

# NORTH ROTHBURY

## Management Plan

Yancoal Warkworth Mine, New South Wales | July 2022



This Management Plan is the framework for the protection and management of a 41 hectare offset area under a legally binding conservation mechanism to satisfy conditions of Warkworth Mining Limited's Commonwealth approval (EPBC 2009/5081) and NSW approval (NSW SSD-6464).

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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 North Rothbury Biodiversity Area Management Plan is complete, current and correct.

2. I am duly authorised to sign this declaration on behalf of the approval holder.

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Signed

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27 July 2022

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Date

Document Title	Version	Date effective	Comment
North Rothbury BA Management Plan,	1	December 2016	Submitted for approval to DAWEDAWE and DPIE on 17 February 2017. DPIE approved on 26/6/2017.
North Rothbury BA Management Plan	2	December 2017	DAWEDAWE provided comments on 13/04/2017 and 22/06/2017 on the Southern BA Management Plan. The final text was approved by DAWEDAWE and these agreed changes have been made to V2 of the North Rothbury BA Management Plan. Also changes to reflect the new ownership of Coal & Allied by Yancoal.
North Rothbury BA Management Plan	3	July 2022	Revision of monitoring results, <i>Persoonia pauciflora</i> surveys and inclusion of salinity information.

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## 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
DAWE	Australian Government Department of the Environment and Energy (previously Department of the Environment (DAWE))
DPIE	NSW Department of Planning and Environment
DPIE-EES	DPIE – Environment, Energy and Science
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 (now DPIE-EES – refer above)
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
Yancoal MTW	Yancoal Mount Thorley Warkworth

# 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 North Rothbury Biodiversity Area (BA). This Plan outlines conservation management actions and a monitoring programme for the North Rothbury BA to achieve conservation objectives.

This Plan has been prepared to satisfy the conditions of Commonwealth and New South Wales (NSW) environmental approvals 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, and a full description is provided in section 3. Attainment of the objective and performance criteria is measured using targeted monitoring, which is detailed in section 5. The following points outline the monitoring programme to measure the regeneration pathway and enhancement of habitat condition;

- Habitat restoration monitoring –27 key variables are measured every two years by an external Biodiversity Auditor to track changes 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**

Actions	National Recovery Plan for the Regent Honeyeater (2016)	National Recovery Plan for the Swift Parrot (2011)	Alignment / Contribution
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 address key threatening processes such as: habitat loss and alteration; forestry and firewood collection; and competition from honeybees.
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 address 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 addresses 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 addresses 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 and, 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 North Rothbury BA is located approximately 1 km south of North Rothbury in NSW, approximately 20 km south-east of Warkworth Mine the land is owned by Warkworth Mining Limited and managed by Yancoal. The total area of the BA is 41.4 hectares (ha) and contains 41 ha 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

### 1.2.1 Commonwealth

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 Mine 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 North Rothbury BA is to be secured with a legally binding mechanism for enduring protection of 41 ha 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.

### 1.2.2 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<sup>th</sup> November 2015. This approval requires the North Rothbury BA to be secured under a legally binding mechanism (Condition 30) and for the ecosystem and species credits to be retired to satisfy Condition 28. This Plan satisfies the requirement under Condition 36, for a Biodiversity Management Plan to implement the biodiversity offset strategy.

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

## 1.3 Function of the Management Plan

The Plan will provide the management framework for the BA with the aim to protect and enhance biodiversity 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 as well as the biodiversity values, nested 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 biodiversity 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**

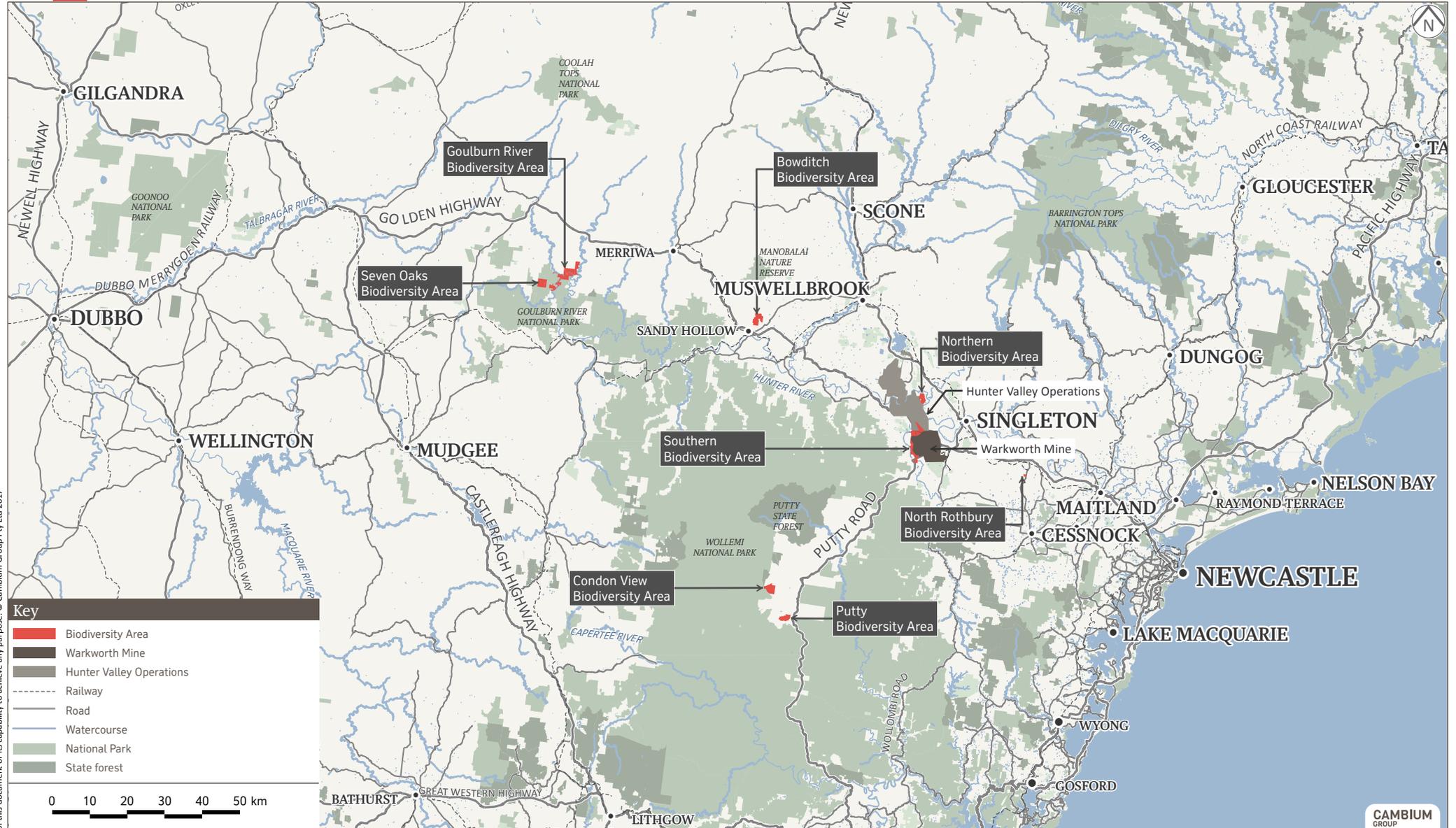
To secure monitoring data and assist in the management of the BA, Yancoal will maintain the online Biodiversity Offsets Portal whilst the BA is under their direct management. This Portal has been designed to centralise and share information among authorised users including regulators, and will include 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, provide 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.

# Location of the Warkworth Mine Biodiversity Areas

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Figure 1



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### 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**

<b>Roles</b>	<b>Responsible Entity</b>	<b>Details</b>
Commonwealth Regulator: Administers approvals granted under the EPBC 2009/5081.	Australian Government Department of the Environment and Energy (DAWE)	<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 – SSD-6464	Department of Planning Industry & Environment (DPIE) DPIE – Environment, Energy and Science (DPIE – EES)	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)		Newcastle Office Conservation and Regional Delivery <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a>
Project Proponent and landowner: Prepare and implement the Plan and complete reporting.	Warkworth Mining Limited, whose operations are managed and operated by Yancoal Australia Ltd.	Manager – Environment & Community Mount Thorley Warkworth
Biodiversity Auditor: Monitor improvement in condition of the biodiversity values and completes ecological monitoring.	Yancoal MTW	Yancoal MTW 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 are 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 DAWE and DPIE. The document may be updated to amend 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 DAWE and DPIE 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;
- analysis of monitoring results with recommendations for modifications, if any, to the management or monitoring activities;
- assessment of any new risks or potential threats to the BA and actions to be undertaken to manage these threats and/or risks; and
- assessment of the progress in attainment of the conservation objectives and key performance indicators.

## 2 Biodiversity Area

### 2.1 Location and Description

The North Rothbury BA is located approximately 1 kilometre (km) south of North Rothbury in NSW, approximately 20 km south-east of Warkworth Mine, and is accessed via Wine Country Drive.

The North Rothbury BA is 41.4 ha in size. It is comprised of Lot 3 DP 104214, Lot 4 DP 104214 and Lot 5 DP 104214, which are owned by Warkworth Mining Limited, as summarised in Table 3. Figure 2 shows the location of the BA and the cadastral boundaries.

This Plan identifies the offset area by mapped vegetation. The cleared vegetation under the existing power easement (approximately 0.5 ha) has been excluded from the offset area. The BioBanking Assessment Report (Niche 2015) identified 41 ha of vegetation and described two Plant Community Types within two Management Zones (MZs) based on the vegetation type and condition. Figure 3 shows the location of these areas.

A summary of the credits generated for ecosystem credits is provided in Section 2.2.1 and species credits in Section 2.3.4.

**Table 3 Biodiversity Areas location details**

Local Land Services Region	Local Government Area	Landowner	Area (ha)	Vegetation (ha)	Lot	DP
Hunter	Cessnock	Warkworth Mining Limited	17.6	17.6	3	104214
Hunter	Cessnock	Warkworth Mining Limited	20.5	20.1	4	104214
Hunter	Cessnock	Warkworth Mining Limited	3.3	3.3	5*	104214
Total			41.4	41		

\*Part Lot 5 is outside BA boundary (approximately 0.2 ha)

The North Rothbury BA falls within the Cessnock Local Government Area and within the Hunter Local Land Services (HLLS) region. It is located within the *Sydney Basin Bioregion* and the *Hunter Interim Biogeographic Regionalisation for Australia* (IBRA) Subregion. The North Rothbury BA is a part of the Central Hunter Foothills (Mitchell) Landscape (Mitchell 2002). The Central Hunter Foothills landscape is characterised by undulating lowlands, rounded to steep hills with rock outcrop on ridges on Permian lithic sandstone, conglomerate, shale and coal.

North Rothbury BA is situated strategically with a number of important conservation areas, including:

- Bedford National Park approximate 4km to the north-west of the BA;
- Werakata National Park approximately 8 km to the south-east;
- Pokolbin State Forest approximately 11 km to the south-west; and
- Yengo National Park approximately 25 km to the 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.

### Cadastral boundaries at the North Rothbury Biodiversity Area

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Figure 2



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**Key**

-  Cadastre
-  North Rothbury Biodiversity Area
-  Road
-  Watercourse

0 0.1 0.2 0.3 km

Vegetation communities, management zones and monitoring sites at the North Rothbury Biodiversity Area  
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Figure 3



## 2.2 Vegetation communities

Two vegetation communities have been identified and mapped at the North Rothbury BA (Niche 2015).

The Red Ironbark – Spotted Gum shrubby woodland aligns with the BioMetric Vegetation Type (BVT) HU814: Spotted Gum – Red Ironbark – Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter. The canopy is dominated by Red Ironbark (*Eucalyptus fibrosa*), Spotted Gum (*Corymbia maculata*) and Grey Box (*Eucalyptus moluccana*). Shrubs are sparse and patchy and include Boxthorn (*Bursaria spinosa*), Gorse Bitter Pea (*Daviesia ulicifolia*) and Rice Flower (*Ozothamnus diosmifolius*). Grasses are abundant and include Wiry Panic (*Entolasia stricta*), Purple Wiregrass (*Aristida ramosa*) and Bushy Hedgehog-grass (*Echinopogon caespitosus*).

The Forest Red Gum grassy open forest aligns with BVT HU812: Forest Red Gum grassy open forest on floodplains of the lower Hunter. The canopy is dominated by Forest Red Gum (*Eucalyptus tereticornis*), Narrow-leaved Ironbark (*Eucalyptus crebra*) and Grey Box (*Eucalyptus moluccana*). Bulloak (*Allocasuarina luehmannii*) is sparse with patchy shrubs including Boxthorn and Coffee Bush (*Breynia oblongifolia*). Grasses are abundant and include Shorthair Plumegrass (*Dichelachne micrantha*), Bushy Hedgehog-grass (*Echinopogon caespitosus*), Brown's Lovegrass (*Eragrostis brownii*) and Barbed Wire Grass (*Cymbopogon refractus*).

Exotic species are common but are generally in low abundance and include Fireweed (*Senecio madagascariensis*), Catsear (*Hypochaeris radicata*) and Cobbler's Pegs (*Bidens pilosa*). A transmission line cuts through the south-eastern corner of the BA and the vegetation has been cleared in this area (approx. 0.5 ha)

The North Rothbury BA supports 2 vegetation communities as shown in Table 4 and the distribution shown in Figure 3.

**Table 4 Plant Community Types across North Rothbury BA**

Code	Vegetation Community	Management Zone	BioBanking Condition	Area (ha)
HU814	Red Ironbark – Spotted Gum shrubby woodland	MZ1	Moderate / Good	24.5
HU812	Forest Red Gum - Grey Box grassy woodland	MZ2	Moderate / Good	16.5
Total				41

### 2.2.1 BioBanking Ecosystem credits

The BioBanking Assessment completed in June 2015 calculated a total of 316 ecosystem credits, as shown in Table 5.

**Table 5 Ecosystem credits created across the North Rothbury BA**

BVT	Plant Community Type	Management Zone	Area (ha)	Ecosystem Credits
HU814	Spotted Gum – Red Ironbark – Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter	MZ1	24.5	198
HU812	Forest Red Gum grassy open forest on floodplains of the lower Hunter	MZ2	16.5	118
Total			41	316

## 2.3 Threatened Species

Fauna habitat at the North Rothbury BA is of moderate to high quality, with mostly a good structure of canopy, understorey and ground cover vegetation, and frequent hollow-bearing trees and stags. Flowering Spotted Gum provides good foraging habitat for native birds. The natural regeneration of the shrub layer and understorey will likely reduce the impact of the Noisy Miners, which have been observed in significant flocks (>25) in the more open woodland areas.

The offset area is to provide suitable habitat for the Swift Parrot and Regent Honeyeater to satisfy the EPBC Act approvals. An expert report has been prepared to confirm the

suitability of habitat on the North Rothbury BA for the Swift Parrot and Regent Honeyeater, as well as confirming the yield of species credits for the Regent Honeyeater.

A brief description of these two species is provided below with a summary of the habitat suitability assessment provided in the Expert Report (Cumberland Ecology and Merops Services 2015).

### 2.3.1 Swift Parrot

The Swift Parrot is a predominantly nectarivorous, migratory species endemic to south eastern Australia (Birds Australia 2011) 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).

Several tree species that provide feeding resources for the Swift Parrot are present within the North Rothbury BA, including Spotted Gum (*Corymbia maculata*), Red Bloodwood (*Corymbia gummifera*), Grey Box (*Eucalyptus moluccana*) and Forest Red Gum (*Eucalyptus tereticornis*). These species could be used on occasion by the Swift Parrot for foraging, depending on flowering intensity.

Based on this and several other factors, the expert report (Cumberland Ecology and Merops Services 2015) concluded that the Swift Parrot is moderately-highly likely to occur in the following communities within the North Rothbury BA (total area 41 ha):

- HU812 – Forest Red Gum grassy open forest
- HU814 – Spotted Gum – Grey Box shrub-grass open forest

### 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.

Several tree species that provide feeding resources for the Regent Honey are present within the North Rothbury BA, including Spotted Gum (*Corymbia maculata*) and Grey Box (*Eucalyptus moluccana*). These species could be used on occasion by the Regent Honeyeater for foraging, depending on flowering intensity.

Based on this and several other factors, the expert report (Cumberland Ecology and Merops Services 2015) concluded that the Regent Honeyeater is moderately-highly likely to occur in the following communities within the North Rothbury BA (total area 41 ha):

- HU812 – Forest Red Gum grassy open forest; and
- HU814 – Spotted Gum – Grey Box shrub-grass open forest



Photo: Swift Parrot (Chris Tzaros)



Photo: Regents Honeyeater (Murray Chambers)

### 2.3.3 North Rothbury Persoonia

*Persoonia pauciflora* is listed as critically endangered under both the EPBC Act and BC Act. It's distribution is highly restricted to the North Rothbury area in the lower Hunter Valley. Much of the species' habitat has been cleared for rural-residential development and it is estimated less than 350 mature individuals remain, across a linear range of only 4.3 km. In 2016 up to 155 individual plants were observed at the BA, making it the largest known sub population of the species. In 2020 and 2022 additional surveys were undertaken covering 25ha of the BA. These surveys resulted in the observation of an increased number of individual *Persoonia pauciflora* plants (Eco Logical Australia 2020 & 2022). The surveys comprised of parallel transects at 5 – 10m intervals undertaken over four days. During these surveys a total of 212 individual *Persoonia pauciflora* and 96 individual hybrids *Persoonia linearis x pauciflora* were recorded. Of these 58 individuals were in flower and 50 individual were fruiting. The additional records are shown in Figure 4. This site is part of OEH Saving Our Species project and access has been granted for researchers to collect seed and monitor the plants. The main threats to the persistence of *P. pauciflora* are continued habitat loss and fragmentation due clearing for residential development; illegal clearing and picking; and habitat degradation resulting from grazing and slashing.

The North Rothbury Persoonia is a small spreading shrub typically 0.4 to around 1.4 m in height. The foliage, which comprises soft, narrow (<1mm) needle-like leaves 3 to 4 cm long is often strikingly bright green to almost fluorescent on some individuals. The flowers are moderately small and yellow, typical of all *Persoonia*. Flowers are usually in low number, in comparison to other *Persoonia* species (hence the name), and are located towards the ends of the branches. Fruit is a fleshy light green to yellow drupe which contains a seed roughly the size and shape of a coffee bean (Patrick 2006). Bark is usually smooth and grey, to slightly fissured in older specimens on the lower portion of the main stem.

The North Rothbury Persoonia is a fire sensitive obligate seeder, does not tolerate frequent disturbance such as slashing, and can die off in dry conditions, the species will exhibit considerable fluctuations in the number of mature individuals over time. To assist in protecting these plants, a species identification guide can be found at **Appendix A** and their distribution is shown in Figure 4.



Photo: North Rothbury Persoonia within North Rothbury Biodiversity Area (Eco Logical Australia 2022)



Photo: North Rothbury Persoonia flowers and (developing) fruit (Eco Logical Australia 2022)

### 2.3.4 BioBanking Species Credits

The North Rothbury BioBanking Assessment Report (Niche 2015) identified a total of 2,391 species credits are available for retirement by Warkworth Mine, as shown in Table 6.

**Table 6 Species credits created across the Bowditch BA**

Species Credits	Scientific name	Area/No. plants	Credits
Regent Honeyeater*	<i>Anthochaera phrygia</i>	41 ha	1,100
North Rothbury Persoonia	<i>Persoonia pauciflora</i>	155	291
<b>Total Species Credits</b>			<b>1,391</b>



Photo: Spotted Pardalote nesting at North Rothbury BA (Niche 2016)

# Threatened species records at the North Rothbury Biodiversity Area

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Figure 4



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## 2.4 Baseline Ecological Condition

### 2.4.1 Woodland condition

A Rapid Condition Assessment (RCA) technique is used as a preliminary assessment of woodland condition within the BA. **Appendix B** provides details on the RCA methodology.

Six permanent RCA sites were established across North Rothbury BA in September 2016. Two RCA sites were established in each Management Zone, MZ1 and MZ2.

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 7 provides the number of RCA sites with their average health rating. All RCA sites had a health rating of > 18/20 with the average being 19/20 in 2021 indicating these areas are healthy and sustainable under current management.

**Table 7 Rapid Condition Assessment health rating**

RCA Plot	MZ	2016	2017	2018	2019	2020	2021
R R1	MZ1	18	18	19	19	19	19
R R2	MZ2	19	17	19	18	18	19
R R3	MZ3	18	18	18	18	19	19
R R4	MZ4	18	20	20	20	20	19
<b>Average</b>		<b>18/20</b>	<b>18/20</b>	<b>19/20</b>	<b>18/20</b>	<b>19/20</b>	<b>19/20</b>

### 2.4.2 Habitat condition

In September 2016, five permanent Habitat Restoration Monitoring plots were established within the North Rothbury BA across MZ1 and MZ2. Figure 3 indicates the location of the plots.

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 8 and have been compared against the benchmark.

The data collected within the monitoring plots indicate both communities were in relatively good condition, with few weed species recorded. The monitoring plot data for MZ1 indicates a high species diversity and intact canopy on average, when compared with benchmark values. The per cent cover of native grasses was near benchmark range on average with ground cover other also near benchmark. Ground cover shrubs were consistently below benchmark values. Exotic species cover was less than 5% of benchmark for all plots, with two plots recorded no exotic species at all. The data was below benchmark for number of tree hollows and consistently above benchmark for length of logs.

In MZ2, the monitoring plot data indicates a plant community in good condition, with most attributes at or near benchmark values. Native overstorey cover was relatively sparse compared to benchmark values, however the data was within benchmark for native species richness, and percent foliage cover of native mid-storey, native grasses, native shrubs and native other. Exotic species were rare in all plots. The data is variable for fallen logs and below benchmark for number of hollows.

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.

Habitat Restoration Monitoring was undertaken during spring in 2018 by Niche (2018) and in 2020 by SLR (2020). The 2020 monitoring data indicates a decline in native species diversity and native ground cover since 2018 in MZ2. There is evidence of strong native regeneration within ground and mid storey strata, with increased coverage across MZ1 and MZ2. Most of the key attributes are close to or within benchmark, indicating that native vegetation continues to show high potential for regeneration across the site. The results are shown in Table 8 and have been compared against benchmark.

**Table 8 Summary of Habitat Restoration Monitoring Result 2020 compared to benchmark values**

		NPSR	NOS	NMS	NGCG	NGCS	NGCO	EPC	Logs (m)	Hollows	No. Trees
Benchmark	Upper		40	40	60	15	25	0			
Benchmark	Lower	38	15	4	30	3	10		10	1.2	N/A
RM1		31.0	16.4	5.8	62.5	4.3	15.0	0.0	13.0	0.0	67
RM4		34.0	27.0	12.5	21.3	7.5	9.3	1.0	21.0	0.0	26
RM5		21.0	17.5	2.0	26.3	4.3	40.0	1.5	32.0	0.0	20
2020 Mean		28.7	20.3	6.8	36.7	5.3	21.4	0.8	22.0	0.0	37.7
2018 Mean		33.3	8.1	3.3	16.9	5.1	7.3	0.1	7.7	0	45

Benchmark	Upper		65	50	90	15	90	0			
Benchmark	Lower	15	15	0	0	1	2		10	0.8	N/A
RM2		23.0	15.8	2.5	17.5	3.3	32.5	1.5	21.0	0.0	18
RM3		22.0	15.7	3.0	25.0	4.5	45.0	1.5	7.0	0.0	42
2020 Mean		22.5	15.8	2.8	21.3	3.9	38.8	1.5	14.0	0.0	30
2018 Mean		37	5.7	0.8	34.4	2.1	26.3	0.4	12.8	0	37

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 Bird usage

Bird assemblages monitoring was completed in 2016 and 2018 by Niche (2016), (2018) and by ANU Enterprise in 2020 (2020). Monitoring was undertaken during winter and early spring as described in Section 5. The bird assemblage monitoring reports are available on the Biodiversity Offsets Portal. The location of the monitoring sites is shown on Figure 3. 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.

The 2020 monitoring increased the survey intensity from one visit to each monitoring site to three visits. The increase in survey intensity has increased the measure of species richness across all Biodiversity Areas and resulted in the regent honeyeater being detected at the Putty BA during the second round of surveys. Bird assemblage monitoring will include three rounds of monitoring for all future monitoring periods.

Three threatened bird species were recorded in the North Rothbury BA during the 2020 monitoring period as presented below in Table 9.

**Table 9 Estimated minimum count of threatened bird species detected during the 2ha 20-minute**

Species	Bowditch	Condon View	Goulburn River	North Rothbury	Northern BA	Putty	Seven Oaks	Southern BA
Wedge-tailed eagle <i>Aquila audax</i>					2 (1)		1 (1)	
Glossy black cockatoo <i>Calyptrorhynchus lathamii</i>							6 (5)	
Little lorikeet <i>Glossopsitta pusilla</i>		4 (4)		4 (1)		26 (2)		
Barking owl <i>Ninox connivens</i>						2 (1)		
Speckled warbler <i>Pyrrholaemus sagittatus</i>	6 (4)		5 (3)	4 (2)		1 (1)	2 (1)	8 (5)
Regent honeyeater <i>Anthochaera phrygia</i>						3 (2)		
Grey-crowned babbler <i>Pomatostomus temporalis</i>		3 (1)			6 (2)			10 (3)
Varied sittella <i>Daphoenositta chrysoptera</i>	7 (3)	6 (2)	2 (1)	2 (1)		3 (2)	2 (1)	5 (2)
Brown treecreeper <i>Climacteris picumnus</i>			1 (1)					
Dusky woodswallow <i>Artamus cyanopterus</i>		4 (1)						3 (1)
Hooded robin <i>Melanodryas cucullata</i>		1 (1)						
Diamond firetail <i>Stagonopleura guttata</i>							3 (1)	

**Numbers in parentheses denote number of individual monitoring site each species was detected at**

After one visit to each monitoring site the number of bird species recorded was 21, a decline of 10 species in 2016 and 18 species in 2018. Monitoring results as presented below in Table 10 (Data for 2020 are presented first after one visit i.e. comparable with previous years' data and second after 3 visits). The decline in bird species richness can probably be attributed to a lack of spotted gum and broad-leaved ironbark blossom, observed eucalypt dieback and high numbers of noisy miners (ANU Enterprise 2020),

After three visits a total of 35 bird species were recorded including three threatened species. The threatened species included Little lorikeet, Speckled warbler and Varied sittella.

The Regent Honeyeater and Swift Parrot were not detected at the North Rothbury BA during 2016, 2018 or 2020 monitoring. The non-detection of the two species during monitoring does not confirm that the species do not use the sites. The North Rothbury BA supports potential habitat for the two species which could visit any of the areas to forage when trees are in flower.

**Table 10 Trends in bird species richness 2016 - 2020**

Biodiversity area (No of plots)	On 2ha sites 2016	On 2ha sites 2018	On 2ha sites 2020 (1 visit)	On 2ha sites 2020 (3 visits)	Detected during 2016 surveys	Detected during 2018 surveys	Detected during 2020 surveys (1 visit)	Detected during 2020 surveys (3 visits)
Bowditch (8)	45	30	42	56	49	50	53	63
Condon View (10)	36	43	30	50	44	57	40	58
Goulburn River (12)	61	63	58	71	72	82		123*
North Rothbury (4)	31	39	21	35	32	49	25	45
Northern BA (5)	18	20	22	36	23	32	28	43
Putty (10)	46	45	43	58	49	57	49	70
Seven Oaks (10)	44	48	47	67	52	68	57	67
Southern BA (9)	43	34	40	56	60	54	54	66
All sites	97	103	105	124	116	125	137	144

## 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 North Rothbury 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 strategies 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 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 11 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 11 North Rothbury BA Conservation Values and Key Performance Indicators**

Conservation Values	Key Performance Indicator	Completion Criteria
Woodland	Extent and condition of 41 ha over 10 years.	Observed and measured increase or maintained Rapid Condition Assessment scores over 10 years (measured annually) in MZ1 and MZ2.
Habitat	Extent and condition of 41ha over 10 years.	Observed and measured trajectory towards and/ or attainment of benchmark values at MZ1 and MZ2 (Table 8 ) 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 11 have been met to the satisfaction of the DAWE and DPIE.

## 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 management zones (MZs) including key management infrastructure.

Yancoal is accountable for the implementation of the conservation management actions, as shown in Table 1, this key responsibility rest with the Environment and Community Manager. 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 beehives, 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.

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

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 completed and approved.

#### 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 as required.

#### 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 and Action
<p>Damage to conservation values by persons undertaking controlled activities – reported through Management Monitoring (Section 5.4) or other visitors to the BA.</p>	<p>Report incident to relevant authority within 30 days.</p> <p>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.</p> <p>Review security measures and offset induction procedure.</p>

# Key infrastructure at the North Rothbury Biodiversity Area

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Figure 5



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## 4.2 Management of grazing for conservation

Strategic grazing will not be used as a management tool in the North Rothbury BA due to the size and location of the BA.

## 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 or impede ecological processes.

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 and BioBanking Assessment Reports indicated that the North Rothbury BA had low levels of weed infestation. The 2020 Habitat Restoration Monitoring indicated weed levels have increased following higher than annual rainfall across the region. Control efforts will be focused on weed species and to limit weed dispersal from tracks. Weed containment zones of 50m from the old track and boundaries will be maintained. Any weeds outside of these areas will be controlled based on the observations from the monitoring programme. The weed control areas are shown in Figure 6 along with the observation of noxious weeds from all of the BioBanking assessment data collected in 2014 to further target control efforts.

### 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 12.

All noxious weeds declared under the *Biosecurity Act 2015* will be given priority for weed control. Noxious weeds recorded in the BA are Bridal Creeper, Fireweed, Lantana, Mother of Millions and Prickly Pear.

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 = 26 – 50%;
- 5 = 51 – 75%; and
- 6 = 76 – 100%.

Table 13 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.

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.

# Weed control areas at the North Rothbury Biodiversity Area

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Figure 6



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Table 12 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>
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>
Slashing – mechanical cutting of weeds to prevent seed production	<p>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).</p>
Manual removal – removal of the weed plant and roots from the site.	<p>Physical removal of new weeds, unearthing of root systems and containment and removal of seed.</p>

Table 13 Target weed species, treatment method and control period and intensity

Species	Photo	Class*	WON	Distribution	Control method/s	Control period and intensity
<b>WOODY WEEDS</b>						
Lantana ( <i>Lantana camara</i> )		2	✓	MZ1 and MZ2	Spot spray with registered herbicide.	October to April From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.
<b>PRICKLY PEARS</b>						
Common Pear ( <i>Opuntia stricta</i> ) Creeping Pear ( <i>Opuntia humifusa</i> ) Tree pear ( <i>Opuntia tomentosa</i> ) Tiger pear ( <i>Opuntia aurantiaca</i> )	 	4	✓	MZ1 and MZ2	Spot spray with registered herbicide. Biological control ( <i>Cactoblastis cactorum</i> and <i>Cochineal (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.
<b>VINES / CREEPERS</b>						
Bridal Creeper ( <i>Asparagus asparagoides</i> )		3	✓	MZ1	Spot spray with registered herbicide. Manual removal of plants by digging out tubers. Biological control with application of fungus.	Spray August to September From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.

Species	Photo	Class*	WON	Distribution	Control method/s	Control period and intensity
<b>PASTURE / ANNUALS</b>						
Fireweed ( <i>Senecio madagascariensis</i> )		4	✓	MZ1 and MZ2	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.
Mother-of-millions ( <i>Bryophyllum Ssp</i> )		3		MZ1	Spot spray with registered herbicide.	Actively growing From Year 1 to Year 4, at least two control events per year. Ongoing maintenance, minimum of one control event per year.

*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.

### 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 12, 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 12, 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 and Action
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 North Rothbury 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 include:

- documentation of access and water supply points for suppression activities;
- 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 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 and very high fire danger rating 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 for MZ1 and MZ2 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 and MZ2 within the next 3 years, unless otherwise specified by the Biodiversity Auditor. However due to the fire sensitive nature of the North Rothbury Persoonia, fire will be excluded.

The power line easement along the eastern boundary is to be maintained as a firebreak, as Wine Country Drive is a potential source of fire ignition. The fire fuel loads along the boundary with the residential properties will be monitored and slashing or fuel reduction burns will be used to reduce the hazard level.

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 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	Not currently recommended		
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, include assessment of damage to North Rothbury Persoonia population. 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 - three metres either side;
  - (b) permanent internal fence - six metres total width of clearing;
  - (c) temporary fence - six 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;
- standing timber that poses an unacceptable safety risk can be felled and retained on ground as habitat;
- 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
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 no artificial structures on waterways or waterbodies in the North Rothbury BA to be removed in order to restore the natural flows.

## 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 conservation 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 at the North Rothbury BA have been impacted by prior clearing 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 cover,
- 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. 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
Natural regeneration	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
No active regeneration and native plant recruitment within 5 years in MZ1 and MZ2 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

There is no requirement for planting to enhance the conservation values of the North Rothbury BA.

## 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 low potential for erosion to occur within the BA. Management options for erosion control include excluding grazing and monitoring the closed tracks and areas that were disturbed for infrastructure the proposed housing development.

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 DPIE-EES

### 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
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.

### 4.9.3 Salinity Control

Dryland salinity occurs where salt in the landscape is mobilised and redistributed closer to the soil surface or into waterways. This often occurs along creek lines and in bare paddocks where vegetation clearing or over grazing exposes bare soils. There is potential for dryland salinity to occur within the BA. Management options for salinity control include excluding grazing and active re-establishment of trees and shrubs where salinity impacts are identified. Visual assessments of land can provide an indication of the severity of salinity.

Salinity within the BA will be monitored through biannual inspections by Yancoal, as well as other observations recorded during the ecological monitoring programme. Appropriate salinity remediation measures will be undertaken in consultation with the HLSS and DPIE-EES

## 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 Regent 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 honeybees;
- 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 impacts on the vegetation and fauna at a regional and local level, and opportunistically control the species listed in Table 14. 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 with the use of firearms is not permitted on within in the BA due to the neighbouring residential area and major road (Wine Country Drive).

Control programs 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 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 Codes of Practice 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 14 Identified Vertebrate Pests control methods, timing and intensity**

Pest	Declared	Control methods	Control timing and intensity
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Pest	Declared	Control methods	Control timing and intensity
European rabbit ( <i>Oryctolagus cuniculus</i> )	Yes	Baiting: 1080 / Pindone 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 cat ( <i>Felis catus</i> )		Trapping: Wire mesh cage trap / Soft net trap/ Padded-jaw trap	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> )		Other - Exclusion fencing / Mustering	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 pig ( <i>Sus scrofa</i> )	Yes	Baiting – 1080 Trapping - Silo, panel or box traps 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 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 Other - Den fumigation / 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.
Wild dog ( <i>Canis lupus spp.</i> )	Yes	Baiting – 1080 / PAPP Trapping - Soft jaw leg hold trap 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 and Standard Operating procedures 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 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 10;
- 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 15. To enhance understanding and knowledge of all key stakeholders in the management of the BA, Yancoal representatives, where feasible, will accompany the Biodiversity Auditors during the field based components of this monitoring programme.

Table 15 Monitoring Schedule

	2020	2021	2022	2023	2024	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						
Property inspection	April / Nov						

## 5.2 Landscape Monitoring

Aerial photographic imagery, baseline photography captured 2017 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 permanent monitoring plots across the North Rothbury BA will monitor the condition of woodland reference sites.

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.

The first survey of all plots was completed in 2016 and subsequent surveys will be biennial (every two years) during late spring/early summer, a summary is provided in Section 2.4.2.

#### 5.3.1.1 Field Methods

There are five monitoring plots established across MZ1 and MZ2 within the North Rothbury BA.

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.

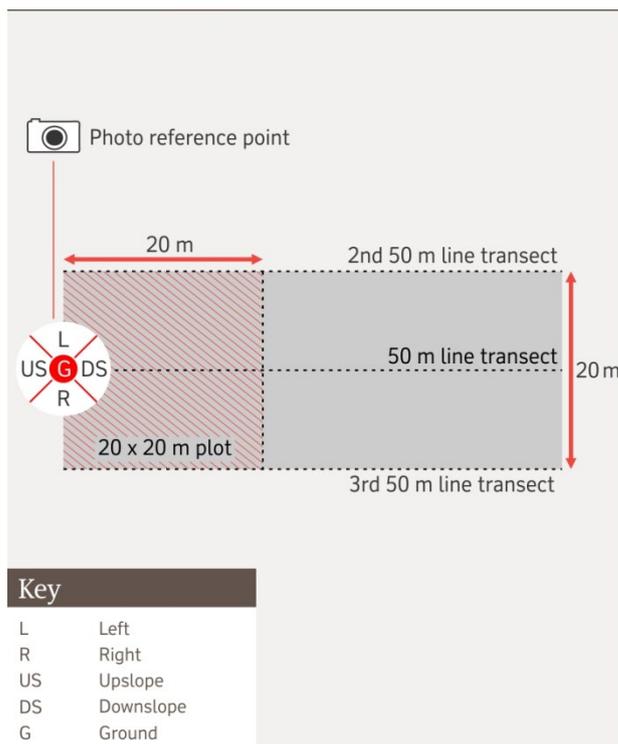
The 50m x 20m plot is used to record details of the over-storey (canopy) layer including species richness, canopy regeneration and canopy health. Specific habitat features, such as the abundance of tree hollows, flowers/fruit, mistletoe and fallen logs are also recorded at this scale

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 C**.

#### a. 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/fruited 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

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 has occurred in winter/spring 2018 and 2020. Additional monitoring will be undertaken in 2022, 2024 and 2026 (Table 15). 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 on three separate visits. Broadcast surveys are to be included in the methodology at the same location as the monitoring plots.

At the North Rothbury BA, 4 bird monitoring plots are established according to the following breakdown:

- 2 plots in MZ1; and
- 2 plots in MZ2.

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

The RCA technique is used as a preliminary assessment of woodland condition within the BA. **Appendix A** provides details on the RCA methodology, the location of the plots is shown in Figure 3.

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 e.g. 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.

## 6 Risk assessment

Table 16 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 16 Risk and Contingency Assessment Matrix

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 DAWE 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.
To enhance the condition of conservation values of the offset area within 10 years at the BA.	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.
	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.

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>

	<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;</p> <p>f) measures to provide fire management regimes appropriate for the MNES;</p> <p>g) measures to manage the MNES in accordance with the recommendations of the approved recovery plan for the migratory and threatened species;</p> <p>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;</p> <p>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</p> <p>j) identify persons responsible and arrangements for implementing the REP and for reporting on performance.</p> <p>The approved REP must be implemented.</p>	<p>Section 4 Conservation Management Actions</p> <p>Section 4 Conservation Management Actions</p> <p>Section 4 Conservation Management Actions</p> <p>Section 5 Monitoring</p> <p>Section 4 Conservation Management Actions Section 6 Risk assessment</p> <p>Section 1.3.2 Key Stakeholders and Roles</p>
7	<p>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.</p>	<p>This Plan</p>

**Table 18 Compliance with relevant conditions of NSW SSD-6464**

Approval Condition	Development Consent SSD-6464, Schedule 3	Reference
28	<p>Retirement of Offsets</p> <p>Within 3 years of the date of commencement of development under this consent, the Applicant shall retire biodiversity credits of a number and class specified in Tables 9 and 10 below to the satisfaction of OEH.</p> <p>The retirement of these credits must be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Projects and can be achieved by :</p> <p>(a) acquiring or retiring credits under the Biobanking Scheme in the TSC Act;</p> <p>(b) making payments into an offset fund that has been developed by the NSW Government; or</p> <p>(c) providing supplementary measures.</p>	<p>The credits reported in this document and the BioBanking Assessment Report will be retired to meet this condition.</p>

Table 9: Ecosystem credit requirements

Vegetation Community	Code (BVT)	Biometric Vegetation Type	Area (ha)	Endangered Ecological Community (EEC)	*Credits required
Warkworth Sands Woodland	HU872	Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area	72.12	Warkworth Sands Woodland in the Sydney Basin Bioregion EEC	3,043
Warkworth Sands Grassland	HU872	Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area	0.67	N/A	16
Central Hunter Grey Box - Ironbark Woodland	HU817	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	614.64	Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC	<sup>b</sup> 12,180
Regenerating Central Hunter Grey Box - Ironbark Woodland	HU817	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	6.43	Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC	108
Central Hunter Grey Box - Ironbark Derived Grassland	HU817	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	378.6	N/A	4,516
Central Hunter Ironbark - Spotted Gum - Grey Box Forest	HU818	Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter	16.61	Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions EEC	633

Notes:

- <sup>a</sup> Or as otherwise determined by OEH as part of its detailed consideration of credits retirement.
- <sup>b</sup> This must be read in conjunction with the similar figure in Table 11. It reflects the fact that some of these credits may be retired through mine rehabilitation.

Table 10: Species credit requirements

Species	*Credits Required
Regent Honeyeater	18,629
Southern Myotis	18,222
Large-eared Pied Bat	139

Note:

- \* Or as otherwise determined by OEH as part of its detailed consideration of credits retirement.

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Direct Land-Based Offsets

Within 3 years of the date of commencement of the development under this consent, the Applicant shall secure offset areas listed in Table 12 under an in perpetuity conservation mechanism such as entering into a biobank agreement, in accordance with the relevant provisions of the TSC Act. The direct land-based offsets may be used as offsets for any approval required under the EPBC Act for this development.

This Plan will form part of the conservation mechanism.

Table 12: Direct Land-based Offsets

Offset Area	Minimum Size (hectares)
Northern Biodiversity Area	303
Southern Biodiversity Area	705
Goulburn River Biodiversity Area	1,063
Bowditch Biodiversity Area	520
Putty Road Biodiversity Area	94
2003 Warkworth Sands Woodland Area	155.8
North Rothbury Biodiversity Area (Hanwood Estate)	40

Note: To identify the areas referred to in Table 12 see the applicable figures in Appendix 4.

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Biodiversity Management Plan

The Applicant shall prepare a Biodiversity Management Plan for the development to the satisfaction of the Secretary, and carry out the development in accordance with this plan. This Plan must:

- be prepared in consultation with OEH and submitted to the Secretary for approval prior to the commencement of any development under this consent;
- describe the short, medium, and long term measures that would be implemented to:
  - manage the remnant vegetation and fauna habitat on the site;
  - implement the biodiversity offset strategy described in the EIS;

Completed – this Plan satisfies the requirements of the Biodiversity Management Plan approved in January 2016. Conditions (c) and (d) see Section 3

Approval Condition	Development Consent SSD-6464, Schedule 3	Reference
	<ul style="list-style-type: none"> <li>• regenerate and conserve Warkworth Sands Woodland EEC in the biodiversity areas;</li> <li>• integrate the implementation of the biodiversity offset strategy to the greatest extent practicable with the rehabilitation of the site;</li> <li>(c) include detailed performance and completion criteria for evaluating the performance of the biodiversity offset strategy (including the regeneration of Warkworth Sands Woodland). and triggering remedial action (if necessary );</li> <li>(d) include a detailed description of the measures that would be implemented over the next 3 years for:                             <ul style="list-style-type: none"> <li>• regenerating Warkworth Sands Woodland in the biodiversity offset areas;</li> <li>• protecting vegetation and fauna habitat outside the approved disturbance area on-site;</li> <li>• enhancing the quality of existing vegetation and fauna habitat on the site and in the biodiversity offset areas;</li> <li>• minimising clearing and avoid unnecessary disturbance;</li> <li>• maximising the salvage of resources within the approved disturbance area - including vegetative and soil resources - for beneficial reuse in the enhancement of any land-based offsets or the rehabilitation of the site;</li> <li>• collecting and propagate seed;</li> <li>• minimising the impacts on fauna on site, including undertaking pre-clearance surveys;</li> <li>• managing salinity using best practice dryland salinity management revegetation measures;</li> <li>• controlling weeds and feral pests;</li> <li>• controlling erosion;</li> <li>• managing grazing and agriculture on site;</li> <li>• controlling access; and</li> <li>• bushfire management;</li> </ul> </li> <li>(e) include a seasonally-based program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria;</li> <li>(f) identify the potential risks to the successful implementation of the biodiversity offset strategy (including the regeneration of Warkworth Sands Woodland) and include a description of the contingency measures that would be implemented to mitigate against these risks; and</li> <li>(g) include details of who would be responsible for monitoring, reviewing, and implementing the plan.</li> </ul> <p>Note: Management measures relating to the biodiversity offset strategy may be addressed via equivalent measures required by OEH as part of a BioBanking Agreement or similar conservation agreement.</p>	<p>and Section 4.                      Condition (e) see Section 5                      Condition(f) see Section 6                      Condition (g) see Section1.3.2.</p>

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## Appendix A – North Rothbury Persoonia field identification guide

# North Rothbury Persoonia

FIELD IDENTIFICATION GUIDE  
for the

## North Rothbury Persoonia (*Persoonia pauciflora*)



The leaves of North Rothbury Persoonia are often strikingly bright green or lime in comparison to the surrounding vegetation.

### Habitat

Most native vegetation within the North Rothbury provides important habitat for this Persoonia.

- The North Rothbury Persoonia may not always be apparent above ground.
- The seed can survive in the soil for many years.

This guide has been prepared to assist in the identification of the North Rothbury Persoonia. For additional information regarding *Persoonia pauciflora* see: [www.threatenedspecies.environment.nsw.gov.au](http://www.threatenedspecies.environment.nsw.gov.au) or contact the coordinator of the *Persoonia pauciflora* Recovery Program on (02) 4908 6800

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Photo: G. Patrick

The North Rothbury Persoonia grows along road verges and in private properties on the North Rothbury area. This critically endangered plant is threatened by accidental damage during land management activities such as mowing, slashing or grading.

# Critically Endangered<sup>1</sup> shrub

## North Rothbury Persoonia

- Grows only within a small area near North Rothbury within the Cessnock City Council Local Government Area.
- Only around **350 plants** are known to remain.
- Most on **private property** or **along road verges**.

<sup>1</sup> North Rothbury Persoonia (*Persoonia pauciflora*) is listed as a critically endangered species on Schedule 1A of the *NSW Threatened Species Conservation Act 1995* (TSC Act) and as a critically endangered species under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).



*Persoonia linearis*

Photos: A. Richardson

North Rothbury Persoonia bark is smooth and grey

### Bark

Two other *Persoonia* species grow in the same habitat as the North Rothbury *Persoonia*: *Persoonia linearis* and *Persoonia levis*. The North Rothbury *Persoonia* can be easily distinguished by its bark:

	Bark:
North Rothbury <i>Persoonia</i>	Smooth and grey. Can be slightly fissured at base in older plants.
Other local <i>Persoonia</i> 's	Flaky paper-like, particularly at base of stem. Brown-reddish.



### Flowers

- small and yellow
- four petals
- located towards the end of branches



### Fruit

- fleshy **light green to yellow** drupe
- contains a **seed** roughly the size and shape of a coffee bean



### Habit

- **small spreading shrub** typically 0.4 -1.4 m in height
- the **leaves** are soft, narrow (<1 mm) needle-like, 3 - 4 cm long

## Appendix B – 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 B1 with an example score for relatively undisturbed woodland.

**Table B1 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 C - 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 C1.

### • 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 C1 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

