KENNA BIODIVERSITY OFFSET MANAGEMENT PLAN

Prepared for
Narrabri Coal Operations Pty Ltd
Revision 2-16 April 2014

DOCUMENT TRACKING

ITEM	DETAIL
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Project Number	12NEWPLA-0003
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Approved by	Robert Humphries
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Cover photo from top left	Intact Grassy White Box Woodland Community, Scattered Trees White Cypress Pine Narrow-leaved Ironbark, River Red Gum riverine woodlands (exotic understory), White Cypress Pine / Silver leaved ironbark (good condition)

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ACKNOWLDGEMENTS

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Abbreviations

ABBREVIATION	DESCRIPTION
ACHMP	Aboriginal Cultural Heritage Management Plan
AEMR	Annual Environmental Management Review
BACI	Before-After-Control-Intervention
BOA	Biodiversity Offset Area
BOS	Biodiversity Offset Strategy
BOMP	Biodiversity Offset Management Plan
CMA	Catchment Management Authority
DECC	NSW Department of Environment and Climate Change (now OEH)
DECCW	NSW Department of Environment, Climate Change and Water (now OEH)
Director-General	The Director-General of the NSW Department of Planning and Infrastructure
DP&I	NSW Department of Planning and Infrastructure
DNG	Derived Native Grassland
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
EP	Extraction Plan
EEC	Endangered Ecological Community
EA Report	Environmental Assessment Report
ELA	Eco Logical Australia Pty Ltd
EPA	Environment Protection Authority
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
HBT	Hollow-bearing tree
LHPA	Livestock Health and Pest Authority
LMP	Landscape Management Plan
NCOPL	Narrabri Coal Operations Pty Ltd
NV Act	NSW Native Vegetation Act 2003
NW Act	NSW Noxious Weeds Act 1993
OEH	NSW Office of Environment and Heritage
PA	Project Approval
PCO	Pest Control Order
RFS	NSW Rural Fire Service
RMP	Rehabilitation Management Plan
TSC Act	NSW Threatened Species Conservation 1995

Executive Summary

This Biodiversity Offset Management Plan (BOMP) for the 'Kenna' property has been prepared by Eco Logical Australia Pty Ltd (ELA) on behalf of Narrabri Coal Operations Pty Ltd (NCOPL) in accordance with Project Approval 2009/5003 under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 and Project Approval 08_0144 under the NSW *Environmental Planning and Assessment Act* (EPBC*) 1979*. This plan applies for a period of twenty years, or until the completion criteria are met, in compliance with condition 2b (EPBC 2009/5003) and the commitment made in the Biodiversity Offset Strategy (ELA 2013a). The off-site offset areas will be protected and managed in perpetuity in accordance with conditions of both the NSW EP&A Act and Commonwealth EPBC Act approvals.

The Biodiversity Offset Area (BOA) covers an area of 1,243 hectares (ha) and consists of five vegetation types that meet the 'like for like' offset requirements consistent with condition 6a the EP&A Act project approval as documented in the Narrabri Coal Mine Stage 1 & 2 Biodiversity Offset Strategy (ELA 2013a).

Biodiversity management objectives and management zones are established for the property and biodiversity performance criteria provided to enable an adaptive management framework to achieve conservation outcomes.

There are several threatening processes that are affecting the site, the most significant being the effects of former cattle grazing and infestations of exotic plants and agricultural weeds. The management of threatening processes has been addressed in **Section 3** of this plan. Methods for monitoring the success of management actions are provided in **Section 4**.

NCOPL will appoint a Property Manager responsible for the coordination and implementation of this plan. The Property Manager will be responsible for approving any access or activities on site to ensure they are consistent with the objectives of this plan and not contradictory to the project approvals.

This BOMP includes provisions for the Independent Environmental Audit of the Biodiversity Offset Area and annual monitoring and reporting requirements.

1 Introduction

This Biodiversity Offset Management Plan (BOMP) has been prepared by Eco Logical Australia Pty Ltd (ELA) on behalf of Narrabri Coal Operations Pty Ltd (NCOPL). This BOMP pertains to the management of the 'Kenna' property purchased by NCOPL to provide part of the agreed biodiversity offsets for current and proposed future operations as part of the Narrabri Mine – Stages 1 and 2. NCOPL will appoint a Biodiversity Offset Area Property Manager responsible for the implementation of this BOMP.

The Biodiversity Offset Strategy (BOS) for Stages 1 and 2 of the Narrabri Mine requires the preparation of a BOMP for each of two offset areas; 1,243 hectares (ha) at 'Kenna' (off-site offset) and a 422 ha portion of land adjacent to Narrabri Mine (on-site offset) (**Figure 1** and **Figure 2).** The BOMP for the on-site offset is reported separately (ELA 2013b).

1.1 PURPOSE & SCOPE

This BOMP identifies management actions to be implemented on the 'Kenna' property by NCOPL as part of the overall BOS. Management actions beyond the scope of this BOMP may be carried out at the discretion of the Property Manager as long as they are consistent with this BOMP. Actions contrary to the approved BOMP will require prior written Commonwealth Ministerial approval of the varied strategy.

'Kenna' is located approximately 45 kilometres south east of the township of Narrabri and approximately 30km east of the Narrabri Coal Mine. 'Kenna' adjoins the southern boundary of Mt Kaputar National Park in northern NSW (**Figure 1**). The property is 1,840 ha in total. The Biodiversity Offset Area (BOA) at 'Kenna' covers an area of 1,243 ha and consists of the following vegetation types:

- 680.78 ha of remnant White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion;
- 476.90 ha of White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (37.7 ha as intact remnants and 428.2 ha as modified Derived Native Grassland (DNG));
- 35.07 ha of River Red Gum riverine woodlands and forests in the Nandewar and Brigalow Belt South Bioregions;
- 10.49 ha of White Cypress Pine - Silver-leaved Ironbark - Tumbledown Red Gum shrubby open forest of the Nandewar and Brigalow Belt South Bioregions;
- 18.07 ha of Heathy shrublands on rocky outcrops of the western slopes; and
- 25.52 ha of cleared land.

The BOA on 'Kenna' will be secured for biodiversity outcomes in accordance with conditions of both the EP&A and EPBC Act approvals. The appropriate mechanism for long-term security is still being negotiated and the management plans will be updated and resubmitted for approval once the preferred mechanism has been identified.

A 520 ha portion of the BOA may be transferred to the NSW Office of Environment and Heritage (OEH) to be included in the adjacent Mount Kaputar National Park during the early implementation of this BOMP. OEH have provided an in-principle agreement to this transfer (letter dated 8 September

2011). This BOMP assumes NCOPL's responsibility for the management of the entire BOA on 'Kenna' until the transfer conditions are fulfilled and negotiations completed. The transfer requires NCOPL to grant easement access to the parcel across the remaining portion of 'Kenna'. The existing easement route has been included in the preparation of this plan with appropriate management recommendations.

1.2 CONDITIONS OF APPROVAL

The conversion of the Narrabri Coal Mine from a continuous mining operation with an annual production rate of 2.5 Mtpa to a longwall mining operation with maximum production rate of 8 Mtpa was approved under Section 75J of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and under Sections 130(1) and 133 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) subject to specified conditions in:

- Project Approval 08-0144 'Narrabri Coal Project – Stage 2' granted by NSW Minister for Planning 26 July 2010.
- Approval EPBC Ref 2009/5003 granted to Narrabri Coal Operations Pty Ltd by the Department of Sustainability, Environment, Water, Population and Community (DSEWPaC) 21 January 2011.

Table 1 provides a summary of the relevant biodiversity offset conditions from the NSW Department of Planning and Infrastructure (DP&I) and DSEWPaC approvals and identifies how/where these have been addressed in this BOMP.

Table 1: Compliance with Conditions of Approval

EP&A ACT DA 08_0144 REQUIREMENT	EPBC ACT APPROVAL 2009/5003 REQUIREMENT	BOMP COMMITMENTS	SECTION ADDRESSED
Schedule 5, Condition 7 provide long term security for the offset areas (by 31st Dec 2011) or other date agreed by the Director-General	2.a. Secure 933 ha in a legally binding conservation covenant on title approved in writing by the Minister.	NCOPL has received an extension to arrange for the long-term security of the offset. Once the appropriate mechanism has been identified NCOPL will update and resubmit this management plan for approval.	Section 1.1, Section 3
Schedule 5, Condition 6 a Preparation of a Biodiversity Offset Strategy in consultation with DECCW b. Biodiversity Offset Strategy submitted to Director General by 31st Dec 2011 c provide detailed assessment of 'like for like or better' and 'maintain or improve outcomes'	2. The final version of biodiversity offset strategy must be submitted to the Minister for approval.	Final Biodiversity Offset Strategy (BOS) prepared (ELA 2013a) a. in consultation with OEH (formerly DECCW). b. completed 4 October 2011 and submitted to Minister(s) c. 'Like for like' addressed section 3.1 and 'maintain or improve' in section 3.2 in BOS (ELA 2011) This BOMP addresses the active management of the 'Kenna' property as one of two areas comprising the BOS. This BOMP and the BOS (ELA 2013a) will be formally submitted to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities for approval.	Refer to final BOS Report (ELA 2013a)
Schedule 5, Condition 6 e. Offset direct and indirect impacts (i.e. edge effects) of the proposal	2.c. Define biodiversity off set area boundaries in map, text and shape file (digital format).	BOS defines the Biodiversity Offset Areas (BOAs) to address direct & indirect impacts.	Figures 2 and 3

EP&A ACT DA 08_0144 REQUIREMENT	EPBC ACT APPROVAL 2009/5003 REQUIREMENT	BOMP COMMITMENTS	SECTION ADDRESSED
f. Determine best overall combination of lands to provide a suitable offset		Refer to Figure 4, Section 4 and in shape files. Boundary & vegetation characteristics of 'Kenna' BOA defined in Figures 2 & 3 in this BOMP.	
Schedule 5, Condition 6 d. Offset impacts to Inland Grey Box EEC		24.8 direct impacts and 20.5 estimated indirect impacts offset by 591 hectares "like for like" Equivalent Offset Area Vegetation Types to be protected across two Biodiversity Offset Areas (Section 4 BOS). 476.9 ha (out of 591 ha) "like for like" vegetation to be protected on 'Kenna'	This BOMP
Schedule 5. Condition 6 d. Offset impacts to foraging habitat for the Superb Parrot	2.b. Develop and implement an active monitoring and management plan for ''Kenna' for 20 yrs to enhance White Box Grassy Woodland as habitat for Superb Parrot. .	477 ha of remnant White Box grassy woodland and 35 ha of remnant River Red Gum Riverine woodland on 'Kenna' BOA is suitable foraging and roosting habitat for Superb Parrot,	Section 3.2 Management strategies addressed across all management zones Section 4.3 Targeted surveys embedded in fauna monitoring strategy
Schedule 6, Condition 6.a-f. Annual review and reporting of works completed and monitoring results (trend & discrepancies of impact) and forecast improvement actions and works for year ahead.	2.b.i. & ii. management actions and responsibilities for monitoring, reviewing and implementing the plan	Section 4 and Section 5 of this BOMP	Section 4 & Section 5 of this BOMP
	10. Actions contrary to the approved Biodiversity Offset Management Plan and approved Extraction Plan require prior written Ministerial approval of the varied strategy.	Section 1.1 of this BOMP	Section 1.1 of this BOMP

In addition to the BOS, this BOMP addresses the following OEH Offset principles (DECC 2008):

- To 'enhance condition by management actions and the removal of threats' in accordance with OEH Offset Principle 10;
- To provide 'additional management or increased security' OEH Offset Principle 6; and
- To manage 'uncertainties and risks associated with actions such as revegetation' OEH Offset Principle 6.

1.3 RELATIONSHIP TO OTHER PLANS

This BOMP pertains to management actions on land dedicated to biodiversity offsets under NSW PA08_0144 Schedule 5, Condition 6 and EPBC Act Ref 2009/5003.

The management actions in this plan are designed to be consistent with the mine plans outlined in **Table 2**. This is to facilitate consistency amongst other company plans and practices relating to NCOPL land and to ensure that the conservation management on both BOAs is comparable where possible.

Table 2: Mine plans related to this BOMP

TITLE	SUBJECT
Narrabri Coal Mine Stage 1 and 2 Final Biodiversity Offset Strategy	Overarching strategy identifying biodiversity offset requirements including preparation of this BOMP. Strategy addresses direct and indirect mine impacts. Conservation/Management actions to be undertaken on two properties; a 422 ha portion of land adjacent to Narrabri Mine (NM) and 1,243 ha of land at 'Kenna'
Revised Landscape Management Plan	Coordination and direction for landscape management responsibilities of Stage 1 & 2 Narrabri Mine, applies to whole mine site
Rehabilitation Management Plan	Key component of LMP, applies to whole mine site Management protocols for feral animals, weeds, bushfire and vegetation rehabilitation have been applied to this BOMP
Mine Closure Plan	Key component of LMP, applies to whole mine site Long term management objectives for site post closure including environmental impact management. Supplementary BOA located over long walls subject to performance criteria
Long Wall 101-105 Biodiversity Management Plan	Component of Narrabri Mine Long Wall 101-105 Extraction Plan (EP) addressing flora and fauna impacts identified by the Mine Subsidence Effect Predictions and Impact Assessment (DGS 2011) Informs onsite BOMP monitoring framework (ELA 2012) to ensure compatible methods and provide for cost efficiencies
Long Wall 101-105 Land Management Plan – Narrabri Mine	Component of Narrabri Mine Long Wall 101-105 Extraction Plan (EP) addressing potential impacts and/or environmental consequences of general land impacts identified by the Mine Subsidence Effect Predictions and Impact Assessment (DGS 2011) Informs onsite BOMP (ELA 2012) where supplementary BOA located over long walls
Aboriginal Cultural Heritage Management Plan	Coordination and implementation for management actions in relation to items/sites of cultural heritage significance, applies to the whole mine site. General management measures to be implemented on BOA.

1.4 BIODIVERSITY OFFSET MANAGEMENT PLAN OBJECTIVES

The BOMP objectives are to:

- Identify the land that will be required to be managed in accordance with this BOMP;
- Provide a clear, concise, staged and instructional working document outlining the management actions for the 'Kenna' BOA;
- Provide a management framework that will lead to an improvement in the condition of native vegetation on the 'Kenna' BOA utilising expert knowledge of resilience in natural landscapes and through specific bushland restoration techniques;
- Outline management actions to conserve and augment foraging habitat for Superb Parrot;
- Minimise the impacts of key threats to the site through specific management actions. Key threats include weeds and feral animals; and
- Outline the monitoring, performance evaluation and reporting procedures that are practical and able to be implemented and understood by NCOPL.

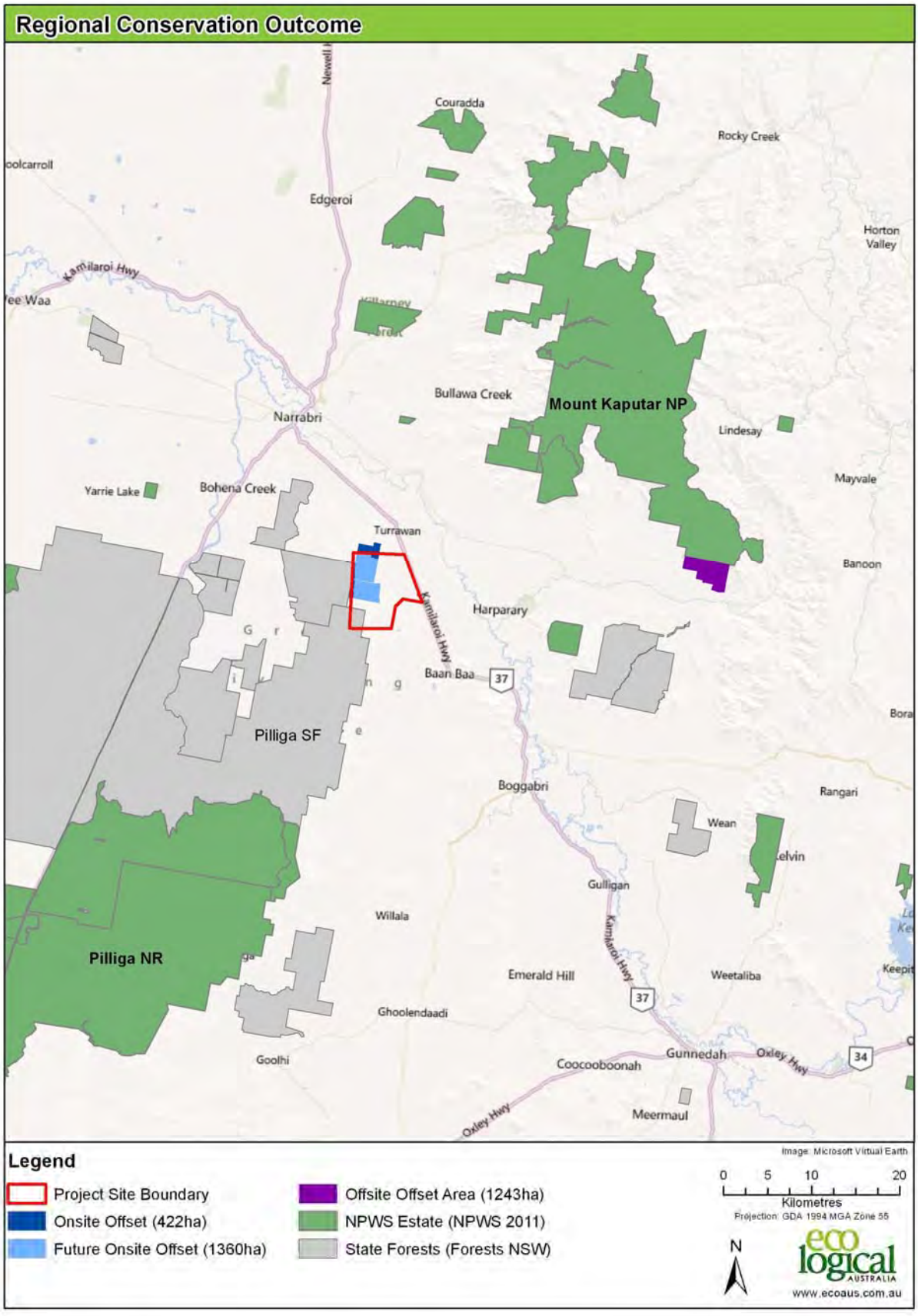

Figure 1: Regional Context of Biodiversity Offset Area

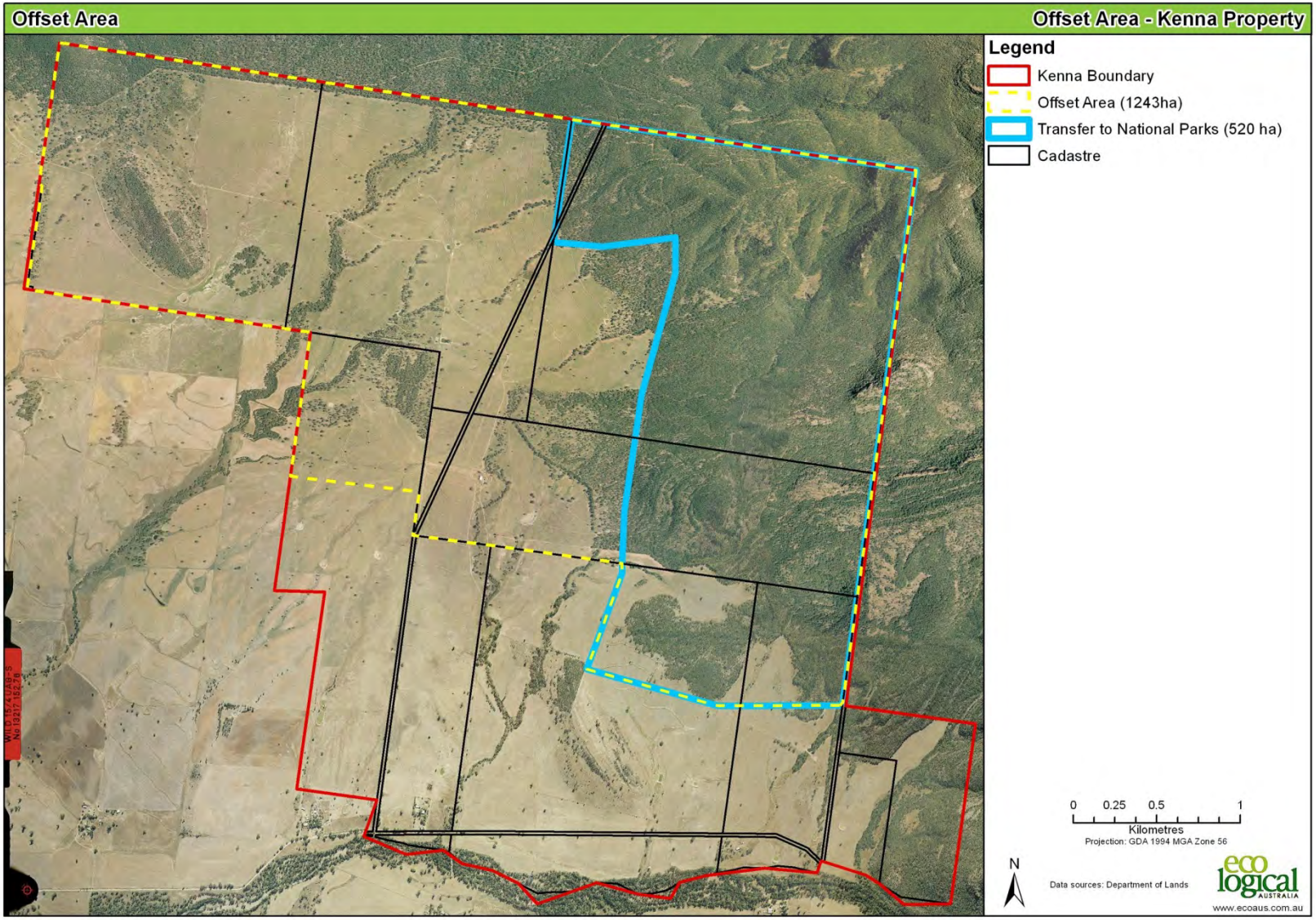

Figure 2: Kenna Biodiversity Offset Area

2 Description of the 'Kenna' BOA

2.1 LOCATION

The 'Kenna' Biodiversity Offset Area (BOA) is located approximately 45 km south-east of the township of Narrabri in northern NSW (**Figure 1**). The BOA covers 1,243 ha (out of 1,840ha) of the 'Kenna' property. The BOA largely consists of White Cypress Pine Narrow-leaved Ironbark shrub/grass open forest of the Western Nandewar Bioregion and the Threatened Ecological Community (TEC), White Box - Yellow Box - Blakely's Red Gum Woodland with small areas of River Red Gum riverine woodlands, Heathy shrublands and White Cypress Pine Silver-leaved Ironbark – Tumbledown Red Gum shrubby open forest of the Nandewar and Brigalow Belt South.

2.2 CLIMATE

The nearest long term meteorological station is Narrabri Airport (approximately 40 km to the north-west). The Narrabri area is influenced by a temperate weather system and experiences warm summer and mild winter temperatures. Summer maximum temperatures are experienced in January with a mean maximum of 34.1^{O}C (daily) and minimum of 19.9^{O}C (nightly). Winter minimums are experienced in July with a mean maximum of 17.7^{O}C (daily) and minimum of 3.9^{O}C (nightly). The mean annual rainfall is 663 mm per year with the greatest falls received in January (85.6 mm) and the lowest falls in May (22.0 mm).

2.3 NATIVE VEGETATION COMMUNITIES, FLORA AND FAUNA

2.3.1 Vegetation

Native vegetation has been mapped on site based on Namoi Catchment Management Authority (CMA) Vegetation mapping (ELA 2009) and ground-truthing undertaken by ELA in August 2010. Floristic plots (20 m x 20 m) were undertaken in most vegetation types to assess species richness and vegetation condition (**Figure 3**).

Five vegetation types have been mapped on site and are described in accordance with the biometric vegetation types used as a statewide standard by Office of Environment and Heritage (OEH) (DECC 2008b). Vegetation types were mapped across the 'Kenna' property, and trimmed to the boundary of the BOA.

The condition of each vegetation community was assigned to one of four condition classes based on the presence/absence of a canopy layer and whether the ground cover was greater than or less than 50% native ground cover, in accordance with the following criteria:

- Good condition - All native strata present;
- Scattered trees with native understorey - Scattered characteristic native trees and native ground layer (> 50 % native ground cover);
- Scattered trees with exotic understorey - Scattered characteristic native trees and exotic ground layer (> 50 % exotic ground cover); and
- Derived native grassland (Poor Condition) – native species present (% composition varies with time of assessment, prevailing seasonal conditions and grazing pressure), species composition derived from Box Gum Grassy Woodland. Poor or highly modified condition.

Cleared land, defined as areas without a native canopy and with > 50 % of the ground cover consisting of exotic species, were mapped as cleared land consistent with the NSW *Native Vegetation Act 2003* (NV Act) and Biobanking Methodology (DECC 2009).

The area and condition of each vegetation type within the BOA is shown in **Table 3** and **Figure 3.**

Table 3: Vegetation condition at 'Kenna' Biodiversity Offset Area

BIOMETRIC VEGETATION TYPE	CONDITION					
	GOOD	SCATTERED TREES WITH EXOTIC UNDERSTOREY	SCATTERED TREES WITH NATIVE UNDERSTOREY	DNG (POOR)	CLEARED	TOTAL
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	13.80	10.97	23.90	428.23		**476.91**
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	551.77		95.99	33.02		**680.78**
White Cypress Pine - Silver-leaved Ironbark - Tumbledown Red Gum shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	10.49					**10.49**
River Red Gum riverine woodlands and forests in the Nandewar and Brigalow Belt South Bioregions		21.13	13.94			**35.06**
Heathy shrublands on rocky outcrops of the western slopes	18.07					**18.07**
Cleared					20.52	**20.52**
Total	**594.13**	**32.10**	**133.83**	**461.26**	**20.52**	**1,241.83**

The vegetation type 'White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregion' relates to the 'White Box-Yellow Box-Blakely's Red Gum grassy woodland' as listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and has capacity to be regenerated to meet the definition of 'White Box – Yellow Box Blakely's Red Gum grassy woodland and derived native grassland' as listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

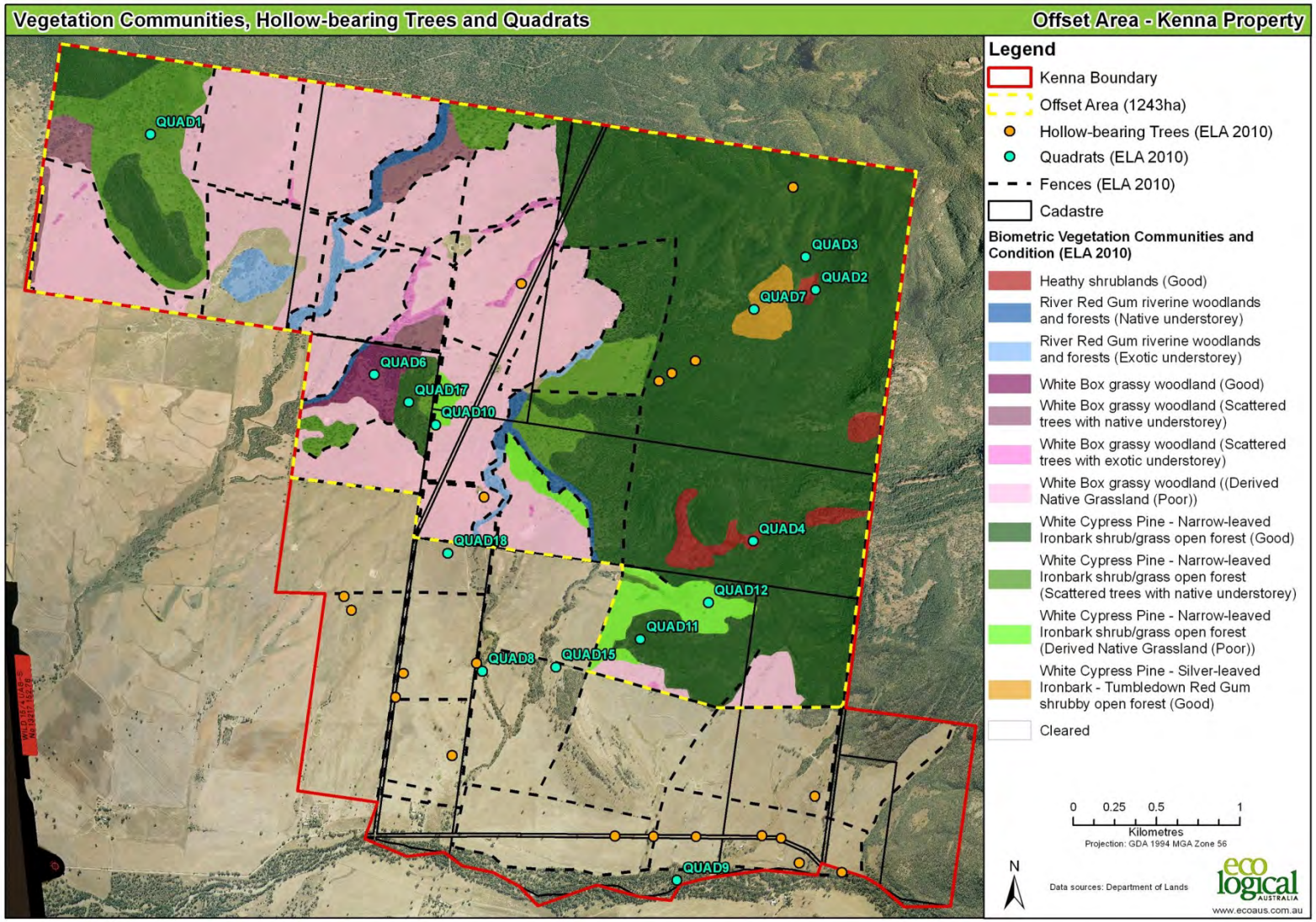

Figure 3: 'Kenna' Biodiversity Offset Area Boundary showing vegetation communities and vegetation condition

2.3.2 Fauna

Fauna surveys were not conducted as part of the preparation of the BOMP. Site reconnaissance undertaken by ELA in August 2010 recorded the general fauna habitat values of the different vegetation types at the BOA (**Table 4**). Baseline fauna surveys will be undertaken as part of the monitoring program outlined in this BOMP and will inform future management actions.

Hollow-bearing trees (HBTs) encountered during the site reconnaissance were recorded and mapped (**Figure 3**, ELA 2010). Six HBTs were recorded within the BOA although this does not represent all HBTs within the BOA. Field surveys noted the majority of hollows were small to medium size suited to birds and bats. Cockatoos and Galahs were observed using many of the larger hollows.

Table 4: General fauna habitat values by vegetation type and condition

VEGETATION TYPE/CONDITION	FAUNA HABITAT VALUES
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	
Good	Hollow bearing trees and woody debris present. Likely to be utilized by birds, mammals, bats and reptiles.
Scattered trees with native understorey	As above
Scattered trees with exotic understorey	Large *Eucalyptus albens* (White Box) with hollows present provides likely habitat for woodland birds, bats, and small nocturnal birds e.g. Nightjars. Nesting habitat for other bird species. Fauna habitat value otherwise limited.
Derived Native Grassland (Poor Condition)	Limited habitat value. Potential for small birds to shelter in long grass e.g. Songlarks and Quails. Potential foraging habitat for lizards and birds of prey due to likely presence of *Mus musculus* (House Mouse).
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	
Good – all strata present	Presence of hollow-bearing trees, woody debris, rocky outcrops, shrubby and grassy formations and abundant leaf litter. Species likely to utilise this community include birds, mammals, bats, and reptiles
Scattered trees with native understorey	Likely to provide habitat for a variety of bird species. Given the presence of *Eucalyptus crebra* (Narrow-leaved Ironbark), hollows are limited. The grassy groundlayer provides potential habitat for small mammals, reptiles and shelter for some small birds (e.g. Songlarks). The rocky features are also likely to provide suitable habitat for reptiles.
Derived Native Grassland (Poor Condition)	Limited habitat value. Rocky areas would provide potential habitat for reptiles and the grassy areas particularly in the east of the site would provide habitat for small birds, reptiles and ground-dwelling mammals.

White Cypress Pine - Silver-leaved Ironbark - Tumbledown Red Gum shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	
Good – all strata present	Presence of hollow-bearing trees, woody debris, rocky outcrops, a shrubby understorey and abundant leaf litter. Species likely to utilise this community include birds, mammals, bats, and reptiles.
Scattered trees with native understorey	Scattered trees are likely to provide nesting habitat for woodland birds and bats may forage throughout the area. The grassy ground layer provides habitat for birds, mammals and reptiles
River Red Gum riverine woodlands and forests in the Nandewar and Brigalow Belt South Bioregions	
Scattered trees with native understorey	Hollow-bearing trees and stags present. Provides habitat for a variety of birds, bats, reptiles and amphibians. The riparian zone along Maules Creek is likely to be used for movement by a variety of fauna species given the fragmented nature of much of the areas outside the riparian corridor.
Scattered trees with exotic understorey	Dense shrub layer that is likely to be used by small birds for shelter. The watercourses also provide habitat for reptiles, ground-dwelling mammals and amphibians and foraging habitat for bats. A number of hollow-bearing trees are present along the drainage lines primarily in areas where Red Gum and White Box are present in the central parts of the site.
Heathy shrublands on rocky outcrops of the western slopes	
Good	Dense shrub layer that is likely to be used by small birds for shelter. The rocky outcrop and pools associated with the waterfall are likely to provide habitat for reptiles and amphibians.

2.3.3 Threatened flora and fauna

Threatened flora and fauna were not surveyed as a part of the preparation of the BOMP. Offset measures for impacts to *Polytelis swainsonii* (Superb Parrot) are addressed in this BOMP in accordance with the conditions of the EPBC Act and EP&A Act approvals.

Pomatostomus temporalis temporalis (Grey-crowned Babbler), a threatened woodland bird, was opportunistically recorded in DNG of White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions. Grey-crowned Babblers nest in white cypress pine which is common and widespread at the site. Management Actions in this BOMP will enhance the condition of the nesting and foraging habitat of *Pomatostomus temporalis temporalis* (Grey-crowned Babbler).

A NSW BioNet search of records on the NSW Wildlife Atlas within 10 km (bounded area North: -30.43 West: 150.2 East: 150.32 South: -30.54) found six threatened fauna species located in the adjacent Mt Kaputar National Park and 1 threatened plant species (OEH BioNet 2012). Baseline flora and fauna inventories will need to be undertaken for the BOA as part of the implementation of this management plan.

Table 5: Threatened Flora and Fauna records (NSW BioNet) adjacent to 'Kenna' BOA

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC STATUS	EPBC STATUS	LIKELIHOOD OF OCCURRENCE
Plant	*Cadellia pentastylis*	Ooline	V,P	V	Potential
Bird	*Neophema pulchella*	Turquoise Parrot	V,P		Potential
	Glossopsitta pusilla	Little Lorikeet	V,P		Potential
	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P		Potential
	Chthonicola sagittata	Speckled Warbler	V,P		Potential
Mammal	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		Potential
	Nyctophilus timoriensis	Greater Long-eared Bat South-eastern form	V,P	V	Potential

V = Vulnerable, P = Protected

2.3.4 Noxious and environmental weeds

Fourteen weed species were observed during the site reconnaissance across the 'Kenna' property. A detailed floristic survey of the BOA is recommended as a baseline to inform management responses as part of this plan. Of the fourteen weed species observed, two weed species are listed as noxious weeds in the Narrabri Shire Council under the NSW *Noxious Weeds Act 1993* (NW Act), these species are listed in **Table 6**. *Opuntia stricta* (Prickly Pear) is scattered within the White Cypress Pine – Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion. Several weed species were sown for pasture qualities that will not be required once the property is destocked.

Table 6: List of noxious and environmental weeds observed on the site

SPECIES NAME	COMMON NAME	NOXIOUS WEED CATEGORY (NSC 2006)	RECOMMENDED CONTROL METHOD(S)#
Opuntia stricta	Prickly Pear	4	Cut and paint technique using a non-specific herbicide* (i.e. glyphosate) Care must be taken not to let segments remain on the ground as they will re-shoot Alternative method: spraying using a backpack sprayer with diesel (fuel) mixed with a surfactant
*Schinus areira**	Pepper Tree	n/a	Tree may provide physical shelter in exposed, cleared areas. Removal only required once alternate habitat provided Control via cut and paint technique using a non-specific herbicide* (i.e. glyphosate)
Echium plantagineum	Patterson's Curse	n/a	Spot spray using a broadleaf herbicide* (e.g. roundup) Avoid spray drift to native species Annual consecutive years of weed control to deplete the weed seed-bank
*Hypochaeris radicata**	Catsear		
*Cerastium glomeratum**	Mouse-ear Chickweed		
*Medicago sp.**	Medic		
*Trifolium arvense**	Haresfoot Clover		
*Trifolium sp.**	Clover		
*Malva parviflora**	Small-flowered Mallow		
*Capsella bursa-pastoris**	Shepherd's Purse		
*Bromus sp.**	Brome		
*Digitaria sp.**			
*Lamium amplexicaule**	Henbit Death nettle	n/a	Spot spray using a broadleaf herbicide* (e.g. roundup) Control seed flushes April – November (Cotton CRC

SPECIES NAME	COMMON NAME	NOXIOUS WEED CATEGORY (NSC 2006)	RECOMMENDED CONTROL METHOD(S)#
			2011) Seed viability is up to 5 years so quite a bit of follow up may be needed Mechanical weeding, including using a small harrow, can be successful for this species when young or at the seedling stage if at high density levels
Araujia sericifera	Moth vine	n/a	Pull out individual plants or scrap and paint with selective herbicide* (e.g. round up)

- Any use of pesticides will be undertaken in accordance with the requirements of the *Pesticides Act 1999*, refer to **Appendix B**, including the use of registered chemicals, training and record keeping requirements.

3 Management strategies

3.1 PROPERTY PLAN

This section outlines a property plan for the purposes of managing the 'Kenna' BOA for conservation.

The 'Kenna' BOA (1,243 ha) will be secured in accordance with conditions of both the EP&A and EPBC Act approvals. NCOPL has received an extension from the DP&I to determine the appropriate mechanism for long-term security. Once the preferred mechanism has been identified NCOPL will update and resubmit the management plans for approval.

The 'Kenna' BOA has been divided into four management zones according to condition and resilience, and therefore similar intervention and recovery strategies. The zones are described below and illustrated in **Figure 4**.

Ecological resilience is defined as the capacity to recover from disturbance. The resilience of the site was categorised as follows:

- Very High resilience – sufficient native vegetation remaining in-situ to enable the natural regeneration of native vegetation. Low levels of management is required to facilitate restoration (Management zone 1);
- High resilience – native vegetation is present, but native species richness needs augmenting. Low levels of management is required to facilitate restoration (Management zone 2);
- Moderate resilience – native species present in the overstorey at low densities and modified understorey with majority exotic species. Active management required to address species composition and structural diversity (Management zone 3); and
- Low resilience – no or very little native vegetation is present and the overstorey has been removed or remains only as isolated paddock trees. Significant levels of active management is required to facilitate restoration, which may include landscape planting of canopy, midstorey and ground covers (Management zone 4).

Zones 1 and 2 have high to very high levels of resilience and only require minor intervention works including weed/feral animal control, light, periodic, conservation grazing until stock removal and implementing sensitive fire management regimes. Zones 3 and 4 have relatively low levels of resilience (the ability for native vegetation to naturally regenerate) and will require intervention through weed/feral animal control and extensive revegetation works.

The BOMP has been designed to be part of an 'adaptive management' framework, whereby should any one aspect of the BOMP be identified as performing poorly against the performance criteria, then additional aspects of the BOMP are to be implemented to ensure positive outcomes are achieved.

The revegetation methodologies provided are indicative only and used as a basis for developing management actions. NCOPL has the ability to vary the specified revegetation methodology because of issues with availability of numbers and diversity of species and/or equipment/labour. Also opportunities for direct seeding will be undertaken in circumstances that allow and rates/densities may be modified given changes in environmental conditions (either natural regrowth or poor soil moisture etc).

3.2 MANAGEMENT STRATEGIES

This section describes the management zones at the 'Kenna' BOA and sets the strategic management objectives and actions for each zone.

Management of *Polytelis swainsonii* (Superb Parrot) as required by EPBC Approval condition 2b, and EP&A Project Approval 08_0144 Schedule 5, Condition 6d is addressed in each zone where foraging habitat is present. *Polytelis swainsonii* (Superb Parrot) feeds on a range of plant species, including grasses and wattle species. The species typically uses wooded corridors for local foraging movements between patches (Baker-Gabb 2011). If baseline surveys indicate the presence of rabbits, feral cats or red foxes in any zone, baiting programs will need to consider potential impacts on Superb Parrot to avoid accidental poisoning.

The number of native species (species richness) for each vegetation type reflects the results of field surveys undertaken in August 2010. Conservation management actions to improve native species richness aim to restore species richness to benchmark values over time (refer to **Table 12**).

3.2.1 Management Zone 1 –Very High Resilience

Management Zone 1 is 594 ha and mainly located at the east of the 'Kenna' property with three smaller outliers in the west. Management Zone 1 is characterised by intact vegetation with good native species richness, all strata present and remnants generally in good condition. There are four vegetation types represented in this zone (shown in **Table 7**). Whilst all areas have undergone some level of past disturbance (including logging) and are currently lightly grazed, and there is greater species diversity than in other zones.

The primary management objective in this zone is to maintain vegetation structural and species diversity, exclude stock, remove threats to biodiversity, conduct baseline surveys and implement ongoing monitoring of condition to detect changes in vegetation condition to inform adaptive management procedures.

Polytelis swainsonii (Superb Parrot) may potentially occur in this zone in areas of White Box grassy woodland and White Cypress Pine – Narrow leaved Ironbark shrub/grass open forest where *Austrodanthonia* spp. (Wallaby grass) and Acacia sp (Wattle) occur in the understorey and midstorey (Baker-Gabb 2011, Webster 1988). The species will benefit from the removal of grazing pressure, retention of hollow bearing trees for potential nesting sites, and retaining habitat connections through woody cover to other parts of 'Kenna'.

Table 7: Vegetation Characteristics in Management Zone 1

VEGETATION TYPE	DOMINANT CANOPY SPECIES	MID STOREY SPECIES	GROUND COVER SPECIES	NATIVE SPECIES RECORDED IN PLOTS	QUADRAT NO. #
Heathy shrublands,	*Eucalyptus dealbata (mallee form), Callitris glaucophylla*	*Micromyrtus sessilis, Cryptandra propinqua, Pimelea neo-anglica*	*Cymbopogon refractus, Aristida* sp., *Austrostipa* sp., *Cheilanthes sieberi, Gonocarpus elatus, Geranium* sp.	29	4
White Cypress Pine – Silver leaved Ironbark – Tumbledown Red Gum shrubby open forest	*Callitris glaucophylla, Eucalyptus melanophloia. E. dealbata* in some areas	*Beyeria viscosa, Acacia* sp., *Indigofera adesmiifolia*	*Austrostipa scabra, Eragrostis sp, Aristida ramosa, Aristida* sp., *Enneapogon* sp., *Cymbopogon refractus.* – Up to 85% bare ground/rock	19	7
White Cypress Pine – Narrow leaved Ironbark shrub/grass open forest	*Callitris glaucophylla, Eucalyptus crebra. E. albens, E. dealbata, Alphitonia excelsa* in some areas	*Beyeria viscose, Olearia elliptica, Notelaea microcarpa, Acacia. cheelii, Cassinia quinquefaria, Melichrus urceolatus*	*Austrostipa scabra, Eragrostis* spp., *Aristida ramose, Enneapogon, Cymbopogon refractus, Austrodanthonia* sp., *Panicum effusum*	23	3,11
White Box grassy woodland.	*Eucalyptus albens, Callitris glaucophylla*	*Geijera parviflora, Brachychiton populneus, Pimelea neo-anglica*	*Bothriochloa decipiens, Austrostipa scabra, Eragrostis leptostachya, Aristida* sp., *Sporobolus creber, Chloris truncata, Austrodanthonia* sp.	27	6

Management actions in this zone include:

- Conduct baseline flora and fauna surveys to identify original reference condition for measuring future changes in condition, and to inform extent and location of weed management interventions;

- Grazing exclusion to promote understorey recovery and reduce competition for food with *Polytelis swainsonii* (Superb Parrot);
- Management of human disturbance including signage (and compliance checks) to prevent unauthorised entry/use;
- Retain dead timber (prevent fire wood collection);
- Minor weed removal and ongoing monitoring to compliment adjacent areas. *Opuntia stricta* noted in areas of intact "Heathy shrublands on rocky outcrops of the Western slopes'; and
- Targeted control of foxes, rabbits, goats and pigs required across whole BOA. Goats noted in 'White Cypress Pine Narrow-leaved Ironbark open forest' and 'Heathy shrublands on rocky outcrops of the Western slopes'.

3.2.2 Management Zone 2 – High Resilience

Management Zone 2 is distributed across 134 ha adjacent to good condition vegetation in Management Zone 1. It is characterised by native vegetation with scattered trees and native understorey (**Table 8**).

The management objectives in this zone are to restore native species richness to all strata, initially through passive regeneration assisted by removal and treatment of threats, followed by active regeneration if required. The high resilience of the vegetation in Management Zone 2 should enable natural regeneration in structural and species diversity to improve fauna habitat capacity over time (McIntyre et al. 2001). Management Zone 2 will augment and buffer the core conservation areas in Management Zone 1 and provide habitat connectivity to water courses on the 'Kenna' BOA and to adjoining areas.

Polytelis swainsonii (Superb Parrot) may potentially occur in this zone in areas of White Box grassy woodland, White Cypress Pine – Narrow leaved Ironbark shrub/grass open forest and River Red Gum riverine woodlands and forests in the Nandewar and Brigalow Belt South Bioregions. The management actions listed below will reduce threats and enhance potential foraging habitat for this species.

Table 8: Vegetation Characteristics in Management Zone 2

VEGETATION TYPE	DOMINANT CANOPY SPECIES	GROUND COVER SPECIES >50% NATIVE	NATIVE SPECIES RECORDED IN PLOTS	QUADRAT NO. #
White Cypress Pine – Narrow leaved Ironbark shrub/grass open forest	Scattered trees including *Callitris glaucophylla, Eucalyptus crebra.*	*Eragrostis* sp.*, Aristida* spp.*, Cymbopogon refractus, Sporobolus creber, Panicum effusum, Digitaria* sp.*, Wurmbea dioica, Geranium* sp.*, Vittadinia cuneata, Daucus glochidiatus, Crassula* sp. Previously improved with *Medicago* sp.**, Trifolium glomeratum*.* Scattered *Opuntia stricta**	19	1
White Box grassy woodland.	Canopy intact *Eucalyptus albens, Callitris glaucophylla, scattered E. crebra*	*Bothriochloa decipiens, Austrostipa scabra, Eragrostis leptostachya, Aristida* sp.*, Sporobolus creber, Chloris truncata, Austrodanthonia* sp. Previously improved *with Medicago* sp.**, Trifolium glomeratum**	Less diverse ground cover	6
River Red Gum riverine woodlands and forests in the Nandewar and Brigalow Belt South Bioregions	*Eucalyptus camaldulensis, Casuarina cunninghamiana, Angophora floribunda* Small trees (mid storey) *Acacia* sp.*, Brachychiton populneus*	*Austrostipa verticillata, Microlaena stipoides, Dichondra repens, Cerastium glomeratum*, Araujia sericifera*, Hypochaeris radicata*, Sida rhombifolia*, Medicago* sp.**, Bidens pilosa**	15	9

* denotes exotic species

Management actions in this zone include:

- Conduct baseline flora and fauna surveys to identify original reference condition for measuring future changes in condition, and to inform extent and location of weed management interventions (refer to Section 4);
- Periodic, light grazing permitted e.g. cell grazing. Grazing removal to be timed to coincide with maximum native ground cover (typically associated with seasonal rains in mid-late summer) and minimum exotic species dominance of ground cover to avoid interim deterioration of condition and avoid resource competition for *Polytelis swainsonii* (Superb

parrot). This will increase fauna habitat values including for *Pomatostomus temporalis temporalis* (Grey-crowned Babbler). Grazing must be actively managed to balance the objectives of overstorey regeneration and agricultural weed suppression. Temporary stock exclusion fencing will be required to protect high conservation areas (zone 1). In the mid-term (>5yrs) grazing will be excluded to accommodate supplementary plantings or promote further maturation of natural regeneration;

- Management of human disturbance including signage at external access points to the BOA (and compliance checks) to prevent unauthorised entry/use;
- Retain dead timber including standing and fallen (prevent fire wood collection) to protect habitat niches;
- Weed removal to support adjacent core areas (Management Zone 1). *Opuntia stricta* noted in 'White Cypress Pine – Narrow leaved Ironbark shrub/grass open forest' (February/October growing season);
- Feral animal management to support adjacent core areas. Targeted control of foxes, rabbits, goats and pigs required across whole BOA. Goats observed in 'White Cypress Pine – Narrow leaved Ironbark shrub/grass open forest'; and
- Revegetation plantings will be undertaken in instances where monitoring indicates that natural regeneration is poor after five years (refer to Section 4). Revegetation species selection, density and methods are outlined in Section 3.3.12.

3.2.3 Management Zone 3 – Moderate Resilience

Management Zone 3 is a relatively small 32 ha and restricted to creek lines across 'Kenna'. Two vegetation types are present (**Table 9**) and the zone is characterised by scattered trees in the canopy layer and >50% exotic species in the understorey. The management objectives in this zone are to improve biodiversity values and restore habitat connectivity through strategic revegetation and threat removal.

Polytelis swainsonii (Superb Parrot) may potentially occur in this zone in areas of White Box grassy woodland and River Red Gum riverine woodlands and forests in the Nandewar and Brigalow Belt South Bioregions. The same species protection measures from zone 1 & 2 are applied to management actions, however, grazing exclusion will be a long term objective following successful weed suppression and regeneration of native species.

Table 9: Vegetation Characteristics in Management Zone 3

VEGETATION TYPE	DOMINANT CANOPY SPECIES	MID STOREY SPECIES	GROUND COVER SPECIES >50% NATIVE	NATIVE SPECIES RECORDED IN PLOTS	QUADRAT NO. #
White Box grassy woodland.	*Eucalyptus albens, Callitris glaucophylla,*		*Medicago* sp.*, *Trifolium* sp.*, *Bromus* sp.*	N/A	18
River Red Gum riverine woodlands and forests in the Nandewar and Brigalow Belt South Bioregions	*Eucalyptus dealbata, E. Blakelyi*	*Melaleuca bracteata, Geijera parviflora, Casuarina glauca, Callitris glaucophylla*	*Medicago* sp.*, *Aristida* sp., *Austrostipa verticillata, Bothriochloa decipiens, Sporobolus creber, Cotula australia, Oxalis* sp., *Rumex brownii*	15	8

* denotes exotic species

Management actions in this zone include:

- Conduct baseline flora and fauna surveys to identify original reference condition for measuring future changes in condition, and to inform extent and location of weed management interventions;
- Exclude grazing from riparian areas. Periodic, light grazing of remnant patch of 'White Box grassy woodland' permitted with appropriate management as per zone 2. This will minimise soil erosion along creeklines, facilitate understorey recovery, protect potential foraging habitat for *Polytelis swainsonii* (Superb Parrot). In the mid-term (>5yrs) grazing will be excluded to accommodate supplementary plantings or promote further maturation of natural regeneration;
- Management of human disturbance including signage (and compliance checks) to prevent unauthorised entry/use;
- Develop and implement targeted weed management strategy following baseline surveys. It is likely that there will be a significant weed seed bank from previous agricultural land uses and weed management will need to respond to prevailing seasonal conditions that determine species dominance;
- Develop and implement a feral animal management control plan. Targeted control of foxes, rabbits, goats and pigs required across whole BOA. Goats (sighted on property August 2010), rabbits and foxes;
- Targeted revegetation planting of the DNG of 'White Box grassy woodland' will be undertaken in instances where monitoring indicates that natural regeneration is poor after five years (refer to Section 4). Revegetation species selection, density and methods are outlined in Section 3.3.12. Revegetation in Zone 3 aims to enhance vegetation condition and restore connectivity for flora and fauna species including *Polytelis swainsonii* (Superb Parrot); and
- Erosion and sediment control in riparian areas, in-fill planting scheme to widen vegetated areas to stabilise soil erosion.

3.2.4 Management Zone 4 –Low Resilience

Management Zone 4 covers 461 ha of DNG distributed across 'Kenna'. There are 2 main vegetation types (**Table 10**) that require active management to improve native species richness and structural diversity. Within the zone, habitat connectivity between large intact patches and reducing edge effects by buffering vegetation in Management Zones 2 and 3 are a priority. Whilst natural regeneration is optimal for species integrity, the poor baseline condition of vegetation means zone 4 has low resilience to recover from disturbance without a revegetation regime to compliment threat abatement and conservation management. Direct seeding is recommended in Zone 4 as a cost-effective way to re-establish native vegetation over broad areas that often results in a more natural distribution of species across a site than planting. Should direct seeding prove to be ineffective than NCOPL will supplement the direct seeding with tube stock planting and/or landscaping etc to meet the completion criteria for this zone.

Polytelis swainsonii (Superb Parrot) may potentially occur in this zone in the derived native grassland of White Box grassy woodland and White Cypress Pine – Narrow leaved Ironbark shrub/grass open forest as it is known to feed in crops of *Triticum aestivum* (wheat) or *Avena sativa* (oats) if required (SEWPaC website accessed 20/4/12).

Table 10: Vegetation Characteristics in Management Zone 4

VEGETATION TYPE	DOMINANT CANOPY SPECIES	GROUND COVER SPECIES >50% NATIVE	NATIVE SPECIES RECORDED IN PLOTS	QUADRAT NO. #
White Box grassy woodland.	*Eucalyptus albens, Callitris glaucophylla,*	*Medicago* sp.*, *Trifolium* sp.*, *Bromus* sp.*	N/A	18
White Cypress Pine – Narrow leaved Ironbark shrub/grass open forest	Scattered trees *Callitris glaucophylla, Eucalyptus crebra.*	*Eragrostis* spp., *Aristida* spp., *Cymbopogon refractus, Sporobolus creber, Panicum effusum, Digitaria* sp., *Wurmbea dioica, Geranium* sp., *Vittadinia cuneata, Daucus glochidiatus, Crassula* sp. Previously improved *with Medicago* sp.*, *Trifolium glomeratum**. Scattered *Opuntia stricta**		

* denotes exotic species

Management actions in this zone include:

- Conduct baseline flora and fauna surveys to identify original reference condition for measuring future changes in condition, and to inform extent and location of weed management interventions;
- Develop and implement a weed control regime (prior to revegetation planting). Note additional environmental and noxious weed species may be present at the time of survey;

- Conservation grazing to reduce weed infestations and fire hazards until direct seeding events, thereafter grazing exclusion;
- Control of over abundant native herbivores in consultation with adjacent landholders (including OEH);
- Develop and implement a feral animal management control plan. Targeted control of foxes, rabbits, goats and pigs required across whole BOA;
- Targeted revegetation of the DNG using direct seeding with local endemic species of pre-clearing vegetation type (refer to section 3.1.12) to enhance native flora diversity and increase fauna habitat values including for *Polytelis swainsonii* (Superb Parrot) and *Pomatostomus temporalis temporalis* (Grey-crowned Babbler);
- Should direct seeding prove to be ineffective in meeting the completion criteria for this zone then NCOPL will supplement the seeding with tube stock planting and/or landscaping etc; and
- Management of human disturbance including signage (and compliance checks) to prevent unauthorised entry/use.

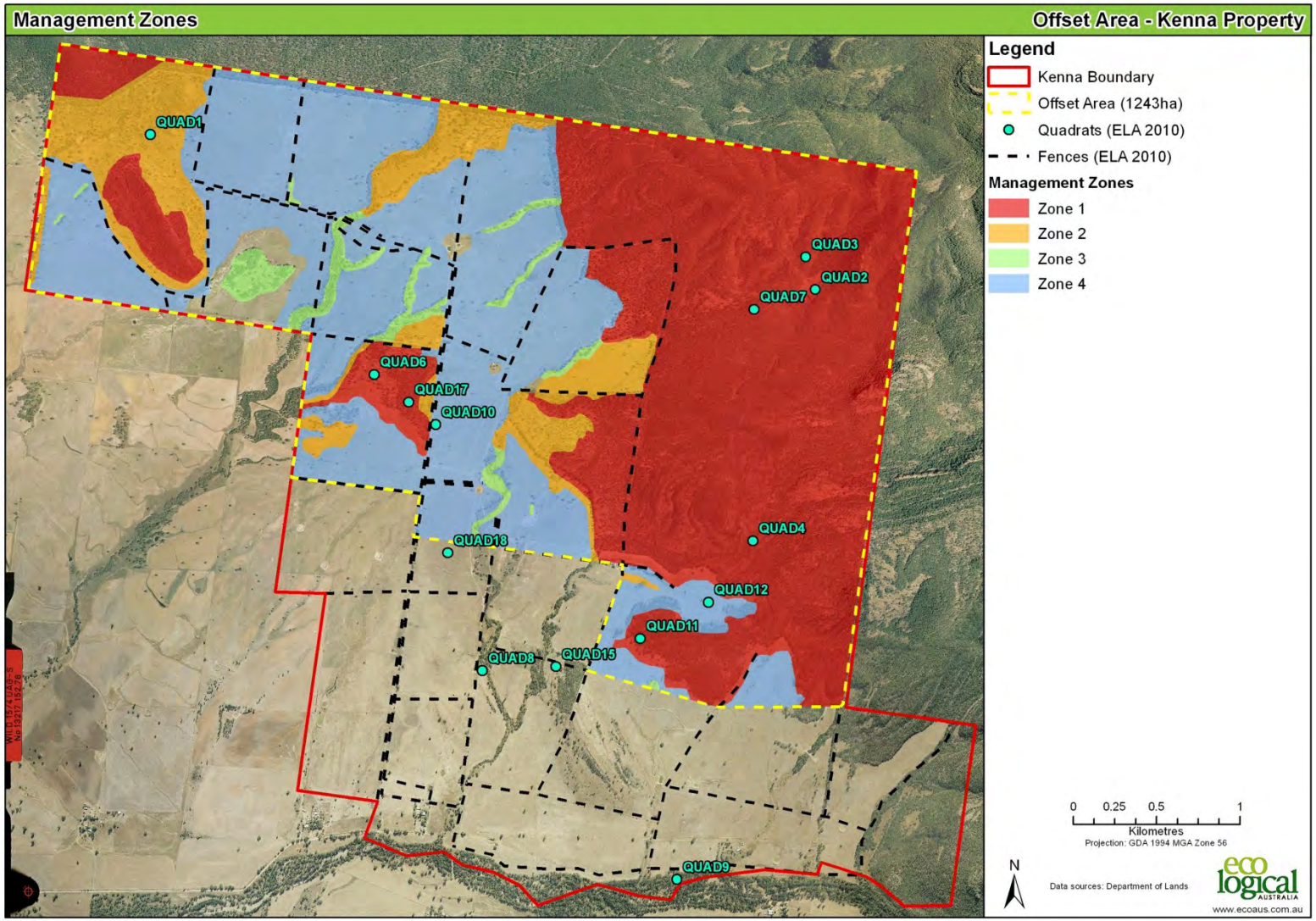

Figure 4: Management Areas

3.3 MANAGEMENT ACTIONS

This section outlines the management actions that will be undertaken at the 'Kenna' BOA including addressing the requirements identified in PA 08_0144 and EPBC 2009/5003. These management actions apply to the offset area under NCOPL control prior to transfer to NPWS.

The objective of all management actions is to improve the biodiversity values of the 'Kenna' BOA to meet an 'improve or maintain' outcome (as defined in the *Native Vegetation Regulation 2005* and the Biobanking Assessment Methodology). The conservation management strategy has been designed to enhance structural diversity and compositional diversity (species richness) of the remnant vegetation on 'Kenna' to provide flora and fauna habitat to offset the direct and indirect impacts of the Narrabri Mine Stages 1 and 2.

3.3.1 Management of Aboriginal Cultural Heritage Items/Sites

The management of cultural heritage values in the 'Kenna' BOA will be undertaken in accordance with the "*NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects*", developed by the NSW Minerals Council in 2010.

This minerals industry due diligence code of practice outlines six (6) steps that should be followed for surface disturbance works. These steps are outlined below and will be adopted for surface disturbance works on the 'Kenna' BOA:

Step 1: Check for records of Aboriginal Objects and Places in the Area of Proposed Activity. This will be undertaken utilising the Aboriginal Heritage information Management System (AHIMS) and the list of Aboriginal Places on the OEH website.

Step 2: Is the Activity a 'Low Impact Activity', as Defined by the NPW Regulation? 'Low Impact Activities', as defined by the *National Parks and Wildlife Amendment Regulation 2010* (NPW Regulation), may be undertaken without the need for due diligence, e.g. land management activities such as maintaining existing fences. It is important to note that the 'Low Impact Activity' does not apply where scarred trees are present and that a search as mentioned in Step 1 will be undertaken prior to any surface disturbance activities.

Step 3: Are there any Landscape Features on Undisturbed Land that are Likely to Indicate the Presence of Aboriginal Objects? Further investigations will be required if the proposed activity is not on disturbed land and is: within 200m of waters; located within a sand dune system; located on a ridge top, ridge line, or headland; located within 200m below or above a cliff face; and/or within 20m of or in a cave, rock shelter, or a cave mouth.

Step 4: Does a Desktop Assessment and Visual Inspection Confirm that there are Aboriginal Objects Present or Likely to be Present? If there is undisturbed land and landscape features mentioned above then a desktop assessment and visual inspection will be required. The visual inspection should be conducted by a person with expertise in locating and identifying Aboriginal objects.

Step 5: Can the Activity be Relocated Away from the Known/Likely Area for Aboriginal Objects? Relocation of the activity is the preferred alternative where Aboriginal objects are present, or a likely to be present. If it is not possible to move the activity then further assessment and consideration of an Aboriginal Heritage Impact Permit (AHIP) application should be made. Any culturally modified trees will remain *in situ*.

Step 6: Commence Investigations for an AHIP. Professional advice will be sought to prepare an AHIP application required under the *National Parks and Wildlife Act 1974* (NPW Act).

In addition to the above, in the event of the discovery of a potential site or artefact, the following procedure will be followed.

1. Work will cease in the area of discovery.
2. If the area of discovery is in deposited material, then work will also cease in the area where the material originated from.
3. The person discovering the artefact will notify the Property Manager who will ensure that work has ceased and area(s) is(are) cordoned off with tape.
4. The Property Manager will:
    (a) request a qualified archaeologist to attend the site and advise on its archaeological significance;
    (b) request the site monitor from the Narrabri LALC and the Gomeroi Narrabri People if not already present to attend and advise on its cultural significance in consultation with the qualified archaeologist; and
    (c) if the find is determined to be a site, notify the OEH with the advice from the archaeologist and the Narrabri LALC and Gomeroi Narrabri People for determination of further procedures.
5. If the find is confirmed as a site, an AHIP will be applied for as outlined in Step 6 above.

3.3.2 Management of human disturbance/restricting access

Unauthorised access to the whole 'Kenna' BOA will be prohibited and actively enforced . This will prevent soil disturbance, weed dispersal, fauna habitat disturbance and illegal rubbish dumping. Avoiding soil disturbance is an effective means to prevent weed establishment (McIntyre et al. 2002).

Access by NPWS personnel (and NPWS authorised contractors) will be allowed to the 520ha of proposed land transfer along the existing 'track in use' that roughly aligns with the crown road easement (**Figure 5**).

NCOPL will appoint a Biodiversity Offset Area Property Manager who will be responsible for coordinating the implementation and reporting on all aspects of this management plan. The approval of the Property Manager must be obtained for any access to or activities on or in the 'Kenna' BOA. Personnel will only be permitted into the offset area to undertake management and monitoring actions identified through this BOMP.

3.3.3 Fencing and signage

NCOPL will maintain external fencing around the entire BOA to restrict human and stock access. Signage will be erected to identify the site as a BOA and prohibit 4WD, trail bikes, rubbish dumping, camping, shooting, fires and unauthorised access. The signage will be supplemented by a direct communication strategy with adjoining landholders to encourage compliance and support for conservation objectives.

Some fencing will be required to protect revegetation works and to meet interim conservation grazing objectives. Internal fencing will be maintained as an interim management measure where it excludes stock to enable natural regeneration. Temporary stock exclusion fencing is recommended to supplement existing fencing to manage grazing pressure appropriate to each zone. **Figure 5**

illustrates the fences required to compliment the revegetation strategy. Barbed wire is not recommended for new temporary, internal fencing. The long term objective will be to remove all internal fencing to minimise obstructions to fauna movements.

3.3.4 Management of grazing for conservation

Grazing management on 'Kenna' will be conducted to support primary conservation objectives in a deliberate shift from historical productivity objectives. Grazing by domestic stock reduces food and habitat resources for native animals, however, light to moderate grazing by stock can be compatible with native grassland management as it may be used to suppress weeds (McIntyre et al. 2002). In the mid- term grazing will be excluded from the BOA once weed infestations have been minimised and plantings completed.

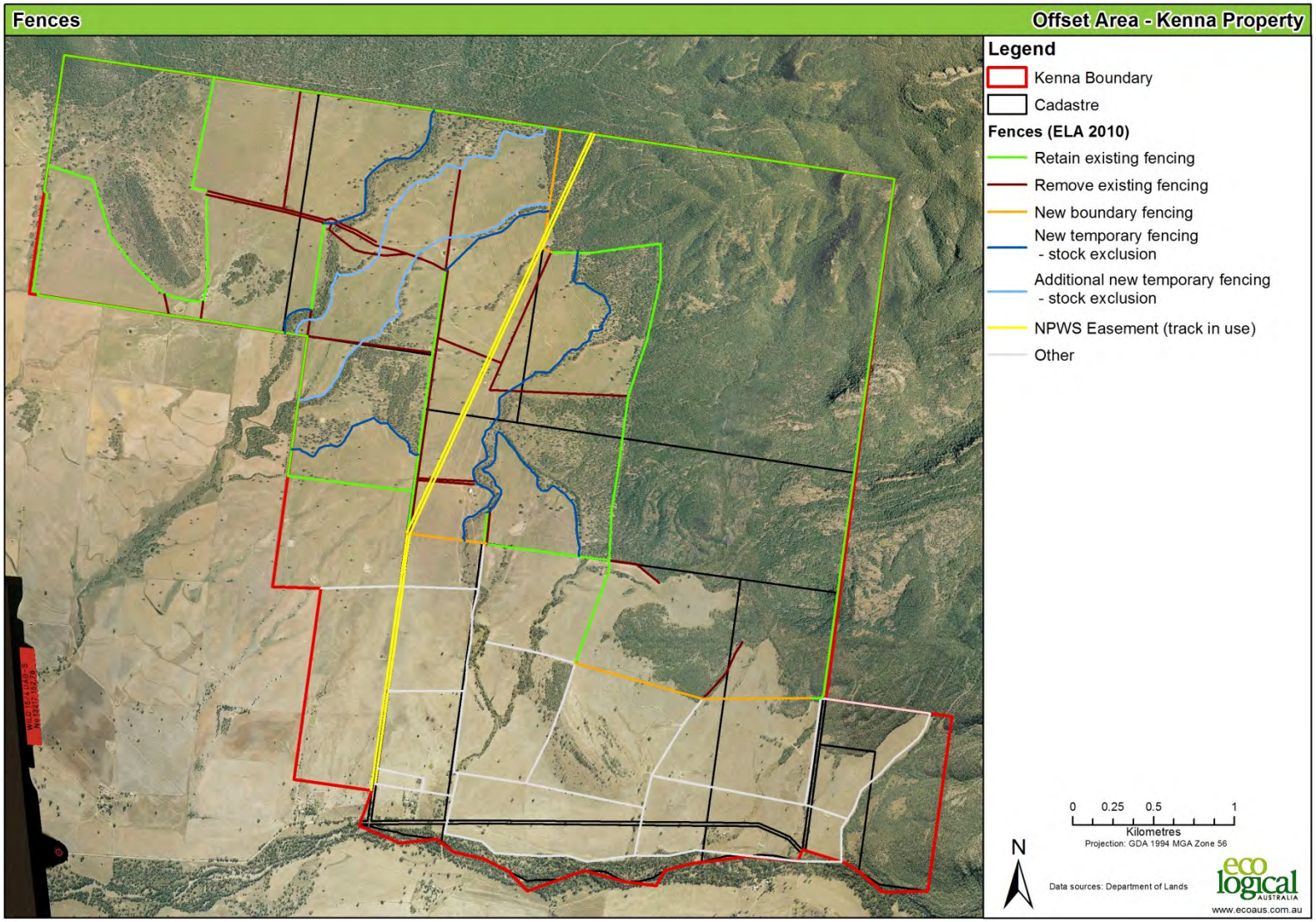

Figure 5: Fences in the Biodiversity Offset Area

3.3.5 Weed control

There are two aspects to weed control at the 'Kenna' BOA:

1. General control of environmental weeds; and

2. Targeted control of noxious weeds.

The removal and on-going control of noxious and environmental weeds will be undertaken to improve the condition of remnant vegetation in the BOA.

Baseline condition surveys will be conducted as part of this BOMP and will inform the type and extent of weed infestations on site. The proposed weed control strategy involves:

- Control of all *Opuntia stricta* infestations by manual removal (i.e. dug out by shovel) or spot spraying with diesel (fuel) mixed with surfactant (using back pack sprayer), refer to **Appendix B**. All plant material dug out will be bagged and disposed on site (outside of management zones) to prevent regeneration from vegetative material. Plant material is not to be left in contact with the ground and should either be buried, wrapped in black plastic, or burned;
- Conservation grazing management to suppress environmental and pasture weeds in Zones 2, 3 and 4. If NCOPL elect not to graze areas (and save temporary fencing costs), areas of DNG should be slashed regularly for weed control;
- Maintenance of ground cover in grazed areas to prevent new infestations. Grazing to be selectively removed to facilitate maximum native ground cover;
- Spot spraying infestations of environmental weeds using a selective herbicide prior to flowering, herbicide use to be undertaken in accordance with the *Pesticides Act 1999*, (per **Table 6** and refer to **Appendix B**);
- Spot spraying of environmental weeds as part of annual works program with a minimum three years consecutive control of persistent infestations to reduce seed bank;
- Specific spot spraying events ahead of planting schedule (to minimise competition for newly established plants); and
- Follow up work will be required for all species to control new growth.

3.3.6 Bushfire management

Prescribed Burning Regime

No prescribed burning will be implemented in Management Zones 3 & 4 until planted trees are mature and able to withstand the impact of fire. Fire intervals for grassy woodlands have been identified as being a minimum of eight years and a maximum of 40 years for grassy woodlands (Bush Fire Coordinating Committee 2008). For Dry sclerophyll forest (shrub/grass formation) recommended intervals range from five years to fifty years. For Dry sclerophyll forest (shrub formation) and heath lands this reduces to between seven and thirty years. The recommended minimum interval for semi-arid woodlands (grassy subformation) is six years and for shrubby subformation ten years. Burns should be low intensity ground burns only.

Small fire breaks will be maintained along existing or new fence lines installed as part of this BOMP. These breaks will double as access for the Rural Fire Service (RFS) in the event of wildfire, and will be maintained annually by slashing the fire breaks.

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

Fire Fighting Equipment

NCOPL will engage with the local RFS in relation to the site and its intended protection for conservation purposes as the RFS will be used in any bushfire event. This will be to inform local RFS members of the site so they understand:

- potential for fire risk;
- access points across the property; and
- location of watering points.

3.3.7 Retention of regrowth and remnant native vegetation

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. Clearing native vegetation in the 'Kenna' BOA is not permitted.

Exceptions to this rule include maintenance of fence lines, minimal clearing required to erect new fences as shown in Figure 5, and management tracks associated with the 'Kenna' BOA. For example if a tree or shrub is growing through or falls on the fence line this will damage the fence and potentially provide access for livestock to the offset area. This vegetation will be removed using minimal disturbance techniques. All waste from the clearance of this vegetation will remain in situ in the BOA away from any fence lines or management tracks. NCOPL will maintain an access track to the north western boundary with Mt Kaputar National Park (**Figure 5**).

3.3.8 Retention of dead timber

Dead standing and fallen timber will be retained in all Management Zones except in designated boundary fire breaks. This will provide micro habitats for roosting, breeding and shelter. In addition to fauna habitat for insects, reptiles, birds, and mammals, fallen timber is recognised as an important successional habitat for specialised colonising plants (DEC 2003).

3.3.9 Erosion & sedimentation control

Erosion and sediment control is required in drainage lines in Management Zone 3. The proposed treatment is to:

- Remove stock grazing in riparian areas to prevent further erosion;
- Periodically monitor the status of creeklines to identify significant erosion hotspots that require remediation (methods may include retaining natural snags to slow water velocity, battering off steep areas, jute matting and rock lining of creek banks); and
- Increase vegetation cover in the creeklines and on the banks, making them more stable and less vulnerable to soil erosion.

Control of grassy or herbaceous weeds along the creek lines will be selective until there is greater than 50% cover of native vegetation, as all vegetation cover (native and exotic) will aid in the stabilisation of the creekline. Selective weed control works will be required to prevent the creation of bare areas of soil. All woody weeds found occurring in the creek line will be controlled by the cut and paint method as this will retain the root structure of the plant in the bank and assist in holding the soil together. Woody debris from weed control is to be left in the creek bed provided the species cannot shoot from vegetative material.

3.3.10 Soil and water management

There are currently no soil and water management actions required outside of erosion and sedimentation control measures outlined above.

3.3.11 Retention of rocks

All rocky habitat in the 'Kenna' BOA will be retained and will not be removed for any purpose.

3.3.12 Vertebrate pest management program

Control of feral animals and over abundant native herbivores will be undertaken in all zones of the 'Kenna' BOA. The total grazing pressure from native and feral animals will be monitored annually and an adaptive management approach used. The location of dams and watering points will be mapped to inform monitoring, baiting and control activities. Feral goats have been observed to be impacting the 'Kenna' BOA. Rabbits and foxes are also likely to be present. Pigs and deer may be using the area intermittently.

A Vertebrate Pest Management Program will be developed in consultation with adjoining landholders (including OEH) for maximum efficacy. The proposed strategy includes:

- Shooting feral goats using a high powered (calibre) rifle as humanely as possible (i.e. a single shot to head);
- Joint aerial control of feral goats with OEH;
- Obtaining a permit from OEH for controlled culling (by shooting) Eastern Grey Kangaroos if required;
- Fox baiting using 1080 poison or pindone baits with safety precautions. Fox control will be undertaken through a baiting programme across the BOA as necessary. Fox control should be undertaken in autumn, when young foxes are leaving the den and dispersing and in spring, when foxes are breeding; and
- Rabbit baiting (as fox) with warren destruction if found.

The feral animal control strategy must consider potential adverse impacts on Superb Parrot which is vulnerable to poisoning from rabbit and fox baiting (Baker-Gabb 2011). If Superb Parrot is detected on 'Kenna' fox baits should be buried and den ripping used for control of rabbits. New biological control methods may be investigated if required.

3.3.13 Revegetation strategy

The Revegetation Strategy uses three approaches to encourage and establish native vegetation across the BOA (natural regeneration, direct seeding and planting). The benefits and limitations of each are outlined in **Table 11**.

Table 11: Costs and benefits of revegetation techniques

	Natural regeneration	Direct seeding	Landscape planting
Establishment Cost	(+) Lowest	(+) Moderate	(-) High
Adaption	(+) Plants are well-adapted to the site	(+) Natural look and more diversely structured	(-) Often results in unnatural looking rows
Establishment Timeframe	(-) Potentially the longest establishment timeframe	(-) Moderate establishment times	(+) Fast, more reliable timeframe (+) Revegetation is immediately visible to passers by
Seed Availability and Sources	(-) Needs an adjacent seed source or soil stored seed bank	(-) Requires the largest amount of seed.	(+) Uses small quantities of seed
Health	(+) Establishes healthiest plants	(+) Establishes healthier plants	(-) Health is related to the seed source and maintenance performed

(-) = negative aspect (cost), (+) = positive aspect (benefit), Source ELA (2011b)

The approach recommended for each zone applies adaptive management principles:

- Zone 1: Natural regeneration to be facilitated by weed and stock management. No planting is proposed;
- Zone 2: Natural regeneration to be facilitated by weed and stock management. Landscape planting will only be undertaken to re-establish over-storey and mid storey species if natural regeneration is not observed after five years of commencement of stock exclusion. No planting proposed for understorey species;
- Zone 3: Landscape planting of mid and understorey species will be undertaken to improve native species richness. Additional landscape planting of canopy species will only be undertaken if natural regeneration is not observed after five years of commencement of stock exclusion; and
- Zone 4: Weed management prior to and maintenance after direct seeding of mixed canopy, mid and understorey species will be undertaken. Should direct seeding prove to be ineffective than NCOPL will supplement the direct seeding with tube stock planting and/or landscaping etc to meet the completion criteria for this zone.

Wherever possible, the seed for the planting program will be collected from the 'Kenna' BOA. Seeds should be prepared for direct seeding (% mix) or propagated for planting as 'Hiko' tube stock by a specialist native species propagation nursery.

Areas to be planted with tube stock are to be deep ripped to 500 mm followed by topsoil cultivation. Weed control including knockdown and pre-emergent herbicide are likely to be required prior to and after planting.

Areas to be direct seeded will be slashed prior to planting. Direct seeding is only to be undertaken during the optimum period of growth for the majority of species being seeded (typically late winter / early spring). Methods of direct seeding depend on safe machine access with minimal disturbance of existing native vegetation and soil erosion. Two main methods may be used for revegetation:

- **Mechanised direct seeding**: A direct seeding machine, or seed box, is used; typically towed by a tractor on a three point linkage system. This approach is useful as it prepares the seed bed and plants the seed in one operation. Limitations include that it is only suited to seed which can easily pass through the machinery, such as Acacia species, and to areas with a slope of 3:1 or less;
- **Hand seeding**: Hand seeding (or other air delivery systems) is useful for native grass and eucalyptus seed which is unable to pass through a seed box. Hand seeding also allows for revegetation in restricted areas. The approach is usually more labour intensive than using a seed box.

The following rates for direct seeding of native species (per ha) is recommended based on experience with broad-acre revegetation in similar climatic regions (ELA 2011b):

- Tree species – 200g/ha;
- Shrub species – 300g/ha; and
- Grass species – 5,000g/ha.

Tube stock are to be planted in 'Hiko' cells in autumn and spring to capitalise on greater soil moisture and reduced heat stress with follow up watering as required.

Plant density will depend on the amount of existing vegetation and the results of natural regeneration. All vegetation types are to be managed towards the benchmark range canopy cover per Biometric vegetation type (**Table 12**). As a guide, a density of one tree per 100 m 2 (one every 10 metres) will achieve a final density of one tree every 200 m2 or a canopy cover of between 5-25% as per the benchmark for the 'White Box grassy woodland' vegetation type, assuming a 50% success rate. This planting density allows for time lag to maturation and mixed success of plantings.

Species selection will be determined by parent vegetation type. **Table 13** outlines recommended species for each vegetation type.

Table 12: Biometric Benchmark Values per Vegetation type

VEG TYPE NAME	NATIVE OVER-STOREY COVER*	NATIVE MID-STOREY COVER *	NATIVE GROUND COVER* (grasses)	NATIVE GROUND COVER * (shrubs)	NATIVE GROUND COVER * (other)	NATIVE PLANT SPECIES RICHNESS
White Cypress Pine - Silver-leaved Ironbark grassy woodland of the Nandewar Bioregion	25-40	6-25	20-30	3-10	3-5	30
White Cypress Pine - Silver-leaved Ironbark grassy woodland of the Nandewar Bioregion	6-25	0-5	30-40	0-0	3-5	23
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	6-25	0-5	30-40	0-0	3-5	23
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	25-40	6-25	20-30	3-10	3-5	30
River Red Gum riverine woodlands and forests in the Nandewar and Brigalow Belt South Bioregions (Benson 78)	0-40	3-25	20-30	0-0	3-5	28
Heathy shrublands on rocky outcrops of the western slopes	40	0.1-20	5-10	5-25	3-10	25

Cover as % (DECC 2008a)

Table 13: Recommended species for revegetation by vegetation type

VEGETATION TYPE	OVERSTOREY	MID-STOREY	UNDERSTOREY (GRASSES)	UNDERSTOREY (HERBS/FORBS)
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	*Eucalyptus albens* *Callitris glaucophylla* *Eucalyptus crebra*	*Geijera parviflora Brachychiton populneus*	*Bothriochloa decipiens* *Austrostipa scabra* *Eragrostis leptostachya* *Aristida sp* *Sporobolus creber* *Chloris truncata* *Austrodanthonia sp*	*Chrysocephalum apiculatum)* *Vittadina cuneata* *Cymbonotus lawsonianus*
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	*Callitris glaucophylla* *Eucalyptus crebra* *Eucalyptus albens* *Eucalyptus dealbata* *Alphitonia excelsa*	*Beyeria viscose* *Olearia elliptica* *Notelaea microcarpa A. Cheelii* *Cassinia quinquefaria* *Melichrus urceolatus* *Acacia triptera x cheelii,*	*Austrostipa scabra* *Eragrostis spp.* *Aristida ramose* *Enneapogon sp.* *Cymbopogon refractus* *Austrodanthonia sp.* *Panicum effusum*	*Desmodium brachypodum* *Fimbristylis dichotoma* *Dianella revoluta*
White Cypress Pine - Silver-leaved Ironbark - Tumbledown Red Gum shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	*Callitris glaucophylla* *Eucalyptus melanophloia.* *Eucalyptus dealbata*	*Beyeria viscose* *Indigofera adesmiifolia*	*Austrostipa scabra, Eragrostis spp., Aristida ramosa, Aristida sp., Enneapogon sp., Cymbopogon refractus,*	*Desmodium brachypodum,* *Lomandra filiformis*
River Red Gum riverine woodlands and forests in the Nandewar and Brigalow Belt South Bioregions	*Eucalyptus camaldulensis* *Casuarina cunninghamiana* *Angophora floribunda*	*Acacia sp.* *Melaleuca bracteata* *Brachychiton populneus*	*Austrostipa verticillata* *Microlaena stipoides*	
Heathy shrublands on rocky outcrops of the western slopes	*Eucalyptus dealbata* *Callitris glaucophylla* *Eucalyptus dealbata*	*Micromyrtus sessilis* *Cryptandra propinqua*	*Cymbopogon refractus), Aristida sp., Austrostipa sp.* *Enneapogon sp.* *Poa sieberiana*	

4 Flora and fauna monitoring program

The management of this BOA is designed to be part of an adaptive management framework to achieve conservation objectives in a cost-effective manner. The objective of the monitoring program is to evaluate the vegetation and fauna habitat condition in the 'Kenna' BOA to identify where rehabilitation is performing poorly and additional actions are required. On-going monitoring **Table 14** details the performance criteria by which the success of the conservation actions will be measured.

Table 14: Biodiversity management performance criteria

MANAGEMENT ACTION	EXPECTED OUTCOME	TARGET	TIMING
Revegetation activities including natural rehabilitation, direct seeding and planting	Increased native plant diversity and structure	Restore native plant species richness, and native canopy, mid-storey and grass cover to within 75% of benchmark condition (see Table 12) within specified timeframes and ultimately 100% as part of in perpetuity protection and management	Canopy:15 yrs Midstorey:10 yrs Groundcover: 5 yrs
Supplementary Planting	Increased Canopy/Mid-storey cover (if required), ground cover species richness (if required)	25% survival of seedlings (direct seeding) to achieve a future canopy cover within benchmark range 75% survival of direct landscape plantings	After 3 years
Management of human disturbance, fencing, signage	Reduction of resource competition and soil disturbance	Site access restricted to approved personnel No timber clearing or removal	<1 yr and throughout project life
Grazing management		Stock exclusion from management zones 1&3 (Riparian zone)	<1 yr and throughout project life
		Conservation grazing management of stock in management zones 2, 3 (non riparian zone) & 4 until plantings for revegetation strategy are completed	1-5 years
		Stock exclusion from management zone s 3&4	>5 yrs/revegetation activities

MANAGEMENT ACTION	EXPECTED OUTCOME	TARGET	TIMING
Weed management	Reduction in weed cover	New infestations of problem grasses controlled Exotic ground cover to be reduced to <10% in zones 3 and 4 by Year 10 and maintained at less than 5% in all zones thereafter Woody weeds in all zones to be maintained at less than 1% after year 5 All infestations of noxious weeds managed as per NW Act	6 months after identification of infestation Throughout project life
Feral fauna management	Reduction in feral fauna abundance	Feral fauna control undertaken as per Vertebrate Pest Management Plan	<1 yr and throughout project life. Minimum quarterly inspections.

Monitoring will be undertaken over a period of 20 years in compliance with EPBC Approval Condition 2(b). Should the key completion criteria not be met in this timeframe or if some environmental event delays the recovery of the offset area, e.g. bushfire, NCOPL will continue to manage the offset area until the completion criteria are met. Once this is achieved, the offset area will then be managed in perpetuity via the security mechanism which is yet to be finalised. The monitoring program is based on sound statistical principals and is generally consistent with the standard flora and fauna assessment guidelines (DECC 2004). The monitoring program is broken up into the following components of quarterly visual inspections of disturbance factors including weeds and feral animals and annual flora and fauna monitoring.

4.1 VISUAL INSPECTIONS

Visual inspections will be undertaken by the BOA Property Manager quarterly, or in response to incidents, to detect:

- Disturbance factors including fire and unauthorised access e.g. fire wood collection;
- Presence of feral animal species;
- Grazing pressure from over-abundant native herbivores; and
- Presence of exotic weed species.

Inspection results will be reported annually as part of the Reporting Protocol (**Section 5**).

4.2 FLORA MONITORING

The Flora Monitoring program outlined is adapted from DECC (2004) and ELA (2012a, 2012b).

It is proposed that field surveys in permanent plots will occur annually and will be supplemented with additional photo monitoring. Field survey is to be undertaken in spring to maximise the detection of cryptic species.

The location of permanent plots will be determined in conjunction with the results of baseline surveys. Plots should be located applying a random, stratified sampling regime. The BOA will be divided into eleven strata (environmental sampling units) based on vegetation type, condition and management zone. To determine plot locations in the first round of survey, random points are allocated in each strata on a field map prior to field surveys to avoid potential sampling bias.

A Before-After-Control-Intervention (BACI) design is recommended for flora monitoring to enable comparison of changes in vegetation condition against baseline data collected on site and between sites that are actively managed and sites that are not. This will measure changes effected by interventions and the variability due to prevailing climatic conditions to provide a more useful management measure of the amount and need for intervention measures. As the biometric benchmark data (**Table 12**) are quite broad, local reference sites may be used as benchmarks but must be in similar vegetation type/condition and not be subject to management interventions. For practical purposes, reference sites may be located on 'Kenna' or in the adjacent National Park. A minimum of twenty-two (22) flora monitoring sites will be required to measure changes to vegetation condition in control (Reference) sites (one in each of 5 vegetation communities in benchmark condition) and intervention sites (2 in each vegetation type/management zone combination). The total number of permanent sites may be varied following baseline surveys. **Table 15** lists the attributes to be collected at each plot.

Flora monitoring plots are undertaken in a standard 100m by 20m plot as shown below.

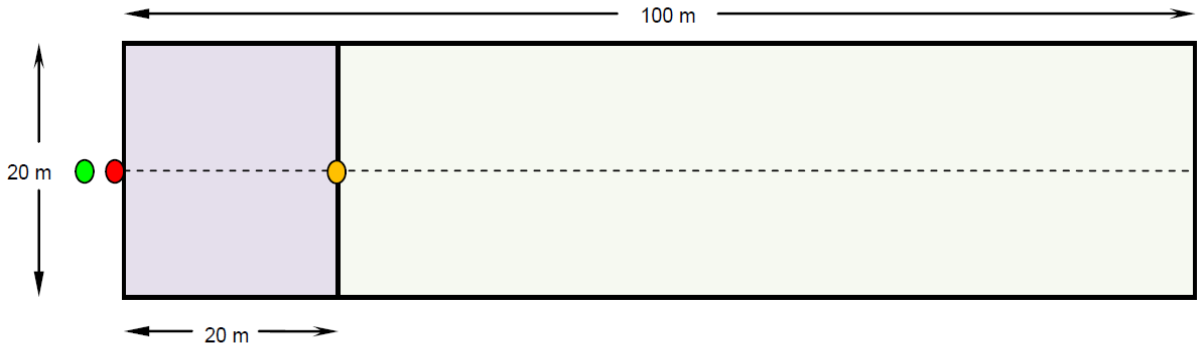

Figure 6: Plot design

Table 15: Ecological attributes to be measured within condition plots

THEME	ATTRIBUTE	DESCRIPTION
Native overstorey (canopy)	Cover	Measured as Projected Crown Cover along a 100m transect Measured as Projected Foliage Cover under three canopies
	Health	Categorised into categories based on proportion of canopy dieback: Normal healthy crown 100%, Slight dieback in crowns 70% - 99%, Moderate dieback in crowns 30% - 69%, Severe dieback in crowns 1% - 30%, Dead 0% (Wylie et al 1992)
	Richness	List of native overstorey species (including emergents)
	Recruitment	Presence/absence of trees in the juvenile and sapling diameter classes
Native midstorey (shrub and small tree)	Cover	Measured as Projected Crown Cover along a 100m transect
	Richness	List of native midstorey species
Native ground layer	Cover	Measured as Projected Foliage Cover of native groundcover plants at each of 100 points along a 100 m transect
	Richness	List of native groundcover species
Exotic species	Cover	Measured as Projected Crown Cover along a 100m transect for exotic canopy and exotic midstorey species. Measured as Projected Foliage Cover at each of 100 points along a 100 m transect in exotic ground layer species.
	Richness	List of exotic flora species
Groundcover	Large woody debris	Measured in the sub-plot as the total number and combined length of all sections of dead fallen timber ≥ 10 cm diameter, ≥ 0.5 m in length, and completely detached from living or dead standing trees
	Organic litter	Recorded as a 'hit' or 'miss' at each of 100 points along a 100 m transect, then calculated as % litter cover
	Cryptograms	Recorded as a 'hit' or 'miss' at each of 100 points along a 100 m transect, then calculated as cryptogram
	Bare ground	Recorded as a 'hit' or 'miss' at each of 100 points along a 100 m transect, then calculated as bare ground
	Rock	Recorded as a 'hit' or 'miss' at each of 100 points along a 100m transect, then calculated as rock

Table 16: Sampling units

ATTRIBUTES MEASURED	SAMPLING UNIT
Photo Point	Point from which plot is located and oriented, and from which plot image is recorded 5 m back behind reference point (taken after plot laid out)
Reference point	Site marker post with ID tag and flagging tape attached
Alignment Point	Positioned 20 m from photo point along the transect
Baseplot (100 m x 20 m)	Native canopy health Native and exotic canopy species Native and exotic midstorey species (shrub and small tree) Large tree density (native species only) Recruitment of native canopy species
Subplot (20 m x 20 m)	Native and exotic ground layer species Coarse woody debris
Transect (100 m)	Native canopy cover Native midstorey cover Native groundcover Exotic cover Organic litter Cryptogram Rock Bare ground

4.3 FAUNA MONITORING

The fauna monitoring program comprises three elements:

- Targeted surveys for Superb Parrot in preferred habitat;
- Quarterly inspections and monitoring for presence of feral animal species; and
- General fauna surveys across all management zones.

Except for the quarterly visual inspections, fauna monitoring will be undertaken by appropriately qualified, licensed and trained ecologists.

The fauna monitoring program recognises the slow recovery time taken for a number of species to re-colonise areas subject to restoration that have initially limited habitat values.

The first year of monitoring will cover all species groups to establish baseline data sets for ongoing comparison (i.e. ongoing data collected will be directly comparable using the same methodology). Elliot trapping is not required in areas of derived native grasslands.

Years 2 to ten will focus on woodland birds and microbats, which represent all of the threatened species previously recorded on or adjoining the 'Kenna' BOA, and include monitoring of reptiles as these will provide more information on the progress of woodland restoration than other fauna groups, particularly in the first 10 years of restoration activity. An adaptive management approach will be applied if early surveys detect significant species e.g. quolls. Years ten to twenty will monitor the full suite of fauna using methods outlined in **Table 17** after DECC (2004).

Targeted surveys for Superb Parrot will be undertaken annually in spring (this coincides with nesting time). Standardised effort will be applied as a 20 minutes count morning and dusk over 2 days near suitable nest trees in preferred habitat along drainage lines and in patches of Grassy White Box Woodland. Survey location will be recorded in GPS to facilitate repeat annual visits.

Ten fauna monitoring replicates for the Biodiversity Offset Area will be distributed across all vegetation types and condition classes, with the exception of Zone 4 which will be sampled once. For nocturnal bird monitoring, the standard survey methodology requires separation of 1km between sites (DECC 2004).

The fauna monitoring sites will be selected at the most relevant vegetation monitoring sites for consistency.

Table 17: Fauna Monitoring methods and intensity in each vegetation community/condition class

METHOD	DETAIL	REQUIREMENT PER SITE	FREQUENCY	SEASON	LOCATION
Elliot traps	Small traps placed in straight lines on the ground, primarily to target small and medium sized mammals. Traps will be set for 3 consecutive nights	10 medium Elliot traps (Elliot A); 3 large cage traps.	1st year baseline and then 10th year* and then every third year after 10 years	Spring	All strata except DNG

METHOD	DETAIL	REQUIREMENT PER SITE	FREQUENCY	SEASON	LOCATION
Hair funnels	At each site for a minimum of 4 nights and possibly set in habitat trees if present. These target small and medium sized mammals.	10 hair funnels.	1st year baseline and then 10th year* and then every third year after 10 years	Spring.	All strata
Spotlighting	Pedestrian spotlight survey, 2 nights at each site. Targets nocturnal mammals, birds, reptiles and amphibians.	1 hr spotlighting transect covering 1km distance. Repeated over 2 nights	Annually	Spring.	All strata
Call playback	Nocturnal broadcasting of calls, two nights at each site in conjunction with spotlighting. Targets nocturnal birds.	5 minutes of broadcasting plus 10 minutes listening.	Annually	Spring.	As necessary
Bat detection	Anabat recordings to identify microbat species occurring on site. 2 nights at each site	1 detector for 2 nights set for a minimum of 4 hrs	Annually	Spring.	All strata
Bird survey	Timed, fixed area surveys for diurnal birds, observing and listening.	20 minutes count morning and dusk over 2 days	Annually	Spring.	All strata
Herpetological searches	Timed, fixed area, direct searches for reptiles, scanning surfaces, rolling logs and rocks and raking leaf litter.	0.5 hrs searching of microhabitat on 2 separate days.	Annually	Spring.	All strata
Collection of scats	Collect scats and send to laboratory for analysis of predator and prey species.	Opportunistic.	In line with other activities	Year round.	All strata
Quarterly visual inspections (particularly feral animal numbers)	Inspections by the Property Manager	Opportunistic, general inspections of all areas	Quarterly or in response to incidents, e.g. bushfire	Year round	All strata

* - Lower frequency for the time taken for habitat development following vegetation establishment (hollows, logs and litter on ground) and slow response time of ground mammalian fauna.

The results of monitoring will be analysed and compared to previous survey results to determine general population trends, including trends in the presence of feral animals. In the event that negative trends are identified indicating the decline of particular threatened species, appropriate amelioration measures will be recommended.

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

- Certain planned activities being postponed or modified;
- Modification of the monitoring program; and
- Immediate survey and assessment of the new record, and an assessment of the impact of any proposed revegetation activities on it.

If further threatened species or significant new records of existing threatened species are collected, the significance of such records will be reviewed, as will the likely impact of existing or proposed management activities, and any options for minimising impacts on these species.

5 Annual 'Kenna' BOA Report

The annual 'Kenna' BOA report will be incorporated into NCOPL's Annual Environmental Management Report (AEMR) and Annual Review reporting period, i.e. 1 April-31 March, and will consist of two parts:

- Summary of the implementation of management actions within the BOA including inspection results and review findings; and
- The results of the flora and fauna monitoring program.

The timing of the AEMR coincides with the DSEWPaC requirement to report on the compliance of conditions of approval within 3 months of every 12 month anniversary of the '*Commencement of Action*', which is by the end of July each year as the activity commenced during April 2012.

5.1 BOMP IMPLEMENTATION

The annual BOMP implementation report will provide a summary of all the actions implemented during the previous year. Any significant events that occurred during the year (e.g. wildfire, outbreak of any weeds or incidence of any new threats) and any recommended changes to the management actions, their duration, intensity or relative priority identified through the annual review (**Section 6**) will be included.

5.2 VEGETATION MONITORING REPORTING

Annual vegetation monitoring reporting is to include a written summary of the methodology and the current year's findings for each vegetation plot, including the average results of each variable recorded. Photo monitoring records and field data sheets will be included in an appendix. A flora species list with corresponding plot numbers where species were recorded is to be included in an appendix.

A discussion section is to be included that compares the results from the current monitoring year with previous years either through actual annual records or a mean value where several previous years are being compared. The annual report is to include statistical graphs illustrating changes in diversity and cover/abundance of each attribute recorded within each management zone.

5.3 FAUNA MONITORING REPORTING

The report is to include methods and results of fauna monitoring and significant findings, including any new records of threatened species. A fauna species list with corresponding transect numbers/survey site numbers where species were recorded will be included as an appendix.

A discussion section will be included that compares the species diversity results, as absolute numbers and grouped into various guilds representing the diversity of habitat types present from the current monitoring year with previous years will be compared.

The annual report will include statistical graphs and tables illustrating changes in the nocturnal birds, bats, diurnal birds and reptile abundance and diversity over time. The key species groups targeted to be monitored includes:-

Bats

Bat diversity will be measured in three different groups:

- Megachiropteran (i.e. Flying-foxes);
- Microchiropteran (micro bats) that forage in the sub canopy; and
- Microchiropteran that are canopy or above canopy forages.

For each group the report will include a species list and species count. Statistical graphs or tables that illustrate changes in bat diversity in each of these three groups are to be developed for each monitoring plot.

Birds

Bird diversity is to be measured in three different groups:

- Raptors or birds of prey including nocturnal and diurnal;
- Ground and shrub guild, including woodland birds such as finches, wrens and warblers including *Pomatostomus temporalis temporalis* (Grey-crowned Babbler); and
- Generalists such as parrots including *Polytelis swainsonii* (Superb Parrot) and honeyeaters.

For each group the report will include a species list and species count. Statistical graphs or tables that illustrate changes in avian diversity in each of these three groups are to be developed for each strata (vegetation type /fauna habitat type). Data will be summarised and reported by management zone to track trend in condition.

Reptiles

Reptile results will be reported as a species list and species count. Data will be reported by management zone to detect changes in reptile usage under different management regimes.

5.4 REPORT RECOMMENDATIONS AND CONCLUSION

A concluding section within the Annual 'Kenna' BOA Report that highlights and describes significant findings, either positive or negative, is to be prepared. Changes to any management recommendations for the following year will also be suggested.

6 Annual review and auditing

PA 08_0144 requires NCOPL to annually review performance against the BOMP and if necessary, revise the BOS/BOMP to the satisfaction of the Director-General. To facilitate the annual review, a Review Protocol has been developed in **Appendix 3** to be completed by the Property Manager during quarterly inspections or following incidents, e.g. bushfire. Annual reviews are conducted to assess the effectiveness of management strategies against the objectives of this BOMP. A review protocol for the BOMP will be completed annually in March of each year. The findings of the annual review of the BOMP will be reported to NCOPL management and in the AEMR/Annual Review, and if required the BOMP will be updated for DP&I/DSEWPaC approval.

In general, the BOMP may be revised due to:

- Deficiencies being identified;
- Outcomes from the Annual Review;
- Recommendations from the Annual 'Kenna' BOA Report;
- Changing environmental requirements;
- Improvements in knowledge or new technology becomes available;
- Change in legislation or relevant approvals; and
- Change in the activities or operations associated with Narrabri Coal operations.

6.1 AUDITING

Schedule 6, Condition 7 of PA 08_0144 requires an independent audit of this BOMP to be completed prior to 13 September 2010 and every three years thereafter paid for by NCOPL. A suitably qualified, experienced and independent person approved by the DP&I Director General will assess the performance of the BOMP and recommend actions or measures to improve the performance of the BOMP.

As a minimum, this BOMP will be reviewed against the findings of annual reviews or independent audits. Any changes proposed to the BOMP as a consequence of the review will be submitted to DP&I/DSEWPaC for approval.

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Appendix A: Works Program

An annual works programme will be implemented at the 'Kenna' BOA in compliance with EPBC Act Approval 2009/5003 and EP&A Act Project Approval 08-0144. The Annual works program will be consistent with the management procedures outlined in this BOMP. Management will be staged to occur in four management periods as follows:

- Management Period 1 – Years 1 to 3;
- Management Period 2 – Years 4 to 5;
- Management Period 3 – Years 6 to 20; and
- Management Period 4 – >20 years, subject to meeting completion criteria.

Detailed management actions will be added following baseline surveys. Baseline surveys will inform the:

- 'starting point' for biodiversity values against which interventions will be measured; and
- extent and location of management issues outlined in this report including vertebrate pests, weed infestations and watering points across the BOA.

MANAGEMENT PERIOD	TASK/OBJECTIVE	ZONE (S)	MANAGEMENT ACTION	TIMING	PERFORMANCE MEASURE (BY END OF PERIOD)
Period 1	Collect baseline flora and fauna data Inform adaptive management to refine this annual works program	All	Baseline surveys applying visual inspection, flora and fauna monitoring methods	<1 yr	Baseline property data for flora, fauna values and general management issues pertaining to this BOMP
All	Grazing exclusion	1, 3 (riparian areas)	Maintain fencing and exclude stock from zone 1	<1 yr	Stock exclusion
Period 1			New fencing sections installed to exclude stock from riparian areas		
Period 1	Signage/ Awareness Raising of BOA boundaries, access and objectives	External boundary	Install signage to identify BOA and prohibit unauthorised access	<1yr	Site access restricted to approved personnel

MANAGEMENT PERIOD	TASK/OBJECTIVE	ZONE (S)	MANAGEMENT ACTION	TIMING	PERFORMANCE MEASURE (BY END OF PERIOD)
		fences to BOA including to other portion of BOA	Liase with neighbouring properties to encourage compliance with BOA restrictions and identify opportunities to collaborate on weed/pest management		
All	Retain Dead Timber	All	Install signage prohibiting unauthorised access and conduct periodic compliance checks	<1yr	
All	Weed control	All	Map weed infestations	1-20 yrs	Location and severity of weed infestations mapped across BOA
			Develop and implement weed control strategy for 1. general control of environmental weeds 2. targeted control of noxious weeds		All infestations of noxious weeds managed per NW Act Exotic ground cover reduced to less than 20% by year 10, maintained at less than 5% in all management zones thereafter Woody weeds maintained at less than 1% cover in all management zones
			Maintenance of ground cover in grazed areas to prevent new infestations		New infestations of problem grasses controlled
All	Spot spraying environmental weeds	All	Spot spraying regime to be included in the weed control strategy	1-20 yrs	Existing infestations controlled New infestations of problem grasses controlled Undertaken in accordance with the requirements of the *Pesticides Act 1999*.
All	Annual slashing of fire breaks	All	Slashing fire breaks along inside of all external boundary fences	1-20 yrs	Fire breaks maintained along external fences
Period 1-2	Monitoring grazing pressure	2,3,4	Conservation grazing to be checked quarterly at the beginning of each season for presence of regenerating saplings, amount of native ground cover and amount of exotic species	Quarterly 0-5 yrs	Native ground cover maintained or increased in grazed areas

MANAGEMENT PERIOD	TASK/OBJECTIVE	ZONE (S)	MANAGEMENT ACTION	TIMING	PERFORMANCE MEASURE (BY END OF PERIOD)
All	Monitoring erosion along creek lines	All	Baseline survey to identify existing management issues. Annual visual inspection of bank stability to inform any erosion control required. Implement erosion controls as required.	Annually 1-20 yrs	Soil erosion controlled if required
All	Targeted vertebrate pest management	All	Develop and implement targeted vertebrate pest management strategy with results of baseline surveys, map of watering points and in liaison with adjoining landholders	<1yr/ All	Integrated, strategic vertebrate pest management control plan (<1yr) Vertebrate pest population decreased
Period 1	Targeted revegetation strategy	All	Local seed collection	<3yr	Local seed sourced for revegetation species
Period 2		n/a	Contracted hiko tube stock preparation using local seed	<5yr	Hiko tube stock prepared in time for landscape plantings. Local seed from BOA used where possible
		n/a	Contracted seed preparation for direct seeding (%mix, medium) using local seed	<5yr	Native seed mix prepared in time for direct seeding planting. Local seed from BOA used where possible
Period 3		2,3,4	Preliminary weed control – slashing and spot spraying	5yr	Weed suppression and ground preparation for plantings
		4	Direct seeding		25% survival of seedlings after 3 years to establish a future canopy cover within benchmark range.
		2,3	Deep rip 500m planting area		Timely preparation of planting area
		2,3	Landscape plantings		75% survival rate of plantings after 3 years
		all	Follow up watering	5-20	75% survival rate of plantings after 3 years
All	Flora and Fauna Monitoring	All	Implement annual monitoring	0-20	Annual 'Kenna' BOA report informed by monitoring results

Appendix B: Implementation Methods

Weed Control

All weed management works outlined should be undertaken by a suitably qualified and experienced bush regeneration contractor. Details of specific weed control techniques to be used such as hand pulling weeds, grass control and the use of herbicides are described in detail in Muyt (2001) and summarised in Table 6: List of noxious and environmental weeds observed on the site.

SPECIES NAME	COMMON NAME	RECOMMEND CONTROL METHOD(S)
Echium plantagineum	Patterson's Curse	Spot Spray using a broadleaf herbicide (e.g. metsulfuron methyl)
Opuntia stricta.	Prickly Pear	Dig out and dispose of appropriately

The following is a description of appropriate methods to carry out the management actions.

Weed Treatment

Weed control techniques within the 'Kenna' BOA will be undertaken using minimal disturbance techniques so as to prevent minimal disturbance to the soil. Disturbance to the soil will result in increased weed germination and potentially lead to soil erosion.

Hand Pulling

Hand pulling is suited to individual plants, small patches or restricted areas. Hand pulling of weeds includes:

- Selecting the most appropriate tool for the weed being removed (if required);
- Minimise soil disturbance by controlling weeds when the soil is moist;
- Control plants before fruits or other propagules develop;
- Remove excess soil from the root system when there is no risk of spreading vegetative material;
- Cover disturbed soil or gaps with leaf litter and twigs;
- Ensure bulbs, corms, tubers, rhizomes or stolons are carefully dug out; and
- Bag all propagules before removing them off-site (Muyt 2001).

Herbicide Use

Herbicides are required for use for the spraying of herbaceous and re-shooting woody weeds. Only a non-specific herbicide (e.g. glyphosate) will be used for this work. Herbicide use near waterways is restricted as all waterways are ephemeral. Spraying in the vicinity of any waterways with flowing water will only be undertaken on a spot spraying basis using Roundup BioActive. Any use of herbicides will be undertaken in accordance with the requirements of the NSW *Pesticides Act 1999* including the use of registered chemicals, maintaining training and chemical use records and disposal records. Also refer to the Noxious and Environmental Weed Control Handbook (NSW

Department of Primary Industries, 2011) and the Narrabri Shire Council website for more information on noxious weed management.

Spot Spraying

Spot spraying will be required for seedlings and the regrowth of woody weeds. These species will be controlled using a non-selective herbicide mixed appropriately with water. When spot spraying, ensure the target plant has been correctly identified and that the target plant is sprayed with the herbicide. Off-target damage should be minimised through the correct identification of target weed species. Spot spraying with diesel (fuel) mixed with surfactant (using back pack sprayer) can be undertaken as alternative way to control *Opuntia stricta*, however if utilising this method refer to the NSW DPI Noxious and Environmental Weed Control Handbook for application rates etc.

Cut and Paint Technique

The plant needs to be actively growing with green foliage present. O*puntia stricta* is usually actively growing in February and October. Control will be undertaken during summer months prior to fruiting occurring. The plant needs to be cut horizontally as close to the base as possible and below any branches. Either a chainsaw, handsaw or secateurs can be used to make the cut, depending on the size of the plant. Remove any dirt from the stump and immediately apply the neat herbicide directly to the stump using a dabber bottle or brush. Plants may re-sprout and follow up work maybe required.

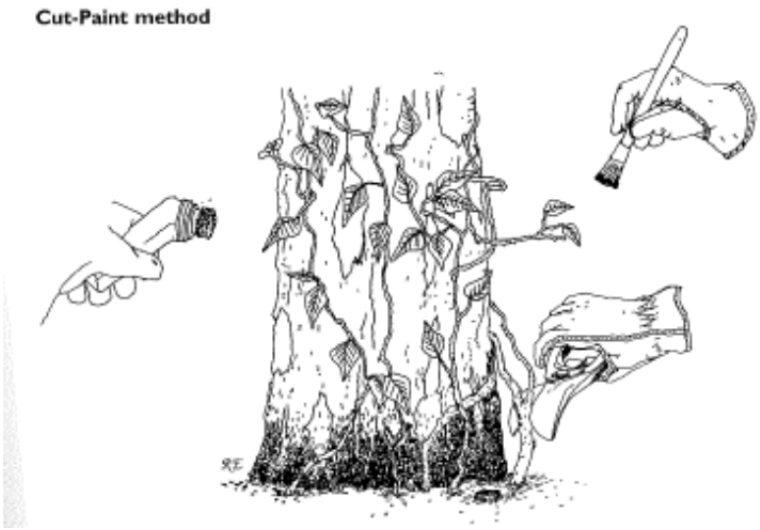

Figure 7: The cut and paint method

Slashing

Regular slashing of agricultural weeds in paddocks not subject to periodic grazing may be suitable to prevent seed set and dispersal. This is control method rather than a removal method.

Feral Animal Control

Pesticide Baiting

Pesticide Control Orders (PCOs) exist for the use of each of Pindone and 1080 under Part 4 of the NSW *Pesticides Act 1999* and associated regulations. These PCOs stipulate that only Authorised Control Officers are authorised to implement the use of concentrated Pindone and 1080 baits, although ready-made baits can be used by landowners/managers. Furthermore, as of 1 September 2005, training in the use of pesticides has been compulsory if pesticides are used in a job or business (including farming).

The following is a broad outline of the process for using each chemical, notwithstanding the requirement for the operator to be trained in the use of these chemicals. Advice should be sought from OEH as to the most effective methods to minimise off-target kills and animal ethics in relation to the disposal of un-used bait and carcases.

It is highly recommended that any baiting that takes place within the 'Kenna' BOA is supported by a strategic off-site baiting program with cooperation from adjacent landowners (including OEH).

Pindone (Rabbits)

- Under take baiting in summer or when there is limited green feed on the BOA.
- Select appropriate sites – it is recommended to locate sites near known rabbit harbour.
- Acquire Pindone Baits (mixing of Pindone concentrate must be carried out by an Authorised Control Officer).
- 'Free feed' rabbits on non-toxic bait prior to baiting commencing.
- Place Pindone baits in bait stations with safety precautions in selected locations and repeat dose three to four days apart for the entirety of the baiting treatment period.
- If possible destroy warrens once a kill of the rabbit population has been assured. This prevents recolonisation of warrens.

1080 Baits (Foxes and Feral Pigs)

Foxes

- Seek approval from relevant agencies (e.g. Livestock Health and Pest Authority (LHPA), Department of Agriculture) for baiting program;
- Notify neighbours;
- Erect signage;
- Acquire 1080 fox baits and feral pig baits; and
- Foxes using guidelines developed by OEH (2010):
    a) Bury baits 8-10 cm below the surface;
    b) Place baits at least 500 metres apart or 1 per 10 ha (150 baits will be sufficient for the Kenna site);
    c) Conduct baiting in autumn (juveniles dispersing) and spring (breeding season);
    d) Check baits regularly and replace taken baits during treatment; and
    e) Collect and dispose of unused baits after treatment.

Feral Pigs

- Establish bait stations near known areas of feral pig occupation (wallows, tracks, feeding areas, etc).
- Establish a pre-feed program over several months with small, strategically placed piles of grain or other food-stuffs.
- Create muddy or sandy swept pads to identify if Feral Pigs are eating the pre-feed.
- Over months gradually reduce bait stations to encourage Feral Pigs to feed from only a couple of points (or one central point if possible).
- Place baits at bait stations in clusters and monitor uptake daily and replace taken baits until uptake ceases.
- Collect and dispose of unused baits after treatment.

Feral Goats

- Select appropriate sites – it is recommended to locate sites near water sources where goats will congregate.
- Notify neighbours.
- Shooting feral goats using a high powered (calibre) rifle as humanely as possible (i.e. a single shot to head).
- Joint aerial control of feral goats with OEH.

Native Vegetation Re-establishment

Revegetation

- Specialist native species propagation nursery engaged to collect, propagate and supply locally endemic plants as 'Hiko' tube stock;
- Species to be sourced from those listed in **Table 13**;
- Tractor mounted ripper required to rip lines to a depth of 500 mm followed by topsoil cultivation for tubestock planting;
- No tillage required for direct seeding following slashing;
- Planting to be carried out in autumn or spring during favourable weather conditions; and
- Plants to be planted with fertiliser pellets. One pellet per plant.

Plants to be watered on the day of planting and twice in the following week. Additional watering may be required depending on weather conditions

Appendix C: Review Protocol

BOMP SECTION	CLAUSE	COMPLIANT	EVIDENCE/COMMENT	RECOMMENDATION
	Manage human disturbance • Rubbish dumping • Timber removal/clearing			
	Exclusion of Grazing stock • No stock present • Fence Maintenance			
	Weed Control • MZ1 • MZ2 • MZ3 • MZ4			
	Bushfire Mgt • Slashing of firebreaks • Prescribed Fire • Fire Fighting Equipment			
	Retention of regrowth and remnant vegetation			

	In fill plantings • MZ2 (if natural regeneration insufficient) • MZ3 (Paddock Trees as per **Table 8**) • MZ4 (Native ground cover, midstorey and tree plantings to vegetation type)			
	Retention of Dead Trees			
	Erosion and Sedimentation Control (if required)			
	Soil and Water Management			
	Retention of Rocks			
	Control of Feral and overabundant native herbivores • Rabbits (Poisoning) • Goats (Shooting) • Kangaroos (under Licence)			
	Vertebrate Pest Management • Foxes (1080 baiting) • Cats (Shooting and/or trapping) • Pigs (Shooting)			

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