



# BIODIVERSITY OFFSET MANAGEMENT PLAN

## MOOLARBEN COAL PROJECT STAGE 1 MODIFICATION (EPBC 2013/6926)

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## 1 INTRODUCTION

Moolarben Coal Operations Pty Ltd (MCO) operates the Moolarben Coal Project (MCP) located in the Western Coalfields of New South Wales, east of Ulan and approximately 40 km north-east of Mudgee. The MCP falls within the Mid-Western Regional Council (MWRC) Local Government Area and is adjacent to the Ulan and Wilpinjong coal mines. MCO operates the MCP under existing State and Commonwealth approvals, including 05\_0117 and EPBC 2007/3297 respectively.

On 13 November 2014, approval from the Australian Government under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) was granted for the Moolarben Coal Project Stage 1 Modification NSW (EPBC 2013/6926).

EPBC 2013/6926 authorises clearing of 171.4 hectares (ha) of native vegetation (habitat for EPBC listed threatened species), including clearing of 16.5 ha of *White Box-Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (WBGW) ecological community, within open cut (OC) mine extension areas (OC 1 and OC 2) approved under modification 9 to NSW state approval 05\_0117 for the MCP.

Prior to commencing the approved action, EPBC 2013/6926 requires (inter alia) the preparation, approval and implementation of a Biodiversity Offset Management Plan (BOMP).

This BOMP has been prepared to address the conditions of the EPBC 2013/6926 approval and is consistent with existing management plans and protocols approved under EPBC 2007/3297.

### 1.1 PURPOSE AND SCOPE

The purpose of this BOMP is to:

- identify the land areas described as Offset Areas at Schedule 2 (Figures 1-5) of EPBC 2013/6926 (**Appendix 1**);
- describe the current condition (prior to any management activities) of the offset areas;
- describe management actions, strategies and timeframes to be implemented to improve the ecological quality of the offset areas;
- describe performance and completion criteria to evaluate the implemented management actions, and criteria for triggering remedial action (where required);
- describe monitoring and reporting procedures to evaluate progress against the performance and completion criteria;
- describe potential risks to successful implementation of management actions, measures to mitigate against these risks and contingency measures to be implemented where additional management or mitigation actions are triggered to be required; and
- details of who is responsible for monitoring, reviewing and implementing the BOMP.

This BOMP relates only to the action approved under EPBC 2013/6926 and to the conditions of approval relevant to management of the offset areas.

### 1.2 EPBC APPROVAL CONDITIONS

**Table 1** provides a summary of the conditions of EPBC 2013/6926 relevant to management of biodiversity offset areas with reference to where in the plan the relevant requirements have been addressed.

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**Table 1: Relevant EPBC 2013/6926 Approval Conditions**

EPBC 2013/6926 Requirement	Section Addressed
4) To compensate for the loss of 16.5 hectares of the <i>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</i> (WBGW) ecological community and 171.4 hectares of habitat for EPBC listed threatened species, the <b>approval holder</b> must prepare and submit a Biodiversity Offset Management Plan ( <b>BOMP</b> ) for the proposed EPBC offset sites, for the <b>Minister's</b> written approval. The BOMP must:	Appendix 2
a. Identify those lands described as the Offset Areas at Schedule 2 (Figures 1-5) of this notice that are necessary to achieve the outcomes required by the Environmental Offsets Policy 2012 (or subsequent published revisions). This must include <b>offset attributes, shapefiles</b> , textual descriptions and maps to clearly define the location and boundaries of the offset area(s).	Section 2 and Appendix 1 Figures 1, 2, 3, 4, 5 and 6. ESRI shape files and offset attributes are also required under Condition 7 of EPBC 2013/6926. These files were provided to the Department enclosed with a letter addressing this Condition on 1 December 2014 (Appendix 2).
b. Provide a survey and description of the current condition (prior to any management activities) of the offset areas identified in Condition 4a.	Section 3
c. Detail management actions and regeneration and revegetation strategies to be undertaken on the offset areas to improve the ecological quality of these areas, including:	Section 4
i. a description and timeframe of measures that would be implemented to improve the condition of the ecological communities on the site;	Section 4
ii. performance and completion criteria for evaluating the management of the offset area, and criteria for triggering remedial action;	Sections 4 and 6
iii. a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria;	Section 6 and 7
iv. a description of potential risks to the successful implementation of the plan, a description of the measures that will be implemented to mitigate against these risks and a description of the contingency measures that will be implemented if defined triggers arise; and	Sections 4 and 5
v. details of who would be responsible for monitoring, reviewing, and implementing the plan.	Section 7
5) The approval holder must not commence the action until the BOMP is approved by the Minister. The approved BOMP must be published on an internet web site approved by the Department, within 1 month of being approved and for a period of 5 years thereafter. The approved BOMP must be implemented.	BOMP will be available on the MCO website – Section 1 and 7

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EPBC 2013/6926 Requirement	Section Addressed
<p>6) To compensate for the loss of 16.5 hectares of the <i>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</i> (WBGW) ecological community and 171.4 hectares of habitat for EPBC listed threatened species, the approval holder must secure the lands identified as the <i>Offset Areas</i> at Schedule 2 (Figures 1-5) of this notice as a biodiversity offset by a legal instrument under relevant nature conservation legislation on the title of the land. This instrument must:</p> <ul style="list-style-type: none"> <li>a. provide for the protection of the land in perpetuity;</li> <li>b. prevent any future development activities, including mining and mineral extraction; and</li> <li>c. ensure the active management of the land.</li> </ul> <p>The approval holder must not commence the action until the Department has approved the proposed instrument in writing</p>	Section 2
<p>7) The <b>approval holder</b> must provide evidence to the <b>Department</b> of their compliance with Condition 6, along with <b>offset attributes, shapefiles</b> and textual descriptions and maps to clearly define the location and boundaries of the offset sites, prior to the <b>commencement</b> of the action.</p>	<p>Section 2  Figures 2, 3, 4, 5 and 6.  ESRI shape files and offset attributes are also required under Condition 7 of EPBC 2013/6926. These files were provided to the Department enclosed with a letter addressing this Condition on 1 December 2014 (Appendix 2).</p>
<p>9) The approval holder must maintain accurate records substantiating all activities associated with or relevant to these conditions of approval, including measures taken to implement the BOMP and VCPLMP, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media.</p>	Section 7
<p>10) Within three months of every 12 month anniversary of the commencement of the action, the approval holder must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of the BOMP and VCPLMP as specified in the conditions. Documentary evidence providing proof of the date of publication must be provided to the Department at the same time as the compliance report is published.</p>	Section 7
<p>11) Non-compliance with any of the conditions of this approval must be reported to the Department within 2 business days of becoming aware of the non-compliance.</p>	Section 7
<p>12) Upon the direction of the Minister, the approval holder must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The independent auditor must be approved by the Minister prior to the commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.</p>	Section 7

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EPBC 2013/6926 Requirement	Section Addressed
<p>13) If the approval holder wishes to carry out any activity otherwise than in accordance with the Plan as specified in the conditions, the approval holder must submit to the Department for the Minister’s written approval a revised version of that Plan. The approval holder must not commence the varied activity until the Minister has approved the varied Plan in writing. The Minister will not approve a varied Plan unless the revised Plan would result in an equivalent or improved environmental outcome over time. If the Minister approves the revised Plan, that Plan must be implemented in place of the Plan originally approved.</p>	<p>Section 7</p>
<p>14) If the Minister believes that it is necessary or convenient for the better protection of listed threatened species and ecological communities to do so, the Minister may request that the approval holder make specified revisions to the Plan specified in the conditions and submit the revised Plan for the Minister’s written approval. The approval holder must comply with any such request. The revised approved Plan must be implemented. Unless the Minister has approved the revised Plan then the approval holder must continue to implement the Plan originally approved.</p>	<p>Section 7</p>

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## 2 IDENTIFICATION OF OFFSET AREAS

### 2.1 LAND PARCELS

The location of the Biodiversity Offset Areas (BOAs) (**Appendix 1**) approved under EPBC 2013/6926 is shown on **Figure 1** and comprises five identified property areas and associated land parcels (**Figures 2, 3, 4, 5 and 6**) (**Table 2**).

**Table 2: Biodiversity Offset Area Identification**

Offset Property	Land Parcel Identifier	Parish	County	Total Offset Area
Clarke ( <b>Figure 2</b> )	Lot 611 DP810926	Ulan	Bligh	332.7 ha
Clifford ( <b>Figure 3</b> )	Lot 288 DP704081	Moolarben	Phillip	80.8 ha
Bobadeen ( <b>Figure 4</b> )	Part Lot 1 DP593639 Lot 1 DP110465 Part Lot 6 DP750736 Part Lot 1 DP131753 Lot 1 DP111560	Bobadeen	Bligh	168.0 ha
Bobadeen ( <b>Figure 4</b> )	Lot 2 DP111560 Lot 3 DP111560 Lot 4 DP111560 Lot 5 DP111560 Lot 5 DP 750750	Durrigeree	Bligh	
Elward ( <b>Figure 5</b> )	Lot 84 DP704077	Bobadeen	Bligh	170.8 ha
Property 5 ( <b>Figure 6</b> )	Part Lot 237 DP755442	Moolarben	Phillip	63.9 ha

### 2.2 LAND SECURITY

Each of the above properties has been acquired by MCO and will be secured for long-term biodiversity conservation using an appropriate and suitable legal instrument (agreed to by the Minister, in fulfilment of condition 6 to EPBC 2013/6926) to:

- provide for the protection of the land in perpetuity;
- prevent any future development activities, including mining and mineral extraction; and
- ensure the active management of the land.

### 2.3 GIS DATA AND OFFSET ATTRIBUTES

A copy of digital GIS “shape files” and offset attributes was provided under separate correspondence to the Department (Appendix 2), in fulfilment of conditions 4a and 7 to EPBC 2013/6926.

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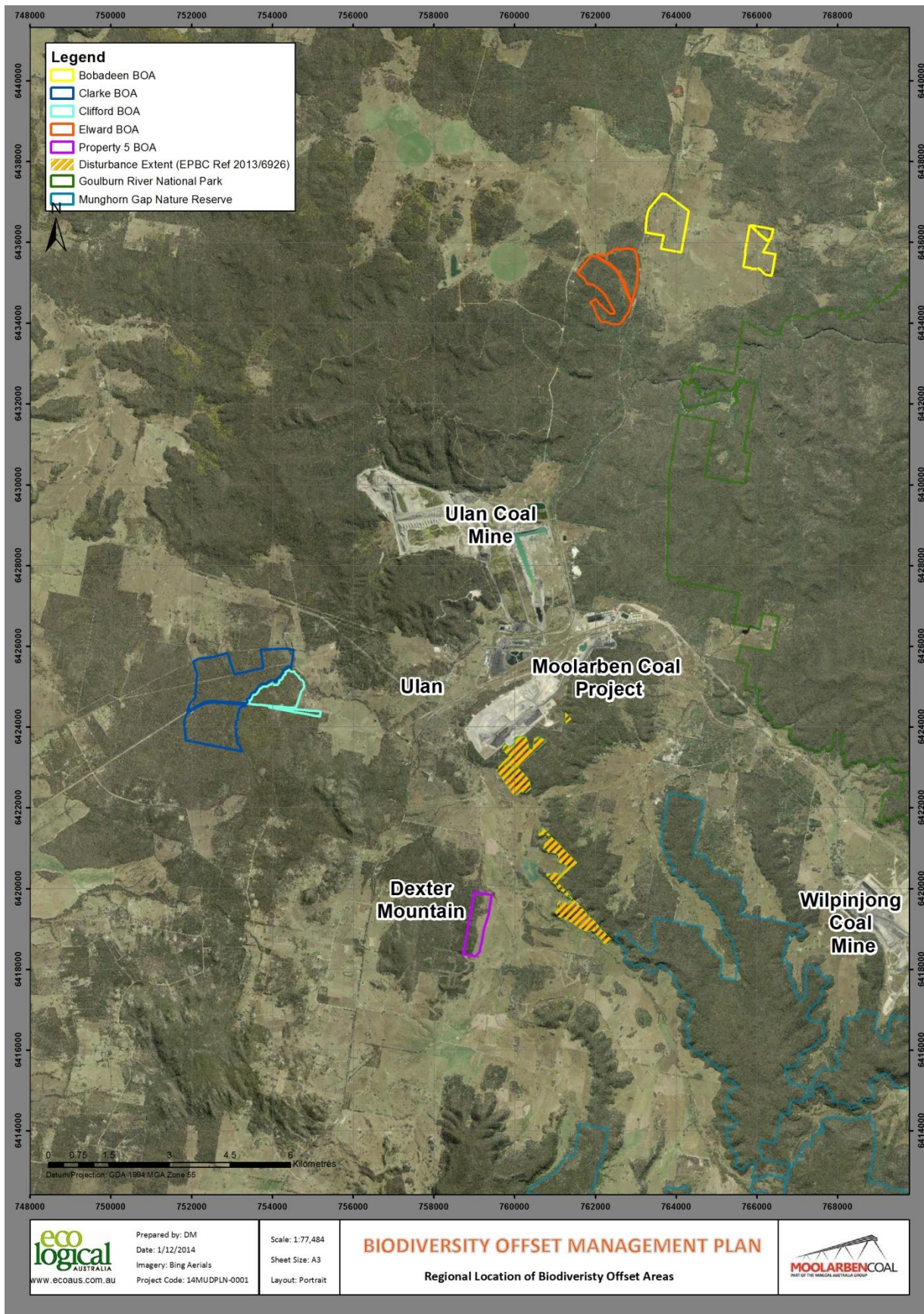


Figure 1: Regional Location of Biodiversity Offset Areas

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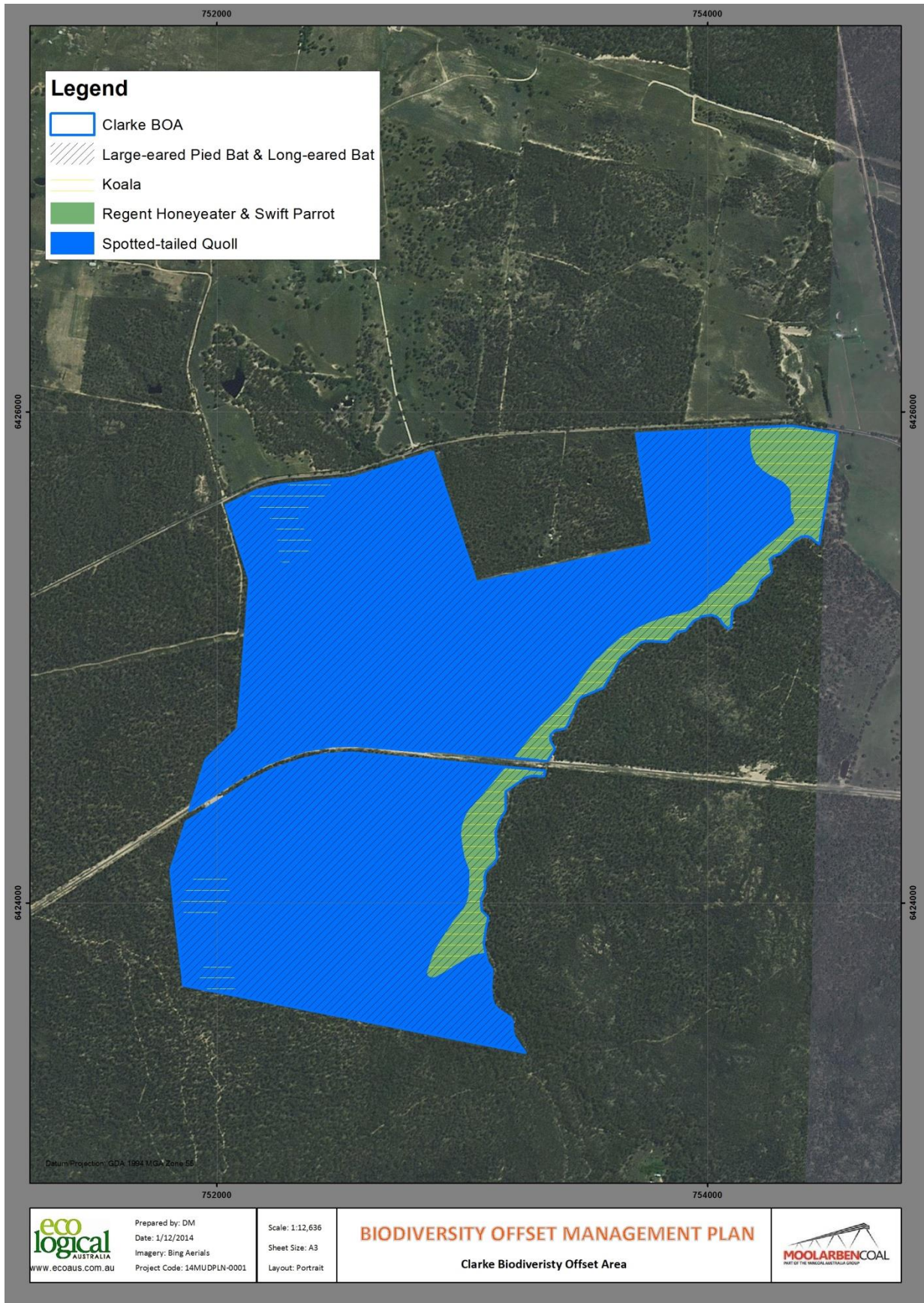


Figure 2: Clarke Biodiversity Offset Area

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Figure 3: Clifford Biodiversity Offset Area

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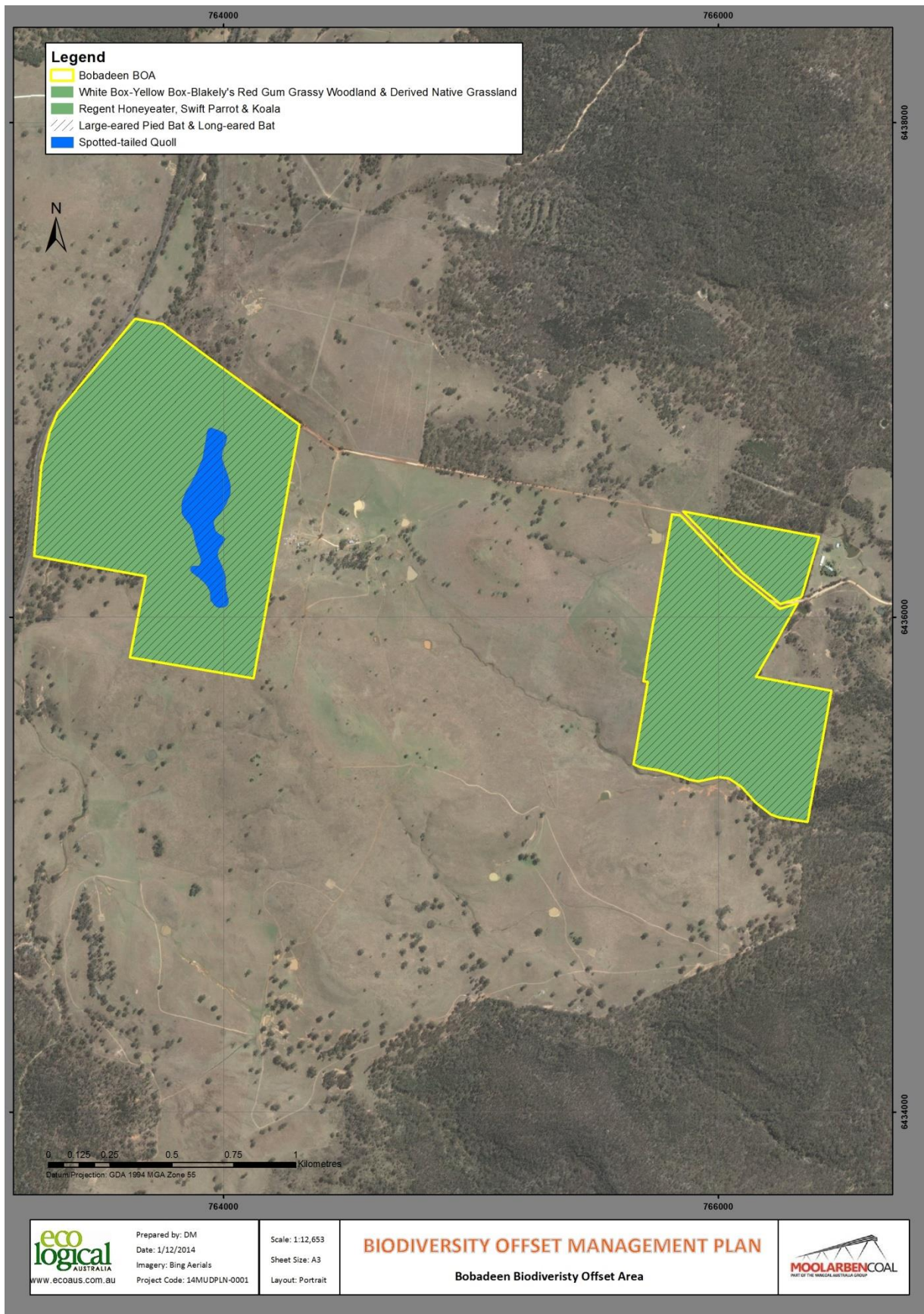


Figure 4: Bobadeen Biodiversity Offset Area

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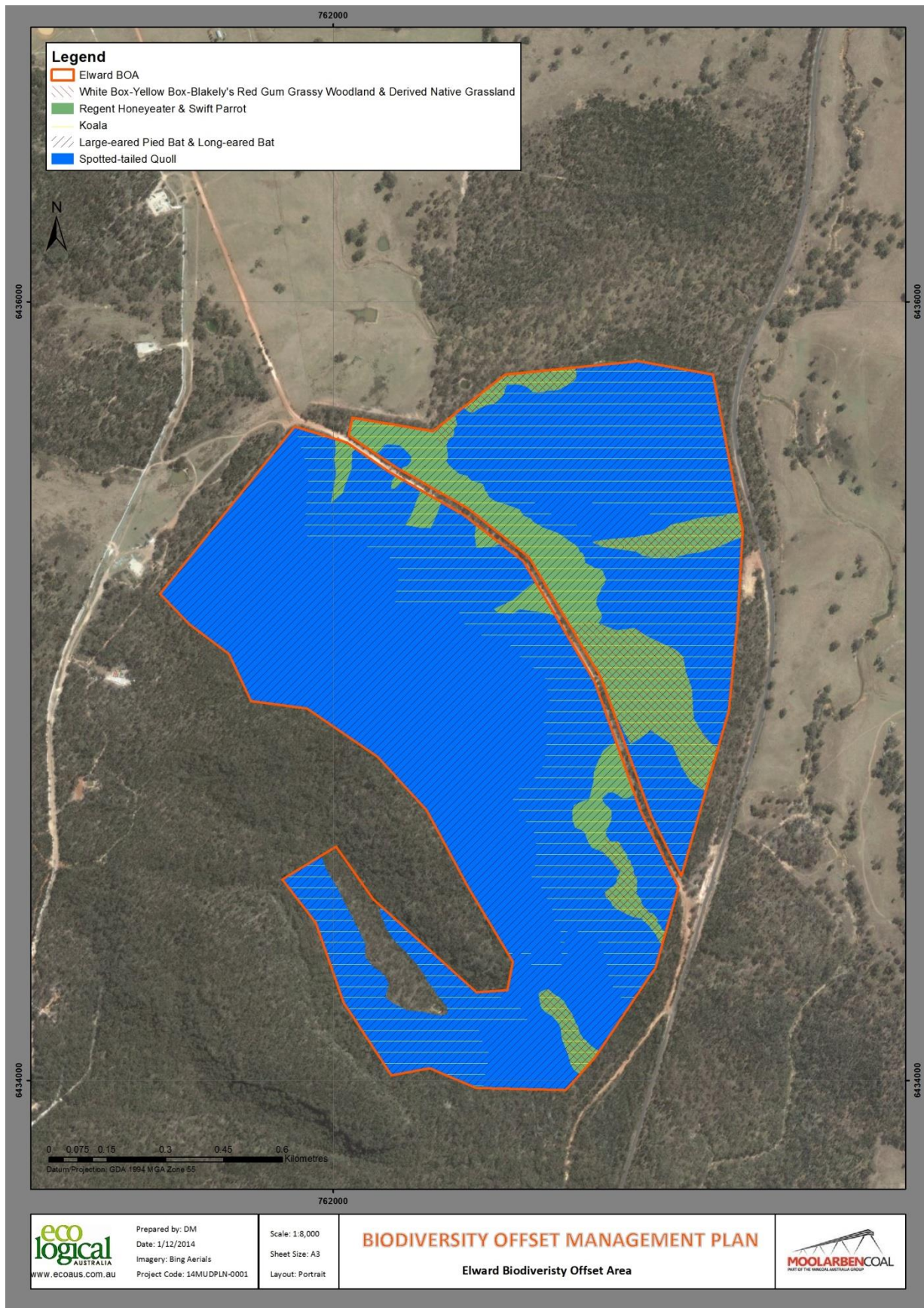


Figure 5: Elward Biodiversity Offset Area

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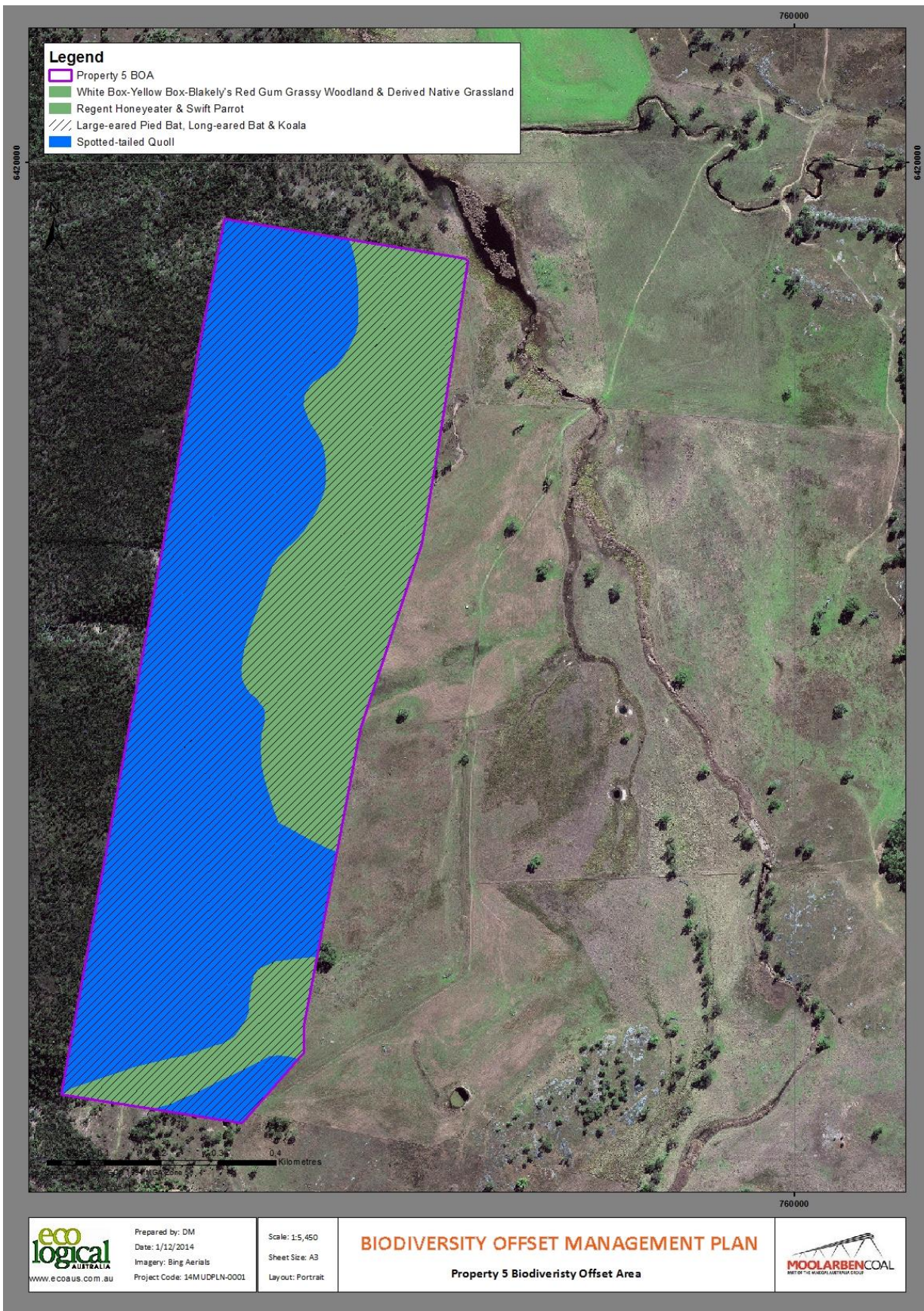


Figure 6: Property 5 Biodiversity Offset Area

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### 3 DESCRIPTION OF THE BIODIVERSITY OFFSET AREAS

#### 3.1 GENERAL LOCATION AND SETTING

Each of the BOAs is located proximal to the MCP at Ulan (**Figure 1**) in the north-west corner of the Sydney Basin Bioregion at the western end of the Hunter Valley. This Bioregion borders both the South Western Slopes and Brigalow Belt South Bioregions and is a transitional zone for flora species; representing plants and communities from the south-east, north-west and western parts of NSW.

Within the Sydney Basin Bioregion the BOAs are located within the upper Goulburn River catchment. The Goulburn River catchment is the largest sub-catchment of the Hunter River covering just under one third of the total Hunter River catchment (of 22,000 km<sup>2</sup>).

#### 3.2 CLIMATIC INFORMATION

The Ulan area is influenced by a temperate weather system and experiences warm summer and mild winter temperatures. Summer maximum temperatures are experienced in January with an average maximum of 31.1 degrees Celsius (°C) (daily) and minimum of 16.7°C (nightly). Winter minimums are experienced in July with an average maximum of 14.7°C (daily) and minimum of 2.6°C (nightly).

The average rainfall is 651.1 millimetres (mm) per year with the greatest falls received in January (70.2 mm) and the lowest falls in April (43.9 mm) (BOM 2014).

#### 3.3 SURVEY AND CURRENT CONDITION

##### 3.3.1 Vegetation Mapping

Vegetation mapping has been undertaken across the BOAs, with initial mapping for all vegetation communities completed during 2013 and further detailed mapping for WBGW in spring 2014.

The BOAs have been mapped into broad vegetation associations (consistent with NSW Office of Environment and Heritage [OEH] vegetation types) and contain 10 BioMetric vegetation types:

- Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU515)
- Caley's Ironbark – Currawong shrubby woodland on sandstone ridges of the Upper Hunter Valley, Sydney Basin (HU527)
- Dwyer's Red Gum low woodland on exposed sandstone ridges of the upper Hunter Valley, Sydney Basin (HU537)
- Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin (HU551)
- Narrow-leaved Ironbark – Grey Gum shrubby woodland on footslopes on the upper Hunter Valley, Sydney Basin (HU574)
- Narrow-leaved Ironbark shrubby open forest on hills of the central Hunter Valley, Sydney Basin (HU575)
- Rough-barked Apple – Silvertop Stringybark – Ribbon Gum shrub/grass open forest on hills of the southern Nandewar Bioregion (HU603)
- Scribbly Gum - Brown Bloodwood woodland of the southern Brigalow Belt South (HU608)
- Tea-tree Shrubland of drainage areas of the slopes and tablelands (HU647)
- White Box – Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)

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The locations of each Biometric vegetation type within the BOAs is shown in **Figures 7 and 8**.

The BOAs contain one listed EPBC Act Threatened Ecological Community (i.e. WBGW – listed as a Critically Endangered Ecological Community [CEEC]). In total, approximately 242 ha of WBGW occurs in the BOAs, of which 103.5 ha are woodland and 138.4 ha is derived native grassland (DNG).

Generally, the BOAs contain a mixture of intact existing native vegetation (657.3 ha, including 103.5 ha of WBGW woodland), grasslands (158.8 ha, including 138.4 ha of WBGW DNG) and disturbed land.

**Table 3** outlines the areas of native vegetation and WBGW occurring within the offset areas.

**Table 3: Area of Native Vegetation (including WBGW) within Each BOA**

Property	Vegetation Area		
	Woodland	DNG	Total
Clarke	317.3	15.3	332.7
Clifford	80.2 (44.1)	0.6 (0)	80.8 (44.1)
Elward	170.8 (13.4)	-	170.8 (13.4)
Property # 5	42.4 (7.2)	21.6 (17.0)	64.0 (24.2)
Bobadeen	46.7 (38.8)	121.4 (121.4)	168.0 (160.2)
<b>Total</b>	<b>657.3 (103.5)</b>	<b>158.8 (138.4)</b>	<b>816.1 (241.9)</b>

(#) Numbers within brackets indicate the area of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and DNG.

### 3.3.2 WBGW Condition

The condition of WBGW within each BOA varies from undisturbed woodland to DNG as summarised below:

#### Clarke BOA:

No WBGW has been identified within the BOA.

#### Clifford BOA:

Two WBGW vegetation zones have been identified – one zone was identified as being advanced regeneration from previous clearing (estimated at > 10 years earlier) and another zone was relatively undisturbed woodland. The canopy cover ranged from 5% to 14% and is dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *Angophora floribunda* with *Eucalyptus melliodora* (Yellow Box), *Eucalyptus bridgesiana* (Apple Box) and *Eucalyptus conica* (Fuzzy Box) also present at lower densities. Generally low exotic plant cover with exotic species infrequent across the majority of the undisturbed Yellow Box - Blakely's Red Gum Grassy Woodland. Within the advanced regeneration of Yellow Box - Blakely's Red Gum Grassy Woodland, exotic foliage cover was approximately 18%.

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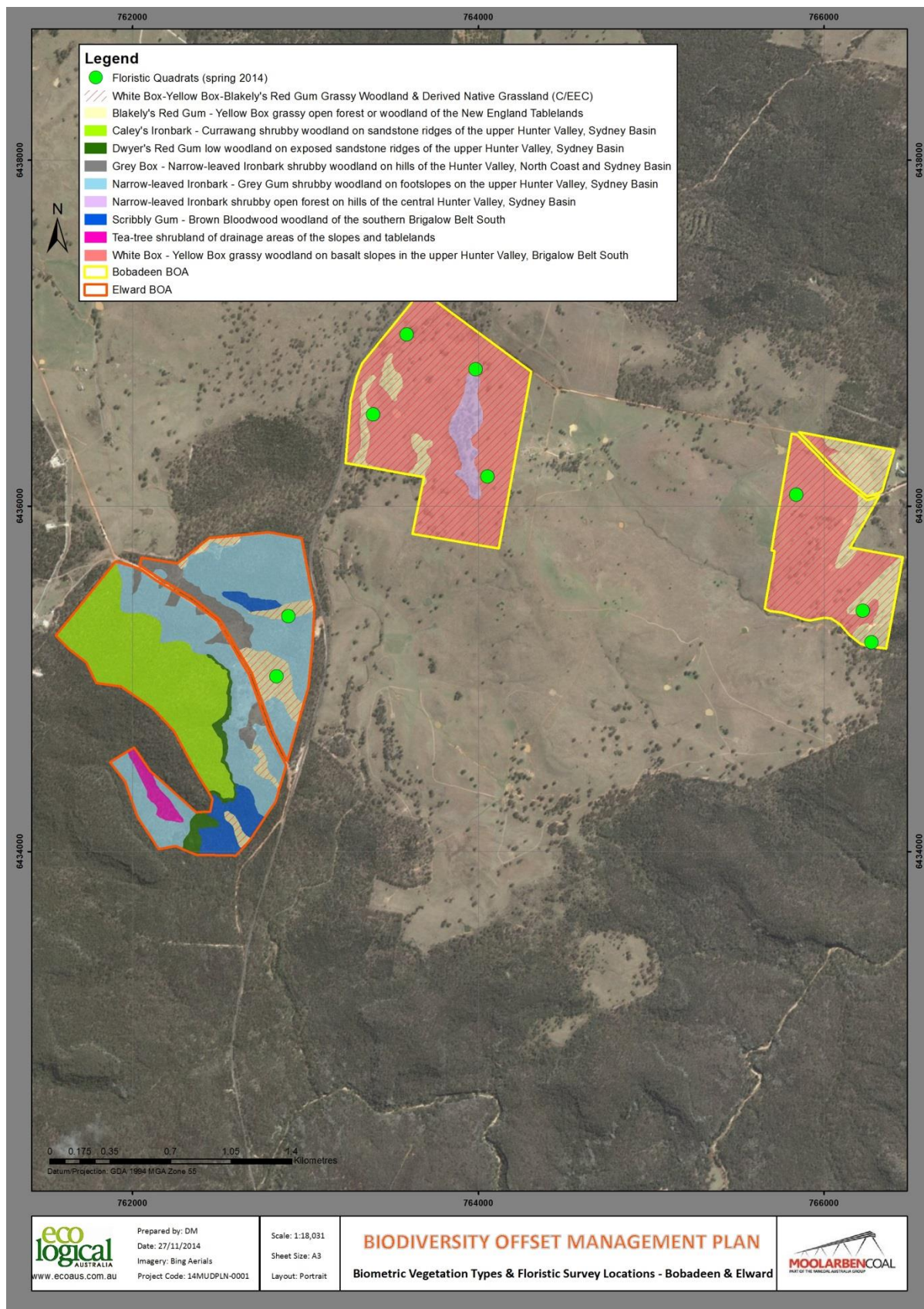


Figure 7: Biometric Vegetation Types & Floristic Survey Locations - Bobadeen & Elward

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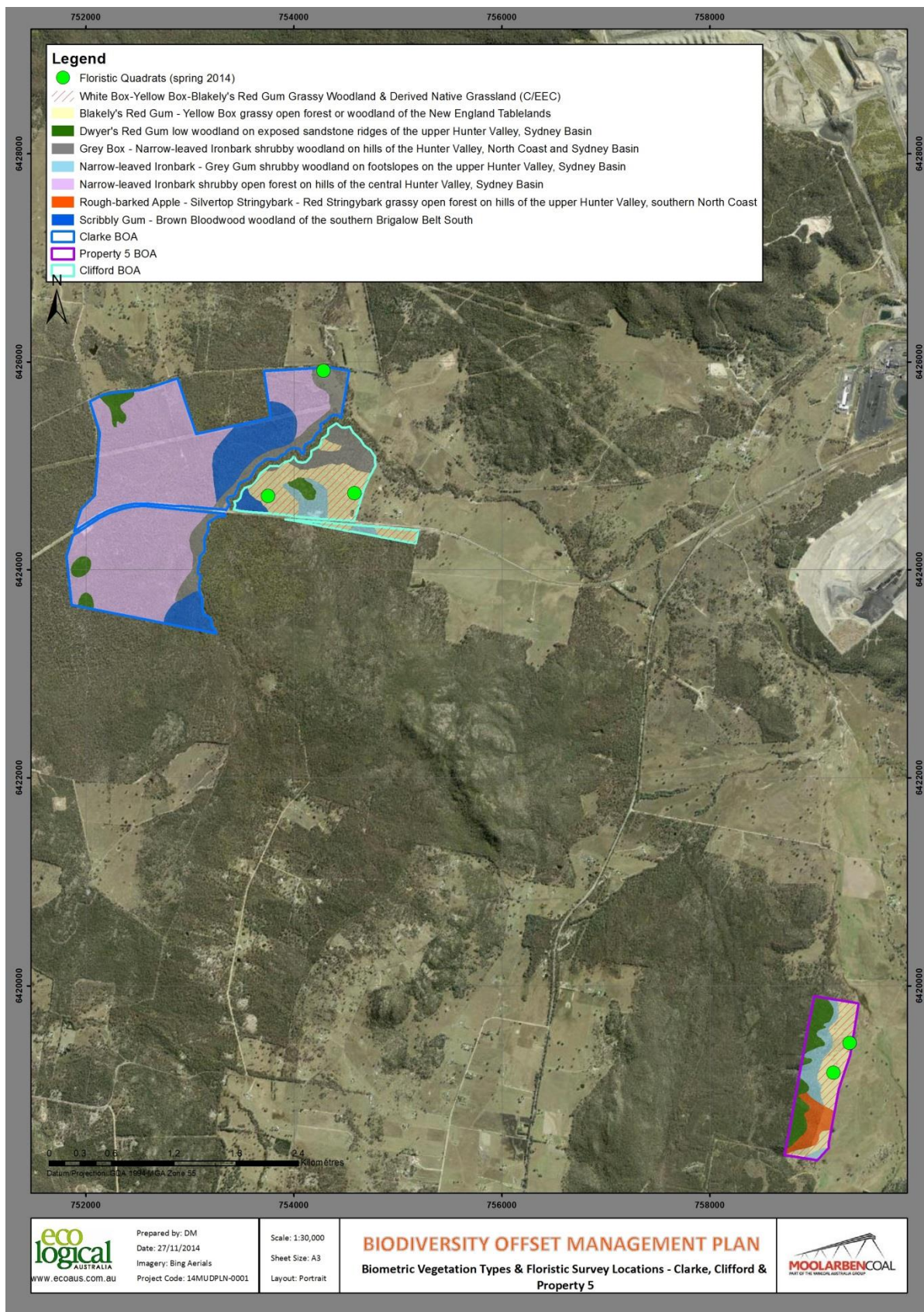


Figure 8: Biometric Vegetation Types & Floristic Survey Locations - Clarke, Clifford & Property 5

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In addition to the above, ELA (2014) (Appendix 3) provide the following assessment of condition of WBGW within the Clifford Offset:

*The site condition score for the Clifford Offset site was informed by a site inspection in March 2013 including twobiometric vegetation plots consistent with Schedule 2 of the Biobanking Assessment Methodology and Credit Calculator Operational Manual (DECC 2009). Two vegetation zones were identified within the Box-Gum Woodlands within the Clifford offset site, one zone was identified as being advanced regeneration from previous clearing (estimated at > 10 years earlier; Plate 2) and another zone was relatively undisturbed (Plate 3). The*

*Box-Gum Woodland across the offset site was characterised as having:*

- A canopy including Eucalyptus blakelyi (Blakely's Red Gum) and Angophora floribunda with Eucalyptus melliodora (Yellow Box), Eucalyptus bridgesiana (Apple Box) and Eucalyptus conica (Fuzzy Box) also present at lower densities. Canopy cover ranged from 5% (within area of advanced regeneration) to 14% within undisturbed woodland.*
- A diverse understorey dominated by native grasses including Aristida spp., Cymbopogon refractus (Barbed Wire Grass), Arundinella nepalensis (Reedgrass), Digitaria brownii (Cotton Panic Grass) and Sporobolus creber (Slender Rat's Tail Grass). Projected foliage cover of grasses ranged from 50% to 96% with a low cover of native shrubs (4 - 18%) and herbs (6 - 16%).*
- High native species richness with 41 and 42 native species recorded within 20 x 20 m plots within the advanced regeneration and undisturbed woodland, respectively. The high native species included seven 'important species' (DEH 2006b) within the advanced regeneration [Astroloma humifusum (Native Cranberry), Calotis cuneifolia (Purple Burr-daisy), Dianella revoluta (Blue Flax-Lily), Eriochilus cucullatus, Glycine clandestina, Tricoryne elatior (Yellow Rush-lily) and Zornia dyctiocarpa (Zornia)] and 12 'important species' in the woodland [Astroloma humifusum, Dianella revoluta, Dichelachne micrantha, Exocarpos strictus (Dwarf Cherry), Hibbertia obtusifolia (Hoary guinea flower), Glycine clandestina, Goodenia hederacea (Forest Goodenia), Laxmannia gracilis (Slender Wire Lily), Leucopogon virgatus, Themeda australis, Tricoryne elatior and Zornia dyctiocarpa].*
- Native regeneration of all canopy species within the Box-gum Woodland.*
- Generally low exotic plant cover with exotic species infrequent across the majority of the undisturbed woodland and recorded at 18% foliage cover within the advanced regeneration. Exotic species recorded included Hypochaeris radicata (Catsear), Conyza sp. (Fleabane) and Bidens subalternans (Greater Beggar's Ticks).*
- Habitat elements including hollow bearing trees and fallen logs present, though not recorded within area sampled within the biometric vegetation plots.*

*Accordingly, the habitat scores for the Clifford offset site used a start condition component score of 7/10 for all Box-Gum Woodland within the site. The future condition without offset for the Box-Gum Woodland within this site was assigned a score of 6/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.*

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### Bobadeen BOA:

Two WBGW vegetation zones have been identified – one zone was identified as DNG and the other as woodland. The DNG has been previously grazed by stock and the understorey consists of predominately grasses less palatable to stock including *Bothriochloa macra* (Red-leg Grass), *B. decipiens* (Red Grass), *Aristida* spp., *Sporobolus creber*, *Rytidosperma* spp., *Eragrostis* spp. and *Arundinella nepalensis*. Exotic plant cover was very low within the DNG. The woodland form within the Bobadeen BOA differentiated from the DNG form with the presence of a canopy structural layer and associated habitat elements including hollow-bearing trees and fallen logs.

In addition to the above, ELA (2014) (Appendix 3) provide the following assessment of condition of WBGW within the Bobadeen Offset:

*The site condition score for Box-Gum Woodland within the Bobadeen offset sites was based on site inspections undertaken in March 2013, although no floristic plots were conducted within the Box-Gum Woodlands within this offset site. Two forms of Box-Gum Woodland were identified within the Bobadeen offset sites, a DNG form and a 'woodland' form, each given different site condition scores.*

*The 121.4 ha of Box-Gum Woodlands DNG within the Bobadeen offset sites (Plate 6) was noted as having been previously grazed with the understorey consisting predominately of grasses less palatable to stock including *Bothriochloa macra* (Red-leg Grass), *B. decipiens* (Red Grass), *Aristida* spp., *Sporobolus creber*, *Rytidosperma* spp., *Eragrostis* spp. and *Arundinella nepalensis*, though some more palatable herbs of the *Chenopodiaceae* and *Fabaceae* families were also present. Additionally, *Bothriochloa biloba* a species previously listed as Vulnerable under the EPBC Act, was recorded within the Box-Gum Woodland DNG within this offset site. The occurrence of weeds was noted as being very low within this area although this was considered to have been influenced by the dry conditions preceding the site inspection. Accordingly, the habitat scores for the Box Gum Woodland DNG within the Bobadeen offset sites used a start condition component score of 3/10.*

*The future condition without offset for the Box-Gum Woodland DNG within this site was assigned a score of 2/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 6/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.*

*The 38.8 ha of the 'woodland' form of Box Gum Woodland within the Bobadeen offset sites (Plate 6 and Plate 7) was differentiated from the DNG form by the presence of a canopy structural layer and potential for associated habitat elements including hollow-bearing trees and fallen logs. Generally, the understorey was similar to that observed within the DNG form of the community although grazing was considered slightly reduced resulting in increased native species richness. Accordingly, the habitat scores for the woodland form of Box Gum Woodland within the Bobadeen offset sites used a start condition component score of 7/10 for Box- Gum Woodland.*

*The future condition without offset for the woodland form of Box-Gum Woodland within this site was assigned a score of 6/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.*

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### Elward BOA:

The WBGW within this BOA consists of woodland. The projected canopy cover is 20.5% and is dominated by Blakely's Red Gum, with Eucalyptus crebra (Narrow-leaved Ironbark) and Callitris endlicheri (Black Cypress Pine) also present. Low exotic plant cover occurs throughout the WBGW woodland of the BOA.

In addition to the above, ELA (2014) (Appendix 3) provide the following assessment of condition of WBGW within the Elward Offset:

*The site condition score for Box-Gum Woodland within the Elwood offset site was informed by a site inspection in March 2013 including one biometric vegetation plot within Box-Gum Woodland consistent with Schedule 2 of the Biobanking Assessment Methodology and Credit Calculator Operational Manual (DECC 2009). Box-Gum woodland within the Elwood offset (Plate 4) site was characterised as having:*

- *A canopy dominated by Eucalyptus blakelyi (Blakely's Red Gum), with Eucalyptus crebra (Narrowleaved Ironbark) and Callitris endlicheri (Black Cypress Pine) also present. Projected foliage cover of the canopy layer was recorded at 20.5 % within the biometric plot;*
- *A diverse understorey dominated by native grasses (68% projected foliage cover recorded) including Microlaena stipoides (Weeping Grass), Arundinella nepalensis and Aristida spp. A sparse cover of herbs and sedges was also present (8% projected foliage cover);*
- *High native species richness with 34 native species recorded within a 20 x 20 m area, including six 'important species [DEH 2006b; Chrysocephalum apiculatum (common everlasting), Desmodium varians, Dichelachne micrantha, Glycine clandestina, Lagenophora stipitata (Common Lagenophora) and Tricoryne elatior].*
- *Native regeneration of all canopy species within the Box-gum Woodland.*
- *Low exotic plant cover with exotic species infrequent across the majority of the Box-Gum Woodland. Within the biometric vegetation plot a single exotic species was recorded (Hypochaeris radicata) with projected foliage cover of 2% recorded.*
- *Habitat elements including hollow bearing trees and fallen logs present (one hollow bearing tree and 62 m of fallen logs recorded within 50 x 20 m plot).*

*Accordingly, the habitat scores for the Elwood site used a start condition component score of 7/10 for Box-Gum Woodland. The future condition without offset for the Box-Gum Woodland within this site was assigned a score of 6/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.*

### Property 5 BOA:

Two WBGW vegetation zones have been identified – one zone was identified as DNG and the other as woodland. The DNG has been previously grazed by stock and is heavily dominated by native Sporobolus spp. with up to 85% projected foliage cover. Native species richness within the DNG is considered to be moderate with very low percent foliage cover of exotic species observed. The woodland form within the Property 5 BOA differentiated from the DNG form with the presence of a canopy structural layer and associated habitat elements including hollow-bearing trees and fallen logs.

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In addition to the above, ELA (2014) (Appendix 3) provide the following assessment of condition of WBGW within the Property 5 Offset:

*The site condition score for Box-Gum Woodland within Property # 5 was assessed during site inspections in March 2013, although the vegetation community was not sampled within any floristic plots. Two forms of Box-Gum Woodland were identified within Property # 5, a DNG form and a 'woodland' form.*

*The 17.0 ha of the Box-Gum Woodland DNG within Property # 5 was noted as having been previously grazed by stock and being heavily dominated by native *Sporobolus* spp. with up to 85% projected foliage cover. Though a number of other less grazing tolerant groundcover species were also noted as being present including *Glycine clandestina*, members of the *Chenopodiaceae* family and the 'important species' *Calotis lappulacea* (Yellow Burr-daisy; DEH 2006b). Native species richness was considered to be moderate with very low percent foliage cover of exotic species observed. No canopy structural layer was present within this form of the Box- Gum Woodlands and habitat elements including hollow-bearing trees and fallen logs were not recorded and considered absent or very limited. Accordingly, the habitat scores for the Box Gum Woodland DNG within Property # 5 used a start condition component score of 3/10 for Box-Gum Woodland. The future condition without offset for the DNG form of Box-Gum Woodland within this site was assigned a score of 2/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 6/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.*

*The 7.2 ha of the 'woodland' form of Box Gum Woodland within Property # 5 was differentiated from the DNG form by the presence of a canopy structural layer and associated habitat elements including hollow-bearing trees and fallen logs (Plate 5). Generally, the understorey was considered similar to that observed within the DNG form of the community, although grazing pressure appears slightly reduced in the woodland areas resulting in increased native species richness. Accordingly, the habitat scores for the woodland form of Box Gum Woodland within Property # 5 used a start condition component score of 7/10 for Box-Gum Woodland. The future condition without offset for the woodland form of Box-Gum Woodland within this site was assigned a score of 5/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.*

### 3.3.3 Floristic Surveys

Floristic surveys have been undertaken across the BOAs during 2013 and 2014. Detailed floristic surveys within WBGW stands have identified 202 flora species (150 native and 52 exotic) across 14 floristic plots within the WBGW. There has been no EPBC Act listed threatened flora species identified during the surveys to date.

Noxious weeds observed within the BOAs include *Rubus fruticosus* spp agg. (Blackberry), *Opuntia* spp. (Prickly Pear), *Hypericum perforatum* (St John's Word), *Nassella trichotoma* (Serrated Tussock), *Onopordum acanthium* subsp. *acanthium* (Scotch Thistle) and *Xanthium* sp. (Cocklebur).

### 3.3.4 Fauna Surveys

Targeted fauna surveys have been undertaken across the BOAs during 2013 and 2014, including diurnal bird surveys and Anabat detection during 2013 and diurnal bird surveys, songmeter recordings, infra-red cameras and opportunistic observations during spring 2014.

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Bird surveys included a diurnal bird survey at seven sites within the Elward and Clifford BOAs during 2013 and diurnal bird survey coupled with songmeters to record bird calls at 8 sites within White Box - Yellow Box - Blakely's Red Gum Grassy Woodland of the BOAs during spring 2014.

Anabat detection devices were placed at four sites within the Elward and Clifford BOAs during 2013. Infra-red cameras were set up at 6 sites across the BOAs during spring 2014 to target the Spotted-tail Quoll and introduced species (**Figure 9**). Opportunistic observations have been recorded at all BOAs during initial surveys undertaken in 2013 and 2014.

Surveys undertaken within the BOAs recorded the following EPBC Act listed threatened fauna and migratory species:

- Large-eared Pied Bat – listed as vulnerable.
- Rainbow Bee-eater – listed as migratory.

Across the BOAs, six introduced mammal species have been recorded and, of these, four are declared pests in NSW (*Canis lupus* (Dog), *Vulpes vulpes* (Fox), *Oryctolagus cuniculus* (Rabbit) and *Sus scrofa* (Feral Pig).

### 3.3.5 Fauna Habitat Condition

Fauna habitat across the BOAs consists of a range of broad habitat classes including:

- Intact canopy layer.
- Derived native grasslands.
- Hollow-bearing trees.
- Stags.
- Ephemeral drainage lines and associated vegetation.
- Dams with open water and emergent vegetation.
- Woody debris (fallen logs and braches).
- Rocky outcrops.
- Cliff lines.

These identified habitat classes provide potential habitat for the following EPBC Act listed threatened fauna and migratory species (refer **Figures 2 to 6**):

#### Regent Honeyeater (*Anthochaera phrygia*), and Swift Parrot (*Lathamus discolor*):

The potential habitat for the Regent Honeyeater and Swift Parrot within the BOAs consists of two forms of potential habitat, woodland habitat with a total area of 166.7 ha and grassland habitat with a total area of 157.7 ha.

#### Long-eared Pied Bat and South-eastern Long-eared Bat (*Nyctophilus corbeni*), syn. Eastern Long-eared Bat (*Nyctophilus timoriensis*):

The potential habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat is considered to include all woodland and DNG areas, 709.2 ha and 209.5 ha, respectively. Cliffines and rock overhangs are present within some of the BOAs and have potential to provide roosting habitat.

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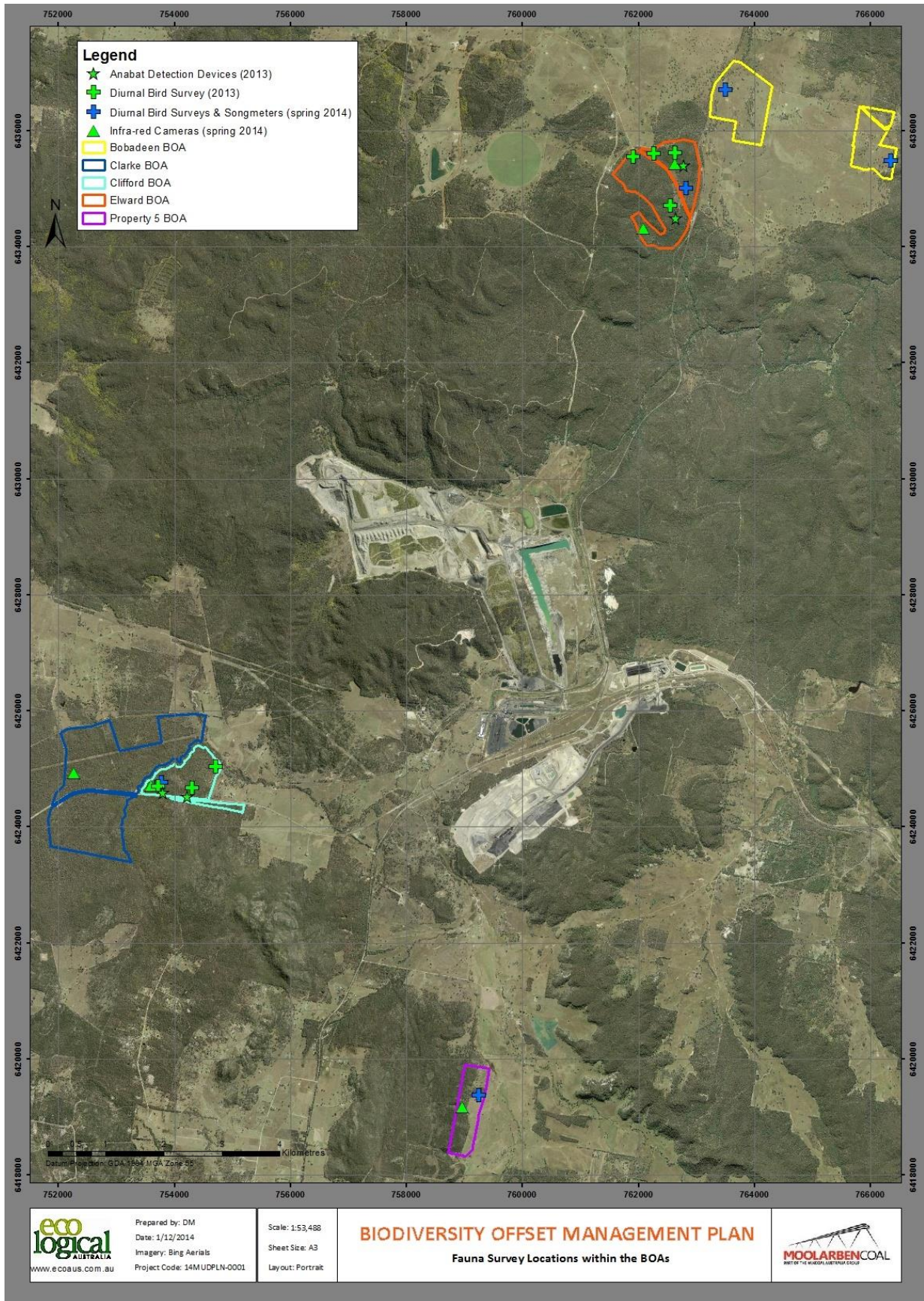


Figure 9: Fauna Survey Locations within the BOAs

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Spotted-tailed Quoll (*Dasyurus maculatus*):

Two forms of potential habitat have been identified with regard to the Spotted-tailed Quoll, woodland habitat with a total area of 542.4 ha and grassland habitat with a total area of 51.8 ha.

Koala (*Phascolarctos cinereus*):

Potential Koala habitat is identified as those areas of vegetation which include known Koala feed trees (including primary, secondary or supplementary species) as identified in **Table 4**. Two forms of potential habitat have been identified with regard to the Koala, woodland habitat with a total area 353.3 ha and grassland habitat with a total area of 199.9 ha. (Note only secondary or supplementary feed tree species have been identified within the BOAs).

**Table 4: Koala Habitat within the BOAs**

Biometric vegetation type	Koala food tree species present	Food tree type (DECC 2008)	Area	
			Woodland	DNG
HU515 - Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands	<i>E. blakelyi</i> (Blakely's Red Gum) <i>E. melliodora</i> (Yellow Box)	Secondary	89.3	21.5
HU537 - Dwyer's Red Gum low woodland on exposed sandstone ridges of the upper Hunter Valley, Sydney Basin	<i>E. dwyeri</i> (Dwyer's Red Gum) <i>E. dealbata</i> (Tumbledown Red Gum)	Secondary	35.1	-
HU551 - Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin	<i>E. moluccana</i> (Grey Box)	Secondary	55.8	4.9
HU552 - Grey Gum - Narrow-leaved Stringybark - ironbark woodland on ridges of the upper Hunter Valley, Sydney Basin;	<i>E. punctata</i> (Grey Gum) <i>E. sparsifolia</i> (Narrow-leaved Stringybark)	Secondary & Supplementary	1.8	-
HU574 - Narrow-leaved Ironbark - Grey Gum shrubby woodland on footslopes on the upper Hunter Valley, Sydney Basin	<i>E. punctata</i> (Grey Gum)	Secondary	119.7	1.2
HU603 - Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast	<i>E. dealbata</i> (Tumbledown red Gum) <i>E. macrorrhyncha</i> (red Stringybark)	Secondary & Supplementary	30.0	41.0
HU653 - White Box - Narrow-leaved Ironbark shrubby open forest on hills of the central Hunter Valley, Sydney Basin;	<i>E. albens</i> (White Box)	Secondary	-	-
HU654 - White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South	<i>E. albens</i> (White Box) <i>E. melliodora</i> (Yellow Box)	Secondary	21.6	131.3
<b>Total</b>			<b>353.3</b>	<b>199.9</b>

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## 4 MANAGEMENT APPROACH

An 'adaptive' approach to the management of BOAs will be implemented with the objective of managing offset areas to improved ecological quality outcomes, consistent with the developed completion criteria (see **Section 4.2**).

The proposed management strategy and actions are focussed in the first instance on areas that will respond to ecological enhancement (i.e. DNG and pasture areas). Additional strategies or actions may be developed and implemented in response to monitoring outcomes to address areas where initial management measures have not achieved an improvement outcome.

### 4.1 ZONES OF MANAGEMENT

Each BOA has been divided into two distinct zones of management based on pre-existing vegetation and habitat condition and assessed resilience. Each management zone has strategic ecological management objectives which have informed the development of relevant management actions necessary to achieve a sustainable landscape with improved overall ecological quality in the long-term.

The division of each BOA into the two management zones is shown **Figure 10**. A description of the management strategy to be applied to each zone is provided below. Further detail description of management actions is provided in **Section 4.3** below.

#### 4.1.1 Management Zone 1 – Remnant Vegetation

Management Zone 1 (MZ1) covers an area of 657.3 ha and is characterised by intact vegetation with good native species richness, all strata present and remnant vegetation in generally good condition.

The primary management objective of MZ1 is to maintain vegetation structure and species diversity. This will be achieved through (inter alia) minimising stock and unauthorised human impacts, removal of threats to biodiversity and monitoring, which will inform review of management procedures where required. Management actions to be implemented in this zone include:

- Review and confirm baseline flora and fauna surveys are appropriate to define the reference condition of MZ1 areas within the BOAs, and implement additional survey where required.
- Exclusion of stock and grazing to promote understorey recovery and reduce competition for food with native fauna species (unless controlled crash grazing for weed control or hazard reduction purposes is required).
- Management of human access and disturbance including installation of fencing, gates and signage (where required) to prevent unauthorised entry/use.
- Stabilising and remediating eroding areas (where required).
- Retaining dead timber (i.e. prevent fire wood collection).
- Targeted control of noxious and environmental weeds (where required).
- Targeted control of feral animals including foxes, rabbits, goats, wild dogs and pigs.

Further detail on specific management actions is provided in **Section 4.3** below.

#### 4.1.2 Management Zone 2 – Regeneration of Grassland to Forest/Woodland

Management Zone 2 (MZ2) covers an area of 158.8 ha and includes areas of native grassland, exotic grassland and cleared areas. MZ2 requires implementation of management actions to improve native species richness and structural diversity.

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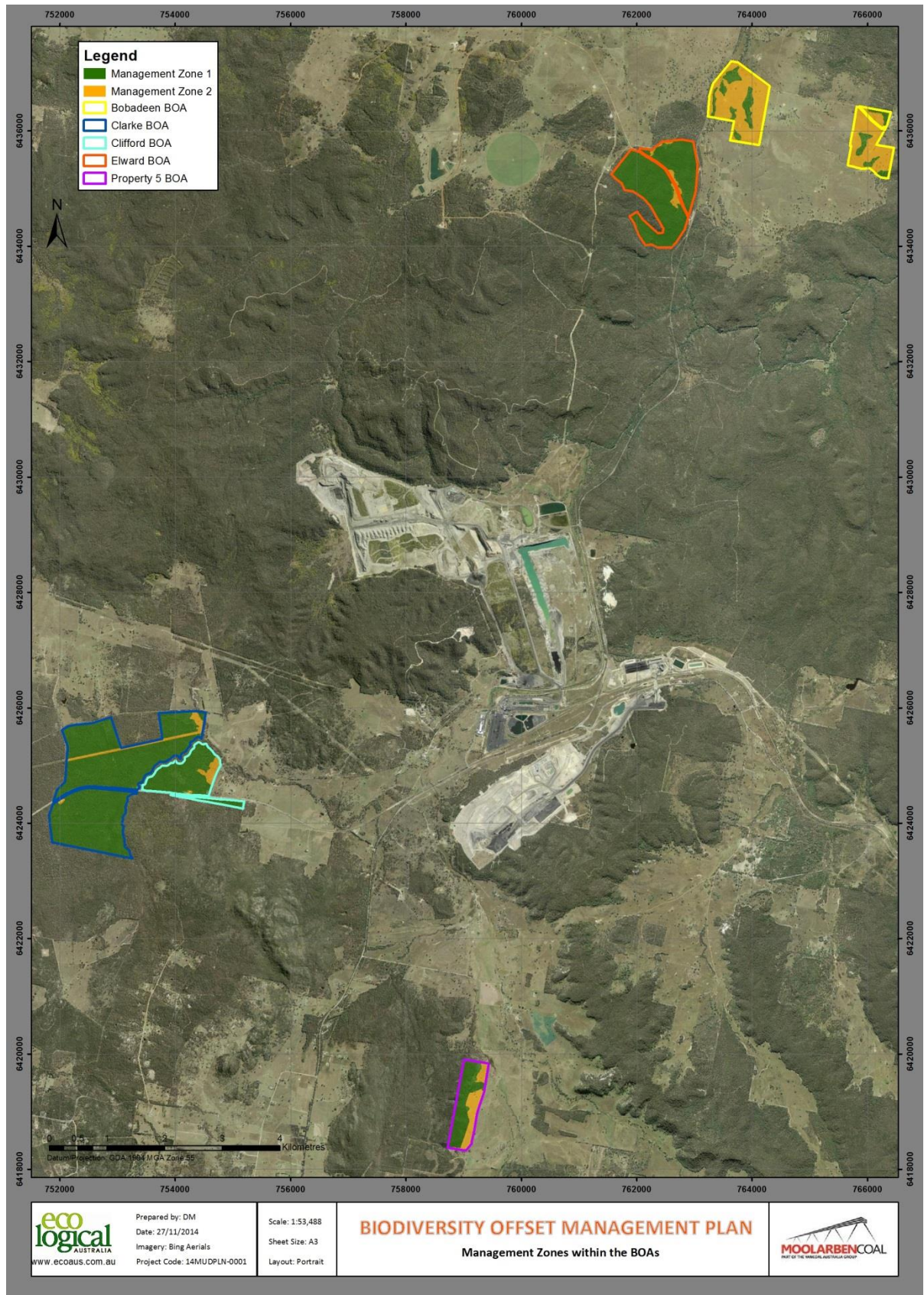


Figure 10: Management Zones with the BOAs

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Areas of natural regeneration within MZ2 will be mapped and monitored until the end of Year 3. Upon completion of monitoring in Year 3, areas of poor condition vegetation within MZ2 will be considered to have a low ability to recover from disturbance without an active revegetation regime to compliment threat abatement and conservation management.

MZ2 will then be divided into two sub-management zones:

- MZ2a – natural regeneration management zone.
- MZ2b – assisted natural regeneration/revegetation management zone.

MZ2a will undergo active management through implementation of weed and feral animal management activities to continue to encourage natural regeneration of vegetation.

A revegetation schedule will be developed for areas classified as MZ2b to assist with re-establishment of vegetation within these areas. Management actions to be implemented in MZ2 include:

- Review and confirm baseline flora and fauna surveys are appropriate to define the reference condition of MZ2 areas within the BOAs.
- Conduct baseline mapping (where required) of natural regeneration areas and undertake ongoing monitoring of these areas.
- Develop and implement a weed control regime (prior to revegetation planting) and control of over abundant native herbivores in consultation with adjacent landholders (including OEH).
- Develop and implement a Vertebrate Pest Management Program. Targeted control of foxes, rabbits, goats, wild dogs and pigs will be undertaken.
- Management of human disturbance including installation of signage (and compliance checks) to prevent unauthorised entry/use.
- Direct seeding for re-establishment of native vegetation in MZ2b (where required).
- Revegetation with tube stock planting to assist regeneration and direct seeding in MZ2b (where required).

Further detail on specific management actions is provided in **Section 4.3**.

## 4.2 COMPLETION CRITERIA

Completion criteria for the BOAs has been developed based on Biometric benchmark values (per vegetation type) (**Table 5**) for the mapped vegetation types occurring within the BOAs and for regeneration (natural and assisted) of WBGW (where required) within the MZ2 areas. Managing regeneration and revegetation activities within the BOAs to achieve these criteria will provide improvements in woodland vegetation cover, fauna habitat and contribute to enhanced long-term biodiversity conservation outcomes.

The completion criteria will be taken to have been achieved when the vegetation has either achieved the relevant benchmark condition (i.e. at least one of the groundcover benchmark conditions and at least one of either the overstorey or midstorey benchmark conditions has been met) or it can be demonstrated that it is on a self sustaining trend towards the relevant benchmark condition.

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**Table 5: Biometric Benchmark Values per Biometric Vegetation Type**

Vegetation Type	Native overstorey cover %	Native midstorey cover %	Native groundcover (grasses) %	Native groundcover * (shrubs) %	Native groundcover * (other) %
Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands	10-35	0-30	10-75	0-15	10-60
Caley's Ironbark - Currawong shrubby woodland on sandstone ridges of the upper Hunter Valley, Sydney Basin	15-40	5-40	5-60	5-20	5-40
Dwyer's Red Gum low woodland on exposed sandstone ridges of the upper Hunter Valley, Sydney Basin	20-50	10-60	5-15	5-10	5-15
Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin	15-40	10-55	3-10	5-15	5-25
Narrow-leaved Ironbark - Grey Gum shrubby woodland on footslopes on the upper Hunter Valley, Sydney Basin	15-40	10-55	3-10	5-15	5-25
Narrow-leaved Ironbark shrubby open forest on hills of the central Hunter Valley, Sydney Basin	25-40	11-50	5-45	5-30	5-20
Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast	15-40	5-40	5-60	5-20	5-40
Scribbly Gum - Brown Bloodwood woodland of the southern Brigalow Belt South	20-50	10-60	5-15	5-10	5-15
Tea-tree shrubland of drainage areas of the slopes and tablelands	10-50	10-50	20-60	1-5	10-30
White Box – Yellow Box grassy woodland on basalt slopes in the Upper Hunter Valley NSW	10-45	5-60	5-45	2-10	5-35

\*Cover as % (DECC 2008)

Note: Measured values of mature woodland/forest adjoining the revegetation/regeneration areas may be used instead of the values listed in this table if they are deemed to be more appropriate following the first round of monitoring.

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### 4.3 MANAGEMENT ACTIONS

This section outlines the management actions that will be implemented for all BOAs, therefore addressing the requirements identified in Condition 4c EPBC 2013/6926.

The objective of the management program and associated actions is to maintain and improve the ecological quality of the BOAs. The management actions have been designed to enhance structural diversity and compositional diversity (species richness) of the remnant vegetation to provide flora and fauna habitat to offset the impacts of the approved action.

#### 4.3.1 Access Management

Unauthorised access to the BOAs will be prohibited. This will reduce the risk of disturbance to intact vegetation and regenerating or revegetated areas, disturbed soil, weed dispersal, fauna habitat disturbance and illegal rubbish dumping. Measures will be implemented to limit access to these areas to authorised personnel only.

BOAs will be locked to prevent public access. Signage will be erected to identify each site as a BOA.

Access tracks will be mapped and categorised as:

- Required – these tracks will undergo routine inspections and maintenance to allow access for management activities. This category will include tracks that should be used as access for all emergency vehicles. This category may be broken down further to allow for different vehicle types; and
- Redundant – these tracks will be rehabilitated as they are no longer required.

Fences that are no longer required will be removed. MCO will maintain internal and external fencing to restrict human access and control stock access to vegetation and BOAs.

Existing easements will be mapped and management measures developed to maintain necessary access and required vegetation clearance.

All access tracks, fence lines and signage erected within the BOAs will be inspected and maintained on a regular basis.

**Table 6** below outlines the actions to be implemented for managing access to BOAs.

**Table 6: Access Management**

Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Inspect and map fences, gates and internal access tracks, including, fences and tracks to be managed and redundant fences and tracks to be removed/remediated	All fences, gates and tracks are mapped, and a plan for management established	Redundant fences removed Redundant access tracks remediated Inspection and maintenance of fences and tracks as required	Fences and gates maintained in good condition Access to BOAs restricted to authorised personnel Access tracks maintained in good condition
Inspect and install (where required) access gates and access security (e.g. locks)	All access points to BOAs made secure	Inspection and maintenance of gates as required	Signage maintained in good condition

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Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Erect signage to prohibit 4WD, trail bikes, rubbish dumping, camping, shooting, fires and unauthorised access	Erect signage at each site	Inspection and maintenance of signs as required	

#### 4.3.2 Waste Management

Where present, waste (rubbish) within BOAs and vegetated areas should be removed. In some cases, waste may be left in-situ as it presents major health concerns if removed or it is providing important habitat value.

Table 7 below outlines the actions to be implemented for waste management.

**Table 7: Waste Management**

Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Inspect and survey rubbish/waste in BOAs	All rubbish/waste in BOAs inspected Monitoring for illegal dumping Notification of illegal dumping to relevant authorities as required	Ongoing monitoring for illegal dumping Notification of illegal dumping to relevant authorities as required	Rubbish/waste removed Areas remediated as required Record of any retained and encapsulated waste maintained Monitoring for illegal dumping maintained
Remove rubbish/waste	Rubbish able to be removed without causing environmental harm removed Area remediated as required	Removal of dumped rubbish as required (or encapsulation of waste to be retained onsite)	

#### 4.3.3 Erosion Control

Areas within the BOAs that have erosion or soil management issues will be identified through site inspections, the location mapped and a plan for remediation of these areas developed. The areas will be identified as part of ongoing environmental monitoring activities and through incidental identification as part of other management activities.

Erosion control may be required along drainage lines, or other disturbed or exposed areas such as access tracks. Controls to be implemented may include:

- Exclusion of stock.
- Access control.
- Maintaining retained access tracks.

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- Remediatng redundant access tracks (through natural or assisted regeneration/ revegetation).
- Increasing vegetation cover in exposed areas and areas susceptible to erosion (e.g. drainage lines, creek banks, fire breaks, etc).
- Periodical monitoring of exposed areas and areas susceptible to erosion to identify significant erosion hotspots that require remediation.

Control of grassy or herbaceous weeds along the creek lines and access tracks will be selective (in the short-term), as all vegetation cover (native and exotic) will aid in the stabilisation of exposed areas.

**Table 8** below outlines the actions to be implemented to control and manage erosion.

**Table 8: Erosion Control**

Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Inspect and map significant (or potentially significant) erosion areas/occurrences	Ongoing monitoring for significant erosion outbreaks		Remdiation of erosion areas and ongoing controls implemented
Develop and implement erosion control and remediation protocols	Remdiation of erosion areas as required Inspection of remediated areas and ongoing monitoring		

#### 4.3.4 Stock Management

Stock within the BOAs will be excluded, unless deemed benefeical for the ecological function of the BOAs by an appropraite expert to control weeds and as a hazard reduction measure.

Stock will be excluded from the BOAs prior to any revegetation works commencing. Where stock exclusion has seen a marked increase in weed density, limited natural regeneration of native vegetation and increased potential bushfire fuel loads, cattle may be reintroduced to these areas for short periods by way of controlled crash grazing if recommended by an appropraitly qualified expert.

If grazing activities are to be conducted within the BOAs through controlled crash grazing, they will adhere to the specifications shown in *A Guide to Managing Box Gum Grassy Woodlands* (Rawlings *et. al.* 2010).

Controlled grazing if used as a management tool will:

- Be undertaken as ‘pulse’ or ‘crash’ grazing, where fencing restricts stock movement to a limited area for a brief amount of time at deliberate intervals
- Take into account variability within the BOAs. Pulse grazing is most effective in grasslands and less effective in woodlands
- Be undertaken in such a way as to promote patchiness (i.e. areas of different age, density, and species)
- Take into account the ecological requirements of the native species being targeted for promotion
- Not be undertaken during spring unless for control of annual exotics
- Not be undertaken during wet conditions

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- Utilise 'clean' (i.e. weed free) stock.
- Incorporate adequate rest time for the patch after grazing to promote native recovery. Weed and erosion control may also be required.

**Table 9** below outlines the actions to be implemented to manage stock.

**Table 9: Stock Management**

Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Remove stock grazing from BOAs	Exclude stock from BOAs	Maintain stock exclusion	Stock prevented from accessing BOAs unless under supervision for weed control or other environmental purpose
Maintain secure boundary fencing (where required)	Inspection and maintenance of fences and gates as required		
Undertake annual inspection	Ongoing inspection as required		
Implement communication strategy with neighbouring farming enterprises	Inform neighbouring enterprises of stock encroachment and work with neighbours to maintain stock exclusion		
Feral stock control	Cull/control feral stock as required		

#### 4.3.5 Native Seed Collection and Propagation

If revegetation of a BOA is required, local provenance seed will be targeted for collection and use in seeding BOAs. Seed collection will occur in suitable areas when viable seed is considered to be available. Supplementation of seed supply with non-local provenance seed may be required when local provenance seed is unavailable.

The seed collection program will generally be compliant with the Florabank guidelines (Florabank 2000) which detail the best practice principles for seed collection.

Where tube stock is required this will be either propagated from seed collected or purchased from a suitable supplier. Seed collected on the BOAs for tubestock propagation will be by personnel who are experienced in the propagation of native species. Propagation requirements will be determined by MCO and communicated to the contractor responsible for seed propagation with the aim of seedlings being ready for planting each year that they are required.

**Table 10** outlines the actions to be implemented in collecting and propagating seed.

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**Table 10: Seed Collection and Propagation Management**

Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Identify species within BOAs to be targeted for seed collection so the genetic integrity of seed is maintained	Seed collection species identified as required	No further action	Seed collection species identified and adequate seed stocks maintained to supplement direct seeding and tube stock planting campaigns as required
Develop seed collection strategy and implement as require	Collect seed from species suitable for direct seeding and/or propagation as required		
Maintain a stock of seed for key species	Maintian adequate stock of native seed to supplement direct seeding (purchase of appropriate seed from a supplier may be required depending on seed availability within BOAs) campaigns and propagation of tube stock as required		

#### 4.3.6 Revegetation Management

Restoring native vegetation and fauna habitat through revegetation activities will be undertaken within MZ2b of the BOAs.

Activities to restore native vegetation and fauna habitat within grasslands of BOAs will focus on assisted natural regeneration and targeted vegetation (i.e. revegetation) establishment, where required.

The results of condition monitoring (**Section 6.3.1**) will guide development of a revegetation schedule for areas of poor condition vegetation that have been determined to have a low resilience to recover naturally from disturbance. It is expected that revegetation and restoration activities may be required within MZ2b grassland communities. These communities will be identified at the completion of monitoring activities in Year 3.

Encouraging the successful establishment of revegetation will be provided through implementation of the following measures:

- Fencing to control stock access.
- Weed control (**Section 4.3.7**).
- Vertebrate pest control (**Section 4.3.8**).
- Fire management (**Section 4.3.9**).
- Vehicle access control.
- Installation of tree guards around seedlings (where required).

Targeted vegetation establishment (within MZ2b and other areas as required) will require direct seeding or tubestock planting at sites not responding to natural regeneration of native species . Revegetation will include the planting of species characteristic of the local vegetation communities, including WBGW community species, with selection guided by adjacent and/or predicted parent vegetation types.

Ground preparation activities will be completed in areas to undergo revegetation prior to revegetation commencing, with seeding and/or tubestock planting to occur during the most appropriate period (i.e. favourable climatic conditions).

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Weed control activities will be considered prior to and after planting to promote successful establishment of target flora species.

Plant densities post-revegetation activities will be dependent upon existing vegetation densities and the results of natural regeneration. However, all vegetation types will be managed towards the benchmark range canopy cover per Biometric vegetation type (**Table 11**). This planting density allows for time lag to maturation and mixed success of plantings.

**Table 11** outlines the actions to be implemented for managing natural regeneration and revegetation.

**Table 11: Regeneration and Revegetation Management**

Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Review and augnment baseline surveys and mapping for vegetation communities, vegetation condition and management zones as required	Baseline mapping completed	No further action	Species diversity and vegetation density trending towards benchmark values
Monitor and map natural regeneration recovery	To be completed annually		
Develop a revegetation schedule for underforming areas of natural regeneration and MZ2b areas	Reviewed and revised annually (or as required) to reflect success of revegetation works		
Implement revegetation schedule	To be commenced by Year 5 Ongoing implementation of revegetation as required		

#### 4.3.7 Weed Control

Weed species within revegetation and regeneration areas have the potential to impede the success of revegetation and restoration activities. Weeds compete with the revegetation species for moisture, nutrients and light. Should weed management activities be required, these will be undertaken in a manner that will not significantly impact the naturally regenerating vegetation.

There are two aspects to weed control within the BOAs:

1. General control of environmental weeds.
2. Targeted control of noxious weeds.

A weed control program will be implemented to reduce the extent and limit the spread and colonisation of both noxious and environmental weeds across the BOAs. The weed control program will consist of:

- Regular inspections of the BOAs to identify areas requiring the implementation of weed management measures.
- Implementation of weed management measures including mechanical removal, slashing, application of approved herbicides or biological controls.
- Control of noxious weeds identified within the BOAs in accordance with the relevant NSW Department of Primary Industries control category and the relevant regional weed management plan.

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- Follow-up inspections to assess the effectiveness of the weed management measures implemented and the requirement for any additional management measures.
- Minimising the potential for establishment of new weeds on BOAs by minimising the transport of weed species to and from BOAs (e.g. stock exclusion/control, limiting vehicle access and inspection/wash-down of vehicles and machinery where required).

Should a herbicide be required for weed control, application will occur in accordance with the requirements detailed on the relevant Material Safety Data Sheet.

Once weed control programs have been undertaken, inspections of the BOAs will be conducted to establish the success of the program. Where it has been identified that activities have not been successful, control activities will be reviewed to determine the appropriateness of the control activity prior to further management actions being undertaken. As seasonal conditions influence the extent of weed infestations monitoring of weed management areas will occur at least annually.

Noxious weeds that have been identified within the BOAs will be treated in accordance with the MWRC Local Weed Management Control Plan (MWRC 2014) specific to Class 4 Noxious Weeds. All work will be completed in accordance with the *Pesticides Act 1999*.

**Table 12** below outlines the actions to be implemented in controlling weeds.

**Table 12: Weed Control**

Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Inspect and map noxious and environmental weed occurrences/outbreaks	Identify weed management activities required to control weed populations	Weed monitoring/inspection at least annually	Weed control program developed and implemented to achieve downward trend in weed occurrences/outbreaks
Develop and implement targeted weed control	Ongoing weed control (planned and implemented in consultation with neighbouring properties, Council and Local Land Services as required)		

#### 4.3.8 Vertebrate Pest Control

Predation and habitat destruction of existing native species by vertebrate pests has the potential to cause impacts on existing native species. A number of introduced species (Wild Dog, Red Fox, Rabbit Goat and Feral Pig) have been identified within the BOAs and are likely to be competing with native species and causing vegetation and environmental damage.

Vertebrate pests will be monitored and controlled by appropriately qualified personnel. All vertebrate pest control activities will be undertaken in accordance with the requirements of the Local Land Services.

A program to manage vertebrate pests will be developed in consultation with adjoining landholders for maximum efficacy. The program may include:

- Ground shooting of feral goats using a high powered (calibre) rifle in accordance with the Invasive Animals CRC Standard Operating Procedure (GOA001).
- 1080 baiting for Wild Dogs, Foxes, Rabbits, and Wild Pigs in accordance with the appropriate pesticide control order.
- Rabbit warren destruction, where found.

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- Ongoing monitoring to ensure effective vertebrate pest control. If new feral pests or a significant increase in an existing population of feral pests are observed, the control program will be revised to reflect this.

**Table 13** below outlines the actions to be implemented to control vertebrate pests.

**Table 13: Vertebrate Pest Control**

Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Baseline survey for feral animals and mapping estimates of population size	Identify management activities required to control vertebrate pest populations	Vertebrate pest species and population monitoring/inspection annually	Pest control program developed and implemented to achieve stable or downward trend in population size
Develop and implement targeted pest control program	Ongoing vertebrate pest control planned and implemented in consultation with neighbouring properties and Local Land Services (as required)  Program to be reviewed in year 6, 9, 12 & 15 based on feral animal monitoring and revised as required		

#### 4.3.9 Fire Management

Fire Management requirements encompass bushfire management generally, but also take into consideration the need for ecological burns for weed control or biodiversity enhancement. MCO has developed a Bushfire Management Plan (BFMP) which outlines bushfire controls, emergency response actions and bushfire training requirements. The BFMP will be reviewed and updated where necessary to include any additional fire management procedures applicable to managing the BOAs.

Actions specific to the BOAs may include:

- Establishment of fire breaks within BOAs (e.g. along neighbouring property boundary lines). Small fire breaks will be maintained along existing or new fence lines installed along the boundary. These breaks will double as access for the Rural Fire Service (RFS) in the event of wildfire, and will be maintained annually by slashing the fire breaks.
- Maintenance of access tracks for fire management activities.
- Gaining approval from relevant authorities (NSW Rural Fire Service and Office of Environment & Heritage) to use a fire regime as a management strategy. This may require development of site specific Fire Management Plans.
- Mosaic burning to reduce potential negative impacts. (Note no prescribed burning will be implemented in MZ2 until planted trees are mature and able to withstand the impact of fire).

Any wildfires that do occur in the BOA in the interim will be managed through an appropriate response from the RFS to extinguish or contain the spread of the fire.

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Inspections of fuel load in BOAs will occur at 12 monthly intervals, prior to the commencement of each bushfire season (unless determined otherwise). Any bushfire incident that occurs will be managed via the MCO incident management process and BFMP, and reported to relevant authorities as they occur. Reporting of bushfire incident details will also form a part of the Annual Review (AR).

### Ecological Burn Planning

Ecological burns may be carried out as per Section 5.1.3 of the BFMP (MCO\_ENV\_PLN\_0031).

Fire intervals for grassy woodlands have been identified as being a minimum of eight years and a maximum of 40 years (Bush Fire Coordinating Committee 2008). For Dry sclerophyll forest (shrub/grass formation) recommended intervals range from five years to fifty years. For Dry sclerophyll forest (shrub formation) and heath lands this reduces to between seven and thirty years. The recommended minimum interval for semi-arid woodlands (grassy sub-formation) is six years and for shrubby sub-formation ten years. Burns should be low intensity ground burns only.

Any ecological burn carried out by MCO will occur in accordance with the Bushfire Environmental Code for New South Wales (NSW Rural Fire Service, 2006).

**Table 14** below outlines the actions to be implemented for managing bushfire risk.

**Table 14: Fire Management**

Management Action	Implementation Timeframe		Performance Targets
	Year 3	Year 9	
Develop and implement fire management strategy and protocols	Review and revise BFMP to include BOAs (where required)	Review fire management protocols (in consultation with RFS and neighbouring properties as required)	Environmental burn, hazard reduction and fire management plan in place
Review and establish fire breaks as required	Establish and maintain fire breaks and access tracks as required		Fire breaks and access tracks established
Develop and implement controlled burn regime	Gain relevant approvals for environmental /hazard reduction fire regime	Implement environmental/hazard reduction fire regime in consultation with RFS, neighbouring properties and other relevant authorities as required	Relevant approvals in place prior to implementing environmental/hazard reduction burn

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## 5 RISK ASSESSMENT & CONTINGENCY PLAN

Condition 4.c.iv of the EPBC Approval 2013/6926 requires MCO to describe the potential risks to the successful implementation of this BOMP and to provide a description of the contingency measures that would be implemented to mitigate these risks.

MCO's biodiversity management program incorporates consideration of unpredicted impacts. MCO has undertaken a preliminary qualitative risk assessment to assess the potential consequences of unpredicted impacts to the BOAs.

The methodology used for the risk assessment was in accordance with MCO's Risk Management Standard, which follows the principles of ISO 31000:2009 Risk Management (Standards Australia), including:

- Establish the context for the risk assessment process.
- Identify risks and potential impact.
- Analyse risks.
- Evaluate risks to determine the necessary controls for mitigation.
- Re-assess the risk post identification of additional controls.

The key risks associated with the BOAs have been assessed using the consequence and probability ratings and risk matrix presented in **Tables 15** and **16**, respectively.

**Table 17** outlines the key identified risks and associated inherent risk ratings. The ratings assume that the identified risk controls have been implemented. With these measures in place all identified risks have been ranked as having a low risk rating. **Table 17** also outlines contingency measures to be implemented if defined triggers arise.

**Table 15: Consequence Ratings**

Effect / Consequence					
Loss Type	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
<b>Environmental Impact</b>	<p><b>Environmental nuisance</b> – trivial or negligible, short term impact to area of low significance, minimal or no physical remediation required</p> <p>Cost &lt; \$1,000</p>	<p><b>Minor environmental harm</b> – short term impact to area of limited local significance, limited physical remediation</p> <p>Costs \$1,000 - \$5,000</p>	<p><b>Serious environmental harm</b> – medium term impact to area of local conservation value, medium term physical remediation, actual community health impacts or significance or pollution or contamination</p> <p>Costs \$5k - \$50k</p>	<p><b>Major environmental harm</b> – long term reversible impacts to area of regional conservation significance, health statistics in community alter as a result of this incident or pollution or contamination</p> <p>Costs \$50k - \$500k</p>	<p><b>Extreme environmental harm</b> – irreversible impacts on environmental values of extreme &amp; widespread areas, or those of national conservation significance, community fatalities or pollution or contamination</p> <p>Costs &gt; \$500k</p>

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Effect / Consequence					
Loss Type	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
<b>Asset Damage and Other Consequential Losses</b>	<b>Slight damage</b> < \$0.1M or  < 1 shift disruption to operation	<b>Minor damage</b> \$0.1M - \$1.0M. or 1 Shift – 1 day disruption to operation	<b>Local damage</b> \$1.0M - \$5.0M or  1 day - 1 week disruption to operation	<b>Major damage</b> \$5.0M - \$25.0M or  1 week – 1 month Partial loss of operation	<b>Extreme damage</b> > \$25.0M or > 1 month  Substantial or total loss of operation
<b>Impact on Reputation</b>	<b>Slight impact</b> Public awareness may exist but no public concern. Isolated compliance failure – no brand damage	<b>Limited impact</b> Some local public concern. Intervention of regulating authority – minimal brand damage	<b>Considerable impact</b> Regional public concern. Major compliance failure involving fines – medium brand damage	<b>National impact</b> National public concern. Temporary withdrawal of license to operate – significant brand damage	<b>International impact</b> International public attention. Loss of shareholder confidence – irreparable brand damage

Table 16: Risk Matrix

Likelihood	Level of Risk				
<b>A</b> (Almost Certain)	11 (M)	16 (H)	20 (H)	23 (E)	25 (E)
<b>B</b> (Likely)	7 (M)	12 (M)	17 (H)	21 (E)	24 (E)
<b>C</b> (Possible)	4 (L)	8 (M)	13 (H)	18 (H)	22 (E)
<b>D</b> (Unlikely)	2 (L)	5 (L)	9 (M)	14 (H)	19 (H)
<b>E</b> (Rare)	1 (L)	3 (L)	6 (M)	10 (M)	15 (H)

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**Table 17: Key Risks, Controls, Action Triggers and Contingency Measures**

Risk	Risk Controls	Risk Rating	Trigger	Contingency measures
Widespread degradation/loss of native vegetation (remnant and regenerating) in BOAs	<p>Native vegetation is on land owned and controlled by MCO. BOAs are not on adjoining properties limiting widespread degradation/loss of native vegetation from fire, pests, disease or other source across BOA properties.</p> <p>Assessment of areas following impact, with follow-up reseeding/replanting where determined appropriate.</p> <p>MCO has established and tested landscape, regeneration and revegetation management experience that will be applied to BOAs, including adaptive management practices.</p>	5L	25% loss of either remnant or regenerating vegetation identified through scheduled monitoring.	<p>Increase monitoring frequency at the area effected</p> <p>Implement appropriate action to reverse trend</p> <p>Supplement with direct seeding and/or tube stock planting as required</p>
			Complete loss/failure of existing remnant vegetation areas	Consider replacement BOA
			Complete failure of regeneration/revegetation actions	<p>Extend regeneration program timeframe</p> <p>Supplement regeneration with direct seeding and/or tube stock planting</p> <p>Consider replacement BOA as required</p>
Widespread degradation/loss of native vegetation (remnant and regenerating) in BOAs from uncontrolled bush fire	<p>Bush fire management and response protocol developed and implemented.</p> <p>Hazard reduction, including low intensity low level mosaic burning or crash grazing.</p> <p>Assessment of areas following fires, with follow-up reseeding/replanting if determined appropriate.</p> <p>Maintain contingency supplies of seed for key native species.</p>	5L	BOA does not recover from fire damage	<p>Extend regeneration program timeframe</p> <p>Supplement regeneration with direct seeding and/or tube stock planting</p> <p>Consider replacement BOA as required</p>

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Risk	Risk Controls	Risk Rating	Trigger	Contingency measures
Inappropriate MCO bushfire management practices leading to failure of regeneration/revegetation management areas and/or continued sustainability of offset area ecosystems	Hazard reduction, including low intensity low level mosaic burning or crash grazing. Mosaic burning planned and carried out in consultation with relevant regulators. Monitoring of areas following fires, with follow-up reseeding/replanting as necessary. Maintain contingency supplies of seed for key native species.	2L	Regeneration/revegetation areas do not recover from controlled burn or weed infestation post fire prevents native vegetation recovering	Extend regeneration program timeframe Supplement regeneration with direct seeding and/or tube stock planting Implement targeted weed control measures
Severe and/or prolonged drought leading to failure of regeneration/revegetation within MZ2b	Selection of drought-tolerant species within species mix for revegetation. Monitoring of BOAs during/following drought event and reseeding/replanting as necessary. Maintain contingency supplies of seed for key native species. Selective watering of revegetation areas as required.	5L	Complete loss/failure of regenerating/revegetated areas	Extend regeneration program timeframe Supplement regeneration with direct seeding and/or tube stock planting Implement irrigation of regenerating/revegetated areas where practicable
Major storm event resulting in flood or major erosion damage to BOAs	Monitoring of BOAs following a major storm and reseeding/replanting as necessary. Implement rectification works for major erosion areas. Maintain contingency supplies of seed for key native species.	5L	Widespread damage to existing remnant vegetation or regenerating areas	Extend regeneration program timeframe Supplement regeneration with direct seeding and/or tube stock planting
Inadequate weed and pest animal control leading to failure of regeneration/revegetation or continued sustainability of offset area ecosystems	BOAs are not on adjoining properties limiting widespread degradation/loss of native vegetation from fire, pests, disease or other source across BOA properties. Targeted weed management and control program developed and implemented.	5L	25% loss of either remnant or regenerating vegetation identified through scheduled monitoring.	Increase monitoring frequency at the area effected Implement appropriate action to reverse trend Supplement with direct seeding and/or tube stock planting as required

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Risk	Risk Controls	Risk Rating	Trigger	Contingency measures
Cont.	<p>Pest animal management and control program developed and implemented.</p> <p>Visual inspections/cleaning of vehicles entering sensitive areas to mitigate risk of weed dispersal.</p> <p>Maintain contingency supplies of seed for key native species.</p>		Complete loss/failure of regenerating/revegetated areas	<p>Extend regeneration program timeframe</p> <p>Supplement regeneration with direct seeding and/or tube stock planting</p> <p>Implement additional targeted weed and pest control measures</p>
Insect attacks (e.g. locusts and beetles) leading to failure of regeneration/revegetation or continued sustainability of offset area ecosystems	<p>BOAs are not on adjoining properties limiting widespread degradation/loss of native vegetation from fire, pests, disease or other source across BOA properties.</p> <p>Planting to avoid insect prone periods.</p> <p>Monitoring to identify if further plantings required</p> <p>Monitoring following insect attack and reseed/replanting as necessary.</p> <p>Maintain contingency supplies of seed for key native species.</p>	5L	Complete loss/failure of regenerating/revegetated areas	<p>Extend regeneration program timeframe</p> <p>Supplement regeneration with direct seeding and/or tube stock planting</p> <p>Implement targeted pest control measures</p>
Inappropriate direct seeding and/or planting techniques resulting in failure of regeneration/revegetation or continued sustainability of offset area ecosystems	<p>Assessment prior to undertaking any replanting works.</p> <p>Use of experienced land management consultants and contractors.</p> <p>Monitoring of BOAs.</p> <p>Maintain contingency supplies of seed for key native species.</p>	3L	Complete loss/failure of regenerating/revegetated areas	<p>Review seeding and or planting techniques in consultation with experienced/qualified specialists and authorities</p> <p>Extend regeneration program timeframe</p> <p>Supplement regeneration with direct seeding and/or tube stock planting</p>
Frost leads to high mortality rates of revegetation (average of 42 days frost/year)	<p>Monitoring to identify if further plantings required.</p> <p>Maintain contingency supplies of seed for key native species.</p> <p>Avoid planting in frost season.</p>	3L	Complete loss/failure of revegetated areas	<p>Review revegetation practices and species</p> <p>Extend revegetation program timeframe</p>

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Risk	Risk Controls	Risk Rating	Trigger	Contingency measures
Inappropriate grazing (native species, pests and livestock) regime leading to failure of regeneration/revegetation or continued sustainability of offset area ecosystems	<p>BOAs are not on adjoining properties limiting widespread degradation/loss of native vegetation from fire, pests, disease or other source across BOA properties.</p> <p>Fencing of BOAs to exclude grazing of domestic stock under normal situations.</p> <p>Active management of stock where “crash” grazing implemented.</p> <p>Management of native grazing as required.</p> <p>Use of plant tubes to protect seedlings from grazing.</p>	2L	25% loss of either remnant or regenerating vegetation identified through scheduled monitoring.	<p>Increase monitoring frequency at the area effected</p> <p>Implement appropriate action to reverse trend</p> <p>Supplement with direct seeding and/or tube stock planting as required</p>
			Complete loss/failure of revegetated areas	<p>Review and augment fencing</p> <p>Implement additional pest control measures (including culling in consultation with authorities)</p> <p>Extend revegetation program timeframe</p>
Damage from unauthorised entry into BOAs	<p>Fencing of BOAs, with inspection and maintenance program implemented.</p> <p>Lock gates at access points with access managed by the environmental department, where possible.</p> <p>Motion activated security cameras as required.</p>	4L	Damage leads to widespread reduction in landscape/vegetation quality and condition	<p>Review and augment fencing and access security (including use of video surveillance or security patrols where practicable)</p> <p>Remediate damage</p>
Competition from other native vegetation – e.g. other native species invading designated offset CEEC areas	<p>Targeted monitoring program.<sup>1</sup></p> <p>Implementation of select control program to remove invasive native species in early phases of the revegetation programs</p> <p>Maintain contingency supplies of seed for key native species.</p>	5L	Complete loss/failure of regenerating/revegetated WBGW areas	<p>Extend regeneration program timeframe</p> <p>Supplement regeneration with direct seeding and/or tube stock planting</p> <p>Implement targeted invasive species control measures</p>

<sup>1</sup> Some non-EEC volunteer species may assist in the long term reestablishment of EEC. The monitoring program should identify if a species is potentially going to hinder EEC establishment.

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Risk	Risk Controls	Risk Rating	Trigger	Contingency measures
Incompatible neighbouring land owner practices leading to failure of regeneration/revegetation areas	<p>Communicate the BOMP with neighbouring properties and local community, where appropriate.</p> <p>Fencing of BOAs, with inspection and maintenance program implemented.</p> <p>Lock gates at access points with access managed by the environmental department, where possible.</p>	4L	Damage leads to widespread loss/failure of regenerating/revegetated areas	<p>Develop and implement neighbour communication strategy</p> <p>Review and augment fencing and access security</p> <p>Extend regeneration program timeframe</p> <p>Supplement regeneration with direct seeding and/or tube stock planting</p>
Insufficient provision and allocation of resources (financial, human, equipment, etc) resulting in delayed achievement of performance targets or completion criteria	<p>Budgetary allocation sufficient to cover requirements with resources available to implement BOMP.</p> <p>Corporate support to meeting all regulatory requirements.</p>	5L	Underperforming achievement against performance targets or completion criteria in more than three successive years	Allocate adequate additional resources
Inadequate or insufficient (incorrect species mix/quality) seed/seedlings for enhancement/revegetation of the BOAs	<p>Species list reflective of target vegetation community.</p> <p>Use of local provenance seed and/or seedlings.</p> <p>Depending upon seed viability may require identification of suitable alternate seed sources.</p> <p>Seed collectors are familiar with the species for which seed is required.</p> <p>Use of experienced/licensed seed propagating facility</p>	4L	Widespread failure of target species within regenerating/revegetated areas	<p>Source and maintain adequate and suitable stocks of seed from target species</p> <p>Implement additional seedling propagation program</p>
Limited availability of contractors and/or equipment to undertake land management works	<p>Develop relationship with variety of specialty contractors.</p> <p>MCO have equipment and operators available in the event that contractors are unavailable.</p>	2L	Underperforming achievement against performance targets or completion criteria in more than three successive years	<p>Allocate adequate additional resources</p> <p>Engage alternate land management contractors/specialists</p>

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## 6 ECOLOGICAL MONITORING

### 6.1 OBJECTIVES

The management of BOAs is designed to be part of an adaptive management framework to achieve conservation objectives. The objective of the ecological monitoring program is to evaluate the vegetation and fauna habitat condition within the BOAs (including recovery and or enhancement of native vegetation within the BOAs) and to identify appropriate management actions to be applied, where required. This data is additional to monitoring against the Completion Criteria (Section 4.2) although can be used in support if required.

The additional flora and fauna monitoring has been designed to track the performance of the following management actions (to enable the BOAs to achieve the Completion Criteria described in Section 4.2):

- DNG condition and woodland restoration. (Note these areas will be given time to naturally regenerate in the short term period, e.g. first three years, after which specific revegetation actions may be required within MZ2b areas).
- Revegetation of MZ2b areas.
- Noxious and environmental weed controls.
- Vertebrate pest controls.

### 6.2 FLORA & FAUNA PERFORMANCE TARGETS

**Table 18** outlines additional performance targets (i.e. additional to **Tables 5 – 14**) targeted specifically at flora and fauna monitoring. As indicated the focus in the first three years is to develop a suitable monitoring program, review and collect additional base line data (where required) and review and revise performance targets for subsequent years.

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MCO_ENV_PLN_0034	1	12/12/2014	17/12/2014	31/12/2019	MCO	S Archinal

**Table 18: Flora and Fauna Management Performance**

Action	Performance Measure	Performance Target (PT) (By Year 3)
Map vegetation and monitoring stratification units	N/A	Complete in year 1
Select monitoring site replicates and develop monitoring program	N/A	Complete in year 1
Floristic and biometric monitoring	SD	Undertake floristic and biometric monitoring, as per below, or as per subsequent monitoring report recommendations. For each performance measure, develop PT (achievable target in following three years).
	NTC	
	NMC	
	NGC	
	EC	
Noxious and environmental weed monitoring	Weed species impact area	Conduct visual inspections for weeds Undertake weed mapping showing species and areas of impact in year 1 and at least every three years to allow for targeted control Develop PT (achievable target in following three years) for each key weed species
Fauna monitoring	Bird and Microbat diversity and abundance/activity trends	Undertake spring fauna monitoring in DNG and reference/analogue sites, as per below or as per subsequent monitoring report recommendations. Develop list of key indicator bird and bat species representative of DNG and woodland/forest assemblages to allow comparisons and monitoring assemblage trends of DNG sites
Vertebrate pest monitoring	Vertebrate pest monitoring program	Complete in year 1
	Vertebrate pest populations	Develop PT (achievable target in following three years) for each key vertebrate pest population
	Vertebrate pest impact area	Develop PT (achievable target in following three years) for impact area of each key vertebrate pest species

Key: SD= Native Species Diversity; NTC=Native Tree Cover; NMC= Native Mid-storey Cover; NGC= Native Ground Cover; EC= Exotic Species Cover.

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### 6.3 FLORA AND FAUNA MONITORING METHODS

Field survey monitoring will be conducted annually in autumn and/or spring during the initial three years, with monitoring results being reviewed annually to inform the level of monitoring and frequency required in successive years, as well as informing review of implemented management practices. In addition, visual and opportunistic inspections of BOAs will be carried out to detect other factors that may be contributing to vegetation and land disturbance in these areas.

Flora and fauna monitoring will be undertaken by suitability qualified and experienced personnel.

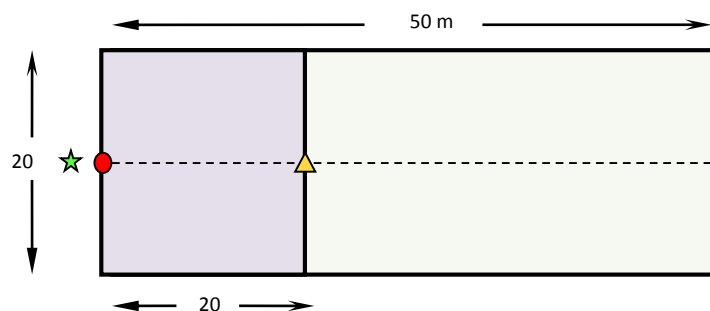
#### 6.3.1 Flora Monitoring

Floristic monitoring in permanent plots will include photo monitoring. The location of permanent plots will be determined in conjunction with the results of vegetation mapping and development of the monitoring program in year 1.

Monitoring plots will be established within areas defined as DNG or cleared as well as in analogue or near pristine vegetation types that are representative of the DNG or cleared area target communities. Plots will be located applying a stratified random sampling regime based on assumed vegetation type and condition (DNG and cleared/exotic grassland will be mapped according to their predicted community, based upon surrounding vegetation types and landscape position).

Floristic monitoring will be undertaken at a minimum of one monitoring site per stratification unit (i.e. DNG/cleared unit stratified into target vegetation type or analogue/near pristine vegetation type) within each offset area (Note monitoring site replicates of stratification units should take in to account the area and condition of the units). Data collected at each floristic monitoring site is to include:

- Full floristic surveys of the 20m x 20m nested plot (**Figure 11**) using Braun and Blanquet cover abundance scores for each species
- Biometric plot data within a 20m x 50m plot (**Figure 11**).



(★●▲ photo monitoring points)

**Figure 11: Plot Design**

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### 6.3.2 Fauna Monitoring

The fauna monitoring program will focus on collecting data that can inform assessment against the targets in **Table 19** (i.e. allow for comparison of DNG versus woodland/forest reference sites via trends over time).

Fauna monitoring will be undertaken to target key fauna indicator species. Key fauna indicator species will include woodland birds, microbats and reptiles. Trends in species diversity and numbers should show a trajectory towards the diversity and numbers within analogue sites. Evidence of fauna habitat utilisation will also be monitored over time, with roosting and nesting habitat monitored for birds and microbats.

Fauna monitoring will focus on fauna assemblages that are good indicators of improvements in habitat structure, with birds and microbats being the primary focus. Other assemblages will also be targeted to inform general site diversity, including reptiles and nocturnal fauna. **Table 19** provides the minimum fauna survey methods to be applied in the monitoring.

**Table 19: Fauna Monitoring Methods at Each Location**

Method	Detail	Frequency	Target Season <sup>1</sup>	Location
Spotlighting	Pedestrian/vehicle spotlight survey, 2 nights at each BOA. Targets nocturnal mammals, birds, reptiles and amphibians.	Annually	Spring	Representation of all strata
Call playback	Nocturnal broadcasting of calls, two nights at each site in conjunction with spotlighting. Targets nocturnal birds.	Annually	Spring	As necessary
Bat detection	Anabat recordings to identify microbat species occurring on site. 2 nights at each site	Annually	Spring	Representation of all strata
Bird survey	Timed, fixed area surveys for diurnal birds, observing and listening.	Annually	Spring Winter (targeting winter flowering Eucalyptus areas)	Representation of all strata
Introduced Fauna	Remote cameras will be used to identify feral animal population size within each BOA. 4 remote cameras will be set up along a transect line within each BOA.	Annually	Spring	Representation of all strata
Other targeted fauna survey methods	A range of targeted fauna survey methods may also be used (e.g. Funnel traps, Elliot trapping, cage trapping, hair funnels and pit fall traps), depending on habitat, to sample the broader fauna assemblage as part of base line or general biodiversity survey. This would be focussed on gaining an understanding of the fauna assemblage, rather than acquiring data for analysis of monitoring trends. Monitoring methods that may be implemented are outlined below. The selection/use of these additional methods would be determined by MCO based on advice from an appropriately qualified person.			

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Method	Detail	Frequency	Target Season <sup>1</sup>	Location
	<p><b>Elliott &amp; Cage Trapping</b> Small traps placed in straight lines on the ground and mounted on trees, primarily to target small and medium sized ground-dwelling and arboreal mammals. Traps set for 4 consecutive nights.</p>	1st year baseline	Spring	Representation of all strata except DNG
	<p><b>Hair Funnels</b> At each site for a minimum of 4 nights and possibly set in habitat trees if present. These target small and medium sized mammals.</p>	1st year baseline	Spring	Representation of all strata
	<p><b>Pit Fall Trapping</b> Pit fall traps (with drift fences) may be established and set for a period of 5 days (where suitable soil types are present), primarily to target small and medium sized ground-dwelling and arboreal mammals.</p>	1st year baseline	Spring	Representation of all strata except DNG
Herpetological searches	Timed, fixed area, direct searches for reptiles, scanning surfaces, rolling logs and rocks and raking leaf litter.	Annually	Spring	Representation of all strata
Collection of scats	Collect scats and send to laboratory for analysis of predator and prey species.	In line with other activities	Year round	Representation of all strata
Biannual visual inspections (particularly feral animal numbers)	Inspections by MCO.	Quarterly or in response to incidents, e.g. bushfire	Year round	Representation of all strata

1 Work may be done outside of this timing if deemed appropriate by a suitably qualified or experience person.

The results of monitoring will be analysed, comparing DNG versus woodland/forest reference sites and with previous years results. In the event that negative trends are detected, appropriate amelioration measures will be considered.

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If new populations of existing threatened species or additional threatened species are identified through the course of monitoring or other observations, records will be assessed by a qualified ecologist to advise on any changes required to the management of the BOAs. This may result in:

- planned activities being postponed or modified; and/or
- modification of the monitoring program.

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## 7 REVIEW, REPORTING AND AUDITS

### 7.1 PLAN IMPLEMENTATION RESPONSIBILITIES

**Table 20** summarises key responsibilities of relevant site personnel relating to the implementation of this BOMP.

**Table 20: BOMP Responsibilities**

Position	Tasks
General Manager	Take overall leadership and responsibility for compliance with all environmental approvals
	Provide adequate resourcing (personnel and financial) to enable full implementation of the BOMP
	Approve subsequent revisions of this Plan
Environment and Community Manager	Report any land related incidents in accordance with legal requirements
	Identify land management risks and budget for sufficient resources to effectively manage those risks
	Provide training to all employees and contractors in environmental awareness, legal responsibilities and land management methods
	Restrict access to BOAs
	Oversee communication of conditions of approval to relevant site personnel and contractors
	Oversee implementation of the BOMP
	Oversee all regulatory reporting in relation to the BOMP
	Coordinate relevant reviews of the BOMP
Environment and Community Coordinator	Coordinate implementation of the BOMP
	Coordinate regulatory reporting in relation to the BOMP
	Coordinate revegetation of native vegetation in BOAs
	Coordinate ecological monitoring program for the BOAs
	Evaluate results of monitoring programs and longer trends and where appropriate recommend changes to management
	Coordinate internal and external reporting on the performance of land management within BOAs
	Coordinate annual slashing of cleared areas (where appropriate) to reduce annual exotic species
	Coordinate seed collection for revegetation works within the BOAs
	Coordinate weed and feral animal surveys and control programs within the BOAs

Management actions beyond the scope of this BOMP may be carried out at the discretion of the Environment and Community Manager as long as they are consistent with this BOMP. Any actions not consistent with the approved BOMP will require the prior written approval of the Minister.

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## 7.2 REVIEW

This BOMP will be reviewed by the ECM and, where necessary, updated following:

- An independent environmental audit which recommends changes to the BOMP.
- A request from the Minister of the Environment to update the BOMP.

The ECM (or delegate) will be responsible for the implementation of the BOMP as well as the implementation of any revisions of the BOMP resulting from consultation.

## 7.3 REPORTING

As per condition 10 of EPBC Approval 2013/6926 *“Within three months of every 12 month anniversary of the commencement of the action, the approval holder must publish a report on their website addressing compliance with each of the conditions of this approval.”*

Details of implementation of the management actions proposed within this management plan will be provided within this report. The Compliance Review will provide a summary of all the actions implemented during the previous year. Any significant events that occurred during the year (e.g. wildfire, outbreak of any weeds or incidence of any new threats) and any recommended changes to the management actions, their duration, intensity or relative priority identified through the annual review will be included. These details will be published as part of the MCO Annual Review..

Documentary evidence showing proof of the date of publication will be provided to the Department of the Environment at the same time that the compliance report is published.

All internal and external reporting will be done in accordance with the MCO’s Environmental Management Strategy.

Within 1 month of approval of this BOMP, a copy will be made available on the MCO website.

## 7.4 AUDITING

An independent audit against the EPBC approval conditions (2013/6926) may be initiated by the Minister for the Environment at any time. MCO will undertake an audit against these conditions if requested. The independent auditor to be used is to be approved by the Minister for the Environment prior to the audit commencing. Audit criteria to be used will be agreed to by the Minister for the Environment and be audited against the criteria identified to a level deemed satisfactory by the Minister for the Environment.

## 7.5 RECORD KEEPING

MCO will maintain accurate records of all activities associated with the conditions of EPBC Approval 2013/6926 as per Condition 9 of the approval. Records to be kept include measures that have been taken to implement this BOMP.

MCO will make these records available to the Department of the Environment when requested. These records may undergo audit as per section 458 of the EPBC Act, or used to determine compliance of activities with the conditions of approvals. The results of any audits undertaken may be published on the Department’s website or through the general media.

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## REFERENCES

Environmental Protection and Biodiversity Conservation Approval - EPBC 2013/6926

Florabank 2000 Florabank Guideline 1 - Native seed storage for revegetation  
Florabank Guideline 2 - Basic methods for drying, extraction and cleaning native plant seed  
Florabank Guideline 3 - Improving on basic native seed storage  
Florabank Guideline 4 - Keeping records on native seed  
Florabank Guideline 5 - Seed collection from woody plants for local revegetation  
Florabank Guideline 6 - Native seed collection methods  
Florabank Guideline 7 - Seed production areas for woody native plants  
Florabank Guideline 8 - Basic germination and viability tests for native plant seed  
Florabank Guideline 9 - Using native grass seed in revegetation  
Florabank Guideline 10 - Seed collection ranges for revegetation

Eco Logical Australia (2013). *Revised Moolarben Coal Project Stage 1 – Optimisation Modification Project Biodiversity Offset Strategy and Proposed Offset Package*. Prepared for Moolarben Coal Operations.

Department of Environment and Climate Change (2008) *Vegetation Condition Benchmarks* Website: <http://www.environment.nsw.gov.au/projects/BiometricTool.htm> Date Retrieved 23/4/12.

Mid-Western Regional Council (MWRC) (2014). *Local Weed Control Management Plan – For Class 4 Noxious Weeds*.

NSW Rural Fire Service, 2006. *Bushfire Environmental Code for New South Wales*.

Rawlings *et al.* (2010). *A Guide to Managing Box Gum Grassy Woodlands*.

Document	Version	Issue	Effective	Review	Author	Approved
MCO_ENV_PLN_0034	1	12/12/2014	17/12/2014	31/12/2019	MCO	S Archinal

## DEFINITIONS

AR	Annual Review and report required under condition 10 to EPBC 2013/6926
BOMP	Biodiversity Offset Management Plan (this plan)
BFMP	Bushfire Management Plan
CEEC	Critically Endangered Ecological Community
Department	Department of the Environment
DNG	Derived Native Grassland component of WBGW
DotE	Department of the Environment
ECM	Environment and Community Manager of MCO
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
ha	hectares
MCO	Moolarben Coal Operations Pty Limited
MCP	Moolarben Coal Project
OEH	Office of Environment and Heritage. Formerly the Department of Environment, Climate Change and Water (DECCW), and previously the Department of Environment and Climate Change (DECC) and Department of Environment and Conservation (DEC) and National Parks and Wildlife Service (NPWS).
RFS	Rural Fire Service
WBGW	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

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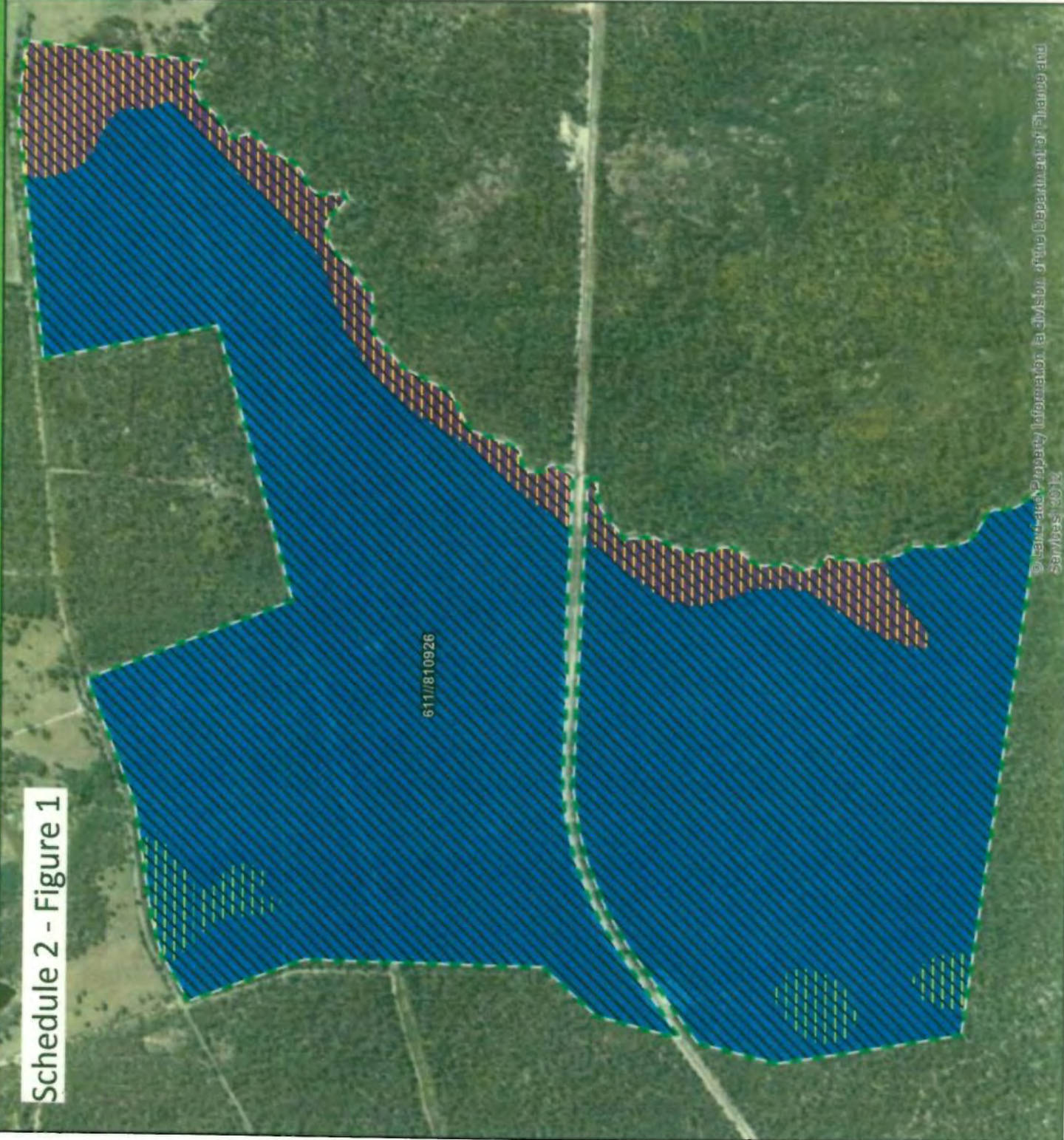


## APPENDIX 1

### EPBC 2013/6926 SCHEDULE 2 – OFFSET AREAS

Document	Version	Issue	Effective	Review	Author	Approved
MCO_ENV_PLN_0034	1	12/12/2014	17/12/2014	31/12/2019	MCO	S Archinal

Schedule 2 - Figure 1



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**Legend**

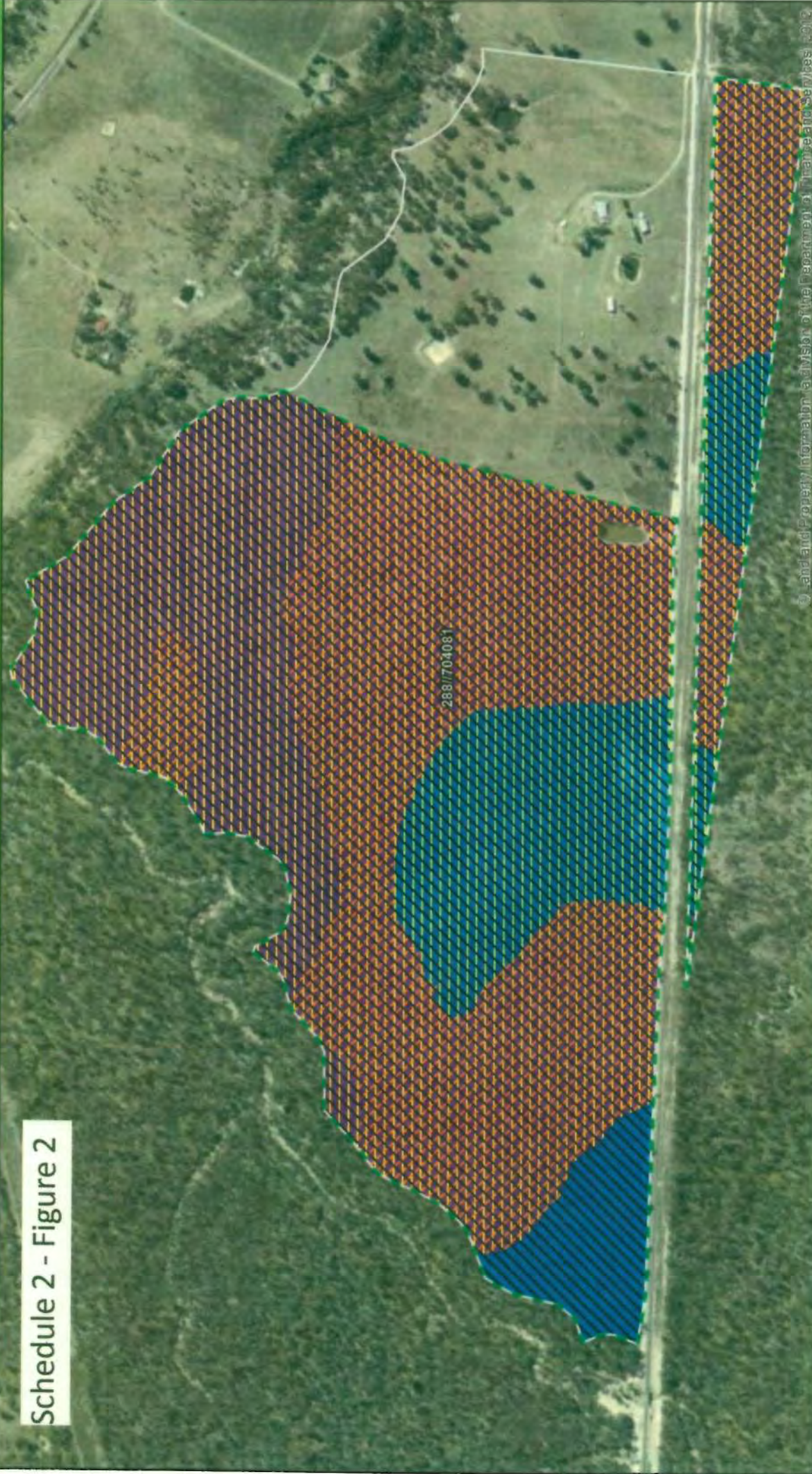
-  Clarke Offset Area
-  Property Cadastre
- EPBC Species Habitat**
-  Regent Honeyeater
-  Swift Parrot
-  Koala
-  Large-eared Pied Bat
-  Long-eared Bat
-  Spotted-tailed Quoll



Projection: GDA 1994 MGA Zone 56



Schedule 2 - Figure 2



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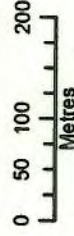
**Legend**

Clifford Offset Area  
Property Cadastre

**EPBC Communities and Species Habitat**  
White Box-Yellow Box-Blakely's Red Gum Grassy  
Woodland and Derived Native Grassland

Koala  
Large-eared Pied Bat  
Long-eared Bat  
Spotted-tailed Quoll

Regent Honeyeater  
Swift Parrot



Projection: GDA 1994 MGA Zone 55



Schedule 2 - Figure 3

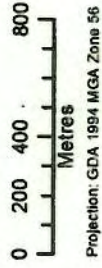


**Legend**

Bobadeen Offset Areas  
Property Cadastre

**EPBC Communities and Species Habitat**  
 White Box-Yellow Box-Blakely's Red Gum Grassy  
 Woodland and Derived Native Grassland  
 Regent Honeyeater  
 Swift Parrot  
 Koala

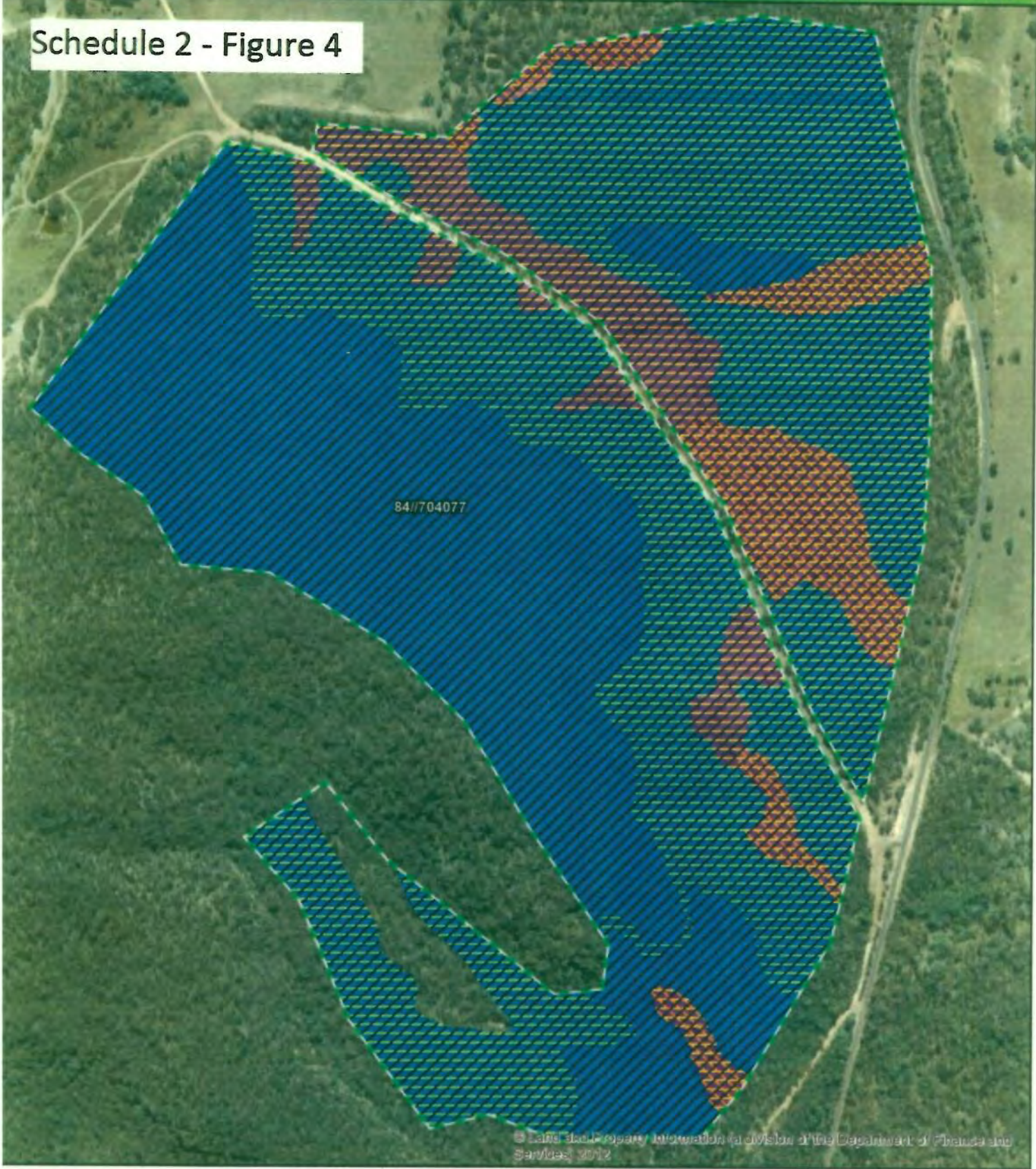
Large-eared Pied Bat  
 Long-eared Bat  
 Spotted-tailed Quoll



Projection: GDA 1994 MGA Zone 56



Schedule 2 - Figure 4

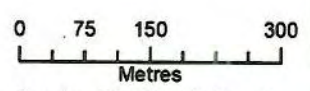


**Legend**

Elward Offset Area

Property Cadastre

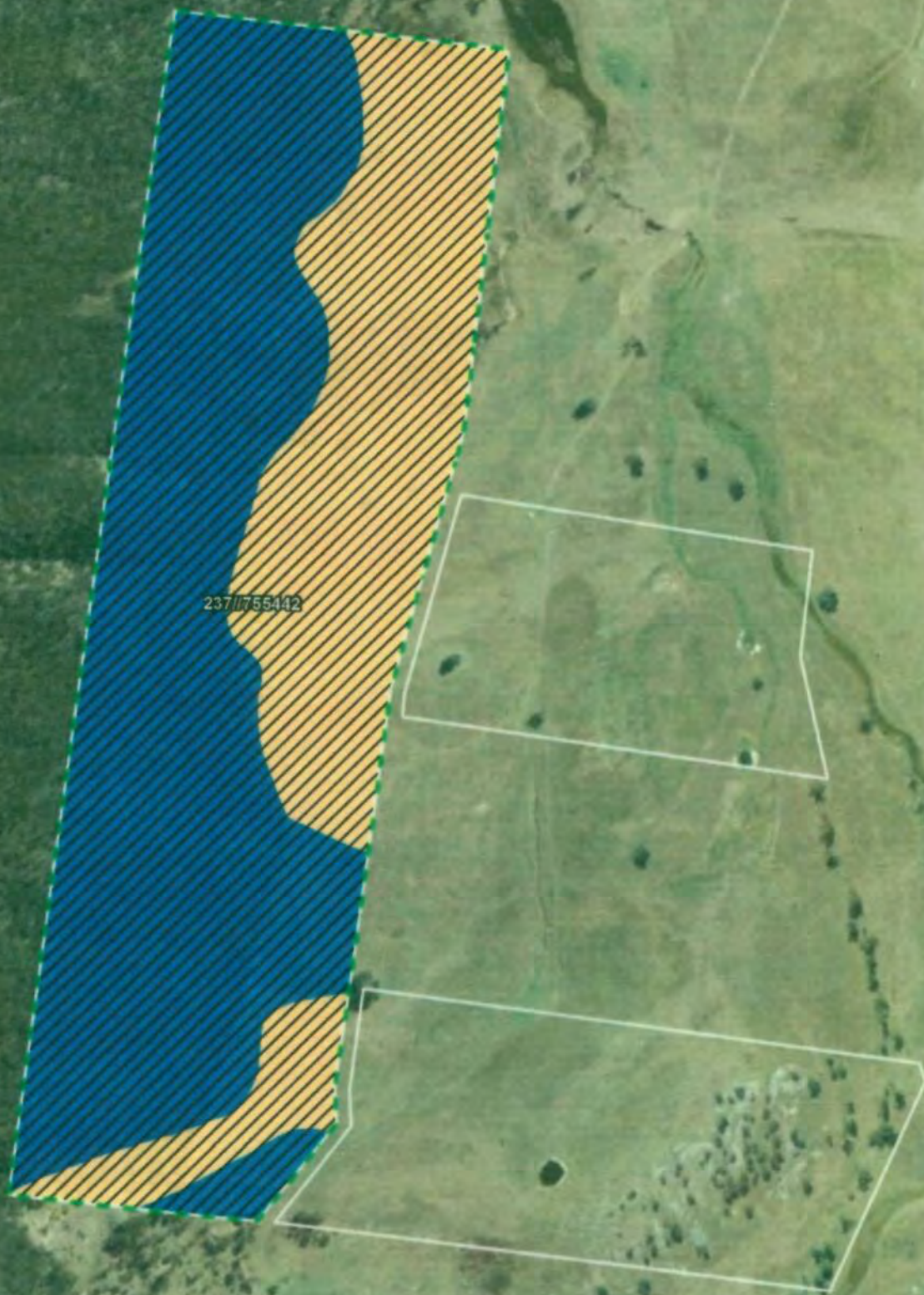
- EPBC Communities and Species Habitat**
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
  - Regent Honeyeater Swift Parrot
  - Koala
  - Large-eared Pied Bat Long-eared Bat
  - Spotted-tailed Quoll



Projection: GDA 1994 MGA Zone 56



Schedule 2 - Figure 5



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**Legend**

Property 5 Offset Area  
 Property Cadastre

**EPBC Communities and Species Habitat**

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Regent Honeyeater Swift Parrot
- Large-eared Pied Bat
- Long-eared Bat
- Koala
- Spotted-tailed Quoll

0 50 100 200  
 Metres

Projection: GDA 1994 MGA Zone 56



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 AUSTRALIA

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## APPENDIX 2

### BOMP APPROVAL CORRESPONDENCE

Document	Version	Issue	Effective	Review	Author	Approved
MCO_ENV_PLN_0034	1	12/12/2014	17/12/2014	31/12/2019	MCO	S Archinal

SITE: 4250 Ulan Road, Ulan NSW 2850  
POSTAL: Locked Bag 2003 Mudgee NSW 2850  
PHONE: +61 2 6376 1500  
FAX: +61 2 6376 1599  
WEBSITE: www.moolarbencoal.com.au  
ABN: 59 077 939 569

26 November 2014

Post Approvals Section  
Commonwealth Department of the Environment  
GPO Box 787  
CANBERRA ACT 2601

Attention: Peter Blackwell

Dear Peter,

**RE: MOOLARBEN COAL PROJECT STAGE 1 MODIFICATION (EPBC 2013/6926) COMPLIANCE WITH CONDITIONS 6 & 7**

Condition 6 of EPBC Approval 2013/6926 states:

*To compensate for the loss of 16.5 hectares of the White Box-Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (WBGW) ecological community and 171.4 hectares of habitat for EPBC listed threatened species, the **approval holder** must secure the lands identified as the Offset Areas at Schedule 2 (Figures 1-5) of this notice as a biodiversity offset by a legal instrument under relevant nature conservation legislation on the title of the land. This instrument must:*

- a. provide for the protection of the land in perpetuity;*
- b. prevent any future development activities, including mining and mineral extraction; and*
- c. ensure the active management of the land.*

*The **approval holder** must not **commence** the action until the **Department** has approved the proposed instrument in writing.*

In accordance with Condition 6 of EPBC Approval 2013/6926 and consistent with the *EPBC Act Environmental Offsets Policy*, Yancoal proposes to secure the individual offset properties through a conservation covenant and restriction of use instrument. Both of these instruments would be registered on the title of the land under Section 88E(3) of the *Conveyancing Act 1919*.

Condition 7 of the EPBC Approval 2013/6926 states:

*The **approval holder** must provide evidence to the **Department** of their compliance with Condition 6, along with the **offset attributes, shapefiles** and textual descriptions and maps to clearly define the location and boundaries of the offset sites, prior to the **commencement** of the action.*

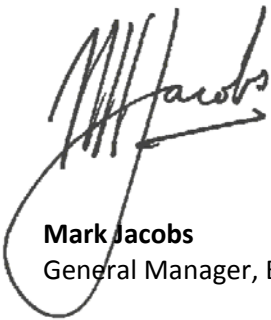


In accordance with Condition 7 of EPBC Approval 2013/6926, please find enclosed maps which clearly define the location and boundaries of the offset properties. Also enclosed with this letter is a Compact Disc containing the offset attributes and shapefiles of the offset properties.

As previously discussed, commencement of this Action is critical to the continuity of operations at Moolarben. In order to confirm that this condition has been satisfied, could you please confirm that the Department is satisfied with the proposed security instrument?

Please do not hesitate to contact me should you wish to discuss.

Yours sincerely,

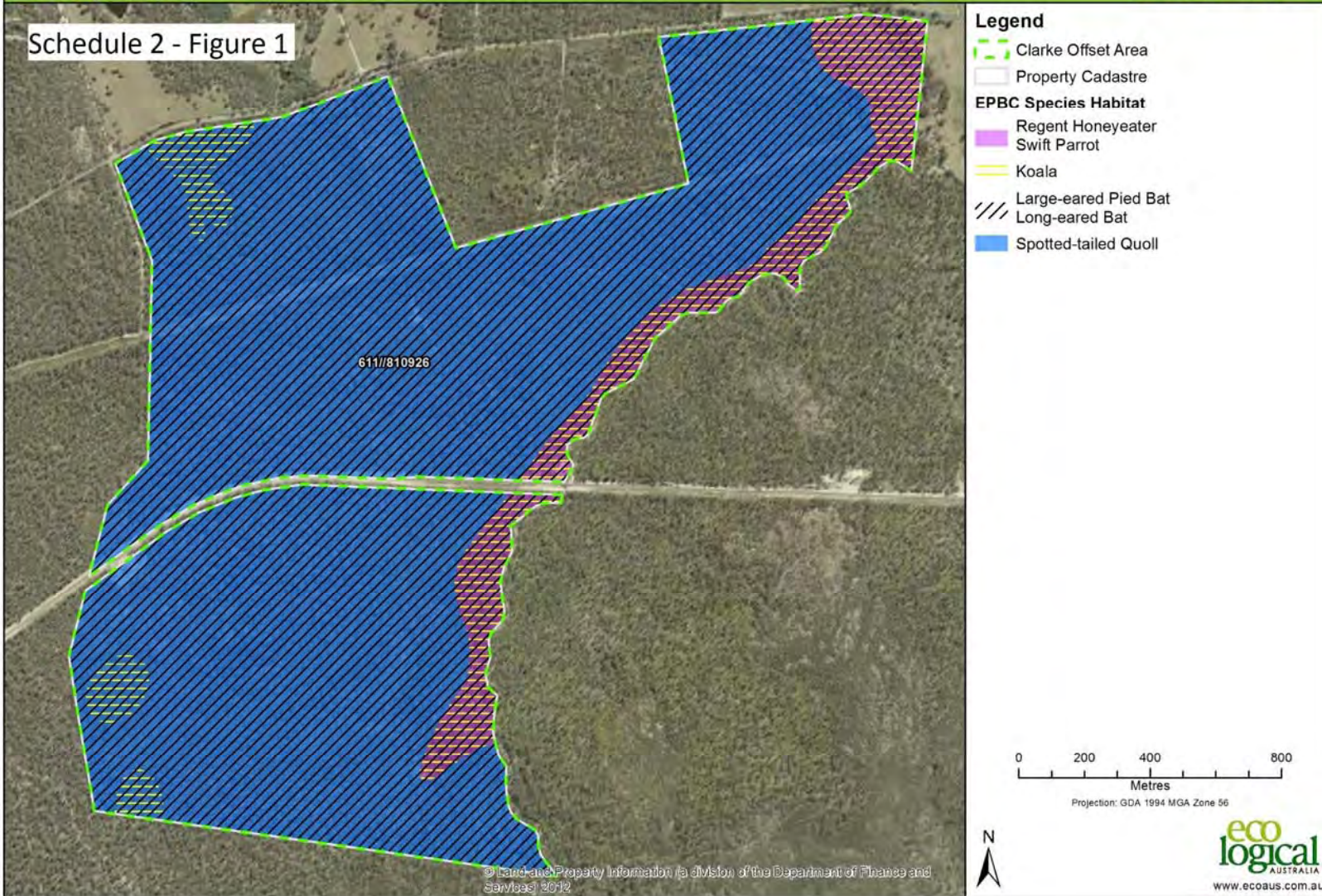
A handwritten signature in black ink, appearing to read 'Mark Jacobs', with a large, stylized flourish underneath.

**Mark Jacobs**  
General Manager, Environment & Community

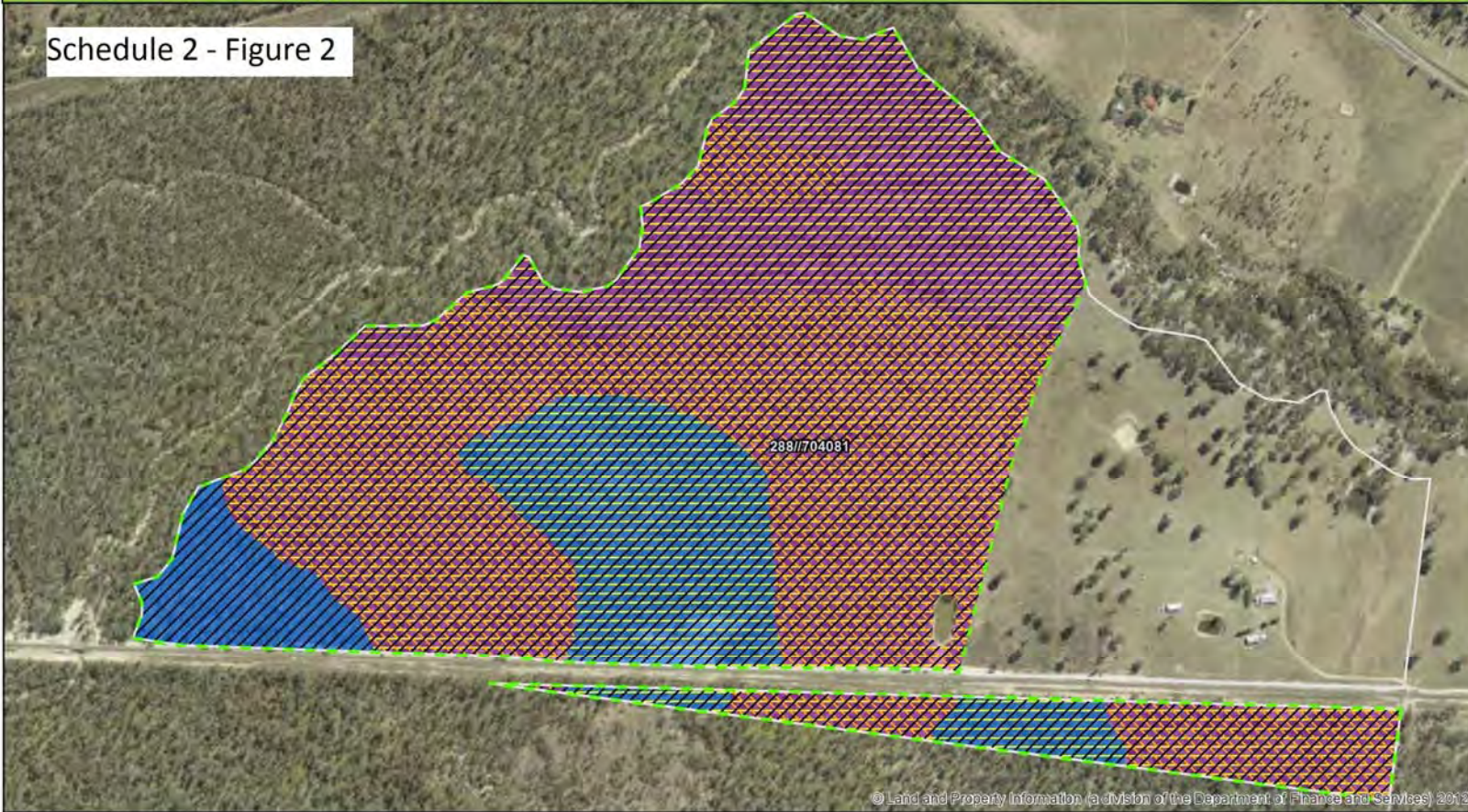
**ENCLOSURE A**

**MAPS**

Schedule 2 - Figure 1



Schedule 2 - Figure 2



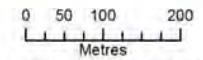
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**Legend**

- Clifford Offset Area
- Property Cadastre

- EPBC Communities and Species Habitat**
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
  - Regent Honeyeater
  - Swift Parrot

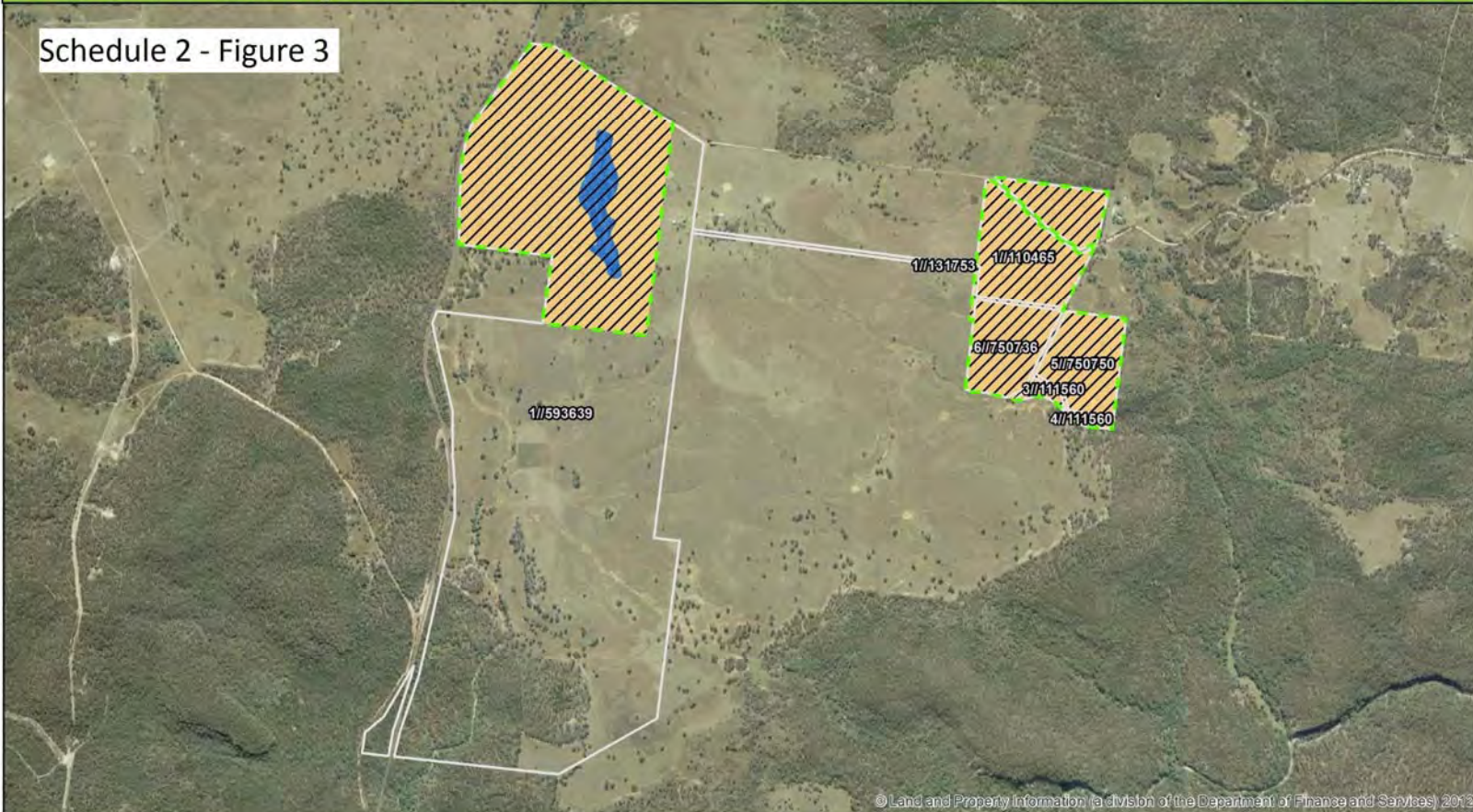
- Koala
- Large-eared Pied Bat
- Long-eared Bat
- Spotted-tailed Quoll



Projection: GDA 1994 MGA Zone 56



Schedule 2 - Figure 3



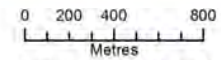
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**Legend**

- Bobadeen Offset Areas
- Property Cadastre

- EPBC Communities and Species Habitat**
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
  - Regent Honeyeater
  - Swift Parrot
  - Koala

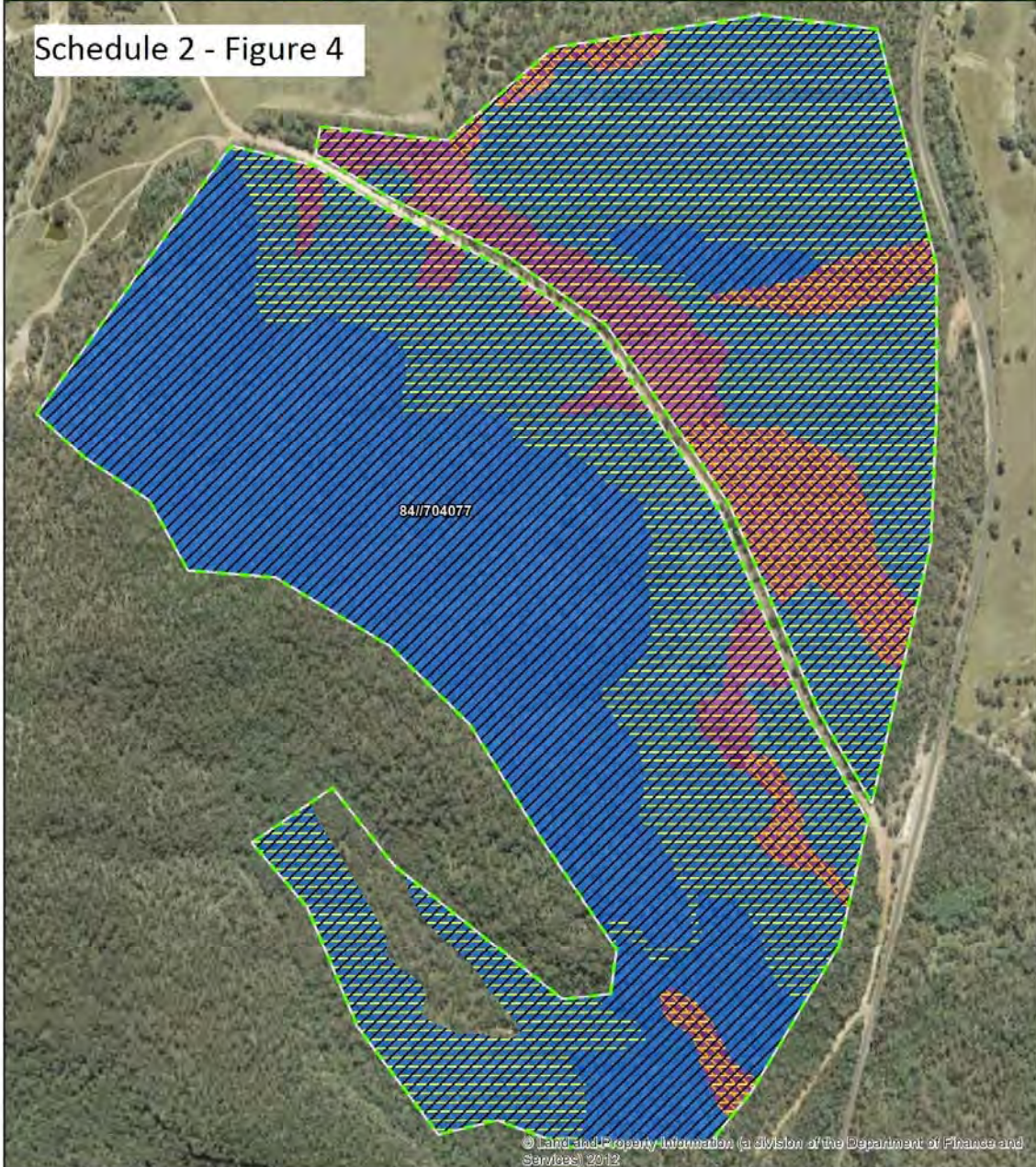
- Large-eared Pied Bat
- Long-eared Bat
- Spotted-tailed Quoll



Projection: GDA 1984 MGA Zone 56



Schedule 2 - Figure 4



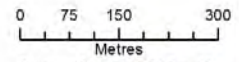
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**Legend**

- Elward Offset Area
- Property Cadastre

**EPBC Communities and Species Habitat**

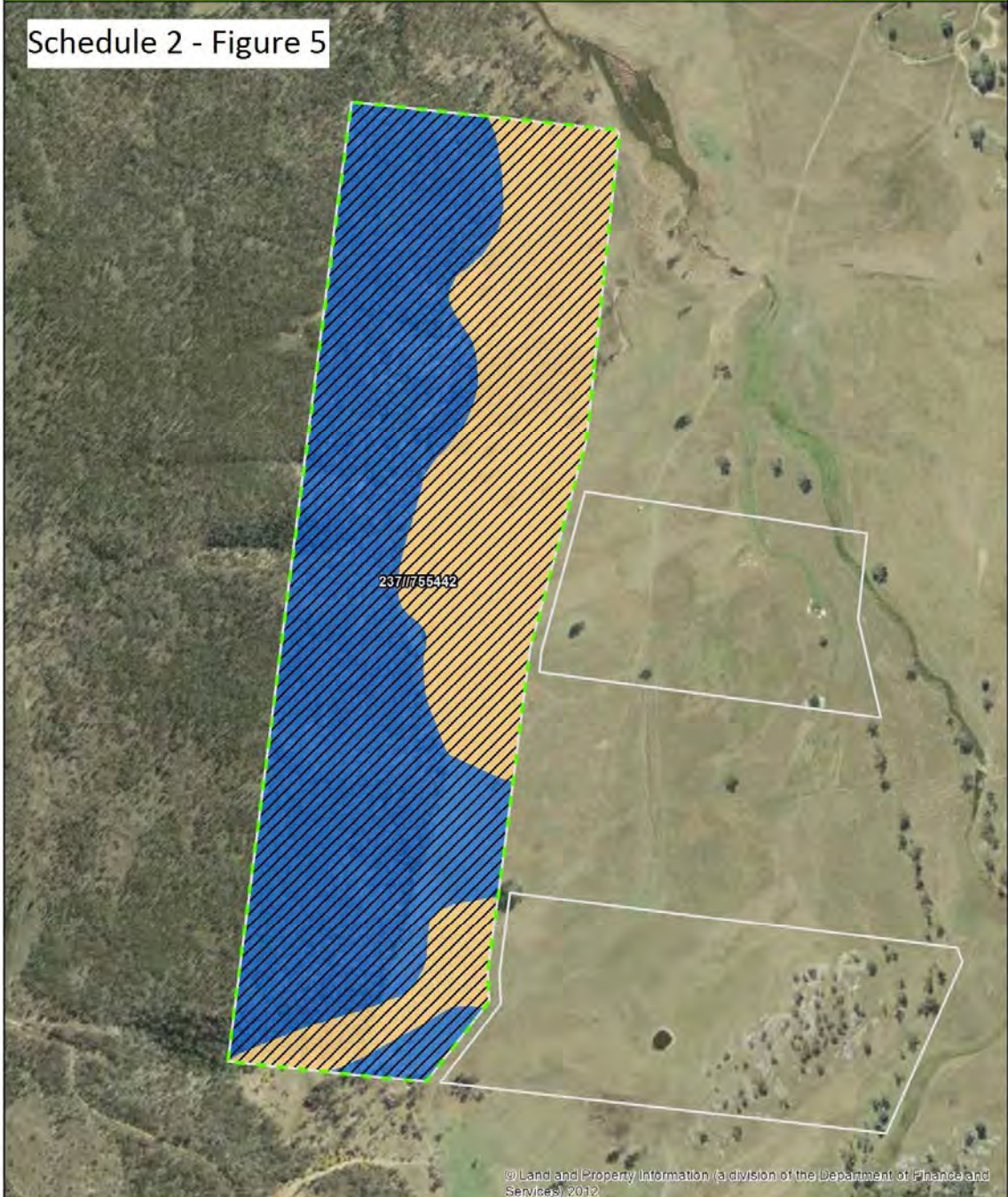
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Regent Honeyeater Swift Parrot
- Koala
- Large-eared Pied Bat Long-eared Bat
- Spotted-tailed Quoll



Projection: GDA 1994 MGA Zone 56



Schedule 2 - Figure 5

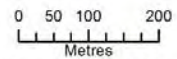


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**Legend**

- Property 5 Offset Area
- Property Cadastre

- EPBC Communities and Species Habitat**
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
  - Regent Honeyeater Swift Parrot
  - Large-eared Pied Bat
  - Long-eared Bat
  - Koala
  - Spotted-tailed Quoll



Projection: GDA 1994 MGA Zone 56





Mark Jacobs  
General Manager, Environment, Approvals and Community Relations  
Moolarben Coal  
Locked Bag 2003  
MUDGEE NSW 2850

Dear Mr Jacobs

**Moolarben Coal Project Stage 1 Modification (EPBC 2013/6926) –  
Biodiversity Offset Management Plan  
Vegetation Clearance Protocol and Landscape Management Plan and  
Proposed Instrument to Secure the Offset Areas**

I refer to your correspondence of 25 November and 3 December 2014 requesting approval of the above plans and protocol as required under conditions 2 and 4 of EPBC Approval 2013/6926.

The above plans have been reviewed by officers of the Department and have been found to meet the requirements of conditions 2 and 4 of EPBC Approval 2013/6926. On this basis, and as delegate of the Minister, I have decided to approve the above plans. In doing so I draw your attention to the requirements of condition 9 of this approval to maintain accurate records substantiating all activities associated with these conditions including measures taken to implement the above plans.

In accordance with condition 5 of EPBC approval 2013/6926, the Biodiversity Offset Management Plan must be published on your website within one month of this approval and remain published there for at least five years thereafter.

In accordance with conditions 3 and 5 of EPBC approval 2013/6926, the approved plans must be implemented. Under conditions 13, if Moolarben Coal wants to act other than in accordance with the approved plan, Moolarben Coal must submit a revised plan for approval. Until the Minister (or his delegate) has approved a revised plan, Moolarben Coal must continue to implement the original plan.

I am informed that you have also submitted to the Department shapefiles which define the boundaries of the proposed offset sites and a file containing the offset attributes, in accordance with the requirements of conditions 6 and 7 of EPBC approval 2013/6926.

I also refer to your letter of 26 November 2014 in which you advise that Moolarben Coal proposes to use a conservation covenant and restriction of use instrument to be registered on the title of the land as the instrument by which the Moolarben Coal Project Stage 1 Modification Biodiversity Offsets are to be protected. I have approved this as the instrument required under condition 6 of EPBC approval 2013/6926.



Should you require any further information please contact Mr Rod Whyte, Director,  
Post Approvals Section, on 02 6275 9934 or by email: [rod.whyte@environment.gov.au](mailto:rod.whyte@environment.gov.au).

Yours sincerely



Shane Gaddes  
Assistant Secretary  
Compliance and Enforcement Branch  
17 December 2014

### APPENDIX 3

#### THREATENED SPECIES HABITAT AND COMMUNITY CONDITION AND EPBC OFFSET CALCULATOR TOOL INPUTS AND RESULTS (SOURCE: ECOLOGICAL AUSTRALIA, 2014)

Document	Version	Issue	Effective	Review	Author	Approved
MCO_ENV_PLN_0034	1	12/12/2014	17/12/2014	31/12/2019	MCO	S Archinal

Michael Moore  
Manager, Planning Approvals  
Yancoal Australia Ltd  
Level 26, 363 George Street, Sydney, NSW, 2000  
13MUDENV-0002

11 July 2014

Dear Michael,

**Condition of Box-Gum Woodlands and threatened species habitat within proposed offset sites for the Moolarben Coal Project Stage 1 – Optimisation Modification Project**

This letter has been prepared to provide detailed descriptions of the quality and condition of the 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland' (here after referred to as 'Box-Gum Woodlands'(BGW)) and habitat for relevant threatened species occurring across the proposed impact and offset sites for the proposed Moolarben Coal Project (MCP) Stage 1 – Optimisation Modification Project (the proposed modification). Specifically, the condition of potential habitat for the threatened species, Large-eared Pied-bat (*Chalinolobus dwyeri*), South-eastern Long-eared Bat (*Nyctophilus corbeni*), Spotted-tailed Quoll (*Dasyurus maculatus*), Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*) and Koala (*Phascolarctos cinereus*), within the proposed offset sites is discussed consistent with section 2c of "How to use the offsets assessment guide" should the Commonwealth Department of the Environment form a view that residual significant impacts are likely for these species.

Details of the proposed modification and proposed offset sites are included within the Ecological Assessment report (EA report) prepared for the proposed modification (EMM 2013) and the Biodiversity Offset Strategy and Biodiversity Package (BOS; ELA 2013) which accompany the EA report. For the purposes of this letter and the attachments, the term 'impact area' refers to defined impacts of the proposed modification in the EA report (EMM 2013).

*Robert Humphries*

Robert Humphries  
**Eco Logical Australia**

## Box Gum Woodlands

The following sections outline the various site characteristics for the Box-Gum Woodland within the impact area and each of the proposed offset sites, consistent with the EPBC Act Environmental Offset Policy (DSEWPaC 2012). These characteristics have been used to undertake an assessment of the overall condition or quality of the Box-Gum Woodlands using the EPBC Act offset calculator.

From a review of the EPBC Act offset policy and the associated 'offsets assessment guide' ELA has generated suggested values for the attributes utilised in the offset calculator (**Appendix A** and **Appendix B**) and provided justification for these below. These values are based on ELA's knowledge of the calculator tool and have been undertaken in conjunction with Dr Steven Ward who has attended training sessions with the Department of Environment (DoE) on the application of the policy. We note that the policy states that the operation of the EPBC offset assessment guide is to be performed by expert users within the Department, but provide the suggested values based on our experience and knowledge of the proposed offset sites.

Habitat scores for Box-Gum Woodland were generated by combining scores for context and condition (based on 50% context and 50% condition), whilst for threatened species habitat scores were based on 30% context, 30% condition and 40% species stocking rate. Following the offset assessment guide requirements a rounding function was used to convert the numbers generated to a whole integer out of 10.

Habitat scores were calculated for each different state or form of Box-Gum Woodland within each of the proposed offset sites. Two forms of Box-Gum Woodland were recorded across the offset sites, namely:

- Derived native grassland (DNG) form with zero to very low canopy cover and with very high to moderate nativeness of plant groundcover. Equivalent to State 1B, 2B and 3B of Rawlings *et al.* (2010); and
- Woodland forms with canopy cover present (with varying amount of recruitment) and high to moderate native plant diversity and ground cover nativeness. Equivalent to States 1A, 2A and 3A of Rawlings *et al.* (2010).

Where multiple forms of Box-Gum Woodland were identified within an offset site, a separate habitat score was assigned for each form of Box-Gum Woodland.

### Impact area

Within the impact area for the proposed modification a total of 16.5 ha of Box-Gum Woodlands was identified that met the condition thresholds in the EPBC Act endangered ecological community listing advice (DEH 2006a). Two forms of Box-Gum Woodland were recognised within the impact area, a DNG (7.2 ha) and woodland form (9.3 ha; EMM pers. comm. 2013).

### Site Context:

The 16.5 ha of Box-Gum Woodland within the impact area occurs as a single contiguous stand located to the south of areas mined as part of Stage 1 of the MCP (see Figure 4.1 of the EA report). The Box-Gum Woodlands within the impact area adjoins (and includes) areas previously cleared for agriculture to the south and, and adjoins other native vegetation to the north and east (EMM 2013).

The previously cleared agricultural areas to the south and west of the Box-Gum Woodland in the impact area were identified as 'improved/cropped', although this includes some small isolated patches of Box-Gum Woodlands (Moolarben Biota 2006). The intact native vegetation to the north and east of the Box-Gum Woodland in the impact area, extends north-east towards Goulburn River National Park and has the potential to act as a partially fragmented regional corridor between Munghorn Gap Nature Reserve and Goulburn River

National Park (See Figure 4.3 of the EA report). Accordingly, the habitat scores for the impact area used a context component score of 6/10 for both the woodland and DNG forms of the Box-Gum Woodland.

Site Condition:

The site condition score for Box-Gum Woodland within the impact area was informed by the information included within the EA report (EMM 2013). The woodland form of the Box-Gum Woodland within the impact area was sampled by EMM (2013) within one biometric vegetation plot consistent with Schedule 2 of the Biobanking Assessment Methodology and Credit Calculator Operational Manual (DECC 2009). From the data collected in this plot, and the description of the vegetation community within the EA report, the woodland form of the Box-Gum woodland within the impact area can be summarised as:

- Including a canopy of *Eucalyptus albens* (White Box) and *Angophora floribunda* (Rough-barked Apple) with projected foliage cover of 24% recorded;
- Having an understorey dominated by grasses (foliage cover estimated at 57%) including *Rytidosperma monticola*, *Austrostipa verticillata* (Bamboo Grass) and *Poa sieberiana* (Snowgrass), with other understorey components including herbs, sedges and low shrubs occurring at low densities.
- Native species richness was generally low with only 11 species recorded across all structural layers within a 20 x 20 m area (EMM 2013). Furthermore, this patch was not identified as containing the high diversity required for small patches of Box-Gum Woodland [12 or more native understorey species, excluding grasses, and one 'important species' listed for Box-Gum Woodlands (DEH 2006a; DEH 2006b)], but rather formed part of the listed community due to its size (greater than 2 hectares with natural overstorey regeneration; EMM 2013).
- Exotic species cover was low with no exotic species recorded within the floristic plot;
- Regeneration of all canopy species was observed within the vegetation community; and
- Habitat elements including hollow bearing trees and fallen logs were present within the vegetation community.

Accordingly, the habitat scores for the impact area used a start condition component score of 7/10 for the woodland form of the Box-Gum Woodland.

The DNG form of the Box-Gum woodland within the impact area was not sampled within any floristic plots although is described by EMM (2013) and shown in **Plate 1**. Four 'important species' (DEH 2006b) were identified as occurring within the DNG form of Box-Gum Woodland, *Dichelachne micrantha* (Shorthair Plumegrass), *Desmodium varians* (Slender Tick-trefoil), *Themeda australis* (Kangaroo Grass) and *Glycine tabacina*. For the purposes of determining habitat scores, the Box-Gum Woodlands DNG was considered generally similar to the woodland form of this community, although lacking the canopy structural layer including hollow-bearing trees and fallen logs. Accordingly, the habitat scores for the impact area used a start condition component score of 5/10 for the Box-Gum Woodland DNG.

The future condition within the impact area with development was assigned a score of 0/10, with an expectation that all Box-Gum Woodlands within the impact area would be lost as part of the proposed modification.



**Plate 1: Box-Gum Woodland (DNG form) impact area (Source: EMM 2013)**

**Proposed Offset sites**

Details of each of the proposed offset sites are provided within the BOS (ELA 2013). **Figure 1** shows the locations of each of the proposed offset sites and **Table 1** outlines the areas of native vegetation and Box-Gum Woodlands within each of the proposed offset sites.

The following sections outline the habitat scores for Box-Gum Woodland for each of the proposed offset sites. It should be noted that no Box-Gum Woodland was identified within the Clarke offset site (**Table 1**).

**Table 1: Area of native vegetation, including Box-Gum Woodland within each proposed offset property**

Property	Vegetation Area		
	Woodland	DNG	Total
Clarke	317.3	15.3	332.7
Clifford	80.2 (44.1)	0.6 (0)	80.8 (44.1)
Elwood	170.8 (13.4)	-	170.8 (13.4)
Property # 5	42.4 (7.2)	21.6 (17.0)	64.0 (24.2)
Property # 24 & 25	25.1 (2.6)	38.5 (0.7)	63.5 (3.3)
Bobadeen	46.7 (38.8)	121.4 (121.4)	168.0 (160.2)
Moolarmoo	30.8 (4.8)	13.7 (13.7)	44.5 (18.5)
<b>Total</b>	<b>713.2 (110.9)</b>	<b>211.0 (152.8)</b>	<b>924.1 (263.7)</b>

(#) Numbers within brackets indicate the area of Box-Gum Woodlands

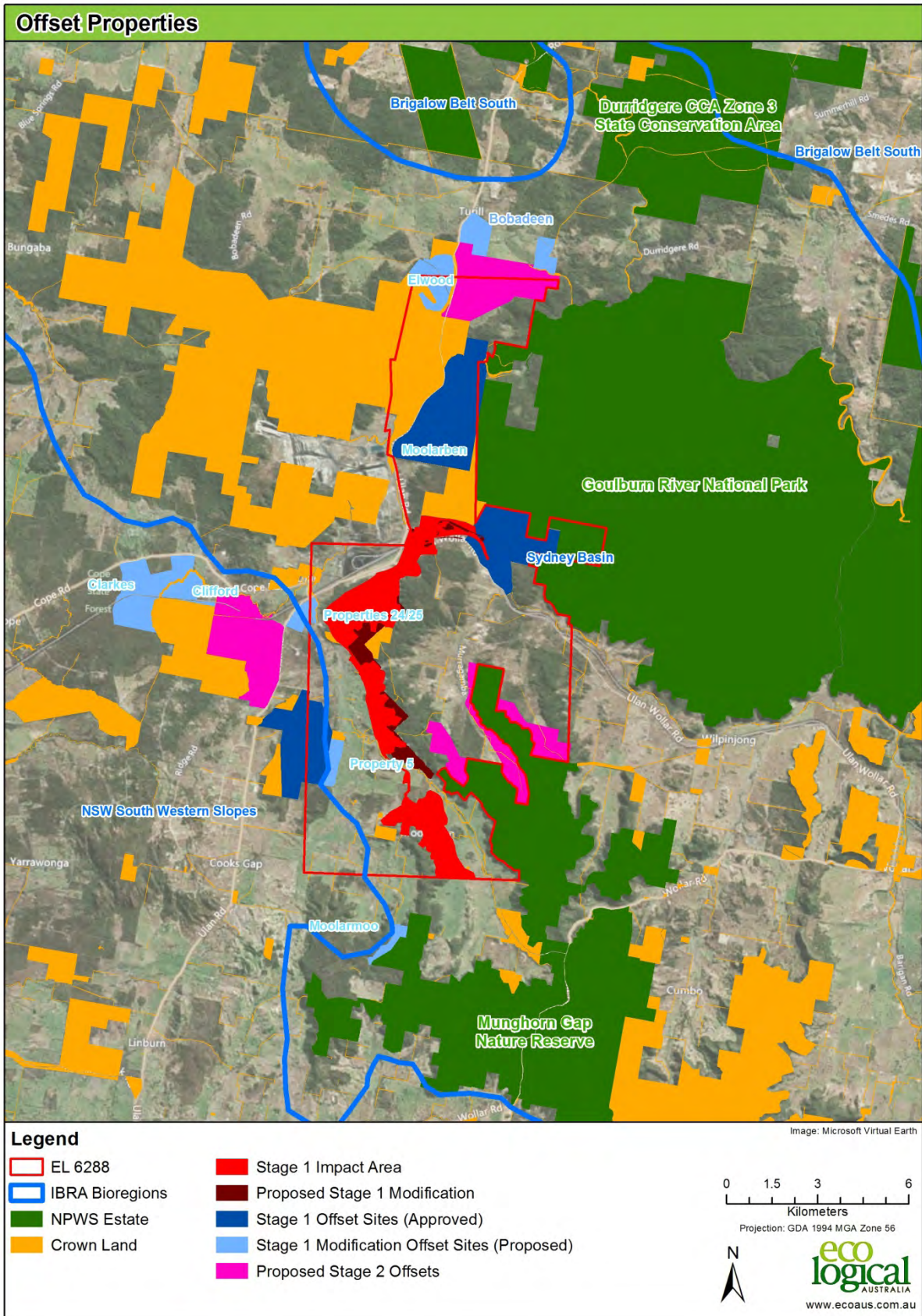


Figure 1: MCP Stage 1 Modification location, existing and proposed offset areas

## Clifford

### Site Context:

The 44.1 ha of Box-Gum Woodland within the Clifford offset site adjoins previously cleared and grazed agricultural land to the east and native woodland vegetation to the west and south, including the proposed Clarke offset site (**Figure 1**). More broadly, the Clifford site is connected to large areas of woodland vegetation, including Cope State Forest and unreserved native woodland in the Yarrowonga area, interrupted only by a rail corridor and several small unsealed roads. The Clifford site and adjacent areas of woodland have the potential to act as a corridor between Yarrowonga and crown land north-west of Ulan and Goulburn River National Park. Accordingly, the habitat scores for this offset site used a context component score of 8/10 for Box-Gum Woodland.

### Site Condition:

The site condition score for the Clifford Offset site was informed by a site inspection in March 2013 including two biometric vegetation plots consistent with Schedule 2 of the Biobanking Assessment Methodology and Credit Calculator Operational Manual (DECC 2009). Two vegetation zones were identified within the Box-Gum Woodlands within the Clifford offset site, one zone was identified as being advanced regeneration from previous clearing (estimated at > 10 years earlier; **Plate 2**) and another zone was relatively undisturbed (**Plate 3**). The Box-Gum Woodland across the offset site was characterised as having:

- A canopy including *Eucalyptus blakelyi* (Blakely's Red Gum) and *Angophora floribunda* with *Eucalyptus melliodora* (Yellow Box), *Eucalyptus bridgesiana* (Apple Box) and *Eucalyptus conica* (Fuzzy Box) also present at lower densities. Canopy cover ranged from 5% (within area of advanced regeneration) to 14% within undisturbed woodland.
- A diverse understorey dominated by native grasses including *Aristida* spp., *Cymbopogon refractus* (Barbed Wire Grass), *Arundinella nepalensis* (Reedgrass), *Digitaria brownii* (Cotton Panic Grass) and *Sporobolus creber* (Slender Rat's Tail Grass). Projected foliage cover of grasses ranged from 50% to 96% with a low cover of native shrubs (4 - 18%) and herbs (6 - 16%).
- High native species richness with 41 and 42 native species recorded within 20 x 20 m plots within the advanced regeneration and undisturbed woodland, respectively. The high native species included seven 'important species' (DEH 2006b) within the advanced regeneration [*Astroloma humifusum* (Native Cranberry), *Calotis cuneifolia* (Purple Burr-daisy), *Dianella revoluta* (Blue Flax-Lily), *Eriochilus cucullatus*, *Glycine clandestina*, *Tricoryne elatior* (Yellow Rush-lily) and *Zornia dyctiocarpa* (Zornia)] and 12 'important species' in the woodland [*Astroloma humifusum*, *Dianella revoluta*, *Dichelachne micrantha*, *Exocarpos strictus* (Dwarf Cherry), *Hibbertia obtusifolia* (Hoary guinea flower), *Glycine clandestina*, *Goodenia hederacea* (Forest Goodenia), *Laxmannia gracilis* (Slender Wire Lily), *Leucopogon virgatus*, *Themeda australis*, *Tricoryne elatior* and *Zornia dyctiocarpa*].
- Native regeneration of all canopy species within the Box-gum Woodland.
- Generally low exotic plant cover with exotic species infrequent across the majority of the undisturbed woodland and recorded at 18% foliage cover within the advanced regeneration. Exotic species recorded included *Hypochaeris radicata* (Catsear), *Conyza* sp. (Fleabane) and *Bidens subalternans* (Greater Beggar's Ticks).
- Habitat elements including hollow bearing trees and fallen logs present, though not recorded within area sampled within the biometric vegetation plots.

Accordingly, the habitat scores for the Clifford offset site used a start condition component score of 7/10 for all Box-Gum Woodland within the site. The future condition without offset for the Box-Gum Woodland within this site was assigned a score of 6/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through



appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.



**Plate 2: Box-Gum Woodland – Regen, Clifford offset site.**



**Plate 3: Box-Gum Woodland, Clifford offset site.**

## Elwood

### Site Context:

The 13.4 ha of Box-Gum Woodland within the Elwood offset site adjoins cleared grazed agricultural land to the north, separating it from Curryall State Forest, although adjoins large areas of crown land supporting native vegetation to the south and south-east (**Figure 1**). The Box-gum woodland and adjacent native vegetation within the Elwood site is separated only by Ulan Road from Goulburn River National Park. The Elwood site and adjacent areas of woodland have the potential to act as a corridor between areas to the south and west of this site and Goulburn River National Park. Accordingly, the habitat scores for this offset site used a context component score of 8/10 for Box-Gum Woodland.

### Site Condition:

The site condition score for Box-Gum Woodland within the Elwood offset site was informed by a site inspection in March 2013 including one biometric vegetation plot within Box-Gum Woodland consistent with Schedule 2 of the Biobanking Assessment Methodology and Credit Calculator Operational Manual (DECC 2009). Box-Gum woodland within the Elwood offset (**Plate 4**) site was characterised as having:

- A canopy dominated by *Eucalyptus blakelyi* (Blakely's Red Gum), with *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Callitris endlicheri* (Black Cypress Pine) also present. Projected foliage cover of the canopy layer was recorded at 20.5 % within the biometric plot;
- A diverse understorey dominated by native grasses (68% projected foliage cover recorded) including *Microlaena stipoides* (Weeping Grass), *Arundinella nepalensis* and *Aristida* spp. A sparse cover of herbs and sedges was also present (8% projected foliage cover);
- High native species richness with 34 native species recorded within a 20 x 20 m area, including six 'important species [DEH 2006b; *Chrysocephalum apiculatum* (common everlasting), *Desmodium varians*, *Dichelachne micrantha*, *Glycine clandestina*, *Lagenophora stipitata* (Common Lagenophora) and *Tricoryne elatior*].
- Native regeneration of all canopy species within the Box-gum Woodland.
- Low exotic plant cover with exotic species infrequent across the majority of the Box-Gum Woodland. Within the biometric vegetation plot a single exotic species was recorded (*Hypochaeris radicata*) with projected foliage cover of 2% recorded.
- Habitat elements including hollow bearing trees and fallen logs present (one hollow bearing tree and 62 m of fallen logs recorded within 50 x 20 m plot).

Accordingly, the habitat scores for the Elwood site used a start condition component score of 7/10 for Box-Gum Woodland. The future condition without offset for the Box-Gum Woodland within this site was assigned a score of 6/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.



**Plate 4: Box-Gum Woodlands, Elwood offset site**

## Property # 5

### Site Context:

The 24.2 ha of Box-Gum Woodland within Property # 5 (**Plate 5**) site adjoins cleared agricultural lands to the north, east and south, although to the west it adjoins native woodland which is part of an existing offset area for Stage 1 of the MCP (**Figure 1**). Property # 5 and the existing offset area immediately to the west form a large area of native vegetation which although not contiguous with adjacent woodland areas, maintains a potential fractured corridor between vegetation to the north-west near Ulan and the Clifford and Clarke offset sites. At a broader scale the patch formed by Property # 5 and the adjacent existing offset could act as part of a corridor between Munghorn Gap Nature Reserve and vegetation to the west and north-west of this site. Accordingly, the habitat scores for this offset site used a context component score of 8/10 for Box-Gum Woodland.

### Site Condition:

The site condition score for Box-Gum Woodland within Property # 5 was assessed during site inspections in March 2013, although the vegetation community was not sampled within any floristic plots. Two forms of Box-Gum Woodland were identified within Property # 5, a DNG form and a 'woodland' form.

The 17.0 ha of the Box-Gum Woodland DNG within Property # 5 was noted as having been previously grazed by stock and being heavily dominated by native *Sporobolus* spp. with up to 85% projected foliage cover. Though a number of other less grazing tolerant groundcover species were also noted as being present including *Glycine clandestina*, members of the *Chenopodiaceae* family and the 'important species' *Calotis lappulacea* (Yellow Burr-daisy; DEH 2006b). Native species richness was considered to be moderate with very low percent foliage cover of exotic species observed. No canopy structural layer was present within this form of the Box-Gum Woodlands and habitat elements including hollow-bearing trees and fallen logs were not recorded and considered absent or very limited. Accordingly, the habitat scores for the Box Gum Woodland DNG within Property # 5 used a start condition component score of 3/10 for Box-Gum Woodland. The future condition without offset for the DNG form of Box-Gum Woodland within this site was assigned a score of 2/10, with an

expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 6/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.

The 7.2 ha of the 'woodland' form of Box Gum Woodland within Property # 5 was differentiated from the DNG form by the presence of a canopy structural layer and associated habitat elements including hollow-bearing trees and fallen logs (**Plate 5**). Generally, the understorey was considered similar to that observed within the DNG form of the community, although grazing pressure appears slightly reduced in the woodland areas resulting in increased native species richness. Accordingly, the habitat scores for the woodland form of Box Gum Woodland within Property # 5 used a start condition component score of 7/10 for Box-Gum Woodland. The future condition without offset for the woodland form of Box-Gum Woodland within this site was assigned a score of 5/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.



**Plate 5: Box-Gum Woodland (woodland form), Property # 5**

### **Property # 24 and 25**

#### Site Context:

The 3.3 ha of Box-Gum Woodland within Properties # 24 and 25 adjoins partially cleared areas and previously grazed areas to the north and west, with the existing and proposed Stage 1 modification of MCP to the north-east and east. To the south-west Properties # 24 and 25 adjoin woodland areas forming part of the proposed offsets for Stage 2 of the MCP which are contiguous with the Clifford and Clarke offset sites and Cope State Forest. Through appropriate management of Properties # 24 and 25, the connectivity between areas of habitat

on the west and east of Ulan Road (including Property # 5 and the adjacent existing offset area) could be increased. Accordingly, the habitat scores for this offset site used a context component score of 7/10 for Box-Gum Woodland.

#### Site Condition:

The site condition score for Box-Gum Woodland within Properties # 24 and 25 was based on site inspections in March 2013, although no floristic plots were conducted within the Box-Gum Woodlands within this offset site. Two forms of Box-Gum Woodland were identified within Properties # 24 and 25, a DNG form and a 'woodland' form, each given different site condition scores.

The 0.7 ha of the Box-Gum Woodland DNG within Property # 24 and 25 was noted as having been previously grazed by stock and heavily dominated by native *Aristida* spp. with *Sporobolus* spp., *Echinopogon caespitosus* (Tufted Hedgehog-grass) and *Arundinella nepalensis* also common. Native species richness was considered to be moderate with very low percent foliage cover of exotic species observed. No canopy structural layer was present within this form of the Box-Gum Woodlands and habitat elements including hollow-bearing trees and fallen logs were not recorded and considered absent or very limited. Accordingly, the habitat scores for the Box-Gum Woodland DNG within Properties # 24 and 25 used a start condition component score of 3/10 for Box-Gum Woodland. The future condition without offset of the DNG form of Box-Gum Woodland within this site was assigned a score of 2/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 6/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.

The 2.6 ha of the 'woodland' form of Box Gum Woodland within Properties # 24 and 25 was differentiated from the DNG form by the presence of a canopy structural layer and associated habitat elements including hollow-bearing trees and fallen logs. Generally, the understorey was similar to that observed within the DNG form of the community although grazing pressure was considered slightly reduced resulting in increased native species richness. Accordingly, the habitat scores for the woodland form of Box Gum Woodland within Properties # 24 and 25 used a start condition component score of 7/10 for Box-Gum Woodland. The future condition without offset of the woodland form of Box-Gum Woodland within this site was assigned a score of 5/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.

## **Bobadeen**

#### Site Context:

The Bobadeen site contains two discrete areas (**Figure 1**). The western portion of the Bobadeen offset areas adjoins cleared agricultural land to the north and east. To the south this area adjoins a proposed offset area for Stage 2 of the MCP and to the south-west adjoins a Travelling Stock Route (TSR) which in turn is contiguous with the Elwood offset area and adjacent Crown Land supporting native woodland (**Figure 1**). The eastern portion of the Bobadeen offset area adjoins unreserved native forest forming linkages with both Durrigere State Forest and Goulburn River National Park. Furthermore, the management of the Bobadeen offset sites for conservation, in conjunction with the proposed Stage 2 offset area immediately to the south, would greatly increase connectivity between Goulburn River National Park, Durrigere State Forest and Curyall State Forest

(Figure 1). Accordingly, the habitat scores for this offset site used a context component score of 7/10 for Box-Gum Woodland.

Site Condition:

The site condition score for Box-Gum Woodland within the Bobadeen offset sites was based on site inspections undertaken in March 2013, although no floristic plots were conducted within the Box-Gum Woodlands within this offset site. Two forms of Box-Gum Woodland were identified within the Bobadeen offset sites, a DNG form and a 'woodland' form, each given different site condition scores.

The 121.4 ha of Box-Gum Woodlands DNG within the Bobadeen offset sites (**Plate 6**) was noted as having been previously grazed with the understorey consisting predominately of grasses less palatable to stock including *Bothriochloa macra* (Red-leg Grass), *B. decipiens* (Red Grass), *Aristida* spp., *Sporobolus creber*, *Rytidosperma* spp., *Eragrostis* spp. and *Arundinella nepalensis*, though some more palatable herbs of the *Chenopodiaceae* and *Fabaceae* families were also present. Additionally, *Bothriochloa biloba* a species previously listed as Vulnerable under the EPBC Act, was recorded within the Box-Gum Woodland DNG within this offset site. The occurrence of weeds was noted as being very low within this area although this was considered to have been influenced by the dry conditions preceding the site inspection. Accordingly, the habitat scores for the Box Gum Woodland DNG within the Bobadeen offset sites used a start condition component score of 3/10.

The future condition without offset for the Box-Gum Woodland DNG within this site was assigned a score of 2/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 6/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.

The 38.8 ha of the 'woodland' form of Box Gum Woodland within the Bobadeen offset sites (**Plate 6** and **Plate 7**) was differentiated from the DNG form by the presence of a canopy structural layer and potential for associated habitat elements including hollow-bearing trees and fallen logs. Generally, the understorey was similar to that observed within the DNG form of the community although grazing was considered slightly reduced resulting in increased native species richness. Accordingly, the habitat scores for the woodland form of Box Gum Woodland within the Bobadeen offset sites used a start condition component score of 7/10 for Box-Gum Woodland.

The future condition without offset for the woodland form of Box-Gum Woodland within this site was assigned a score of 6/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.



**Plate 6: Box-Gum Woodland (DNG form in foreground and woodland form in distance), Bobadeen**



**Plate 7: Box-Gum Woodlands (woodland form), Bobadeen**

## Moolarmoo

### Site Context:

The Moolarmoo offset site is a narrow linear area which adjoins Munghorn Gap Nature Reserve along its long axis to the east and unreserved native forest along its long axis to the west (**Figure 1**). The management of this area for conservation would increase connectivity between these two areas of native vegetation. Accordingly, the habitat scores for this offset site used a context component score of 9/10 for Box-Gum Woodland.

### Site Condition:

The site condition score for Box-Gum Woodland within the Moolarmoo offset site was based on site inspections undertaken in March 2013, although no floristic plots were conducted within the Box-Gum Woodlands within this offset site. Two forms of Box-Gum Woodland were identified within the Moolarmoo offset site, a DNG form and a 'woodland' form, each given different site condition scores.

The 13.7 ha of the DNG form of Box-Gum Woodlands within the Moolarmoo offset site (**Plate 8**) was noted as including a small portion which had been cultivated and was in poor condition. The remainder of the Box-Gum Woodland DNG showed no sign of exotic pasture introduction with a good cover of native grasses including *Bothriochloa* spp., *Rytidosperma* spp. *Aristida* spp. and *Microlaena stipoides* (Weeping Grass) in shaded areas. The cover of native herbs was low but included one 'important species' (DEH 2006b), *Glycine clandestina*. Accordingly, the habitat scores for the DNG form of Box Gum Woodland within the Moolarmoo offset site used a start condition component score of 3/10 for Box-Gum Woodland.

The future condition without offset for the DNG form of Box-Gum Woodland within this site was assigned a score of 2/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 6/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and reduced occurrence of exotic species.

The 4.8 ha of the 'woodland' form of Box Gum Woodland within the Moolarmoo offset site was differentiated from the DNG form by the presence of a canopy structural layer and potential for associated habitat elements including hollow-bearing trees and fallen logs. Generally, the understorey was similar to that observed within the DNG form of the community although grazing pressure was considered slightly reduced resulting in increased native species richness. Accordingly, the habitat scores for the woodland form of Box Gum Woodland within the Moolarmoo offset site used a start condition component score of 7/10 for Box-Gum Woodland.

The future condition without offset for the 'woodland' form of Box-Gum Woodland within this site was assigned a score of 5/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the Box-Gum Woodland with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition of this vegetation community would improve including native species richness and diversity, habitat complexity and the occurrence of exotic species.





**Plate 8: Box-Gum Woodland (DNG form). Moolarmoo**

## **Regent Honeyeater / Swift Parrot**

Neither the Regent Honeyeater (*Anthochaera phrygia*) or Swift Parrot (*Lathamus discolor*) have been recorded previously within the impact area or within any of the offset areas. However, these species have been recorded within the broad locality (**Figure 2**) and potential habitat exists within the impact area and offset areas. The following sections outline the various site characteristics of the potential habitat for the Regent Honeyeater and Swift Parrot within the impact area and the proposed offset sites consistent with the EPBC Act Environmental Offset Policy (DSEWPaC 2012). These characteristics have been used to undertake an assessment of the overall condition or quality of the potential habitat for these species using the EPBC Act offset calculator.

From a review of the EPBC Act offset policy and the associated 'offsets assessment guide' ELA has generated suggested values for the attributes utilised in the offset calculator (**Appendix A** and **Appendix B**) and provided justification for these below. These values are based on ELA's knowledge of the calculator tool and have been undertaken in conjunction with Dr Steven Ward who has attended training sessions with the Department of Environment (DoE) on the application of the policy. We note that the policy states that the operation of the EPBC offset assessment guide is to be performed by expert users within the Department, but provide the suggested values based on our experience and knowledge of the proposed offset sites.

Habitat scores were based on 30% context, 30% condition and 40% species stocking rate. Following the offset assessment guide requirements a rounding function was used to convert the numbers generated to a whole integer out of 10.

### **Impact area**

The Regent Honeyeater and Swift Parrot were considered likely to occur within the impact area for the proposed modification based upon presence of suitable habitat for these species and records of the species in areas surrounding the impact area including Munghorn Gap Nature Reserve, Goulburn River National Park and

surrounding the Ulan Coal Mine (Umwelt 2009; EMM 2013). Suitable habitat for these species within the impact area was identified within the 'Grassy White Box Woodland' (Box-Gum Woodlands) and the 'Shrubby White Box Forest' vegetation types due to the presence of *Eucalyptus albens* (White Box) a key eucalypt feed tree for these species. Given the similar habitat preferences of these two species in respect to the proposed modification and proposed offset sites, the offset calculations for these species have been undertaken simultaneously.

The EA report identified approximately 11 ha of potential habitat for the Regent Honeyeater which would be impacted by the proposed modification with an unspecified area of habitat for the Swift Parrot also to be impacted by the proposed modification. This figure was increased as part of the NSW environmental assessment process. An area 30.5 ha was identified within the impact area as representing potential habitat for the Regent Honeyeater and Swift Parrot including the footslope grassy woodlands.

#### Site Context:

The 30.5 ha of potential habitat for the Regent Honeyeater and Swift Parrot within the impact area adjoins areas previously cleared for agriculture and is located to the south of mined areas forming part of the approved Stage 1 of the MCP. The potential habitat does adjoin unreserved native forest to the north-east which has the potential to act as a part of a fractured regional corridor allowing north-south movement of these highly mobile species and other fauna groups between Munghorn Gap Nature Reserve and Goulburn River National Park and west towards Yarrawonga (See Figure 4.3 of the EA report). Accordingly, the habitat quality component for the impact area used a context component score of 6/10 with regard to the Regent Honeyeater and Swift Parrot.

#### Site Condition:

The condition of the 30.5 ha of potential habitat for the Regent Honeyeater and Swift Parrot within the impact area was assessed based upon the information presented within the EA report (EMM 2013). The condition or quality of habitat with regard to the Regent Honeyeater and Swift Parrot is mostly determined by the occurrence of particular tree species utilised for feeding including *Eucalyptus albens*, although greater habitat complexity is likely to improve habitat condition/quality due to presence of alternative food sources including other sugary plant or insect exudates.

Within the impact area historical clearing, particularly within lower more fertile areas, grazing activities, timber and firewood collection are all likely to have reduced the condition of the habitat available to the Regent Honeyeater and Swift Parrot. Nonetheless, the persistence of *Eucalyptus albens* dominated vegetation communities represents a potential habitat resource for both these species. Accordingly, the habitat quality scores for the potential habitat for the Regent Honeyeater and Swift Parrot within the impact area used a start condition component score of 8/10 for these species.

The future condition within the impact area with development was assigned a score of 0/10, with an expectation that all potential habitat for the Regent Honeyeater and Swift Parrot within the impact area would be lost as part of the proposed modification.

#### Species stocking rate:

The species stocking rate represents the usage and or density of species at a particular site, acknowledging that value for a particular species may be high despite having a low condition or site context. As no Regent Honeyeaters or Swift Parrots were recorded within the impact area, the usage of this area has been conservatively estimated based upon records of the species within the broad locality (**Figure 2**), the site context, habitat condition and ecology of these species. A species stocking rate of 8/10 has been estimated for the potential habitat for the Regent Honeyeater and Swift Parrot within the impact area.

### **Offset sites**

The potential habitat for the Regent Honeyeater and Swift Parrot within the offset areas was identified as those areas of vegetation which match the vegetation formations of the identified potential habitat within the impact site (EMM 2013). This refined definition of potential habitat within offset sites produced a conservative assessment of potential habitat within the offset site, with two forms of potential habitat have been identified with regard to the Regent Honeyeater and Swift Parrot, woodland habitat with a total area of 166.7 ha and DNG habitat with a total area of 157.7 ha. This refined approach was undertaken as part of a sensitivity analysis, whereby different determinations of potential habitat were assessed (with broad or selective definitions of habitat applied consistently to impact and offset areas), and considered to most scientifically robust approach.

Across all offset sites the site context, condition and species stocking rate of potential habitat for these species have been pooled across offset sites for each form of potential habitat (woodland and DNG) given the highly mobile nature of these species, the broadly similar condition of habitat for these species within the offset sites and the large area occupied by individuals of these species.

#### Site Context:

With regard to the highly mobile nature of the Regent Honeyeater and Swift Parrot, the potential habitat for these species within all offset sites is located adjacent to existing areas of native vegetation and in proximity to Goulburn River National Park, Munghorn Gap Nature Reserve and large areas of unreserved native woodland/forest (**Figure 1**). Accordingly, the habitat quality component for the offset sites used a context component score of 7/10 with regard to the potential woodland habitat for the Regent Honeyeater and Swift Parrot.

For the DNG form of potential habitat for the Regent Honeyeater and Swift Parrot across all offset sites, the habitat quality component for the offset sites used a context component score of 5/10 as these areas by the nature of being DNG, do not directly adjoin woodland habitat.

#### Site Condition:

The condition of the 166.7 ha of potential woodland habitat for the Regent Honeyeater and Swift Parrot was considered broadly similar to that in the impact area with historical clearing, grazing activities, timber and firewood collection all likely to have impacted the condition of the habitat available to the Regent Honeyeater and Swift Parrot. Nonetheless, the level of impact resulting from these activities within the woodland habitat is considered relatively minor with regard to the potential habitat for the Regent Honeyeater and Swift Parrot. Accordingly, the habitat quality scores for the potential habitat for the Regent Honeyeater and Swift Parrot within woodlands across all offset sites used a start condition component score of 7/10 for these species.

The future condition without offset for the woodland habitat within offset sites was assigned a score of 6/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the woodland habitat with offsetting of this site was assigned a score of 9/10, with an expectation that through appropriate management the condition and context of this habitat would improve including habitat complexity and availability of feed trees.

The condition of the 157.7 ha of potential DNG habitat for the Regent Honeyeater and Swift Parrot was considered significantly less than that within the woodland habitat due to the absence of a canopy layer including important feed trees for the Regent Honeyeater and Swift Parrot. Accordingly, the habitat quality scores for the potential habitat for the Regent Honeyeater and Swift Parrot within DNG areas across all offset sites used a start condition component score of 3/10 for these species.

The future condition without offset for the DNG habitat within offset sites was assigned a score of 2/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for

conservation of biodiversity as part of an offset. The future condition of the DNG with offsetting of this site was assigned a score of 5/10, with an expectation that through appropriate management the condition and context of this habitat would improve including the presence of a canopy including of feed trees for these species.

Species stocking rate:

As for the impact area, no Regent Honeyeaters or Swift Parrots have been recorded within the offset areas, with the usage of this area conservatively estimated based upon records of the species within the broad locality (**Figure 2**), the site context, habitat condition and knowledge of the ecology of these species. A species stocking rate of 7/10 has been estimated for the woodland potential habitat for the Regent Honeyeater and Swift Parrot across the offset sites, which is less than that estimated within the impact area.

The future species stocking rate without offset for the woodland habitat within offset sites was assigned a score of 6/10, with an expectation that this area would be subjected to further grazing and degradation and therefore less usage by these species, if not managed for conservation of biodiversity as part of an offset. The future species stocking rate of the woodland habitat with offsetting of this site was assigned a score of 9/10, with an expectation that as habitat quality and complexity improve the potential usage is likely to increase.

A species stocking rate of 0/10 has been estimated for the DNG potential habitat for the Regent Honeyeater and Swift Parrot across the offset sites. The future species stocking rate without offset for the DNG habitat within offset sites was assigned a score of 0/10, while the future species stocking rate of the DNG habitat with offsetting of this site was assigned a score of 6/10, with an expectation that as habitat quality and complexity improve the potential usage is likely to increase with appropriate conservation management.

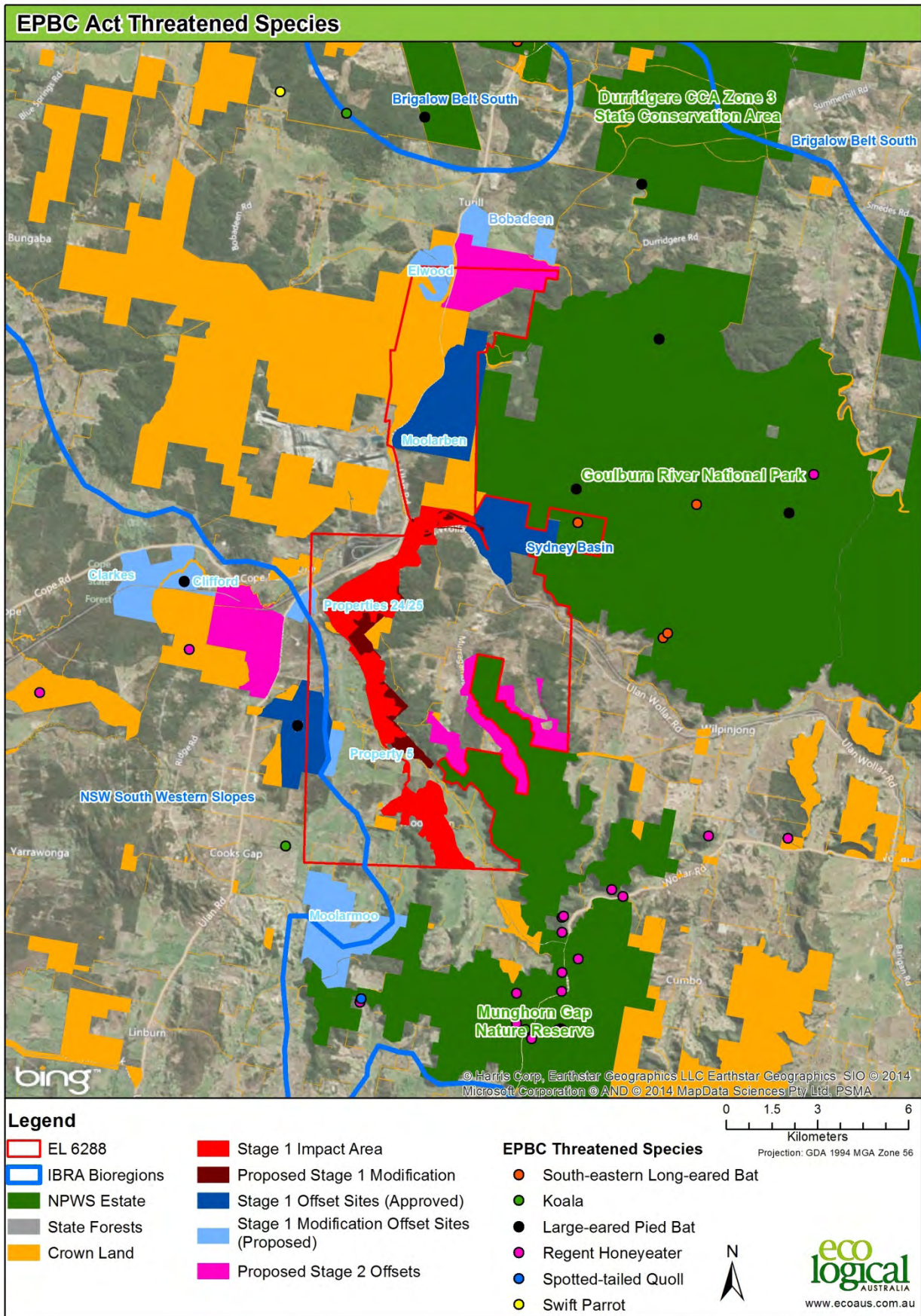


Figure 2: Threatened species records within broad locality

## Large-eared Pied Bat / South-eastern Long-eared Bat

The Large-eared Pied Bat (*Chalinolobus dwyeri*) and South-eastern Long-eared Bat (*Nyctophilus corbeni*), syn. Eastern Long-eared Bat (*Nyctophilus timoriensis*), have been recorded foraging as part of ecology assessments for Stage 1 of the MCP (Moolarben Biota 2006) and Stage 2 of the MCP (Ecovision Consulting 2008). Additionally, the Large-eared Pied Bat has been recorded from ultrasonic detection at the proposed Clifford and Property # 5 offsets sites (**Figure 2**). Neither of these species were recorded as part of the EA report (EMM 2013), although were considered likely to utilise the impact area given their detection in previous ecological assessments (Moolarben Biota 2006; Ecovision Consulting 2008) and the presence of suitable habitat.

For the Large-eared Pied Bat the impact area was also considered to include impacts to marginal roosting habitat in the form of approximately 3 km of cliffline to be removed as part of the proposed modification. These clifflines comprised shallow outcrops with cracks and fissures, and some rock overhangs (EMM 2013b). Additionally, roosting habitat for the South-eastern Long-eared Bat, hollow-bearing trees, was considered marginal within the impact area as mature trees have been largely removed from the lower slopes and DNG within the impact area, evidenced by ringbarking and dead tree stumps. Foraging habitat within the impact area was considered widespread including all areas of native vegetation, representing 171.4 ha of the total 178 ha footprint of the proposed modification. Given the similar habitat preferences of these two species in respect to the impact area of the proposed modification and proposed offset sites, the offset calculations for these species have been undertaken simultaneously.

The following sections outline the various site characteristics of the potential habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat within the impact area and the proposed offset sites consistent with the EPBC Act Environmental Offset Policy (DSEWPaC 2012). These characteristics have been used to undertake an assessment of the overall condition or quality of the habitat for these species using the EPBC Act offset calculator.

From a review of the EPBC Act offset policy and the associated 'offsets assessment guide' ELA has generated suggested values for the attributes utilised in the offset calculator (**Appendix A** and **Appendix B**) and provided justification for these below. These values are based on ELA's knowledge of the calculator tool and have been undertaken in conjunction with Dr Steven Ward who has attended training sessions with the Department of Environment (DoE) on the application of the policy. We note that the policy states that the operation of the EPBC offset assessment guide is to be performed by expert users within the Department, but provide the suggested values based on our experience and knowledge of the proposed offset sites.

Habitat scores were based on 30% context, 30% condition and 40% species stocking rate. Following the offset assessment guide requirements a rounding function was used to convert the numbers generated to a whole integer out of 10.

### Impact area

#### Site Context:

As for other threatened species and communities within the impact area, the 171.4 ha of potential habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat within the impact area was assigned a context component score of 6/10. This reflects the location of the impact area in relation to the current mining operations, proximity to cleared agricultural areas and the connection to unreserved native forest to the north-east.

**Site Condition:**

The condition of the habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat within the impact area was assessed based upon the information presented within the EA report (EMM 2013). The condition or quality of habitat with regard to these species was considered in relation to availability of roosting and foraging habitat.

Within the impact area historical clearing, particularly within lower more fertile areas, grazing activities, timber cutting and firewood collection are all likely to have reduced habitat complexity and density of prey species for the Large-eared Pied Bat and South-eastern Long-eared Bat. Accordingly, the habitat quality scores for the potential habitat for these species within the impact area used a start condition component score of 8/10 for these species.

The future condition within the impact area with development was assigned a score of 0/10, with an expectation that all potential habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat within the impact area would be lost as part of the proposed modification.

**Species stocking rate:**

The species stocking rate represents the usage and or density of species at a particular site, acknowledging that value for a particular species may be high despite having a low condition or site context. As no detailed assessments have been undertaken of the frequency or density of Large-eared Pied Bat or South-eastern Long-eared Bat within the impact area, the usage of this area has been conservatively estimated based upon the frequency of records of these species within the broad locality (**Figure 2**), the site context, habitat condition and understanding of the ecology of these species. A species stocking rate of 8/10 has been estimated for the habitat for these within the impact area.

**Offset sites**

Across the offset sites habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat was considered to include all woodland and DNG areas, 709.2 ha and 209.5 ha, respectively, although different condition scores were assigned for these two forms of habitat. Across all offset sites the site context, condition and species stocking rate of habitat available to these species have been pooled across offset sites for each form of potential habitat (woodland and DNG) given the broadly similar condition of habitat for these species within each of the offset sites and the highly mobile nature of these species.

**Site Context:**

With regard to the Large-eared Pied Bat and South-eastern Long-eared Bat, the habitat for these species within all offset sites is located adjacent to existing areas of native vegetation and in proximity to Goulburn River National Park, Munghorn Gap Nature Reserve and large areas of unreserved native woodland/forest (**Figure 1**). Accordingly, the habitat quality component for the offset sites used a context component score of 8/10 with regard to the potential woodland habitat for this species.

For the DNG form of habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat, the habitat quality component for the offset sites used a context component score of 5/10 as these areas by their nature of being DNG do not directly adjoin woodland habitat.

**Site Condition:**

The condition of the 709.2 ha of potential woodland habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat was considered broadly similar to that in the impact area with historical clearing, grazing activities, timber and firewood collection all likely to have impacted the condition of the habitat available to the species. Accordingly, the habitat quality scores for the habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat within woodlands across all offset sites used a start condition component score of 8/10 for these species.

The future condition without offset for the woodland habitat within offset sites was assigned a score of 7/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the woodland habitat with offsetting was assigned a score of 9/10, with an expectation that through appropriate management the condition of this habitat would improve including abundance of prey species.

The condition of the 209.5 ha of DNG habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat was considered significantly less than that within the woodland habitat due to the absence of a canopy layer. Accordingly, the habitat quality scores for the potential habitat for the Large-eared Pied Bat within DNG across all offset sites used a start condition component score of 0/10 for this species.

The future condition without offset for the DNG habitat within offset sites was assigned a score of 0/10, with an expectation that this area would remain in its current condition if not managed for conservation of biodiversity as part of an offset. The future condition of the DNG habitat with offsetting of this site was assigned a score of 5/10, with an expectation that through appropriate management the condition and context of this habitat would improve including the presence of a canopy layer.

#### Species stocking rate:

As for the impact area, no studies of the density or frequency of occupation have been undertaken within the offset areas with the usage of this area conservatively estimated based upon records of the species within the broad locality (**Figure 2**), the site context, habitat condition and knowledge of the ecology of these species. A species stocking rate of 8/10 has been estimated for the woodland potential habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat across the offset sites.

The future species stocking rate without offset for the woodland habitat within offset sites was assigned a score of 6/10, with an expectation that this area would be subjected to further grazing and degradation and therefore less usage by this species, if not managed for conservation of biodiversity as part of an offset. The future species stocking rate of the woodland habitat with offsetting was assigned a score of 9/10.

A species stocking rate of 0/10 has been estimated for the DNG habitat for the Large-eared Pied Bat across the offset sites. The future species stocking rate without offset for the DNG habitat within offset sites was assigned a score of 0/10, remaining unchanged while the future species stocking rate of the DNG habitat with offsetting was assigned a score of 5/10.

## **Spotted-tailed Quoll**

The Spotted-tailed Quoll (*Dasyurus maculatus*) has not previously been recorded within the impact area or within any of the offset areas. However, this species has been recorded within the broad locality (**Figure 2**) and potential habitat exists within the impact area and offset areas. A total of 96.8 ha of the total 178 ha of the proposed modification was considered to represent potential habitat for the Spotted-tailed Quoll, specifically the ridges containing rocky outcrops, mapped as 'Ridgetop Broad-leaved Ironbark Grey Gum Forest' identified by EMM (2013). On this basis impact to potential habitat within the impact area and the value of similar potential habitat within offset sites has been assessed.

The Spotted-tailed Quoll is found in a variety of habitats, including sclerophyll forest and woodlands, coastal heathlands and rainforests (Dickman & Read 1992; Edgar & Belcher 1995). Occasional sightings are made in open country, grazing lands, rocky outcrops and other treeless areas. This species feeds on a wide variety of birds, reptiles, mammals and invertebrates. Nesting occurs in rock shelters, hollow logs, caves or tree hollows and they use numerous dens within the home range. Estimates of home ranges vary from 800 ha to 20 km<sup>2</sup>



and individuals may move several kms in a night. It is a highly mobile species and there are numerous records of overnight movements of several kms (Edgar & Belcher 1995).

The following sections outline the various site characteristics of the potential habitat for the Spotted-tailed Quoll within the impact area and the proposed offset sites consistent with the EPBC Act Environmental Offset Policy (DSEWPaC 2012). These characteristics have been used to undertake an assessment of the overall condition or quality of the potential habitat for this species using the offset calculator.

From a review of the EPBC Act offset policy and the associated 'offsets assessment guide' ELA has generated suggested values for the attributes utilised in the offset calculator (**Appendix A** and **Appendix B**) and provided justification for these below. These values are based on ELA's knowledge of the calculator tool and have been undertaken in conjunction with Dr Steven Ward who has attended training sessions with the Department of Environment (DoE) on the application of the policy. We note that the policy states that the operation of the EPBC offset assessment guide is to be performed by expert users within the Department, but provide the suggested values based on our experience and knowledge of the proposed offset sites.

Habitat scores were based on 30% context, 30% condition and 40% species stocking rate. Following the offset assessment guide requirements a rounding function was used to convert the numbers generated to a whole integer out of 10.

### **Impact area**

#### Site Context:

As for other threatened species and communities within the impact area, the 96.8 ha of potential habitat for the Spotted-tailed Quoll identified within the impact area was assigned a context component score of 6/10. This reflects the location of the impact area to the south of mined areas forming part of the approved Stage 1 of the MCP, proximity to cleared agricultural areas and the connection to unreserved native forest to the north-east.

#### Site Condition:

The condition of the potential habitat for the Spotted-tailed Quoll within the impact area was assessed based upon the information presented within the EA report (EMM 2013). The condition or quality of habitat with regard to the Spotted-tailed Quoll was considered in relation to availability of nest/shelter sites (rock shelters, hollow logs, caves or tree hollows) and by the abundance of prey species (birds, reptiles, mammals and invertebrates).

Within the impact area historical clearing, particularly within lower more fertile areas, grazing activities, timber and firewood collection are all likely to have reduced habitat complexity, density of prey species and nest/shelter sites for the Spotted-tailed Quoll. Accordingly, the habitat quality scores for the potential habitat for the Spotted-tailed Quoll within the impact area used a start condition component score of 7/10 for this species.

The future condition within the impact area with development was assigned a score of 0/10, with an expectation that all potential habitat for the Spotted-tailed Quoll within the impact area would be lost as part of the proposed modification.

#### Species stocking rate:

The species stocking rate represents the usage and or density of species at a particular site, acknowledging that value for a particular species may be high despite having a low condition or site context. As no Spotted-tailed Quolls were recorded within the impact area, the usage of this area has been conservatively estimated based upon records of the species within the broad locality (**Figure 2**), the site context, habitat condition and understanding of the ecology of this species. A species stocking rate of 5/10 has been estimated for the potential habitat for the Spotted-tailed Quoll within the impact area.

### **Offset sites**

Two forms of potential habitat have been identified with regard to the Spotted-tailed Quoll, woodland habitat with a total area of 542.4 ha and DNG habitat with a total area of 51.8 ha. Across all offset sites the site context, condition and species stocking rate of potential habitat for the Spotted-tailed Quoll has been pooled for each form of potential habitat (woodland and DNG) given the broadly similar condition of habitat for this species within each of the offset sites and the large area occupied by individuals of this species.

#### Site Context:

With regard to Spotted-tailed Quoll, the potential habitat for this species within all offset sites is located adjacent to existing areas of native vegetation and in proximity to Goulburn River National Park, Munghorn Gap Nature Reserve and large areas of unreserved native woodland/forest (**Figure 1**). Accordingly, the habitat quality component for the offset sites used a context component score of 8/10 with regard to the potential woodland habitat for this species.

For the DNG form of potential habitat for the Spotted-tailed Quoll, across all offset sites, the habitat quality component for the offset sites used a context component score of 5/10 as these areas by their nature of being DNG do not directly adjoin woodland habitat.

#### Site Condition:

The condition of the 540.4 ha of potential woodland habitat for the Spotted-tailed Quoll was considered broadly similar to that in the impact area with historical clearing, grazing activities, timber and firewood collection all likely to have impacted the condition of the habitat available to the species. Accordingly, the habitat quality scores for the potential habitat for the Spotted-tailed Quoll within woodlands across all offset sites used a start condition component score of 7/10 for this species.

The future condition without offset for the woodland habitat within offset sites was assigned a score of 5/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the woodland habitat with offsetting of this site was assigned a score of 8/10, with an expectation that through appropriate management the condition of this habitat would improve including prey density and shelter sites.

The condition of the 51.8 ha of potential DNG habitat for the Spotted-tailed Quoll was considered significantly less than that within the woodland habitat due to the absence of a canopy layer. Accordingly, the habitat quality scores for the potential habitat for the Spotted-tailed Quoll within DNG across all offset sites used a start condition component score of 3/10 for this species.

The future condition without offset for the DNG habitat within offset sites was assigned a score of 2/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the DNG habitat with offsetting of this site was assigned a score of 4/10, with an expectation that through appropriate management the condition and context of this habitat would improve including the density of prey species and availability of nest/shelter sites.

#### Species stocking rate:

As for the impact area, no Spotted-tailed Quolls have been recorded within the offset areas with the usage of this area conservatively estimated based upon records of the species within the broad locality (**Figure 2**), the site context, habitat condition and knowledge of the ecology of this species. A species stocking rate of 5/10 has been estimated for the woodland potential habitat for the Spotted-tailed Quoll across the offset sites.

The future species stocking rate without offset for the woodland habitat within offset sites was assigned a score of 4/10, with an expectation that this area would be subjected to further grazing and degradation and therefore

less usage by this species, if not managed for conservation of biodiversity as part of an offset. The future species stocking rate of the woodland habitat with offsetting was assigned a score of 7/10.

A species stocking rate of 2/10 has been estimated for the DNG potential habitat for the Spotted-tailed Quoll across the offset sites. The future species stocking rate without offset for the DNG habitat within offset sites was assigned a score of 1/10, while the future species stocking rate of the DNG habitat with offsetting was assigned a score of 3/10.

## Koala

The Koala (*Phascolarctos cinereus*) has not previously been recorded within the impact area or within any of the offset areas. However, this species have been recorded within the broad locality (**Figure 2**) and potential habitat exists within the impact area and offset areas. On this basis impact to potential habitat within the impact area and value of similar potential habitat within offset sites has been assessed. A total of 127.3 ha of the total 178 ha of the proposed modification was considered to represent potential habitat for the Koala based upon the presence of primary, secondary or supplementary food tree species as specified in the Recovery Plan for the Koala prepared under the NSW *Threatened Species Conservation Act 1995* (TSC Act). Relevant food trees and their presence within different biometric vegetation types within the impact and offset site are outlined in **Table 2**. Similarly the presence of these trees has been used to identify potential habitat within the offset areas.

The following sections outline the various site characteristics of the potential habitat for the Koala within the impact area and the proposed offset sites consistent with the EPBC Act Environmental Offset Policy (DSEWPaC 2012) in order to allow for an assessment of the overall condition or quality of the Box-Gum Woodlands using the offset calculator.

From a review of the EPBC Act offset policy and the associated 'offsets assessment guide' ELA has generated suggested values for the attributes utilised in the offset calculator (**Appendix A** and **Appendix B**) and provided justification for these below. These values are based on ELA's knowledge of the calculator tool and have been undertaken in conjunction with Dr Steven Ward who has attended training sessions with the Department of Environment (DoE) on the application of the policy. We note that the policy states that the operation of the EPBC offset assessment guide is to be performed by expert users within the Department, but provide the suggested values based on our experience and knowledge of the proposed offset sites.

Habitat scores were based on 30% context, 30% condition and 40% species stocking rate. Following the offset assessment guide requirements a rounding function was used to convert the numbers generated to a whole integer out of 10.

### Impact area

#### Site Context:

As for other threatened species and communities within the impact area, the 127.3 ha of potential habitat for the Koala identified within the impact area was assigned a context component score of 6/10. This reflects the location of the impact area to the current mining operations, proximity to cleared agricultural areas and the connection to unreserved native forest to the north-east.

#### Site Condition:

The condition of the potential habitat for the Koala within the impact area was assessed based upon the information presented within the EA report (EMM 2013). The condition or quality of habitat with regard to the Koala was considered in relation to availability of feed trees species (including primary, secondary and supplementary species).

Within the impact area historical clearing, particularly within lower more fertile areas, grazing activities, timber and firewood collection are all likely to have reduced habitat quality for the Koala. Accordingly, the habitat quality scores for the potential habitat for the Spotted-tailed Quoll within the impact area used a start condition component score of 7/10 for this species.

The future condition within the impact area with development was assigned a score of 0/10, with an expectation that all potential habitat for the Koala within the impact area would be lost as part of the proposed modification.

#### Species stocking rate:

The species stocking rate represents the usage and or density of species at a particular site, acknowledging that value for a particular species may be high despite having a low condition or site context. As no Koalas were recorded within the impact area, the usage of this area has been conservatively estimated based upon records of the species within the broad locality (**Figure 2**), the site context, habitat condition and understanding of the ecology of this species. A species stocking rate of 5/10 has been estimated for the potential habitat for the Koala within the impact area.

#### **Offset sites**

Across the offset sites potential habitat was identified as those areas of vegetation which include known Koala feed trees (including primary, secondary or supplementary species) as identified in **Table 2**. Two forms of potential habitat have been identified with regard to the Koala, woodland habitat with a total area 353.3 ha and DNG habitat with a total area of 199.9 ha. Across all offset sites the site context, condition and species stocking rate of potential habitat for the Koala has been pooled for each form of potential habitat (woodland and DNG) given the broadly similar condition of habitat for this species within each of the offset sites.

#### Site Context:

With regard to the Koala, the potential habitat for this species within all offset sites is located adjacent to existing areas of native vegetation and in proximity to Goulburn River National Park, Munghorn Gap Nature Reserve and large areas of unreserved native woodland/forest (**Figure 1**). Accordingly, the habitat quality component for the offset sites used a context component score of 7/10 with regard to the potential woodland habitat for this species.

For the DNG form of potential habitat for the Koala, across all offset sites, the habitat quality component for the offset sites used a context component score of 4/10 as these areas by their nature of being DNG do not directly adjoin woodland habitat.

#### Site Condition:

The condition of the 353.3 ha of potential woodland habitat for the Koala was considered broadly similar to that in the impact area with historical clearing, grazing activities, timber and firewood collection all likely to have impacted the condition of the habitat available to the species. Accordingly, the habitat quality scores for the potential habitat for the Koala within woodland habitat across all offset sites used a start condition component score of 7/10 for this species.

The future condition without offset for the woodland habitat within offset sites was assigned a score of 5/10, with an expectation that this area would be subjected to further grazing and degradation if not managed for conservation of biodiversity as part of an offset. The future condition of the woodland habitat with offsetting of this site was assigned a score of 8/10, with an expectation that through appropriate management the condition of this habitat would improve including density of feed trees.

The condition of the 199.9 ha of potential DNG habitat for the Koala was considered significantly less than that within the woodland habitat due to the absence of a canopy layer. Accordingly, the habitat quality scores for the

potential habitat for the Koala within DNG across all offset sites used a start condition component score of 0/10 for this species.

The future condition without offset for the DNG habitat within offset sites was assigned a score of 0/10, with an expectation that this area would remain unchanged if not managed for conservation of biodiversity as part of an offset. The future condition of the woodland habitat with offsetting of this site was assigned a score of 4/10, with an expectation that through appropriate management the condition and context of this habitat would improve including the presence of a canopy structural layer.

Species stocking rate:

As for the impact area, no Koalas have been recorded within the offset areas with the usage of this area conservatively estimated based upon records of the species within the broad locality (**Figure 2**), the site context, habitat condition and knowledge of the ecology of this species. A species stocking rate of 5/10 has been estimated for the woodland potential habitat for the Koala across the offset sites.

The future species stocking rate without offset for the woodland habitat within offset sites was assigned a score of 4/10, with an expectation that this area would be subjected to further grazing and degradation and therefore less usage by this species, if not managed for conservation of biodiversity as part of an offset. The future species stocking rate of the woodland habitat with offsetting was assigned a score of 7/10.

A species stocking rate of 0/10 has been estimated for the DNG potential habitat for the Koala across the offset sites. The future species stocking rate without offset for the DNG habitat within offset sites was assigned a score of 0/10, while the future species stocking rate of the DNG habitat with offsetting was assigned a score of 4/10.

**Table 2: Potential Koala habitat within impact and offset areas**

Biometric vegetation type	Koala food tree species present	Food tree type (DECC 2008)	Area		
			Offset		Impact
			Woodland	DNG	
HU515 - Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands	<i>E. blakelyi</i> (Blakely's Red Gum) <i>E. melliodora</i> (Yellow Box)	Secondary	89.3	21.5	-
HU537 - Dwyer's Red Gum low woodland on exposed sandstone ridges of the upper Hunter Valley, Sydney Basin	<i>E. dwyeri</i> (Dwyer's Red Gum) <i>E. dealbata</i> (Tumbledown red Gum)	Secondary	35.1	-	-
HU551 - Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin	<i>E. moluccana</i> (Grey Box)	Secondary	55.8	4.9	-

Biometric vegetation type	Koala food tree species present	Food tree type (DECC 2008)	Area		
			Offset		Impact
			Woodland	DNG	
HU552 - Grey Gum - Narrow-leaved Stringybark - ironbark woodland on ridges of the upper Hunter Valley, Sydney Basin;	<i>E. punctata</i> (Grey Gum) <i>E. sparsifolia</i> (Narrow-leaved Stringybark)	Secondary & Supplementary	1.8	0	96.8 <sup>1</sup>
HU574 - Narrow-leaved Ironbark - Grey Gum shrubby woodland on footslopes on the upper Hunter Valley, Sydney Basin	<i>E. punctata</i> (Grey Gum)	Secondary	119.7	1.2	-
HU603 - Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast	<i>E. dealbata</i> (Tumbledown red Gum) <i>E. macrorrhyncha</i> (red Stringybark)	Secondary & Supplementary	30.0	41.0	
HU653 - White Box - Narrow-leaved Ironbark shrubby open forest on hills of the central Hunter Valley, Sydney Basin;	<i>E. albens</i> (White Box)	Secondary	-	-	13.3
HU654 - White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South	<i>E. albens</i> (White Box) <i>E. melliodora</i> (Yellow Box)	Secondary	21.6	131.3	17.2
<b>Total</b>			<b>353.3</b>	<b>199.9</b>	<b>127.3</b>

<sup>1</sup> Only includes the sub community "Ridgetop Broad-leaved Ironbark- Grey Gum Forest" which includes the Grey Gum as the secondary browse species.

## Summary

Impacts for each Commonwealth listed species as detailed above has been entered into the EPBC Act offsets calculator, together with the informed values/estimates for 'Habitat Context', 'Start Condition', 'Stocking Rate', 'Future Condition with Development' (assuming no mine site rehabilitation), to obtain a 'Total Quantum of Impact'. Similarly, values/estimates for 'Habitat Context', 'Start Condition', 'Stocking Rate', 'Future Condition with Offset' were entered for the proposed offsets sites to determine a Net Present Value Score. In all cases, the NPV score for offset sites exceeds the Quantum of Impact score as shown in **Table 3**.

**Table 3: Total Quantum of Impact and Net Present Value Scores using offset calculator**

IMPACT AREA ATTRIBUTES			OFFSET SITE ATTRIBUTES		
IMPACT SITE	AREA OF IMPACT (ha)	TOTAL QUANTUM OF IMPACT	AREA	FINAL NPV SCORE	% OF IMPACT OFFSET
Box-Gum Woodland (Woodland)	9.3	3.72	110.9	5.33	143%
Box-Gum Woodland (DNG)	7.2	2.16	152.8	6.78	314%
Large-eared Pied Bat and South-eastern Long-eared Bat (Potential Habitat)	171.4 <sup>1</sup>	119.98	918.7 <sup>2</sup>	190.56	159%
Regent Honeyeater and Swift Parrot (Potential Habitat)	30.5 <sup>3</sup>	21.35	324.4 <sup>4</sup>	65.36	306%
Spotted-tailed Quoll (Potential Habitat)	96.8 <sup>5</sup>	58.08	594.2 <sup>6</sup>	109.11	188%
Koala	127.3 <sup>7</sup>	76.38	553.2 <sup>8</sup>	101.14	132%

1. Includes all areas of native vegetation (woodland and DNG) within the impact area.
2. Includes all areas of native vegetation (woodland and DNG) within the offset areas except map units HU647 and HU548.
3. Includes areas of 'Shrubby White Box Forest' and 'Grassy White Box Woodland' vegetation communities of EMM (2013; Biometric vegetation types HU653 and HU 654).
4. Includes all areas of HU654, HU515, HU551 within the offset areas.
5. Includes portion of the area of HU552 identified as 'Ridgetop Broad-leaved Ironbark Grey Gum Forest' by EMM (2013),
6. Includes all areas of HU552, HU537, HU574, HU608, HU575, HU603, HU527 across the offset areas.
7. Includes all areas of HU653 and HU654 and portion of HU552 including *Eucalyptus punctata* (Grey Gum), identified as 'Ridgetop Broad-leaved Ironbark Grey Gum Forest' by EMM (2013), within impact area.
8. Includes all areas of HU515, HU537, HU551, HU552, HU574, HU603, HU653, HU654 across the offset sites

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## Appendix A: EPBC Act offset calculator habitat quality scores for Impact area

Impact Site Attributes				Habitat quality components			
MNES	%Risk Loss	%Risk Loss for calculation process	Area	Context (0 - 10)	Start Condition (0 - 10)	Species Stocking Rate (0 - 10)	Future condition with development (0 - 10)
White Box Yellow Box (woodland)	6.8	1.068	9.3	6	7	-	0
White Box Yellow Box (DNG)			7.2	6	5	-	0
Large-eared Pied Bat / South-eastern Long-eared Bat	0.2	1.002	171.4	6	8	8	0
Regent Honeyeater / Swift Parrot	1.2	1.012	30.5	6	8	8	0
Spotted tail-quoll	1.2	1.012	96.8	6	7	5	0
Koala	0.2	1.002	127.3	6	7	5	0

**Appendix B: EPBC Act offset calculator habitat quality scores for offset sites**

Offset Site		Offset Site Attributes										Habitat quality components							Time and Risk of Loss Factors				
		MNES	%Risk Loss	%Risk Loss for calculation process	Habitat Condition Label	Area	Context (0 - 10)	Start Condition (0 - 10)	Start Species Stocking Rate (0 - 10)	Future condition without offset (0 - 10)	Future Species Stocking Rate without offset (0 - 10)	Future quality with offset (0 - 10) - condition	Future Species Stocking Rate with offset (0 - 10)	Average Start Habitat	Habitat Score Confidence (%)	Risk related time horizon (max. 20years)	Time until ecological benefit	Risk of loss without offset	Risk of loss with offset	Confidence (%)			
Clifford					44.07	8	7		6		9		4.5	70	20	10	20	1.00	75				
Elwood				Woodland	13.41	8	7		6		9		4.5	70	20	10	20	1.00	75				
Old Bobadeen				Woodland	38.79	7	7		6		9		4.2	70	20	10	20	1.00	75				
Old Bobadeen - DNG				DNG	121.36	7	3		2		6		3	70	20	20	40	1.00	75				
Moolarmoo - woodland				Woodland	4.8	9	7		5		9		4.8	70	20	10	20	1.00	75				
Moolarmoo - DNG		6.8	1.068	DNG	13.68	9	3		2		6		3.6	70	20	20	40	1.00	75				
Property #5				Woodland	7.2	8	7		5		9		4.5	70	20	10	20	1.00	75				
Property #5 DNG				DNG	17.01	8	3		2		6		3.3	70	20	20	40	1.00	75				
Property #24/25				Woodland	2.62	7	7		5		9		4.2	70	20	10	20	1.00	75				
Property #24/25 DNG				DNG	0.79	7	3		2		6		3	70	20	20	40	1.00	75				
Total Woodland					110.89																		
Total DNG					152.84																		
Total Woodland				Woodland	709.16	8	8	8	7	6	9	9	8	50	20	10	20	1.00	75				
Total DNG				DNG	209.52	5	0	0	0	0	5	5	1.5	50	20	20	40	1.00	75				
Total Woodland				Woodland	166.69	7	7	7	6	6	9	9	7	70	20	10	20	1.00	75				
Total DNG				DNG	157.69	5	3	3	2	0	5	6	2.4	70	20	20	40	1.00	75				
Total Woodland				Woodland	540.37	8	7	5	5	4	8	7	6.5	70	20	10	20	1.00	75				
Total DNG				DNG	51.83	5	3	2	2	1	4	3	3.2	70	20	20	40	1.00	75				
Total Woodland				Woodland	353.31	7	7	5	5	4	8	7	6.2	70	20	10	20	1.00	75				
Total DNG				DNG	199.86	4	0	0	0	0	4	4	1.2	70	20	20	40	1.00	75				