


# SEVEN OAKS

## Management Plan

Yancoal Warkworth Mine, New South Wales | December 2017



This Management Plan is the framework for the protection and management of a 519 hectare offset area under a legally binding conservation mechanism to satisfy conditions of Warkworth Mining Limited's Commonwealth approval (EPBC 2009/5081).



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This document has been prepared using maps prepared by:

Cambium Group

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Cover Photo: Seven Oaks BA, 2016

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### Declaration of accuracy

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Seven Oaks Biodiversity Area Management Plan is complete, current and correct.
2. I am duly authorised to sign this declaration on behalf of the approval holder.
3. I am aware that:
  - a. Section 490 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.
  - b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.
  - c. The above offences are punishable on conviction by imprisonment, a fine or both.



Signed

DARIN (BILL) BAXTER

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Full name (please print)

YANCOAL AUSTRALIA

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Organisation (please print)

7 DECEMBER 2017

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Date

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Document Title	Version	Date effective	Comment
Seven Oaks BA Management Plan,	1	December 2016	Submitted for approval to DoEE and DPE on 17 February 2017. DPE approved on 26/6/2017.
Seven Oaks BA Management Plan	2	December 2017	DoEE provided comments on 13/04/2017 and 22/06/2017 on the Southern BA Management Plan. The final text was approved by DoEE and these agreed changes have been made to V2 of the Seven Oaks BA Management Plan. Also changes to reflect the new ownership of Coal & Allied by Yancoal.

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# Contents page

<b>1</b>	<b>Introduction</b>	<b>7</b>
1.1	Intent	9
1.2	Environmental Approvals	9
1.2.1	New South Wales	9
1.3	Function of the Management Plan	11
1.3.1	Information Management	11
1.3.2	Key Stakeholders and Roles	12
1.3.3	Review and reporting	12
<b>2</b>	<b>Biodiversity Area</b>	<b>14</b>
2.1	Location and Description	14
2.2	Vegetation communities	16
2.3	Threatened Species	16
2.3.1	Swift Parrot	18
2.3.2	Regent Honeyeater	18
2.4	Baseline Ecological Condition	20
2.4.1	Woodland condition	20
2.4.2	Habitat condition	20
2.4.3	Fauna usage	21
<b>3</b>	<b>Objectives, Key Performance Indicators and Completion Criteria</b>	<b>22</b>
3.1	Conservation Objective	22
3.2	Key Performance Indicators	22
3.3	Completion Criteria	22
<b>4</b>	<b>Conservation Management Actions</b>	<b>23</b>
4.1	Controlled activities	23
4.1.1	Prohibited actions	23
4.1.2	Exemption for clearing vegetation	23
4.1.3	Access	24
4.1.4	Recreation activities and residences	24
4.1.5	Cultural Heritage	24
4.1.6	Waste	24
4.1.7	Performance Criteria	25
4.1.8	Trigger, Response and Action plan	25
4.2	Management of grazing for conservation	27
4.2.1	Performance Criteria	27
4.2.2	Trigger, Response and Action plan	28
4.3	Weed control	28
4.3.1	Control areas	28
4.3.2	Control methods and target weed species	28
4.3.3	Performance Criteria	35
4.3.4	Trigger, Response and Action plan	35

4.4	Management of fire for conservation	35
4.4.1	Performance Criteria	36
4.4.2	Trigger, Response and Action plan	37
4.5	Infrastructure improvement	37
4.5.1	Performance Criteria	37
4.5.2	Trigger, Response and Action plan	37
4.6	Maintenance or reintroduction of natural flow regimes	38
4.7	Retention of regrowth and remnant native vegetation	38
4.7.1	Encourage natural regeneration	38
4.7.2	Performance Criteria	38
4.7.3	Trigger, Response and Action plan	38
4.8	Supplementary planting	39
4.8.1	Seed Collection	39
4.8.2	Species mix and tubestock numbers	39
4.8.3	Planting method	39
4.8.4	Timing	40
4.8.5	Survival assessments	40
4.8.6	Performance and completion criteria	40
4.8.7	Trigger, Response and Action plan	40
4.9	Erosion control	41
4.9.1	Performance Criteria	41
4.9.2	Trigger, Response and Action plan	41
4.10	Vertebrate Pest and Overabundant Native Animal Control	41
4.10.1	Performance Criteria	44
4.10.2	Trigger, Response and Action plan	44
<b>5</b>	<b>Monitoring</b>	<b>45</b>
5.1	Monitoring objectives	45
5.2	Landscape Monitoring	46
5.3	Ecological Monitoring	46
5.3.1	Habitat Restoration Monitoring	46
5.3.1.1	Field Methods	46
5.3.1.2	Photo Reference Points	47
5.3.2	Bird Assemblage Monitoring	48
5.3.2.1	Field Methods	48
5.3.3	Data Analysis and Interpretation	49
5.4	Management Monitoring	49
5.4.1	Rapid Condition Assessment	49
5.4.2	Property inspections	49
5.4.3	Survival Assessment	50
<b>6</b>	<b>Risk assessment</b>	<b>51</b>
<b>7</b>	<b>Compliance table</b>	<b>53</b>



<b>8</b>	<b>References</b>	<b>55</b>
	<b>Appendix A – Rapid Condition Assessment</b>	<b>57</b>
	<b>Appendix B - Habitat Restoration Monitoring</b>	<b>58</b>

## Abbreviations and Definitions

asl	Above sea level
BA	Biodiversity Area (includes the Offset Area, infrastructure and other land)
BB	Braun-Blanquet (cover abundance score)
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BFMP	Bushfire Management Plan
BVT	BioMetric Vegetation Type
CE	Critically Endangered
CEEC	Critically Endangered Ecological Community
CHWG	Cultural Heritage Working Group
CHGBIW	Central Hunter Grey Box – Ironbark Woodland
CHVEF	Central Hunter Valley Eucalypt Forest
Coal & Allied	Coal & Allied Industries Limited
COPs	National Codes of Practice
DoEE	Australian Government Department of the Environment and Energy (previously Department of the Environment (DoEE))
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GDP	Ground Disturbance Permit
ha	Hectare
HLLS	Hunter Local Land Services
km	Kilometre
LLS Act	<i>Local Land Service Act 2013</i>
Ma	Marine Migratory
MNES	Matters of National Environmental Significance
MZ	(BioBanking) Management Zone
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
offset area	Area of vegetation and habitat secured by legally binding mechanism.
RCA	Rapid Condition Assessment
SDS	Safety Data Sheets
SOPs	Standard Operating Procedures
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>
WON	Weed of National Significance
Yancoal	Yancoal Australia Limited

# 1 Introduction

This Management Plan (Plan) details the management activities to protect and enhance the conservation and habitat values of the offset areas located within the Seven Oaks Biodiversity Area (BA). This Plan outlines conservation management actions and a monitoring programme for the Seven Oaks BA to achieve conservation objectives.

This Plan has been prepared to satisfy the conditions of Commonwealth environmental approval held by Warkworth Mining Limited for the Warkworth Coal Mine located in the Hunter Valley NSW. The Warkworth Mine forms part of the Mount Thorley Warkworth complex managed by Yancoal Australia Limited (Yancoal).

The Plan's conservation objectives include a short term objective to measure the effectiveness of initial restoration efforts and longer term outcomes from the continued implementation of the Plan. The short term conservation objective is to protect and enhance the condition and extent of the conservation and habitat values of the offset areas within 10 years. The Plan details active restoration to increase the extent and enhance habitat for the Critically Endangered woodland birds, the Regent Honeyeater and Swift Parrot, and increasing connectivity and resilience to climate change. Section 2 provides a full description of the conservation values, including their baseline condition. In terms of measuring success of the Plan the conservation values have been identified as:

- Woodland; and
- Fauna habitat (in particular habitat for Regent Honeyeater and Swift Parrot).

Key performance criteria have been set for each of the conservation values, section 3 provides a full description. Attainment of the objective and performance criteria is measured using targeted monitoring, which is detailed in section 5, the following outline the monitoring to measure the regeneration trajectory and enhanced habitat condition;

- Habitat restoration monitoring – 27 key variables are measured every two years by an external Biodiversity Auditor to track change in vegetation and habitat condition. The data is analysed to assess the trajectory towards the benchmark description for the vegetation community and improved condition in woodland habitats.
- Bird assemblages monitoring – systematic surveys are completed every two years by an external Biodiversity Auditor to collect data on bird usage, assemblages and habitat. Monitoring of bird assemblages is also indicative of biodiversity as a whole and environmental change.
- Rapid Condition Assessment – photo monitoring and rapid assessment of woodland condition is undertaken every year; and
- Property inspections – monitoring for early detection of potential threats to the conservation values and failures of the Plan.

The conservation management actions to be implemented are described in section 4, each action has a specific Performance Criteria and Trigger, Response and Action plan to ensure the actions deliver the intended outcome and are adaptable. The actions are guided by relevant National Recovery Plans, as well as the requirements of the legally binding conservation mechanism. To demonstrate this alignment the conservation management actions are listed in Table 1 against the National Recovery Plan objectives or strategy for the Regent Honeyeater and Swift Parrot.



**Table 1 Alignment to the National Recovery Plans for Regent Honeyeater and Swift Parrot**

<b>Actions</b>	<b>National Recovery Plan for the Regent Honeyeater (2016)</b>	<b>National Recovery Plan for the Swift Parrot (2011)</b>	<b>Alignment / Contribution</b>
Controlled activities (Section 4.1)	Improve the extent and quality of regent honeyeater habitat.	To identify and prioritise habitats and sites used by the species across its range, on all land tenures. To implement management strategies to protect and improve habitats and sites on all land tenures	Protection of habitat in Hunter Valley identified as Priority habitat for conservation for both species. The prohibited activities addresses key threatening processes such as: habitat loss and alteration; forestry and firewood collection; and competition from honey bees.
Management of grazing for conservation (Section 4.2)	Improve the extent and quality of regent honeyeater habitat.	To implement management strategies to protect and improve habitats and sites on all land tenures	The grazing controls addresses key threatening processes such as: habitat loss and fragmentation; habitat degradation; and regeneration suppression.
Weed control (Section 4.3)	Improve the extent and quality of regent honeyeater habitat.	To implement management strategies to protect and improve habitats and sites on all land tenures	Control of weeds addressed key threatening process such as: regeneration suppression; encourage regeneration; and habitat loss.
Management of fire for conservation (Section 4.4)	Improve the extent and quality of regent honeyeater habitat.	To implement management strategies to protect and improve habitats and sites on all land tenures	Control of fuel loads to address key threatening process such as: frequent fire; and high intensity fires
Infrastructure improvement (Section 4.5)	Improve the extent and quality of regent honeyeater habitat.	To implement management strategies to protect and improve habitats and sites on all land tenures	Infrastructure to protect offset areas such as: fencing to exclude persons and grazing; safe access to implement management activities; and fire protection infrastructure.
Supplementary planting, (Section 4.8)	Improve the extent and quality of regent honeyeater habitat.	To implement management strategies to protect and improve habitats and sites on all land tenures	Active restoration of areas within the offset areas that have limited regenerative capacity and require introduction of plants to trigger regeneration to establish more and enhanced habitat.
Vertebrate Pest and Overabundant Native Animal Control. (Section 4.10)	Improve the extent and quality of regent honeyeater habitat.	To implement management strategies to protect and improve habitats and sites on all land tenures	Pest control to address key threatening process such as: Predation– cats; and Competition – noisy miners, starlings.
Ecological Monitoring – Bird Assemblages (Section 5.3.2)	Increase understanding of the size, structure, trajectory and viability of the wild population.	To monitor population trends and distribution throughout the range.	Biennial monitoring contributing to records of sighting, breeding and numbers.

The Plan requires the preparation of an Annual Report, to review all activities undertaken and review the monitoring data against the key performance criteria and conservation management actions performance criteria. The Trigger, Response and Action plans for each action and the risk assessment in section 6 ensure the Plan is comprehensive and adaptive to new risks and changing circumstances. Key risks identified include:

- Unlawful damage;
- Bushfire;
- Suppression of regeneration from weeds and / or uncontrolled grazing; and
- Climate change impacting native regeneration.

Consistent management of the offset area is best achieved through the implementation of one plan, therefore this Plan has been prepared to satisfy a range of requirements including:

- compliance with Commonwealth and State environmental approvals;
- legally binding conservation mechanism;
- contractual to engage consultants and contractors; and
- operational guide for Yancoal staff.

The Seven Oaks BA is located 35km west of the township of Merriwa in NSW, approximately 100km north-west of the Warkworth mine. The land is owned by Warkworth Mining Limited and managed by Yancoal. The total area of the BA is 521 hectares (ha) and contains 519ha of native vegetation (offset area). Figure 1 provides the location of the BA and its proximity to Warkworth Mine, as well as the other BAs containing biodiversity offset areas.

## 1.1 Intent

The intent of the Plan, is to ensure compliance with all environmental approvals and support the legally binding conservation mechanism by:

- implementing the conservation management actions in Section 4 and monitoring in Section 5, to meet and measure attainment of the conservation objectives set out in Section 3.

The legally binding conservation mechanism must remain on the land title in perpetuity, for the cadastral blocks listed in Table 3.

## 1.2 Environmental Approvals

The Commonwealth Minister for the Environment, under provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), has issued two approvals for the Warkworth Mine; the first in February 2004 (EPBC 2002/629) and the second in August 2012 (EPBC 2009/5081).

These approvals require Warkworth Mining Limited to offset the impact upon Matters of National Environmental Significance by protecting and managing habitat for the Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*).

Under these approvals, the Seven Oaks BA is to be secured with a legally binding mechanism for enduring protection of 519ha of suitable habitat for these species for Phase 2 of EPBC2009/5081. This Plan satisfies the requirement to prepare an Offset Management Plan and Re-establishment Management Plan for the EPBC 2009/5081 approval.

### 1.2.1 New South Wales

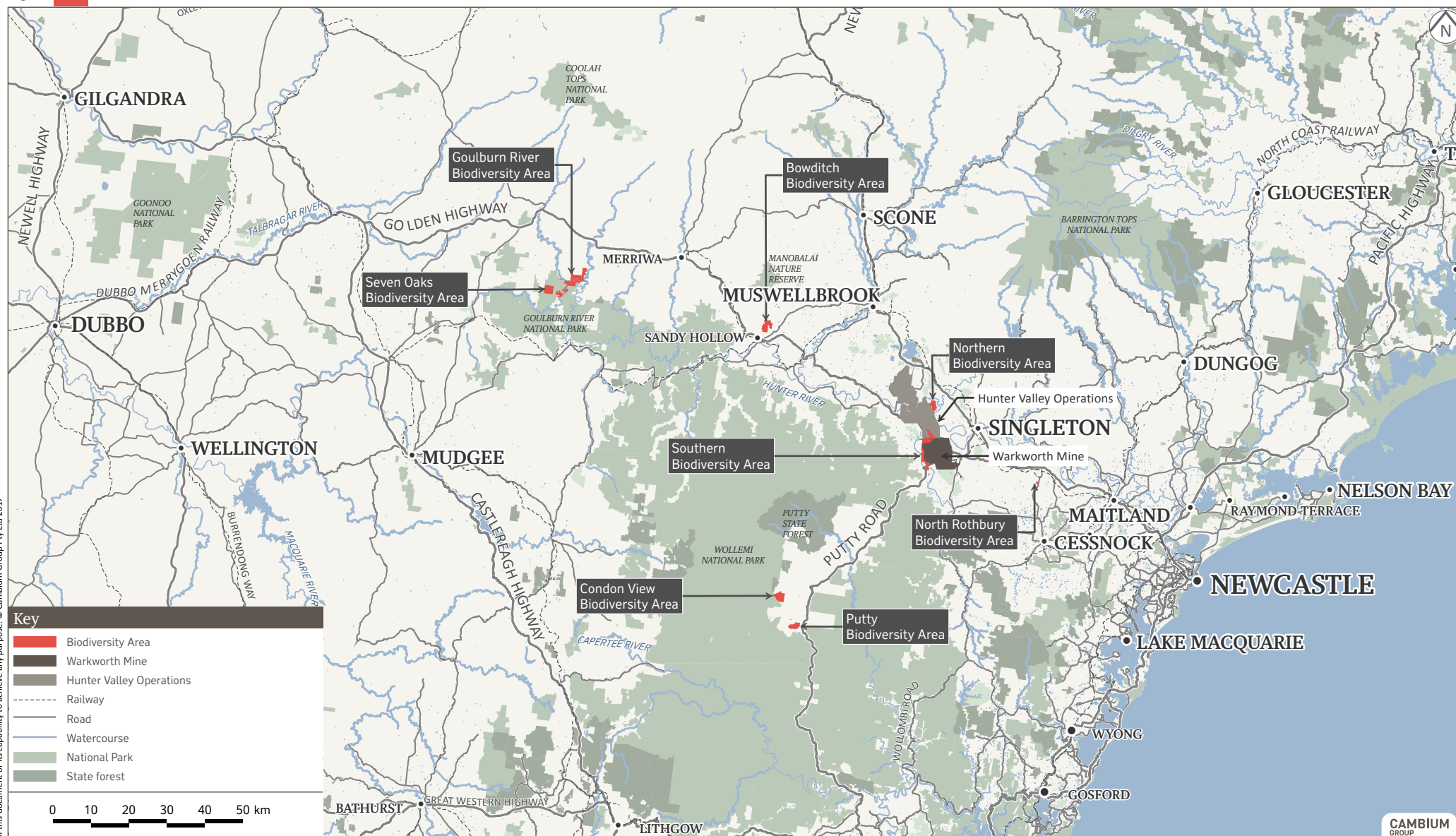
The Warkworth Mine was granted the NSW Development Approval (SSD-6464) issued under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 26 November 2015. At the time of writing this Plan these offset areas are not required to satisfy the requirements of the NSW approval. However, the offset area may be used to generate species credits for the Regent Honeyeater, if required.

To ensure this Plan satisfies the requirement of all approvals Section 7 provides a compliance table to demonstrate attainment of the relevant conditions.

## Location of the Warkworth Mine Biodiversity Areas

Management Plan 2017

Figure 1





### 1.3 Function of the Management Plan

The Plan will provide the management framework for the BA with the aim to protect and enhance conservation values through the implementation of conservation management actions.

For the Plan to be successful it needs to define the baseline ecological condition of the BA, provide clear conservation objectives, detail the conservation management actions and measure success. To that end the Plan comprises the following sections:

- Biodiversity Areas: description of the BAs and baseline ecological condition of the vegetation communities and habitats, including the biodiversity credits to be retired;
- Conservation Objectives, Key Performance Indicators and Completion Criteria: outlines the conservation objectives for the Plan, conservation values and key performance indicators that have guided the development of conservation management actions and the monitoring programme;
- Conservation Management Actions: lists the primary management actions to be implemented to increase the extent, connectivity and condition of the plant community types and habitats, including Trigger, Response and Action plans;
- Monitoring: details the approach to data collection, analysis and interpretation to measure impacts of the conservation management strategies, to guide adaptive management, to identify positive trends in conservation values and assess attainment of Key Performance Indicators; and
- Risk Assessment: matrix of key risks in the implementation of the Plan and attainment of the objectives.

#### 1.3.1 Information Management

To secure monitoring data and assist in the management of the BA, Yancoal will maintain the online Biodiversity Offsets Portal, whilst the BA is under their direct management. This Portal has been designed to centralise and share information among authorised users including regulators, and will include spatial data, an image library, Annual Reports, plans, BioBanking reports, survey results, records of management activities such as planting and weed control and other non-spatial data. The Portal will, improve communication among stakeholders, transparency of management and monitoring activities and will ensure data security and integrity (e.g. preventing risks of data loss due to staff turnover and minimising the risk of using superseded information). Ultimately, this will result in improved decision making and adaptive management that is responsive to seasonal conditions and current operational challenges.

The Portal will also provide access to an Interactive Map that will allow users to visualise data in a geo-spatial context, assisting in data interpretation. This data will include aerial imagery, site information (e.g. cadastral, site access, topographic, infrastructure, geology) and data relating to management and monitoring activities. The Interactive Map will allow users to query information, turn layers on and off, mark up and print maps. This is an easy to use but powerful tool that does not require knowledge of Geographic Information Systems on the part of the user.

### 1.3.2 Key Stakeholders and Roles

The key stakeholders are identified by their roles in Table 2.

**Table 2 Key Stakeholders Roles and Responsibilities**

Roles	Responsible Entity	Details
Commonwealth Regulator: Administers approvals granted under the EPBC Act - EPBC 2009/5081.	Australian Government Department of the Environment and Energy (DoEE)	<a href="mailto:PostApproval@environment.gov.au">PostApproval@environment.gov.au</a> (for submission of plan and matters related to the EPBC approval) <a href="mailto:EPBCMonitoring@environment.gov.au">EPBCMonitoring@environment.gov.au</a> (for submission of Annual Report and EPBC Annual Compliance reports)
NSW Regulator: Administers approvals granted under the EP&A Act.	Department of Planning & Environment (DPE)	Compliance (Mining) Mining & Industry Projects Department of Planning & Environment <a href="http://www.planning.nsw.gov.au">http://www.planning.nsw.gov.au</a>
NSW Regulator: Administers the <i>National Parks and Wildlife Act 1974</i> (NPW Act) and the Biodiversity Conservation Act 2016 (BC Act)	Office of the Environment and Heritage (OEH)	Newcastle Office Regional Operations OEH <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a>
Project Proponent and land owner: Prepare and implement the Plan and complete reporting.	Warkworth Mining Limited, whose operations are managed and operated by Yancoal Australia Ltd.	Manager - Environment NSW Phone: 1300 727 745
Biodiversity Auditor: Monitor improvement in condition of the biodiversity values and completes ecological monitoring.	Yancoal Australia Ltd	Yancoal to engage suitably qualified person/s.

### 1.3.3 Review and reporting

The Plan will be reviewed within four years from the date the Plan is approved by the Commonwealth and NSW regulators. The purpose of the review is to incorporate suggestions from the Biodiversity Auditor after completing the Ecological Monitoring, update information on the ecological condition and extent of the plant community types and habitats across the BA and refine conservation management actions. The review will incorporate any updated National Recovery Plans and other literature to ensure the management actions of the Plan is aligned and consistent with current science and conservation management practice.

At the end of year 10, an Advisory Group comprising representatives for each of the stakeholders listed in Table 2 will be invited to complete a review of the implementation of the Plan. The review will be informed by the Annual Reports, all monitoring reports, EPBC Annual Compliance reports and NSW Independent Audit results. The outcomes from the 10 year review will include a revised timeframe for the conservation objective, conservation management actions, and monitoring programme and reporting schedule. All revisions of the Plan are to be approved by DoEE and DPE. The document may be updated to amend changes to contact details, agency names or other secondary information.

Annual Reports will include a summary of monitoring data, and analysis of that data and management highlights.

The Annual Reports will be prepared and submitted to DoEE and DPE in **May 2018** following implementation of the first year (2017) and then each year following. The report will be prepared with input from a suitably qualified ecologist or environmental scientist.

Annual Reports will include the following information as a minimum:

- name and contact details of the Landholder and/or Leaseholder;
- list of conservation management actions undertaken, describing scope of works, skill and expertise of the responsible entity/ies completing the works and performance;
- monitoring results, all data will be correctly labelled with date, location and GPS points;
- an analysis of monitoring results with recommendations for modifications, if any, to the management or monitoring activities;
- an assessment of any new risks or potential threats to the BA and actions to be undertaken to manage these threats and/or risks; and
- an assessment of the progress in attainment of the conservation objectives and key performance indicators.



## 2 Biodiversity Area

### 2.1 Location and Description

The Seven Oaks BA is located approximately 5 kilometres (km) west of Putty in NSW, approximately 60km southwest of Warkworth Mine, and is accessed via the Box Tree Clearing Trail off Putty Valley Road.

The Seven Oaks BA is approximately 521 hectares in size. It is comprised of Lot 91 DP 750757, Lot 92 DP 750757, Lot 108 DP 750757 and Lot 109 DP 750757, which are owned by Warkworth Mining Limited, and Crown road EP43746, as summarised in Table 3. Figure 2 shows the location of the BA and the cadastral boundaries.

**Table 3 Biodiversity Area details**

Land Owner	Lot	DP	Area inside Seven Oaks BA(ha)	Offset Area (ha)
Warkworth Mining Limited	91	750757	61	61
Warkworth Mining Limited	92	750757	194	193
Warkworth Mining Limited	108	750757	66	66
Warkworth Mining Limited	109	750757	196	195
Crown Road EP43746			4	4
Total			521	519

The Seven Oaks BA falls within the Mid-Western Regional Local Government Area and within the Hunter Local Land Services (HLLS) region. It is located within the *Brigalow Belt South Bioregion* and the *Pilliga Interim Biogeographic Regionalisation for Australia* (IBRA) Subregion. The Seven Oaks BA is a part of the Cassilis Slopes (Mitchell) Landscape (Mitchell 2002). The Cassilis Slopes landscape is characterised by undulating hills with dendritic drainage on sub-horizontal Jurassic and Triassic quartz sandstone, siltstone and shale.

Seven Oaks BA is situated strategically with a number of important conservation areas, including:

- Goulburn River National Park surrounds the BA on all boundaries, except the northern third of the western boundary;
- Munmurra State Forest shares borders with the Goulburn River National Park on the western portion of BA;
- Goulburn River State Conservation Area approximately 2 km to the south-west; and
- Durrigere State Conservation Area approximately 8 km to the north-west.

The protection and enhancement of the BA will help facilitate the movement of fauna across the landscape and extend broad areas of suitable habitats for threatened fauna species.

Seven Oaks BA is characterised by a broad, flat hilltop with two steep sandstone gullies that converge on the northern boundary, with gentle slopes to the south. The elevated hilltops has been historically cleared for agricultural use, however limited livestock grazing over recent years has resulted in significant regeneration of shrubs and groundcover species, with some canopy species also regenerating in some areas. Vegetation on the steeper gullies and slopes is less disturbed.

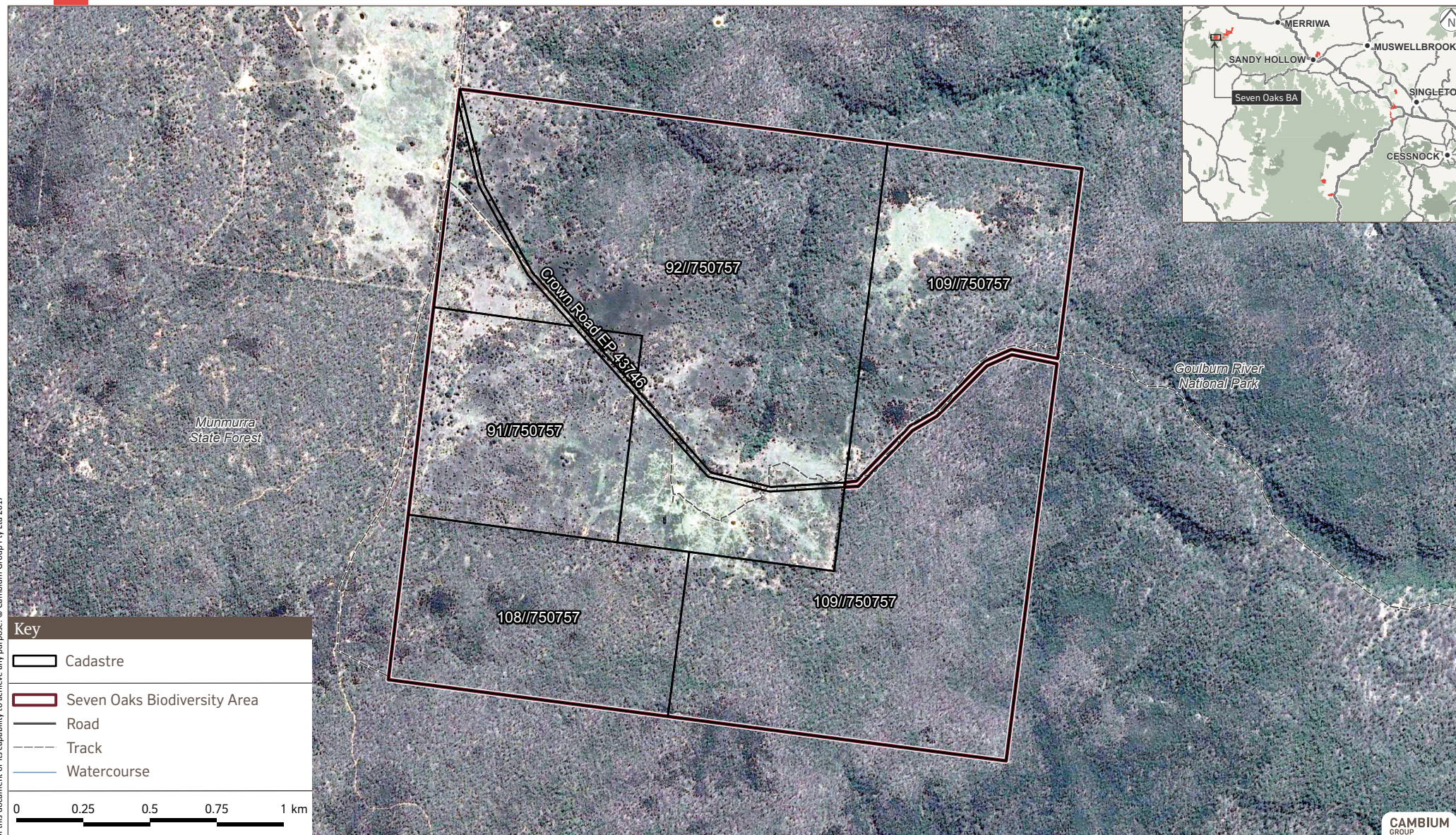
This Plan identifies the offset area by mapped vegetation, however it is recognised that the surrounding infrastructure is required to provide access and protect the offset area. The Habitat Restoration Monitoring Report (Niche and Cambium Group 2016) identified 519 ha of vegetation and described Plant Community Types within five Management Zones (MZs) based on the vegetation and condition.



# Cadastral boundaries at the Seven Oaks Biodiversity Area

Management Plan 2017

Figure 2





## 2.2 Vegetation communities

The abundance and diversity of species across the BA reflects the landscape and history of disturbance, including slope and elevation, with the disturbed hilltops of the BA being less floristically diverse with fewer native species than the steep gullies and slopes to the south. A total of 171 plant species were recorded across the BA and 151 of these were natives. Of the 171 species recorded across the BA 12% (i.e. 20 species) are considered to be weed species. These weed species are generally confined to the regenerating woodland and derived grassland areas, and there is little evidence of their spread into the intact areas of native vegetation.

The distribution of the vegetation is shown by plant community types in Figure 3 and listed in Table 4.

A full description of the plant community types is provided in the Seven Oaks Habitat Restoration Monitoring Report (Niche and Cambium Group 2016) located on the Biodiversity Offsets Portal.

**Table 4 Plant Community Types across Seven Oaks BA**

Code	Plant Community Type	Vegetation Community	Management Zone	Area (ha)
HU713	Rough-barked Apple - Blakelys Red Gum - Narrow-leaved Stringybark +/- Grey Gum sandstone riparian grass fern open forest on in the southern Brigalow Belt South Bioregion and Upper Hunter region	Rough-barked Apple/Stringybark Open Forest	MZ1	24
HU824	White Box - Black Cypress Pine shrubby woodland of the Western Slopes	White Box Shrubby Woodland	MZ2	1
HU910	Blakelys Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Red Gum Shrubby Woodland	MZ3	44
HU875	Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	Narrow-leaved Ironbark/Blue-leaved Ironbark Shrubby Woodland	MZ4	252
HU875	Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin	Cassinia / Acacia Regenerating Shrubland	MZ5	198
Total				519

## 2.3 Threatened Species

The Seven Oaks BA contains large areas of previously cleared grazing land, though significant regeneration has occurred with good shrub growth and canopy species. The BA provides significant bird habitat, as well as foraging and breeding habitat for a number of fauna species. Figure 4 shows the location of threatened species records for the BA.

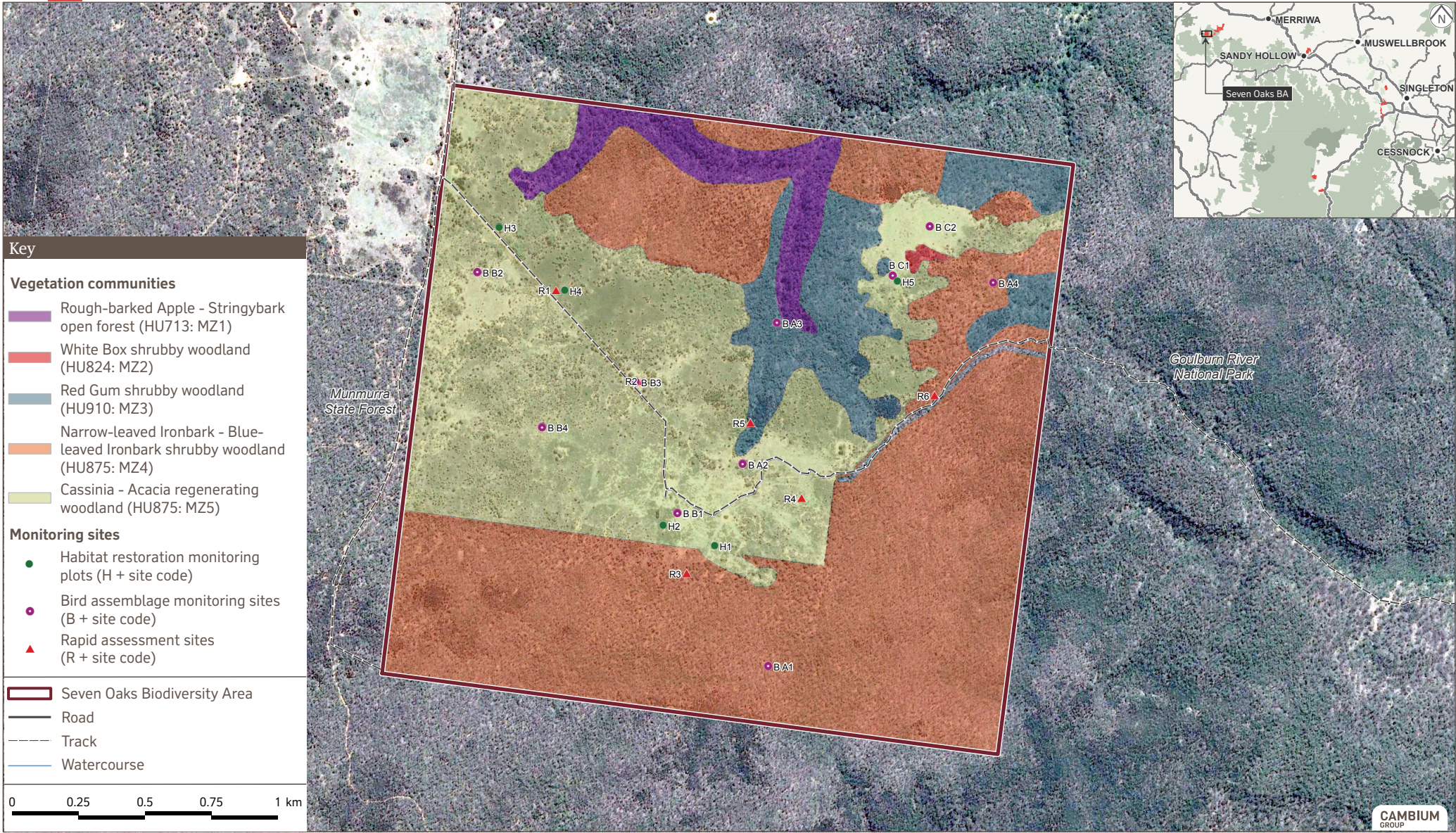
The offset area is to provide suitable habitat for the Swift Parrot and Regent Honeyeater to satisfy the EPBC Act approvals and has been previously approved as suitable by DoEE as part of the 2009 EPBC Warkworth Extension Project Assessment process. The baseline Bird Assemblage Monitoring 2016 (Niche 2016) concluded that flowering Narrow-leaved Ironbark, Yellow Box and Box Mistletoe provided suitable foraging resources for both the Swift Parrot and the Regent Honeyeater. A brief description of these two species is provided below.



Vegetation communities, management zones and monitoring sites at the Seven Oaks Biodiversity Area

Management Plan 2017

Figure 3



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### 2.3.1 Swift Parrot

The Swift Parrot is a predominantly nectarivorous, migratory species endemic to south eastern Australia (Birds Australia 2013) and is listed as Critically Endangered under the EPBC Act and Endangered under the NSW *Biodiversity Conservation Act 2016* (BC Act). The species breeds in Tasmania and migrates to the mainland in winter, where it is most commonly found in dry, open eucalypt forests and woodlands containing Grey Box, White Box and Yellow Gum (Garnett and Crowley 2000; OEH 2012). The species is reliant on Box-Ironbark communities for winter foraging and movement is strongly associated with the availability of lerps and winter-flowering eucalypt species. Swift Parrots often occur in urban areas, including farmland with remnant patches of eucalypt woodland (DEC (NSW) 2005; Saunders and Heinsohn 2008).

### 2.3.2 Regent Honeyeater

The Regent Honeyeater is a winter migrant endemic to south eastern Australia where it is widespread but sparsely scattered, and strongly associated with the western slopes of the Great Dividing Range (Garnett and Crowley 2000) and is listed as Critically Endangered under the EPBC Act and the BC Act. The species is also known to forage and breed in Box-Ironbark woodland in the Hunter Valley region. It is found in temperate eucalypt forests and woodlands but prefers Box-Ironbark associations and River Oak riparian forest in wet, fertile sites along creek lines and river valleys (DEC (NSW) 2006).

The Regent Honeyeater is strongly nomadic and follows blossoming trees and mistletoe (Franklin, Menkhorst *et al.* 1989; NSW Scientific Committee 2004). Numbers fluctuate greatly between years and sites, and movement outside of breeding season is poorly understood. Only 1,500 individuals are thought to make up the single subpopulation of this species. Regent Honeyeaters forage in the canopy tops of mature feed trees, but roost in saplings (Oliver, 1998). This suggests that the species requires a more extensive area of habitat than other similar nectarivorous species.

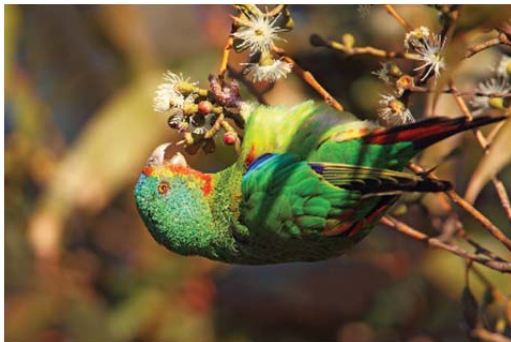


Photo: Swift Parrot (Chris Tzaros)

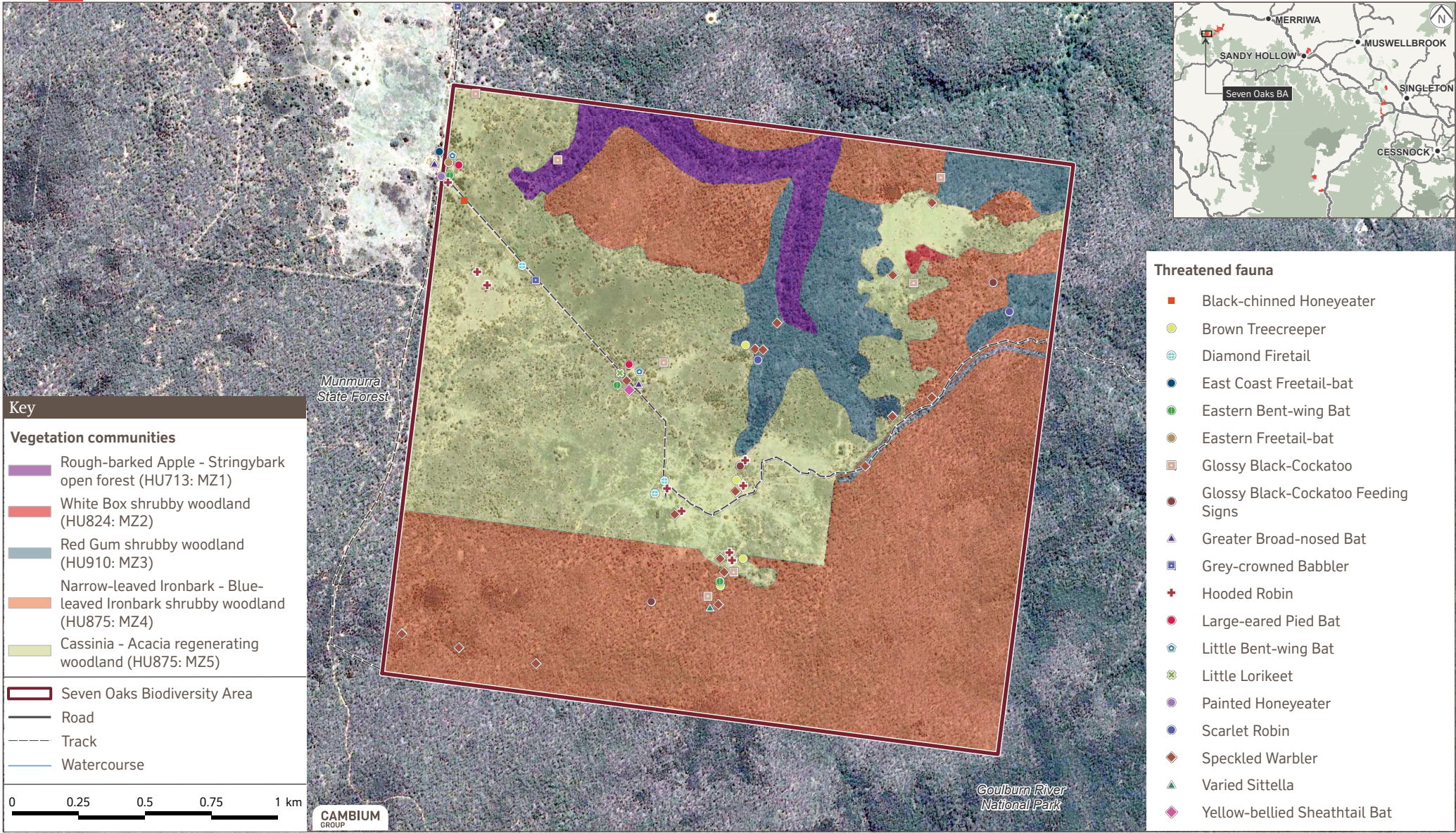


Photo: Regents Honeyeater (Murray Chambers)



Threatened species records at the Seven Oaks Biodiversity Area  
Management Plan 2017

Figure 4





## 2.4 Baseline Ecological Condition

### 2.4.1 Woodland condition

The BA is a combination of mature and regenerating woodland communities with few management issues. A Rapid Condition Assessment (RCA) technique was used as a preliminary assessment of the condition of the woodland. **Appendix A** provides details on the RCA methodology.

Six permanent RCA sites were established across Seven Oaks BA in October 2016. RCAs were positioned across MZ3, MZ4 and MZ5. Sites were selected near access tracks so that future access to the sites will be maintained. Additionally, these sites might act as early indicators of emerging threats given the greatest risks from threats are often at the more easily accessible areas.

Photo reference points were established at each RCA site where a series of photos (north, east, south, west and ground) was taken. This will provide a visual record of any changes in vegetation and habitat condition.

All RCA plot data and associated photo monitoring can be accessed from the online Biodiversity Offsets Portal.

Table 5 provides the number of RCA sites with their average health rating of 18. All RCA sites had a health rating of > 16/20 indicating these areas are healthy and sustainable under current management.

**Table 5 Rapid Condition Assessment health rating results**

RCA Plot Number	MZ	2016
R1	MZ5	18
R2	MZ5	19
R3	MZ4	19
R4	MZ5	16
R5	MZ3	18
R6	MZ4	19
Average		18/20

### 2.4.2 Habitat condition

In October 2016, five permanent Habitat Restoration Monitoring plots were established within the Seven Oaks BA. In accordance with the Seven Oaks MP, habitat restoration monitoring focused on areas that have been degraded from previous land management practices. Accordingly, five monitoring plots were established MZ5 (Cassinia / Acacia Regenerating Shrubland).

Section 5 describes the programme and the methodology to assess changes in habitat values within the offset area through time and relative to the benchmark values associated with the BioMetric Vegetation Type (BVT). The results are shown in Table 6 and have been compared against the benchmark. A full description of the baseline monitoring results is provided in the Habitat Restoration Monitoring Report (Niche and Cambium Group 2016) and is available on the Biodiversity Offsets Portal.

The monitoring plot data indicates a very sparse canopy cover, when compared with the benchmark values. The native mid-storey cover is within or close to benchmark for most plots. The per cent cover of native grasses, shrubs and other is variable within plots, but close to or within benchmark on average. Exotic species cover was greater than benchmark for all plots, but less than 5% for two of the plots. Number of tree hollows and length of logs was below benchmark.

**Table 6 Summary of Habitat Restoration Monitoring Result 2016 compared to benchmark values**

Attributes		NPSR	NOS	NMS	NGCG	NGCS	NGCO	EPC	Logs(m)	Hollows
<b>MZ5 HU875:</b> Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin										
Benchmark	min	25	20	10.0	5	5	5	0.0	66	0.8
	max		50	60.0	15	10	15			
H1		21	0	37.5	5	2.5	21.25	21.25	0	0
H2		22	0	63.5	32.5	3.75	33.75	13.75	0	0
H3		23	2	67.5	40	37.5	10	1	0	0
H4		23	3	7	2.75	2.5	3.5	0.5	5	0
H5		27	0	5.5	26.25	2	65	17.5	0	0
<b>Average</b>		<b>23.2</b>	<b>1</b>	<b>36.2</b>	<b>21.3</b>	<b>9.65</b>	<b>26.7</b>	<b>10.8</b>	<b>1</b>	<b>0</b>

	0-10% or >200% of benchmark (>66% cover for EPC)
	10-50% or 150-200% of benchmark (33-66% cover for EPC)
	50-100% or 100-150% of benchmark (5-33% cover for EPC)
	within benchmark or > benchmark for NPSR, Hollows and Logs (0-5% cover for EPC)

NPSR Native plant species richness  
 NOS Native over-storey % cover  
 NMS Native mid-storey % cover  
 NGCG Native ground cover (grass) % cover  
 NGCS Native ground cover (shrubs) % cover

NGCO Native ground cover (other) % cover  
 EPC Exotic plant cover % cover  
 Logs (m) Length of logs (m)  
 Hollows No. trees with hollows

### 2.4.3 Fauna usage

In 2016 bird assemblages monitoring was completed from 28 July to 02 August, as described in Section 5. The monitoring is designed to observe changes in ecological conditions and the habitat value over time, in particular assess the presence of Swift Parrot and Regent Honeyeater, and their movements and habitat usage within the BA.

Fifty-two species of birds were recorded in the Seven Oaks BA, including three threatened species. Good nesting resources were available for a range of woodland species. Multiple nests of Brown Thornbill were found in woodland habitats, and nesting behaviour of the White-throated Treecreeper was observed. There was evidence of Emu throughout the BA, with multiple scats found. Aggressive behaviour of Red Wattlebirds was observed in open areas of MZ5 where there was a distinctly lower diversity of birds, with some seen chasing off White-eared Honeyeaters. There was good flowering of Narrow-leaved Ironbark, Yellow Box and Box Mistletoe, as well as flowering shrubs.

Three threatened birds were recorded in the Seven Oaks BA within MZ1, as presented below in Table 7.

**Table 7 Summary of locations where threatened birds species were observed and number of individuals at the Seven Oaks BA (2016)**

Species	Scientific name	BC Act	EPBC Act	A2 (MZ5)	A3 (MZ3)	A4 (MZ4)	B1 (MZ5)	B2 (MZ5)	B3 (MZ5)
Glossy-black Cockatoo	<i>Calyptorhynchus lathami</i>	V		S		S			
Hooded Robin	<i>Melanodryas cucullata</i>	V		2			2	2	
Speckled Warbler	<i>Chthonicola sagittatus</i>	V				2	3		2

### 3 Objectives, Key Performance Indicators and Completion Criteria

#### 3.1 Conservation Objective

The conservation objective for this Plan is to protect and enhance the condition and extent of the conservation values of the offset area within 10 years at the Seven Oaks BA.

The conservation management actions described in the following Section 4 outline activities to achieve the conservation objectives.

The methods to monitor the attainment of these objectives are described in Section 5. The monitoring data will be annually reviewed to adapt conservation management actions through continual improvement.

The key conservation outcomes from the long term management and protection of the offset areas include:

- enhanced landscape connectivity within the surrounding landscape;
- improved fauna movement and flora dispersal opportunities within the surrounding landscape;
- increased condition and area of suitable habitats for threatened fauna species within protected reserves, specifically for the Regent Honeyeater and Swift Parrot; and
- enhanced the existing network of protected vegetation within the Hunter Valley.

#### 3.2 Key Performance Indicators

The Key Performance Indicators will measure conservation values, being woodland and grassland vegetation attributes and habitat to indicate an enhancement of ecological and habitat condition. The woodland area to be measured contains habitat for the Regent Honeyeater and Swift Parrot and long term conservation gains will be achieved through the regeneration of the grassland to create additional woodland habitat for these birds. Table 8 lists the key conservation values within the offset area, as well as their Key Performance Indicators and Completion Criteria. The monitoring programme, outlined in Section 5, details the attributes to be measured to provide evidence and demonstrate achievement of the Key Performance Indicators from the implementation of the conservation management actions detailed in Section 4.

**Table 8 Seven Oaks BA Conservation Values and Key Performance Indicators**

Conservation Values	Key Performance Indicator	Completion Criteria
Woodland	Extent and condition of 519ha over 10 years.	Observed and measured increase or maintained Rapid Condition Assessment scores over 10 years (measured annually) in MZ3, MZ4 and MZ5.
Habitat	Improved habitat condition over 10 years.	Observed and measured trajectory towards and/ or attainment of benchmark values at MZ5 (Table 6) over 10 years (measured biennially).
	Bird usage over 10 years.	Observed increased or maintained species richness and usage by woodland birds over 10 years (measured biennially).

#### 3.3 Completion Criteria

The objectives will be deemed to be attained when the Completion Criteria defined in Table 8 have been met to the satisfaction of DoEE.



## 4 Conservation Management Actions

This Section outlines the management actions to protect and increase the extent and condition of the conservation values in the offset area, the offset area is defined by the vegetation community and Biobanking Management Zones as shown in Figure 3. They focus on addressing the key threats to the conservation values, such as unauthorised activity, clearing, altered fire regimes, weeds, feral animals, and overgrazing.

The following details the purpose, scope and methodology for the actions. Each action has been assigned Performance and Completion Criteria (noting Year 1 is 2017), and Trigger, Response and Action plan, to identify corrective actions in the event of unexpected outcomes from implementing the Plan, and support adaptive implementation.

Figure 5 indicates the key management infrastructure.

Yancoal is accountable for the implementation of the conservation management actions, as shown in Table 2, this key responsibilities rest with the Manager, Environmental. The Manager is supported by staff who engage and supervise qualified consultants and contractors to complete the Biodiversity Auditor role, other monitoring, weed and pest animal control, supplementary planting, construction and maintenance of infrastructure and other works as described in the following Section.

### 4.1 Controlled activities

#### 4.1.1 Prohibited actions

The offset area will have legal protection that includes penalties to enforce its protection. Yancoal will ensure that all employees or representatives, contractors, consultants and visitors are aware of these legal protections and penalties prior to entering the offset area.

The following activities will not be permitted within the offset area (Figure 3):

- littering or dumping of waste;
- removal of standing or fallen dead timber, firewood, native plants or animals;
- removal of rocks, sand or gravel;
- clearing or destruction of native vegetation (unless required to implement conservation management actions, such as infrastructure construction or re-vegetation);
- hunting;
- trapping or shooting (unless controlling pest animals);
- broad-acre use of fertilisers;
- broad-acre aerial application of pesticide from planes or helicopters;
- continuous grazing;
- use of livestock feed; or
- keeping of European bee hives, domestic cats and/or dogs.

#### 4.1.2 Exemption for clearing vegetation

Native vegetation cannot be cleared or disturbed within the offset area, with the exception of:

- clearing to implement the conservation management actions described in this Section, being:
  - a) infrastructure improvements;
  - b) control of weeds and vertebrate pests;
  - c) protect personal safety;

- d) establish and/or maintain firebreaks, to manage fuel loads; and
- e) ground preparation or thinning to support revegetation activities, including care and maintenance of planting areas (even if not currently prescribed in this Plan).

To ensure compliance with all legal and environmental protection measures the Yancoal Ground Disturbance Permit (GDP) process will be adopted prior to any planned disturbance.

The GDP process is a checklist that considers the impact of the disturbance on:

- cultural heritage – search relevant sources to determine their presence;
- land ownership and tenement – ensure action is located on land owned or managed by Yancoal;
- environment – search relevant sources to identify presence of listed ecological communities, flora or fauna;
- regulatory approval – legal authority for the action;
- rehabilitation – requirement for rehabilitation; and
- water – potential water impacts and mitigation.

#### **4.1.3 Access**

Access to the offset area will be controlled through locked gates and fences and signs at main access points to inform all visitors they are entering a protected area. Routine inspections and maintenance of infrastructure (access/fire tracks, fence lines and gates) will be undertaken to ensure they are to standard and fit for purpose.

Vehicles may cause soil compaction, dispersal of weeds and vegetation disturbance. To minimise the impact vehicles on the BA, vehicle access will be restricted to authorised personnel only and vehicle speed should not exceed a maximum of 40km/h.

#### **4.1.4 Recreation activities and residences**

Passive recreation activities are permitted, where they do not negatively impact upon the biodiversity values being protected, and only after permission is granted by Yancoal and a risk assessment is to be completed and approved.

The residences within the BA may be leased to provide increased security to deter detrimental activities such as illegal harvesting of firewood, rubbish dumping and hunting. The residences are outside the offset areas and the lease arrangement will provide clear directions to ensure protection of the BA.

#### **4.1.5 Cultural Heritage**

No cultural heritage sites will be disturbed by any management actions implemented through the provisions of this Plan. Any identified cultural heritage sites or values have been recorded and will be managed to ensure their protection.

#### **4.1.6 Waste**

Removal of waste from identified areas and periodic waste removal to be completed will be undertaken.

#### 4.1.7 Performance Criteria

Controlled Activities	Annual Criteria from Year 1 to Year 10
Prohibited actions	No reported incidents of prohibited actions undertaken by Yancoal, contractors, consultants or other agents of Yancoal.
Exemption of clearing vegetation	Any clearing of vegetation reported in Annual Report.
Access	Signage and locks (where required) maintained.
Recreation and residences	Completed risk assessment for any recreation activities. All occupants of residences compliant with requirements of the Plan
Cultural heritage	No Cultural heritage sites knowingly disturbed and any protective barricading maintained.
Waste	Removal of waste from known sites and as required.
Monitoring	All Property Inspections (Section 5.4) completed.

#### 4.1.8 Trigger, Response and Action plan

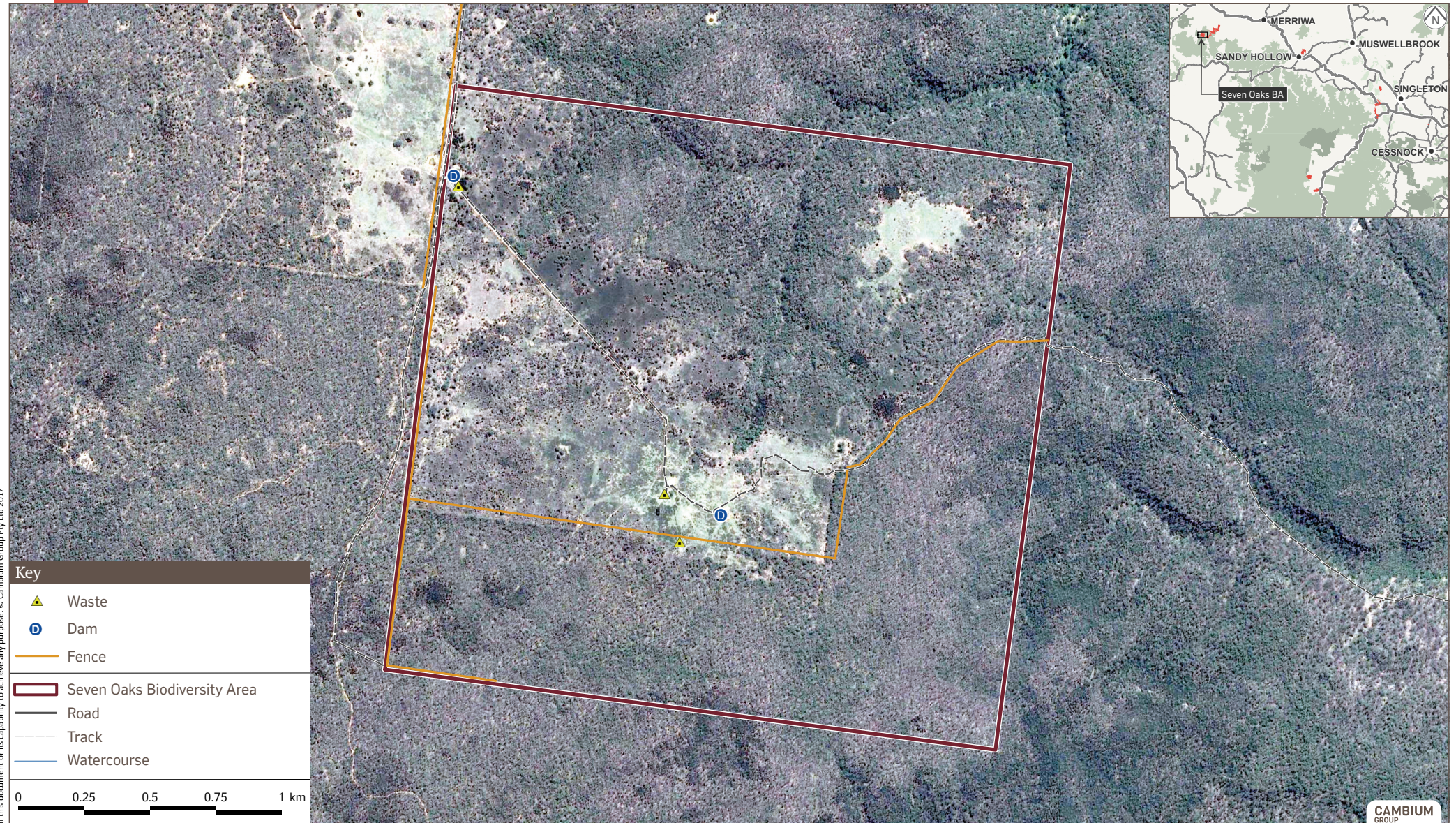
Trigger	Response
Damage to conservation values by persons undertaking controlled activities – reported through Management Monitoring (Section 5.4) or other visitors to the BA.	Report incident to relevant authority within 30 days. Include incident report in the Annual Report complete self-assessment of the significant residual impact from the damage. In situations where there is assessed to be a significant residual impact a rehabilitation plan including active and or passive restoration works is to be prepared and implemented. Review security measures and offset induction procedure.



# Key infrastructure and waste at the Seven Oaks Biodiversity Area

Management Plan 2017

Figure 5





## 4.2 Management of grazing for conservation

Strategic grazing will be used as a management tool to promote regeneration, control weeds, and reduce excessive fire fuel loads. Strategic grazing is preferred because the short duration and intensive regimes prevent or minimise selective grazing and thereby ensure that overall gains in biodiversity can be achieved.

Grazing will be excluded from the Seven Oaks BA, except to improve conservation values or reduce fire risk. Grazing will only be implemented where prescribed by the biodiversity auditor or BioBanking accredited assessor. The trigger point to cease grazing will be less than 70 % ground cover (i.e. no greater than 30% bare ground) and average height of ground cover of less than 12cm (approximately 2500kg dry matter per/ha). The trigger point will be measured using the following quadrat sampling method for ground cover and herbage mass (Lang 2005) by the Biodiversity Auditor:

Using a wooden or metal square (quadrat) of at least 0.5m x 0.5m internal dimensions, undertake the following steps:

- a. Walk at random path within each area to be assessed and throw the quadrat a short distance.
- b. For each throw look only at the area within the quadrat and assess and record the following:
  - A = the percentage of total pasture cover (living and dead);
  - B = the percentage cover of live native plants;
  - C = the percentage cover of live non-native plants; and
  - D = measure height of pasture cover using Meat and Livestock Australia Pasture Ruler to estimate herbage mass.
- c. Take at least 10 random samples for each assessment area (the number of sample will be increased by 1 for each addition 5ha for areas greater than 50ha).
- d. Calculate the percentage of the assessment area covered by vegetation (living or dead):  $\text{Sum of A} / \text{Number of samples}$ .
- e. Calculate the percentage of the living vegetation that is live native groundcover by:  $(\text{Sum of B} \times 100) / (\text{Sum of B} + \text{Sum of C})$ .
- f. Calculate average mass by:  $\text{Sum of D} / \text{Number of samples}$ .

This quadrat data will be provided for the commencement and at the completion of grazing in the annual reports along with the following information:

- livestock movement including dates of entry and removal from the grazing area;
- a map of the grazed offset area;
- number of livestock, type and condition;
- quantity of supplement (if any);
- any livestock health or other management issues; and
- daily rainfall data.

Grazing periods will not exceed four weeks and temporary watering points and fencing will be used to protect sensitive areas, such as planting areas.

### 4.2.1 Performance Criteria

Strategic Grazing	Annual Criteria from Year 1 to Year 10
Grazing	Grazing is conducted in accordance with this Plan and reported in annual report
Unauthorized stock grazing is prevented	Boundary fences maintained
Monitoring	Complete Rapid Condition Assessment and Property Inspections (Section 5.4)

## 4.2.2 Trigger, Response and Action plan

Trigger	Response and Action
Fence damaged and not excluding stock from neighbouring property– impact reported through Management Monitoring (Section 5.4) or visitor to BA.	Repair fence within 15 days and inspect fence at least one month after repair completed and continue Management Monitoring. Return stock to owner and discuss the importance of maintaining stock exclusion from the offset area and options to improve the efficacy of the fencing.
Over grazing – groundcover less than 70 % ground cover and average height of ground cover of less than 12cm as reported by Ecological monitoring or trigger point exceeded under strategic grazing.	Undertake ground cover survey, advise auditor and determine whether/not the trigger values are exceeded (ie less than 70% groundcover, less than 12 cm height). If confirmed remove stock from affected management area.
Biodiversity Audit recommends strategic grazing is required to reduce weed competition and / or encourage regeneration of native plants when completing Ecological Monitoring.	Biodiversity auditor or BioBanking accredited assessor to prepare plan to implement strategic grazing to control weeds, manage fire hazard and/or encourage regeneration. Record and report all strategic grazing activities and outcomes.
Neighbour raises concerns over high biomass increasing fire risk - observed high levels of biomass/grass prior to fire season.	Review monitoring reports and Bushfire Management Plan. Discuss appropriate course of action with neighbour and Rural Fire Service. Review and update Bushfire Management Plan.

## 4.3 Weed control

Control of weed species is critical to restoring the natural species composition, diversity and structure of the vegetation communities across the BA. Weeds are typically non-indigenous plants that invade areas after significant disturbance, such as land clearing or over grazing. Weed control will focus on species that exclude or have the potential to exclude native species, disrupt recruitment of native species, impede ecological processes, or impact native animals.

The aim of weed control is to incorporate a variety of control methods and reduce the reliance on herbicides to keep un-infested areas clear of weeds and control the spread of existing weed infestations.

### 4.3.1 Control areas

The 2016 Habitat Restoration Monitoring Report indicated that weeds at the Seven Oaks BA were generally confined to the regenerating shrublands (MZ5) and were sparse in some plots and dense in others. The regenerating shrubland in MZ5 will therefore be the primary focus of control actions. In addition, to limit weed dispersal from tracks and incursions from the neighbouring farming areas, weed management will also focus on containment zones of 50 m from the tracks. Figure 6 indicates the location of the control areas along with the observation of noxious weeds from the 2016 monitoring. Any weeds outside of these areas will be controlled based on the observations of the monitoring programme.

### 4.3.2 Control methods and target weed species

An integrated weed management approach will be implemented utilising a range of suitable control methods that include:

- biological control - a long term technique;
- herbicide control - a short to medium technique;
- land management – a medium to long term technique; and
- manual control – a short term technique.

The preferred control methods are described in Table 9.

All noxious weeds declared under the *Biosecurity Act 2015* will be given priority for weed control. Noxious weeds recorded at the BA are *Opuntia stricta* (Prickly Pear), *Hypericum perforatum* (St John's Wort) and *Senecio madagascariensis* (Fireweed).



In addition, environmental weeds and/or exotic plants recorded with a relatively high Braun-Blanquet (BB) cover abundance ranking (Braun Blanquet 1928) will also be controlled only where they pose a risk to native species recruitment particularly of native grasses.

The BB cover abundance ranking included:

- 1 = < 5% (rare number of individuals);
- 2 = < 5% (species common at the site);
- 3 = 5 – 25%
- 4 = 25 – 50%;
- 5 = 51 – 75%; and
- 6 = 76 – 100%.

Table 10 lists the target weed species to be controlled, their declaration class under the *Biosecurity Act 2015* or nomination as a Weed of National Significance (WON), control methods, timing and intensity required to manage these weeds, based on the *NSW Department of Primary Industries Noxious and Environmental Weed Control Handbook* (NSW DPI 2014). The photos have been sourced from <http://weeds.dpi.nsw.gov.au/>. Should a control event not be required or conditions are unsuitable (due to dry plants under stress) then evidence of this will be provided in the Annual Report.

The use of chemicals in the BAs will be undertaken by suitably qualified, accredited and experienced personnel (bush regenerators) with specific experience in native plant and weed identification and management. All chemical weed control will be in accordance with the registered label or current minor use permit, Safety Data Sheets and appropriate safety standards. Chemical use in the vicinity of waterways will be restricted to herbicides and adjuvants registered for use in or near aquatic environments.

Chemical weed control operations pose a substantial risk to successful natural regeneration processes unless carefully planned, implemented and monitored. Planning considerations relevant to weed control operations in natural or assisted revegetation areas include:

- Selection of personnel based on demonstrated experience and skill in selective weed control methods in regeneration areas; and
- Timing of proposed application in relation to recent or planned revegetation works.



Exotic *Pinus radiata* within MZ5



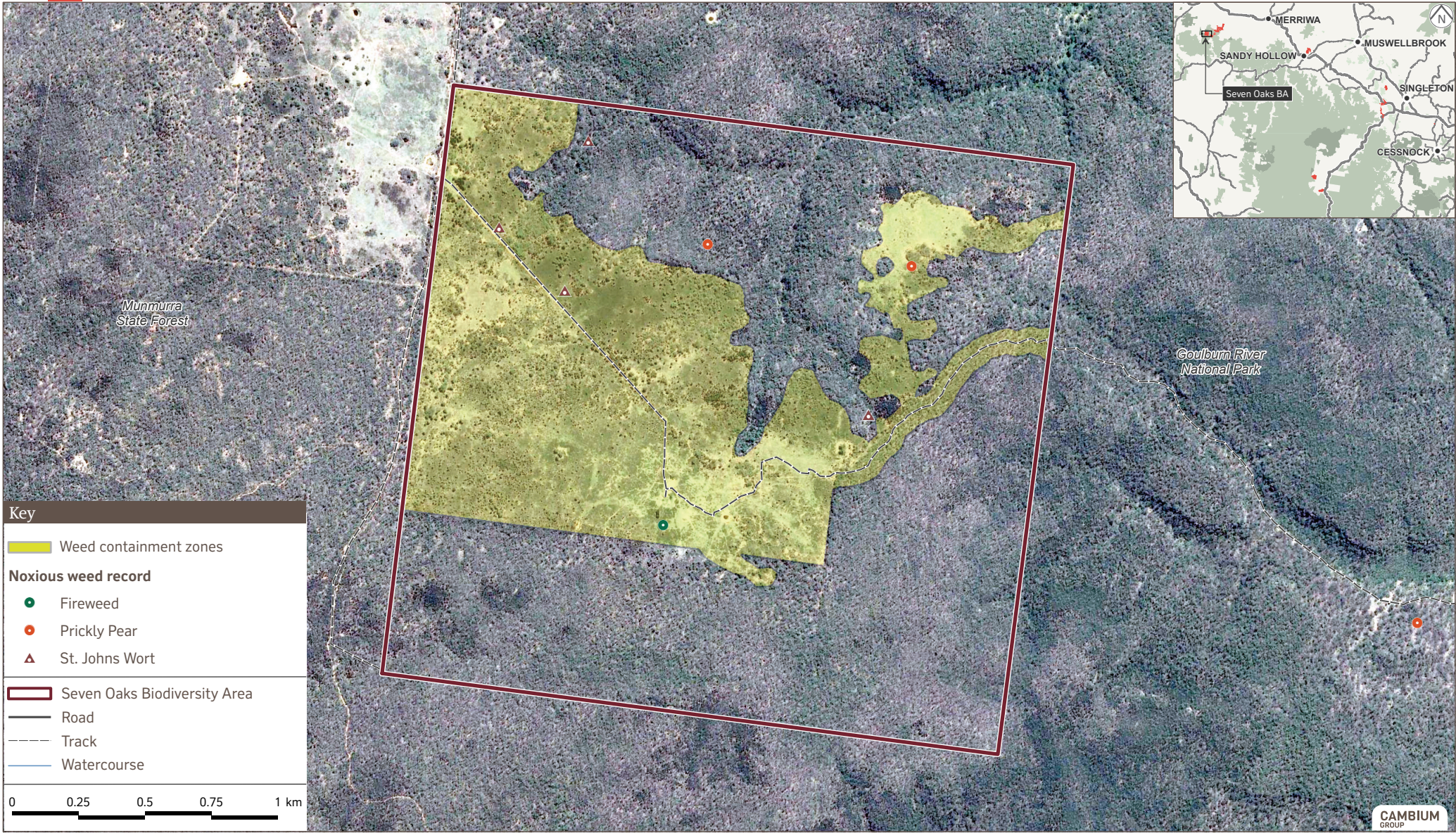
Exotic *Pinus radiata* cleared within MZ5 (2016)



Weed control areas at the Seven Oaks Biodiversity Area

Management Plan 2017

Figure 6



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Table 9 Weed Control Methods





Control Method	Potential use in control regime
Chemical Control – is the application of chemicals to kill the weed by interfering in the plants growth processes.	<p>Spot application of herbicide is the preferred method of application. Boom spray application is permissible as part of ground preparation for re-establishment activities. Areas that cannot be accessed safely by ground based methods the use of Unmanned Aerial Vehicles (UAV) can be used.</p> <p><b>Herbicides:</b></p> <p>Only registered herbicides will be used for the control of the weed species and used in accordance with the directions on the label. Users have a legal obligation to read and follow the instructions on the label. Where appropriate, selective herbicides will be used to minimise impacts on native vegetation.</p> <p><b>Handling and application:</b></p> <p>Herbicide is to be applied to actively growing plants.</p> <p>Herbicides must be handled and applied with consideration of their toxic nature and potentially harmful effects on human health, livestock and the environment. Only accredited and trained in the identification of native plant operators are permitted to apply herbicides.</p> <p>During application weather condition, nozzles, equipment and operator are to be closely monitored throughout application to reduce the risk of drift and subsequent off- target damage. Coarse to very coarse nozzles should be used to increase droplets size.</p> <p>Suitable weather conditions for spraying are extremely important.</p> <p><u>Weather guidelines</u></p> <ul style="list-style-type: none"> <li>• Read the product label and follow all label instructions.</li> <li>• Spray when wind is steady and ideally 3–15 km/h.</li> <li>• Avoid variable or gusty wind conditions.</li> <li>• Avoid calm conditions - small droplets remain suspended for long periods.</li> <li>• Spray when wind blows away from sensitive areas.</li> <li>• Avoid spraying in temperatures above 28 °C.</li> <li>• Aim to spray when Delta T is between 2 and 8 and not greater than 10.</li> <li>• Do not spray when inversion conditions exist.</li> <li>• Aim to spray when the atmosphere is neutrally stable.</li> <li>• Most chemicals require a rain free period – check the label.</li> <li>• Be aware of local topographic and convective influences on wind speed and direction.</li> <li>• Record on-site weather conditions at spray time.</li> </ul> <p>For more detail please refer to <a href="http://www.bom.gov.au/info/leaflets/Pesticide-Spraying.pdf">www.bom.gov.au/info/leaflets/Pesticide-Spraying.pdf</a>.</p> <p><b>Reporting:</b></p> <p>All commercial pesticide users (that includes farmers, leaseholders and spray contractors) must keep records on their pesticide application.</p>
Land Management – good land management practices can reduce the incidence and impact of weeds.	<p><b>Weed hygiene:</b></p> <p>All machinery will be cleaned and washed down to reduce the spread of weed seed.</p> <p>Livestock being introduced to a BA will be quarantined for several days, so any potential weed seeds can pass through their system in a known area and be treated later.</p> <p><b>Weed Identification:</b></p> <p>Yancoal staff and other key stakeholders visiting the BA will be required to report any new infestation of weeds.</p>
Grazing management	<p>Grazing may be used to control weeds subject to not meeting or exceeding ground cover trigger values (section 4.2) and there is evidence the weed species are preferentially grazed by stock.</p> <p>Spray graze - applying a hormone herbicide and grazing 7-10 days later. Other grazing management practices that are recommended by the Biodiversity Auditor or the Hunter Local Land Services (HLLS).</p>
Biological Control – is a long term control technique.	<p>This is a complementary strategy and alone it may not eradicate the weed. Any use of biological controls will be undertaken in conjunction with advice from OEH and the HLLS.</p>

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Control Method	Potential use in control regime
Slashing – mechanical cutting of weeds to prevent seed production	Areas heavily infested with exotic grasses can be treated with slashing equipment mounted on a tractor prior to flowering (likely to be late spring/ early summer).
Manual removal – removal of the weed plant and roots from the site.	Physical removal of new weeds, unearthing of root systems and containment and removal of seed.

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Table 10 Target weed species, treatment method and control period and intensity

Species	Photo	Class*	WON	Distribution	Control method	Control period and intensity
Fireweed ( <i>Senecio madagascariensis</i> )		4	✓	MZ5 – BB cover abundance score 1 (<5% - rare to common)	Spot spray with registered herbicide whilst the plant is actively growing and not under stress. Hand pulling individual plants	Autumn to Spring - control period. From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
Prickly Pear ( <i>Opuntia stricta</i> )		4	✓	MZ4 - BB cover abundance score 1 (<5% - rare).	Spot spray with registered herbicide Biological control ( <i>Cactoblastis cactorum</i> ) and Cochineal ( <i>Dactylopius spp.</i> ) – better suited to large infestations or inaccessible areas.	All year – control period. From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
St John's Wort ( <i>Hypericum perforatum</i> )		4		MZ1, MZ3 and MZ4 - average BB cover abundance score 1 (<5% - rare).	Spot spray, boomspray or aerial (UAV) spray with registered herbicide Biological control ( <i>Chrysolina</i> beetles). Grazing management when hypericin levels in the plant are low – generally May through to October (may vary with climatic conditions)	Spring to late autumn From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
<i>Pinus radiata</i>				MZ5 – first control completed in 2016 follow up control of seedlings required	Spot spray with registered herbicide Manual removal.	From Year 1 to Year 4, at least one control events per year. Ongoing maintenance as required.

*Control Class	Weed type	Example control requirements
Class 1	Plants that pose a potentially serious threat to primary production or the environment and are not present in the state or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also 'notifiable' and a range of restrictions on their sale and movement exist.
Class 2	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also 'notifiable' and a range of restrictions on their sale and movement exist.
Class 3	Plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.	The plant must be fully and continuously suppressed and destroyed.*
Class 4	Plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.*
Class 5	Plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.	There are no requirements to control existing plants of Class 5 weeds. However, the weeds are 'notifiable' and a range of restrictions on their sale and movement exist.



The impact of weeds will be assessed through the ecological monitoring programmes. This information will be used to monitor the success of the weed control methods.

### 4.3.3 Performance Criteria

	Year 1 to Year 4	Year 5 to Year 10	Completion Criteria
Weed control	At least two weed control events each year for species listed in Table 10, and any other weeds recorded from monitoring activities. All actions recorded in Annual Report.	At least one weed control event each year for species listed in Table 10, and any other weeds recorded from monitoring activities. All actions recorded in Annual Report.	Ecological monitoring data indicates a trajectory for reduction in exotic plant cover over three consecutive assessments.
Monitoring	Complete Ecological Monitoring Section 5.3), (Rapid Condition Assessment and Property Inspections (Section 5.4	Complete Ecological Monitoring Section 5.3), (Rapid Condition Assessment and Property Inspections (Section 5.4.	

### 4.3.4 Trigger, Response and Action plan

Trigger	Response
Weeds having detrimental impact - Ecological Monitoring results indicate low native plant recruitment and regeneration and / or no trajectory to benchmark values and increase in exotic plant cover.	Increase the number of weed control events. Suitably qualified and experienced person to review weed control action. Revise the Plan.
New noxious and/or environmental weed is identified within BA.	Notify Government Agency and neighbours of new noxious and/or environmental weed outbreak. Implement new hygiene controls. Review Plan. Follow all directions given by relevant government agency to assist in control.

## 4.4 Management of fire for conservation

Bushfire prevention is required under the *Rural Fires Act 1997* and a fire regime is required to maintain ecological condition and reduce the risk of damage from wildfire. The absence of fire and the reduction of livestock grazing may lead to a build-up of fire fuel and risk of high intensity bushfire. The land manager is required to take practicable steps to prevent the occurrence of bush fires on the land and minimise the spread of bushfire.

Yancoal, with assistance from the Hunter and Liverpool Range Rural Fire Services, has prepared a Regional BA Bushfire Management Plan, that covers the Seven Oaks BA, it identifies fire risks, control measures and communication procedures. A copy of this plan is available on the Biodiversity Offsets Portal.

The quick identification of a threatening bushfire, notification of the Rural Fire Service and suppression is the primary goal.

Key control measures will focus on:

- documentation of access and water supply points for suppression activities;
- maintain safe and clear access tracks that also form fire breaks;
- use of grazing to reduce fuel build-up along potential ignition sources, such as public roads, prior to the fire season;
- use of ecological burns (with any required approvals and/or permits from Rural Fire Service) to reduce fuel build-up to protect the conservation values;
- establishment of asset protection zones around priority infrastructure;
- investment in water and other fire suppression assets; and
- communication of the Bushfire Management Plan and response procedures with key stakeholders, including Leaseholders, neighbours, consultants, contractors and employees.

Key management and safety restrictions for total fire ban days include:

- no working alone;
- travel plans on these days are to be communicated to staff or family member, so you can be located in the case of an emergency; and
- no contractor, consultant or visitor access or undertaking 'hot works', unless these activities are required for firefighting purposes.

Any fuel hazard reduction burns will be planned in accordance with the Bush Fire Environmental Assessment Code for New South Wales (Rural Fire Service, February 2006) and the guidelines contained in the Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code.

Current recommendations under the Code are:

- in woodland vegetation, fire should not occur within 5 years of a previous fire and consideration should be given to burning within 40 years of any previous fire; and
- in grassland vegetation derived from the woodland vegetation, the recommended fire intervals are the same as woodland vegetation.

Based on the Code recommendations an ecological burn should be completed across MZ1, MZ2, MZ3 and MZ4 within the next 10 to 15 years, unless otherwise specified by the Biodiversity Auditor. Fire is to be excluded from supplementary planting areas in MZ5.

All ecological burns are dependent upon suitable climatic conditions and appropriate level of risk. The advice of a suitably qualified person experienced in ecological fire management will be required to plan and implement the ecological fire management plan, including a post fire monitoring programme to specifically assess the impact of the ecological burn. Any burns are to be scheduled to occur when conditions are suitable for a low intensity burn. Typically this is winter or early spring. Burning should also be scheduled prior to a significant rain event to assist in extinguishing of the fire.

Data is to be recorded for all ecological burns including the date and intensity of the fire, the area burnt (shown on a map) during fire, any canopy scorch and percentage of leaf litter remaining. Any additional damage, including fire breaks or new tracks, must also be recorded.

#### 4.4.1 Performance Criteria

	Year 1 to Year 4	Year 5 to Year 10	Completion Criteria
Regional BA Bushfire Management Plan (BFMP),	Actions implemented Review and revise if required.	Actions implemented Review and revise if required.	All required actions of BFMP have been implemented BFMP has been reviewed annually and revised if required.
Ecological burn		Completed ecological fire management plan.	
Monitoring	Complete Ecological Monitoring Section 5.3), (Rapid Condition Assessment and Property Inspections (Section 5.4)	Complete Ecological Monitoring Section 5.3), (Rapid Condition Assessment and Property Inspections (Section 5.4)	

#### 4.4.2 Trigger, Response and Action plan

Trigger	Response and Action
BA impacted by wildfire.	Map fire damaged area. Prepare fire restoration plan to reinstate infrastructure and monitor post fire to evaluate regenerative capacity and regeneration. Suitably qualified and experienced person to review BFMP. Revise the Plan to include actions from the fire restoration plan.
Post fire monitoring results indicate a reduction in native plant cover and increase in exotic cover.	Evaluate active regeneration, increase in weed control and implement supplementary planting. Revise Plan.

### 4.5 Infrastructure improvement

Construction of new or maintenance of existing infrastructure (such as access tracks/ fire breaks, fences, off-stream watering points or pipes and removal of dam structures) will be required to maintain safe access to complete weed and feral animal control, fire management, and monitoring activities.

Infrastructure improvement action may cause localised site disturbance.

During the construction or maintenance of infrastructure the following guidelines apply:

- Vegetation clearing is only permissible for actions that are required to achieve the objectives of the Plan:
  - (a) permanent boundary fence - ten metres either side;
  - (b) permanent internal fence - ten metres total width of clearing;
  - (c) temporary fence - three metres total width of clearing; or
  - (d) road or track - six metres total width of clearing.
- constructed fences will be stockproof;
- fallen timber and any other obstructions can be removed to maintain access and retained on ground as habitat;
- standing timber that poses an unacceptable safety risk can be felled;
- all works will be undertaken in a manner that minimises disturbance to soil and hydrological characteristics, and avoids erosion, as per OEH guidelines Erosion and Sediment Control on unsealed roads (OEH 2012);
- old fences will be removed and unwanted tracks closed and rehabilitated within the offset area; and
- site disturbance will be required to facilitate certain revegetation activities, such as soil cultivation and slashing.

#### 4.5.1 Performance Criteria

Annual Criteria from Year 1 to Year 10	
Infrastructure improvements	Completed GDP for all infrastructure improvement actions. Maintenance of tracks and fences completed at least every 3 years.
Monitoring	Property Inspections (Section 5.4)

#### 4.5.2 Trigger, Response and Action plan

Trigger	Response and Action
Unauthorised clearing of vegetation	Report and review incident within 30 days. Complete significant residual impact assessment of the incident. For incidents with a significant residual impact a rehabilitation plan is to be prepared and implemented. Review the Plan.

## 4.6 Maintenance or reintroduction of natural flow regimes

Artificial structures on waterways or waterbodies restrict natural flows, however dams and habitat ponds support strategic grazing and other management actions. All dams were excluded from the mapping of the offset area as specified by BioBanking assessment guidelines.

There are 2 dams located within the BA and these will be retained as habitat ponds.

## 4.7 Retention of regrowth and remnant native vegetation

Remnant native vegetation and regrowth is important as it is the key component of the BA. The retention of this native vegetation and its regrowth is important to maintain and enhance the biodiversity value of the offset area.

Natural regrowth of remnant vegetation will be preferentially retained to promote recovery of native vegetation. Dense patches of native regrowth will be allowed to self-thin unless new plantings require regulated control.

Exceptions to this rule include maintenance of fence lines and management tracks associated with the BA (Section 4.5).

### 4.7.1 Encourage natural regeneration

The woodlands on the regenerating shrubland (MZ5) have been impacted by agriculture and the native plant diversity, community structure and habitat values have been degraded. Consequently, re-instating/restoring these components will aim to:

- Increase native mid-storey diversity,
- Increase native ground cover (herbs, ferns, lilies, rushes, sedges), and
- Maintain and/or increase woodland canopy cover.

The regenerative potential is substantial and natural regeneration is already evident in many areas, particularly where grazing pressure has been removed/substantially reduced. In the absence of disturbance, these areas are likely to regenerate with minimal assistance. Low to moderate management intervention is required in this region and will be implemented in accordance with the management actions outlined in this Section.

### 4.7.2 Performance Criteria

	Year 1 to Year 10	Completion Criteria
Passive restoration management	Annual weed control, vertebrate pest and fire management actions implemented as per management plans	Ecological monitoring demonstrates a trajectory to benchmark values for all attributes measured over three consecutive assessments (the average of all plots).
Monitoring	Complete Ecological Monitoring Section 5.3), (Rapid Condition Assessment and Property Inspections (Section 5.4).	

### 4.7.3 Trigger, Response and Action plan

Trigger	Response and Action
No active regeneration and native plant recruitment within 5 years in MZ5 recorded through the ecological monitoring, indicated by no trajectory towards benchmark ranges.	Consider planting actions and revise the Plan. Planting actions to be considered include direct seeding, tube stock planting of species selected from the description of the plant community type, details of the methodology and maintenance to be included in the revised Plan.
Single species and age class domination constraining species diversity observed by Ecological Monitoring (Section 5.3)	Prepare ecological thinning plan to increase species and age class diversity. Implement ecological thinning plan and revise this Plan.



## 4.8 Supplementary planting

To increase the extent and condition of the conservation values active restoration through planting is to be undertaken in:

- MZ5 *Cassinia* / *Acacia* Regenerating Shrubland (HU875 low).

The re-establishment process will adopt a shelter belt approach, with planting confined to strips that run perpendicular to the prevailing wind direction or patches close to remnant woodland of canopy species. This approach aims to create micro climates that will encourage and support natural regeneration between the strips / patches. It minimises site disturbance to avoid damage to existing regeneration and enables natural and sustainable regeneration to increase connectivity.

Control of the native *Cassinia arcuata* (Sifton Bush) will be required during planting operations due to its overwhelming dominance in MZ5.

This supplementary planting action is only to occur after assessment of the 2018 monitoring data to determine if satisfactory natural regeneration is occurring without this management intervention.

All planting is to occur when suitable climatic conditions prevail. The following describe the key actions for re-establishment of this vegetation community.

### 4.8.1 Seed Collection

It is preferable that seed for planting and seeding activities is from local or endemic provenances. Therefore, it will be permissible to collect seed from remnant patches of vegetation communities across the property. However seed collection must be for non-commercial purposes and meet the standards of the "Guidelines and Codes of Practice" developed by Florabank ([www.florabank.org.au](http://www.florabank.org.au)), or subsequent equivalent, and the following limitations and permissions apply:

- Collect seed in the BA only if seed of the particular species and genotype is not available elsewhere or if the seed collected is intended for seedlings that will be planted within the BA;
- Seeds may be collected from within endangered ecological communities;
- Seeds may not be collected from species individually listed on schedules 1, 1A or 2 of the TSC Act without prior written approval from the Director General, or under a licence granted under S132c of the Act or S91 of the TSC Act;
- Seeds may be collected from any protected species listed under Section 131 (Schedule 13) of the TSC Act; and
- Seeds may be collected from any other native species.

### 4.8.2 Species mix and tubestock numbers

Table 11 lists the species to be targeted for seed collection and planting. This includes known feed trees for Regent Honeyeater and Swift Parrot.

**Table 11 Native species for planting in cleared areas**

Species' common name	Species' scientific name	Management Zone	Estimated number of tubestock to be planted
Narrow-leaved ironbark	<i>Eucalyptus cebra</i>	MZ5	9,000
Blue-leaved ironbark	<i>Eucalyptus nubila</i>	MZ5	9,000
Rough barked apple	<i>Angophora floribunda</i>	MZ5	9,000
Blakely's Red Gum	<i>Eucalyptus blakelyi</i>	MZ5	9,000
Yellow Box	<i>Eucalyptus melliodora</i>	MZ5	4,500
White Box	<i>Eucalyptus albens</i>	MZ5	4,500
<b>Total</b>			<b>45,000</b>

### 4.8.3 Planting method

The following activities described in Table 12 are to be followed.

**Table 12 Planting criteria**

Activity	Minimum requirement
Soil test	Complete soil test across planting site to identify soil deficiencies or impediments for plant growth
Species selection	Species selected are species listed on the description of the vegetation communities issued by the NSW Scientific Committee or NSW government description. Seed can be collected from site or regionally from equivalent vegetation communities.
Cultivation	Cultivation for tube stock planting should be to a depth of 500-600mm at least 6 months prior to planting and when soil moisture is low to improve sub surface soil shatter. Cultivation for direct seeding may include light soil scarification.
Preplant weed control	Chemical control of weeds at least 1 week prior to planting or seeding. An area of at least 1m diameter around each tree or seeding patch is to be sprayed to remove all competition for site resources.
Tube stock planting	Planting will only occur when there is suitable soil moisture, typically 1 -2 days after 25mm of rainfall, in spring or autumn. Tube stock is to be at least 25mm in height, with a well-established root system and in good condition. The tube stock root plug is to be saturated at the time of planting. Soil conditioner is to be applied into the planting hole and all plants should be planted deep, with their root plug at least 50mm below ground and gently firmed in to remove any air pockets in the soil.
Direct seeding	Seed is to be free of weed seed. Seeding must only occur when there is suitable soil moisture, typically 1 -2 days after 25mm of rainfall, in spring or autumn.
Watering	Watering is to occur at the time of planting or seeding, and if required for 6 months post planting.
Maintenance	Maintenance period will apply for at least 18months.
Replanting	Where the survival of tubestock is less than 70% the area will be replanted.

#### 4.8.4 Timing

Tubestock are to be planted in autumn, with good soil moisture, all site preparation activities are to be completed at the appropriate time to facilitate planting in autumn. All activities are dependent upon suitable climatic condition and may be postponed. If this occurs, weather records will be reported to support any delay in activities.

#### 4.8.5 Survival assessments

Survival assessments are to be completed at 3 and 6 month post planting to assess the success of tubestock planting. Details of the monitoring programme are provided in Section 5.

#### 4.8.6 Performance and completion criteria

	Year 1 to Year 2	Year 3 to Year 7	Completion Criteria
Sifton Bush Control	Completed control Sifton bush event	Completed control Sifton bush event	Ecological monitoring in MZ5 demonstrates a trajectory to benchmark values for all attributes measured over three consecutive assessments (the average of all plots).
Planting in MZ5: Yellow Box – Grey Box – Red Gum grassy woodland (198ha)	Collection of seed. Plant propagation (if required)	Tubestock planted (if required) Completed survival assessment (if required)	Planting achieves above 70% survival.

#### 4.8.7 Trigger, Response and Action plan

Trigger	Response and Action
Ecological monitoring does not show trajectory toward reference site or the NSW Biometric benchmark.	Review adequacy of management actions, assess if performance can be attributed to factors that cannot be controlled. Consider review of completion criteria. Revise Plan to include suggested remediation actions.
Average survival assessment less than 70%	Review planting activities, including soil test results, determine if poor survival is due to climatic conditions or operational matters. Complete further site assessments if cause cannot be identified. Review Plan in light of findings and replant the area.

## 4.9 Erosion control

Soil erosion occurs when vegetation has been removed exposing bare soils, making them susceptible to erosion where water flow is able to mechanically remove or disperse the soil. This often occurs along creek lines but can occur in bare paddocks where vegetation clearing or over grazing exposes bare soils. Bare soils in locations where high volumes of water occur can lead to severe soil erosion.

There is some potential for erosion to occur within the BA. Management options for erosion control include excluding grazing, controlling vehicle access, maintenance of tracks and rehabilitation of drainage lines, watercourses and riparian areas where erosion impacts are identified.

Erosion within the BA will be monitored through biannual inspections by Yancoal, as well as other observations recorded during the ecological monitoring programme. Appropriate erosion remediation measures will be undertaken in consultation with the Hunter Local Land Service (HLLS) and NSW OEH.

### 4.9.1 Performance Criteria

	Year 1 to Year 10	Completion Criteria
Monitoring inspections and reports	Complete Ecological Monitoring Section 5.3), (Rapid Condition Assessment and Property Inspections (Section 5.4)	

### 4.9.2 Trigger, Response and Action plan

Trigger	Response and Action
Active erosion observed through monitoring.	Install erosion control measures, within 30 days of detection of active erosion, undertake monitoring of the area over 12 months post event to ensure the site is stabilised. Repeat area inspections annually to monitor stability. Report and review incident, within 30 days. Review the Plan.

## 4.10 Vertebrate Pest and Overabundant Native Animal Control

Vertebrate pest species and overabundant native herbivores can pose a threat to native flora and fauna through degradation of habitat, competition for habitat resources, and direct predation.

The recovery plans for Swift Parrot and Regents Honeyeater list the following key threatening processes, which are relevant to the pest animal control across the BA:

- competition and grazing by the feral European rabbit;
- competition and habitat degradation by feral goats;
- competition from feral honey bees;
- environmental degradation caused by feral deer;
- predation by feral dogs;
- predation by the European red fox;
- predation by the feral cat; and
- competition from Noisy Miners / starlings.

This Plan will target the control of declared vertebrate pests and those that cause environmental degradation that impact on the vegetation and fauna at a regional and local level, and opportunistically control of the species listed in Table 13. Other vertebrate pests, overabundant native herbivores, or noisy miners will be managed as required under a specific management plan prepared prior to their control. If the control event is not required or conditions are unsuitable then evidence will be presented in the Annual Report.

Under the *Local Land Services Act 2013* (LLS Act), species that are currently declared pests in NSW include rabbits, feral pigs and wild dogs. Pest Control Orders can be issued by the regulator to legally enforce land managers to control the species on their land. Land managers are defined as either owners or occupiers of the land. Occupiers of land



in NSW are not obliged to control other vertebrate pest animals. However, these species may have significant negative impacts on the environment and agricultural production in many areas.

The *Game and Feral Animal Control Act 2002* requires the control of feral deer.

This Plan acknowledges that populations of vertebrate pests are determined by several factors such as topography, shelter, territorial behaviour and food availability. Property fences do not restrict pests, and control actions will not therefore be limited to artificial boundaries. Most vertebrate pests are highly mobile and can readily replace those that are killed on individual properties. A variety of control methods can be utilised provided they are:

- species specific (wherever possible);
- cause no or little damage to the natural environment;
- are humane;
- meet relevant Work, Health, Safety and Environment regulatory requirements; and
- are regularly monitored.

Control programmes are likely to be far more effective when coordinated with multiple landholdings. Yancoal will endeavour to work with the HLLS on regional control programmes and supported by local on ground control actions. Neighbours are to be notified on local on ground actions to facilitate coordination of efforts and deliver more effective control.

Design and implementation of local controls will be guided by the National Codes of Practice (COPs) and Standard Operating Procedures (SOPs) produced by the Commonwealth Department of the Environment (available at [www.feral.org.au](http://www.feral.org.au)). The COPs for each of the key pest animal species provides general information on best practice management, control strategies, species biology and impact, and the humaneness of current control methods. The SOPs describe management techniques and their application for these pest animal species, including a discussion of animal welfare impacts for target and non-target species. They also cover the health and safety aspects of management techniques.

**Table 13 Identified Vertebrate Pests control methods, timing and intensity**

Pest	Declared	Control methods	Control timing and intensity
European rabbit ( <i>Oryctolagus cuniculus</i> )	Yes	Baiting: 1080 / Pindone Trapping: cage trap Shooting: ground based Biological: Myxomatosis and / or Rabbit Haemorrhagic Disease(RHD) Other: Exclusion fencing / Warren fumigation / Warren ripping	Control event in Autumn and /or Spring From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
Feral Deer ( <i>Cervus timorensis</i> ) ( <i>Dama dama</i> ) ( <i>Cervus elaphus</i> )	Yes	Shooting: ground based	Control event in Autumn and /or Spring From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
Feral cat ( <i>Felis catus</i> )		Trapping: Wire mesh cage trap / Soft net trap/ Padded-jaw trap Shooting – ground based	Control event in Autumn and /or Spring From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
Feral cattle ( <i>Bos taurus</i> )		Other - Exclusion fencing / Mustering	As required.
Feral Goat ( <i>Capra hircus</i> )		Shooting – ground / aerial based Other - Exclusion fencing / Mustering	Control event in Autumn and /or Spring From Year 1 to Year 4, at least two control events per year.

Pest	Declared	Control methods	Control timing and intensity
			Ongoing maintenance, minimum of one control event per year.
Feral pig ( <i>Sus scrofa</i> )	Yes	Baiting – 1080 Trapping - Silo, panel or box traps Shooting – ground / aerial based Other - Exclusion fencing	Control event in Autumn and /or Spring From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
Hares ( <i>Lepus europaeus</i> )		Trapping – cage trap Shooting – ground based Other - Exclusion fencing / Habitat modification / Repellents	Control event in Autumn and /or Spring From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
Red fox ( <i>Vulpes vulpes</i> )		Baiting – 1080 Trapping - Wire mesh cage trap / Soft jaw leg hold trap Shooting – ground based Other - Den fumigation / Exclusion fencing / Ejectors / Habitat modification	Control event in Autumn and /or Spring From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
Wild dog ( <i>Canis lupus spp.</i> )	Yes	Baiting – 1080 / PAPP Trapping - Soft jaw leg hold trap Shooting – ground based Other - Exclusion fencing/ Ejectors	Control event in Autumn and /or Spring From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.

### Local control

Local on ground control measures including trapping, baiting and shooting (as appropriate) are to occur in Autumn and Spring, to coincide with breeding seasons of many of the vertebrate pest species. Reactive control may be undertaken at other times in response to reports of threatened species and/or livestock predation.

All control actions will be undertaken by appropriately qualified personnel and are required to complete of a comprehensive job safety assessment prior to commencement of actions. Control actions must follow the Model Codes of Practice (COPs) and Standard Operating procedures (SOPs) for the humane control of pest animal (available online <http://www.pestsmart.org.au/animal-welfare/humane-codes/>).

### Regional control

Yancoal will continue to participate in regional aerial and ground control programmes for feral pigs and wild dogs, managed and coordinated by the HLLS and/or National Parks and Wildlife Service. It will apply across all MZs in the BA.

Regional control programmes are managed and co-ordinated by the HLLS. The HLLS will be responsible for advising the community of the control action, while Yancoal will notify Leaseholders. The HLLS will provide a report detailing the timing, number of animal culled and the GPS output from the aircraft to Yancoal.

### 4.10.1 Performance Criteria

	Year 1 to Year 4	Year 5 to Year 10	Completion Criteria
Vertebrate pest local control	At least two control events each year for species listed in Table 13, and any other species recorded from monitoring activities. All actions recorded in Annual Report.	At least one control events each year for species listed in Table 13, and any other species recorded from monitoring activities. All actions recorded in Annual Report.	No observed vertebrate pest or damage. Ecological monitoring demonstrates a trajectory to benchmark values for all attributes measured over three consecutive assessments (the average of all plots).
Vertebrate pest regional control	Active participation in programme coordinated by HLLS, this may include local control actions.	Active participation in programme coordinated by HLLS, this may include local control actions.	
Monitoring	Complete Ecological Monitoring Section 5.3), (Rapid Condition Assessment and Property Inspections (Section 5.4)	Complete Ecological Monitoring Section 5.3), (Rapid Condition Assessment and Property Inspections (Section 5.4)	

### 4.10.2 Trigger, Response and Action plan

Trigger	Response and Action
Vertebrate pest having detrimental impact - Ecological Monitoring results indicate no trajectory towards benchmark and management monitoring observes evidence of vertebrate pests. .	Increase the number of control events. Suitably qualified and experienced person to review control action. Revise the Plan.
New vertebrate pest is identified within BA.	Targeted vertebrate pest control. Notify Government Agency and neighbours, if required. Revise the Plan. Follow all directions given by relevant government agency to assist in control.



## 5 Monitoring

This Section outlines the monitoring programme designed to assess changes in the habitats of the offset areas at three different scales:

- landscape monitoring: to assess vegetation changes and habitat connectivity at the landscape scale in the long-term (10 - 15 years);
- ecological monitoring: to assess habitat restoration and bird assemblages by quantifying changes in vegetation structure, key fauna habitat features and bird assemblages in the short to medium-term (2 years); and
- management monitoring: to assess woodland condition and identify emerging threats in the short-term (biannually/annually).

### 5.1 Monitoring objectives

The objectives of this monitoring programme are to detect whether the conservation objectives of the Plan are being achieved, and that the Plan is being effectively implemented.

The variables to be monitored are therefore comprised of:

- the key performance and completion criteria, as listed in Table 8;
- the performance criteria and the trigger events, as specified in Section 4; and
- scenarios that represent risk to the attainment of the plans objectives, as assessed in Table 15, Section 6.

It is anticipated that effective monitoring of ecological condition, and management will demonstrate that implementation of the Plan is achieving the conservation objectives. The monitoring is designed to measure the key performance indicators/completion criteria, and identify where corrective actions are required. In this way it is intended that monitoring activities will have a clear relationship to operational decision-making such that:

- if the landscape (Section 5.2), ecological (Section 5.3), and the management (Section 5.4) monitoring demonstrate an increase in woodland extent and enhanced habitat condition then the Plan is achieving the desired outcomes and should proceed without modification;
- if the monitoring indicates no increase in extent of woodland and enhancement of ecological condition then the corrective actions listed in risk assessment at Table 15 should be implemented; and
- if the monitoring indicates that the performance criteria for the conservation management actions are not achieved, then the Trigger, Response and Action plan should be enacted.

The Annual Reports will provide ongoing review of the monitoring results; this includes the annual management monitoring and the biennial ecological monitoring reports. These reports may include recommendations to amend the monitoring programme and any recommendations will be considered and incorporated as part of the review of the Plan or immediately provided it does not diminish the monitoring effort.

The frequency of monitoring activities will vary according to the monitoring schedule provided in Table 14. To enhance understanding and knowledge of all key stakeholders in the management of the BA, and Yancoal representatives, where feasible, will accompany the Biodiversity Auditors during the field based components of this monitoring programme.

**Table 14 Monitoring Schedule**

	2016	2017	2018	2019	2020	2021 to 2025	2026
<b>Landscape</b>							
Aerial photo interpretation							X
<b>Ecological</b>							
Habitat Restoration	Sept - Nov		Sept - Nov		Sept - Nov		
Bird Assemblage	July-Aug		July-Aug		July-Aug		
<b>Management</b>							
Rapid Condition Assessment	Sept - Nov	Sept - Nov	Sept - Nov	Sept - Nov	Sept - Nov	Sept - Nov	Sept - Nov
Property inspection	April / Nov	April / Nov	April / Nov	April / Nov	April / Nov	April / Nov	April / Nov

## 5.2 Landscape Monitoring

Aerial photographic imagery baseline photography captured in 2015 will be updated in up to 15 years. This imagery will be analysed and the findings ground-truthed to assess the extent of canopy regeneration within the BA.

The analysis of tree canopy cover will be used to map changes in the distribution and condition of woodland habitats and the connectivity of vegetation remnants. An increase in the extent and condition of woodland habitats will be indicative of successful management of the offset areas towards the Key Performance Indicators.

## 5.3 Ecological Monitoring

Habitat restoration and bird assemblage monitoring aims to assess changes in the condition and extent of the woodland habitats within the BAs and the ongoing usage of these habitats by woodland birds.

### 5.3.1 Habitat Restoration Monitoring

The objectives of the habitat restoration monitoring are to:

- Demonstrate a change in degraded habitats towards benchmark (BioMetric) values; and
- Demonstrate recruitment of canopy species through transition up age classes (measured as Diameter at Breast Height);

Five monitoring plots are established across MZ5, that was degraded from previous land management practices, within the Seven Oaks BA.

The location of the Habitat Restoration Monitoring Plots is shown in Figure 3. All monitoring results will be stored on the Biodiversity Offsets Portal.

The habitat restoration monitoring programme will assess changes in habitat values within the BAs through time and relative to the benchmark values presented in the BioMetrics Vegetation Types Database (NSW DEH 2013). These benchmark values relate to species richness and percent cover of native plants in the various vegetation layers as well as counts of tree hollows and the length of fallen timber. Additional habitat features will also be included in this monitoring programme to track canopy regeneration and health.

#### 5.3.1.1 Field Methods

The field methods follow the 'Field methodology for measuring condition variables for Site Value and at Reference Sites' according to the BioMetric 3.1 methods (Department of Environment, Climate Change and Water, 2011). In addition, more detailed data are collected on species composition and cover abundance, canopy regeneration and health, and habitat features as outlined below.

The plots are 50m x 20m and are established such that the plot runs downslope. A 20m x 20m quadrat is positioned within this larger plot and three 50m transects run its length (Figure 7). Marker pegs are positioned at the top-middle of the plot to establish a permanent plot position. GPS coordinates have been taken to ensure monitoring plots can be relocated over time.

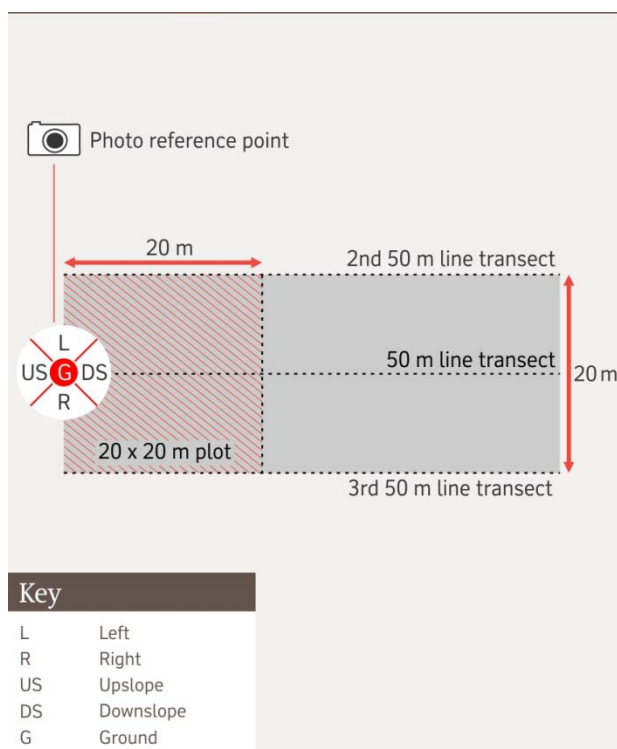
The 50m x 20m plot is used to record details of the over-storey (canopy) layer including species richness, canopy regeneration and canopy health. Specific habitat features, such as the abundance of tree hollows, flowers/fruit, mistletoe and fallen logs are also recorded at this scale

The 20m x 20m quadrat is used to record details of the mid-storey and ground stratum structure including details of the composition and % cover of native/exotic species for various plant groups (e.g. grasses, shrubs, other herbaceous plants). Additional habitat features such as rocks, litter and bare ground are also recorded at this scale.

Three 50m transects are used to assess the % foliage cover of the over-storey. These data are collected at 10 points (i.e. at every 5m) along the length of the transects.

Further details of the field sampling methods, including a table summarising the variables (measurements) that are recorded, their unit of measurement and the sampling unit are provided in **Appendix B**.

**Figure 7 Monitoring plot for habitat restoration monitoring**



### 5.3.1.2 Photo Reference Points

A photo reference point are also established and permanently marked within each habitat monitoring plot. Photo reference points are established at the top of the middle 50m transect at each monitoring site. During each monitoring event, a series of photos are taken from this point to provide a visual record of any changes in vegetation and habitat condition. Depending of the location of the monitoring plot, this might include:

- changes in vegetation structure (e.g. presence/ absence of canopy species, shrubs, tussock grasses);
- the presence/condition of special habitat features (e.g. rock outcrops, flowering/fruitlet species); and
- changes in identified threatening processes (e.g. weed infestations, erosion).



At each photo reference point, a minimum of five photos is taken, in the following directions:

- downslope;
- upslope;
- across the slope – left (when facing downslope);
- across the slope – right (when facing downslope); and
- directly down.

The photo records are displayed on the Biodiversity Offsets Portal such that monitoring photos can be viewed against the baseline (2016) photo. This will provide an ongoing and gradual visual record of changes in habitats as the management strategies are implemented as well as changes in existing threats and early warning of emerging threats at monitoring sites.

### 5.3.2 Bird Assemblage Monitoring

Bird assemblage monitoring focuses on areas of existing woodland habitat.

The objectives of the bird assemblage monitoring are to:

- Demonstrate ongoing habitat usage by woodland birds and a decrease in the relative abundance of bird species typical of forest margins and grasslands; and
- Assess the presence of Swift Parrot and Regent Honeyeater within the offset areas and collect information regarding their movements and habitat usage.

Birds are typically abundant and widespread taxa whose populations are easily surveyed. Although they are relatively mobile, many species can show specialisation in their habitat requirements. Patterns in the distribution and abundance of bird assemblages can be indicative of biodiversity as a whole and of environmental change. Accordingly, bird assemblages are being monitored as indicators of general ecosystem condition.

A desktop study has been undertaken to predict the timing and distribution of the Swift Parrot and Regent Honeyeater in the region so that habitat and bird assemblage surveys are designed to maximise the likelihood of detecting these species. Swift Parrots are likely to occur in the region occasionally and in very low numbers between July and October to feed on winter-flowering eucalypts (Swift Parrot Recovery Team 2000; Saunders and Tzaros 2011; OEH 2012). The Regent Honeyeater is known to breed around the Upper Hunter Valley and Mudgee regions. The species has regular movements with seasonal patterns of abundance and breeding related to regional patterns in flowering of key forage species (Franklin, Menkhorst et al. 1989; Menkhorst, Schedvin et al. 1999; OEH 2012; SEWPaC 2012).

Accordingly, bird assemblage monitoring started in winter/spring 2016 to collect baseline data and subsequent monitoring will occur in winter/spring 2018, 2020 and 2022 (Table 14). Birds Australia may be consulted prior to the commencement of these surveys to coordinate survey effort and increase the likelihood of observations, therefore the timing of survey maybe adjusted.

#### 5.3.2.1 Field Methods

Habitat area searches are conducted in accordance with Birds Australia Atlas search methodology and EPBC Act bird survey guidelines (DEWHA 2010). This method involves searching a set area and recording data only from within the pre-defined search zone. A two ha area is surveyed for 20 minutes by two observers. Broadcast surveys are to be included in the methodology in 2018 at the same location as the monitoring plots.

At the Seven Oaks BA, 10 bird monitoring plots are established according to the following breakdown:

- 3 plots across MZ2 and MZ3 (intact woodland);
- 7 plots across MZ5 (within shrubby regenerating woodland); and

Incidental and opportunistic surveys are also conducted where suitable habitat areas for the Swift Parrot or Regent Honeyeater are observed when travelling to and between monitoring sites. All opportunistic sightings of these species and their locations are

recorded. General notes and important habitat resources such as tree hollows, flowering trees and nests are recorded incidentally and photographed, as well as any notable bird activities such as specific forage behaviour or signs of breeding activity.

### 5.3.3 Data Analysis and Interpretation

To assess the success of the management actions in meeting the Key Performance Indicators, data on vegetation, fauna habitats and bird assemblages is analysed against the predicted changes in these groups associated with implementation of the actions.

Univariate and multivariate techniques will be used to analyse and visualise patterns in the data and will include one or more of the following techniques:

- Analysis of Variance (ANOVA): to test for changes in univariate data including species richness, abundance of specific habitat features, % cover vegetation structural layers;
- distance-based permutational Analysis of Variance based on Bray-Curtis dissimilarities: to test for changes in multivariate data including fauna and plant community composition;
- graphs and charts: to summarise patterns in univariate data and visualise changes in variables relative to the reference condition (medium-high quality woodland); and
- non-metric Multidimensional scaling and SIMPER analyses: to summarise patterns in multivariate data, visualize changes in the data relative to the reference condition and assist in ecological interpretation of the results.

The ecological data will be analysed to assess the nature and extent of change through time, relative to the benchmark values. It is expected that in subsequent years, with the progressive improvement in habitat condition, the ecological data analysis will eventually show a convergence of ecological variables to that of the woodland benchmark. This is expected to be a medium to long-term upward trend that will reflect the enhancement of woodland and the development and availability of critical fauna habitat features such as hollows, ground debris and forage resources. By demonstrating this convergence through time, it will be inferred that the proposed conservation management actions have been successful in enhancing the extent and condition of the vegetation communities and restoring the lower quality vegetation and fauna habitats (in particular for Regent Honeyeater and Swift Parrot) towards the benchmark condition.

## 5.4 Management Monitoring

### 5.4.1 Rapid Condition Assessment

Each year, RCA sites in mature and regrowth vegetation are revisited to record the presence or absence of key habitat components and threatening processes.

The results of the RCA, together with property inspections and photo reference points will be used to monitor woodland condition and identify emerging threats.

### 5.4.2 Property inspections

Regular property inspections are undertaken to ensure that there is a systematic monitoring of the offset area, to ensure its protection and to ensure early detection of potential threats or failures. A Yancoal representative will undertake biannual inspections, to ensure regular visual inspections of the offset area to detect:

- physical condition of fencing and gates;
- disturbance factors including fire and unauthorised access eg. hunting, fire wood collection;
- condition of erosion;
- evidence of waste dumping;
- presence/activity of feral pest species;
- grazing pressure from over-abundant native herbivores;

- presence of exotic weed species; and
- assessment of fire fuel loads in winter.

#### 5.4.3 Survival Assessment

To assess the survival of planted tubestock and observe regeneration a 50m line transect will be used and 2m x 2m quadrats will be placed every 10m along the transect. One transect will be established to assess every 10ha of re-establishment.

Along the 50m transect, the number of dead and living tubestock will be recorded. Within the 2m x 2m quadrats at every 10m the following is to be recorded:

- number of native plants regenerating;
- number of weed species; and
- record any erosion.

The starting point and end point of each transect is to be recorded by GPS.



Photo -*Glossodia*'s were quite common within the regenerating woodlands.



## 6 Risk assessment

Table 15 identifies the key risks to this Plan. The risk assessment is undertaken in accordance with the following risk framework, having regard for the likelihood and consequence definitions used below.

		Consequence				
		Minor	Moderate	High	Major	Critical
Likelihood	Highly Likely	Medium	High	High	Severe	Severe
	Likely	Low	Medium	High	High	Severe
	Possible	Low	Medium	Medium	High	Severe
	Unlikely	Low	Low	Medium	High	High
	Rare	Low	Low	Low	Medium	High

### Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)

Highly likely Is expected to occur in most circumstances

Likely Will probably occur during the life of the project

Possible Might occur during the life of the project

Unlikely Could occur but considered unlikely or doubtful

Rare May occur in exceptional circumstances

### Qualitative measure of consequences (what will be the consequence/result if the issue does occur)

Minor Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.

Moderate Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.

High High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.

Major The plan's objectives are unable to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.

Critical The plan's objectives are unable to be achieved, may include widespread and severe environmental harm, with no evidenced mitigation strategies.

Table 15 Risk and Contingency Assessment Matrix

Table 16 Objective	Scenario <sup>1</sup>	Likelihood	Consequence	Risk level	Trigger	Corrective Action
To protect the conservation values of the offset area within 10 years at the BA.	Delay in securing the offset area under a legally binding mechanism	Likely	Minor	Low	NSW biodiversity reforms not providing a fit for purpose mechanism to legally secure offset area.	Additional consultation with DoEE and OEH.
	Unable to attach the Plan to the land title.	Likely	Minor	Low	NSW government requires different plan to be attached to the land title.	Ensure that a new plan is equivalent to this Plan.
	Illegal access to offset area causing significant residual impact.	Unlikely	Moderate	Low	Failure in access control (Section 4.1.3) captured in management monitoring (Section 5.4.2) and reported in the Annual Report.	Review access control and improve security measures. Consider relocation of offset area.
	Uncontrolled bushfire impact offset area.	Possible	High	Medium	Bushfire on extreme or catastrophic fire danger day impacts offset area.	Implement Post Fire Event recovery with NSW Rural Fire Service. Complete post fire survey, map fire damaged areas, and revise the Plan.
To enhance the condition of conservation values of the offset area within 10 years at the BA.	No enhancement of condition in the conservation values measured by the Habitat Restoration Monitoring (Section 5.3.1) and Rapid Condition Assessment (Section 5.4.1).	Possible	Moderate	Medium	Review of Annual Reports and Monitoring data.	Review external factors (climate) and monitoring effort. Revise Plan and consider new Conservation Management Action. Assess influence on success from other factors such as extreme climatic conditions. Consider relocation of offset area.
	No increase in extent of woodland from the active restoration of grassland as measured by the Landscape (Section 5.2) and Habitat Restoration Monitoring (Section 5.3.1).	Possible	Moderate	Medium	Review of Annual Reports and Monitoring data.	Review external factors (climate) and monitoring effort. Revise Plan and consider new Conservation Management Action. Assess influence on success from other factors such as extreme climatic conditions. Consider relocation of offset area.
To enhance and maintain the habitat values of the offset areas within 10 years at the BA	Observed decrease in species richness and usage of the offset area as measured by the Bird Assemblage Monitoring (Section 5.3.2)	Possible	Moderate	Medium	Review of Annual Reports and Monitoring data.	Review external factors (climate / disease) and monitoring effort. Revise Plan and consider new Conservation Management Action.

Note 1 Assumes effective implementation of management actions as described in the Plan

## 7 Compliance table

**Table 17 Compliance with relevant conditions of EPBC2009/5081**

Approval Condition	EPBC 2009/5081	Reference
2	<p>To offset the impacts on the foraging habitat of the regent honeyeater and swift parrot, the person taking the action must submit to the <b>Minister</b> for approval an Offset Management Plan (OMP) for the <b>Phase 1 Offset</b> identified in <u>Attachment A</u> by no later than 13 April 2014.</p> <p>The OMP must include, but not be limited to the following:</p> <ul style="list-style-type: none"> <li>a) a textual description and map to clearly define the location and boundaries of all of the offset areas. This must be accompanied with the <b>offset attributes</b> and a <b>shapefile</b></li> <li>b) details of management actions to protect and enhance the extent and condition of habitat values of the offset areas including but not limited to rehabilitation, weed control, fire management, erosion and sediment control, management of livestock and restrictions on access to habitat for the regent honeyeater and swift parrot</li> <li>c) the timing, responsibilities and performance criteria for management actions</li> <li>d) a monitoring plan including the undertaking of ecological surveys by a qualified ecologist to assess the success of the management actions against identified milestones and objectives</li> <li>e) a process to report, to the department, the management actions undertaken in the offset areas and the outcome of those actions, including identifying any need for improved management</li> <li>f) description of the potential risks to successful management and rehabilitation in the offset areas, and a description of the contingency measures that would be implemented to mitigate these risks</li> <li>g) details of parties responsible for management, monitoring and implementing the plan, including their position or status as a separate contractor.</li> </ul> <p>The approved OMP must be implemented.</p> <p><i>Note: Offset areas can accommodate offset requirements for more than one species habitat within the one area, if a qualified ecologist verifies that suitable habitat is present and includes specific habitat requirements for the relevant species.</i></p>	<p>Section 2.1 Location and description</p> <p>Section 3 Objectives, Key Performance Indicators and Completion Criteria</p> <p>Section 4 Conservation Management Actions</p> <p>Section 4 Conservation Management Actions</p> <p>Section 5 Monitoring</p> <p>Section 1.3 Function of the Management Plan</p> <p>Section 4 Conservation Management Actions</p> <p>Section 6 Risk assessment</p> <p>Section 1.3.2 Key Stakeholders and Roles</p>
5	<p>The approved OMP, as described in condition 2, must be revised by the person taking the action to include, but not be limited to, those activities as described in condition 2a-g for the <b>Phase 2 Offset</b>. The revised OMP must be submitted for approval by the <b>Minister</b> within 12 months of the approval of the <b>Phase 2 Offset</b>. The revised approved OMP must be implemented.</p>	Refer to condition 2 above.
Re-establishment of Woodland in Biodiversity Management and Offset Areas		
6	<p>Within 12 months of the Commencement of Construction of Phase 1, the person taking the action must submit to the Minister for approval a Re-establishment Plan (REP) for the Phase 1 Offset area. The REP must include, but not be limited to the following:</p> <ul style="list-style-type: none"> <li>a) details of the areas to be re-established (re-establishment areas) including location and maps;</li> <li>b) documentation including mapping of current environmental values relevant to MNES of the re-establishment areas;</li> <li>c) 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;</li> <li>d) the source and provenance of the seeds and/or seedlings which will be used;</li> </ul>	<p>This Plan</p> <p>Section 4 Conservation Management Actions</p> <p>Section 2 Biodiversity Area</p> <p>Section 4 Conservation Management Actions</p> <p>Section 4 Conservation Management Actions</p>



	e) measures to address threats to MNES including but not limited to grazing pressure and damage by livestock and adverse impacts from feral animals and weeds;	Section 4 Conservation Management Actions
	f) measures to provide fire management regimes appropriate for the MNES;	Section 4 Conservation Management Actions
	g) measures to manage the MNES in accordance with the recommendations of the approved recovery plan for the migratory and threatened species;	Section 4 Conservation Management Actions
	h) monitoring measures including ecological surveys to measure the establishment and ongoing success of the revegetation based on a comparison with high quality habitat for the MNES;	Section 5 Monitoring
	i) performance measures and reporting requirements against identified objectives, including trigger levels for contingency measures to be taken to ensure performance measures and objectives are met	Section 4 Conservation Management Actions Section 6 Risk assessment
	j) identify persons responsible and arrangements for implementing the REP and for reporting on performance.	Section 1.3.2 Key Stakeholders and Roles
	The approved REP must be implemented.	
7	The approved REP, as described in condition 6, must be revised by the person taking the action to include at least those activities as described in conditions 6a-j for the Phase 2 Offset. The revised REP must be submitted for approval by the Minister within 12 months of the Commencement of Construction of Phase 2 of the action. The approved revised REP must be implemented.	This Plan

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## Appendix A – Rapid Condition Assessment

The Rapid Condition Assessment (RCA) is derived from the ‘Save the Bush Toolkit’ technique (Wakefield and Goldney, 1997), which identifies the presence or absence of key habitat components and threatening processes. This technique is not applicable to all types of native vegetation (e.g. native grasslands, wetlands or pastures) but is a quick and reliable way to assess the condition of woodland communities.

The RCA requires answering true or false to a series of questions, with a tally of the “True” scores indicating woodland health. Where answers are false, improved management in these areas may be required. Sites scoring 16 - 20 “trues” are generally considered to be areas of healthy vegetation that are sustainable under current management. Sites scoring 10 - 15 “trues” are generally considered to be areas of moderately disturbed bushland that have key elements missing and need improved management. Scores lower than 10 are highly disturbed and have many key elements missing. They are generally unsustainable under the current management and require improved management. These RCA attributes are listed in Table A1 with an example score for relatively undisturbed woodland.

**Table A1 Rapid Condition Assessment attributes**

Remnant attribute	Site
Low grazing intensity - never farmed	True
Tree and shrub regeneration present (<2m)	True
Infrequent fire regime (<5year intervals)	True
Healthy mature trees (no dieback)	False
Little to no evidence of rabbits	True
Little to no evidence of foxes/cats	True
Low abundance of weeds (most remnants contain some weeds)	True
No evidence of firewood collection	False
No obvious signs of erosion or salinity	True
Not susceptible to fertiliser application, herbicide or pesticide drift	True
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)	True
Few tracks, trails or fence lines	True
Presence of native shrubs	True
Presence of large, old growth trees with hollows	True
Dead timber is left standing	True
Fallen timber and logs are left on the ground	True
Abundance of native ground flora	True
Presence of litter, cryptogams, cracks and rocks	True
Remnant is large (> 5ha is optimum)	True
Connected to or in close proximity to other remnant vegetation	True
<b>Total No. True answers (x/20)</b>	<b>18/20</b>

## Appendix B - Habitat Restoration Monitoring

### Field Methods

Details of the field methods for Habitat Restoration Monitoring are provided below and a summary of the key variables that will be extracted from this data for analysis is provided in Table B1.

- **50x20m plot**

**Over-storey composition and species richness:** Systematically cover the entire 50x20m plot identifying all over-storey species (tallest woody stratum >1m).

**Over-storey regeneration:** When identifying over-storey species, also record stem diameter class (0-10cm, 10-20cm or >20cm) for each tree.

**Additional habitat features:** When identifying over-storey species, note the presence of tree hollows (minimum entrance width of 5cm), mistletoe or flowers/fruit on each tree and any dead trees. Also record the length of fallen logs (minimum diameter 10cm and minimum length 0.5m) within the plot.

- **20x20m quadrat**

**Community species richness:** Systematically cover the entire 20x20m quadrat identifying and recording all native species in the mid-storey (all vegetation between the over-storey and >1m including tall shrubs, under-storey trees and tree regeneration) and all native species in the ground stratum noting native grasses (plants belonging to the Family Poaceae), native shrubs (woody vegetation <1m), other native species (other native non-woody vegetation in ground stratum e.g. forbs, herbs, lilies, rushes, sedges) and exotic species.

**Community structure:** Divide the 20x20m quadrat into four 10x10m quarters and estimate the % cover of native species in each stratum (mid-storey, ground stratum (grasses), ground-stratum (shrubs), ground stratum (other) and exotics) within each quarter. Average the four estimates to obtain an average % cover for each stratum in the 20x20m quadrat.

**Additional habitat features:** Within each quarter of the quadrat, also estimate % cover of litter, rock and bare ground. Average the four estimates to obtain an average % cover for each habitat feature in the 20x20m quadrat.

- **50m transect**

**Community structure:** At 10 points along each of the three 50m transects (every 5m) estimate % foliage cover directly overhead (over-storey) using reference images provided in the BioMetric 3.1 Operational Manual (Department of Environment, Climate Change and Water, NSW, 2011). Average the estimates to obtain an average % foliage cover for the plot.

**Table B1 Key variables used to monitor changes in the vegetation/habitat condition**

Variable	Measurement units	Sampling units
<b>SPECIES RICHNESS</b>		
Native over-storey	Species ID and No. species/sampling unit	50x20m plot
Native mid-storey	Species ID and No. species/sampling unit	20x20m quadrat
Native ground stratum (grasses)	Species ID and No. species/sampling unit	20x20m quadrat
Native ground stratum (shrubs)	Species ID and No. species/sampling unit	20x20m quadrat
Native ground stratum (other)	Species ID and No. species/sampling unit	20x20m quadrat
Exotic ground stratum	Species ID and No. species/sampling unit	20x20m quadrat
Total	Species ID and No. species/sampling unit	20x20m quadrat for mid-storey and ground strata, 50x20m plot for over-storey
Total Native	Species ID and No. species/sampling unit	20x20m quadrat for mid-storey and ground strata, 50x20m plot for over-storey
Total Exotic	Species ID and No. species/sampling unit	20x20m quadrat for mid-storey and ground strata, 50x20m plot for over-storey
<b>COMMUNITY STRUCTURE</b>		
Native over-storey	% cover	3x50m transects
Native mid-storey	% cover	20x20m quadrat
Native ground stratum (grasses)	% cover	20x20m quadrat
Native ground stratum (shrubs)	% cover	20x20m quadrat
Native ground stratum (other)	% cover	20x20m quadrat
Exotic	% cover	20x20m quadrat
<b>OVERSTOREY REGENERATION &amp; HEALTH</b>		
Over-storey species regeneration	No. species	50x20m plot
Over-storey species stem diameter class (0-10cm)	No./sampling unit	50x20m plot
Over-storey species stem diameter class (10-20cm)	No./sampling unit	50x20m plot
Over-storey species stem diameter class (>20)	No./sampling unit	50x20m plot
<b>ADDITIONAL HABITAT FEATURES</b>		
Litter	% cover	20x20m quadrat
Rock	% cover	20x20m quadrat
Bare ground	% cover	20x20m quadrat
Log	Length	50x20m plot
Tree hollows	Number	50x20m plot
Dead trees	(% tree population)	50x20m plot
Mistletoe	(% tree population)	50x20m plot
Flower/fruit	(% tree population)	50x20m plot

