott traps were baited with a mixture of rolled oats, peanut butter and honey. The entrance and adjacent trunk of arboreal Elliott traps were sprayed with a honey and water mixture. Terrestrial hair tube baits were a mixture of peanut butter and rolled oats or a piece of fresh chicken neck. Arboreal hair tubes were baited with a mixture of rolled oats, peanut butter and honey. Cage traps were baited with fresh chicken necks.

All Elliott traps, cage traps and hair tubes were set for four consecutive nights at the subject site trapping site and for three nights at the Yarrawonga trapping site (**Figure 3-2**). One harp trap was set at the impact area trapping site for three consecutive nights. A single harp trap was set at the Yarrawonga trapping site for two consecutive nights.

Table 3-1: Trap Night Effort Across the Two Trapping Sites.

	Impact Area	Yarrawonga	Totals
Terrestrial Elliott A Traps	100	75	175
Terrestrial Elliott B Traps	100	75	175
Arboreal Elliott B Traps	24	18	42
Terrestrial Cage Traps	24	18	42
Medium Terrestrial Hair Tubes	40	30	70
Small Arboreal Hair Tubes	40	30	70
Harp Traps	3	2	5
Totals	248	248	579

Note: One trap night equals one trap set for one night.

3.3.2.3 Survey Effort

Bird Surveys

Where possible, bird surveys were undertaken during early morning or late afternoon. Each survey comprised one person hour of survey (**Table 3-2**). Bird surveys were completed by a single observer for one hour. Birds were identified using a 15-45×60mm spotting scope or 8×40 mm binoculars and from characteristic calls. Two bird surveys were completed at each of the trapping sites. Bird sightings were also recorded opportunistically during all other survey activities.

Diurnal Reptile and Amphibian Searches

Where possible, diurnal reptile and amphibian searches were undertaken during early to mid morning or mid to late afternoon. Each survey comprised half a person hour of survey (**Table 3-2**). Diurnal reptile and amphibian searches were completed by a single observer for 30 minutes. Two diurnal reptile and amphibian searches were completed at each of the trapping sites. Habitat features investigated during diurnal reptile and amphibian searches included leaf litter, fallen timber, rocks, tree trunks, loose soil and grassland areas.

Nocturnal Reptile and Amphibian Searches

Nocturnal reptile and amphibian searches were undertaken between early and mid evening. Nocturnal reptile and amphibian searches focused on small dams at both sites but also included areas of terrestrial habitat. Nocturnal reptile and amphibian searches were undertaken at each of the trapping sites (**Table 3-2**). Each terrestrial survey comprised one person hour of survey completed by two observers. Nocturnal reptile and amphibian searches were undertaken with hand-held torches and head lamps.

Walking Spotlight Survey

Walking spotlight surveys were undertaken between dusk and 1 am. Each survey comprised a single person hour of survey (two observers). Walking spotlight surveys were undertaken with hand held Lightforce spotlights (100 and 35 Watt). Two walking spotlight surveys were undertaken at each of the trapping sites (**Table 3-2**).

Driving Spotlight Survey

A driving spotlight survey was undertaken between dusk and 10.30 pm, along the 1.2km vehicle track between the two trapping sites. Each survey was undertaken while driving in first gear (less than 10 km per hour). The driving spotlight survey was completed on two nights.

Nocturnal Call Playback

Call playback for owl and nocturnal mammal species was undertaken at dusk or during early evening at each of the trapping sites (**Table 3-2**). The nocturnal calls of the following species were played using a Cotina megaphone (10W rated output):

- Bush stone-curlew
- Squirrel glider
- Koala
- Barking owl
- Masked owl
- Powerful owl

After listening for five minutes, the calls of the above species were broadcast for approximately four minutes each and were separated by a listening period of two minutes. At the end of each two minute listening period a brief spotlighting scan was made of surrounding trees for owls that approached silently. The calls were broadcast in the order shown above. At the completion of the final species call a listening period of five minutes was undertaken and followed by a final spotlight scan of the surrounding trees.

Koala Scat Searches

At each of the trapping sites the bases of 10 large eucalypt trees were searched for koala scats. A one metre radius around each tree trunk was searched for scats. Searches included the moving of shrubs and grasses and searching below the top level of litter. At each trapping site the trees were selected non-randomly. All trees were greater than 200 millimetres in diameter at breast height (DBH). After the first tree the surrounding trees were selected to sample the diversity of species present. The larger trees present were selected over smaller trees.

Micro-bat Survey

An Anabat micro-bat echolocation detector and recorder (hereafter referred to as 'Anabat detector') was used to record the echolocation calls of micro-bats. An Anabat detector (in a weather proof case) was positioned at about 2.5 m high on bare tree trunks and at a slope of 15 degrees above the horizontal. The Anabat detector began recording at dusk and recorded echolocation calls throughout the night, automatically switching off at sunrise. The Anabat detector was located along likely micro-bat flyways. The Anabat detector was set at each trapping site for two nights (**Table 3-2**). Unfortunately the Anabat detector failed to record any calls during the two nights at the Yarrawonga property due to a mechanical or programming failure. Anabat files were analysed by Anna Lloyd of Echolocation.

Table 3-2: Survey Effort of Non-trapping Methods

Survey Method	Impact Area	Yarrawonga	Totals
	Person Hours		
Bird Surveys	2	2	4
Diurnal Reptile and Amphibian Surveys	2	2	4
Nocturnal Reptile and Amphibian Surveys	2	2	4
Walking Spotlight Surveys	2	2	4
	Total Person Hours		16
	Kilometres		
Driving Spotlight	2.4		2.4
	Total Kilometres		2.4
	Call Playback Sessions		
Owl and Mammal Call Playback	2	2	4
	All Night Anabat Surveys		
	2	0	2

3.4 Survey Limitations

In instances where surveys were not able to reliably detect a particular species or guild, a precautionary approach has been adopted; as such 'assumed presence' of known and expected threatened species, populations and ecological communities has been made where relevant and scientifically justified to ensure a holistic assessment.

3.4.1 Flora Species / Communities

The flora survey undertaken for this report consisted of vegetation community ground truthing within the subject site. This community identification and mapping was achieved using quadrats and random meanders to ascertain the dominant flora species and to identify the biometric vegetation communities within the proposed new impact area.

Weather conditions leading up to the survey period consisted of a long period of drought. There was some rain in the weeks prior to the survey period, resulting in a flush of new growth. Despite the recent flush of new growth the previous extended dry period likely resulted in many ground cover species being undetectable during the timing of the field survey.

The seasonality of the surveys places limits on the number of flora species identified in the site as the surveys occurred in February which is outside the known flowering period for some species making them difficult to detect. Thus the flora species list cannot be considered to be complete when one survey has been completed, due to seasonality of flowering.

Additionally, the cryptic nature of a number of flora species means that surveys may not have been able to detect species, despite being present. There is a range of common albeit cryptic plant species that have a brief flowering period and hence small 'window' of effective 'detect-ability'. In addition, the seasonality of surveys also places limits on the number of flora species identified within the site at any given time. Therefore, some threatened species not detected cannot be discounted off-hand due to seasonality and other factors, and are therefore addressed in terms of their potential for occurrence within the subject site based on ecological factors.

The delineation of some vegetation community boundaries is sometimes difficult due to the intergradations or ecotones of vegetation types. These ecotones can occur over a narrow width (2 to 10m) or very wide bands (30 to 150m width or greater) which sometimes makes the delineation of vegetation boundaries very subjective.

3.4.2 Fauna Species

The presence of fauna within a particular area is not static over time, may be seasonal or in response to the availability of a particular resource. The environmental conditions during which fauna surveys are undertaken greatly influence the species which are recorded. In terms of herpetofauna, conditions such as humidity, rainfall, temperature and barometric pressure can greatly affect the detect-ability of certain species. As such, where survey effort targeting particular threatened fauna species has not specifically met guidelines recommended by DECCW, habitat assessment and prediction of the occurrence of threatened fauna species has been applied.

The flowering and fruiting plant species that attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources more accessible to threatened species fail. As a consequence threatened species may be absent from some areas where potential habitat exists for extended periods.

Nevertheless, it is considered that the combined survey effort and dataset from all of the investigations undertaken to date within the locality provide a substantial picture of the fauna species and habitat values occurring within the site.

3.4.3 Data Availability and Accuracy

The collated threatened flora and fauna species records provided by the DECCW Atlas of NSW Wildlife for the region are known to vary in accuracy and reliability. Traditionally this is due to the reliability of information provided to DECCW for collation and/or the need to protect specific threatened species locations. During

the review of threatened species records sourced from DECCW Atlas of NSW Wildlife, consideration has been given to the date and accuracy of each threatened species record in addition to an assessment of habitat suitability within the site.

Similarly EPBC Protected Matters Searches provide a list of threatened species and communities that have been recorded within 40km, or which have suitable habitat within the wider area.

In order to address these limitations in respect to data accuracy, threatened species records have been used to provide a guide only to the types of species which occur within the locality of the site. Habitat assessment and the results of surveys conducted within the site have been used to assess the likelihood of occurrence of threatened species, populations and ecological communities to occur within the site.

4.0 RESULTS

4.1 Literature Review

4.1.1 Database Searches

4.1.1.1 Atlas of NSW Wildlife

Flora

Due to the lack of records within the usual 10 kilometre radius search, the search area was expanded to a 40 kilometre radius to ensure an adequate locality assessment was achieved. A total of three flora species on the Atlas of NSW Wildlife database have been recorded within the 40 kilometre radius of the subject site. All three species are listed as Vulnerable on the TSC Act. The three flora species are:

- *Cadellia pentastylis* Ooline (V)
- *Digitaria porrecta* Finger Panic Grass (V)
- *Hakea pulvinifera* Lake Keepit Hakea (V)

No threatened flora populations were listed as occurring within 40km of the subject site within the NPWS Atlas of NSW Wildlife search.

Fauna

Threatened Species

Due to the lack of records within the usual 10 kilometre radius search, the search area was expanded to a 40 kilometre radius to ensure an adequate locality assessment was achieved. A total of 28 threatened terrestrial fauna species on the Atlas of NSW Wildlife database have been recorded within the 40 kilometre radius, comprising two reptile, 17 bird and nine mammal species (**Table 4-1**). Of these, 26 are currently listed as Vulnerable and five are listed as Endangered on the TSC Act. Eight species are also listed in the Commonwealth EPBC Act, two as Endangered, one as Endangered and Migratory and five as Vulnerable.

Table 4-1: Atlas of NSW Wildlife Database Search Results of Threatened Fauna Species Records within 40 Kilometres of the Subject Site

Common Name	Scientific Name	Status TSC Act	Status EPBC Act	First Date	Last Date	40km Radius	10km Radius
Reptiles							
Border Thick-tailed Gecko	<i>Underwoodisaurus sphyrurus</i>	V		1996	2000	2	3
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	V		1996	1996	1	0
Birds							
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E		1994	1994	2	0
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	V		1996	1996	1	0
Square-tailed Kite	<i>Lophoictinia isura</i>	V		1996	2008	2	0
Little Lorikeet	<i>Glossopsitta pusilla</i>	V		1996	2006	13	4
Swift Parrot	<i>Lathamus discolor</i>	E1	E	1996	1996	1	0
Turquoise Parrot	<i>Neophema pulchella</i>	V		1981	2008	44	6
Barking Owl	<i>Ninox connivens</i>	V		2007	2008	2	0
Masked Owl	<i>Tyto novaehollandiae</i>	V		1993	2008	5	2
Brown Treecreeper	<i>Climacteris picumnus</i>	V		1991	2008	55	11
Speckled Warbler	<i>Pyrrholaemus sagittatus</i>	V		1992	2008	30	3
Pied Honeyeater	<i>Certhionyx variegatus</i>	V		1972	1972	1	0
Painted Honeyeater	<i>Grantiella picta</i>	V		1996	2008	2	0
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	V		2001	2001	1	0
Regent Honeyeater	<i>Xanthomyza phrygia</i>	E1	E, M	1998	1998	2	1
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V		2000	2003	16	6
Hooded Robin	<i>Melanodryas cucullata</i>	V		2003	2003	9	1
Diamond Firetail	<i>Stagonopleura guttata</i>	V		2000	2008	12	1
Mammals							
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	E	1980	2006	10	1
Koala	<i>Phascolarctos cinereus</i>	V		1943	2008	398	3
Squirrel Glider	<i>Petaurus norfolcensis</i>	V		1996	1996	1	0
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	E1	V	2003	2003	1	0
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V		1996	2008	11	2
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V		2000	2000	1	1
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	2000	2003	4	1
Little Pied Bat	<i>Chalinolobus picatus</i>	V		2001	2001	1	1
Greater Long-eared Bat	<i>Nyctophilus timoriensis</i> (South-eastern form)	V	V	1979	2008	9	0

Status (TSC Act):

E1 Schedule 1, Part 1: Endangered Species
V Schedule 2: Vulnerable Species

Status (EPBC):

E Endangered Species
V Vulnerable Species
M Migratory Species

Endangered Fauna Populations

No endangered fauna populations were identified within a 40 kilometre radius of the subject site following a search of the Atlas of NSW Wildlife database.

Critical Habitat

No areas of critical habitat were identified within a 40 kilometre radius of the subject site following a search of the Atlas of NSW Wildlife database.

4.1.1.2 EPBC Protected Matters Database Search

A 40 kilometre radius search of the EPBC Protected Matters Database identified the flora and fauna species listed on the EPBC Act shown in **Table 4-2**.

Table 4-2: EPBC Protected Matters Database Search Results for a 40 kilometre Radius around the Subject Site

Threatened Ecological Communities (TECs)				
TECs	Name		Status	
	Grey Box (<i>E. microcarpa</i>) Grassy Woodlands and derived Native Grasslands of South-eastern Australia		E	
	Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and QLD		CE	
	Weeping Myall Woodlands		E	
	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	
Threatened Species				
Flora	Scientific Name		Common Name	Status
	Species or Species Habitat Likely to Occur			
	<i>Cadellia pentastylis</i>		Ooline	V
	<i>Dichanthium setosum</i>			V
	<i>Digitaria porrecta</i>		Finger Panic Grass	E
	<i>Hakea pulvinifera</i>			E
	<i>Pterostylis cobarensis</i>		Cobar Greenhood Orchid	V
	<i>Philothea ericifolia</i>			V
	<i>Swainsona murrayana</i>		Slender Darling-pea	V
	<i>Tylophora linearis</i>			E
	<i>Thesium australe</i>		Austral Toadflax, Toadflax	V
	Species or Species Habitat May Occur			
	<i>Diuris sheaffiana</i>		Tricolour Diuris	V
	<i>Homopholis belsonii</i>			V
<i>Prasophyllum</i> sp. Wybong (C.Phelps ORG 5269)		A leek-orchid	CE	
Fauna	Species or Species Habitat May Occur			
	<i>Litoria booroolongensis</i>		Booroolong Frog	E
	<i>Elseya belli</i>		Bell's Turtle	V
	<i>Polytelis swainsonii</i>		Superb Parrot	V
	<i>Rostratula australis</i>		Australian Painted Snipe	V

	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V
	<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spotted-tail Quoll	E
	<i>Nyctophilus timoriensis</i> (South-eastern form)	Greater Long-eared Bat	V
	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	V
	Species or Species Habitat Likely to Occur		
	<i>Delma torquata</i>	Collared Delma	V
	<i>Underwoodisaurus sphyrurus</i>	Border Thick-tailed Gecko	V
	<i>Anthochaera phrygia</i>	Regent Honeyeater	E
	<i>Lathamus discolor</i>	Swift Parrot	E
	<i>Leipoa ocellata</i>	Malleefowl	V
	Foraging, Feeding or Related Behaviour May Occur Within Area		
	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V
Migratory Species	Breeding Likely to Occur Within Area		
	<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M
	Species or Species Habitat May Occur		
	<i>Hirundapus caudacutus</i>	White-throated Needletail	M
	<i>Merops ornatus</i>	Rainbow Bee-eater	M
	<i>Ardea alba</i>	Great Egret	M
	<i>Ardea ibis</i>	Cattle Egret	M
	<i>Gallinago hardwickii</i>	Latham's Snipe	M
	<i>Rostratula benghalensis s. lat</i>	Painted Snipe	M
	Species or Species Habitat Likely to Occur		
	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	M
	<i>Leipoa ocellata</i>	Malleefowl	M
	<i>Xanthomyza phrygia</i>	Regent Honeyeater	M

CE = Critically Endangered E = Endangered
V = Vulnerable M = Migratory

4.1.2 Previous Ecological Assessments

4.1.2.1 Countrywide Ecological Service (2007) – Belmont Coal Project via Gunnedah Fauna Assessment.

CES (2007) undertook the original fauna assessment for Rocglen Coal Mine (then called Belmont Coal Project) and recorded six threatened fauna species from a study area smaller than but contained within the existing subject site. The six threatened fauna species were:

- Grey Falcon (*Falco hypoleucos*);
- Gilbert's Whistler (*Pachycephala inornata*);
- Turquoise Parrot (*Neophema pulchella*);
- Flame Robin (*Petroica phoenicea*);
- Beccaris Mastiff-bat (*Mormopterus beccarii*); and
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*).

4.1.2.2 Geoff Cunningham Natural Resource Consultants (2007) - Belmont Coal Project via Gunnedah Flora Assessment.

Geoff Cunningham Natural Resource Consultants (2007) undertook the original flora assessment for Rocglen Coal Mine (then called Belmont Coal Project). No threatened flora species were identified.

4.1.3 Summary of Threatened Flora and Fauna Species Previously Recorded

The above literature review has identified the following list of threatened and/or migratory species, fauna species and threatened flora species as occurring within a 40 km radius of the subject site.

4.1.3.1 Flora

TSC Act – Vulnerable

- *Cadellia pentastylis*
- *Digitaria porrecta*
- *Hakea pulvinifera*

EPBC Act – Critically Endangered

- *Prasophyllum sp. Wybong*

EPBC Act – Endangered

- *Digitaria porrecta*
- *Hakea pulvinifera*

EPBC Act – Vulnerable

- *Cadellia pentastylis*
- *Dichanthium setosum*
- *Pterostylis cobarensis*
- *Philothea ericifolia*
- *Swainsona murrayana*
- *Thesium australe*
- *Diuris sheaffiana*
- *Homopholis belsonii*

4.1.3.2 Fauna

TSC Act – Endangered

- Black-necked Stork
- Swift Parrot
- Regent Honeyeater
- Brush-tailed Rock-wallaby

TSC Act – Vulnerable

- Black-breasted Buzzard
- Square-tailed Kite
- Little Lorikeet
- Turquoise Parrot
- Barking Owl
- Masked Owl
- Brown Treecreeper
- Speckled Warbler
- Pied Honeyeater
- Painted Honeyeater
- Black-chinned Honeyeater
- Grey-crowned Babbler
- Hooded Robin
- Diamond Firetail
- Spotted-tailed Quoll
- Koala
- Squirrel Glider
- Yellow-bellied Sheath-tail-bat
- Eastern Freetail-bat
- Large-eared Pied Bat
- Little Pied Bat
- Greater Long-eared Bat

EPBC Act – Endangered

- Booroolong Frog
- Spotted-tail Quoll
- Regent Honeyeater
- Swift Parrot

EPBC Act – Vulnerable

- Bell's Turtle
- Collared Delma
- Border Thick-tailed Gecko
- Superb Parrot
- Australian Painted Snipe
- Large-eared Pied Bat
- Greater Long-eared Bat
- Brush-tailed Rock-wallaby
- Malleefowl
- Grey-headed Flying-fox

EPBC Act – Migratory

- Satin Flycatcher
- White-throated Needletail
- Rainbow Bee-eater
- Great Egret
- Cattle Egret
- Latham's Snipe
- Painted Snipe
- White-bellied Sea-Eagle
- Malleefowl
- Regent Honeyeater

4.2 Flora Survey

4.2.1 Vegetation Community Comparisons and Mapping

The Boggabri Native Vegetation Map at 1:100,000 scale (DLWC 2002) mapped the vegetation within the subject site as:

Map Unit 1c – Slopes Grassy Woodlands (*E. albens*, *Callitris glaucophylla*, *E. melanophloia*);

Map Unit 1d – Foothills Woodlands (*E. melliodora*, *Angophora floribunda*, *E. blakelyi*, *Callitris glaucophylla*);

Map Unit 3g – Black Earth Grasslands (*Dichanthium sericeum*, *Austrostipa aristiglumis*, *Aristida leptopoda*); and

Map Unit 5a – Man Made Features (ie Pastoral or Agricultural uses).

The previous flora survey undertaken within the subject site (Cunningham, 2007) described and mapped five vegetation communities within the Rocglen study area, namely:

1. Narrow-leaf Ironbark – Pilliga Grey Box Community;
2. Pilliga Grey Box – White Cypress Pine Community;
3. Pilliga Grey Box – White Box - Yellow Box – White Cypress Pine Community;
4. Brigalow Community; and
5. Cleared Lands – used for grazing and / or cultivation.

Ground truthing of the vegetation within the subject site identified five vegetation communities (**Figure 4-1**) occurring within the subject site as follows:

1. Narrow-leaved Ironbark (*E. crebra*), White Cypress (*Callitris glaucophylla*) Open Forest;
2. Narrow-leaved Grey Box (*E. pilligaensis*), White Cypress (*Callitris glaucophylla*), Narrow-leaved Ironbark (*E. crebra*) Forest;
3. Bimble Box (*E. populnea*), Yellow Box (*E. melliodora*) Inland Grey Box (*E. microcarpa*), Grassy Woodland (EEC);
4. Brigalow (EEC); and
5. Cleared Land with Scattered Trees.

Following discussions with DECCW during the development of the Biodiversity Offset Strategy, DECCW requested that vegetation communities three and five (above) be further investigated, suggesting that following further field survey they may be identified as other vegetation communities (biometric vegetation types). Such investigations were undertaken during the development of the Biodiversity Offset Strategy by ELA (2010). **Figure 4-2** shows the results of the vegetation community mapping by ELA (2010). ELA (2010) redefined the two communities as follows:

1. Bimble Box (*E. populnea*), Yellow Box (*E. melliodora*) Inland Grey Box (*E. microcarpa*), Grassy Woodland (EEC) was remapped as the following biometric vegetation types:
 - i. Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101); and
 - ii. White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions.
2. Cleared Land with Scattered Trees was remapped as the following biometric vegetation types:
 - i. Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101) – Derived native grassland; and
 - ii. White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions – Derived native grassland.

The following section provides a brief outline of the structure and dominant floral characteristics of the vegetation communities identified by both RPS (this report) and ELA (2010). A full list of flora species is provided in **Appendix 1**.

WARNING
 No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from RPS Newcastle.
 Note that this Vegetation Community Map depicts clearly defined boundaries between vegetation communities that are the product of individual interpretation and are not distinguished by clearly defined boundaries 'on the ground'. Therefore, this map should only be treated as an indication of approximate peripheries between delineated vegetation communities. Caution should therefore be exercised when using this data for purposes requiring high levels of accuracy. Furthermore, no account for intergrading areas between delineated vegetation communities has been made.

LEGEND

- | | | | |
|---|---|---|--|
|  | Subject Site |  | Narrow Leaved Ironbark, White Cypress Open Forest |
|  | Approved Northern Emplacement Area |  | Narrow-leaved Grey Box, White Cypress, Narrow-leaved Ironbark Forest |
|  | Proposed Expanded Northern Emplacement Area |  | Bimble Box, Yellow Box, Inland Grey Box Grassy Woodland (EEC) |
|  | Approved Area of Auger Mining |  | Brigalow (EEC) |
|  | Approved Western Emplacement Area |  | Cleared Land with Scattered Trees |
|  | Approved Open Cut Pit Areas |  | Existing Disturbance |
|  | Proposed Expanded Open Cut Pit Limit | | |
|  | Soil Stockpile Area | | |



Vickery State Forest

Wean Road

0 500 1,000m

SCALE: 1:30,000/AT/A4 SIZE

Copyright
 "This document and the information shown shall remain the property of RPS Australia East Pty Ltd. The document may only be used for the purpose for which it was supplied and in accordance with the terms of engagement for the commission. Unauthorised use of this document in any way is prohibited."

TITLE: FIGURE 4-1 VEGETATION COMMUNITIES

LOCATION: ROCGLLEN COAL MINE

DATUM: N/A
 PROJECTION: MGA ZONE 56 (GDA 94)

DATE: 30/11/2010
 PURPOSE: REPORT FIGURE

LAYOUT REF: 2\J08S126\126230 Rocglen Mine\10- Drafting\
 VERSION (PLAN BY): C A4 (A.P-S-C-N.W.)

CLIENT: GSS ENVIRONMENTAL
 JOB REF: 26230

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
 241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
 T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

LEGEND

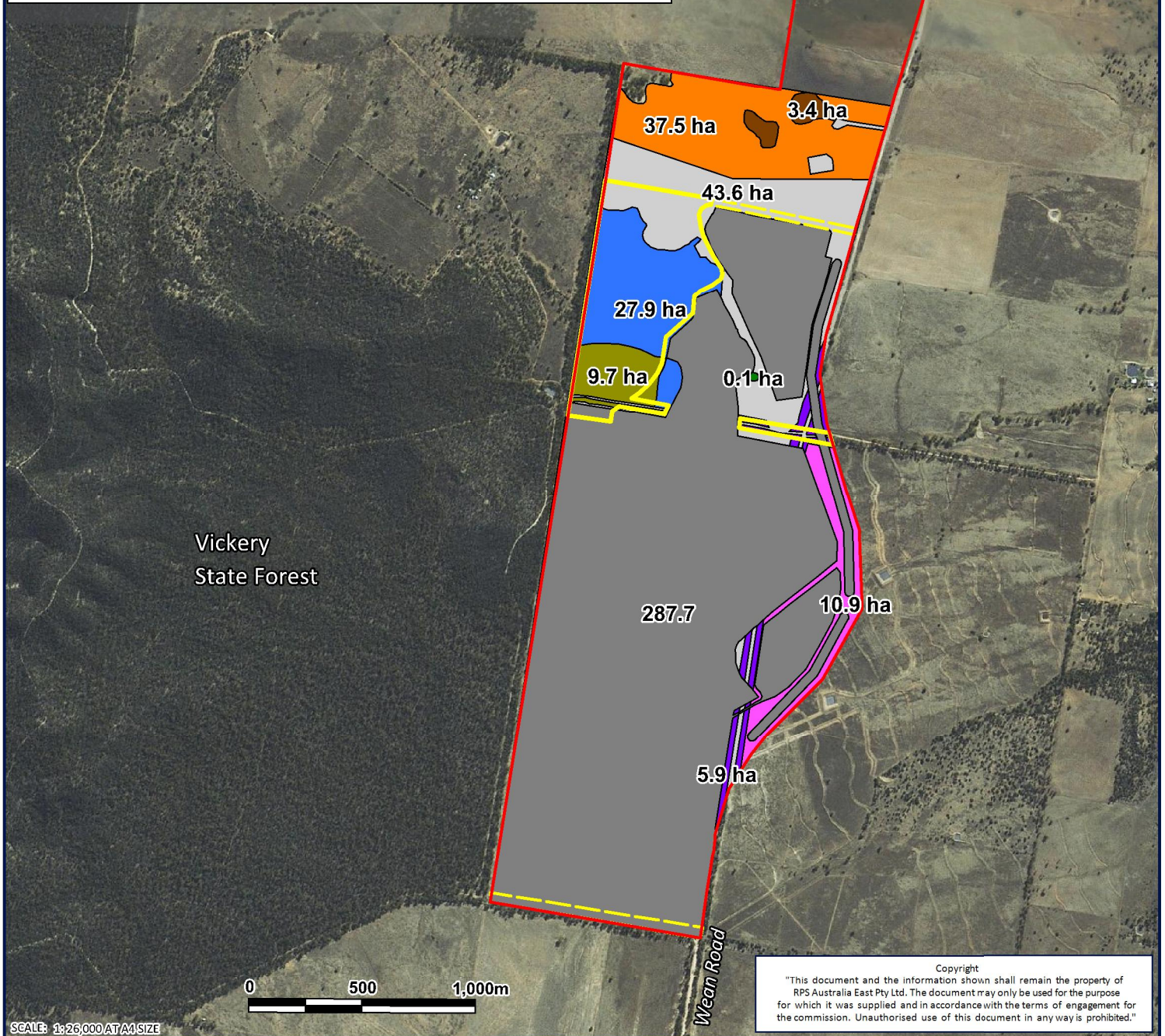
- Subject Site
- Approved Offset Areas
- Habitat Enhancement via Replacing

Vegetation Mapping by Ecological Australia (2010)

Vegetation Type Condition, Ancillary Code

- Approved Development
- Brigalow - Belah woodland on alluvial often gilgaied clay soil, Mod-Good
- Cleared
- Pilliga Box - Poplar Box - White Cypress Pine grassy open woodland on alluvial loams, Mod-Good
- Poplar Box grassy woodland on alluvial heavy clay soils, Mod-Good
- Poplar Box grassy woodland on alluvial heavy clay soils, Mod-Good
- White Box grassy woodland, Mod-Good
- White Box grassy woodland, Mod-Good, DNG
- White Cypress Pine - Narrow-leaved Ironbark, Mod-Good

WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from RPS Newcastle.



TITLE: Figure 4-2 Vegetation Mapping
by Ecological Australia (2010)
& Proposed Vegetation Clearing Areas

LOCATION: ROCGLEN COAL MINE

DATUM: N/A
PROJECTION: MGA ZONE 56 (GDA 94)

DATE: 2/12/2010
PURPOSE: REPORT FIGURE

LAYOUT REF: Eco Report Work\26230 Figure 4-2 Vegetation Mapping
by Ecological Australia (2010) B A4
VERSION (P.LAN BY): B A4 (S.C.N.W)

CLIENT: GSS ENVIRONMENTAL
JOB REF: 26230

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

**Narrow-leaved Ironbark (*E. crebra*), White Cypress (*Callitris glaucophylla*)
Open Forest;**

- Description:** This vegetation community occurred throughout large areas of the study areas and is located predominantly on the slightly elevated slopes and the ridge tops. This is a variable forest with tall forest occurring in gullies and sheltered areas to a low forest on exposed ridge tops. It has relatively open or medium density shrub and ground layers depending on the levels of previous disturbances such as grazing.
- Canopy Layer:** 14 to 20m – 30 to 35% Projected Foliage Cover (PFC). Dominant species include; *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress), and *Eucalyptus pilligaensis* (Narrow-leaved Grey Box).
- Sub-canopy Layer:** 10m to 15m – highly variable 2 to 20% PFC. Dominant species included; juvenile canopy species plus *Geijera parviflora* (Wilga), *Alectryon oleifolius*, (Rosewood), *Callitris endlicheri* (Black Cypress) and *Pittosporum angustifolium* (Butterbush).
- Shrub Layer:** 0.5m to 5m – highly variable 5 to 20% PFC. Dominant shrub species included; *Cassinia laevis* (Cough Bush), *Myoporum montanum* (Western Boobialla), *Dodonaea viscosa* subsp. *spathulata* and *Pimelea microcephala* (Shrubby Riceflower).
- Ground Layer:** 0.1m to 1.2m – 40 to 65% PFC. Dominant species included; *Solanum esuriale* (Quena), *Cymbopogon refractus* (Barbwire Grass), *Dichondra repens* (Kidney Weed), *Austrostipa scabra* (Rough Speargrass), *Digitaria brownii* (Cotton Panic), *Vittadinia muelleri* (Fuzzweed), and *Opuntia stricta* (Prickly Pear).
- Condition:** This community is in moderate to good condition. The canopy layer is comprised of young trees to 15 metres with an average DBH of approximately 35cm. The shrub layer is sparse due to previous grazing, while the ground layer is comprised of mostly native grasses, herbs and forbs. The level of exotic species is low and consists of common pasture exotics such as Saffron Thistle, Khaki Weed and Paddy's Lucerne.

Classification: It is considered that this vegetation community is not commensurate with any threatened ecological community known in the locality. This community corresponds to; Map Unit 1b – White Cypress and Ironbark Forest as described by DLWC (2002), to the Narrow-leaved Ironbark, White Cypress Open Forest as described by Cunningham (2007), and to Pilliga Box – Poplar Box – White Cypress Pine grassy open woodland on alluvial loams mainly on the temperate (hot summer) climate zone - Biometric Vegetation Type (ELA 2010).

Narrow-leaved Grey Box (*E. pilligaensis*), White Cypress (*Callitris glaucophylla*), Narrow-leaved Ironbark (*E. crebra*) Forest

Description: This vegetation community occurred in some parts of the study area on the mid-slopes and some of the higher elevations on gravelly metasediment soils. This vegetation was generally of medium height with some taller emergents in localised areas.

Canopy Layer: 20 to 25m – variable 20 to 35% PFC. Dominant species included; *Eucalyptus pilligaensis* (Narrow-leaved Grey Box) and *Callitris glaucophylla* (White Cypress). Specimens of *Eucalyptus albens* (White Box) and *Eucalyptus crebra* (Narrow-leaved Ironbark) were also sparsely scattered throughout this community.

Sub-canopy Layer: 8 to 18m – 5% PFC. Dominant species included juvenile and suppressed canopy species as well as *Geijera parviflora* (Wilga).

Shrub Layer: 2m to 5m – variable 5 to 15% PFC. Dominant species included; juvenile sub-canopy species as well as *Dodonaea viscosa*, *Maireana microphylla* (Small-leaf Bluebush), *Notolaea macrocarpa* (Native Olive), *Myoporum montanum* (Western Boobialla) and *Acacia oswaldii* (Miljee).

Ground Layer: 0.2m to 1.5m – 70 to 85% PFC. Dominant species included; *Aristida ramosa* (Purple Wiregrass), *Sporobolus caroli* (Fairy Grass), *Austrostipa verticillata* (Slender Bamboo Grass), *Sclerolaena birchii* (Galvanised Burr), *Austrostipa scabra* (Speargrass), *Paspalidium constrictum* (Knottybutt Grass) and *Sida rhombifolia* (Paddy's Lucerne).

Condition: This community is in moderate to good condition. The canopy layer is comprised of mostly mature trees to 25 metres with an average DBH of approximately 70cm. There is some recruitment of young saplings, mostly of *E. pilligaensis* and *Callitris*. The shrub layer has a moderate but patchy density and is comprised of mostly evenly scattered Wilga with localised patches of *Dodonaea*. Due to previous grazing, the ground layer is comprised of mostly native grasses, herbs and forbs. The level of exotic species is low and consists of common pasture exotics such as Saffron Thistle, Khaki Weed and Paddy's Lucerne.

Classification: This vegetation community is considered to be commensurate with; Map Unit 1d - Footslopes Woodlands (*E. melliodora*, *Angophora floribunda*, *E. blakelyi*, *Callitris glaucophylla*) as described by DLWC (2002), Narrow-leaved Grey Box, White Cypress, Narrow-leaved Ironbark Forest described by Cunningham (2007), White Cypress Pine – Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion – Biometric Vegetation Type (ELA 2010).

This community does not correspond with any of the Threatened Ecological Communities (TECs) known in the area.

Bimble Box (*E. populnea*), Yellow Box (*E. melliodora*), Inland Grey Box (*E. microcarpa*) Grassy Woodland

Description: This vegetation community occurs on the lower slopes near gilgai-like depressions or close to small broad watercourses on fine-grained clayey soils. Its structure has moderately sized well spaced trees with a variable density shrub layer and a generally grassy ground layer. Narrow-linear patches of this community also occur along Wean and Jaeger Lane road reserves.

Canopy Layer: 20 to 25m – 20-35% PFC. Dominant species include; *Eucalyptus pilligaensis* (Narrow-leaved Grey Box), *Eucalyptus populnea* (Bimble Box), *Callitris glaucophylla* (White Cypress), *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus microcarpa* (Inland Grey Box).

Sub Canopy Layer: 6 to 12m – 3 to 5% PFC. Dominant species were juvenile canopy species with *Geijera parviflora* (Wilga), *Alectryon oleifolius* (Rosewood) and *Pittosporum angustifolium* (Butterbush).

Shrub Layer: 2m to 4m – 5 to 25% PFC. Dominant shrub species included; *Lycium ferocissimum* (African Boxthorn), *Sclerolaena birchii* (Galvanized Burr), *Maireana microphylla* (Small-leaf Bluebush) and *Dodonaea viscosa* subsp. *spathulata*.

Ground Layer: 0.2m to 1.5m – variable 75 to 90% PFC. Dominant species included; *Austrostipa verticillata* (Slender Bamboo Grass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Digitaria brownii* (Cotton Panic Grass), *Aristida ramosa* (Purple Wiregrass), *Chloris truncata* (Windmill Grass) and *Carthamus lanatus* (Saffron Thistle).

Condition: This vegetation community has a variable condition depending on location and previous disturbances. The areas along the road reserves within the subject site are slightly less disturbed due to the lack of / or minimal grazing. The patches within road reserves have an intact native grassy ground layer, a sparse shrub layer and a canopy layer showing good recruitment. The patches found elsewhere have been grazed and subsequently the shrub layer and tree recruitment has been suppressed, while the ground layer shows evidence of grazing by containing exotics such as Saffron Thistle, Prickly Lettuce, Khaki Weed, occasional Prickly Pear and Lucerne.

Classification: This vegetation community corresponds to Map Unit 4c – Floodplain Woodlands (*E. populnea*, *E. microcarpa*, *E. melliodora*) as described by DLWC (2002).

This vegetation also corresponds to Map Unit 3 – Pilliga Grey Box, Whitebox, Yellowbox, White Cypress community as described by Cunningham (2007).

This vegetation community is considered to be commensurate with White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions as described and mapped by the Namoi Catchment Management Authority.

This community was later identified by ELA (2010) as the Biometric vegetation type - White Box grassy woodland of the

Nandewar and Brigalow Belt South Bioregions. This community is present within the subject site as both remnant woodland and derived native grassland.

This community also corresponds with the EEC known as White Box, Yellow Box, Blakeley's Red Gum Woodland which is listed within the schedules of the TSC Act.

This community is also commensurate with the federally listed threatened community known as White Box, Yellow Box, Blakeley's Red Gum Grassy Woodland and derived Grasslands. This community is listed as Critically Endangered within the schedules of the EPBC Act.

Brigalow

Description:	This vegetation community occurred within a single small area of 0.14 hectares on the eastern side of the mine pit. It contains approximately 38 stems all of which were greater than 10cm DBH. The shrub layer was absent while the ground layer consisted of a single grass species; <i>Austrostipa verticillata</i> (Slender Bamboo Grass).
Canopy Layer:	To 15m – 70% PFC. There was a single dominant species; <i>Acacia harpophylla</i> (Brigalow).
Shrub Layer:	Very sparse occurrences of <i>Maireana microphylla</i> (Small-leaf Bluebush) and <i>Lycium ferocissimum</i> (Boxthorn) were observed by Cunningham (2007) and by Colin Bower (2010).
Ground Layer:	To 1.5m – 50% PFC. Dried stems of <i>Austrostipa verticillata</i> (Slender Bamboo Grass) were observed to be present emerging from muddy sediment and water which at the time of the survey was approximately 10 to 15cm deep surrounding the Brigalow stand.
Disturbance:	This community is surrounded by existing mine operations and has been impacted by flooding due to earthworks (berms, roads) occurring in close proximity. These earthworks have trapped water around the bases of this stand and the soil appears to be regularly inundated and was waterlogged with approximately 10 to 15 cm depth of free water and fine sediment at the time of the flora survey.

Condition: This vegetation patch is highly disturbed. It is very small in size (0.14 hectares) and is particularly susceptible to the effects of surrounding disturbances. The patch consists of 38 stems of mature Brigalow and no recruitment of seedlings. The shrub and ground layer species indicative of the EEC are also completely absent. It is considered that this stand of Brigalow is no longer truly representative of the EEC community and it is not a viable patch.

Classification: The DLWC (2002) mapping for the Boggabri 1:100,000 Map Sheet did not map any Brigalow dominant or co-dominant vegetation communities within the map sheet.

This vegetation community corresponds to Map Unit 6 – Brigalow Community as described by Cunningham (2007) and to the Biometric Vegetation Type – Brigalow – Belah woodland on alluvial often gilgaied clay soil mainly in the Brigalow Belt South Bioregion.

This vegetation community corresponds to the Endangered Ecological Community (EEC) listed within the TSC Act known as Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions.

This community also corresponds to the federally listed (EPBC Act) Endangered Ecological Community known as Brigalow (*Acacia harpophylla* dominant and co-dominant).

Notwithstanding the possibility that the Brigalow patch may not constitute EEC vegetation due to either geographical occurrence or due to vegetation composition, it has been included and assessed as such herewith to ensure consistency with previous site reporting and to ensure a precautionary approach is applied to impact assessment.

Cleared Land with Scattered Trees

At the request of DECCW this community was later split by ELA (2010) into the two following biometric vegetation communities:

- a. White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions – Derived native grassland; and
- b. Poplar Box grassy woodland on alluvial heavy clay soils in the Brigalow Belt South Bioregion (Benson 101) – Derived native grassland.

The White Box grassy woodland community is consistent with the RPS mapped community Bimble Box (*E. populnea*), Yellow Box (*E. melliodora*), Inland Grey Box (*E. microcarpa*), Grassy Woodland (EEC) and is described above.

Poplar Box grassy woodland was mapped by ELA (2010) and is not further described within this report.

4.2.2 Significant Flora

Suitable habitat for two cryptic threatened flora species, Finger Panic Grass (*Digitaria porrecta*) and Tricolour Diuris (*Diuris sheaffiana*), may occur in the local area. Surveys for this report were undertaken during the January to February flowering period for Finger Panic Grass (when it is most likely to be detected). Surveys for Tricolour Diuris during the flowering period of September to November were not possible due to Proposal timing however the proposed removal of a relatively small area of 'moderate' potential habitat relative to the availability of nearby similar habitat areas would be unlikely to significantly impact the species (see **Section 6.1**).

All other species of threatened flora known or likely to occur in the local area are non-cryptic or were surveyed within their recommended survey period.

No threatened flora species were observed within the subject site during flora surveys.

4.3 Habitat Survey

4.3.1 Terrestrial Habitats

Five main types of habitat were recorded within the subject site. They were:

- Woodland areas;
- Woodland trees along road verges;
- Open pasture paddocks;
- Disturbed mining areas; and
- Farm dams.

4.3.1.1 Woodland Areas

Within the subject site detailed habitat assessments were undertaken in the woodland areas that may be impacted by the Proposal, namely the existing biodiversity offset areas. Within the biodiversity offset areas two vegetation communities were recorded and present two different habitat types, a middle-aged and mature stand of Narrow-leaved Ironbark – White Cypress Open Forest Community and a regenerating Narrow-leaf Grey Box – White Cypress – Narrow-leaved Ironbark Forest Community. Woodland areas along road verges present a different habitat type and are discussed separately below.

Narrow-leaved Ironbark, White Cypress Open Forest Community

The vegetation of the Narrow-leaf Ironbark, White Cypress Open Forest Community comprised a regenerating woodland overstorey and a scattered understorey habitat area. The canopy was dominated by a stand of regenerating (100 – 200 mm DBH) trees reaching 15 metres in height. Middle aged (201 – 400 mm DBH) trees also occurred but at lower frequencies within the canopy. No mature (400 – 600 mm DBH) or old growth trees (600+ mm DBH) were recorded. Saplings (< 100 mm diameter stems) were rare ranging between one and two metres in height. Stags (dead standing trees) were rare reaching up to 18 metres in height. The canopies of individual trees were typically affected by slight levels of dieback and slight levels of mistletoe infestation during the time of the field surveys. The dominant canopy species were Narrow-leaved Ironbark, White Cypress with very few Narrow-leaved Grey Box.

No tree hollows were recorded. Naturally formed tree stumps (> 100 mm diameter; not cut by humans) were scarce and typically hollow in nature.

An isolated shrub layer ranged between one metre and two metres in height and contained a low level of species diversity and a low level of structural diversity. Ground cover was dominated by grass cover. Areas of litter and herb/forbs also occurred. No areas of lichen, rock, boulder/solid rock ground cover were recorded. The understorey was typically grassy, comprised of a predominately native species composition reaching an average height of 0.4 to 0.7 metres. Log cover (fallen trees and branches) was scattered, and dominated by small (< 100 mm diameter) logs, with occasional medium (101 – 300 mm diameter) logs. Log cover was predominately comprised of a mixture of solid (with and without bark) and hollow logs however some rotten (collapse if stepped on) logs were also recorded.

Species specific habitat areas of loose tree bark were recorded at very low density. No areas of rock on rock, rock overhangs, caves or litter at the base of trees were recorded. None of the ten koala food tree species listed in Schedule 2 of SEPP 44 were recorded at an individual or combined total of 15 percent of the canopy cover. No potential food trees of the Glossy Black-cockatoo were recorded.

The Narrow-leaf Ironbark - White Cypress Community was disturbed by a moderate number of cut stumps, slight grazing pressure from kangaroos and wallabies, and a slight level of weed infestation. No evidence of a past fire history, erosion or rubbish dumping was recorded. Study areas were typically characterised by gentle (0-5 degrees) sloping terrain and a north-easterly aspect.

Narrow-leaved Grey Box, White Cypress, Narrow-leaved Ironbark Forest Community

The vegetation of the Narrow-leaved Grey Box, White Cypress, Narrow-leaved Ironbark Forest Community comprised an open woodland overstorey and a scattered understorey habitat area. The canopy was dominated by a stand of mature (400 – 600mm DBH) trees occasionally reaching 25 metres in height. Regenerating (100 – 200mm DBH) and middle aged (201 – 400 mm DBH) trees also occurred but at lower frequencies within the canopy. No old growth trees (600+ mm DBH) were recorded. Saplings (< 100 mm diameter stems) were rare ranging between one and three metres in height. Stags (dead standing trees) were scarce. The canopies of individual trees were typically affected by slight levels of dieback and mistletoe infestation during the time of the field surveys. The dominant canopy species were Narrow-leaved Grey Box, White Cypress, Narrow-leaved Ironbark with a shrub layer dominated by patchy occurrences of Wilga.

Tree hollows were recorded in middle-aged and mature trees. Tiny (<25 mm), small (26 – 50 mm) and medium (51 – 100 mm) tree hollows were uncommon, large (101 – 300 mm) tree hollows were scarce and no extra large (> 301 mm) tree hollows were recorded. Naturally formed tree stumps (> 100 mm diameter; not cut by humans) were rare and typically hollow in nature.

A scattered shrub layer ranged between one metre and three metres in height and contained a low level of species diversity and a low level of structural diversity. Ground cover was dominated by herb/forb and grass cover. Areas of soil and litter also occurred. No areas of lichen, rock or boulder/solid rock ground cover were recorded. Grassland areas were typically comprised of a predominately native species composition reaching an average height of 0.3 to 1.0 metres. Log cover (fallen trees and branches) was scattered and dominated by large (>100mm diameter) logs. Log cover was predominately comprised of solid (with and without bark) and hollow logs.

Species specific habitat areas of loose tree bark were recorded. No areas of rock on rock, rock overhangs, caves or litter at the base of trees were recorded. One of the ten koala food tree species (*Eucalyptus albens*) listed in Schedule 2 of SEPP 44 were recorded at an individual or combined total of less than 2 percent of the canopy cover. No potential food trees of the Glossy Black-cockatoo were recorded.

The study area was disturbed by a moderate number of cut stumps, previous grazing by livestock, ongoing moderate grazing pressure from kangaroos and wallabies and slight sheet erosion. No evidence of a past fire history, rubbish dumping or weed infestation was recorded. Fauna study areas were typically characterised by gentle (0-5 degrees) sloping terrain and a north-easterly aspect.

4.3.1.2 Woodland Trees Along Road Verges

Woodland trees along Wean Road and Jaeger Lane reached a height of 25 metres and were a mixture of White Box, Inland Grey Box, White Cypress Pine and Narrow-leafed Ironbark. This vegetation corresponds to the White Box, Yellow Box, Blakeleys Red Gum vegetation type which is a TEC listed within the TSC Act and the EPBC Act (1999). In some areas mature White Cypress reaching eight metres in height occurred. The understorey contained patches of Wilga which was dense in some parts and reached up to eight metres in height. Ground cover comprised 95 percent (mostly native) grass cover to a height of one metre. A moderate density of stags was recorded and most contained tree hollows. Tree hollows in mature eucalypt trees were abundant in all size classes except extra large tree hollows which occurred at a moderate density.

4.3.1.3 Open areas of Pasture Paddocks

The more open areas of pasture or paddocks provided some habitat for foraging birds and macropods.

4.3.1.4 Disturbed Mining Areas

The already disturbed areas associated with the existing mine (the pit area, soil emplacement areas, haul roads, offices, parking, berms and coal processing / loading areas etc) provide very little habitat for native flora and fauna.

4.3.1.5 Farm Dams

Farm dams are scattered throughout the subject site. Farm dams varied greatly with respect to habitat value as some are devoid of vegetation while others have the full suite of deeper water, shallows and mud-flat vegetation present.

4.3.2 Corridors and Habitat Linkages

The subject site and surrounding properties are located at the foot of Bull Mountain (479m ASL) which is contained within the adjacent Vickery State Forest. At present the Vickery State Forest has very poor connectivity to other areas of native vegetation for most fauna species. The only connecting corridors are road easements which are generally 20m wide or less. Not all of these easements are wholly vegetated and there are numerous sparse areas and gaps in the vegetation within these easements.

The closest nearby significant area of forest vegetation in proximity to the Vickery State Forest is Kelvin Aboriginal Area and the Whitehaven Coal Regional Biodiversity Offset Area approximately three kilometres to the east. There is a minimum gap of 2.4 kilometres of mostly cleared land with road easement vegetation providing the only connectivity between Vickery State Forest and the Whitehaven Coal Regional Biodiversity Offset Area.

While the links between Vickery State Forest and Kelvin Aboriginal Area / Whitehaven Coal Regional Biodiversity Offset Area are poor for all but highly

mobile species, Vickery State Forest and the adjacent habitat areas on surrounding properties and the subject site provide a large habitat area for species in the region. In addition both areas provide habitat for species that may be moving north-south through the landscape along a potential corridor of relatively large habitat patches scattered between Werris Creek and Narrabri.

4.4 Fauna Survey

A total of 100 fauna species were recorded across the subject site and Yarrawonga, comprising nine frogs, nine reptiles, 64 birds and 18 mammals (**Appendix 2**). Five threatened fauna species listed on the TSC Act were recorded (**Table 4-3**). No species listed on the EPBC Act were recorded. Three introduced species were recorded (**Appendix 2**).

Table 4-3: Threatened Species Identified During Field Surveys

Scientific Name	Common Name
Vulnerable Species – TSC Act	
<i>Pyrrholaemus sagittatus</i>	Speckled Warbler
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat

4.4.1 Terrestrial Mammals

No terrestrial mammals were captured or identified during terrestrial Elliott trapping, cage trapping or hair tubing. The Eastern Grey Kangaroo (*Macropus giganteus*) was the only macropod observed within the subject site however the Eastern Grey Kangaroo, Swamp Wallaby (*Wallabia bicolor*) and Common Wallaroo (*Macropus robustus*) were all observed nearby on Yarrawonga. The introduced Red Fox (*Vulpes vulpes*) was recorded twice in the subject site area.

A full list of mammals recorded within the site is provided in **Appendix 2**.

4.4.2 Arboreal Mammals

A single arboreal mammal, the Common Brushtail Possum (*Trichosurus vulpecula*) was recorded on the subject site. No other arboreal mammals were recorded during spotlighting surveys.

4.4.3 Bats

A total of 13 microchiropteran bat species were identified, 12 from Anabat echolocation call recordings and five during harp trapping. During Anabat echolocation

analysis, two species were frequently identified, namely Gould's Wattled Bat (*Chalinolobus gouldii*) and the Little Forest Bat (*Vespadelus vulturnus*).

During harp trapping eight bats were captured and comprised five bat species (**Appendix 2**). The Lesser Long-eared Bat (*Nyctophilus geoffroyi*) was captured during harp trapping but was not identified during Anabat echolocation analysis.

One threatened bat species listed on the TSC Act, the Yellow-bellied Sheath-tail-bat, was identified on the subject site (solely from Anabat analysis).

A full list of bat species recorded is provided in **Appendix 2**.

4.4.4 Birds

The bird species recorded were typical common woodland species of the region. Commonly recorded species included the Eastern Rosella (*Platycercus eximius*), Red-rumped Parrot (*Psephotus haematonotus*), Laughing Kookaburra (*Dacelo novaeguineae*), Striated Pardalote (*Pardalotus striatus*), Western Gerygone (*Gerygone fusca*), Brown Thornbill (*Acanthiza pusilla*), Striped Honeyeater (*Plethrhncha lanceolata*) and Noisy Miner (*Manorina melanocephala*). Two nocturnal bird species were recorded, namely the Tawny Frogmouth (*Podargus strigoides*) and the Australian Owlet-nightjar (*Aegotheles cristatus*).

A full list of bird species observed within the subject site is provided in **Appendix 2**.

4.4.5 Reptiles

Nine reptile species were recorded, comprising skinks, a dragon, geckos, a legless lizard and a snake. The Jacky Lizard (*Amphibolurus muricatus*) and Tree-crevice Skink (*Egernia striolata*) were commonly recorded.

A full list of reptile species observed is provided in **Appendix 2**.

4.4.6 Frogs

Nine frog species were recorded, comprising five tree frogs and four ground frogs. The Eastern Burrowing Toadlet (*Uperoleia rugosa*), Peron's Tree Frog (*Litoria peronii*) and Striped Burrowing Frog (*Litoria alboguttata*) were commonly recorded.

4.4.7 Weather Conditions During the Survey Periods

The prevailing weather conditions during the survey period are presented in **Table 4-4** below.

Table 4-4: Weather Conditions¹ during the Survey Period.

	8 Feb 2010	9 Feb 2010	10 Feb 2010	11 Feb 2010	12 Feb 2010
Temperature (°C)	21 - 32	17 - 33	19 - 32	19 - 34	18 - 35
Cloud²	8	1	0	1	2
Wind³	15 E – 20 ESE	13 ESE – 11 SE	15 ESE – 11 SE	6 ESE – 7 WNW	7 NW – 20 NNW
Rain (mm)⁴	4.2	0	0	0	0

1 = Temperature, cloud cover and rainfall measured at the Newcastle University Bureau of Meteorology Weather Station (<http://www.bom.gov.au/climate/dwo/IDCJDW0208.shtml>)

2 = Cloud cover at 9am, measured as eighths of the sky.

3 = Wind strength (km/hr) and direction at 9am and 3pm.

4 = 24 hours to 9am.

5.0 THREATENED SPECIES AND COMMUNITIES ASSESSMENT

5.1 Identification of Subject Species and Communities

Threatened flora and fauna species (listed under the TSC Act and/or the EPBC Act) that have been gazetted and recorded within a 40 km radius of the subject site are considered in the following assessment (**Table 5-1**). Endangered Ecological Communities (EECs) known from the broader area are also addressed. Each species / community is considered for its potential to occur on the subject site and the likely level of impact as a result of the Proposal. This assessment deals with each species / community separately and identifies the ecological parameters of significance associated with the Proposal.

This assessment deals with the following heads of consideration in tabulated form (refer to **Table 5-1** overleaf):

‘Species / Community’ – Lists each threatened species / EEC known from the vicinity. The status of each threatened species under the TSC Act and the EPBC Act are also provided.

‘Habitat Description’ – Provides a brief account of the species / community and the preferred habitat attributes required for the existence / survival of each species / community.

‘Chance of Occurrence on Site’ – Assesses the likelihood of each species / community to occur along or within the immediate vicinity of the site in terms of the aforementioned habitat description and taking into account local habitat preferences, results of current field investigations, data gained from various sources (such as DECCW Atlas of NSW Wildlife, herbariums, etc.) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

‘Likely Level of Impacts from Proposal’ – Assesses the likely level / significance of impacts to each species / community that would result from the proposed development, taking into account direct and indirect short and long-term impacts.

Table 5-1: Assessment of Likelihood of Occurrence of Threatened Species and Communities and Assessment of Potential Impacts

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
THREATENED ECOLOGICAL COMMUNITIES (TECs)			
Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions (E) Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) (E*)	Brigalow, where <i>Acacia harpophylla</i> is a dominant or co-dominant species in the canopy, is found in the Brigalow Belt South Bioregion in NSW and as isolated occurrences in the Darling Riverine Plains and Nandewar Bioregions. Brigalow is usually associated with heavy clay soils.	High Due to the occurrence of this species within the site. This community occupies a single small stand totalling 0.14 hectares and consists of approximately 38 specimens. However, the degraded nature of the stand and its small size indicates that the stand is not viable in the long term.	High Due to the proposed removal of the single stand of this community within the site (see Table 4 of ELA (2010)). A Biodiversity Offset Strategy (ELA 2010) has been prepared to achieve a 'maintain or improve' outcome for this community on a "like for like or better" basis consistent with NSW offset principle No. 12.
Native vegetation on cracking clay soils of the Liverpool Plains (E) Natural Grasslands on Basalt and fine-textured alluvial Plains of northern New South Wales and Southern Queensland (CE*)	Native Vegetation on Cracking Clay Soils of the Liverpool Plains is mainly a native grassland community which includes a range of small forb and herb species. The main grass species include Plains Grass (<i>Austrostipa aristiglumis</i>), Queensland Bluegrass (<i>Dichanthium sericeum</i>) and Coolibah Grass (<i>Panicum queenslandicum</i>). It also contains scattered and patchy shrubs and trees, including Boree (<i>Acacia pendula</i>), Rough-barked Apple (<i>Angophora floribunda</i>), Fuzzy Box (<i>Eucalyptus conica</i>), Bimble Box (<i>E. populnea</i>) and Yellow Box (<i>E. melliodora</i>). In wetter locations rushes and sedges are common. This	Low An inventory of plant species for the site exhibits some species that are found associated with this community (e.g. Plains Grass, Bimble Box and Yellow Box) however, the majority of the key indicator species are not present within the subject site and the site is not located on the Cracking Clay Soils associated with this community. It is considered that this EEC does not occur on-site.	Low Due to the absence of this EEC within the subject site it is unlikely that this EEC would be affected by this Proposal.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	community is located around Coonabarabran, Gunnedah, Murrurundi, Narrabri, Tamworth and Quirindi, on the North West Slopes and Plains of NSW. The vast majority of this vegetation community has been converted through agriculture and no examples are within conservation reserves. Most surviving remnants of the community are on Travelling Stock Routes.		
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions. (E) Weeping Myall Woodlands (E*)	This ecological community is scattered across the eastern parts of the alluvial plains of the Murray-Darling river system. Typically, it occurs on red-brown earths and heavy textured grey and brown alluvial soils within a climatic belt receiving between 375 and 500 mm mean annual rainfall. The structure of the community varies from low woodland and low open woodland to low sparse woodland or open shrubland, depending on site quality and disturbance history. The tree layer grows up to a height of about 10 metres and invariably includes <i>Acacia pendula</i> (Weeping Myall or Boree) as one of the dominant species or the only tree species present. The understorey includes an open layer of chenopod shrubs and other woody plant species and an open to continuous groundcover of grasses and herbs. The structure and composition of the	Low An inventory of plant species for the site shows that <i>Acacia pendula</i> (Myall) does not inhabit the site. However several other widely distributed species (e.g. <i>Alectryon oleifolius</i> , <i>Austrostipa scabra</i> and <i>Austrostipa aristiglumis</i>) also associated with other vegetation types as well as this EEC are present within the site. The key indicative species is not present within the subject site. It is considered that this EEC does not occur on-site.	Low Due to the absence of this EEC within the subject site it is unlikely that this EEC would be affected by this Proposal.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	community varies, particularly with latitude, as chenopod shrubs are more prominent south of the Lachlan River district, while other woody species and summer grasses are more common further north. In some areas the shrub stratum may have been reduced or eliminated by clearing or heavy grazing.		
White Box Yellow Box Blakely's Red Gum Woodland (E) White Box – Yellow Box – Blakeley's Red Gum Grassy Woodland and derived native Grassland (CE*)	White Box, Yellow Box, Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: <i>Eucalyptus albens</i> (White Box), <i>E. melliodora</i> (Yellow Box) and <i>E. blakelyi</i> (Blakely's Red Gum). Intact sites contain a high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs. The community also includes a range of mammal, bird, reptile, frog and invertebrate fauna species. Intact stands that contain diverse upper and mid-storeys and groundlayers are rare. Modified sites include the following: 1. areas where the main tree species are present ranging from an open woodland formation to a forest structure, and the groundlayer is	High Ground truthing flora surveys recorded this community within the subject site.	High The Proposal would remove 5.9 hectares of intact remnants along Wean Road and Jaeger Lane and 10.9 hectares of derived native grassland from within the subject site. A Biodiversity Offset Strategy (ELA 2010) has been prepared to achieve a 'maintain or improve' outcome for this community on a "like for like or better" basis.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	predominantly composed of exotic species; and 2. sites where the trees have been removed and only the grassy groundlayer and some herbs remain.		
Inland Grey Box Woodland in the Riverina, NSW Southwestern Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (E) Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and derived Native Grasslands of South-eastern Australia (E*)	This community is found on relatively fertile soils of the western slopes and plains of NSW in which <i>Eucalyptus microcarpa</i> (Inland Grey Box) is the most characteristic species. The community generally occurs where average rainfall is 375-800mm p.a. and the mean maximum annual temperature is 22-26°C. The most characteristic tree species - <i>Eucalyptus microcarpa</i> - is often found in association with <i>Eucalyptus populnea</i> subsp. <i>bimbil</i> (Bimbil Box), <i>Callitris glaucophylla</i> (White Cypress-pine), <i>Brachychiton populneus</i> (Kurrajong), <i>Allocasuarina luehmannii</i> (Buloke) or <i>Eucalyptus melliodora</i> (Yellow Box), and sometimes with <i>Eucalyptus albens</i> (White Box). This community is associated with Red Brown Earths (DEWHA 2010).	Low An inventory of plant species for the site exhibits some species that are found associated with this community (e.g. Inland Grey Box (<i>E. microcarpa</i>), Bimbil Box, Yellow Box and White Cypress) however, the majority of the key indicator species in the shrub and groundcover layers are not present within the subject site and the site is not located on the Red Brown Earths associated with this community. With regards to the EPBC listed community the tree layer within Map Unit 4 - Bimbil Box, Yellow Box community is comprised of less than 5% <i>E. microcarpa</i> which does not meet the 50% or greater criterion for this community. It is considered that this EEC does not occur on-site.	Low Due to the absence of this EEC within the subject site it is unlikely that this EEC would be affected by this Proposal.
PLANTS			
<i>Cadellia pentastylis</i> Ooline (V, V*)	A relict rainforest tree species to 10m occurring on the western edge of the North West Slopes between Tenterfield and north of Gunnedah. It is predominantly found within vine	Low Some suitable woodland habitat is known within the subject site and the wider study area. This species	Low Habitat suited to this species would not be affected by the Proposal. This species was not

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	thickets and dry rainforest but occasionally occurs within woodland habitats. It tends to favour upper to mid-slope positions with a northerly aspect. Flowers in Spring	was not observed within the subject site or the study area during vegetation mapping surveys. This species does not occur within the proposed mine extension areas, in addition, the majority of the other woodland vegetation suitable for this species is proposed to be retained.	observed within the subject site.
<i>Dichanthium setosum</i> Bluegrass (V, V*)	Grows in woodland and native grassland on stony, red-brown, hard setting soils over basalt, or on black soil. Occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, as well as in Qld and WA.	Moderate Suitable habitat (Black Soils) are present within the lower elevations and plains within the subject site. This species was not observed during flora surveys.	Low Only a small area of suitable habitat suited to this species would be affected by the Proposal. This species was not observed within the subject site.
<i>Digitaria porrecta</i> Finger Panic Grass (E, E*)	Occurs on richer soils within native grassland, woodlands or open forest with a grassy understorey. It flowers in summer and is often found along roadsides and travelling stock routes where there is light grazing and occasional fire. Occurs in NSW and Queensland. In NSW it is found on the North West Slopes and Plains, from near Moree south to Tambar Springs and from Tamworth to Coonabarabran.	Moderate Suitable habitat (Black Soils) are present within the lower elevations and plains within the subject site. This species was not observed during flora surveys.	Low Only a small area of suitable habitat suited to this species would be affected by the Proposal. This species was not observed within the subject site.
<i>Diuris sheaffiana</i> Tricolour Diuris (V, V*)	<i>Diuris tricolor</i> (formerly known as <i>Diuris sheaffiana</i>) is a terrestrial species sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the far north of NSW. This species	Moderate Suitable habitat is present within the lower elevations and plains within the subject site. This species was not observed during flora surveys	Low Only a small area of suitable habitat suited to this species would be affected by the Proposal. This species was not observed

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	grows in sclerophyll forest amongst grasses often with native Cypress Pine (<i>Callitris</i> spp.). The flowering period for this species is Sept to Nov.	however, the flora surveys were undertaken in Feb which is outside the Sept to Nov flowering period for this species.	within the subject site.
<i>Hakea pulvinifera</i> Lake Keepit Hakea (E, E*)	Root-suckering shrub to 4m high with thick tessellated bark, young branchlets pubescent. Confined to a single population on a hard rocky hillside below Keepit Dam (Gunnedah), apparently reproduces only by root suckers. Yellowish-white flowers in Spring.	Low The subject site is located approximately 25 kilometres from the extremely restricted known occurrence of this species. The subject site otherwise has possible rocky habitat.	Low Habitat suited to this species would not be affected by the Proposal. This species was not observed within the subject site.
<i>Homopholis belsonii</i> Belson's Panic (V*)	A perennial grass growing to 0.5m growing in dry woodland, including Belah, on poor soils, north from the Warialda district and into Queensland. Habitat and ecology appear to be poorly known however it is known from the Kelvin group of state forests north from Gunnedah.	Moderate Suitable habitat (dry woodland on poor soils) are present within the higher elevations and plains within the subject site. This species was not observed during flora surveys.	Low No area of suitable habitat suited to this species would be affected by the Proposal. This species was not observed within the subject site.
<i>Philotheca ericifolia</i> (V, V*)	Favours damp sites on sandy flats or gullies within dry sclerophyll forest and heath. Species known to be associated include <i>Melaleuca uncinata</i> (Broombrush), <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), <i>E. rossii</i> (White Gum), <i>E. punctata</i> (Grey Gum), <i>Corymbia trachyphloia</i> (Brown Bloodwood), <i>Acacia triptera</i> (Spurwing Wattle), <i>A. burrowii</i> (Wattle), <i>Beyeria viscosa</i> (Pinkwood), <i>Philotheca australis</i> , <i>Leucopogon muticus</i> (Blunt Beard-heath) and <i>Calytrix tetragona</i> (Common Fringe Myrtle). Recorded	Low No suitable habitat (damp sites on sandy flats or gullies within dry sclerophyll forest and heath), nor the suite of plants associated with this Species were present within the subject site or wider study area.	Low No area of suitable habitat suited to this species would be affected by the Proposal. This species was not observed within the subject site.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	from the upper Hunter Valley at Wingen Maid NR and Denman, its range spreads spasmodically west to the Pilliga and south to West Wyalong. It flowers in spring and population sizes range from several plants to 200.		
<i>Prasophyllum</i> sp. Wybong A Leek Orchid (CE*)	A terrestrial orchid that grows to approximately 30 cm high, appearing as a single leaf over winter and spring. The species flowers in spring and dies back to a tuber over summer and autumn. It generally found in shrubby and grassy habitats in dry to wet soil. It is known to occur in open eucalypt woodland and grassland. It has a single, tubular, fleshy, dull-green leaf and a single flower spike with numerous fragrant flowers. It is known from seven populations in eastern NSW near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell and Tenterfield.	Low The vegetation within the existing offset area is already disturbed by previous grazing and associated trampling / compaction of the soil surface therefore providing poor habitat for this species. However, suitable habitat (shrubby and grassy areas in dry to wet soil in open eucalypt woodland and grassland) is present on surrounding properties. The flora surveys were undertaken outside the known flowering period for this species.	Low The subject site provides poor habitat for this species.
<i>Pterostylis cobarensis</i> Cobar Greenhood Orchid (V, V*)	A terrestrial orchid with 7-11, narrow-elliptic leaves forming a basal rosette, each 1.5-2.5 cm long and 5-8 mm wide. Known chiefly from the Nyngan-Cobar-Bourke district in the far western plains of New South Wales. Recorded districts include Narrabri, Nyngan, Cobar, Nymagee, Mt Gundabooka, Mt Grenfel and Mutawintji National Park. There are also records from the Darling Downs district of Queensland. Habitats are	Low There is suitable habitat for this species within the subject site. However, the subject site is outside the known distribution of this species.	Low This species is unlikely to occur within the subject site. The Proposal would be unlikely to significantly impact upon this species.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	eucalypt woodlands, open mallee or <i>Callitris</i> shrublands on low stony ridges and slopes in skeletal sandy-loam soils with a tendency to grow in sites of litter accumulation and near rocks where run-off is concentrated. Flowers: Sept.– Nov.		
<i>Swainsona murrayana</i> Slender Darling Pea (V, V*)	Found on a range of clay-based soil from cracking clays to earths and loams this species grows within a variety of vegetation types, including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions where it is often found with <i>Maireana</i> spp.. Generally found in more western areas it has been recorded from a number of sites between Dubbo and Moree. A spring to early summer flowering species it has the capacity to survive some disturbance events.	Low Suitable habitat (grassland on level plains with <i>Maireana</i>) occurs within the subject site. The study area is outside the known distribution of this species.	Low This species is unlikely to occur within the subject site. The Proposal would be unlikely to significantly impact upon this species.
<i>Thesium australe</i> Austral Toadflax (V, V*)	Occurs in grassland or grassy woodland, often in damp sites with <i>Themeda australis</i> (Kangaroo Grass).	Low No suitable habitat for this species occurs within the subject site. This species was not observed within the study area.	Low This species is unlikely to occur within the subject site. The Proposal would be unlikely to significantly impact upon this species.
<i>Tylophora linearis</i> (V,E*)	Slender, almost hairless twiner with a clear sap. Leaves dark green, linear, 1-5 cm long, 0.5-3 mm wide. Flowers purplish, 3-6 mm in diameter, in radiating groups of 3-8. Fruit is cigar shaped, up to 100mm long and	Low No suitable habitat for this species occurs within the subject site. This species was not observed during flora surveys.	Low This species is unlikely to occur within the subject site. The Proposal is unlikely to significantly impact upon this species.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	approximately 5 mm diameter, hairless. Grows in dry scrub in the Barraba, Mendooran, Temora and West Wyalong districts in the northern and central western slopes of NSW. Records include Crow Mountain near Barraba, Goonoo SF, Pillaga West SF, Cumbil SF, Eura SF, Coolbaggie NR, Goobang NP and Beni CCA. Also occurs in Qld. Flowers spring		
RETILES AND AMPHIBIANS			
<i>Underwoodisaurus sphyrurus</i> Border Thick-tailed Gecko (V)	Found only on the tablelands and slopes of northern NSW (south to Tamworth and west to Moree) and southern Qld. Most common in granite country of the New England tablelands. Occurs on rocky hills with dry open eucalypt forest and woodland. Favours areas with rock slabs, boulders, fallen timber and deep leaf litter.	Low No suitable habitat occurs for this species.	Low This species is unlikely to occur within the subject site. The Proposal would be unlikely to significantly impact upon this species.
<i>Litoria booroolongensis</i> Booroolong Frog (E)	Permanent flowing rocky streams with fringing vegetation or groundcover. Forage up to 100 metres from streams and creeks. Detectable September – December. Predominately restricted to western flowing streams of the Great Dividing Range.	Low No suitable stream habitat occurs within the subject site for the species. This species was not observed during field surveys.	Low The species does not occur in the subject site and would not be significantly impacted by the Proposal.
<i>Elseya belli</i> Bell's Turtle (V*)	Only found in upper reaches of the Namoi, Gwydir and MacDonald Rivers on the North West Slopes of NSW. Uses shallow to deep pools in upper tributaries of major rivers in granite country. Often found in sections of	Low No suitable river habitat occurs within the subject site for the species. This species was not observed during field surveys.	Low The species does not occur in the subject site and would not be significantly impacted by the Proposal.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	river 30 to 40 metres wide in grazing land.		
<i>Delma torquata</i> Collared Delma (V*)	Only known to occur in Queensland, from four populations between Gladstone and Brisbane. Occurs on rocky hillsides on basalt and lateritic soils supporting open eucalypt and Acacia woodland with a sparse understorey of shrubs and tussocks or semi-evergreen vine thicket.	Low No suitable habitat occurs for this species and the species is not known to occur in NSW.	Low This species does not occur within the subject site. The Proposal would not significantly impact upon this species.
BIRDS			
<i>Hamirostra melanosternon</i> Black-breasted Buzzard (V)	Raptor that occurs in woodlands, scrubs and grasslands, mainly west of the divide. Preferred habitat, especially for breeding, is along timbered watercourses. Hunts over grassland and lightly timbered woodland. Has been recorded on the east coast but is very rare and are most likely vagrant birds.	Moderate Suitable habitat for this species is located within the subject site. This species was not observed during field surveys.	Low The Proposal will remove a small area of sub-optimal foraging habitat for this species. The Proposal would be unlikely to significantly impact upon this species.
<i>Lophoictinia isura</i> Square-tailed Kite (V)	Found in a range of habitats, locally within sclerophyll forests and woodlands where appropriate / preferred prey species occur (being predominantly terrestrial mammals). Requires large Eucalypt hollows for nesting and prefers to roost in these hollows as well.	Moderate Suitable habitat for this species is located within the subject site. This species was not observed during field surveys.	Low The Proposal will remove a small area of sub-optimal foraging habitat for this species. The Proposal would be unlikely to significantly impact upon this species.
<i>Leipoa ocellata</i> Malleefowl (E,V*)	The Malleefowl is a large and distinctive ground-dwelling bird that grows up to 60 cm in length and can weigh up to 2.5kg. It occurs in semi-arid and arid zones of temperate Australia, where it occupies	Low There is no suitable mallee vegetation habitat within the subject site. This species was not observed during field surveys.	Low Due to the lack of habitat resources, and the absence of this species within the subject site, it is considered unlikely this species

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine <i>Callitris</i> woodlands, acacia shrublands, Broombush <i>Melaleuca uncinata</i> vegetation or coastal heathlands. The low woodlands communities where Malleefowl occur are dominated by multi-stemmed species of eucalypts (such as <i>Eucalyptus socialis</i> , <i>E. dumosa</i> or <i>E. incrassata</i>) and occur on sandy or loamy soils that receive 200 to 450 mm of rainfall each year. The eucalypt woodlands (dominated by species such as <i>Eucalyptus sideroxylon</i> , <i>E. baxteri</i> , <i>E. araneosa</i> , <i>E. wandoo</i> , <i>E. leucoxylon</i> , <i>E. reudunca</i> , <i>E. microcarpa</i> , <i>E. astringens</i> , <i>E. populnea</i> , <i>E. camaldulensis</i> or <i>Corymbia callophylla</i>), native pine <i>Callitris</i> woodlands, acacia shrublands and Broombush vegetation.		would be significantly affected by the Proposal.
<i>Ephippiorhynchus asiaticus</i> Black-necked Stork (E)	Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds.	Low The few dams within the subject site may provide short-term foraging habitat for the species. This species was not observed during field surveys.	Low Due to the small size and small number of dams within the subject site and the significant provision of farm dams in the surrounding area, it is considered unlikely that this species would be significantly affected by the Proposal.
<i>Glossopsitta pusilla</i> Little Lorikeet	<i>Glossopsitta pusilla</i> extends from Cairns to Adelaide coastally and to	Moderate	Low

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
(V)	inland locations. Commonly found in dry, open eucalypt forests and woodlands. Can be found in roadside vegetation to woodland remnants. <i>G. pusilla</i> feeds on abundant flowering Eucalypts, but will also take nectar from, <i>Melaleuca</i> sp and <i>Mistletoe</i> sp. <i>Eucalyptus albens</i> (White Box) and <i>E. melliodora</i> (Yellow Box) are favoured food sources on the western slopes in NSW. On the eastern slopes and coastal areas favoured food sources are <i>Corymbia maculata</i> (Spotted Gum), <i>E. fibrosa</i> (Broad-leaved Ironbark), <i>E. robusta</i> (Swamp Mahogany) and <i>E. pilularis</i> (Blackbutt). Nesting takes place in hollow bearing trees.	This species may use forest areas of the subject site for foraging purposes on a seasonal basis. This species was not observed during field surveys.	Due to the relatively small area of forest vegetation on the subject site in comparison to the area of also suitable forest vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Lathamus discolor</i> Swift Parrot (E, E*)	On the mainland this species frequents Eucalypt forests and woodlands with large trees having high nectar production during winter. Mainland winter foraging sites often vary from year to year. Swift Parrots are dependent on habitats that provide winter foraging resources such as nectar and lerps (sugary exudates from leaf insects). Within these habitats, Swift Parrots prefer foraging in mature trees that provide a higher quality and quantity of nectar than regrowth trees.	Low This species may use forests areas of the subject site for foraging purposes on a seasonal basis. This species was not observed during field surveys.	Low Due to the relatively small area of forest vegetation on the subject site in comparison to the area of also suitable forest vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Rostratula benghalensis australis</i> Painted Snipe (Australian subspecies) (E, V*)	A small freshwater and estuarine wader, which prefers fringes of swamps, dams and nearby marshy areas where there is a cover of	Low Very limited foraging habitat is present in the form of several small	Low Due to the small size and small number of dams within the subject

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	grasses, lignum, low scrub or open timber	dams on the subject site. This species was not observed during field surveys.	site and the significant provision of farm dams in the surrounding area, it is considered unlikely that this species would be significantly affected by the Proposal.
<i>Polytelis swainsonii</i> Superb Parrot (V, V*)	Inhabit box gum, box cypress-pine and boree woodlands and river red gum forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian river red gum forest or woodland. On the south west slopes nest trees can be in open box gum woodland or isolated paddock trees. Species known to be used are Blakely's red gum, yellow box, apple box and red box. Nest in small colonies, often with more than one nest in a single tree. Breed between September and January. May forage up to ten kilometres from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.	Moderate Suitable habitat for this species is located within the subject site. This species was not observed during field surveys.	Low Due to the relatively small area of forest vegetation on the subject site in comparison to the area of also suitable forest vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Neophema pulchella</i> Turquoise Parrot (V)	In NSW this species occurs in eucalypt woodlands and open forests, with a ground cover of grasses and low understorey of shrubs. The species has also been recorded in a variety of other habitats, including savannah and riparian woodlands and farmland. It	Moderate Large areas of open woodland and grassy farmland occur within the subject site. This species may utilise these areas within the subject site for foraging purposes. This species	Low Due to the relatively small area of forest vegetation and grassy woodlands on the subject site in comparison to the area of also suitable vegetation in Vickery

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	forages primarily on the seeds of shrubs, grasses and herbs, both native and introduced. Breeding pairs nest in small hollow branches of Eucalypts.	was not observed during field surveys.	State Forest and the surrounding area, it is unlikely that this species would be significantly affected by the Proposal.
<i>Ninox connivens</i> Barking Owl (V)	Occurs mainly in dry sclerophyll woodland. Nests in large Eucalypt hollows, and roosts in hollows or thick vegetation. Can be found roosting in dense <i>Acacia</i> sp. and <i>Casuarina</i> sp. or the dense clumps of Eucalypt trees. More commonly found west of the divide and on the slopes. Favours tree lined watercourses, with hollow bearing tress. Hunts a range of prey species including birds and both terrestrial and arboreal mammals.	Moderate Forest and woodland areas of the subject site may provide suitable habitat areas for this species. This species was not observed during field surveys.	Low Due to the relatively small area of forest vegetation on the subject site in comparison to the area of also suitable forest vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Tyto novaehollandiae</i> Masked Owl (V)	Found in a range of habitats, more commonly found in dry eucalypt forests and woodlands. A forest owl which often hunts on forest edges and also roadsides. Requires large Eucalypt hollows for nesting and these hollows are also preferred for roosting sites. Breeding has also been recorded in caves.	Moderate Forest and woodland areas of the subject site may provide suitable habitat areas for this species. This species was not observed during field surveys.	Low Due to the relatively small area of forest vegetation on the subject site in comparison to the area of also suitable forest vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Climacteris picumnus</i> Brown Treecreeper (V)	Frequents drier forests and woodlands, particularly open woodland lacking a dense understorey. Also found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby. Feeds on invertebrate larvae and small insects,	Moderate Woodland areas of the subject site may provide suitable habitat areas for this species. This species was not observed during field surveys.	Low Due to the relatively small area of woodland vegetation on the subject site in comparison to the area of also suitable woodland vegetation in Vickery State Forest, it is unlikely that this species

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	particularly ants. Utilises hollows for roosting/nesting. Appears not to persist in remnants less than 200ha.		would be significantly affected by the Proposal.
<i>Chthonicola sagittata</i> Speckled Warbler (V)	Occupies Eucalypt and Cypress woodlands in drier areas and on the western/eastern slopes of the Great Dividing Range. More commonly found on the western slopes, mainly due to habitat. Requires a grassy understorey, a sparse shrub layer and an open canopy. Most foraging takes place on ground around tussocks, around bushes and trees. Appears unable to persist in districts where no forested fragments larger than 100ha remain.	High This species was recorded during field surveys on the subject site and the Yarrawonga property.	Low Due to the relatively sparse shrub cover only small areas of foraging habitat occur on the subject site for the species. Breeding is unlikely to occur within the subject site. Due to the record of the species on the adjacent Yarrawonga property where the shrub layer is more developed and breeding likely occurs, the species is unlikely to be significantly affected by the Proposal. Removal of woodland vegetation from the subject site is unlikely to result in the loss of any individuals and would likely only result in a reduction of the foraging range of one or two groups (pairs or trios). The species would be unlikely to be significantly affected by the Proposal.
<i>Pomatostomus temporalis</i> Grey-crowned Babbler (V)	Occupies open forests and woodlands, <i>Acacia</i> shrubland and adjoining farmland. Also Box-Gum Woodlands on the divide slopes and Box-Cypress Pine and open Box Woodlands on the plains. They feed on terrestrial invertebrates and insects on lower trunks and branches. Generally they prefer wooded areas	High This species was recorded during field surveys on the subject site and the Yarrawonga property.	Low A group of 11 birds was recorded repeatedly within the woodland areas to be removed as part of the Proposal. Additionally nests of the species were also identified within the subject site. The removal of woodland vegetation from the

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	with an intact ground cover, although in such areas as the Hunter Valley they occur in sparsely vegetated areas such as properties and golf courses. Appears unable to persist in cleared and highly fragmented habitats. Nest comprise of a dome shape stick nest which is often only a couple of metres from the ground in shrubs or Eucalypt saplings.		subject site would likely displace the resident group of birds into nearby similar vegetation on Yarrawonga. The fate of any displaced group is difficult to determine however the surrounding areas appear to provide suitable habitat for the species and may support the establishment of a new territory for the group. While the resident group would be displaced, it is unlikely that the species in the local area (comprising Yarrawonga, Vickery State Forest and surrounding properties) would be significantly affected.
<i>Certhionyx variegatus</i> Pied Honeyeater (V)	Widespread throughout acacia, mallee and spinifex scrubs of arid and semi-arid Australia. Occasionally occurs further east, on the slopes and plains and the Hunter Valley, typically during periods of drought. Inhabits wattle shrub (primarily Mulga, <i>Acacia aneura</i>), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering; feeds on nectar, predominantly from various species of emu-bushes (<i>Eremophila</i> spp.); also from mistletoes and various other shrubs (e.g. <i>Brachysema</i> spp. and <i>Grevillea</i> spp.); also eats saltbush fruit, berries, seed, flowers and insects. Highly nomadic, following the erratic flowering of shrubs; can be	Low This species favours more arid or semi-arid habitats. There is sub-optimal habitat for this species within the subject site during shrub and tree flowering periods. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	locally common at times.		
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater (V)	In NSW this species occurs in eastern Australia, along the inland slopes of the Great Dividing Range, extending to the coast between Sydney and Newcastle, NSW. Occupies dry Eucalypt woodland within an annual rainfall range between 400-700 mm, particularly within associations containing Ironbark and Box species. It is estimated that the Black-chinned Honeyeater spends 60% of its time searching foliage for such food as insects, nectar and lerp.	Moderate There is suitable habitat for this species within the subject site. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Grantiella picta</i> Painted Honeyeater (V)	<i>Grantiella picta</i> inhabits dry forests and woodlands especially those infested with mistletoe species. It can be found along water courses with <i>Allocasuarina</i> and <i>Melaleuca</i> sp. and <i>Acacia</i> woodlands. It has also been recorded in treed farmland and gardens. Box-Ironbark forests containing mistletoe such as <i>Amyema miquelii</i> are habitat on the foothills of the divide. <i>G. picta</i> also has a strong association with <i>Acacia</i> sp. with mistletoe. Such species include <i>A. pendula</i> (Weeping Myall) and <i>A. slicina</i> (Willow Wattle) and also the mistletoe <i>Amyema quandong</i> . These <i>acacia</i> sp. are also used for breeding. Predominately a western species and on the slopes. Is infrequently recorded east of the divide during summer.	Low The subject site contains only low numbers of mistletoes favoured by this species. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
<i>Anthochaera phrygia</i> Regent Honeyeater (E, E*)	Occurs in temperate woodlands and open forest, including forest edges. Seasonal movements appear to be dictated by the flowering of various species of <i>Eucalyptus</i> sp. that are characteristic of the dry forests and woodlands of South-Eastern Australia. The Regent Honeyeater prefers to forage on large-flowered <i>Eucalypts</i> . They also forage on mistletoe and <i>Banksia</i> flowers, and arthropods. Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February.	Low This species may use forest and woodland areas of the subject site for foraging purposes on a seasonal basis. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Melanodryas cucullata</i> Hooded Robin (V)	Primarily known from Eucalypt forest, woodland and scrub, although has been known to use cleared paddocks with regrowth or stumps in close proximity to wooded areas. Favours areas with sparse shrub cover and fallen timber. Appears unable to persist in remnants less than 100-200ha.	Low Forest and woodland areas of the subject site may provide suitable habitat for this species. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Daphoenositta chrysoptera</i> Varied Sitella (V)	Occur in eucalypt forest, woodland, mallee, farm trees, shelter belts, roadside trees and parks and gardens. Occur in most treed habitats except rainforest.	High This species was recorded during field surveys on the Yarrawonga property.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
<i>Stagonopleura guttata</i> Diamond Firetail (V)	Occupies open woodlands / forests and associated habitats with grassy understorey. Generally found west of the Divide or in drier semi-coastal areas such as the upper Hunter Valley. Appears unable to persist in remnants less than 200ha. A small number of records exist from the Lower Hunter Region (HBOC, Atlas of NSW Wildlife data 2009).	High This species was observed within the Yarrowonga property during fauna surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
MAMMALS			
<i>Dasyurus maculatus</i> Spotted-tailed Quoll (V, E*)	Found in a variety of forested habitats from sclerophyll forests, rainforests and coastal woodlands. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. It is an opportunistic hunter of a variety of prey.	Low Forest and woodland areas of the subject site may provide foraging suitable habitat for this species. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Petaurus norfolcensis</i> Squirrel Glider (V)	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species.	Low Forest and woodland areas of the subject site may provide suitable habitat for this species. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	Occurs in forests and woodlands along the Great Divide and on the	Low	Low

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
(E, V*)	western slopes in escarpment country with suitable caves and rocky overhangs for shelter. Records exist from the Watagan Mountains where it is associated with the above habitats.	No suitable habitat occurs for this species.	This species is unlikely to occur within the subject site. The Proposal would be unlikely to significantly impact upon this species.
<i>Phascolarctos cinereus</i> Koala (V)	Occurs in forests and woodlands where it requires suitable feed trees (particular <i>Eucalyptus</i> spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions.	Low There are only three records of this species within 10km of the subject site. Only one feed tree species (<i>E. albens</i>) is present in low numbers (less than 5%) within the plains vegetation of the subject site. Although it is likely that this species occurs in larger areas of habitat in the region the isolation of the subject site with respect to vegetated corridors containing suitable feed trees means that if utilised the subject site would be a temporary or transitory stopover for this species. No evidence such as scats or scratches of koalas were observed during the fauna survey. Targeted scat searches as the base of 20 potential food trees failed to record any scats. No koalas were recorded during spotlight surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Pteropus poliocephalus</i> Grey-headed flying-fox (V, V*)	Found within 200km of the eastern coast of Australia. Regularly occurs along the eastern coastal plain through NSW. Roosts in camps, usually in dense riparian habitats. At dusk disperses in search of the preferred food source, mainly Eucalypt	Low Forest and woodland areas of the subject site may provide foraging suitable habitat for this species. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	nectar and pollen, and rainforest fruits. Occurs in subtropical and temperate rainforest, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and planted fruit crops. May travel up to 50 km each night in search of food.		State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Nyctophilus timoriensis</i> Greater Long-eared Bat (V)	Greater long-eared bats roost in tree hollows and fissures. Inhabits a variety of vegetation types, including mallee, bullock <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland.	Moderate There is suitable habitat for this species within the subject site. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat (V,V*)	This species forages in tall open forests and the edges of rainforest. It roosts in mine shafts and similar structures. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of <i>Hirundo ariel</i> (Fairy Martin), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined	Moderate There is suitable habitat for this species within the subject site. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
	with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy.		
<i>Chalinolobus picatus</i> Little Pied Bat (V)	Occurs in the dry areas of NSW and Qld west of the Great Divide and also in SA where it inhabits dry open forest and woodlands, Mulga, <i>Callitris</i> , mallee and chenopod shrub-lands. Adaptable in its roosting requirements this species has been recorded roosting in tree hollows, houses, abandoned mines and caves.	Moderate There is suitable habitat for this species within the subject site. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat (V)	Range of habitats from rainforest to arid shrubland, roosts in tree-hollows, sometimes roosts in mammal burrows when no hollows available. Seasonal movements are unknown, may migrate to southern Australia in summer. Feeds by foraging for insects over the canopy, but flies low in arid shrubland.	High This species was recorded during field surveys on the subject site.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly affected by the Proposal.
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat (V)	This species forages predominantly in dry forests and woodlands east of the divide. Individuals have been recorded in riparian zones in rainforest and wet sclerophyll forest. Forages above the canopy or forest edges. It roosts in tree hollows, under bark and within man-made structures.	Moderate There is suitable habitat for this species within the subject site. This species was not observed during field surveys.	Low Due to the relatively small area of forest and woodland vegetation on the subject site in comparison to the area of also suitable forest and woodland vegetation in Vickery State Forest, it is unlikely that this species would be significantly

SPECIES/COMMUNITY	HABITAT DESCRIPTION	CHANCE OF OCCURRENCE ON SITE	LIKELY LEVEL OF IMPACT
			affected by the Proposal.

Notes: (V) = Vulnerable Species listed under the TSC Act.
 (CE) = Critically Endangered Species listed under the TSC Act.
 (E*) = Endangered Species listed under the EPBC Act.

(E) = Endangered Species listed under the TSC Act.
 (V*) = Vulnerable Species listed under the EPBC Act.
 (CE*) = Critically Endangered Species listed under the EPBC Act.

6.0 KEY THREATENING PROCESSES

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act. There are nine KTPs that have the potential to affect the site as a consequence of the Proposal. The nine relevant KTPs are:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Loss of hollow-bearing trees;
- Removal of dead wood and dead trees;
- Clearing of native vegetation;
- Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*);
- Invasion, establishment and spread of Lantana, *Lantana camara*;
- Ecological consequences of high frequency fires;
- Invasion of native plant communities by exotic perennial grasses;
- Predation by the European red fox (*Vulpes vulpes*);
- Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*);
- Human-caused climate change; and
- Degradation of native riparian vegetation along NSW watercourses.

“Alteration of the Natural Flow Regimes of Rivers, Streams, Floodplains and Wetlands”

While no permanently flowing creeks or rivers occur within the subject site, two ephemeral creeks traverse the subject site. A first order stream of Driggle Draggie Creek begins within and drains the northern part of the subject site in a north-westerly direction. Driggle Draggie Creek reports to the Namoi River via Barbers Lagoon watercourse, which is approximately 14 kilometres from the subject site. The upper reaches of an unnamed ephemeral second order stream that drains a small part of Vickery State Forest is currently diverted to Driggle Draggie Creek due to existing mining operations. Runoff to the east of the subject site and to the north of Jaeger Lane is also diverted to Driggle Draggie Creek via a series of existing contour drains and dams. To the south of Jaeger Lane, a section of the ephemeral second order stream has been removed due to the existing mining void. The stream within the subject site to the south of the void is also heavily disturbed and drains via a series of dams. Runoff to the east of the site and to the south of Jaeger Lane reports to this disturbed section. The unnamed stream then flows in a general south-west direction from the subject site into the Namoi River approximately 10 kilometres away.

Due to past and present disturbance, current flow patterns are unlikely to resemble natural flow regimes. However the alteration of surface water drainage, as outlined above, is likely to contribute to the Key Threatening Process “Alteration of the natural flow regimes of rivers, streams, floodplains & wetlands”.

“Loss of Hollow-bearing Trees”

The Proposal may require the removal of hollow-bearing trees and as such will contribute to the Key Threatening Process “Removal of Hollow-bearing Trees”. Due to the use of hollow-bearing trees by threatened fauna, particularly arboreal fauna, birds and Microchiropteran bats, removal has the potential to impact any local population of dependant species. Therefore retention of hollow-bearing trees within strategic planning wherever possible would aid to mitigate potential impacts.

“Removal of Dead Wood and Dead Trees”

The Proposal will require the removal of ground debris and as such could contribute to the Key Threatening Process “Removal of Dead Wood and Dead Trees”. Due to the use of dead wood debris on the ground for foraging, removal has the potential to impact any local population of dependant species. Therefore retention of stag trees, trees with hollows and fallen wood debris wherever possible would aid to mitigate potential impacts.

“Clearing of Native Vegetation”

The Proposal will require the removal of areas of native vegetation and as such will incrementally contribute to the Key Threatening Process “Clearing of Native Vegetation”.

“Competition and Grazing by the Feral European Rabbit (*Oryctolagus cuniculus*)”

Rabbits are present within the subject site and within the wider study area. The Proposal will provide an opportunity to control the rabbit population within the subject site and the wider study area, therefore mitigating the effect of this Key Threatening Process.

“Invasion, Establishment and Spread of Lantana, *Lantana camara*”

The Proposal has the possibility to contribute to the Key Threatening Process “Invasion, establishment and spread of *Lantana camara*” as a result of vegetation removal and other disturbance. However, the proposed works will provide an opportunity to manage weed invasion (including Lantana) by utilising existing recommended means and policies. Those areas that will be modified during the process of development will be managed into the future, eliminating opportunities for Lantana to take hold.

“Ecological Consequences of High Frequency Fires”

The Proposal has the potential to contribute to the occurrence of bushfire in the area due to accidental ignition by vehicles or installed machinery. Therefore the Proposal has the potential to increase the effects of this Key Threatening Process. However, it is understood that the mine will have a set of emergency procedures in place to detect and deal with any fire outbreak, thereby mitigating this KTP.

“Invasion of Native Plant Communities by Exotic Perennial Grasses”

The subject site and the wider study area are already affected by low levels of exotic perennial grasses. These species are generally exotic species commonly found in pasture areas. The Proposal will be removing some areas of vegetation affected by this KTP, however any future rehabilitation works will provide an opportunity to re-establish a native grass groundcover which when established will be resistant to exotic perennial grass invasion.

“Predation by the European Red Fox (*Vulpes vulpes*)”

This species is likely to be present within the subject site and the wider study area. The Proposal is not likely to exacerbate this KTP but will provide an opportunity to undertake control measures to mitigate the effects of the fox population in the area.

“Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs (*Sus scrofa*)”

This species is likely to be present within the subject site and the wider study area. The Proposal is not likely to exacerbate this KTP but will provide an opportunity to undertake control measures to mitigate the effects of the pig population in the area.

“Human Caused Climate Change”

The Proposal is likely to contribute to the Key Threatening Process “Human Caused Climate Change” as a result of clearing a small amount of native vegetation. The extent to which the Proposal could contribute to this process is considered unlikely to be significant.

“Degradation of Native Riparian Vegetation Along NSW Watercourses”

The Proposal is not likely to incrementally contribute to the KTP ‘Degradation of native riparian vegetation along NSW watercourses’ as the Proposal is not located within or adjacent to any native riparian vegetation.

7.0 OTHER LEGISLATIVE CONSIDERATIONS

7.1 Considerations under the State Environmental Planning Policy No. 44 – Koala Habitat Protection

7.1.1 First Consideration – Does SEPP 44 Apply in this Local Government Area?

The subject site is within the Gunnedah LGA which is listed in the *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44), Schedule 1 as an LGA where this policy applies.

7.1.2 Second Consideration - Is the Land 'Potential Koala Habitat'?

Schedule 2 of SEPP 44 lists 10 tree species that are considered indicators of 'Potential Koala Habitat'. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for 'Potential Koala Habitat'. SEPP 44 defines potential Koala Habitat as:

“areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component”.

Two Schedule 2 feed tree species (*Eucalyptus albens* and *E. populnea*) were recorded within the Rocglen site and within the Yarrawonga and Greenwood sites. Some areas have either or both of these two species present in numbers approaching 15%, therefore parts of the study areas do constitute potential Koala habitat.

7.1.3 Third Consideration – Is the Land 'Core Koala Habitat'?

No koalas were observed within the subject site or on the Yarrawonga property during field surveys. No evidence of koalas such as scats or scratches on tree trunks were observed. Due to the small size of the forest and woodland areas on the subject site, and the open nature of the woodland areas (most of the area), it is unlikely that any koalas present would be missed during two nights of spotlighting by two observers. It is considered that the subject site is unlikely to provide suitable core breeding habitat for the koala and that the subject site does not constitute Core Koala Habitat as defined in SEPP-44.

7.2 Considerations under the EPBC Act

Considerations have been made under the EPBC Act. An EPBC Act Protected Matters Search was undertaken within the DEWHA on-line database (accessed 3rd January 2010) to generate a list of those matters of National Environmental Significance (NES) within 40km of the site, which may have the potential to occur

within the site (see Section 4.1.1.2). This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed on the site will have, or is likely to have a significant impact upon a matter of NES, or on the environment of Commonwealth land.

Commonwealth land

The site is not land owned by the Commonwealth, and hence this portion of the Act is not applicable.

World Heritage Properties

The site is not a World Heritage Property. There are no World Heritage Properties listed as occurring in the Region. The Proposal would not have a significant impact upon any World Heritage Properties.

National Heritage Places

The site is not a National Heritage Place. There are no National Heritage Places listed as occurring in the Region. The Proposal would not have a significant impact upon any National Heritage Place.

Wetlands Protected by International Treaty (the RAMSAR convention)

There are no wetlands protected by international treaty (the RAMSAR convention) arising from the EPBC Act Protected Matters Report generated for an area within 40km of the site.

Nationally Listed Threatened Species and Ecological Communities

A total of 27 threatened species or ecological communities listed under the EPBC Act have been recorded or have suitable habitat within a 40 km radius of the subject site (see Table 5-1 in Section 5.1 for likelihood of occurrence of threatened species listed under EPBC Act). The potential for the Proposal to significantly impact on threatened species and ecological communities has been assessed in **Section 6.0** above.

The Proposal will require the removal of approximately 5.9 hectares of the White Box, Yellow Box, Blakeley's Red Gum Grassy Woodland in the form of intact remnants along Wean Road and Jaegar Lane and 10.9 hectares of the community as derived native grasslands, and 0.14 hectares of the Brigalow (*Acacia harpophylla* dominant and co-dominant). ELA (2010) provides a detailed Biodiversity Offset Strategy to provide a 'maintain or improve' outcome for the removal of the above vegetation communities.

None of the 14 threatened fauna species listed on the EPBC Act were recorded during field surveys. Only two species were assessed as having a moderate likelihood of occurrence on the subject site (Large-eared Pied Bat and Greater Long-eared Bat). Given the relatively small area of potentially suitable woodland

and forest habitat for the 14 threatened fauna species in comparison to the much larger provision of woodland and forest habitat in Vickery State Forest and surrounding rural properties, it is unlikely that the Proposal would significantly affect any of the 14 threatened fauna species. Additionally ELA (2010) provides a detailed Biodiversity Offset Strategy to provide a 'maintain or improve' outcome for the removal of potential habitat areas for threatened fauna species.

Nationally Listed Migratory Species

A total of 10 migratory species listed under the EPBC Act have been recorded or have suitable habitat within a 40 km radius of the site. The Proposal is unlikely to substantially modify, destroy or isolate an area of important habitat, result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat or seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

All Nuclear Actions

No type of nuclear activity is proposed for the site.

The Environment of Commonwealth Marine Areas

No Commonwealth marine areas exist within or adjacent to the site.

Summary Statement:

The Proposal was found to be considered as a 'Controlled Action' under the EPBC Act following referral of the Proposal to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC), which was formally the Department of Environment, Water, Heritage and the Arts (DEWHA), during earlier drafts of this report.

8.0 EXPECTED IMPACTS

8.1 Flora

No threatened flora species were observed within the subject site. It is considered that the Proposal will not have any significant effect on locally occurring threatened flora species.

Two Endangered Ecological Communities (EECs) were observed within the subject site. These EECs were White Box Yellow Box Blakely's Red Gum Woodland and Brigalow.

8.1.1 White Box Yellow Box Blakely's Red Gum Woodland EEC

The White Box Yellow Box Blakely's Red Gum Woodland EEC corresponds to Map Unit 4 – Bimble Box (*E. populnea*), Yellow Box (*E. melliodora*) Inland Grey Box (*E. microcarpa*), Grassy Woodland as described earlier in this report and shown in **Figure 4-1**. This EEC is also included in the White Box Yellow Box Blakely's Red Gum grassy Woodland and derived native Grassland vegetation community which is listed as a Critically Endangered Ecological Community within the EPBC Act.

It is expected that the proposed works will remove 5.9 hectares of the White Box Yellow Box Blakely's Red Gum Woodland EEC along Wean Road and Jaegar Lane, and 10.9 hectares of derived native grassland of the EEC from within the subject site.

Habitat critical to the survival of this EEC has not been gazetted within the TSC Act or the EPBC Act. Therefore the proposed action is not likely to impact any habitat critical to this community.

The importance of the patch of White Box Yellow Box Blakely's Red Gum Woodland EEC to be removed is considered to be 'medium' due to a number of factors:

- Disturbances such as invasion by some common exotic pasture species;
- Trampling and grazing by livestock;
- Suppression of the shrub layer via grazing and other land management practices;
- Suppression of tree recruitment, also by grazing and other land management practices; and
- The area of EEC proposed for removal comprises the eastern most portion of a larger contiguous patch of woodland vegetation extending into Vickery State Forest.

The Proposal is not expected to extensively modify abiotic factors such as ground or surface water levels such that it affects other areas of White Box Yellow Box Blakely's Red Gum Woodland EEC within the local area.

ELA (2010) provides a detailed Biodiversity Offset Strategy to provide a 'maintain or improve' outcome for the removal of areas of this vegetation community.

8.1.2 Brigalow EEC

A small stand (approximately 0.14 hectares) of Brigalow trees (*Acacia harpophylla*) is present within the proposed mine expansion area. The presence of this species is not definitive but is indicative of the EEC "Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions Endangered Ecological Community" listed as an EEC under the TSC Act. EEC vegetation triggers a "red flag" response under the Bio-banking tool (DECC 2009), which is used for calculation of impact assessment and required offsets.

Cunningham (2007) describes this vegetation below:

"The Brigalow community is represented by a single isolated remnant of about 55 stems of Brigalow [Acacia harpophylla]. Some trees may be multi-stemmed so the number of individual trees present is undoubtedly somewhat less. The remnant is located in the centre of a cultivated paddock that regularly produces crops. Eastern Cottonbush [Maireana microphylla] shrubs are spaced from <1 to 3m apart and some African Boxthorn [Lycium ferocissimum] plants (an exotic weed) are present. The community was heavily grazed and the only recognisable ground cover species was Slender Bamboo Grass [Austrostipa veritcillata]."

Two factors need to be considered where a highly cleared landscape is concerned, if that area is less than or equal to 4 hectares (DECC 2009). These are:

- (1) the contribution of the stand to regional biodiversity values; and
- (2) viability of the stand.

If both of the above factors are considered to be "low", then the DG may consider that "Red Flag" areas may not be impacted by a development if the overall impact can be regarded as improving or maintaining biodiversity values. The issues are dealt with in the Bio-banking assessment methodology (DECC 2009).

Contribution to regional biodiversity

This condition is defined by a number of related features which describe the relative abundance of this community at the site and within the broader region

where it occurs. While no other stands of this EEC exist at the development site, the actual extent of this community in the Gunnedah region is not known.

Benson et al. (2006) describes this EEC as occupying up to 18,000 hectares in the bioregion (which includes the Liverpool and Moree Plains). The removal of 0.14 hectares of this community is an extremely small reduction in the overall extent of this EEC in the region/bioregion. In this case, its contribution to regional biodiversity values is likely to be low.

In terms of condition of the stand, a “low” condition is defined as where:

“Native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and (there is) less than 50% of the groundcover vegetation is indigenous species, or more than 90% of groundcover vegetation is cleared.”

In this case, while the Brigalow stand groundcover is disturbed by exotic species invasion, and the native mid and groundcover species normally associated with this community are almost completely absent the over-storey is relatively intact and so according to the criteria of the Bio-banking assessment tool (DECC 2009) the vegetation must be considered to be in “moderate to good” condition.

In order to be considered as being not regionally significant, the number and extent of further stands of the community in the wider area should be identified. Analysis of local vegetation mapping (NSW Department of Land and Water Conservation 2002 – Boggabri 1:100 000 mapsheet) failed to identify any areas of similar vegetation in the local area. Due to the small size and significant isolation of the Brigalow stand it is considered regionally unviable and thus regionally insignificant.

Stand viability

The stand viability depends upon a number of factors, mainly concerned with the ability of the stand to self-propagate under natural circumstances.

All factors to be considered in this category indicate that the stand of Brigalow is not viable.

- (a) Current and future surrounding land use is cleared and disturbed land;
- (b) Size and connectivity is low; and
- (c) The condition of the vegetation is substantially degraded. That is, the majority of tested site variables as identified in the bio-banking methodology (DECC 2009) are substantially outside the benchmarks for this community despite it not meeting the definition of “low” condition.

In terms of its conservation significance this community is too small to be registered as a measureable site in the bio-banking methodology (as it is much less than 0.25 hectares in size). As such it could not register as an area that can be offset under the methodology. This is a significant factor as DECCW currently are using the methodology to guide offset arrangements for both Part 3A and other non-state significant developments.

Other factors that should be considered relate to the viability of the stand. Wattle seeds do not persist in the seedbank for very long. Given the past use of the area by cattle (causing ground compaction), the insitu seedbank for this species is unlikely to be viable. Grazing has also ensured that regeneration of this community has not occurred. The absence of any signs of regrowth during a recent site inspection confirm the above. The old age of the trees would also suggest that the end of their natural lifespan is close. In addition the native shrub and ground layer species associated with this EEC are completely absent within the subject site patch, in other words the community is represented wholly by the occurrence of only one species (*Acacia harpophylla*).

The current distribution and extent of the EEC known as Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions is unknown at this time, however Benson *et. al.* (2006) estimated that 18,000 hectares of this community remain in the region. The occurrence of this EEC within the subject site consists of a very small patch totalling 38 mature stems of *Acacia harpophylla* (Brigalow). This patch does not contain any young stems of *A. harpophylla*, nor does it contain any of the other species which characterise this EEC.

Given the location of the subject site it is considered that this patch of Brigalow EEC is not at the limit of the known distribution for Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions. This EEC is known to occur within scattered locations over a wide range.

The removal of this very small (0.14 hectares) and floristically depauperate patch is not likely to have an adverse effect on the extent of the ecological community given that the stand is not considered to be ecologically viable.

Given the very poor biodiversity of the Brigalow patch it is considered that the Proposal is not likely to further substantially and adversely modify the composition of the ecological community as it is already depauperate with regard to species composition. The patch consists of Brigalow (*Acacia harpophylla*) with shrub and groundcover species that are not commensurate with the Brigalow vegetation community.

The Brigalow patch within the subject site is already fragmented or isolated from other areas of similar vegetation. Occurrences of Brigalow within or in proximity to the subject site were not observed. This patch of Brigalow is very small and

isolated and is unlikely to provide an adequate stepping-stone patch for any flora or fauna species specialising in this vegetation type. The removal of this small patch of Brigalow will therefore be unlikely to further fragment or isolate this community.

The importance of the habitat of this fragment of Brigalow is considered to be low due to the small size of the remnant, the isolation of the remnant, small number of stems and lack of other species indicative of the community.

The Critical Habitat Registers within the TSC Act (1995) and the EPBC Act (1999) do not list any critical habitat pertaining to the Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions Endangered Ecological Community. Therefore, the Proposal is not likely to have any direct or indirect adverse effect on critical habitat for this EEC.

There are currently no draft or final recovery plans for the Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions (DECCW). The proposed removal of the small (0.14 hectare) patch of Brigalow would not be consistent with the general aims to protect, conserve and manage Brigalow within the state of NSW. However, ELA (2010) provides a detailed Biodiversity Offset Strategy to provide a 'maintain or improve' outcome for the removal of vegetation communities from the subject site.

The Proposal constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of the Key Threatening Processes listed on Schedule 3 of the TSC Act such as:

- Removal of Native Vegetation, and
- Invasion of native plant communities by exotic perennial grasses.

It is considered that the existing stand of Brigalow is not viable due to its small size, lack of recruitment, depauperate condition, isolation and lack of an adequately sized gene pool for continued survival.

8.2 Fauna

Five threatened fauna species were identified across the subject site and Yarrawonga property. While the removal of forest and woodland vegetation from the subject site would displace a group of Grey-crowned Babblers and reduce the foraging area for one or more groups (pairs and trios) of Speckled Warblers, suitable areas of similar habitat occur on the adjacent Yarrawonga property. Both the Grey-crowned Babblers and Speckled Warblers that occurred on the subject site were also recorded on the adjacent Yarrawonga property.

The Varied Sittella and Diamond Firetail were recorded on Yarrawonga and likely also utilise the subject site forest and woodland vegetation. Both species would be unlikely to be significantly affected by the Proposal due to the large amount of similar vegetation occurring on Yarrawonga and in Vickery State Forest.

The Yellow-bellied Sheath-tail-bat was identified on the subject site from Anabat analysis. Due to a mechanical/programming failure no Anabat data was collected from Yarrawonga however, it is likely that the Yellow-bellied Sheath-tail-bat also occurs on Yarrawonga and across Vickery State Forest. Due to the large areas of suitable habitat on Yarrawonga and in Vickery State Forest the Yellow-bellied Sheath-tail-bat would be unlikely to be affected by the Proposal.

The Proposal would be unlikely to significantly affect any threatened, migratory or protected fauna species occurring within the subject site.

9.0 KEY THRESHOLDS ASSESSMENT (PART 3A)

As required by the Draft Guidelines for Threatened Species Assessment for Part 3A Applications (DEC / DPI 2005), the following assessment of Key Thresholds is provided for the proposed expansion of Rocglen Coal Mine.

1. **Whether or not the Proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.**

It is considered that the information presented within this document combined with the Biodiversity Offset Strategy by ELA (2010) is likely to result in a maintained if not an improved long term outcome for biodiversity within the region.

2. **Whether or not the Proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.**

The threatened species, populations and ecological communities considered within the report occurring within the subject site are, or are likely, well represented in the surrounding habitat areas of Vickery State Forest and Kelvin Aboriginal Area. The removal of the relatively small area of habitat for the Proposal is considered unlikely to reduce the long-term viability of any species, population or EEC.

3. **Whether or not the Proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.**

The threatened species, populations and ecological communities considered within the report occurring within the subject site are, or are likely, well represented in the surrounding habitat areas of Vickery State Forest and Kelvin Aboriginal Area as well as the wider region. The removal of the relatively small area of habitat for the Proposal is considered unlikely to accelerate the extinction or place at risk of extinction any species, population or ecological community.

4. **Whether or not the Proposal will adversely affect critical habitat.**

There is no declared "Critical Habitat" within the Rocglen Coal Mine locality, and as such the Proposal will not adversely affect any such habitat.

10.0 CONCLUSION AND RECOMMENDATIONS

10.1 Conclusion

RPS HSO was engaged by Whitehaven Coal Limited to undertake a Flora and Fauna Assessment for the proposed extension of the Rocglen Coal Mine under Part 3A of the EP&A Act. A range of flora and fauna survey methods were employed to detect a representative sample of species present within the sites.

No threatened flora species were observed within the subject site.

Two Endangered Ecological Communities (EECs) were observed within the subject site. These EECs were White Box Yellow Box Blakely's Red Gum Woodland and Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions as listed in the TSC Act.

The White Box Yellow Box Blakely's Red Gum Woodland EEC corresponds to vegetation community 4 - Bimble Box (*E. populnea*), Yellow Box (*E. melliodora*) Inland Grey Box (*E. microcarpa*) Grassy Woodland as described and mapped within this report. This community also corresponds to the federally listed EEC (EPBC Act) known as White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. It is expected that the Proposal will remove 5.9 hectares of the White Box Yellow Box Blakely's Red Gum Woodland EEC along Wean Road and Jaegar Lane, and 10.9 hectares of derived native grassland of the EEC from within the subject site.

The Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions corresponds to vegetation community 5 – Brigalow as described and mapped within this report. This community also corresponds to the federally listed EEC (EPBC Act) known as Brigalow (*Acacia harpophylla* dominant and co-dominant). It is considered that the existing 0.14 hectare stand of Brigalow is not viable due to its small size, depauperate condition and lack of an adequately sized gene pool for continued survival.

ELA (2010) provides a detailed Biodiversity Offset Strategy to provide a 'maintain or improve' outcome for the removal of vegetation communities from the subject site.

Three threatened fauna species on the TSC Act were identified on the subject site (Grey-crowned Babbler, Speckled Warbler and Yellow-bellied Sheath-tail-bat) and a further two were identified on a neighbouring property (Diamond Firetail and Varied Sittella). Potential habitat exists on the subject site for a further 13 threatened fauna species listed on the TSC Act. Of the 14 threatened species and 10 migratory species listed on the EPBC Act Protected Matters Database search

results, none were identified on the subject site. Potential habitat exists on the subject site for two of the threatened species and seven of the migratory species. Consideration for the likely level of impact on each of these species found that the Proposal would be unlikely to significantly impact on any of the identified threatened or migratory fauna species.

10.2 Recommendations

The following mitigation measures have been recommended to minimise the potential impacts of the Proposal on flora and fauna species:

- A high level of hygiene should be adopted in respect to vehicle and machinery to help prevent soil-borne disease transmission and weed seed dispersal;
- Strict erosion and sediment control measures should be installed, monitored and maintained to prevent the erosion and sedimentation impact on adjacent areas;
- Dust control measures should be implemented to protect adjacent retained vegetation communities;
- The minimal amount of clearing should take place as a general objective of the Proposal, particularly within those areas that currently contain identified threatened species or ecological communities. These areas have been described within this report;
- Construction areas should be fenced to protect adjoining vegetation prior to construction activities in order to reduce potential damage from uncontrolled or accidental access;
- Stockpiling of materials should occur within already disturbed areas and not within retained vegetation;
- Strict weed management, monitoring and control practices should be implemented to minimise the spread of exotic species into natural areas within the site. Some minor weed invasion in recently disturbed areas was observed and should be controlled;
- A tree felling protocol will need to be developed to minimize harm to all fauna species during the clearing of trees for the Proposal. The tree felling protocol should be developed by a suitably qualified and licensed ecologist with previous experience supervising the felling of trees. The tree felling protocol should involve as a minimum the following key steps of: establishment of the

best time of the year for felling (depends on the likely species to be affected), pre-felling mapping of habitat trees, inspections of trees on the day of felling, procedures for the safe removal of fauna species from trees prior to and post felling, a relocation/release protocol, leaving the tree overnight where it fell, and a protocol for the salvaging of tree hollows for rehabilitation works where necessary. Where possible, tree felling should be undertaken during the best time of year as identified in the tree felling protocol. All tree felling should be supervised by the ecologist that developed the tree felling protocol (and in accordance with the tree felling protocol) or by another suitably qualified and licensed ecologist;

- Where trees are to be removed as part of the Proposal an assessment of the surrounding level of tree hollow provision should be undertaken by a suitably qualified ecologist. The ecologist would determine the need for local supplementing of tree hollows (using salvaged tree hollows or nest boxes) based on the number of hollows lost during felling and the surrounding provision of remaining natural hollows. If the ecologist recommends the establishment of nest-boxes to compensate for the loss of tree hollows:
 - One nest box is to be installed for every hollow removed;
 - A range of nest box sizes and shapes should be installed to encompass the range of hollow sizes to be removed;
 - Nest boxes should be installed prior to the commencement of vegetation clearing;
 - A nest box monitoring and maintenance (repair and replacement) program should be developed and implemented for at least 10 years from commencement of construction;
- Mature and hollow-bearing trees should be retained wherever feasible within the site;
- Vegetation to be removed is to be clearly marked in the field using temporary fencing (flagging tape or similar exclusion tape) so that boundaries are clearly established and to minimise the potential for equipment to accidentally enter areas to be retained; and
- Where possible, the timing of clearing activities should be undertaken at such times to avoid removal of hollow-bearing trees during breeding season of threatened species.

11.0 REFERENCES

- Benson, J., Allen, C., Togher, C. and Lemmon, J. (2006). *New South Wales Vegetation Classification and Assessment: Part 1 Plant communities of the NSW Western Plains*. *Cunninghamiana* (2006) 9(3): 383-450.
- Cropper, S. (1993). *Management of Endangered Plants*. CSIRO Publications, East Melbourne, Victoria.
- Countrywide Ecological Services (2007). *Belmont Coal Project via Gunnedah; Fauna Assessment*.
- Cunningham, G., Natural Resource Consultants Pty Ltd (2007). *Specialist Consultant Studies Compendium, Part 2. – Flora – Report to Whitehaven Coal Mining Pty Ltd*.
- Department of Environment and Conservation, Department of Primary Industries (2005). *Draft Guidelines for Threatened Species Assessment*.
- Department of Environment and Conservation (NSW) (2004). *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft*.
- Department of the Environment, Water Heritage and the Arts (2006) EPBC Act Policy Statement 1.1 - Significant Impact Guidelines.
- Department of the Environment, Water Heritage and the Arts (2010) Commonwealth listing advice for the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and derived native grasslands of South-eastern Australia.
- DECC (2009). *Bio-banking Assessment Methodology and Credit Calculator Operational Manual*. DECC, Sydney.
- Eco-logical (2009), *Whitehaven Coal Regional Biodiversity Offset; Canyon and Rocglen Mines*.
- Eco Logical Australia (ELA) (2010). *Rocglen Coal Mine – Biodiversity Offset Strategy*. Prepared for GSS Environmental on behalf of Whitehaven Coal Limited.
- GSS Environmental (2009), *Whitehaven Coal Limited, Rocglen Coal Mine Project; Part 3A of the EP&A Act 1979 – Project Briefing Paper*.

NSW Department of Land and Water Conservation (2002). Boggabri – 8936
Native Vegetation Map Report Series No. 3.

APPENDIX 1

Flora Species List

FLORA SPECIES LIST

Family	Scientific Name	Common Name	Q1	Q2	Other
TREES					
Capparaceae	<i>Capparis mitchellii</i>	Wild Orange			x
Casuarinaceae	<i>Casuarina cristata</i>	Belah			x
Cupressaceae	<i>Callitris endlicheri</i>	Black Cypress Pine			x
Cupressaceae	<i>Callitris glaucophylla</i>	White Cypress	x	x	
Mimosoideae	<i>Acacia dealbata</i>	Silver Wattle			x
Mimosoideae	<i>Acacia harpophylla</i>	Brigalow			x
Myrtaceae	<i>Eucalyptus albens</i>	White Box			x
Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	x		
Myrtaceae	<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark			x
Myrtaceae	<i>Eucalyptus melliodora</i>	Yellow Box			x
Myrtaceae	<i>Eucalyptus microcarpa</i>	Inland Grey Box			x
Myrtaceae	<i>Eucalyptus pilligaensis</i>	Narrow-leaved Grey Box	x	x	
Myrtaceae	<i>Eucalyptus populnea</i>	Bimble Box			x
Oleaceae	<i>Notelaea microcarpa</i> var. <i>microcarpa</i>	Velvet Mock Olive			x
Pittosporaceae	<i>Pittosporum angustifolium</i>	Butterbush			x
Sapindaceae	<i>Alectryon oleifolius</i>	Rosewood			x
Sterculiaceae	<i>Brachychiton populneus</i>	Kurrajong			x
SHRUBS					
Amaranthaceae	<i>Amaranthus viridis</i> *	Green Amaranth			x
Asteraceae	<i>Cassinia laevis</i>	Cough Bush	x		
Chenopodiaceae	<i>Atriplex spinibractea</i>	Spiny-fruit Saltbush		x	
Chenopodiaceae	<i>Maireana microphylla</i>	Small-leaf Bluebush			x
Chenopodiaceae	<i>Sclerolaena birchii</i>	Galvanized Burr		x	
Chenopodiaceae	<i>Sclerolaena muricata</i>	Black Rolypoly			x
Faboideae	<i>Swainsona galegifolia</i>	Smooth Darling Pea	x		
Faboideae	<i>Swainsona monticola</i>	-	x		
Mimosoideae	<i>Acacia oswaldii</i>	Miljee			x
Myoporaceae	<i>Myoporum montanum</i>	Western Boobialla			x
Rutaceae	<i>Geijera parviflora</i>	Wilga	x	x	
Sapindaceae	<i>Dodonaea viscosa</i> subsp. <i>spathulata</i>	-		x	
Solanaceae	<i>Lycium ferocissimum</i> *	African Boxthorn			x
Thymelaeaceae	<i>Pimelea microcephala</i>	Shrubby Riceflower			x
GROUNDCOVERS					
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet	x	x	
Amaranthaceae	<i>Alternanthera pungens</i> *	Khaki Weed	x	x	
Amaranthaceae	<i>Amaranthus mitchellii</i> *	Boggabri Weed			x
Asteraceae	<i>Calotis lappulacea</i>	Yellow Burr Daisy			x
Asteraceae	<i>Carthamus lanatus</i> *	Saffron Thistle			x
Asteraceae	<i>Chondrilla juncea</i> *	Skeleton Weed			x

Family	Scientific Name	Common Name	Q1	Q2	Other
Asteraceae	<i>Chrysocephalum apiculatum</i>	Common Everlasting		x	
Asteraceae	<i>Lactuca serriola</i> *	Prickly Lettuce			x
Asteraceae	<i>Vittadinia cuneata</i> var. <i>cuneata</i>	Fuzzweed			x
Asteraceae	<i>Vittadinia muelleri</i>	-	x		
Asteraceae	<i>Xanthium spinosum</i> *	Bathurst Burr			x
Asteraceae	<i>Xerochrysum bracteatum</i>	Golden Everlasting			x
Cactaceae	<i>Opuntia stricta</i> *	Prickly Pear	x	x	
Campanulaceae	<i>Wahlenbergia communis</i>	Tufted Bluebell	x		
Chenopodiaceae	<i>Salsola kali</i> var. <i>kali</i>	-			x
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	x		
Crassulaceae	<i>Bryophyllum delagoense</i> *	Mother of Millions			x
Cyperaceae	<i>Cyperus gracilis</i>	Slender Flat-sedge		x	
Faboideae	<i>Medicago polymorpha</i> *	Burr Medic			x
Faboideae	<i>Medicago sativa</i> *	Lucerne			x
Faboideae	<i>Trifolium glomeratum</i> *	Clustered Clover	x		
Gentianaceae	<i>Centaurium tenuifolium</i> *	-	x		
Lamiaceae	<i>Marrubium vulgare</i> *	White Horehound		x	
Malvaceae	<i>Sida corrugata</i>	-			x
Malvaceae	<i>Sida cunninghamii</i>	Ridge Sida	x		
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's Lucerne		x	
Malvaceae	<i>Sida subspicata</i>	-			x
Oxalidaceae	<i>Oxalis perrenans</i>	Yellow-flowered Wood Sorrel	x	x	
Plantaginaceae	<i>Plantago debilis</i>	Slender Plantain			x
Poaceae	<i>Aristida personata</i>	Purple Wiregrass	x		
Poaceae	<i>Aristida ramosa</i>	Purple Wiregrass			x
Poaceae	<i>Austrodanthonia setacea</i>	Smallflower Wallaby Grass	x	x	
Poaceae	<i>Austrostipa aristiglumis</i>	Plains Grass		x	
Poaceae	<i>Austrostipa scabra</i> subsp. <i>scabra</i>	Speargrass	x		
Poaceae	<i>Austrostipa verticillata</i>	Slender Bamboo Grass			x
Poaceae	<i>Chloris truncata</i>	Windmill Grass	x	x	
Poaceae	<i>Cymbopogon refractus</i>	Barbwire Grass	x		
Poaceae	<i>Cynodon dactylon</i>	Common Couch			x
Poaceae	<i>Digitaria brownii</i>	Cotton Panic Grass	x	x	
Poaceae	<i>Enteropogon acicularis</i>	Curly Windmill Grass			x
Poaceae	<i>Eragrostis cilianensis</i> *	Stinkgrass	x		
Poaceae	<i>Eragrostis lacunaria</i>	Purple Lovegrass			x
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Rice Grass			x
Poaceae	<i>Paspalidium constrictum</i>	Knottybutt Grass			x
Poaceae	<i>Sporobolus caroli</i>	Fairy Grass			x
Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass		x	
Polygonaceae	<i>Rumex brownii</i>	Swamp Dock			x
Portulacaceae	<i>Portulaca oleracea</i>	Purslane	x	x	
Sinopteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Poison Rock Fern	x	x	
Solanaceae	<i>Solanum esuriale</i>	Quena	x	x	

Family	Scientific Name	Common Name	Q1	Q2	Other
Stackhousiae	<i>Stackhousia viminea</i>	Slender Stackhousia			x
Zygophyllaceae	<i>Tribulus terrestris</i>	Cat-heads	x		
CLIMBERS					
Chenopodiaceae	<i>Einadia nutans</i> subsp. <i>nutans</i>	Climbing Saltbush		x	
Faboideae	<i>Desmodium brachypodum</i>	Large Tick-trefoil	x		
Faboideae	<i>Glycine tabacina</i>	Twining Glycine		x	
Q1 = Quadrat 1 Other = all other observations during transects, vegetation mapping or meanders					
* = Exotic Species E = Endangered Species V = Vulnerable Species					

APPENDIX 2

Fauna Species List

FAUNA SPECIES LIST

Family sequencing and taxonomy follow for each fauna class:

Birds – Christidis and Boles (2009).

Herpetofauna - Cogger (1996).

Mammals - Van Dyck and Strahan (ed) (2008).

Appendix Key:	P = Species Detected
	* = Introduced species
	(E) = Species listed under <i>NSW TSC Act</i> as Endangered.
	(V) = Species listed under <i>NSW TSC Act</i> as Vulnerable.
	(V*) = Species listed under the Commonwealth <i>EPBC Act</i> as Vulnerable
	(E*) = Species listed under the Commonwealth <i>EPBC Act</i> as Endangered
	(M*) = Species listed under the Commonwealth <i>EPBC Act</i> as Migratory
	(C) = Species listed under CAMBA
	(J) = Species listed under JAMBA
	Bold = Threatened and/or migratory species
	D = Definite level of identification of Anabat echolocation call

Data Source:

- 1 = Species recorded during this survey in the subject site
- 2 = Species recorded during this survey on the Yarrawonga property
- 3 = Species recorded opportunistically in the local area (approximate 2km radius of the subject site)

Family Name	Scientific Name	Common Name	1	2	3
REPTILES					
Agamidae (Dragons)	<i>Amphibolurus muricatus</i>	Jacky Lizard		P	
Pygopodidae (Legless Lizards)	<i>Delma plebeia</i>	Leaden Delma		P	
Gekkonidae (Geckoes)	<i>Gehyra variegata</i>	Common Dtella	P		
	<i>Oedura robusta</i>	Robust Velvet Gecko		P	
Scincidae (Skinks)	<i>Cryptoblepharus virgatus</i>	Wall Lizard	P		
	<i>Ctenotus taeniolatus</i>	Copper-tailed Skink	P		

Family Name	Scientific Name	Common Name	1	2	3
	<i>Egernia striolata</i>	Tree-crevice Skink	P	P	
	<i>Tiliqua scincoides</i>	Eastern Blue-tongued Lizard	P		
Elapidae (Venomous Snakes)	<i>Pseudonaja textilis</i>	Eastern Brown Snake	P		
FROGS					
Hylidae (Tree Frogs)	<i>Litoria alboguttata</i>	Striped Burrowing Frog	P	P	
	<i>Litoria caerulea</i>	Green Tree Frog	P	P	
	<i>Litoria latopalmata</i>	Broad-palmed Frog	P	P	
	<i>Litoria peronii</i>	Peron's Tree Frog	P	P	
	<i>Litoria rubella</i>	Desert Tree Frog		P	
Myobatrachidae (Ground Frogs)	<i>Limnodynastes ornatus</i>	Ornate Burrowing Frog		P	
	<i>Limnodynastes fletcheri</i>	Barking Marsh Frog	P		
	<i>Limnodynastes tasmaniensis</i>	Spotted Grass Frog	P		
	<i>Uperoleia rugosa</i>	Eastern Burrowing Toadlet	P	P	
BIRDS					
Anatidae (Swans, Geese and Ducks)	<i>Chenonetta jubata</i>	Australian Wood Duck	P		
	<i>Anas superciliosa</i>	Pacific Black Duck	P		
Podicipedidae (Grebes)	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	P		
Ardeidae (Hérons, Bitterns and Egrets)	<i>Ardea pacifica</i>	White-necked Heron		P	
	<i>Egretta novaehollandiae</i>	White-faced Heron	P		
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle		P	

Family Name	Scientific Name	Common Name	1	2	3
(Hawks, Kites and Eagles)					
Falconidae (Falcons)	<i>Falco berigora</i>	Brown Falcon			P
	<i>Falco peregrinus</i>	Peregrine Falcon	P		
	<i>Falco cenchroides</i>	Nankeen Kestrel	P		
Columbidae (Pigeons and Doves)	<i>Geopelia humeralis</i>	Bar-shouldered Dove	P	P	
	<i>Ocyphaps lophotes</i>	Crested Pigeon	P	P	
	<i>Phaps chalcoptera</i>	Common Bronzewing	P	P	
Cacatuidae (Cockatoos)	<i>Eolophus roseicapillus</i>	Galah	P	P	P
	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo			P
	<i>Nymphicus hollandicus</i>	Cockatiel			P
Psittacidae (Parrots)	<i>Platycercus eximius</i>	Eastern Rosella	P	P	P
	<i>Psephotus haematonotus</i>	Red-rumped Parrot	P		P
Podargidae (Frogmouths)	<i>Podargus strigoides</i>	Tawny Frogmouth		P	
Aegothelidae (Owlet-nightjars)	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	P	P	
Halcyonidae (Kingfishers and Kookaburras)	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	P		
	<i>Todiramphus sanctus</i>	Sacred Kingfisher	P		
Coraciidae (Typical Rollers)	<i>Eurystomus orientalis</i>	Dollarbird		P	
Climacteridae (Australo-Papuan Treecreepers)	<i>Cormobates leucophaea</i>	White-throated Treecreeper	P	P	
Maluridae (Fairy-Wrens and)	<i>Malurus cyaneus</i>	Superb Fairy-wren		P	

Family Name	Scientific Name	Common Name	1	2	3
Emu-Wrens)					
Pardalotidae (Pardalotes, Scrubwrens, Thornbills)	<i>Paradalotus striatus</i>	Striated Pardalote	P		
	<i>Chthonicola sagittata</i>	Speckled Warbler (V)	P	P	
	<i>Smicronis brevirostris</i>	Weebill	P	P	
	<i>Gerygone fusca</i>	Western Gerygone	P	P	
	<i>Acanthiza pusilla</i>	Brown Thornbill		P	
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill		P	
	<i>Acanthiza nana</i>	Yellow Thornbill	P	P	
Meliphagidae (Honeyeaters)	<i>Anthochaera carunculata</i>	Red Wattlebird		P	
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater		P	
	<i>Plectrhynga lanceolata</i>	Striped Honeyeater	P	P	
	<i>Philemon corniculatus</i>	Noisy Friarbird	P	P	
	<i>Manorina melanocephala</i>	Noisy Miner	P		P
	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater		P	
Eopsaltriidae (Robins)	<i>Petroica goodenovii</i>	Red-capped Robin		P	
	<i>Eopsaltria australis</i>	Eastern Yellow Robin	P	P	
Pomatostomidae (Australo-Papuan Babblers)	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler (V)	P	P	
Neosittidae (Sittellas)	<i>Daphoenositta chrysoptera</i>	Varied Sittella (V)		P	
Pachycephalidae (Whistlers, Shrike-tit, Shrike-thrushes)	<i>Pachycephala rufiventris</i>	Rufous Whistler	P	P	
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush		P	
Dicruridae	<i>Myiagra rubecula</i>	Leaden Flycatcher	P	P	

Family Name	Scientific Name	Common Name	1	2	3
(Monarchs, Fantails and Drongo)					
	<i>Grallina cyanoleuca</i>	Magpie-lark	P	P	
	<i>Rhipidura albiscarpa</i>	Grey Fantail		P	
	<i>Rhipidura leucophrys</i>	Willie Wagtail	P	P	
Campephagidae (Cuckoo-shrikes and Trillers)	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	P		P
Oriolidae (Orioles and Figbird)	<i>Oriolus sagittatus</i>	Olive-backed Oriole	P		
Artamidae (Woodswallows, Butcherbirds, Currawongs)	<i>Artamus cyanopterus</i>	Dusky Woodswallow	P		
	<i>Cracticus torquatus</i>	Grey Butcherbird	P	P	
	<i>Cracticus nigrogularis</i>	Pied Butcherbird	P		P
	<i>Cracticus tibicen</i>	Australian Magpie	P	P	P
	<i>Strepera graculina</i>	Pied Currawong		P	
Corvidae (Crows and allies)	<i>Corvus coronoides</i>	Australian Raven	P	P	P
Cororacidae (Mud-nesters)	<i>Corcorax melanorhamphos</i>	White-winged Chough	P	P	P
	<i>Struthidea cinerea</i>	Apostlebird	P	P	P
Passeridae (Sparrows, Weaverbirds, Waxbills)	<i>Stagonopleura guttata</i>	Diamond Firetail (V)		P	
	<i>Taeniopygia bichenovii</i>	Double-barred Finch	P	P	
Dicaeidae (Flowerpeckers)	<i>Dicaeum hirundinaceum</i>	Mistletoebird	P	P	
Sylviidae (Old World Warblers)	<i>Cincloramphus mathewsi</i>	Rufous Songlark		P	

Family Name	Scientific Name	Common Name	1	2	3
Zosteropidae (White-eyes)	<i>Zosterops lateralis</i>	Silvereye	P	P	
Sturnidae (Starlings and allies)	* <i>Sturnus vulgaris</i>	Common Starling	P		P
	* <i>Sturnus tristis</i>	Common Mynah	P		P
MAMMALS					
Phalangeridae (Brushtail Possums and Cuscuses)	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	P		
Macropodidae (Wallabies and Kangaroos)	<i>Macropus giganteus</i>	Eastern Grey Kangaroo		P	
	<i>Macropus robustus</i>	Common Wallaroo		P	
	<i>Wallabia bicolor</i>	Swamp Wallaby		P	
Emballonuridae (Sheathtail-bats)	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat (V)	D		
Molossidae (Freetail-bats)	<i>Mormopterus</i> sp.2	Eastern Freetail-bat	D		
	<i>Mormopterus</i> sp.3	Inland Freetail-bat	D		
	<i>Mormopterus</i> sp.4	Southern Freetail-bat	D		
	<i>Tadarida australis</i>	White-striped Freetail-bat	P D	P	
Vespertilionidae (Vespertilionid Bats)	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	P		
	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	P D		
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	P D		
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	P D		
	<i>Scotorepens greyii</i>	Little Broad-nosed Bat	D		

Family Name	Scientific Name	Common Name	1	2	3
	<i>Scotorepens orion</i>	Eastern Broad-nosed Bat	D		
	<i>Vespadelus darlingtoni</i>	Large Forest Bat	D		
	<i>Vespadelus vulturnus</i>	Little Forest Bat	P D	P	
Canidae (Dogs)	* <i>Vulpes vulpes</i>	Red Fox	P		

APPENDIX 3

Staff Qualifications



Curriculum Vitae

Name: Steven Cox

Office: RPS Harper Somers O'Sullivan

Position in Company: Senior Ecologist

Qualifications / Memberships: Bachelor of Applied Science (Environmental Science) (Honours)
NSW Driver's Licence (Class C)
OH&S Induction Training (Green Card)
NPWS Scientific Investigation Licence
NSW Animal Ethics Research Authority
Senior First Aid
Landscape Function Analysis (LFA)
Birds Australia (BA)
Australian Mammal Society (AMS)
Ecological Society of Australia (ESA)
Royal Zoological Society of Australia (RZS)
Hunter Bird Observer Club (HBOC)

Areas of Expertise:

Design and management of ecological impact assessment projects. Flora, fauna and habitat survey methodology design and management. Detailed understanding of threatened species legislation and issues. Terrestrial fauna and fauna habitat surveys. Ecological project management and report writing. Koala and Platypus field survey and impact assessment. Nest box installation and monitoring. Tree felling supervision and ecological report review.

Recent Experience Includes:

Steven has 12 years experience in the environmental industry with key skills in ecological project management, survey design, field survey, report writing, report review and client relations. In his position as Senior Ecologist, Steven is responsible for the management of ecological projects at all levels, ranging from proposal preparation to report delivery and client liaison.

Steven has excellent communication, management and negotiation skills, developed over his 12 years as an ecological consultant. Steven has project managed and/or participated in numerous mining, energy, local government and private projects, including impact assessments for new coal and gold mines, extensions to existing mines, power substations, power lines, pipelines, access roads and private infrastructure. Steven has designed and/or undertaken the ecological component of structure plans for local government, prepared an affidavit for court proceedings (in an alleged illegal clearing case) and undertaken ecological report reviews for a local council.

Steven also has considerable research experience and has managed and/or participated in long term research projects on the Koala (including capture and radio-tracking) and the Platypus (including capture and handling). Steven has also undertaken research projects on the ecology of the white-winged chough and the impacts of roads on frog communities.



Curriculum Vitae

Name: Craig Anderson

Office: RPS Newcastle

Position in Company: Principal

Qualifications / Memberships: Bachelor Applied Science (Environmental Assessment & Management) University of Newcastle, NSW (1994)
Currently undertaking Graduate Diploma in Archaeological Heritage through UNE
Frog and Tadpole Study Group (FATS)
Hunter Birds Observers Club (HBOC) Committee Member & Records Appraisal Committee 2008 - present
Bird Observers Club of Australia (BOCA)
RFS/PIA NSW Consulting Planners Bushfire Training

Areas of Expertise:

- Strategic ecological advice and project pathway planning
- Detailed understanding and application of environmental legislation
- Production of complex ecological impact assessment documents
- Conflict resolution and environmental impact mediation
- Community Consultation & Project Advocacy
- Flora, habitat, and fauna surveys including threatened species
- Bushfire Threat Assessment & Management reporting
- Project Management (including areas outside environmental sphere)

Recent Experience Includes:

Craig is a Principal within the Environment Division at RPS Newcastle, and has over 15 years experience in a wide range of environmental consulting. He has undertaken and managed commissions for a diverse range of projects within land development, energy, mining, infrastructure and conservation, including State Significant developments.

Extensive background in ecological field surveys, encompassing all aspects of flora and fauna identification, targeted surveying and mapping. Involved in the initial formulation of an Association of Consulting Ecologists for NSW in 1998. Has acted as an expert witness in several Land and Environment Court matters relating to ecology and bushfire assessment. An experienced negotiator of ecological / development outcomes, and has a detailed understanding of legislation related to ecological matters. Craig has been actively involved in representations to the Department of Environment on behalf of the NSW Urban Taskforce in regards to proposed changes to the NSW Threatened Species Conservation Act, and for the Urban Development Institute of Australia (UDIA) on matters relating to issues such as the proposed listing of endangered ecological communities, regional environmental biodiversity strategies, and the Native Vegetation Act and the operations of the Catchment Management Authority (CMA).

Craig is currently a Board Member of the Donaldson Conservation Trust, established to oversee the implementation of environmental programs to offset Tasman Coal Mine.



Curriculum Vitae

Name: Robert Sansom

Office: RPS Harper Somers O'Sullivan

Position in Company: Botanist /Ecologist

Qualifications / Memberships: Bachelor of Science
Bachelor of Science (Honours)
NSW Driver's Licence (Class C)
OH&S Induction Training (Green Card)
Planning for Bushfire Prone Areas (Short Course)
Erosion and Sediment Control – Fundamentals of Erosion and Sediment Control
NPWS Scientific Investigation Licence
NSW Animal Ethics Research Authority

Areas of Expertise:

- Environmental and ecological impact assessment, monitoring and reporting
- Terrestrial flora and habitat survey design, execution, analysis and reporting
- Spatial mapping of vegetation and threatened flora species using differentially corrected GPS accurate to less than 1 metre
- Understanding of threatened species legislation, issues and requirements
- Bushland and vegetation management planning and monitoring
- Threatened Flora Management Plans and Monitoring
- Bushfire Threat Assessments
- Production of a wide variety of reports and assessments
- Targeted threatened flora surveys
- Flora identification and habitat assessment
- Delineation and GPS mapping of vegetation community boundaries
- Ecological Community quality assessments and reports
- Experience in PATN Statistical package

Recent Experience Includes:

Robert has over eleven years experience in undertaking a diverse array of ecological and environmental surveys and assessments. Rob has also produced or sourced background information on ecological and environmental matters for use by expert witnesses in support of clients in the NSW Land and Environment Court.

Rob's fields of special competence are Threatened Flora species searches; Threatened Flora, Vegetation and Bushland Management Plans; delineation and GPS plotting of Vegetation Community boundaries; and species / community / wetland monitoring surveys and reporting.