

# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

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### Revision History

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Version 2	23/6/15	Amendments following Modification Project Approval for submission to DP&E
Version 3	07/12/15	Revision incorporating MSC and DP&E comments

### Contents

1.0	Introduction.....	4
1.1	Purpose and Scope.....	4
1.2	BMP Structure .....	8
1.3	Regulatory Requirements.....	9
1.4	Adaptive Change/Management .....	13
1.5	Risks to this Strategy.....	13
1.6	Roles and Responsibilities .....	14
1.7	Consultation .....	16
1.8	Long Term Security of Offsets & Conservation Areas .....	16
2.0	Existing Baseline Information .....	17
2.1	Rawlings State and Transition Model for Box Gum Woodland .....	18
2.2	Climatic Information.....	21
2.3	Biodiversity Offset Location & Land Use History .....	22
2.4	Landform and Geology .....	22
2.5	Vegetation Communities, Threatened and Migratory Species.....	22
3.0	Objectives and Criteria .....	34
3.1	Offset and Conservation Area Objectives.....	34
3.2	Disturbed Mined Land Rehabilitation Objectives .....	34
3.3	Completion Criteria.....	35
3.4	Intervention and Adaptive Management.....	36
4.0	Ecological Condition Improvement Targets .....	46
5.0	Offset Area Management Measures.....	48
5.1	Offset Area Revegetation/Regeneration Works.....	48
5.2	General Offset Area Management Measures .....	48
6.0	Disturbed Mine Land Biodiversity Management Measures.....	54
6.1	Ground Disturbance Permit Process .....	54
6.2	Pre-Clearance Surveys .....	54
6.3	Tree Felling .....	55
6.4	Salvage and Beneficial Use of Resources.....	55
6.5	Managing Impacts on Fauna .....	58
6.6	Final Landform Design .....	58
6.7	Substrate Management .....	58
6.8	Revegetation of Mine Disturbed Areas .....	59
6.9	Management of Grazing .....	60
7.0	Rehabilitation and Offset Schedule .....	60
7.1	Offset and Conservation Areas .....	60
7.2	Rehabilitation Areas .....	61
8.0	Biodiversity and Rehabilitation Monitoring.....	62
8.1	Biodiversity Monitoring .....	62
8.2	Vegetation Monitoring.....	63
8.3	Fauna Monitoring.....	65
8.4	Rehabilitation Monitoring .....	66
9.0	Reporting Requirements.....	68

9.1	External Reporting.....	68
9.2	Community Complaints .....	68
9.3	Incidents and Corrective Actions .....	68
9.4	Records Management .....	69
10.0	Compliance Auditing.....	69
11.0	Review of Management Plan.....	69
12.0	References .....	70
	Appendix 1 .....	72
	Regulatory Conditions.....	72
	Appendix 2 .....	78
	Offset Management Program – Middle Deep Creek and Oakvale Offset Areas .....	78
	Appendix 3 .....	79
	Offset Management Program – Onsite and Near Offsite Offset Areas.....	79
	Appendix 4 .....	80
	Rehabilitation and Ecological Monitoring Procedure .....	80
	Appendix 5 .....	81
	Mining Operations Plan.....	81
	Appendix 6 .....	82
	Correspondence Records .....	82

### Figures

Figure 1.1: Locality plan .....	<b>Error! Bookmark not defined.</b>
Figure 1.2: Mt Arthur Coal Complex.....	<b>Error! Bookmark not defined.</b>
Figure 1.3: BMP structure and relationship with other Mt Arthur Coal documents .....	<b>Error! Bookmark not defined.</b>
Figure 2.1: Box Gum Grassy Woodland State and Transition Model.....	<b>Error! Bookmark not defined.</b>
Figure 2.2: Mean monthly temperatures for Jerry’s Plains 1907-2014.....	21
Figure 2.3: Mean monthly rainfall for Jerry’s Plains 1884-2014 .....	21

### Tables

Table 1.1: Mt Arthur Coal Complex biodiversity offset requirements for Project Approval (09_0062 MOD1) and EPBC Approval (2011/5866) .....	12
Table 1.2: Biodiversity management issues and risks .....	13
Table 1.3: Biodiversity Management Roles and Responsibilities .....	15
Table 3.1: Trigger Action Response Plan for Offset, Conservation and Rehabilitation Area Establishment .....	37
Table 8.1: Modified Braun-Blanquet Crown Cover-Abundance Scale.....	64

# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

## 1.0 Introduction

Hunter Valley Energy Coal Pty Limited (HVEC) operates Mt Arthur Coal mine near Muswellbrook in the Upper Hunter Valley of NSW. Mt Arthur Coal is located approximately 5 kilometres south west of the township of Muswellbrook (refer to **Figure 1.1**).

The Department of Planning and Environment (DP&E) approval for the Mt Arthur Coal Mine - Open Cut Consolidation Project (Project Approval 09\_0062) was granted to HVEC on 24 September 2010. This approval allows for a single, consolidated planning approval for its open cut operations. In 2013, HVEC lodged an application to modify the Project Approval 09\_0062 under section 75W of the EP&A Act (the Mt Arthur Coal Open Cut Modification [the Modification]). The application was approved by the Planning Assessment Commission (as delegate of the Minister for Planning) on 26 September 2014 (Project Approval 09\_0062 MOD 1). The Modification includes the continuation of open cut mining operations at the Mt Arthur Coal Mine for an additional operational life of four years from 2022 to 2026 at the maximum rate of 32 Mtpa, an increase in open cut disturbance areas, additional overburden emplacement areas, duplication of the existing rail loop and various additional infrastructure changes.

On 30 April 2012, HVEC gained Department of Sustainability, Environment, Water, Population and Communities (now Department of Environment (DoE)) approval (EPBC 2011/5866) under Sections 130 (1) and 133 of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) for the Mt Arthur Coal Mine Extension Project. This version of the Mt Arthur Coal Biodiversity Management Plan (BMP) has been updated to address the requirements of both the State and Federal approvals as listed in **Appendix 1**. As such, the BMP replaces the original version entitled 'Biodiversity and Rehabilitation Management Plan' (Mt Arthur Coal, 2012a).

Mt Arthur Coal produces approximately 22 million tonnes (Mt) of thermal coal annually, with approval up to 32 Mt annually for the combined open operations as per Project Approval 09\_0062 MOD 1. Primarily the coal is produced for sale on the export market, where it is railed to the Port of Newcastle for transport to international customers. In addition some coal is sold to neighbouring power plants for energy generation, but this is less than 5 per cent of total Run of Mine (ROM) coal annually.

In order to liberate the coal, Mt Arthur Coal removes approximately 110 million bank cubic meters (bcm) of overburden annually. Overburden is transported to emplacement areas generally within the mine void, performing a secondary function of reforming previously mined areas. Suitable overburden material with generally inert qualities and low propensity to spontaneous combustion and acid water generation is used in the emplacement and shaping for final rehabilitation.

### 1.1 Purpose and Scope

The purpose of this BMP is to describe the ecological management controls and monitoring programs that are to be implemented for the management of flora and fauna within the Mt Arthur Coal conservation areas, offset areas (both onsite and off-site) and rehabilitation areas,

as described in the Mt Arthur Coal Modification Project Environmental Assessment (Resource Strategies 2013). Collectively the Project Area (identified in the Environmental Assessment), conservation areas, offset areas and buffer lands are hereby referred to as the Mt Arthur Coal Complex. The scope of this management plan pertains to the entirety of the Mt Arthur Coal Complex, as shown in **Figure 1.2**.

HVEC has designated a number of biodiversity offset and conservation areas, to offset the ecological impacts of disturbance within the mining areas of the Mt Arthur Coal Complex. This biodiversity offsetting has focused primarily on compensating for vegetation/habitat loss and impacts on threatened species, endangered populations and threatened ecological communities (TECs) listed under the Threatened Species Conservation Act 1995 (TSC Act) and EPBC Act. Targeted management actions (including revegetation/regeneration) within the biodiversity offset and conservation areas will provide secure habitat for threatened flora and fauna species, as well as protect and revegetate/regenerate areas of TECs present in those areas.

HVEC's biodiversity offset strategy comprises the following sites:

### **Conservation Areas:**

- Mount Arthur Conservation Area; and
- Saddlers Creek Conservation Area.

### **Offset Areas:**

- Thomas Mitchell Drive Onsite Offset Area;
- Thomas Mitchell Drive Offsite Offset Area;
- Roxburgh Road Offset Area;
- Middle Deep Creek Offset Area; and
- Oakvale Offset Area.

### **Rehabilitation Areas:**

- Rehabilitation Corridor (including Box Woodland Establishment Area); and
- Edderton Road Revegetation Area.

This BMP provides a consolidated document addressing both DP&E and DoE biodiversity management requirements for the Mt Arthur Coal Complex. With reference to Figure 1.2 it is noted that a portion of both the Middle Deep Creek Offset Area and Saddler's Creek Conservation Area in addition to the entire Oakvale Offset Area addresses the requirements of the state Project Approval only. The detailed information on the boundaries of areas under the scope of the EPBC 2011/5866 approval is contained within Preliminary Documentation provided to Department of Sustainability, Environment, Water, Population and Communities (now Department of Environment (DoE)) in December 2011 (Umwelt 2011).



# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN



Image Source: AAM (2012)

**Legend**  
 --- Mt Arthur EA Boundary

**FIGURE 1.1**  
**Locality Plan**







### 1.2 BMP Structure

This BMP represents the framework document for the overall Mt Arthur Coal Complex Biodiversity Management Structure (refer to **Figure 1.3**).

As part of the BMP structure, Offset Management Programs (OMP) have been developed for the *Middle Deep Creek and Oakvale Offset Areas* (MDCO) (refer to **Appendix 2**) and *Onsite and Near Offsite Offset Areas* (ONO) (refer to **Appendix 3**). The OMPs include a detailed program of works required to achieve the objectives and criteria nominated for these areas (refer to **Section 3.0**), and are based on the outcomes of detailed ecological field surveys completed for the MDCO and ONO Offset Areas.

In addition to the offset and conservation areas listed in **Section 1.1**, State approvals require the rehabilitation/regeneration of 2642 ha of woodland corridors on open cut mining disturbed land. Federal approvals require the rehabilitation/regeneration of 1915 ha of woodland corridors on open cut mining disturbed land. The rehabilitation/regeneration areas for these approvals each comprise a 500 ha Box Woodland Establishment Area as part of the total area (refer to **Figure 1.1 Appendix 3**). This BMP outlines the broad strategy for the establishment of these areas, including preliminary rehabilitation objectives. A detailed program of rehabilitation works for the establishment of the woodland corridors will be included in the Mining Operations Plan (MOP) for the relevant time period, which will be submitted for approval to the NSW Department of Trade and Investment – Division of Resources & Energy (DRE).

A comprehensive monitoring program has been implemented to assess performance of biodiversity management measures and to determine whether rehabilitation areas and offset and conservation areas are progressing towards achieving the preliminary completion criteria as discussed in **Section 3.3**. Further details of the monitoring program are presented in a separate Rehabilitation and Ecological Monitoring Procedure (**Appendix 4**, as amended from time to time), and outlined in **Section 8.0**.

### 1.3 Regulatory Requirements

A summary of legislation relevant to this BMP (both State and Federal) is provided in the following section. Details on this legislation can be found on the website [www.legislation.nsw.gov.au](http://www.legislation.nsw.gov.au).

#### ***Mining Act 1992***

The NSW *Mining Act 1992* (Mining Act) is administered by NSW DRE on behalf of the Minister for Resources and Energy and places controls on methods of exploration and mining, the disposal of mining waste, land rehabilitation, and environmental management activities. A mining lease granted under the Mining Act entitles the leaseholder to mine coal from a deposit. HVEC currently holds the mining tenements required to carry out the Project.

#### ***Native Vegetation Act 2003***

The *Native Vegetation Act 2003* does not apply to clearing authorised under the *Mining Act 1992*, or designated developments approved under the *Environmental Planning and Assessment Act 1979* (EP&A Act). However, the *Native Vegetation Act 2003* does apply to HVEC owned land which is outside of the Project Area. Prior to any clearing activities on this land, a Ground Disturbance Permit (GDP) will be completed to ensure the requirements of the *Native Vegetation Act 2003* are followed.

#### ***Threatened Species Conservation Act 1995***

The NSW *Threatened Species Conservation Act 1995* (TSC Act) provides protection for threatened species native to NSW (excluding fish and marine vegetation). Species, populations and ecological communities listed under Schedule 1 (Endangered) and Schedule 2 (Vulnerable) are considered to be threatened in NSW. Protection is provided by integrating the conservation of threatened species, endangered populations, Endangered Ecological Communities (EEC) and Critically Endangered Ecological Communities (CEEC) into development control processes under the EP&A Act. Detailed information on the key biodiversity issues are provided in project EA (Hansen Bailey 2009), including threatened species, populations and ecological communities either present or likely to occur on the site.

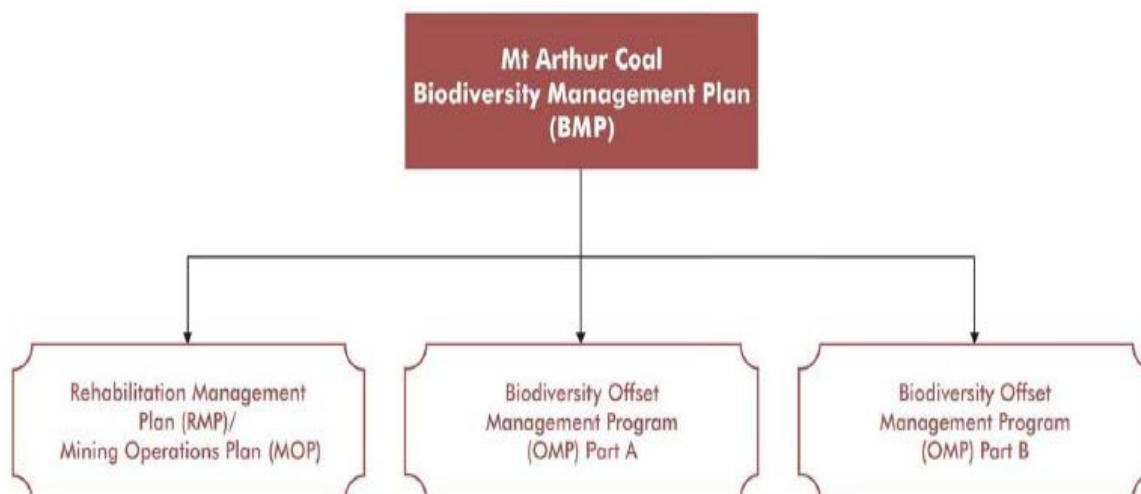


FIGURE 1.3  
**BMP Structure and Relationship  
with Other Mt Arthur Coal Documents**

Impact mitigation measures (such as vegetation clearing protocols and a post-mining rehabilitation procedure) and a biodiversity offset strategy have been developed to mitigate or compensate for impacts on the threatened species, endangered populations and EEC/CEECs of the Project Area, as predicted in the EA. This BMP provides further detail on the mitigation measures committed to in the EA.

### ***Fisheries Management Act 1994***

The objectives of the *Fisheries Management Act 1994* are to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. The impact assessment applied as part of the EA (Hansen Bailey, 2009) concluded there no requirement for aquatic studies to be undertaken as no permanent streams or wetlands exist within the Project Area.

### ***Rural Fires Act 1997***

The *Rural Fires Act 1997* controls the management of bushfires and controlled burning in NSW. The Act requires HVEC to take all practical steps to prevent bushfires and to minimise the danger of the spread of bushfires on or from land under its control (including offset and revegetation areas).

### ***Environmental Planning & Assessment Act 1979***

Under the EP&A Act, approval from the NSW Minister of Planning is required for state significant projects. The act aims to:

- prevent, minimise, and/or offset adverse environmental impacts of the project;
- set standards and performance measures for acceptable environmental performance;
- requires regular monitoring and reporting; and
- provide for ongoing environmental management of the project.

### ***Environment Protection and Biodiversity Conservation Act 1999***

Under the Commonwealth EPBC Act, approval from the Commonwealth Minister for Environment is required for any action that may have a significant impact on matters of national environmental significance (MNES). These matters are:

- listed threatened species and ecological communities;
- migratory species protected under international agreements;
- wetlands of international importance (listed under the Ramsar Convention);
- Commonwealth marine areas;
- World Heritage properties;
- National Heritage places;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mines); and



- a water resource, in relation to coal seam gas development and large coal mining development.

In accordance with the EPBC Act, HVEC received approval from the DoE for MNES on 30 April 2012 (EPBC No. 2011/5866). The EPBC approval placed 17 conditions on the development. The approval conditions relating to this document are outlined in **Section 1.3**.

### ***Mt Arthur Coal Approvals***

Conditions of the DP&E Project Approval (09\_0062 MOD 1) and EPBC Approval (EPBC 2011/5866) relevant to biodiversity management, and where they are addressed within this plan, are contained in **Appendix 1**.

This BMP has been prepared to satisfy the requirements of Condition 40 of Schedule 3 of the Project Approval (09\_0062 MOD 1) and EPBC approval (EPBC 2011/5866). **Table 1.1** outlines the biodiversity offset strategy as required in Condition 36 of Schedule 3 of the DP&E Project Approval (09\_0062 MOD 1) and Condition 4 of the EPBC Approval (2011/5866). The boundaries and areas referred to in this table are shown in **Figure 1.2**. As described in Section 1.1, the detailed information on the boundaries of areas under the scope of the EPBC 2011/5866 approval is contained within the Preliminary Documentation (Umwelt 2011).

**Table 1.1: Mt Arthur Coal Complex biodiversity offset requirements for Project Approval (09\_0062 MOD1) and EPBC Approval (2011/5866)**

Name of Conservation/Offset Area		Project Approval (09_0062 MOD1) (ha)	EPBC Approval (EPBC 2011/5866) (ha)	
			EPBC listed box Gum Woodland	Habitat for EPBC listed birds
Mount Arthur Conservation Area		105	67.0	74.0
Saddlers Creek Conservation Area		426 <sup>5</sup>	87.1	51.2
Thomas Mitchell Drive Offsite Offset Area		495	4.9	63.9 (+ 62.05 marginal) <sup>1</sup>
Thomas Mitchell Drive Onsite Offset Area		222	55.7	36.5
Roxburgh Road Offset Area <sup>8</sup>		110	0	78.0
Oakvale Offset Area <sup>3</sup>		253.5	NA	NA
Middle Deep Creek Offset Area		992 <sup>6</sup>	493.0	373.0
Rehabilitation Area	500 ha Regeneration Area <sup>4</sup>	2642 (including 500 ha of Box Gum Woodland)	299.2	500.0
	2142 ha Rehabilitation Corridors		NA	1415 <sup>2,4</sup>
	Edderton Road revegetation area	154 <sup>7</sup>		
<b>Total</b>		<b>5399.5</b>	<b>1006.9</b>	<b>2491.6</b>

**Notes:**

- 1 – Marginal habitat was given a 0.5 per ha weighting (124.1 ha x 0.5) due to the scattered nature of the canopy trees present.
- 2 – 1415 ha Rehabilitation Corridor to be regenerated to natural woodland and forests as follows:
  - Woodland corridors (1005 ha);
  - Edderton Road revegetation area (154 ha);
  - Regeneration corridors (45 ha); and
  - Rehabilitation area (211 ha).
- 3 – Referred to in Project Approval 09\_0062 MOD 1 as the ‘Additional Off-site Offset Area’ (to be identified under Schedule 3 Condition 37) and offset area approved as 253.5 ha.
- 4 – This area is a component of the overall 2642 ha rehabilitation area.
- 5 – This stated area of 426 ha is consistent with that detailed in the Mt Arthur Coal Modification Environmental Assessment. PA 09\_0062 MOD 1 requires a minimum 131 ha size for the Saddlers Creek Conservation Area.
- 6 – This stated area of 992 ha reflects the approximate area of this offset area and is broadly consistent with the Mt Arthur Coal Modification Environmental Assessment. PA 09\_0062 MOD 1 requires a minimum 410 ha size for the Middle Deep Creek Offset Area.
- 7 – As detailed in the Mt Arthur Coal Modification Environmental Assessment, the Edderton Road Revegetation Area is required to contribute 154 ha in addition to the required 2642 ha of rehabilitation corridors.
- 8 – This area is referred to as ‘Constable Offset Area’ in EPBC 2011/5866.

### 1.4 Adaptive Change/Management

A feedback loop between monitoring and management will be established as part of this BMP. The management of the biodiversity areas of the Mt Arthur Coal Complex will be responsive to ecological data resulting from rehabilitation and biodiversity offset monitoring, or other relevant studies. This will enable a flexible approach to the ecological management requirements, and ongoing refinement of the management strategy for offset areas.

Modifications to mining operations, or associated activities, that have the potential to impact upon the measures outlined in this BMP will be addressed in future revisions.

### 1.5 Risks to this Strategy

A list of issues and risks that may impact upon the successful implementation of this BMP, and where they are addressed within this document, is outlined in **Table 1.2**.

**Table 1.2: Biodiversity management issues and risks**

Issue/Risk	Section of BMP
Failure to meet government and community guidelines and expectations.	<b>Section 1.7</b> – Consultation
Inadequate resourcing to implement the management strategy	<b>Section 1.6</b> – Roles and Responsibilities
Lack of availability of locally occurring species to be either seeded or planted in revegetation or regeneration	<b>Section 5.2</b> – General Offset Area Management Measures

Issue/Risk	Section of BMP
Potential harm to species (both threatened and non-threatened) as part of clearing activities	<b>Sections 6.1</b> – Ground Disturbance Permit <b>Section 6.2</b> – Pre-Clearance Surveys <b>Section 6.3</b> – Tree Felling <b>Section 6.5</b> – Managing Impacts on Fauna
Loss of biological resources for use in rehabilitation (topsoil salvage, hollow salvage, timber and woody debris etc.)	<b>Section 6.4</b> – Salvage and Beneficial Use of Resources
Poor soils/substrate material inhibiting plant establishment and growth	<b>Section 6.4</b> – Salvage and Beneficial Use of Resources <b>Section 6.7</b> – Substrate Management
Inadequate final landform design leading to an unstable landform and inability to obtain sign-off	<b>Section 6.6</b> – Final Landform Design
Rehabilitation failure due to prevailing weather conditions, poor soil conditions or propagation of required species.	<b>Section 6.4</b> – Salvage and Beneficial Use of Resources <b>Section 8.0</b> – Biodiversity and Rehabilitation Monitoring
Weed infestation within offset and rehabilitation areas leading to degradation of biodiversity values	<b>Section 5.2</b> – Weed Management
Damage to offset and rehabilitation areas as a result of bushfire	<b>Section 5.2</b> – General Offset Area Management Measures
Feral fauna species within offset and rehabilitation areas leading to degradation of biodiversity values	<b>Section 5.2</b> – General Offset Area Management Measures
Failure to meet revegetation targets within offset areas	<b>Section 5.1</b> – Offset Area Revegetation/Regeneration Works <b>Section 8.1</b> – Biodiversity Monitoring
Damage to regeneration areas from stock	<b>Section 5.2</b> – General Offset Area Management Measures <b>Section 6.9</b> – Management of Grazing
Unauthorised access of rehabilitation and regeneration areas leading to damage	<b>Section 5.2</b> – General Offset Area Management Measures

### 1.6 Roles and Responsibilities

The Mt Arthur Coal Environmental Management System (EMS) details the roles, responsibilities, authorities and accountabilities for employees and contractors in relation to the environmental management of Mt Arthur Coal Complex. Roles and responsibilities specific to the implementation of this BMP are outlined in **Table 1.3** below.

**Table 1.3: Biodiversity Management Roles and Responsibilities**

Role	Accountabilities for this Document
General Manager Open Cut Operations	<ul style="list-style-type: none"> <li>• Ensure that sufficient resources are allocated for the implementation of measures presented in this BMP.</li> </ul>
Manager Production Planning	<ul style="list-style-type: none"> <li>• Integrate the rehabilitation strategies as outlined in the BMP into relevant mine and project plans.</li> <li>• Ensure the mine planning process integrates ecological management and rehabilitation planning.</li> <li>• Allocate sufficient time and resources to allow for the implementation of ecological management and rehabilitation strategies presented in this BMP.</li> <li>• Ensure that the Mt Arthur Coal Ground Disturbance Permit process is followed in advance of clearing activities.</li> <li>• Maintain all land disturbance and monitoring records in accordance with the EMS.</li> </ul>
Manager Health, Safety and Environment - Execution	<ul style="list-style-type: none"> <li>• Ensure the rehabilitation schedule is consistent with the Project Approval and associated commitments.</li> <li>• Ensure sufficient resources and time is allocated to implement the measures presented in this BMP.</li> <li>• Ensure BMP monitoring program results and research trials are assessed against BMP objectives and targets, and rehabilitation progress criteria, to refine the BMP programs and measures, closure criteria and rehabilitation/revegetation practices.</li> <li>• Ensure that personnel involved in the carrying out and monitoring the BMP activities and values are appropriately qualified, licensed and experienced to undertake the task.</li> </ul>
Superintendent Environment - Execution	<ul style="list-style-type: none"> <li>• Coordinate the implementation of the biodiversity offset and management strategies outlined in the BMP.</li> <li>• Manage and maintain the ecological and rehabilitation monitoring programs in accordance with this plan.</li> <li>• Accountable for the implementation of the GDP process.</li> <li>• Report potential or actual biodiversity or offset issues, including incidents and non-conformances.</li> </ul>
Superintendent Environment – Analysis & Improvement	<ul style="list-style-type: none"> <li>• Ensure that the BMP is reviewed and updated in accordance with the review schedule.</li> <li>• Ensure the BMP is reviewed and updated following any modification or new approvals.</li> <li>• Carry out governance activities to verify management actions and monitoring is being carried in accordance with the BMP.</li> </ul>
Superintendent Health, Safety and Environment Reporting	<ul style="list-style-type: none"> <li>• Ensure all internal and external reporting requirements relating to biodiversity management are met.</li> <li>• Review and verify land management and biodiversity data used in internal and external reporting.</li> </ul>



### 1.7 Consultation

Community engagement and consultation is continual throughout the life of the Mt Arthur Coal Complex. This engagement includes the:

- 24-hour Community Response Line (1800 882 044);
- Website providing information on Mt Arthur Coal's operations, approvals and environmental monitoring  
<http://www.bhpbilliton.com/home/society/regulatory/Pages/default.aspx>; and
- Regular Mt Arthur Coal Community Consultative Committee (CCC) meetings. The CCC provides an interface between the community, mine management and the relevant government departments. The community representatives on the CCC are responsible for sharing information from CCC meetings with the wider community and to report back on community issues at CCC meetings.

Consultation and requests for input specifically regarding the development of the initial version of this BMP (Mt Arthur Coal 2012a) and the Mt Arthur Coal Rehabilitation Strategy (Mt Arthur Coal 2012b) has been undertaken with:

- Department of Planning and Environment (DP&E);
- Office of Environment and Heritage (OEH);
- NSW Office of Water (NOW);
- Muswellbrook Shire Council (MSC);
- Mt Arthur Coal CCC; and
- Neighbouring mining operations.

HVEC proposes to engage throughout the life of the mine with neighbouring operations, agency and community stakeholders.

### 1.8 Long Term Security of Offsets & Conservation Areas

HVEC are committed to registering a legally binding covenant over the Mt Arthur Coal Conservation and Offset Areas in accordance with the requirements of Condition 7(b) of the EPBC Approval (EPBC2011/5866) and Condition 39 of Schedule 3 of Project Approval (09\_0062 MOD1) within the approved timeframe.

## 2.0 Existing Baseline Information

HVEC has provided several offset and conservation areas as part of the biodiversity offset strategy required to achieve both state and federal project approval. The offset and conservation areas have been provided to offset the ecological impacts of disturbance within the Mt Arthur Coal Complex mining areas. This biodiversity offsetting has focused primarily on vegetation/habitat loss and impacts to threatened species, endangered populations and TECs. Targeted management actions (including revegetation/regeneration) within the offset and conservation areas will provide secure habitat for a range of threatened flora and fauna species, as well as protect and revegetate/regenerate substantial areas of TECs present in these areas. HVEC's offset and conservation areas are listed in **Table 1.1** and are shown in **Figure 1.2**.

An additional 'Rehabilitation Area' of 2642 ha is also part of the offset package and comprises of a number of smaller parcels of mine site rehabilitation and woodland corridors (refer to **Section 2.7**). The relevant biodiversity management requirements for these additional areas have been incorporated into this plan.

Detailed ecological field surveys of the ONO and MDCO Offset Areas were conducted in June 2012/September 2012/December 2012/Oct 2014 (MDCO) and April 2013 (ONO) to identify threatened flora species, endangered populations, TECs/CEECs, and species of local or regional significance occurring (or considered to potentially occur) within the Offset Areas (Umwelt 2013, Umwelt 2014 and Hunter Eco 2013). The findings of these surveys have been utilised to develop the OMPs (refer to **Appendices 2 and 3**).

As well as establishing current ecological baseline condition, the ecological field surveys conducted for the ONO and MDCO Offset Areas were used to scope the on-the-ground ecological management works required to achieve the objectives outlined in **Section 3.0**. The following sections provide an overview of the ecological condition of these offset and conservation areas.

The following sections detail the existing environment for the offset/conservation areas and rehabilitation areas. All offset/conservation areas and rehabilitation areas are shown on **Figure 1.2**.

## 2.1 Rawlings State and Transition Model for Box Gum Woodland

*Rawlings et al. (2010)* State and Transition Model splits the Box Gum Woodland into five States based on a range of condition and land use benchmarks. Each of the states are summarised in **Figure 2.1** (*Rawlings et al. 2010*).

Condition 7(e) and Table 1 of the EPBC Approval (EPBC 2011/5866) indicate that 707.7 ha of offset and conservation areas and 299.2 ha of rehabilitation / regeneration area are required to be consistent with the State 1 as described in the State and Transition Model for Box Gum Woodland (*Rawlings et al. 2010*) and listing advice for the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community (Threatened Species Scientific Committee, 2006).

Section 2.5 discusses in more detail the current condition in respect to the five States discussed in *Rawlings et al. (2010)* of the offset and conservation areas. Maps showing the current vegetation condition within the biodiversity offset areas divided into State 1, State 2 and State 3 areas are provided in **Appendix 2 and 3**.

Further information on the three states that occur in Mt Arthur Coal Offset Areas and relevant management measures are stated below.

### State 1

These areas are considered to be the benchmark to which the nominated portions of the State 2 and 3 areas will be compared in order to determine the success of revegetation/regeneration works. State 1 areas will be protected from ongoing impacts through such methods as exclusion of stock and weed and pest management, and will be subject to ecological monitoring. Weed and pest management may be required within State 1 areas if indicated by monitoring. Some erosion control works may also be conducted within State 1 areas if:

- they are deemed necessary, and
- it is determined that the benefit from these works warrants the additional disturbance.

No other active revegetation works are scheduled to occur within these areas, unless monitoring indicates a decline in the ecological health of an area.

### State 2

State 2 refers to areas where some active revegetation works will be required; however, natural regeneration from existing mature vegetation will be encouraged. These areas generally contain significant components of State 1 areas, with some portions close to sources of natural recruitment (such as seed sources and encroachment from adjoining vegetation).

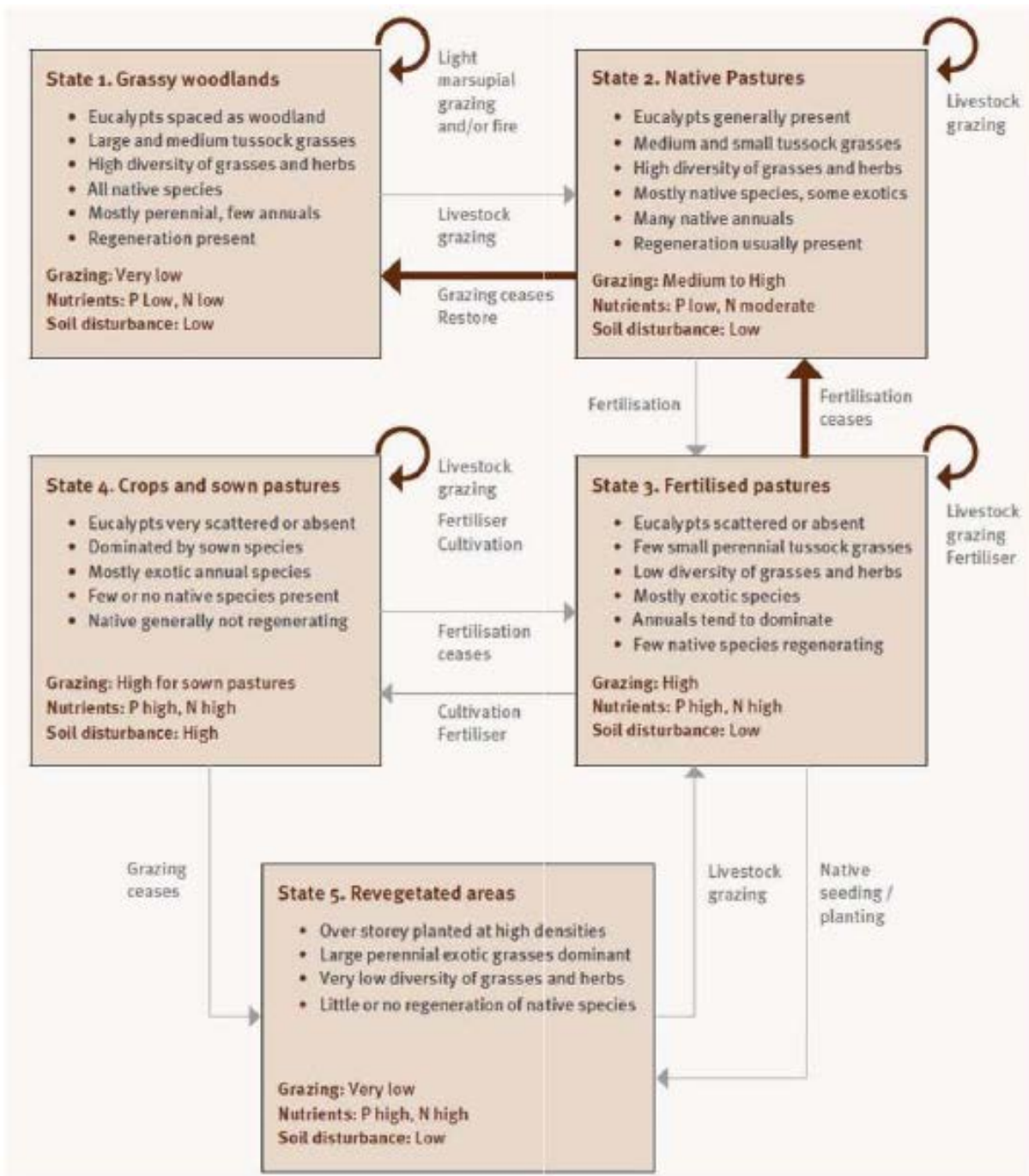


FIGURE 2.1

**Bax Gum Grassy Woodland State and Transition Model**



Natural regeneration of large portions of these areas is occurring and is likely to continue, if given protection from impacts such as grazing, feral fauna and weed invasion. These areas will still, however, require ongoing general management actions to maximize regeneration/revegetation success and protect existing vegetation. Revegetation works (e.g. seeding or planting of tubestock) will be implemented within portions of State 2 areas where it is considered that natural regeneration of native tree species is unlikely to occur (i.e. in areas of Derived Native Grassland with few, if any, canopy species in the immediate vicinity). The following management actions are likely to be required within State 2 areas:

- assisted natural regeneration;
- planting of tubestock and/or direct seeding;
- weed management;
- fencing and signage; and
- feral fauna management.

### *State 3*

State 3 refers to areas requiring a higher level of revegetation works to return disturbed vegetation communities to State 1 condition. Resources focussed on improving State 2 areas are likely to achieve better native ecosystem establishment and native fauna habitat outcomes. The aim of land management works within State 3 portions will be to facilitate an increase in native groundcover species density and diversity, and to significantly reduce weed density. It is considered that these processes will continue to occur naturally over time following the exclusion of stock from the offset and conservation areas.

Exclusion of cattle from these areas is likely to be beneficial in terms of reducing available nutrients that allow weed species to thrive. However, it is possible that the exclusion of cattle may have a negative effect on native species and result in increased weed density over the longer term. Strategic grazing is not currently proposed; however, managed grazing will be investigated as a land management option and State 3 areas will be monitored for native groundcover density, with management actions (e.g. grazing regime and weed management) to be determined by monitoring outcomes.

The following management actions are required within State 3 areas:

- fencing;
- feral fauna management;
- weed management; and
- managed grazing.

## 2.2 Climatic Information

Temperature data for Jerry’s Plains, which was the nearest station to the offset and conservation areas with long-term records, were obtained from the Australian Bureau of Meteorology (BoM) (Figure 2.2). Mean minimum temperatures range from approximately 4 degrees Celsius (°C) to 17°C and mean maximum temperatures from approximately 17°C to 32°C.

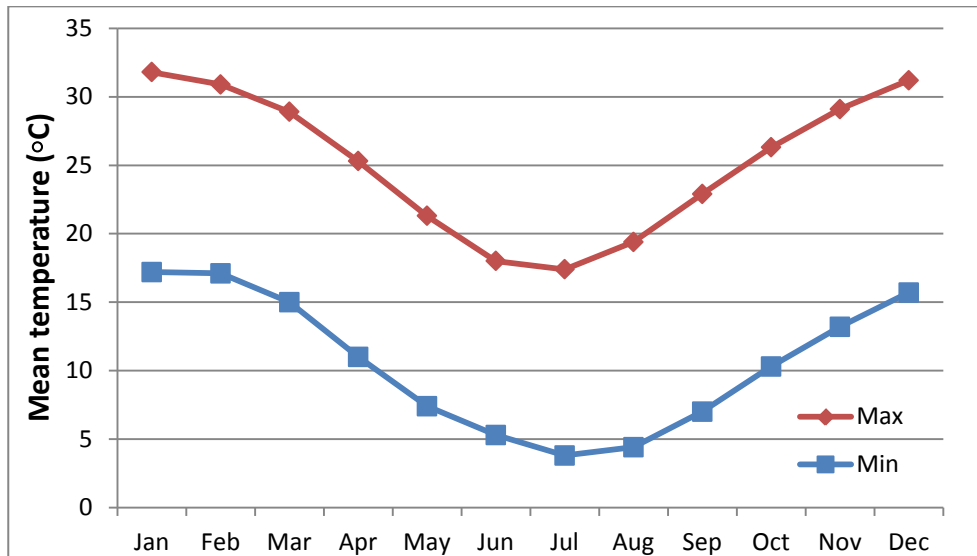


Figure 2.1: Mean monthly temperatures for Jerry’s Plains 1907-2014

Rainfall data for Jerry’s Plains, which was the nearest station to the offset and conservation areas with long-term records, were obtained from the BoM (Figure 2.3). The long-term mean annual rainfall is reported as 646 millimetres.

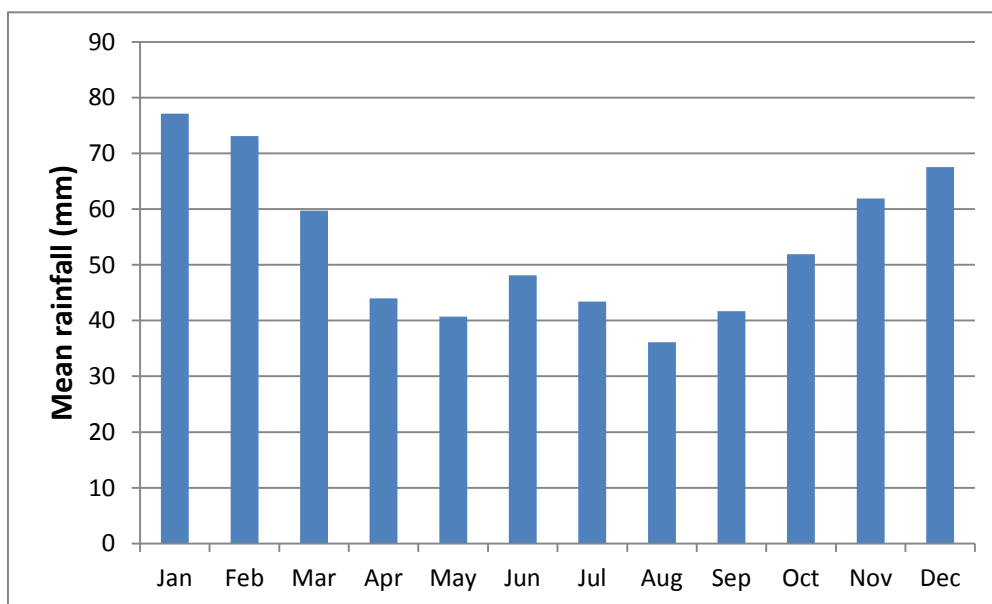


Figure 2.2: Mean monthly rainfall for Jerry’s Plains 1884-2014

### 2.3 Biodiversity Offset Location & Land Use History

The Mt Arthur Coal biodiversity offset and conservation areas are located near to the Mt Arthur mine, near Muswellbrook NSW (**Figure 1.2**). Collectively the Mt Arthur Coal onsite and near offsite biodiversity offset and conservation areas comprise approximately 4154 ha of land, taking into consideration the 500 ha of overlap between the Rehabilitation Woodland Corridor and Box Woodland Establishment Area. Additional offset areas have also been established as part of the Mt Arthur Coal biodiversity offset and conservation areas near Timor in NSW. Collectively, all of the MAC offset and conservation lands are approximately 5400 ha in size.

Historically, the biodiversity offset and conservation areas have primarily been used for agricultural activities, mainly cattle grazing. The Mount Arthur Conservation Area appears to have been the least disturbed by agricultural activities, which is likely due to the rugged terrain.

Extensive areas of agricultural and horticultural activities exist in the surrounding region. Coal mining is the other main industry which is well established in the region. Cattle grazing is the primary agricultural land use in the immediate area.

### 2.4 Landform and Geology

Typically the Mt Arthur Coal biodiversity offset and conservation areas comprise rolling hills with a mixture of remnant grassy woodlands and derived native grassland. The Mount Arthur Conservation Area comprises steep hills and escarpments which rise from the surrounding low hills, with rocky outcrops located on the upper slopes. In rocky areas, and presumably where the soils are less fertile, the understorey becomes shrubby. The southern slope represents the steepest section, which provides a relatively moist environment where sheltered tall moist forest occurs. There are also several creeks and associated floodplains located in several of the biodiversity offset and conservation areas. These include Ramrod Creek in the Thomas Mitchell Drive Off-site Offset Area and Saddlers Creek in the Saddlers Creek Conservation Area. These creeks comprise riparian vegetation within the creeks themselves and woodland associated with the surrounding floodplain.

### 2.5 Vegetation Communities, Threatened and Migratory Species

#### Mount Arthur Conservation Area

The Mount Arthur Conservation Area which is owned by HVEC is approximately 105 ha in size and covers the upper and lower slopes of Mount Arthur. The Mount Arthur Conservation Area is largely undisturbed by mining related activity and consists of many small patches of remnant native vegetation communities. The area contains relatively intact forest and will protect unique habitat features such as rock crevices and a substantial number of tree hollows. Rocky outcropping in this habitat type provides refuge habitat for a variety of fauna species, particularly small reptiles. The proximity of the Mount Arthur Conservation Area to the Saddlers Creek Conservation Area enhances its habitat connectivity value within the landscape.

The area contains 21.4 ha of State 1 condition EPBC listed Box Gum Woodland, 12.7 ha of State 2 Box Gum Woodland, and 68.1 ha of Woodland Habitat for EPBC listed birds.

EPBC listed Box Gum Woodland vegetation within the Mount Arthur Conservation Area includes:

- 12.35 ha of Central Hunter Box – Ironbark Woodland (Box dominated) (also EEC under the NSW TSC Act) – a grassy woodland community characterised by the dominance of grey/white box hybrids (*Eucalyptus albens* x *moluccana*), above a very sparse shrub layer and dense groundcover dominated by native grasses and forbs.
- 8.93 ha of Central Hunter Box – Ironbark Woodland (Box dominated) Derived Native Grassland (also EEC under the NSW TSC Act) – native grasslands derived from Unit Central Hunter Box - Ironbark Woodland (Box Dominated) community, with few scattered remnant and regenerating grey/white box hybrids (*Eucalyptus albens* x *moluccana*). The groundcover is dominated by native grasses and forbs that displayed similarities to the groundcover of the parent woodland community.
- 9.08 ha of Red Gum Grassy Forest (also EEC under the NSW TSC Act) – a grassy forest community occurring on the upper slopes of the Mount Arthur Conservation Area, characterised by the dominance of Blakely’s red gum (*Eucalyptus blakelyi*) above a sparse shrub layer and dense groundcover dominated by native grasses and forbs.
- 3.84 ha of Red Gum Grassy Forest – Derived Native Grassland (also EEC under the NSW TSC Act) – native grasslands derived from Red Gum Grassy Forest, with scattered kurrajong (*Brachychiton populneus* subsp. *populneus*) trees and groundcover dominated by native grasses and forbs that displayed similarities to the groundcover of the parent woodland community. Before clearing this community would have had a canopy dominated by Blakely’s red gum (*Eucalyptus blakelyi*) and red gum hybrids (*Eucalyptus blakelyi* x *tereticornis*).

A small patch of Central Hunter Ironbark – Spotted Gum – Grey Box Forest (0.42 ha), which is an EEC under the NSW TSC Act, was also recorded on the south facing midslope in the eastern portion of the Mount Arthur Conservation Area. It is characterised by a sparse canopy (up to 30 per cent cover) dominated by spotted gum (*Corymbia maculata*), with a generally sparse shrub layer (up to 10 per cent cover), and dense ground layer (up to 70 per cent cover) between 0.1 and 1 metre in height.

These communities provide woodland habitat with the potential to attract species such as the grey-headed flying fox (*Pteropus poliocephalus*), little lorikeet (*Glossopsitta pusilla*) and squirrel glider (*Petaurus norfolcensis*).

The area also contains shrubland habitat, consisting of 4.3 ha of Hunter Valley Vine Thicket, endangered ecological communities (EEC) under the NSW TSC Act. This shrubland habitat comprises very few mature trees and is dominated by small shrubby vegetation typically less than eight metres in height. The vegetation present is not typically associated with hollow-bearing trees, and any hollows present were likely to have been very small in size. Structural diversity in these areas was minimal with little rock or log cover present.

Smaller remnant patches of non-listed communities included Upper Hunter Hills Box - Ironbark - Red Gum Woodland (and Derived Grassland variant), Western Hunter Narrabeen Footslopes Ironbark - Cypress Pine Woodland, Central Hunter Bulloak Forest, Red Gum Grassy Forest –

Rough-barked Apple Variant, Upper Hunter Hills Sheltered Moist Forest (and Derived Grassland variant), and Central Hunter Ironbark - Spotted Gum – Grey Box Forest – Derived Native Grassland.

Rainforest habitat occurs in the Mount Arthur Conservation Area and comprises 0.23 ha. Groundcover species diversity and cover in these area was low, however the shrubby layer is relatively dense and provides a variety of refuge and foraging resources for a variety of fructivorous species (particularly with Port Jackson fig (*Ficus rubiginosa*) which readily produce hollows and a fruiting resource).

Fauna surveys completed previously within the Mount Arthur Conservation Area identified the threatened species, southern myotis (*Myotis macropus*) listed as vulnerable under the NSW TSC Act.

### Saddlers Creek Conservation Area

The Saddlers Creek Conservation Area which is owned by HVEC is approximately 426 ha in size, and includes the main channel and riparian vegetation corridor of Saddlers Creek, running along the southern and south-eastern boundaries of the EA Boundary.

There are also areas of aquatic vegetation located along Saddlers Creek. Saddlers Creek riparian vegetation provides known habitat for a number of threatened fauna species and the tiger orchid (*Cymbidium canaliculatum*), which is listed as an endangered population in the Hunter catchment under the TSC Act.

The area contains 54.8 ha of State 1 condition EPBC listed Box Gum Woodland, 270.3 ha of State 2 Box Gum Woodland, and 54.8 ha of Woodland Habitat for EPBC listed birds.

EPBC listed Box Gum Woodland vegetation within the Saddlers Creek Conservation Area includes:

- 51.2 ha of Hunter Floodplain Red Gum Woodland Complex (also EEC under the NSW TSC Act) – a grassy woodland community occurring on the floodplains within the Saddlers Creek Conservation Area, characterised by the co-dominance of yellow box (*Eucalyptus melliodora*), grey/white box hybrids (*Eucalyptus albens* x *moluccana*), red gum hybrids (*Eucalyptus blakelyi* x *tereticornis*) and Blakely's red gum (*Eucalyptus blakelyi*) above a sparse shrub and dense groundcover dominated by native grasses and forbs.
- 166 ha of Hunter Floodplain Red Gum Woodland Complex - Derived Native Grassland (also EEC under the NSW TSC Act) – native grasslands, derived from Hunter Floodplain Red Gum Woodland Complex, with remnant and regenerating yellow box (*Eucalyptus melliodora*), red gum hybrids (*Eucalyptus blakelyi* x *tereticornis*) and kurrajong (*Brachyachiton populneus* subsp. *populneus*) throughout. The groundcover was dominated by native grasses and forbs that displayed similarities to the groundcover of the parent woodland community.
- 3.5 ha of Central Hunter Box – Ironbark Woodland (Box dominated) (also EEC under the NSW TSC Act) – a grassy woodland community dominated by grey/white box hybrids (*Eucalyptus albens* x *moluccana*), and groundcover dominated by native grasses and forbs.



- 104.3 ha of Central Hunter Box – Ironbark Woodland (Box dominated) Derived Native Grassland (also EEC under the NSW TSC Act) – native grasslands, derived from Unit Central Hunter Box - Ironbark Woodland (Box Dominated), with scattered remnant and regenerating grey/white box hybrids (*Eucalyptus albens* x *moluccana*), and groundcover dominated by native grasses and forbs that displayed similarities to the groundcover of the parent woodland community.

Reedland areas were identified within the Saddlers Creek Conservation Area in artificially constructed areas of pooling water. This habitat formation was approximately 3.11 ha in size. The species and structural diversity provided by the Reedland habitat is low and largely consists of broad-leaved cumbungi (*Typha orientalis*) in shallow waters.

Grassland habitat occurred throughout the Saddlers Creek Conservation Area. Canopy trees were typically absent from this habitat type however occasional mature trees were recorded, which potentially provide hollow resources and woody debris for bird, micro-bat and reptile species. Mixed native grass and forb species provide foraging habitat for macropods and for omnivorous birds. Ephemeral creeklines and farm dams occur throughout this habitat type which provides water resources for a variety of native animals.

Fauna surveys completed within the Saddlers Creek Conservation Area identified the following species, listed as vulnerable under the NSW TSC Act:

- spotted harrier (*Circus assimilis*);
- grey-crowned babbler (eastern subspecies), (*Pomatostomus temporalis temporalis*); and
- eastern freetail bat, (*Mormopterus norfolkensis*).

### Thomas Mitchell Drive Offsite Area

The Thomas Mitchell Drive Offsite Offset Area which is owned by HVEC is approximately 495 ha in size and occurs on the eastern side of Thomas Mitchell Drive.

The Thomas Mitchell Drive Offsite Offset Area has been partially cleared and grazed by cattle. However, its extensive area of native grassy understorey is expected to regenerate upon the recent exclusion of cattle grazing from this area. The Thomas Mitchell Drive Offsite Offset Area also provides potential habitat for a suite of threatened birds and bats that are known to occur in the Mt Arthur Coal Complex. Regeneration of woodland and open forest habitat following reduction or cessation of cattle grazing would progressively benefit those species.

The area contains 32.9 ha of State 1 condition EPBC listed Box Gum Woodland, 75.1 ha of State 2 Box Gum Woodland, and 77.2 ha (plus 119 ha marginal) of Woodland Habitat for EPBC listed birds.

EPBC listed Box Gum Woodland vegetation within the Thomas Mitchell Drive Offsite Offset Area includes:

- 30.67 ha Central Hunter Box – Ironbark Woodland (Box Dominated) Open Woodland Variant (also EEC under the NSW TSC Act) - a grassy woodland community occurring across most of the Mt Arthur Coal biodiversity offset and conservation areas. It is characterised by the dominance of grey/white box hybrids (*Eucalyptus albens* x *moluccana*), above a sparse shrub layer and dense groundcover dominated by native grasses and forbs. Also included are the open woodland and regeneration variants of this community.
- 44.40 ha Central Hunter Box – Ironbark Woodland (Box Dominated) - Derived Native Grassland (EEC under the NSW TSC Act) - native grasslands, derived from Unit Central Hunter Box - Ironbark Woodland (Box Dominated), with scattered remnant and regenerating grey/white box hybrids (*Eucalyptus albens* x *moluccana*), and groundcover is dominated by native grasses and forbs that displayed similarities to the groundcover of the parent woodland community.

The area also contains 43.96 ha Central Hunter Box – Ironbark Woodland (Ironbark Dominated), and 88.32 ha Central Hunter Box – Ironbark Woodland (Ironbark Dominated) Open Woodland Variant, both endangered ecological community (EEC) under the NSW TSC Act.

Fauna surveys completed within the Thomas Mitchell Drive Offsite Offset Area identified the following species listed as vulnerable under the NSW TSC Act:

- spotted harrier (*Circus assimilis*);
- koala (*Phascolarctos cinereus*); and
- diamond firetail (*Stagonopleura guttata*).

### Thomas Mitchell Drive Onsite Offset Area

The Thomas Mitchell Drive Onsite Offset Area which is owned by HVEC is approximately 222 ha in size and occurs on the western side of Thomas Mitchell Drive. The Thomas Mitchell Drive Onsite Offset Area contains areas of remnant woodland communities on low hills in the south of the area, tree screen plantings and open grasslands. The area is bounded to the west by the Whites Creek Diversion channel.

Native and exotic grassland occurred throughout the offset area. Canopy trees were typically absent from this habitat type; however, occasional mature trees were recorded, which potentially provide habitat for bird, micro-bat and reptile species.

The area contains 35.3 ha of State 1 condition EPBC listed Box Gum Woodland, 109.3 ha of State 2 Box Gum Woodland, and 58.8 ha of Woodland Habitat for EPBC listed birds.

EPBC listed Box Gum Woodland vegetation within the Thomas Mitchell Drive Offsite Offset Area includes:

- 35.32 ha of Central Hunter Box – Ironbark Woodland (Box dominated) (also EEC under the NSW TSC Act); and
- 109.37 ha of Central Hunter Box – Ironbark Woodland (Box dominated) - Derived Native Grassland (also EEC under the NSW TSC Act).

Shrubland habitat, comprising 5.6 ha of the non-listed Yarran Shrubland was recorded as occurring within the Thomas Mitchell Drive Onsite Offset Area. The Shrubland habitat comprises very few mature trees and is dominated by small shrubby vegetation typically less

than eight metres in height. The vegetation present is not typically associated with hollow-bearing trees, and any hollows present were likely to have been very small in size. Structural diversity in these areas was minimal with little rock or log cover present.

Other non-listed vegetation communities recorded within the Thomas Mitchell Drive Onsite Offset Area included Central Hunter Bulloak Forest – Derived Native Grassland and Central Hunter Bulloak Forest.

The threatened orchid species painted diuris (*Diuris tricolor*), listed as vulnerable and as an endangered population in the Muswellbrook local government area under the TSC Act, have previously been recorded within the Thomas Mitchell Drive Onsite Offset Area. A flora population listed as an endangered population in the Hunter Catchment under the TSC Act, includes ten individuals of weeping myall (*Acacia pendula*) recorded in the Thomas Mitchell Drive Onsite Offset Area.

Fauna surveys completed within the Thomas Mitchell Drive Onsite Offset Area identified the following species, listed as vulnerable under the NSW TSC Act:

- eastern bentwing bat (*Miniopterus schreibersii oceanensis*);
- black falcon (*Falco subniger*);
- squirrel glider (*Petaurus norfolcensis*);
- eastern freetail bat (*Mormopterus norfolkensis*);
- southern myotis (*Myotis macropus*);
- grey-crowned babbler (*Pomatostomus temporalis temporalis*);
- little eagle (*Hieraaetus morphnoides*);
- yellow-bellied sheath-tail-bat (*Saccolaimus flaviventris*);
- speckled warbler (*Chthonicola sagittata*); and
- brown treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*).

The white-throated needletail (*Hirundapus caudacutus*), a migratory species listed under the EPBC Act, has been recorded within the Thomas Mitchell Drive Onsite Offset Area.

### Roxburgh Road Offset Area

The Roxburgh Road Offset Area which is owned by HVEC is 110 ha in size and occurs approximately 4 kilometres to the north-west of the Project Area. The two houses (and adjacent house yards) located on the property are excluded from the offset area. Dominated by open native remnant and denser regrowth woodland communities, with some open grasslands, the Roxburgh Road Offset Area provides potential habitat for the regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*).

The area contains less than 1 ha of State 1 condition EPBC listed Box Gum Woodland and 78.5 ha of Woodland Habitat for EPBC listed birds.

77.4 ha Central Hunter Box – Ironbark Woodland (Ironbark Dominated) EEC under the NSW TSC Act, were also recorded within the Roxburgh Road Offset Area. Ecological surveys

completed previously within the Roxburgh Road Offset Area have not identified any threatened species.

### Rehabilitation Areas

In addition to the offset and conservation areas listed in **Section 1.1**, State approvals require the rehabilitation/regeneration of 2642 ha of woodland corridors on open cut mining disturbed land. Federal approvals require the rehabilitation/regeneration of 1915 ha of woodland corridors on open cut mining disturbed land. The rehabilitation/regeneration areas for these approvals each comprise a 500 ha Box Woodland Establishment Area as part of the total quantity of area (refer to **Figure 1.1 Appendix 3**). In accordance with the EPBC 2011/5866 approval (refer to **Section 1.3**), the 1915 ha is to comprise of the following:

- woodland corridors (1,005 ha);
- regenerated woodland (500 ha);
- Edderton Road revegetation area (154 ha);
- regeneration corridors (45 ha), and
- rehabilitation areas (211 ha).

The Box Gum Establishment area and rehabilitation woodland corridor areas currently include approximately 124 ha of woodland rehabilitation and 365 ha of grassland rehabilitation. The woodland areas vary in age, species composition and community structure. These areas are currently considered to be State 5 vegetation due to the generally high abundance of weed species and lack canopy species within the grassland rehabilitation, and the woodland rehabilitation areas generally have a moderate abundance of weed species and a dense canopy layer.

This BMP outlines the broad strategy for the establishment of the 2642 ha rehabilitated woodland areas, including preliminary rehabilitation objectives (refer to **Section 3.2**). The detailed program of rehabilitation works for these areas will be included in the Mt Arthur Coal MOP. This MOP will incorporate the outcomes of the ecological baseline surveys and any mine planning considerations, including site constraints and opportunities for native vegetation establishment.

Six individuals of river red gum (*Eucalyptus camaldulensis*), listed flora population within the Hunter Catchment under the NSW TSC Act were recorded at one site in the Rehabilitation Woodland Corridor. These individuals represent plantings and are not natural occurrences of this species.

Fauna surveys completed within the rehabilitation and woodland corridor areas identified the following species, listed as vulnerable under the NSW TSC Act:

- spotted harrier (*Circus assimilis*);
- speckled warbler (*Chthonicola sagittata*);
- flame robin (*Petroica phoenicea*); and
- eastern bentwing bat (*Miniopterus schreibersii oceanensis*).

### Middle Deep Creek West Offset Area

The MDCO Offset Area owned by HVEC is located in the Timor locality of the upper Hunter Valley of NSW (refer to **Figure 1.2**), 45 minutes by road north-east of Scone.

A portion of the MDCO Offset Area (Middle Deep Creek West Offset Area) was identified as a biodiversity offset for the Mt Arthur Coal Extension Project (EPBC 2011/5866) in the Preliminary Documentation (Umwelt 2011). This Preliminary Documentation presented a Biodiversity Offset Strategy for the Mt Arthur Expansion Project which indicated that the Middle Deep Creek West Offset Area would deliver a conservation outcome of 493 ha of White Box – Yellow Box – Blakely's Red Gum Woodland CEEC and 373 ha of regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*) habitat. These figures were based on the results of a brief site inspection and vegetation mapping via aerial photographic interpretation undertaken for the Preliminary Documentation. The commitment was made to complete detailed field surveys to refine this vegetation mapping (including condition), and to define management actions required to achieve the requirements of the EPBC Approval.

This offset area was also proposed as a biodiversity offset for the Mt Arthur Coal Open Cut Modification, which identified approximately 992ha of offset for Middle Deep Creek (including approximately 582 ha in the western portion).

In December 2012, a Baseline Ecological Study (Umwelt, 2013) was conducted to accurately describe the baseline ecological values of the Middle Deep Creek West Offset Area, with a particular focus on identifying, delineating and defining the condition of Box Gum Woodland TEC and habitat for the regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*). The Baseline Ecological Study (Umwelt, 2013) was developed as a support document for both the MDCO OMP (refer to **Appendix 2**) and this BMP and has been prepared to document the current ecological features and condition of the Middle Deep Creek West Offset Area. A summary of the ecological baseline condition of the Middle Deep Creek West Offset Area is provided below.

The Middle Deep Creek West Offset Area is approximately 582 ha in size, with approximately 39 per cent having been cleared for agricultural purposes (refer to **Figure 1.2 and Figure 1.2 Appendix 2**). This cleared land occurs on the lower slopes and undulating land on the plateaus. Steep hills rise up to the west from the low plains in the east of the Middle Deep Creek West Offset Area. A steep south facing slope occurs along much of the northern boundary, while the south-western boundary falls away significantly to the north. The Middle Deep Creek West Offset Area is characterised by remnant woodland on the upper and lower slopes, gullies and drainage lines.

The area contains 357.3 ha of State 1 condition woodland, 195.1 ha of State 2 vegetation, and 373 ha of woodland habitat for EPBC listed birds.

The Middle Deep Creek West Offset Area is part of a large area of similarly positioned woodlands that extend to the north, west and south in excess of 10 kilometres. The woodland of the Middle Deep Creek West Offset Area provides habitat and vegetated connectivity for woodland species moving throughout the local landscape, including reasonable connectivity with the nature reserves.



Historically, the Middle Deep Creek West Offset Area has primarily been used for agricultural activities, primarily cattle grazing. Observations made during the field surveys suggest that stock levels have been kept relatively low over the years, indicated by the large areas of native vegetation cover and the relatively good condition of the majority of the grassland. As at December 2012, all cattle had been removed and there was evidence of natural regeneration occurring without any grazing pressure.

The results of the baseline ecological studies have identified the following key biodiversity values within the Middle Deep Creek West Offset Area:

- three tiger orchids (*Cymbidium canaliculatum*) which conform to the endangered population in the Hunter Catchment listed under the TSC Act;
- 551.30 ha of White Box – Yellow Box – Blakely’s Red Gum Woodland EEC and White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grasslands CEEC. Of which, 356.25 ha are in the form of remnant woodlands and 195.05 ha are in the form of derived native grasslands with or without scattered trees;

Fauna surveys completed within the Middle Deep Creek West Offset Area identified the following species, listed as vulnerable under the NSW TSC Act:

- speckled warbler (*Chthonicola sagittatus*);
- brown tree creeper (eastern subspecies) (*Climacteris picumnus victoriae*);
- grey-crowned babbler (*Pomatostomus temporalis temporalis*);
- hooded robin (*Melanodryas cucullata*);
- diamond firetail (*Stagonopleura guttata*);
- yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*);
- eastern false pipistrelle (*Falsistrellus tasmaniensis*);
- eastern bent-wing bat (*Miniopterus schreibersii oceanensis*);
- large-footed Myotis (*Myotis macropus*); and
- eastern cave bat (*Vespadelus troughtoni*).

The following migratory species listed under the EPBC Act have been recorded within the Middle Deep Creek West Offset Area:

- white-throated needletail (*Hirundapus caudacutus*); and
- rainbow bee-eater (*Merops ornatus*).

It is likely that other threatened flora and fauna species would be present in the Middle Deep Creek West Offset Area, based on the availability of preferred habitat. Additional bird surveys to be undertaken annually in winter could potentially record other threatened woodland birds including swift parrot (*Lathamus discolor*), regent honeyeater (*Anthochaera phrygia*), little lorikeet (*Glossopsitta pusilla*) and scarlet robin (*Petroica rosea*).

Additional threatened flora species with at least a moderate likelihood of occurring in the Middle Deep Creek West Offset Area include Lobed Blue-grass (*Bothriochloa biloba*), Bluegrass (*Dichanthium setosum*) and Austral Toadflax (*Thesium australe*).

In summary, the detailed floristic surveys and habitat assessments undertaken within the MDCO Offset Area have identified approximately 551 ha of vegetation conforming to the White Box – Yellow Box – Blakely’s Red Gum Woodland CEEC and approximately 356 ha of suitable habitat for the swift parrot (*Lathamus discolor*) and regent honeyeater (*Anthochaera phrygia*).

As such, the current study has identified a surplus in the White Box – Yellow Box – Blakely’s Red Gum Woodland CEEC present on the site. However, a shortfall of 16 ha of swift parrot (*Lathamus discolor*) and regent honeyeater (*Anthochaera phrygia*) habitat was identified. This shortfall is relatively minor and will be remedied by the management actions presented in the MDCO OMP, primarily focussing on returning derived grasslands to their original woodland states through natural regeneration and assisted planting, where necessary (refer to **Appendix 2**).

### Middle Deep Creek East Offset Area

The MDCO Offset Area owned by HVEC is located in the Timor locality of the upper Hunter Valley of NSW (refer to **Figure 1.2**), 45 minutes by road north-east of Scone.

The Middle Deep Creek East Offset Area was proposed as a biodiversity offset for the Mt Arthur Coal Open Cut Modification, which identified approximately 992ha of offset for Middle Deep Creek (including 410 ha in the eastern portion).

This property was selected as a biodiversity offset primarily based upon the presence of the Box Gum Woodland TEC (refer to **Figure 1.2 and Figure 1.2 Appendix 2**).

The strategic location of the Middle Deep Creek East Offset Area immediately joining the Middle Deep Creek West Offset Area and the Oakvale Offset Area provided additional strategic value to this property as an offset.

The area contains 101.9 ha of State 1 condition woodland, 307.1 ha of State 2 vegetation, and 103 ha of woodland habitat for EPBC listed birds.

This site is also known to support at least 13 tiger orchids (*Cymbidium canaliculatum*), which are part of the Hunter Catchment endangered population listed under the TSC Act. This offset area is also known to contain the following threatened fauna species:

- grey-headed flying fox (*Pteropus poliocephalus*) – listed as vulnerable under the TSC Act and EPBC Act;
- squirrel glider (*Petaurus norfolcensis*) – listed as vulnerable under the TSC Act;
- brown treecreeper (*Climacteris picumnus victoriae*) - listed as vulnerable under the TSC Act;
- diamond firetail (*Stagonopleura guttata*) - listed as vulnerable under the TSC Act;
- grey-crowned babbler (*Pomatostomus temporalis temporalis*) - listed as vulnerable under the TSC Act;
- hooded robin (*Melanodryas cucullata*) - listed as vulnerable under the TSC Act;
- little lorikeet (*Glossopsitta pusilla*) - listed as vulnerable under the TSC Act;
- speckled warbler (*Chthonicola sagittata*) - listed as vulnerable under the TSC Act; and

- varied sittella (*Daphoenositta chrysoptera*) - listed as vulnerable under the TSC Act.

### Oakvale Offset Area

The MDCO Offset Area owned by HVEC is located in the Timor locality of the upper Hunter Valley of NSW (refer to **Figure 1.2**), 45 minutes by road north-east of Scone.

The Oakvale Offset Area was identified as a biodiversity offset for the Mt Arthur Coal Modification Project State approval requirement for an 'Additional Off-site Offset Area' of 250 ha. The Oakvale Offset Area has been approved with a minimum size requirement of 253.5 ha.

The property was selected as a biodiversity offset primarily based on the presence of Box Gum Woodland (refer to **Figure 1.2 and Figure 1.2 Appendix 2**). The derived native grasslands within the Oakvale Offset Area were believed to be of sufficient condition to support the return of a woodland community through targeted management activities.

The strategic location of the Oakvale Offset Area immediately joining the Middle Deep Creek West Offset Area and Middle Deep Creek East Offset Area provided additional strategic value to this property as an offset.

The area contains 225.3 ha of State 1 condition woodland, 23.2 ha of State 2 vegetation, and 225.3 ha of Woodland Habitat for EPBC listed birds.

Another key driver for the offset site selection was the provision of habitat for the regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*). Habitat for these species is present in the Oakvale Offset Area.

## 3.0 Objectives and Criteria

### 3.1 Offset and Conservation Area Objectives

The primary objective of offset and conservation area establishment is to protect and enhance the extent and condition of TECs and threatened species habitat values within the offset and conservation areas. In particular, the objective of the offset and conservation areas is to conserve and enhance areas of the Box Gum Woodland TEC within the offset and conservation areas and to provide habitat for the regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*).

The key management measures identified to enhance the quality and extent of TECs and threatened species habitat in the offset and conservation areas includes active and passive regeneration and revegetation initiatives. The specific objectives of revegetation and regeneration activities in the offset and conservation areas include the following:

- re-establish vegetation in disturbed portions of the offset and conservation areas consistent with remnant vegetation communities;
- augment existing vegetation to compensate (in part) for the loss of vegetation resulting from mining at Mt Arthur Coal;
- increase connectivity from the offset and conservation areas to remnant vegetation corridors;
- re-establish or augment fauna habitats consistent with extant fauna habitats of the offset and conservation areas;
- re-establish and augment threatened species habitat; and
- provide opportunities to re-establish or augment regionally significant vegetation communities.

The intention of the offset and conservation areas (not including rehabilitation areas) is to prevent disturbance activities other than revegetation; however, offset and conservation area creation will not preclude the maintenance of tracks and fire breaks, the installation of service utilities and any required water management or erosion control works or other such low impact activities.

### 3.2 Disturbed Mined Land Rehabilitation Objectives

Rehabilitation areas on land disturbed by open cut mining operations included as part of the Offset Package (refer to **Section 2.5**) are currently in various conditions. Some areas are yet to be disturbed, whilst other areas have been mined and are in the initial phases of rehabilitation. It is HVEC's intention that, following mining, the 2642 ha of woodland will be rehabilitated progressively. The staging and requirements for rehabilitation will be detailed and refined as part of the ongoing implementation of the MOP.

The approved Mt Arthur Coal Rehabilitation Strategy (Mt Arthur Coal, 2012b) details the rehabilitation strategy for disturbed areas at the Mt Arthur Coal Complex. The primary rehabilitation objectives for the Mt Arthur Coal Complex will be to:



- create a stable non-eroding post-mining landform that blends with the surrounding un-mined topography and allows for acceptable post-mining land use capability;
- re-establish land capability classes equivalent to pre-mining in order to allow for grazing in selected areas;
- restore at least 2642 ha of self-sustaining woodland ecosystems, including at least 500 hectares of box gum woodland. Predominantly this will re-establish those vegetation communities and fauna habitats currently occurring at the Mt Arthur Coal Complex and connect as far as reasonably practical, the habitat areas to the north and south of the disturbance areas with a connecting corridor; and
- in recognition of the importance of vegetation corridors to regional biodiversity, the rehabilitation strategy has been designed to link rehabilitation areas and nature reserves in the surrounding region.

Secondary rehabilitation objectives at the Mt Arthur Coal Complex aim to:

- minimise the potential for long-term environmental impact and liability;
- comply with relevant regulatory requirements and attain regulatory consensus on the successful closure and rehabilitation of the site;
- reduce the need for long term monitoring and maintenance by achieving effective rehabilitation;
- ensure that the rehabilitated post-closure landform, including remaining structures will be physically and chemically stable and will not present a hazard to public health and safety; and
- provide a sustainable plant cover, through rehabilitation of disturbed areas.

The rehabilitation strategy for the Mt Arthur Coal Complex has been developed to meet the intent of the DRE Synoptic Plan (Andrews Neil, 1999) and considers the potential regional outcomes for visual amenity, biodiversity and sustainable post closure use. The Synoptic Plan aims to provide a basis for the development of a long term integrated strategy for rehabilitation of Hunter Valley mines.

### 3.3 Completion Criteria

Specific completion criteria are objective target levels or values assigned to a variety of indicators (i.e. slope, species diversity, groundcover, ecological condition etc.), which can be measured against to demonstrate progress and suitability of rehabilitation for relinquishment. These criteria provide a defined value, at which point rehabilitation or regeneration can be deemed to have met the objectives.

Ecological baselines studies have been undertaken for the offset and conservation areas. Based on the outcomes of these ecological baseline surveys, preliminary completion criteria specific to each offset and conservation area have been developed and included as part of the OMPs (refer to **Appendix 2 and 3**).

As outlined in **Section 2.5**, the MOP confirms the location of woodland areas, as well as identifying target vegetation communities to be established. This process will also involve further refinement of the completion criteria, specifically for the woodland rehabilitation areas, as a means to determine whether the objectives as outlined above have been met.

A key indicator relevant to the completion criteria for both offset and conservation areas and rehabilitation areas is ecological condition. A summary of the targeted ecological condition to be achieved is included in **Section 4**.

The preliminary completion and relinquishment criteria presented in the MOP (**Appendix 5**, as amended from time to time) will be reviewed and revised throughout the life of the Mt Arthur Coal Complex in response to rehabilitation/regeneration monitoring program results; relevant research trials; and consideration of stakeholder feedback. The achievement of these completion criteria will be assessed and discussed in the relevant annual reports (refer to **Section 9.0**), along with the identification of non-achievement of the criteria, and measures undertaken and/or proposed to address any such issues. The proposed ecological monitoring program is discussed in **Section 8.0**.

### 3.4 Intervention and Adaptive Management

The Rehabilitation and Ecological Monitoring Program (**Appendix 4.0**, as amended from time to time) assesses achievement towards final completion criteria along with the identification of threats to non-achievement of criteria. The earlier these threats are identified, the greater the opportunity to introduce effective management actions to negate those threats. Such actions may include the implementation of remedial strategies to address realised impacts, or the modification of existing management processes to prevent impacts developing or worsening (i.e. adaptive management). A Trigger Action Response Plan (TARP) has been developed to provide guidance on appropriate and timely response, if these threats should be identified or predicted. The TARP is presented in Table 3.1 and is applicable to all offset and conservation areas and Rehabilitation areas.

Additional information is presented in **Section 5.0** of the OMP's (**Appendix 2 and 3**).

**Table 3.1: Trigger Action Response Plan for Offset, Conservation and Rehabilitation Area Establishment**

Risk and Level for Response	Monitoring & Measurement Process	Trigger	Proposed Response Action and Mitigation Measures	Responsible Person
<b>Soils, Geology &amp; Erosion</b>				
Poor quality/ insufficient topsoil impeding vegetation establishment for ecological communities or grazing.	Monitoring programs: Landform Stability; Grazing Potential, Topsoil Monitoring.	Trigger: Progress indicators: Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	Utilisation of subsoils/ spoil materials, with appropriate soil supplements and ameliorants, as alternates to topsoil.  Appropriate delineation and recovery of all suitable topsoil resources and topsoil management in accordance with <i>Land Management Procedure</i> to ensure maximum available resource.  Review post-mining land use selection to reduce topsoil intensive uses.	Superintendent Environment Execution  Superintendent Environment Analysis & Improvement
Surface (wind or water) erosion leading to degradation of growth medium and rehabilitation/offset quality.	Monitoring programs: Landform Stability.	Trigger: Progress indicators: Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	Ensure up-catchment reshaping minimises slopes $>10^\circ$ and incorporates appropriate drainage management.  Review rehabilitation methods and monitoring/maintenance regime to identify root cause of erosion.  Remediation of concentrated erosion impacts (if possible).  Rapidly stabilise up-catchment substrate and increase organic matter using sterile cover crops and sow with appropriate ground cover species.	Superintendent Environment Execution  Superintendent Short Term Planning
Major geotechnical failure of overburden emplacement, such as slumping or subsidence.	Monitoring programs: Landform Stability, Geotechnical Inspection.	Trigger: Progress indicators: Landform Establishment.	Ensure emplacement reshaping minimises slopes $>10^\circ$ and incorporates appropriate drainage management.  Review dump design, dumping methods and monitoring/maintenance regime to identify root cause of failure.  Review impacts on proposed post-mine land use in affected area.  Remedial earthworks and/or rehabilitation, as required.	Manager Production  Superintendent Environment Execution  Superintendent Environment Analysis & Improvement  Superintendent Short Term Planning  Principal Geotechnical Engineer

# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

Risk and Level for Response	Monitoring & Measurement Process	Trigger	Proposed Response Action and Mitigation Measures	Responsible Person
Targeted land capability class not met by rehabilitated landform and soils.	Monitoring programs: Landform Stability; Grazing Potential.	Trigger: Progress indicators: Landform Establishment; Growth Medium Development.	<p>Review landform design, rehabilitation planning and reshaping operational controls to identify root cause of incorrect land capability class establishment.</p> <p>Identify future rehabilitation for potential increase of land capability class area to compensate for current loss of area.</p> <p>Investigate impact on proposed post-mining land use, to identify appropriate remedial strategies, or modification of post-mining land use options.</p>	<p>Superintendent Environment Execution</p> <p>Superintendent Environment Analysis &amp; Improvement</p> <p>Superintendent Short Term Planning</p>
Failure of water management structures (or natural drainage lines), leading to erosion, unstable landform and potential pollution.	Monitoring programs: Landform Stability, Geotechnical Inspection.	Trigger: Progress indicators: Landform Establishment; Growth Medium Development; Ecosystem/ land use Establishment.	<p>Review landform design and reshaping operational controls to identify root cause of poor drainage performance.</p> <p>Identify remedial strategy that repairs immediate failure and downstream impacts, improves up-catchment infiltration or drainage diversion.</p>	<p>Civil Engineer</p> <p>Superintendent Environment Execution</p> <p>Superintendent Short Term Planning</p>
Sodicity and/or salinity of spoils/soils leading to accelerated erosion and preventing successful vegetation establishment.	Monitoring processes/ programs: Materials geochemical assessment during project planning. Landform Stability.	Trigger: Progress indicators: Landform Establishment; Growth Medium Development.	<p>Conduct soil characterisation sampling and review current rehabilitation practices to identify root cause of erosion/dispersion.</p> <p>Identify remedial strategy that modifies existing process of soil characterisation and selection and rehabilitation to prevent recurrence, and treats and repairs immediate failure and downstream impacts (i.e. topdressing, gypsum application).</p> <p>Revise proposed post-mining land use to ensure still appropriate for soil type, and identify long-term management requirements.</p>	<p>Superintendent Environment Execution</p> <p>Superintendent Environment Analysis &amp; Improvement</p>
Spontaneous combustion of near-surface waste material generating pollution, destabilising land surface and impeding vegetation establishment.	Monitoring processes/ programs: Materials geochemical assessment during project planning; Spontaneous combustion; Landform Stability.	Trigger: Significant or continued spontaneous combustion surface impacts.	<p>Characterisation of spontaneous combustion risk and adoption of standard combustion prevention measures.</p> <p>Targeted monitoring program in vicinity of impacts.</p> <p>Remedial treatment (i.e. capping) as per Spontaneous Combustion Procedure. Remedial surface rehabilitation, if required.</p>	<p>Superintendent Environment Execution</p> <p>Superintendent Short Term Planning</p>

# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

Risk and Level for Response	Monitoring & Measurement Process	Trigger	Proposed Response Action and Mitigation Measures	Responsible Person
Geotechnical failure of final void residual walls, leading to an unstable and potentially polluting landscape.	Monitoring processes/ programs: Geotechnical assessment of void walls during void treatment design; Landform Stability.	Trigger: Actual or predicted significant void wall failure.	<p>Conduct geotechnical assessment of failed area, and review void treatment design to identify root cause of failure. Identify remedial strategy that mitigates and makes safe the immediate failed area, addresses all associated impacts (i.e. reduced void storage capacity, water quality impacts).</p> <p>Review proposed post-mining void use to determine whether still achievable, and identify long-term management measures.</p>	<p>Principal Geotechnical Engineer</p> <p>Superintendent Environment Analysis &amp; Improvement</p>
<b>Biological Factors</b>				
Insufficient, poor quality or incorrect species seed/seedlings leading to poor vegetation establishment.	Monitoring programs: Ecological Development; Grazing Potential.	Trigger: Progress indicators: Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	<p>Review ecological monitoring results and, if required, seed viability testing to determine if seed/seedling quality is contributing to poor vegetation establishment.</p> <p>Identify required modifications to rehabilitation design or seed sourcing, and complete remedial planting works for areas of poor vegetation establishment.</p> <p>Establish a broad supply base of seed to mitigate supply limitations, and a broad species base to mitigate undersupply and climatic variation.</p>	Superintendent Environment Execution
Poor vegetation development leading to simplified, non-stratified community structure of poor habitat value.	Monitoring programs: Ecological Development.	Trigger: Progress indicators: Ecosystem/Land use Sustainability.	<p>Review ecological monitoring results to determine likely causes of non-development of vegetation stratum (i.e. species selection, seed/seedling quality, vegetation establishment practices or site conditions) and identify remedial treatment options (i.e. remedial planting, modification of species selection and establishment method or additional ground treatment).</p> <p>Conduct remedial treatment, as selected, and review rehabilitation practices to incorporate new measures.</p> <p>Ensure species mix used in rehabilitation programs are aligned to the floristic structure of the targeted plant community/ reference sites.</p>	Superintendent Environment Execution



# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

Risk and Level for Response	Monitoring & Measurement Process	Trigger	Proposed Response Action and Mitigation Measures	Responsible Person
Inadequate weed control, leading to extreme weed competition preventing establishment of desired species.	Monitoring programs: Landform Stability; Ecological Development; Grazing Potential.	Trigger: Progress indicators: Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	<p>Implement remedial treatment program to control weeds (i.e. chemical weed control, encourage rapid establishment of ground cover, scalping of surface layer, topdressing).</p> <p>Weed control undertaken in accordance with the requirements of the <i>Noxious Weeds Act 1993</i> by competent operators.</p> <p>Weed species density and distribution monitored.</p> <p>Topsoil supply treated for weeds prior to stripping, if required.</p>	Superintendent Environment Execution
Continued dominance of exotic tropical grass species, preventing successful establishment of native grass groundcover.	Monitoring programs: Ecological Development.	Trigger: Progress indicators: Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	<p>Review of ecological monitoring results to identify species of concern, and most appropriate treatment (including cost/benefit analysis on starting rehabilitation again).</p> <p>Identify best treatment options, which may include chemical spraying, slashing, cultivating, burning or grazing existing groundcover, and vegetation establishment, which may include tubestock planting or direct drilling seed.</p> <p>Ensure intensified monitoring during re-establishment of remedially treated rehabilitation, and review ongoing monitoring/ maintenance regime to ensure adequate.</p>	Superintendent Environment Execution
Inadequate vertebrate pest animal control leading to predation of juvenile vegetation and poor biodiversity (habitat) outcomes.	Monitoring programs: Ecological Development; Feral Animal Register; community consultation.	<p>Trigger: Progress indicators: Ecosystem/Land use Sustainability.</p> <p>Increasing presence of feral animals.</p>	<p>Review of ecological monitoring results and feral animal register to identify species of concern (rabbit, deer, wild dog fox, pig, goat, etc), damage from pest animal species, and most appropriate treatment regime. Implement control program and intensified monitoring program to determine program success. Pest animal control undertaken by competent/ licenced operators.</p> <p>Consult with neighbouring/ district landowners to coordinate control programs.</p>	Superintendent Environment Execution

# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

Risk and Level for Response	Monitoring & Measurement Process	Trigger	Proposed Response Action and Mitigation Measures	Responsible Person
Ecosystem processes (i.e. reproduction, nitrogen fixing and nutrient recycling) not re-established, leading to sterile unsustainable ecosystem.	Monitoring programs: Landform Stability; Ecological Development; Grazing Potential.	Trigger: Progress indicators: Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	Review ecological monitoring results and, if required, conduct targeted sampling to determine likely causes of non-development of processes (i.e. oversupply or undersupply of nutrients, species selection, soil properties or climatic contributors) and identify remedial treatment options (i.e. mulches, composts, biosolids, inoculants, remedial planting, species selection, etc).  Conduct remedial treatment and/or review rehabilitation planning and practice to incorporate new treatment measures.  Review monitoring program to more accurately detect the presence/ absence of process indicators.	Superintendent Environment Execution
Insect attack, disease infestation causing premature vegetation die-back.	Monitoring programs: Ecological Development.	Trigger: Progress indicators: Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	Review ecological monitoring results and, if required, conduct targeted sampling to determine likely causes of infection/ infestation) and identify remedial treatment options.  Conduct remedial treatment, if required, and review rehabilitation maintenance practices to incorporate new treatment measures.  Review monitoring program to more accurately detect the presence/ absence of disease indicators. Aim to encourage diversity within the vegetation (i.e. colonisation by spiders, insects, frogs, lizards and insectivorous birds) by providing suitable habitat features and vegetation complexity.	Superintendent Environment Execution  Superintendent Environment Analysis & Improvement
<b>Environmental Factors</b>				
Unintended seasonal landform inundation or waterlogging preventing vegetation establishment or causing die-back.	Monitoring programs: Landform Stability; Ecological Development; Grazing Potential.	Trigger: Progress indicators: Landform Establishment; Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	Conduct geotechnical/ hydrological assessment of impacted area, to identify root cause of seasonal inundation (i.e. landform settlement, poor drainage design/ construction) and identify remedial strategy that may involve remedial drainage works, remedial planting, or modification of species selection.  Review proposed post-mining land use for the area to determine whether still achievable, or whether area might be best suited to new purpose (i.e. seasonal wetland/ habitat) and identify long-term management/ mitigation measures.	Superintendent Environment Execution  Superintendent Environment Analysis & Improvement

# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

Risk and Level for Response	Monitoring & Measurement Process	Trigger	Proposed Response Action and Mitigation Measures	Responsible Person
Major Storm event resulting in flooding, geotechnical instability, major erosion and/or widespread damage to rehabilitation areas.	Monitoring programs: Landform Stability; Ecological Development.	Trigger: Progress indicators: Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	<p>Review landform planning and design, and rehabilitation practices, to identify root cause of poor drainage/ rehabilitation performance.</p> <p>Implement remedial strategy that repairs or reinstates the immediate area of rehabilitation and water management structure failure, and all associated downstream impacts, improves catchment infiltration, and drainage design (i.e. improves vegetative cover). All final landforms should be designed in accordance with Blue Book Volume 2E, to cope with major storm events (1 in 20 year ARI). Adopting more stringent design criteria may be warranted, if failure is common or widespread, or storms are frequent.</p>	<p>Civil Engineer</p> <p>Superintendent Environment Execution</p> <p>Superintendent Short Term Planning</p>
Severe and/or prolonged drought leading to widespread failure of revegetation.	Monitoring programs: Landform Stability; Ecological Development; Grazing Potential.	Trigger: Progress indicators: Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	<p>Review rehabilitation practices, to identify any opportunities for drought-proofing rehabilitated areas (i.e. provide internally draining areas, temporary survival irrigation until establishment, or appropriate species selection).</p> <p>Ensure intensified monitoring is undertaken during and after drought to observe rehabilitation performance and resilience.</p> <p>All assessment should be relative to monitored performance of reference sites, to determine whether impacts are rehabilitation specific.</p> <p>Plans should be prepared for post-drought remedial revegetation, if required.</p>	<p>Superintendent Environment Execution</p>

# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

Risk and Level for Response	Monitoring & Measurement Process	Trigger	Proposed Response Action and Mitigation Measures	Responsible Person
Uncontrolled bush fire events leading to widespread failure of revegetation areas.	Monitoring programs: Landform Stability; Ecological Development; Grazing Potential.	Trigger: Progress indicators: Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability.	Attempts should be made, within the capabilities of site resources and the RFS, to prevent uncontrolled fires reaching newly rehabilitated areas.  Review fire control and incident response practices, including consultation with local RFS, to identify the root cause for fire initiation and spread into rehabilitated areas, and modify site procedures to reduce the potential for recurrence.  Ensure intensified monitoring is undertaken after fire to record fire impact, and observe rehabilitation resilience during recovery.  Plans should be prepared for post-fire remedial revegetation, if required.	Superintendent Environment Execution  Property Specialist
<b>Pollution Issues</b>				
Release of leachate/ contaminants from mined materials/ waste material requiring long-term management or treatment.	Monitoring programs: Landform Stability;  Water monitoring/ modelling.	Trigger: Progress indicators: Decommissioning; Landform Establishment.  Or discharge/ seepage from emplacements exceeds EPL/ Water Management Plan water quality criteria.	Response will be in accordance with the <i>Groundwater and Surface Water Response Plan</i> , and will involve the confirmation of laboratory results, investigation of cause, proposal of remedial options, then implementation of remedial strategy.  Water monitoring will be ongoing to determine impact of remedial strategy. Overall monitoring program should be reviewed to ensure continued suitability, in light of investigation findings.	Superintendent Environment Execution  Superintendent Environment Analysis & Improvement
Unsatisfactory water quality of final void waters leading to environmental impacts, and failed post-mining void use.	Monitoring programs: Landform Stability;  Water monitoring/ modelling.	Trigger: Progress indicators: Decommissioning; Landform Establishment; Growth Medium Development;  Or void water quality exceeds EPL/ Water Management Plan water quality criteria.	Response will be in accordance with the <i>Groundwater and Surface Water Response Plan</i> , and will involve the clarification of monitoring data, investigation of cause, proposal of remedial options, then implementation of remedial strategy.  Water monitoring will be ongoing to determine impact of remedial strategy. Overall monitoring program should be reviewed to ensure continued suitability, in light of investigation findings. If required, the decommissioning, rehabilitation and final-use strategies for final voids should also be reviewed to determine ongoing suitability.	Superintendent Environment Execution  Superintendent Environment Analysis & Improvement

# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

Risk and Level for Response	Monitoring & Measurement Process	Trigger	Proposed Response Action and Mitigation Measures	Responsible Person
Unexpected contaminated land, leading to costly treatment and disposal, and delayed relinquishment.	Monitoring programs:  Waste disposal management contract. Asbestos register. Contaminated Site Register.	Trigger: Progress indicators: Decommissioning; Landform Establishment.  Or project specific contamination investigation criteria exceeded, or asbestos in path of proposed disturbance.	Works to be halted or relocated, and site appropriately isolated until declared safe for human access.  Site contamination assessment, remediation and clean-up by qualified consultant, as required.  Appropriate notifications made to EPA and other regulators. Maintain the asbestos and contaminated land registers via regular reviews.	Superintendent Environment Execution  Superintendent Health & Safety Execution
<b>Management and Organisational</b>				
Inadequate resources lodged/ provisioned to successfully rehabilitate mine areas at closure.	Monitoring processes:  MOP cost calculations;  Rehabilitation provisioning;  MOP progress indicators.	Trigger: Internal rehabilitation provisioning does not cover liability at start of final MOP period.	Use qualified personnel to review rehabilitation liability calculations and address any shortfalls identified.  Investigate opportunities for accelerated decommissioning and rehabilitation while mine still operating.  Review Mine Closure Plan to identify opportunities for streamlining the closure process, while still meeting Relinquishment criteria	Superintendent Environment Improvement  Manager Long Term Planning
Poor systems implementation, leading to inadequate rehabilitation monitoring and maintenance.	Monitoring; completion of all Ecological and Rehabilitation monitoring programs.	Trigger; non-achievement of actions and measures committed to in MOP and OMPs.	Appropriate resourcing to ensure all monitoring and management actions are completed as required in MOP or OMPs.	Superintendent Environment Execution
Evolving regulatory requirements, community expectations and district landuses leading to difficulties attaining rehabilitation completion	Monitoring Process: Project Approvals and stakeholder consultation processes.	Trigger: DA lodgement for non-mining/ non-rural landuses adjacent to mine/ mine rehab.	Monitor trends and developments in legislation and changes to community expectations.  Make submissions to incompatible development applications in proximity of site rehabilitated areas.  Continue to regularly consult with stakeholders to gain acceptance of completion criteria.	Superintendent Environment Execution  Superintendent Environment Improvement

# MAC-ENC-MTP-050

## BIODIVERSITY MANAGEMENT PLAN

Risk and Level for Response	Monitoring & Measurement Process	Trigger	Proposed Response Action and Mitigation Measures	Responsible Person
<p>Pasture areas subjected to prolonged/ uncontrolled overgrazing by livestock, leading to loss of vegetative cover, erosion and land degradation.</p>	<p>Monitoring Program: Grazing Potential</p>	<p>Trigger; Progress Indicators for Growth Medium Development; Landuse Establishment; Landuse Sustainability</p>	<p>Destock degraded paddocks until adequately recovered. Increase frequency of Ground and Pasture Assessments, and closely monitor recovery trends.  Review contractual arrangements with grazier to include mechanism for preventing de-stocking, and review monitoring frequency.</p>	<p>Superintendent Environment Execution  Property Specialist</p>



## 4.0 Ecological Condition Improvement Targets

Condition 7(e) and Table 1 of the EPBC Approval (EPBC 2011/5866) indicate that 707.7 ha of offset and conservation areas and 299.2 ha of rehabilitation / regeneration area are required to be consistent with the State 1 as described in the State and Transition Model for Box Gum Woodland (Rawlings *et al.* 2010) and listing advice for the White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland Ecological Community (Threatened Species Scientific Committee, 2006).

The definition of State 1 provided by Rawlings *et al.* (2010) requires the Box Gum Woodland to comprise only native species (with occasional woody weeds) and is discussed in more detail in **Section 2.1**.

Numerous surveys of Box Gum Woodland in various regions of NSW has revealed that the understorey vegetation will invariably contain numerous herbaceous weed species which do not lessen the ecological value of the woodland or inhibit the regeneration potential or long term survival of the woodland. Furthermore, the listing advice for the community states that only 8 per cent of the remaining Box Gum Woodland in Australia contains more than 50 per cent native species, further emphasising the difficulties likely to be experienced in attempting to achieve State 1 under the Rawlings *et al.* (2010) definition.

While the Rawlings definition does allow for occasional woody weeds, it is considered that the definition of State 1 vegetation condition should accept the presence of herbaceous weeds, albeit in low abundances. It is considered that any area of Box Gum Woodland which has been grazed by cattle in the past is likely to contain herbaceous weed species. Complete removal of these species is considered unachievable on a broad scale and is considered to provide little to no advantage to the overall functionality to the woodland.

This would be consistent with the listing advice (Threatened Species Scientific Committee 2006) and the Recovery Plan (DECCW 2011), and would also be consistent with the existing vegetation communities subject to the BMP.

This is supported by the listing advice for White Box - Yellow Box - Blakely’s Red Gum Woodland and Derived Native Grassland Ecological Community (Threatened Species Scientific Committee 2006) which, when determining whether an area be considered part of the listed ecological community, allows for the presence of exotic groundcover species. The listing advice states:

*“In most of the areas that remain, grazing and pasture-improvement have effectively removed the characteristic understorey, leaving only over storey trees with an understorey dominated by exotic species”.*

The listing advice does, however recognise the importance of larger remnants to the recovery of the community, as these are less susceptible to weed invasion than small remnants.

It is also recognised within the National Recovery Plan – White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland (DECCW 2011) that:

“All Box-Gum Grassy Woodland remnants have some level of weed invasion, and it is likely that all will require some degree of active weed management to ensure long-term integrity”.

Indeed, to be considered as part of the listed ecological community, the Recovery Plan (DECCW 2011) states that the vegetation in question:

*“Have a predominately native understorey (i.e. more than 50 per cent of the perennial vegetative ground layer must comprise native species).*

The above examples of the recognition of exotic groundcover species as an inevitable part of this community support the unrealistic requirement of the State 1 condition (from Rawlings et al. 2010) to comprise only native species with occasional woody weeds.

HVEC proposes that the definition of State 1 condition should, in this case, allow for the presence of low abundances of herbaceous weeds in revegetated/regenerated vegetation.

A description of the current extent and condition of the various ‘States’ of vegetation throughout the offset and conservation areas will be included within the respective OMPs for the offset and conservation areas.

Ecological monitoring in the existing remnant areas will be used as a baseline to measure the performance of native woodland rehabilitation areas. Monitoring outcomes will be used to determine the scope of works required to further enhance the ecological value of mine rehabilitation areas in order to achieve the completion criteria. In regards to mine rehabilitation, it is considered that achievement of similar ecological condition to remnant areas may take in the order of at least 5 to 10 years until revegetation reaches maturity. Rehabilitation objectives and completion criteria are discussed in the MOP (**Appendix 5**, as amended from time to time).

## 5.0 Offset Area Management Measures

### 5.1 Offset Area Revegetation/Regeneration Works

All offset and conservation areas will be subject to regeneration and revegetation activities in order to improve ecological values, TEC extent and condition and threatened species habitat. Offset and conservation areas will be revegetated, either passively or utilising active revegetation techniques, to achieve the necessary EPBC Box Gum Woodland objectives outlined in **Sections 3.0** and **4.0**.

Based on the outcomes of ecological baseline surveys, OMPs (**Appendix 2 and 3**) have been developed to detail the range of ecological management measures required to achieve the selected objectives and completion criteria.

The following principles will be applicable to revegetation/regeneration activities within the offset and conservation areas:

- natural regeneration will be encouraged and facilitated through livestock exclusion, fencing and access control, weed and pest management and bushfire management as described in **Section 3.2, 3.5, 3.6, 3.7 and 3.8** of the OMP's (**Appendix 2 and 3**);
- where required, all active revegetation works will be designed with structural and floristic diversity suitable to meet the benchmark vegetation community targets;
- where practicable, active revegetation will involve the use of local provenance seed that will either be utilised for direct seeding or for the propagation of tubestock for planting. Local provenance will be utilised as a first preference; and
- revegetation areas will be subject to a monitoring program developed (refer to **Section 8.0**) to establish a feedback loop to facilitate continual improvement in offset and conservation area management and assessment.

Decisions on revegetation tubestock planting will be made by Mt Arthur Coal Superintendent Environment Execution. The Superintendent Environment Execution typically has tertiary environmental qualifications and several years' mine site environmental management experience. Technical decisions including planting location, layout, preparation and timing, as well as species composition and density, will be consistent with recommendations made by ecological consultants in the BMP & OMPs, and in consultation with the bush regeneration contractors engaged to undertake the planting programs.

### 5.2 General Offset Area Management Measures

This section provides an overview of the general management techniques that are utilised by HVEC in the offset and conservation areas.

### Ground Disturbance Permit

Where management works require ground disturbance (e.g. deep ripping for revegetation or establishment of access tracks) or disturbance to vegetation (including grassland areas), a due diligence process is followed to ensure activities are undertaken in an environmentally responsible manner and in accordance with statutory requirements and site environmental management plans. This will be achieved via the completion of a GDP as discussed in **Section 6.1**.

### Erosion and Sediment Control

Where ground disturbance activities require erosion and sediment control measures to minimise potential land degradation from erosion, they will be in accordance with the Mt Arthur Coal *Erosion and Sediment Control Plan* (ESCP). Controls presented in the ESCP have been developed in accordance with relevant guidelines for erosion and sediment control, including:

- *Managing Urban Stormwater: Soils and Construction (the Blue Book) Volume 1* (Landcom 2004); and
- *Managing Urban Stormwater: Soils and Construction (the Blue Book) Volume 2E Mines and Quarries* (Landcom 2008).

### Seed Collection Program

Revegetation activities in offset and rehabilitation areas will preferentially use local provenance seed (collected within 10km of offset areas) for direct seeding or tubestock propagation. Mt Arthur Coal has developed a seed collection program to maximise the amount of viable seed of local provenance for use in rehabilitation and revegetation activities. The program includes:

- a seed calendar that contains information relating to fruiting and seed collection times for key native species;
- data on seed collection including species, collection location and date of collection;
- seed assessment of native vegetation within the mine path in order to allow for seed collection prior to or immediately following clearing;
- required volumes of seed to be collected in order to ensure adequate supply of native seed for reuse; and
- the utilisation of a seed register to track collection, storage and utilisation of the Mt Arthur Coal seed resource.

Where adverse seasonal conditions (i.e. drought) affect the availability of local provenance seed, supplementation with non-local provenance seed may be required. When sourcing non-local provenance seed the primary considerations are to source as local to Mt Arthur Coal Complex as possible, to utilise locally based supplier at the first instance and to ensure required volumes and species selection to complete the rehabilitation effort with adequate quality.

Alternatively, revegetation works may be delayed until sufficient stocks of local provenance species are available, or if the quality of the rehabilitation is at risk of being impacted through non-viable seed or lack of required volumes.

### Track Construction and Maintenance

The following actions will be undertaken regarding track construction and maintenance in offset and conservation areas:

- New tracks will only be established to provide access to essential activities such as fire hazard reduction or erosion control works;
- prior to the construction or modification of access tracks/roads within offset and conservation areas requiring additional ground disturbance, due diligence inspections are to be undertaken as per the GDP process discussed in **Section 5.2**; and
- in the event of a declared bushfire emergency, all efforts will be made to reduce and/or eliminate the fire hazard/risk in accordance with the *Rural Fires Act 1997*. This may include the construction of emergency access tracks/roads to enable fire fighting personnel access to the fire front and/or the construction of fire breaks without undertaking a due diligence assessment prior to clearing activities.

Adequate erosion and sediment controls, as discussed above will be incorporated into the design of tracks constructed through the offset and conservation areas.

### Fencing/Access Control and Signage

The following actions will be undertaken regarding fencing/access control and signage in offset and conservation areas:

- fencing will only be used within the offset and conservation areas to replace existing fencing, or where potential vegetation disturbance by land use impacts warrants additional protection;
- identification of areas with potential for impact on ecological values from human, vehicle or stock access;
- fencing will be used to delineate those that are being actively regenerated, to exclude grazing impacts and allow vegetation to regenerate naturally;
- new fencing within offset and conservation areas will be installed in line with the Mt Arthur Coal Standard for Fencing Sensitive Areas;
- appropriate signage will be used at key access points to the offset and conservation areas to identify that the areas are of high ecological significance. This will assist land managers in identifying these areas in the field; and
- routine inspections will be carried out by the Specialist Environment Execution and/or Property Specialist to ensure ongoing maintenance of fences and related infrastructure.

### Weed Control

Weed species could inadvertently be brought into the Mt Arthur Coal Complex with imported materials, machinery, or stock movement, or allowed to invade naturally through removal of native vegetation. The presence of weed species has the potential to be a major hindrance to revegetation and regeneration activities.

Machinery used for track construction, fire break construction or erosion control works shall be washed down prior to accessing the offset areas to minimise the transfer of weeds.

A weed control program has been implemented to limit the spread and colonisation of noxious and environmental weeds at the Mt Arthur Coal Complex (in accordance with relevant requirements under the *Noxious Weeds Act 1993*), and typically includes:

- an annual weed assessment across the Mt Arthur Coal Complex to guide the weed control program for the subsequent year;
- an annual weed control program across the Mt Arthur Coal Complex which may include weed management measures including hand removal, mechanical removal and application of approved herbicides (in accordance with the *Pesticides Act 1999*);
- monitoring and inspections of areas to assess the effectiveness of the weed control program and to ascertain the requirement for further work; and
- ongoing consultation with the relevant authorities, as required, regarding weed listings, weed occurrence and management technologies.

Chemicals to be used on site for the purposes of weed control will be evaluated with their Safety Data Sheets and chemical label to determine their registration for control of target species, as well as the safety and environmental requirements during their use. Chemical spraying will be undertaken in accordance with the *Pesticides Act 1999* with records of use maintained for a period of three years. A summary of the weed management activities undertaken on site will be reported in the Annual Review.

### **Pest Management**

Feral fauna at the Mt Arthur Coal Complex may impact on the native fauna species through predation and competition for resources such as food, shelter, and breeding sites. Feral animals can also have a detrimental effect on regenerating areas as well as soil stability. In addition elimination of pest animals in biodiversity offsets is a requirement of the *Rural Lands and Protection Act 1998* and as such HVEC has regulatory requirements to do so.

The ongoing fauna and flora monitoring program will include surveys for the presence of significant populations of feral fauna species. Records of significant populations of such species may trigger appropriate control strategies to reduce and control numbers. In addition Mt Arthur Coal has a pest management register where sightings of pest animals are recorded to help inform requirements for management measures.

Feral animal control programs will be completed at least annually and more frequently if required. These programs typically consist of feral dog and fox baiting and trapping. This will include details of feral animal sightings, control actions and assess the effectiveness of these control strategies. A summary of the pest management activities undertaken on site will be reported in the Annual Review.



### Bushfire Management

Appropriate bushfire management is required to protect life and property, while providing necessary protection to the significant ecological features of the area. A Bushfire Prevention Procedure has been prepared for the Mt Arthur Coal Complex. The procedure prioritises the protection of life and property, along with the significant ecological features within the Mt Arthur Coal Complex.

### Strategic Grazing

Grazing is currently excluded from offset and conservation areas; however, the requirement for strategic grazing in these areas will be assessed. If required, strategic grazing will be undertaken in accordance with a formalised grazing management plan to be developed and submitted to DP&E and DoE before grazing commences. The management measures will address the requirements of Conditions 8 and 9 of the EPBC Project Approval, including:

- biodiversity enhancement objectives of the proposed grazing;
- details of the grazing methods to be used;
- timing including seasons in which grazing will occur, period of grazing and rest period;
- stocking rate per season; and
- monitoring of impacts of grazing including any changes in the condition of vegetation, habitat and weed density.

Grazing management on rehabilitated areas is outlined in the Mt Arthur Coal Mining Operations Plan.

### Waste Management & Conflicting Uses

The review of waste, inert debris, low level contaminated materials and abandoned structures is to occur annually within each offset and conservation area. The aim of the review is to identify what, if any, management or removal strategies may be required. Any waste/structures identified will be categorised into:

- **Waste to be removed** – materials that present no immediate health or safety risk, offer minimal habitat value and that would not result in extensive damage to the offset during removal;
- **Waste to be left in-situ** – materials that may provide important habitat value and/or would cause extensive damage to the offset if removed; and
- **Waste to be investigated** – materials that would ideally be removed but may have potential health and safety impacts and/or biodiversity values such as habitat that need to be investigated further.

The initial investigation of the structures shall be completed by the Property Specialist and Specialist Environment Execution. All materials/structures will be recorded in the *Offsets Waste*

& *Infrastructure* Register along with the current status and any associated management actions required.

## 6.0 Disturbed Mine Land Biodiversity Management Measures

The following section provides an overview of the biodiversity management measures incorporated into land disturbance at the Mt Arthur Coal Complex. Long term disturbance management and rehabilitation strategies, including schedule of works, are detailed within the Mt Arthur Coal Rehabilitation Strategy (Mt Arthur Coal, 2012b) and the current approved MOP (**Appendix 5**, as amended from time to time). Weed and feral animal management and bushfire prevention will also be undertaken in disturbed mine land areas in accordance with the principles outlined in **Section 5.2**.

### 6.1 Ground Disturbance Permit Process

At Mt Arthur Coal, any disturbance of previously undisturbed land, previously rehabilitated land and disturbance resulting in changes to site drainage conditions requires a GDP to be completed and approved as a means to avoid or reduce ecological (and heritage) impacts. The Environment Superintendent Execution (or their delegate) is accountable for the implementation of the GDP process. The purpose of the GDP is to ensure that relevant environmental approval conditions have been met, and appropriate environmental management controls have been implemented prior to the commencement of work. This process is documented in the Land Management Procedure.

Controls outlined on the GDP are to be implemented before any ground disturbing activities may commence. This involves the demarcation of the site disturbance footprint, including sensitive ecological features as outlined in **Section 6.2**.

The GDP process also allows for the identification of suitable biological resources (i.e. topsoil, soil seed bank, tree hollows etc.) for salvage, where feasible, to enhance the quality of mine rehabilitation as discussed in **Section 6.4**.

### 6.2 Pre-Clearance Surveys

A detailed pre-clearing survey and tree felling process has been implemented to minimise the impact of clearing on native species (both threatened and non-threatened) and significant habitat features and is documented in the Land Management Procedure. The aim of this procedure is to identify significant ecological features within areas to be cleared. The pre-clearance survey will be utilised to make all reasonable and feasible attempts to minimise the impact of clearing. Significant ecological features may include, (but are not limited to):

- threatened species;
- endangered populations;
- hollow-bearing trees;
- other habitat trees (such as those containing nest or dreys);
- vegetation containing significant seed resources;
- hollow logs and stumps;
- fallen timber; and

- boulders.

The outcomes of pre-clearing surveys will inform the development and utilisation of any specific management measures to reduce potential impacts on values listed above.

### 6.3 Tree Felling

The Mt Arthur Coal Land Management Procedure documents the steps required when clearing native woody vegetation (including shrub lands and scattered trees within grassland). All activities related to tree felling must be undertaken or supervised by a suitably qualified person.

Habitat tree felling protocols are also contained in the Land Management procedure. A habitat tree is defined as a tree containing a hollow, major trunk or branch crack, spout or fissure (the presence of any of which defining the tree as hollow-bearing) or a tree containing obvious signs of fauna activity, such as a possum drey or active bird nest.

The Land Management Procedure is designed to minimise potential impacts resulting from clearing on native fauna species, particularly threatened species. Habitat tree felling inspections/surveys must be undertaken prior to clearing of habitat trees identified through the pre-clearing survey. The purpose of the inspections is to:

- minimise potential impacts from clearing of habitat trees on threatened fauna species;
- identify fauna within habitat trees and recommend management actions to minimise impact on these species;
- identify safety requirements through the completion of a risk assessment, where applicable; and
- identify habitat features for salvage (hollow logs, fallen timber and boulders).

### 6.4 Salvage and Beneficial Use of Resources

Prior to the clearance of vegetation and stripping of soils, a GDP will be undertaken in accordance with **Section 6.1**. The GDP will identify constraints to clearance through inspections prior to the commencement of works. As part of these inspections, areas or items of beneficial resource will be identified. These may include the potential salvage of hollow bearing trees, or topsoil to be stripped for utilisation in rehabilitation at the site. **Sections 6.4** detail the site procedures for the salvage of vegetative and soil related beneficial resources.

#### Salvage of Hollow Bearing Trees

The salvage of hollow bearing trees, hollow logs, fallen timber and boulders will be undertaken, where feasible and practicable, during the clearing process. The relocation of such habitat resources into post-mining rehabilitation areas and offset and conservation areas (where deemed to be appropriate) is aimed at increasing habitat complexity in these areas, in order to make them more habitable for native species, particularly key threatened species.

The methods to be used for salvaging habitat features are detailed in the Land Management Procedure. Habitat features suitable for salvage are identified and marked in the field as part of pre-clearing surveys. The procedure for salvaging and reinstating habitat features is as follows:

- salvage hollow bearing trees identified as part of the pre-clearing surveys, where practical and safe to do so;
- hollow bearing trees can be stockpiled in unused areas, if necessary, until able to be reinstated;
- identify suitable areas to reinstate hollow bearing trees (may be an area where resources have been identified as being scarce, or within rehabilitated areas to increase habitat complexity and to increase the quality of such areas for key threatened fauna species);
- reinstate hollow bearing trees to identified area; and
- hollow bearing trees can be placed in small piles to increase habitat complexity, while others can be placed individually in post-mining rehabilitation areas.

### **Seed Collection and Propagation**

A seed collection program has been developed by HVEC to maximise the amount of local provenance and viable seed available for rehabilitation and revegetation activities, as well as the re-establishment of target vegetation communities. Details of the seed collection program are provided in **Section 5.2**.

### **Soil Characterisation**

Material characterisation will be undertaken at an appropriate scale across the site, prior to clearing activities or the re-handling of topsoil that has been stored on site for a period of two years or more. Representative samples will be taken to characterise the nature of the soil material (e.g. sodicity, acid-generating potential, etc.) to determine the potential limitations to rehabilitation and sustainable plant growth. The results will be used to determine specific ameliorant techniques that may be applied to the soil material in order for rehabilitation to be sustainable.

### **Topsoil Management**

The Land Management procedure outlines topsoil stripping and handling protocols that have been established for operations at Mt Arthur Coal Complex. The purpose of these protocols is to detail the process to be followed to maximise the opportunity to salvage and re-use topsoil in rehabilitation.

Where there are opportunities to salvage topsoil-type material for rehabilitation purposes, measures will be adopted to protect its quality and enhance rehabilitation outcomes. Topsoil stripping is to be undertaken in accordance with the GDP process. In general, topsoil and subsoil stripping is to involve the key considerations as outlined below:

- pending the outcomes of soil characterisation analysis as outlined in **Section 6.4**, where appropriate and practical, treatment of the soils to address potential rehabilitation constraints is to be undertaken prior to stripping. This may include but is not necessarily

limited to the application of gypsum to overcome potential sodicity issues, microbial treatments and the addition of mulch material from clearing as a means to increase soil carbon;

- where possible, topsoil will be stripped when moist to help maintain soil structure and to reduce dust generation. Topsoil stripping is not recommended when topsoil is completely saturated, as it may result in compaction, loss of structure and microorganisms;
- topsoil stripping activities are to be restricted on extremely windy and dry days to minimise the potential for dust generation;
- when stripping topsoil in either areas visible or close to public roads, a dedicated water cart is to be available to minimise dust emissions during stripping activities;
- topsoil and stripping depths are to be undertaken in accordance with the relevant soil stripping plan, usually informed by the MOP, using appropriate equipment (i.e. dozer or scraper);
- pending the outcomes of topsoil characterisation analysis as outlined in **Section 6.4** as well as rehabilitation trials, where feasible and practical, soil stripping techniques may be adjusted to maximise the viability of the soil seed bank as well as facilitate the segregation of topsoil from less beneficial subsoil layers;
- wherever possible, topsoil is to be transferred directly from stripping and re-spread to areas that have been reshaped for rehabilitation, eliminating the need for storage and re-handling;
- where required, machinery used to handle and transport topsoil shall be washed down prior to and at the completion of works to minimise the transfer of weeds; and
- the potential for cultural heritage items in the area to be stripped will be assessed prior to the commencement of works through the GDP process. All relevant information on topsoil characteristics and stripping details will be recorded for later use in interpretation of rehabilitation monitoring results.

### Transplanting Threatened Flora and Native Grassland

As described by Condition 40(c) of Schedule 3 of the Mt Arthur Coal Project Approval (09\_0062 MOD1), HVEC is required to provide a detailed description of what measures would be implemented for:

*'salvaging, transplanting and/or propagating threatened flora and native grassland, in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee et al., 2004).'*

Based on this requirement, the following strategies have been developed to guide translocation efforts for threatened flora species and native grasslands from the project disturbance area to nearby offset and conservation areas or suitable areas within the post-mining rehabilitation.

As per the mitigation measure requirement listed in the 2009 Environmental Assessment, the threatened orchid *Cymbidium canaliculatum* (Tiger Orchid) individual known from Mine Extension Area 5 will be translocated to a conservation or offset area.

As little is currently known about the methods or success rates for translocating threatened flora species (in general) or native grasslands, all works relating to this approval condition (where



they arise) will be treated as research-based experimental procedures. Detailed records will be kept on all works relating to this requirement, and these will be reviewed regularly in order to assess success and review methodology. Where considered necessary, trials will be completed to test and refine methodologies for these works. Native grassland seed collection and propagation will be undertaken in accordance with **Section 5.2**. The requirement to translocate threatened flora species will be assessed through the pre-clearance survey process.

All translocation/salvage works will be subject to consultation with OEH regarding the suitability of the proposed translocation, increased ecological monitoring, and will be reported on in the Annual Review. Further research initiatives will also be reported in the Annual Review.

### 6.5 Managing Impacts on Fauna

As discussed in Section 4.12 of the EA (Hansen Bailey, 2009), the mine plan for the project has been designed, as far as possible, to reduce environmental impacts, including specific impacts on threatened flora and fauna species. The approach to habitat management, vegetation and rehabilitation has specifically been developed to integrate offset and conservation areas with local and regional vegetation corridors, and HVEC's existing biodiversity conservation commitments.

Minimisation of potential impacts on native fauna species resulting from clearing through the pre-clearing survey and tree felling process is described further in **Sections 6.2** and **6.3**. Where feasible and practicable, the salvage and relocation of hollow logs, fallen timber and boulders will be undertaken to augment habitat complexity within any areas to be rehabilitated or deemed (through monitoring results) to have low occurrences of such habitat resources. The purpose of this will be to increase habitat complexity in these areas, to make them more habitable for native species, particularly threatened fauna species, as described further in **Section 6.4**.

### 6.6 Final Landform Design

Overburden emplacements are designed to generally have an overall slope gradient of approximately 10 degrees, unless otherwise agreed with DRE. Elements such as drainage paths, contour drains, ridgelines, and emplacements will be shaped, where possible, in undulating informal profiles in keeping with natural landforms of the surrounding environment.

### 6.7 Substrate Management

Surface preparation activities for rehabilitated areas will commence as soon as practicable following the completion of mining activities. The general surface preparation activities to be undertaken at the Mt Arthur Coal Complex include:

- prior to rehabilitation of the shaped overburden surface, representative samples will be taken to characterise the nature of the topsoil (and, if required, spoil) material to determine the potential limitations to rehabilitation and sustainable plant growth (e.g. sodicity, acid-generating potential, etc.) and appropriate amelioration techniques (e.g. addition of gypsum, lime, organic matter etc.);

- final shaped spoil surface will be deep ripped parallel with the contour prior to the application of topsoil and seed to break the compacted spoil surface (allowing for subsequent root penetration) and create a key between topsoil and underlying overburden;
- topsoil will be placed and spread, and soil ameliorants will be applied where appropriate. Topsoil will be contour cultivated to provide for an adequate seed bed or substrate for tubestock; and
- suitable erosion control measures will be implemented to minimise soil loss from areas undergoing rehabilitation.

### 6.8 Revegetation of Mine Disturbed Areas

In general, rehabilitation activities at the Mt Arthur Coal Complex will be undertaken in spring and autumn, however, opportunistic rehabilitation may be undertaken if areas become available for seeding throughout the year. The overall revegetation activities, both onsite and offsite (including along public roads), will consider opportunities to minimise visual and lighting impacts from the operation.

Rehabilitation of post-mining areas will be completed as soon as practicable after shaped areas become available. Whilst it is the intention to maximise opportunities for progressive rehabilitation and reduce the disturbance footprint, potential deviations from the rehabilitation schedule may be incurred due to the following scenarios:

- delays or changes to the mining schedule; and
- postponement or rescheduling of rehabilitation activities to avoid revegetating in un-seasonal conditions, which may other lead to poor quality rehabilitation or failure.

As discussed in **Section 3.2**, the rehabilitation strategy primarily consists of the establishment of areas of grassland for potential future agricultural activities such as grazing. These areas will contain pockets of native vegetation including canopy species, which can potentially be utilised by stock as shelter.

In addition, native vegetation corridors will be established over at least 2642 ha of rehabilitated areas to promote regional fauna movements across the Mt Arthur Coal Complex. Native ecosystem rehabilitation will primarily involve direct seeding of native species along with a cover crop or other organic material (e.g. wood mulch if available), as required, to prevent soil loss, dust generation and add biomass to the profile. A range of other techniques including the planting of tubestock will also be utilised where rapid vegetation establishment is required.

Rehabilitated woodland areas will be created to contain flora species assemblages characteristic of the dominant vegetation communities impacted by the Mt Arthur Coal Complex. Rehabilitation techniques will be refined over the life of mining operations through an ongoing process of research, trialling, monitoring and improvement.

## 6.9 Management of Grazing

As the Mt Arthur Coal Complex rehabilitation strategy provides for the establishment of areas for potential future agricultural activities such as grazing, measures will need to be implemented to prevent damage to native woodland rehabilitation areas from stock. As such, all native woodland rehabilitation areas will be fenced where the potential for stock interference exists.

## 7.0 Rehabilitation and Offset Schedule

### 7.1 Offset and Conservation Areas

Based on the outcomes of detailed ecological field surveys OMPs (**Appendix 2 and 3**) have been developed to include detailed work programs required to achieve the objectives and criteria nominated for the offset and conservation areas (refer to **Section 3.0**). These OMPs outline an indicative ten year revegetation/regeneration schedule for those areas that will be targeted for condition improvement. Revegetation will be concentrated on areas that are considered likely to provide the greatest benefit in terms of connectivity and provision of habitat for threatened species. Revegetation works during years 5-10 of the program will also involve the management of previous years' revegetation, including supplementary planting and weed management where identified as per monitoring programs described in **Section 8.0**. It is considered highly likely that natural regeneration of many areas over the next four years will minimise the need for active revegetation (apart from weed management and feral fauna management) across the majority of the site.

More specifically, the OMPs detail the program of works for the first four years of the program, targeting priority areas on site. Works required for years 5-10 will be assessed and updated post monitoring and in line with progress towards preliminary completion criteria.

Year 1 of the implementation programs will primarily involve land management works such as weed management and feral animal control; however, seed collection of target species will be required in preparation for planting of revegetation areas in Year 2 of the program. The timing of revegetation works will be influenced by seasonal conditions, however initial planting is anticipated to occur in autumn 2014. Scheduling of planting works will be determined by the amount of viable seed available and nursery growth rates of tubestock being propagated.

This BMP will be regularly reviewed, and if necessary revised, in accordance with the requirements of Condition 4 of Schedule 5 of PA 09\_0062 MOD 1 to ensure any recommended measures are incorporated to improve biodiversity management outcomes. This BMP will have a three year life span. It is the intention that the implementation program for all offset and conservation areas be reviewed every three years, with this schedule of work being updated appropriately as works progress. Every three years an audit of the offset areas will be undertaken and the outcomes will be considered in the revision of the plan.

A more detailed schedule of works will be developed for years 5-10 by the end of year 4 based on the results of monitoring program, and in respect to progress towards preliminary completion criteria.

## 7.2 Rehabilitation Areas

During the next four years, the primary activity within the Mt Arthur Coal Complex will involve ongoing development of mining areas. The objective will be to undertake pre-disturbance activities that aim to minimise the ecological impacts of the mining operation as well as commence rehabilitation as soon as practical behind the mining activities so as to minimise the extent of disturbance on site. As such, the key rehabilitation and ecological management strategies to be adopted over this time include:

- seed collection and propagation as per the seed collection strategy outlined in **Section 5.2**;
- continuation of pre-clearance surveys ahead of the construction and mining operations. Based on the outcomes of these surveys, undertake the following where required:
  - implement specific tree felling procedures as outlined in **Section 6.3**, in order to minimise the impacts to flora and fauna from the mining operation;
  - undertake soil characterisation works to assess their potential constraints to rehabilitation and the stability of the final landform (refer to **Section 6.4**);
  - salvage and protect the viability of the subsoil and topsoil resource for later use in rehabilitation, as per **Section 6.4**; and
  - commence with the rehabilitation monitoring program as outlined in **Section 8.0**.

HVEC commit to developing a schedule of works for the entire 2642 ha regeneration/rehabilitation area in consultation with relevant authorities. The proposed timings for the rehabilitation of mined land are dependent on the progress of mining operations, which are approved (under PA 09\_0062 MOD1) to occur up until 30 June 2026. **Section 7.2.7** of the MOP (**Appendix 5.0**, as amended from time to time) commits to rehabilitation areas and timings during the MOP period. Progress on these commitments will be reported in the Annual Review.

## 8.0 Biodiversity and Rehabilitation Monitoring

Scheduled, documented monitoring programs for biodiversity offset and conservation areas are outlined in the following sub-sections. Regular housekeeping inspections of offset and conservation areas are also conducted by the Mt Arthur Coal environment-execution staff and the Specialist Property.

### 8.1 Biodiversity Monitoring

This section provides an outline of the ecological and rehabilitation monitoring program designed to assess the adequacy of the ecological management strategies to be implemented as part of the BMP. The BMP monitoring requires a rigorous and systematic monitoring program that provides a feedback loop, to facilitate the adaptive management of BMP strategies. A separate Rehabilitation and Ecological Monitoring procedure, providing further detail on monitoring programs, has been developed. The aims of the ecological and rehabilitation monitoring program are to:

- provide the scientific basis for defining rehabilitation objectives related to biodiversity;
- assess the long-term stability and functioning of re-established ecosystems within post-mining rehabilitation areas, as well as offset and conservation areas;
- facilitate continuous improvement in rehabilitation and regeneration practices;
- record and document changes in retained vegetation within the rehabilitation areas, conservation areas and offset areas, through comparison with baseline data from permanent monitoring sites and comparison with predictions in the EA (Hansen Bailey 2009);
- record and document changes in the structure, composition and condition of vegetation within the offset and conservation areas over time;
- assess progressive changes to flora and fauna species assemblages within the rehabilitation areas and offset and conservation areas;
- trigger remedial (or preventative) activities or works, where progress criteria is not being met; and
- ensure the ecological integrity/function of the offset and conservation areas, and rehabilitation areas are maintained or improved as a result of ongoing management practices.

The ecological monitoring program will involve the monitoring of post-mining rehabilitation areas, remnant native vegetation, regeneration areas, fauna species and their habitats, and key threatened species. The monitoring process and its results will be documented in the relevant annual reports. This reporting will provide details of the flora and fauna species and ecological communities present at monitoring sites, identify impacts of mining related activities, and recommend ameliorative management options (where necessary), to enable continual improvement of the ecological management of the Mt Arthur Coal Complex.

Monitoring of flora and fauna habitat will occur within the offset and conservation areas and rehabilitation areas (once habitat is sufficiently established). The location of the biodiversity monitoring sites is discussed further in the Rehabilitation and Ecological Monitoring procedure.

The vegetation monitoring and fauna monitoring programs described below correlate to the Vegetation Community Assessment and Fauna Survey monitoring components of the Ecological Development program outlined in the Rehabilitation and Ecological Monitoring procedure. In addition, the Ecological Development program outlines the requirements for Periodic Weed Assessment and Re-vegetation Inspections.

All surveys will be undertaken in a manner consistent with the Threatened Species Survey and Assessment Guidelines published by the OEH.

## 8.2 Vegetation Monitoring

### General Ecosystem Monitoring

An annual rapid assessment (i.e. walk over inspection and desktop review of aerial photography where available) of retained vegetation and fauna habitats will be undertaken on an annual basis by an appropriately qualified Mt Arthur Coal environment team employee or contractor in all offset and conservation areas. The condition of retained vegetation within the offset and conservation areas will be monitored to identify any deterioration or improvement in habitat quality. The monitoring surveys will assess and systematically record the following vegetation characteristics:

- general health of vegetation;
- evidence of natural regeneration;
- occurrence and abundance of weed species;
- signs of disturbance, either by stock or humans;
- evidence of feral animals; and
- any observable impacts on the offset and conservation areas including (but not limited to) erosion, dieback, unauthorised access or grazing, that could threaten the ecological integrity of the offset and conservation areas.

### Vegetation Community Assessment

Vegetation monitoring will be undertaken systematically to observe and document changes in vegetation communities through time and to identify any management actions that may be required to maintain functioning environments.

The condition of residual vegetation within the offset and conservation areas will be monitored to identify any deterioration or improvement in habitat quality during the life of the mine as well as to provide a comparison when assessing the performance of rehabilitation sites. Vegetation community assessment will be conducted on a rotational basis at the monitoring sites. This schedule has been developed in consultation with ecological consultants. Once five assessments have been undertaken at a site, the monitoring frequency will be reviewed and



may be modified if data analysis shows ecological development is trending successfully towards completion criteria. Vegetation monitoring is detailed in the Rehabilitation and Ecological Monitoring Procedure.

Permanent monitoring plots will be established within the residual vegetation of the offset areas as well as within rehabilitation areas that are in the post mining phase. The monitoring approach will be to undertake systematic and repeatable surveys at permanent monitoring plots of 20m by 20m quadrats (identified by permanent metal star pickets in each corner, and tagged with metal tags), which will be sampled in order to record species diversity and structural composition. Plots will be sampled using systematic, semi-quantitative, repeatable techniques, such as the Modified Braun-Blanquet Cover-abundance method (Braun-Blanquet 1927, Poore 1955, Austin *et al.* 2000) (see Table 8.1), to ensure data are comparable over time with as little observer bias as possible.

**Table 8.1: Modified Braun-Blanquet Crown Cover-Abundance Scale**

Class	Cover-abundance Scale*	Growth Form Dependent
1	Few individuals (less than 5% cover)	Herbs, sedges and grasses: <5 individuals
		Shrubs and small trees: <5 individuals
2	Many individuals (less than 5% cover)	Herbs, sedges and grasses: ≥ 5 individuals
		Shrubs and small trees: ≥ 5 individuals
		Medium-large overhanging tree
3	5% – less than 20% cover	-
4	20% – less than 50% cover	-
5	50% – less than 75% cover	-
6	75% – 100% cover	-

Note: \* Modified Braun-Blanquet scale (Braun-Blanquet 1927, Poore 1955; Austin *et al.* 2000).

Photo monitoring points will also be established within each of the permanent monitoring plots, to enable a visual assessment of changes over time.

The monitoring surveys will assess and systematically record the following vegetation characteristics:

- floristic composition (including cover and abundance of species) and structure;
- general health of vegetation;
- evidence of natural regeneration;
- occurrence and abundance of weed species;
- presence of threatened or other significant species;
- signs of disturbance, either by stock or humans;
- evidence of feral animals; and
- any observable management impacts, such as the effectiveness of fencing and weed control actions.

If necessary groups of plots will be monitored seasonally (in the same season each year), enabling the collection of comparable seasonal data. A suitably qualified ecologist will be required to complete this monitoring.

If further threatened species, or significant new records of existing threatened species, are collected as part of such monitoring, the significance of such records will be assessed in the annual monitoring reports. This may include due diligence impact assessment (if necessary), a review of the monitoring program, and/or a review of the management of significant ecological features of the site.

### 8.3 Fauna Monitoring

The objective of the fauna monitoring is to record a snapshot of species diversity across the sites to allow comparisons to be made across years and vegetation types. Such comparisons can then be utilised to produce tailored management recommendations. Targeted fauna surveys at the Mt Arthur Coal Complex will be undertaken utilising the methods outlined below.

Monitoring of fauna and fauna habitat will occur within the offset and conservation areas and post-mining rehabilitated areas (once habitat is sufficiently established). The location of these monitoring sites will allow a comparison between the fauna utilisation of various vegetation communities across HVEC owned lands.

At each of the fauna and fauna habitat monitoring sites (refer to **Figure 8.2**), a standard set of monitoring methods (and monitoring effort) will be adopted that will allow the documentation of ongoing fauna use of habitat, particularly focussing on the presence of key threatened species. Fauna monitoring will be conducted on a rotational basis at the monitoring sites. This schedule has been developed in consultation with ecological consultants. Once five VCA have been undertaken at a site, the monitoring frequency will be reviewed and may be modified if data analysis shows ecological development is trending successfully towards completion criteria.

In recognition of the initially reduced habitat of rehabilitation areas, a reduced fauna monitoring methodology will be adopted at the rehabilitation sites (within the post-mining open cut areas). This reduced methodology will focus on the recording of the progress of development of fauna habitat (by adopting the same approach taken for the full fauna sites), until the vegetation reaches a height of 3 to 4 metres. This will then trigger the implementation of the full fauna survey methodology, to document the return of fauna species to the rehabilitation areas.

Fauna Monitoring at the Mt Arthur Coal Complex currently involves a combination of the survey methods and techniques outlined in the sections below. The monitoring program will be expanded, if required, to include additional monitoring locations as rehabilitation progresses.

#### Diurnal Avifauna Surveys

Diurnal avifauna surveys are conducted in early mornings or other times of high bird activity. Surveys target suitable habitat for birds and included searches for signs of habitation. Birds are identified by sight, using binoculars, or by their distinctive calls. Opportunistic records are also

made throughout the survey period, while travelling between monitoring sites and while conducting other targeted searches.

### **Diurnal Herpetological Surveys**

Diurnal herpetological surveys are conducted in likely habitat areas at each monitoring location. During each diurnal search, likely microhabitats are examined, such as under rocks, logs, tree bark, ground litter and in wet soak areas. The diurnal searches are typically conducted between 9.00 am and 5.00 pm.

### **Nocturnal Spotlighting Surveys**

Spotlighting is conducted on foot using 30 watt Lightforce hand-held spotlights. Spotlighting is undertaken generally between 8.30 pm and 11.00 pm, and consists of a slow walk through each monitoring site searching for nocturnal mammals and birds. Any area of potential herpetofauna habitat located within the monitoring sites was also examined during the nocturnal surveys.

### **Micro-Bat Detection Surveys**

Micro-bat echolocation surveys are conducted at each monitoring location using an Anabat SD2 echolocation recorder (Anabat). All digital calls are analysed by the relevant recognised experts.

### **Nest Box Monitoring**

Nest box monitoring will be used to determine the efficacy of the use of nest boxes and salvaged tree hollows to ameliorate the loss of tree hollows from clearing activities. Nest box condition monitoring will be completed to ensure that there is no loss of nest boxes through deterioration over time. Condition monitoring will focus on the physical condition of the nest boxes to determine if they remain attached securely and positioned correctly within the tree and if they require replacement or re-attachment. Monitoring will report on the degree of use of nest boxes, including information on the condition of the boxes, the degree of usage by native species (particularly threatened species), and the degree of usage by feral species, including ants and feral honeybees. Nest box content monitoring will focus on gathering information on whether the nest boxes are providing an effective ameliorative measure for the loss of hollows, particularly for threatened species.

## **8.4 Rehabilitation Monitoring**

The scope of the rehabilitation monitoring program for the Mt Arthur Coal Complex will cover each phase of the mining operation including pre-mining baseline surveys, rehabilitation and post rehabilitation.

### **Rehabilitation Completion Inspection**

Mt Arthur Coal will record the details of each rehabilitation and revegetation campaign so that they are available for later interpretation of rehabilitation monitoring results. This will allow the continual improvement of rehabilitation and revegetation standards on site. Amongst the key monitoring parameters to be included in the program are outlined as follows:

- landform design details;
- drainage design details;
- substrate characterisation;
- site preparation techniques (e.g. topsoil and source, time of sowing, soil ameliorants used, etc.);
- revegetation methodologies (e.g. rate and type of fertiliser, cover crop and rate, species composition, seed viability);
- climatic conditions;
- photographic records; and
- initial follow-up care and maintenance works.

This recording of rehabilitation information correlates to the Rehabilitation Completion monitoring program outlined in the Rehabilitation and Ecological Monitoring Procedure (**Appendix 4**, as amended from time to time).

### **Landform Stability Inspection**

Annual rapid assessments of rehabilitated and revegetated areas will be undertaken over the life of the mine to assess soil conditions and erosion, drainage and sediment control structures, runoff water quality, germination rates, plant health and weed infestation. Outcomes of the annual rapid assessment will be recorded and appropriate maintenance or remedial management actions will be identified and implemented as soon as practical. Where necessary, rehabilitation and revegetation procedures will be amended accordingly with the aim of continually improving standards.

## 9.0 Reporting Requirements

### 9.1 External Reporting

An annual ecological development report will be prepared and will document the monitoring methods and results. This report will provide a comparison of the data collected with previous years' results, baseline data contained in the Environmental Assessment (2009 and 2013), completion criteria outlined in the Mining Operations Plan as well as include management recommendations and ameliorative methods for ongoing biodiversity management of the Mt Arthur Coal Complex. The annual report will be summarised as part of the Annual Environmental Management Report (AEMR), which will be submitted to DP&E, OEH and DRE for review.

Within three months of every 12 month anniversary of the commencement of the operations, HVEC will submit a report to DoE addressing compliance with the conditions of this approval, including implementation of the Biodiversity Offset Strategy and the BMP. These reports will list each approval condition and the actions taken to address each approval condition. These reports will be submitted annually, until such time that DoE is satisfied that the conditions of the approval have been satisfied, and DoE has advised HVEC (in writing), that all the approval conditions have been complied with.

### 9.2 Community Complaints

Community complaints management includes receipt of complaints, investigation, implementation of appropriate remedial action, and feedback to the complainant as well as communication to site management or personnel and notification to external bodies, such as OEH and DP&E or OEH, where necessary.

All community complaints received by HVEC are managed in accordance with the *Community Complaints Handling, Response and Reporting Procedure*. This procedure has been established to record all complaints received by HVEC with all complaints and investigation outcomes reported in the Community Complaints Summary. The Community Complaints Summary is updated monthly and can be accessed via the internet at:

[Bhpbilliton.com/regulatoryinformation](http://Bhpbilliton.com/regulatoryinformation).

### 9.3 Incidents and Corrective Actions

In accordance with Condition 7 of Schedule 5 of the Project Approval (09\_0062 MOD1), HVEC will notify the DP&E and OEH of environmental or community incidents associated with the project as soon as HVEC becomes aware of the incident. HVEC will provide DP&E and OEH with a detailed report on the incident within 7 days of becoming aware of the incident.

The report will include the following details:

- the date, time and nature of the exceedance/incident;
- identify the likely cause of the exceedance/incident;
- description of the response action that has been undertaken to date; and
- description of the proposed measures to address the exceedance/incident.

Environmental incidents will be reported in accordance with the Mt Arthur Coal Hazard, Near Miss & Incident Reporting & Investigation Procedure.

### 9.4 Records Management

All relevant records discussed in this plan for HVEC are stored in the Environment and Community team filing system in accordance with relevant internal administrative procedures.

## 10.0 Compliance Auditing

In accordance with Condition 9 of Schedule 5 of Project Approval 09\_0062 MOD1, this document will be available for assessment as part of the Independent Environmental Audit program, to determine whether HVEC are complying with the relevant rehabilitation, biodiversity and offset management requirements. A field-based audit of the offsets will be undertaken and the outcomes will be considered in the revision of the plan.

On direction from DoE, HVEC will ensure that an independent audit of compliance with the conditions of EPBC approval is conducted and reported on. The independent auditor will be approved by DoE prior to the commencement of the audit. Audit criteria will be agreed to by DoE and the audit report will address these agreed criteria.

## 11.0 Review of Management Plan

The BMP (and associated OMP's) will be reviewed annually or as otherwise directed by DoE or the Secretary of DP&E. Reviews of the BMP will reflect any changes in the environmental procedures and requirements of the Project, advances in current technology or best practice methods, operational procedures or mine planning and regulatory requirements. This review will also take into account any relevant new threatened species listings.

Updated versions of the approved plan will be made publicly available via the internet at: <http://www.bhpbilliton.com/home/society/regulatory/Pages/default.aspx>;



## 12.0 References

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- ANZMEC & MCA (2000). *Strategic Framework for Mine Closure*.
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- Braun-Blanquet, J (1927). *Pflanzensoziologie*. Springer, Vienna.
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Umwelt (Australia) Pty Limited (2011). *Preliminary Documentation for DSEWPC (now DoE)*. Prepared for Mt Arthur Coal.

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Umwelt (Australia) Pty Limited (2014). *Baseline Ecological Study of Mt Arthur Coal Biodiversity Offset and Conservation Areas*.

Umwelt (Australia) Pty Limited (2014). *Baseline Ecological Study of Biodiversity Offset Site at Oakvale, near Timor, NSW*.

## Appendix 1

### Regulatory Conditions

DP&E Project Approval Condition (09_0062 MOD 1 Schedule 3)	Section Addressed
<p><b>Biodiversity Management Plan</b></p> <p><b>40.</b> The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Secretary. This plan must:</p> <ul style="list-style-type: none"> <li>(a) be prepared in consultation with OEH and Council, and be submitted to the Secretary for approval by the end of March 2015, unless otherwise agreed with the Secretary;</li> <li>(b) describe how the implementation of the offset strategy would be integrated with the overall rehabilitation of the site (see below);</li> </ul>	<p><b>Appendix 6 and Section 1.7</b></p> <p><b>Section 3.0</b></p>
<ul style="list-style-type: none"> <li>(c) include: <ul style="list-style-type: none"> <li>(i) a description of the short, medium, and long term measures that would be implemented to: <ul style="list-style-type: none"> <li>• implement the offset strategy; and</li> <li>• manage the remnant vegetation and habitat on the site and in the offset areas;</li> </ul> </li> <li>(ii) detailed performance and completion criteria for the implementation of the offset strategy;</li> </ul> </li> </ul>	<p><b>Sections 5.0 and 6.0</b></p> <p><b>Section 3.0</b></p>

DP&E Project Approval Condition (09_0062 MOD 1 Schedule 3)	Section Addressed
<p>(iii) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:</p> <ul style="list-style-type: none"> <li>• implementing revegetation and regeneration within the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understorey and ground strata;</li> <li>• protecting vegetation and soil outside the disturbance areas;</li> <li>• rehabilitating creeks and drainage lines on the site, both inside and outside the disturbance areas (such as White’s Creek Diversion), to ensure no net loss of aquatic habitat;</li> <li>• managing salinity;</li> <li>• conserving and reusing topsoil;</li> <li>• undertaking pre-clearance surveys;</li> <li>• managing impacts on fauna;</li> <li>• landscaping the site and along public roads (including Thomas Mitchell Drive, Denman Road, Edderton Road and Roxburgh Road) to minimise visual and lighting impacts;</li> <li>• collecting and propagating seed;</li> <li>• salvaging and reusing material from the site for habitat enhancement;</li> <li>• salvaging, transplanting and/or propagating threatened flora and native grassland, in accordance with the <i>Guidelines for the Translocation of Threatened Plants in Australia</i> (Vallee et al., 2004);</li> <li>• controlling weeds and feral pests;</li> <li>• managing grazing and agriculture;</li> <li>• controlling access; and</li> <li>• bushfire management.</li> </ul>	<p><b>Section 5.1 and Appendices 2 and 3 (Sections 2.0 and 3.0)</b></p> <p><b>Section 5.2 Sections 3.1, 3.4 and 8.4</b></p> <p><b>Sections 3.4 and 6.4</b></p> <p><b>Section 6.4 Sections 5.2 and 6.2</b></p> <p><b>Sections 5.2 and 6.5</b></p> <p><b>Section 6.8</b></p> <p><b>Section 5.2</b></p> <p><b>Section 6.4</b></p> <p><b>Section 6.4</b></p> <p><b>Section 5.2</b></p> <p><b>Section 5.2</b></p> <p><b>Section 5.2</b></p> <p><b>Section 5.2</b></p>
<p>(iv) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;</p>	<p><b>Section 8.0</b></p>
<p>(v) a description of the potential risks to successful revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and</p>	<p><b>Sections 1.5 and 3.4 and Appendix 5 (Section 9.2)</b></p>
<p>(vi) details of who would be responsible for monitoring, reviewing, and implementing the plan.</p>	<p><b>Section 1.6</b></p>

DoE Project Approval Condition (EPBC 2011/5866)	Section Addressed
<p><b>Biodiversity Offset Strategy</b></p> <p>3. The person taking the action must register a legally binding conservation covenant over the conservation and offset areas identified in Table 1, within 1 year of the date of this approval. The mechanism must provide enduring protection for no less than:</p> <p>a) 707.7 ha of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland Ecological Community (Box Gum Woodland); and</p> <p>b) 738.7 of suitable habitat for Anthochaera Phrygia (Regent Honeyeater) and Lathamus discolor (Swift Parrot).</p> <p>Note: Offsetting requirements for Regent Honeyeater and Swift Parrot habitat may be accommodated within the White Box – Yellow Box – Blakelys Red Gum Grassy Woodland and Derived Native Grassland Ecological Community components if this habitat is verified as present and includes specific habitat requirements for each of these species in accordance with the departments listing advice, conservation advice and/or recovery plans.</p>	<p><b>Section 1.8</b></p>
<p>4. The person taking the action must commence progressive regeneration of 1915 ha of woodland and forest communities, including 299.20 ha of box gum woodland identified in Table 1, as described in the preliminary documentation within 1 year of commencement of construction.</p>	<p><b>Section 5.1</b></p>
<p><b>Biodiversity Management Plan</b></p> <p>5. The person taking the action must submit for the Minister’s Approval the Biodiversity Management Plan (BMP) for the project by 30 June 2013. The BMP must reflect the proposed Mt Arthur Coal Complex Biodiversity Offset Strategy as outlined in Table 1 and as generally described in the preliminary documentation and focus on the reestablishment and protection of a minimum of 707.7 ha of Box Gum Woodland and a minimum of 738.7 ha of suitable habitat for Regent Honeyeater and Swift Parrot. The approved BMP must be implemented.</p>	<p><b>Section 5.1</b></p>
<p>6. The BMP must describe how the implementation of the Offset Strategy would be integrated with the overall rehabilitation of the site and with local and regional corridors, existing conservation areas and existing biodiversity commitments at Mt Arthur Coal.</p>	<p><b>Section 3.0</b></p>

<b>DoE Project Approval Condition (EPBC 2011/5866)</b>	<b>Section Addressed</b>
<p>7. The BMP must include but not be limited to:</p> <ul style="list-style-type: none"> <li>a) A text description and map to clearly define the location, boundaries and size of the conservation and offset areas and the regeneration area and rehabilitation corridors. This must be accompanied with the offset attributes and a shape file;</li> <li>b) Details of the mechanisms, legal instrument, steps and timing for registering a legally binding conservation covenant that provides enduring protection over each nominated conservation and offset area;</li> <li>c) A detailed description of the current condition of the extant vegetation of each conservation and offset area prior to any management activities. This will provide a baseline description of the vegetation condition for the purpose of monitoring;</li> </ul>	<p><b>Sections 1.1 and 1.3</b></p> <p><b>Section 1.8</b></p> <p><b>Section 2.0</b></p>
<ul style="list-style-type: none"> <li>d) Details of vegetation communities to be re-established to achieve the 500 ha regeneration area and 1415 ha of rehabilitated corridors: <ul style="list-style-type: none"> <li>i. Timing of progressive regeneration;</li> <li>ii. Criteria to determine success of re-establishment of the Box Gum Woodland and other woodland forest communities</li> <li>iii. Documentation including mapping of current environmental values relevant to MNES of the area;</li> <li>iv. Where revegetation through planting seedlings and/or seeds is intended, details of appropriate species and ratios of species relevant to historically occurring listed migratory and listed threatened species habitat and the White Box – Yellow Box – Blakelys’ Red Gum Grassy Woodland and Derived Native Grassland Ecological Community; and</li> <li>v. The source and provenance of the seed and/or seedlings which will be utilised.</li> </ul> </li> </ul>	<p><b>Appendix 3 (Sections 2.0 and 3.0)</b></p> <p><b>Sections 3.0 and 4.0</b></p> <p><b>Section 2.0 and Appendix 3 (Section 3.0)</b></p> <p><b>Appendix 5 (Section 7.2)</b></p> <p><b>Section 5.2 and Appendix 3 (Section 3.0)</b></p>



DoE Project Approval Condition (EPBC 2011/5866)	Section Addressed
<p>e) Details of measures to offset the impacts to the MNES described in conditions 3 and 4 including:</p> <ul style="list-style-type: none"> <li>i. Details of management actions that will improve the condition of a minimum of 707.7 ha within the conservation and offset areas and 299.2 ha regeneration area to 'State 1' consistent with the state and transition model for Box Gum Woodland (Rawlings et al, 2010) and listing advice for the White Box – Yellow Box – Blakelys Red Gum Grassy Woodland and Derived Native Grassland Ecological Community;</li> <li>ii. Management schedules for all conservation and offset areas, the regeneration area and the rehabilitation corridors identifying targeted actions for specific areas to protect and enhance the extent and condition of the habitat values of the offset areas, a map showing areas to be managed;</li> <li>iii. Type of actions for each conservation and offset area, the regeneration area and rehabilitation corridors and details of methods to be used;</li> <li>iv. Timing of management actions for each area;</li> <li>v. Performance criteria for each action;</li> <li>vi. A detailed monitoring plan for each action including, but not limited to, control sites, periodic ecological surveys to be undertaken by a qualified ecologist, as agreed to in writing by the minister, and consistent with the survey guidelines for nationally threatened species and communities, to assess the success of the management actions measured against identified milestones and objectives;</li> <li>vii. Contingency measures to be implemented if performance criteria are not met;</li> <li>viii. A process to report, to the department, the progress of management actions undertaken in the conservation and offset areas, regeneration area and rehabilitation corridors and the outcomes of these actions including identifying the need for improved management and actions to undertake such improvement; and</li> <li>ix. Details of the various parties responsible for management, monitoring and implementing the management activities including their position or status as a separate contractor.</li> </ul>	<p><b>Sections 4.0, 5.0 and 6.0</b></p> <p><b>Appendices 2 and 3 (Sections 2.0 and 3.0)</b></p> <p><b>Appendices 2 and 3 (Sections 2.0 and 3.0)</b></p> <p><b>Appendices 2 and 3 (Sections 2.0 and 3.0)</b></p> <p><b>Section 3.3</b></p> <p><b>Section 8.0</b></p> <p><b>Section 3.4 and Appendix 5 (Section 9.2)</b></p> <p><b>Section 9.0</b></p> <p><b>Section 1.6</b></p>

<b>DoE Project Approval Condition (EPBC 2011/5866)</b>	<b>Section Addressed</b>
<p>8. Where strategic grazing is proposed as a management tool, the person undertaking the action must provide, as part of the BMP identified in Condition 5, details of the proposed grazing activities for each management area. This must include:</p> <ul style="list-style-type: none"> <li>a) Objectives;</li> <li>b) Details of the grazing methods to be used;</li> <li>c) Timing including seasons in which grazing will occur, period of grazing and rest period;</li> <li>d) Stocking rate per season; and</li> <li>e) Monitoring of impacts of grazing including any changes in the condition of vegetation, habitat and weed density.</li> </ul>	<b>Section 5.2</b>
<p>9. Grazing activities must be undertaken in accordance with the guidelines for strategic grazing (Rawlings et al, 2010) and managed so that for each management unit at least 70% of the sward meets a minimum height of 10 cm.</p>	<b>Section 5.2</b>
<p>14. Within three months of every 12 month anniversary of the commencement of the action, the person taking the action must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of the Biodiversity Offset Strategy and the Biodiversity Management Plan as specified in the conditions. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the Department at the same time as the compliance report is published.</p>	<b>Section 9.1</b>
<p>17. Unless otherwise agreed to in writing by the minister, the person taking the action must publish all management plans referred to in these conditions of approval on their website. Each management plan must be published on the website within 1 month of being approved.</p>	<b>Section 11.0</b>

## Appendix 2

### Offset Management Program – Middle Deep Creek and Oakvale Offset Areas

## Appendix 3

### Offset Management Program – Onsite and Near Offsite Offset Areas

## Appendix 4

### Rehabilitation and Ecological Monitoring Procedure

## Appendix 5

### Mining Operations Plan



## Appendix 6

### Correspondence Records

#### **Records of consultation with MSC:**

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**From:** Gale, Michael (NSWEC)  
**Sent:** Thursday, 4 June 2015 11:42 AM  
**To:** council@muswellbrook.nsw.gov.au  
**Subject:** Biodiversity Management Plan - Mt Arthur Coal | Email 1 of 3

Please forward to the attention of [Eddie Love, Director Environmental Services](#).

-----  
Dear Eddie,

In accordance with the requirements of Schedule 3 Condition 40 of the Mt Arthur Coal Modification Project Approval (PA 09\_0062 MOD1), I would like to invite comment and input from the Muswellbrook Shire Council on the following draft plan/programs:

- **Biodiversity Management Plan** – revised to incorporate new biodiversity offset areas associated with the Mt Arthur Coal Modification Project.
- **Offset Management Program for Onsite and Near Offsite Offset Areas** – revised to incorporate revegetation/regeneration works and schedule for new biodiversity areas.
- **Offset Management Program for Middle Deep Creek and Oakvale Offset Areas** – revised to incorporate revegetation/regeneration works and schedule for new biodiversity areas.

I have also attached word document versions without figures attached.

It would be appreciated if you could return any comments by Fri 26 June 2015.

Please contact me if you have any questions in relation to the above.

Regards,

Mike.



**Michael Gale**  
Superintendent Environment Analysis & Improvement  
Mt Arthur Coal

**BHP Billiton**  
Thomas Mitchell Drive, Muswellbrook, 2333, NSW, Australia  
Mail To [Michael.Gale@bhpbilliton.com](mailto:Michael.Gale@bhpbilliton.com)  
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## **Records of consultation with OEH:**

---

**From:** Gale, Michael (NSWEC)  
**Sent:** Thursday, 4 June 2015 11:38 AM  
**To:** Richard Bath  
**Subject:** Biodiversity Management Plan - Mt Arthur Coal | Email 1 of 3

Dear Richard,

In accordance with the requirements of Schedule 3 Condition 40 of the Mt Arthur Coal Modification Project Approval (PA 09\_0062 MOD1), I would like to invite comment and input from the NSW Office of Environment and Heritage on the following draft plan/programs:

- **Biodiversity Management Plan** – revised to incorporate new biodiversity offset areas associated with the Mt Arthur Coal Modification Project.
- **Offset Management Program for Onsite and Near Offsite Offset Areas** – revised to incorporate revegetation/regeneration works and schedule for new biodiversity areas.
- **Offset Management Program for Middle Deep Creek and Oakvale Offset Areas** – revised to incorporate revegetation/regeneration works and schedule for new biodiversity areas.

I have also attached word document versions without figures attached.

It would be appreciated if you could return any comments by [Fri 26 June 2015](#).

Please contact me if you have any questions in relation to the above.

Regards,

Mike.



**Michael Gale**  
Superintendent Environment Analysis & Improvement  
Mt Arthur Coal

**BHP Billiton**  
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**Management Plan approval letter from DP&E:**



Ryan Kinnealy  
A/Manager, Environment Analysis & Improvement  
Mt Arthur Coal  
PMB 8  
MUSWELLBROOK NSW 2333

Contact: Scott Brooks  
Phone: 6575 3401  
Fax: 6575 3415  
Email: [scott.brooks@planning.nsw.gov.au](mailto:scott.brooks@planning.nsw.gov.au)  
Our ref: 09-0062

Dear Ryan,

**Mt Arthur Coal Biodiversity Management Plan.**

Thank you for providing Version 3 of the Mt Arthur Coal Biodiversity Management Plan on the 7<sup>th</sup> December for review. This is required by Condition 40 Schedule 3 of Approval 09-0062.

The Department has reviewed this plan and I can advise that the Secretary has approved the plan.

This management plan is a requirement of the Mt Arthur consent and replaces Version 1. Version 3 of this plan comes into force on the 14<sup>th</sup> December 2015 and remains in force until replaced by any future updated approved Program.

Could you please place this program on your website and forward a finalised copy of the above plan (preferably in PDF format with a copy of this approval letter appended) for the Department's records by the end of December 2015.

If you require further information or clarification in this matter please contact Scott Brooks on 6575 3401 or by email to [scott.brooks@planning.nsw.gov.au](mailto:scott.brooks@planning.nsw.gov.au).

Yours sincerely



Scott Brooks  
**Investigations (lead) Compliance**  
Singleton  
As the Secretary's Nominee.

8-12-2015