



Integra Mine Complex Modification 4

Environmental Assessment

Prepared for Integra Coal Operations Pty Ltd | May 2014



Appendix B

Revised Biodiversity Offset Strategy

Revised Biodiversity Offset Strategy

Integra Mine Complex Modification 4

Prepared for Integra Coal Operations Pty Limited | 17 April 2014



Revised Biodiversity Offset Strategy

Final

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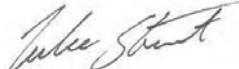
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1 Introduction

1.1 Background

The Integra Mining Complex (Complex) is located in the Hunter Coalfields of the Sydney Basin and is entirely within the Singleton Local Government Area. It is approximately 10 km north-west of Singleton town centre, in the locality of Camberwell (Figure 1.1).

The Complex comprises underground and open cut coal mining operations which have been active since 1991 under the former Glennies Creek and Camberwell joint ventures. The Complex currently operates under a single project approval instrument which combines the Project Approvals for Integra Underground and Integra Open Cut (PA 08_0101 and PA 08_0102, respectively). The Project Approvals were granted under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Project Approval includes requirements for a biodiversity offset strategy to compensate for approved impacts on biodiversity including:

41. The Proponent shall implement the offset strategy summarised in Table 18, described in the open cut and underground project EAs, and shown conceptually in the figure in Appendix 8 to the satisfaction of the Director-General.

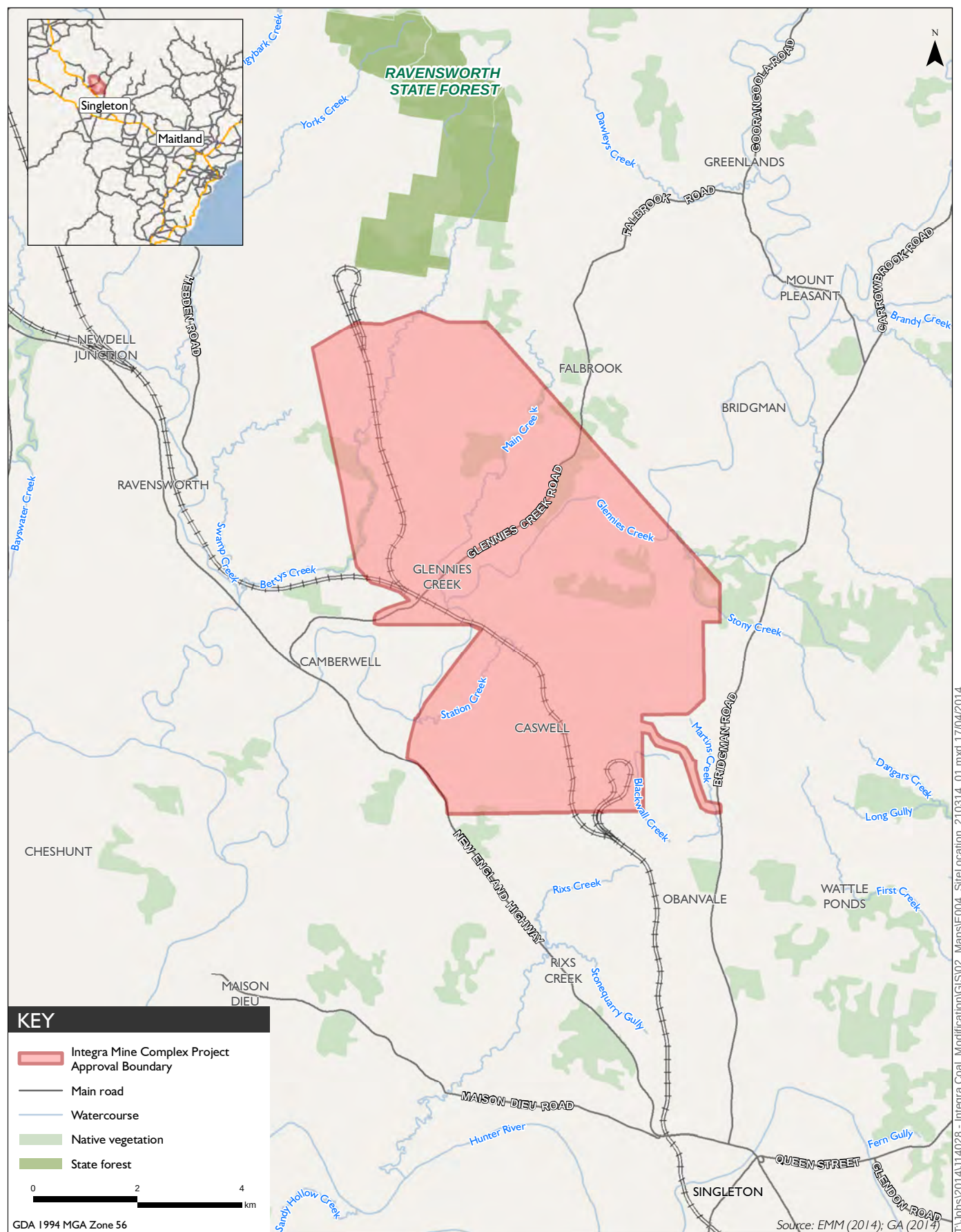
Table 18 Biodiversity Offset Strategy for the Complex	
Offset Areas	Minimum size
Northern Offset Area	121 hectares
Southern Offset Area	39 hectares
Western Offset Area	94 hectares
Supplementary Offset Area	33 hectares
Bridgman Offset Area	86 hectares

42. By the end of September 2012, unless the Director-General agrees otherwise, the Proponent shall revise the offset strategy referred to above, in consultation with OEH, and to the satisfaction of the Director-General. The revised offset strategy must:

(a) ensure provision of at least 140 hectares of Narrow-leaved Ironbark-Spotted Gum-Forest Red Gum Forest (or a suitable equivalent) to further offset the impact of the open cut project; and

(b) include an additional 6 hectares of Central Hunter Swamp Oak Forest (or a suitable equivalent) to offset the impact of the underground project on the Glendell Biodiversity Offset Area.

43. By the end of September 2014, the Proponent shall make suitable arrangements to provide appropriate long term security for all the areas in the revised offset strategy to the satisfaction of the Director-General.



Integra Mine Complex location
Integra Mine Complex Modification 4 Revised Biodiversity Offset Strategy

Integra's approved biodiversity offset strategy was developed to offset the ecological impacts from the project on native vegetation and fauna habitat. Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest, which is part of the Central Hunter Ironbark–Spotted Gum–Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions Endangered Ecological Community (EEC) (the Central Hunter Ironbark–Spotted Gum–Grey Box Forest EEC) and Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC (Swamp Oak Floodplain Forest EEC), are the only intact EECs listed under the TSC Act that have been impacted by approved mining operations at the Complex.

The approved biodiversity offset strategy included four offset areas; namely, the Northern, Southern, Western and Supplementary Biodiversity Offset Areas (BOAs), and was subsequently amended to include the Bridgman BOA (Figure 1.2). The Martin's Creek BOA was later incorporated to further compensate for vegetation clearance associated with the Open Cut and Underground Projects and to meet the requirements of the consolidated Project Approvals.

In total, the approved biodiversity offset strategy currently comprises 575.3 hectares (ha) of BOAs (based on figures provided in PB 2012). These are currently managed in accordance with the Integra Biodiversity Management Plan (BMP) (VALE 2013). The BMP includes a range of management measures to be implemented to improve the biodiversity values of the BOAs over time. This includes fencing, grazing management, weed control, fire management, access management, feral and overabundant native herbivore and pest management, habitat creation and supplementary planting.

1.2 Proposed modification

Exploration activities, undertaken since the offset strategy was approved, have identified a significant coal resource under the Northern, Western and Supplementary BOAs. This resource is valued at approximately \$6.2 Billion.

Modification 2 sought an extension to the timeframe for long term security of the biodiversity offset strategy. The EA prepared for Modification 2 (EMM 2012) highlighted the significance of coal resources identified under the Northern, Western and Supplementary offset areas. The possibility of future alterations to Integra's biodiversity offset strategy was foreshadowed in the Modification 2 EA, which noted that if alternative offsets were to be sought in the future, they would be fully assessed and approval would be sought at the relevant time. Approval for Modification 2 was granted in February 2013.

Since Modification 2 was approved, substantial time and effort has been invested in sourcing and assessing alternative offsets that would provide an improved biodiversity outcome should the approved strategy be affected.

Schedule 3 Condition 43 of the Project Approvals requires the long term security for the areas in Integra's offset strategy to the satisfaction of the Director-General by September 2014. Long term security of the current biodiversity offset areas, as required under Condition 43 would result in the sterilisation of the resource identified under the Northern, Western and Supplementary offset areas, meaning future mining of this resource would be prevented. Sterilisation would have significant economic impacts for the Complex, such as potential reductions in investment, revenue, export earnings, jobs and substantial regional economic flow-on benefits.

Accordingly, Integra is seeking to modify its biodiversity offset strategy to:

- remove the Western and Supplementary Offset Areas;
- reduce the size of the Northern, Southern and Martin's Creek Offset Areas; and

- incorporate an additional offset area, located approximately 30 km to the west of the Complex, adjoining Wollemi National Park in Singleton LGA.

It is noted that the EA for Modification 2 (EMM 2012) contemplated the use of the Upper Hunter Strategic Assessment (UHSA) for the provision of alternative offsets. While Integra continues to participate in the UHSA, the outcomes of the process are not yet available. Accordingly, due to the need to have long term security in place for the BOAs by September 2014 in accordance with condition 43 of the project approvals, Integra has sought this modification to its approved BOS under Section 75W of the EP&A Act.

Integra is committed to securing the revised BOS proposed by this modification by September 2014 in accordance with Condition 43 of the project approvals.

No other changes to approved operations are proposed. The proposed modification does not involve any physical works, including any additional mining, disturbance, physical alterations, vegetation clearing, or the like.

1.3 Objectives

This report provides an overview of the ecological values of the revised biodiversity offsets. It aims to provide a comparison of the revised biodiversity offsets against the requirements of the Project Approvals, the approved biodiversity offset strategy and relevant OEH policies.

The revised biodiversity offset strategy aims to ensure that:

- revised BOAs are similar in condition, contain similar vegetation types and threatened species habitat to the approved offset areas;
- revised BOAs provide the same or better offset to impact ratios for threatened ecological communities (TECs) as the approved offset areas; and
- revised BOAs provide suitable habitat for all threatened species previously identified at the Complex.

1.4 Glossary

approved biodiversity offset strategy	The biodiversity offset strategy for the consolidated approval (2012) incorporating the Northern, Southern, Supplementary, Western, Bridgman and Martin's Creek BOAs.
approved BOAs	The Northern, Southern, Supplementary, Western, Bridgman and Martin's Creek BOAs included in the consolidated approval (2012).
approved project	The Integra Mine Complex Project approved under the consolidated approval (2012) incorporating the Integra Open Cut (PA 08_0102) Integra Underground (PA 08_0101).
offsite BOA	The two land parcels lots that comprise the Appletree Flat BOA.
onsite BOAs	The biodiversity offset areas that are located within, or partially within the Complex.
revised biodiversity offset strategy	The revised biodiversity offset strategy proposed under the modification outlined in Chapter 4 of this report incorporating the Northern, Southern, Bridgman, Martin's Creek and Appletree Flat BOAs.
revised BOAs	The revised boundaries of the BOAs presented in Chapter 4 of this report for the Northern, Southern and Martin's Creek BOAs, the entire Bridgman BOA and the two land parcels that comprise the Appletree Flat BOA.
the Complex	The Integra open cut and underground project areas, including the BOAs.

2 Approved project and biodiversity offset strategy

2.1 Approved project impacts

Project Approvals incorporated the impacts from the Integra Underground and Integra Open Cut projects. The impacts on native vegetation from the approved project are summarised in Table 2.1. A total of 102.1 ha of native vegetation disturbance has been approved for the Complex, including 92.3 ha of forest, and 9.8 ha of disturbed native vegetation (equivalent to Derived Grassland/Native Pasture).

Table 2.1 Native vegetation in the approved project area

Vegetation community	Area of native vegetation impacted (ha)		
	Integra Open Cut (PA 08_0102)	Integra Underground (PA 08_0101)	Total
Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest ¹	87.3	0	87.3
Swamp Oak Forest ²	0	5	5
Shrubland	0.7	0	0.7
Tussock Grassland	6.1	3	9.1
Total native vegetation impacted	94.1	8	102.1
Total area impacted (includes exotic grassland and cleared areas)	405.7	8	413.7

Note: 1. Meets the description of Central Hunter Ironbark–Spotted Gum–Grey Box Forest EEC.
2. Meets the description of Swamp Oak Floodplain Forest EEC.

Of the vegetation approved to be removed, 87.3 ha meets the description of Central Hunter Ironbark–Spotted Gum–Grey Box Forest EEC and 5 ha meets the description of Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC (Swamp Oak Floodplain Forest EEC).

No threatened species or communities listed as matters of National Environmental Significance under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were identified in the approved project area, or required offsets.

The approved impacts on threatened species habitat vary for each species recorded or with known habitat in the Complex (Table 2.2). Generally, 88 ha of threatened species habitat occurs in the approved project area. However this is higher for the Yellow-bellied Sheathtail Bat which has broader habitat requirements, with 357.1 ha of habitat approved to be removed. No threatened flora species were identified in the approved project area.

Table 2.2 Area of habitat in the approved project area

Threatened fauna	Area of habitat impacted (ha)		Total
	Integra Open Cut ¹ (PA 08_0102)	Integra Underground (PA 08_0101)	
Squirrel Glider (woodland habitat)	87.3	0.0	87.3
Grey-crowned Babbler (woodland habitat)	88.0	0.0	88.0
Eastern Bent-wing Bat (woodland habitat)	88.0	0.0	88.0
Eastern Freetail Bat (woodland habitat)	88.0	0.0	88.0
Yellow-bellied Sheath-tail Bat (woodland and grassland habitat)	354.1	3.0	357.1
Grey-headed Flying Fox (woodland habitat)	87.3	0.0	87.3
Speckled Warbler (woodland habitat)	88.0	0.0	88.0
Brown Treecreeper (woodland habitat)	88.0	0.0	88.0
Brush-tail Phascogale (woodland habitat)	87.3	0.0	87.3

2.2 Approved offset strategy

The approved biodiversity offset strategy includes 193.8 ha of Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest which meets the description of Central Hunter Ironbark–Spotted Gum–Grey Box Forest EEC. It also includes the commitment to regenerate 10 ha of this community (Cunningham 2007). This results in an offset to impact ratio of 2.4:1 for this community (Table 2.3). The offset strategy also includes 53.4 ha of Swamp Oak Forest, part of the Swamp Oak Floodplain Forest EEC. This results in an offset to impact ratio of 10.7:1 for this community (Table 1.3).

The overall offset to impact ratio for native vegetation for the approved biodiversity offset strategy is 3:1 (including regeneration), with the total area of BOAs equating to 1.4 times the approved project area (Table 2.3).

Table 2.3 Approved project vegetation offset ratios

Vegetation community	Impact area (ha)	Offset area (ha) ¹	Offset to impact ratio
Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest (Central Hunter Ironbark–Spotted Gum–Grey Box Forest EEC)	87.3	203.8 ²	2.4:1
Swamp Oak Forest	5.0	53.4	10.7:1
Shrubland	0.7	0	0
Tussock grassland	9.1	0	0
Total native vegetation (includes communities not listed above)	102.1	292.2	3:1
Total area (includes native vegetation and exotic grassland/cleared areas)	413.7	575.3	1.4:1

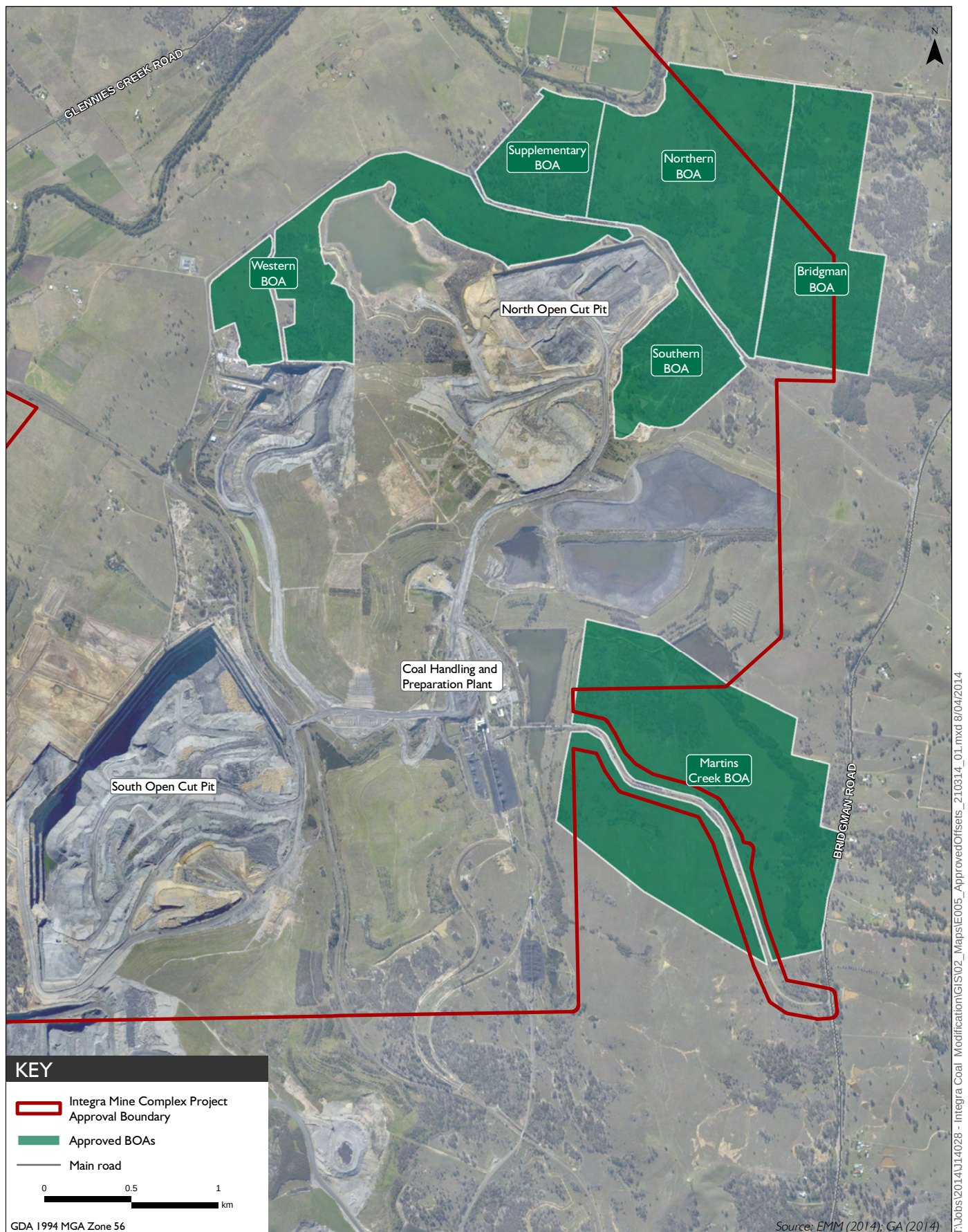
Notes: 1. Areas from Offset Audit Report (PB 2012).

2. Includes 10 ha of regeneration in native pasture within the BOAs (not mine rehabilitation).

The approved biodiversity offset strategy provides offset to impact ratios for threatened species identified in the approved project between 1.6:1 and 3.1:1 (Table 2.4).

Table 2.4 **Approved project threatened species offset ratios**

Threatened fauna	Impact area (ha)	Offset area (ha)	Offset to impact ratio (includes regeneration)
Squirrel Glider (woodland habitat)	87.3	203.8	2.3:1
Grey-crowned Babbler (woodland habitat)	88.0	203.8	2.3:1
Eastern Bent-wing Bat (woodland habitat)	93.0	292.2	3.1:1
Eastern Freetail Bat (woodland habitat)	93.0	292.2	3.1:1
Yellow-bellied Sheath-tail Bat (woodland and native grassland habitat)	362.0	575.3	1.6:1
Grey-headed Flying Fox (woodland habitat)	88.0	193.8	2.2:1
Speckled Warbler (woodland habitat)	88.0	193.8	2.2:1
Brown Treecreeper (woodland habitat)	88.0	193.8	2.2:1
Brush-tail Phascogale (woodland habitat)	88.0	193.8	2.2:1



3 Methods

3.1 Literature and data review

A review of ecological work completed within the Complex and the BOAs over the past seven years was completed. This included, but was not limited to:

- *Appletree Flat Biodiversity Offset Initial Inspection* (PB 2013b);
- *Audit of the Biodiversity Offset Areas for the Integra Complex* (PB 2012);
- *Glennies Creek Open Cut Coal Mine: Biodiversity Offset Assessment* (focusing on Vegetation Communities) (Cunningham 2007);
- *Glennies Creek Open Cut Coal Mine: Fauna Assessment* (Countrywide Ecological Service 2007a);
- *Glennies Creek Open Cut Coal Mine: Fauna Assessment, Annex E* (ERM 2006);
- *Glennies Creek Open Cut Coal Mine: Flora Assessment* (Countrywide Ecological Service 2007b);
- *Integra Coal Complex–Offset Option Investigation* (PB 2013a);
- *Integra Coal Operations Pty Ltd, Biodiversity Offset Assessment* (Forest Fauna Surveys 2011);
- *Integra Coal Operations: Environmental Management System, Biodiversity Management Plan* (Vale 2013);
- *Integra Open Cut Project: Biodiversity Assessment* (URS 2009a);
- *Integra Underground Coal Project: Flora and Fauna Assessment* (URS 2009b);
- *The vegetation and floristics of Wollemi National Park* (Bell 2005); and
- *Threatened Species Management Plan for the Glennies Creek Open Cut Coal Mine* (Kendall and Kendall Ecological Services 2009).

Existing information on the approved BOAs, including survey work undertaken over the last seven years, was reviewed to identify the ecological values present. The review identified any information gaps for the revised BOAs and if additional surveys were required.

3.1.1 Vegetation mapping review

The approved BOAs were first mapped according to the vegetation communities present in 2007 by Geoff Cunningham Natural Resource Consultants. Changes to the cadastral boundaries of the offset areas, minor clearing and reclassification of grassland, shrubland and vegetation community boundaries have been made since the original mapping and implementation of the BMP by Parsons Brinkerhoff (PB). This process was based on detailed work undertaken and documented as part of the BOA audit and as a result of management practices implemented in the BOAs (PB 2012).

The proposed strategy is based on vegetation mapping completed in 2012 and 2013, aerial photograph interpretation and field surveys conducted for the *Audit of the Biodiversity Offset Areas for the Integra Mining Complex* (PB 2012) and subsequent survey work completed by EMM.

3.2 Site surveys

3.2.1 Onsite BOAs

The condition of the grassland areas, mapped as cleared by PB (2012), were re-surveyed as part of the current assessment by EMM in March 2014 (Figure 2.1). Each of the grassland areas of the onsite BOAs was inspected by car and on foot by two ecologists. Rapid floristic assessments were completed to document the condition and composition of the grassland areas. The survey was completed to inform rehabilitation recommendations and offset calculations for the revised BOAs.

Small areas in the revised BOAs occur outside the approved BOAs surrounding the Complex. These were not included in previous mapping of the area, and were subsequently surveyed by EMM in March 2014. Rapid floristic assessments were completed to document the vegetation types present and condition of the areas (Figure 2.1).

The results of the surveys are presented for the onsite BOAs in Section 4.2.1.

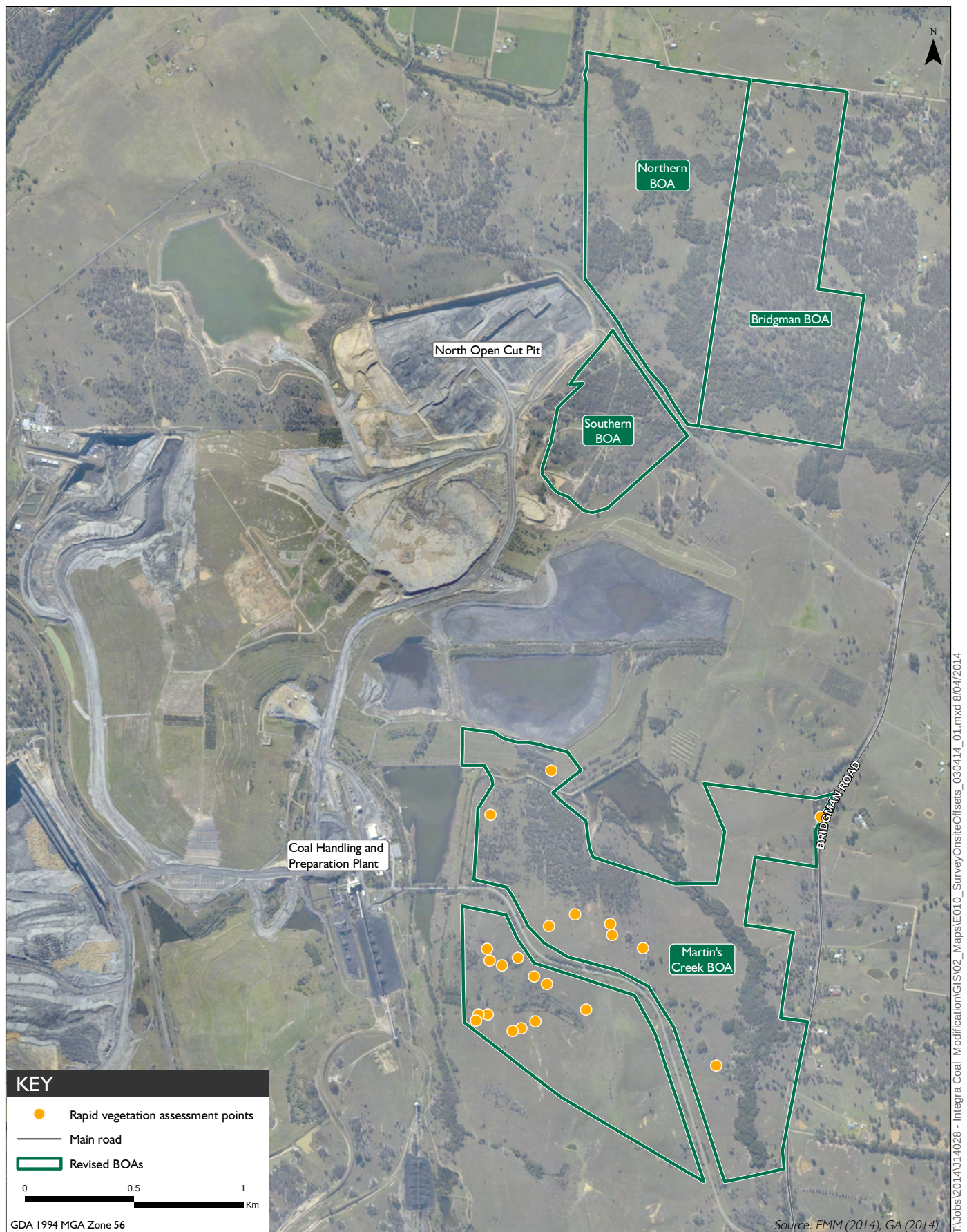
3.2.2 Offsite BOAs

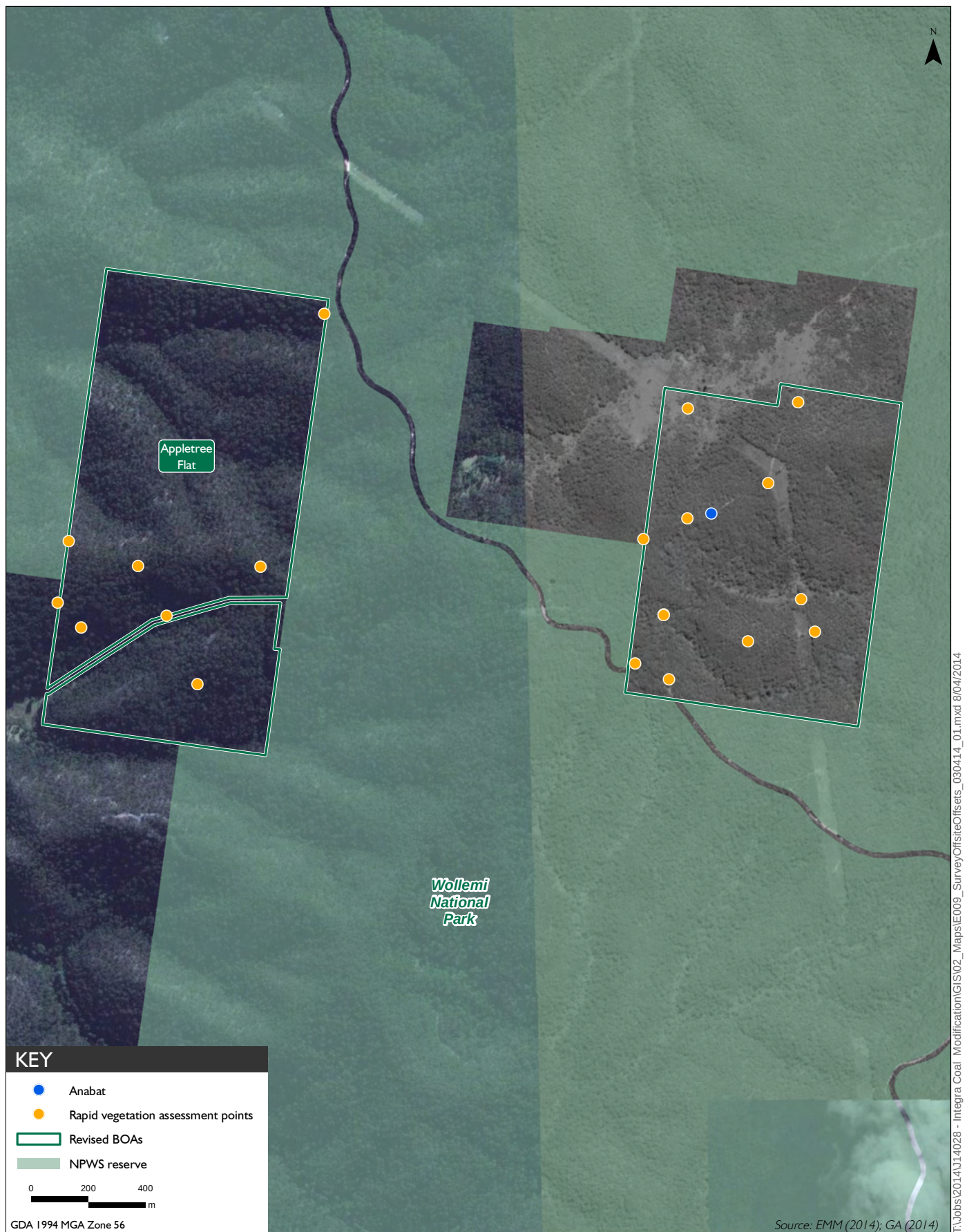
Regional vegetation mapping has been completed for the Wollemi National Park which includes the Appletree Flat BOA. An initial site visit to the Appletree Flat BOA in November 2013 identified discrepancies between the regional vegetation mapping (Bell 2005) for the site and the communities identified onsite (PB 2013).

Regional vegetation mapping was ground-truthed by EMM in March 2014. Surveys were conducted on foot using rapid floristic assessments throughout the property (Figure 2.2). All vegetation types were assigned to the Bell (2005) mapping of the Wollemi National Park and classified to the Biometric Vegetation Types for consistency with the onsite BOA mapping.

The results of the surveys are presented for the onsite BOAs in Section 4.3.1.

Opportunistic fauna surveys were also completed and an anabat detector was placed in the eastern part of the Appletree Flat BOA for one night.





Survey locations for offsite biodiversity offset areas
 Integra Mine Complex Modification 4 Revised Biodiversity Offset Strategy

4 Revised biodiversity offset strategy

4.1 Overview

The revised biodiversity offset strategy proposed by Integra under Modification 4, incorporates onsite and offsite BOAs (Figure 3.1). The onsite BOAs are a modified version of the approved BOAs which surround the Complex, representing 399 ha (Table 4.1). The remaining BOA is a privately owned in-holding within the Wollemi National Park, representing over 215 ha (Table 4.1).

Table 4.1 Revised offset area

Offset area	Revised offset area (ha)
Onsite	
Northern BOA	88.5
Southern BOA	30.4
Bridgman BOA	86.5
Martin's Creek BOA	193.6
Offsite	
Appletree Flat BOA	215.9
Total area of revised BOAs	614.9

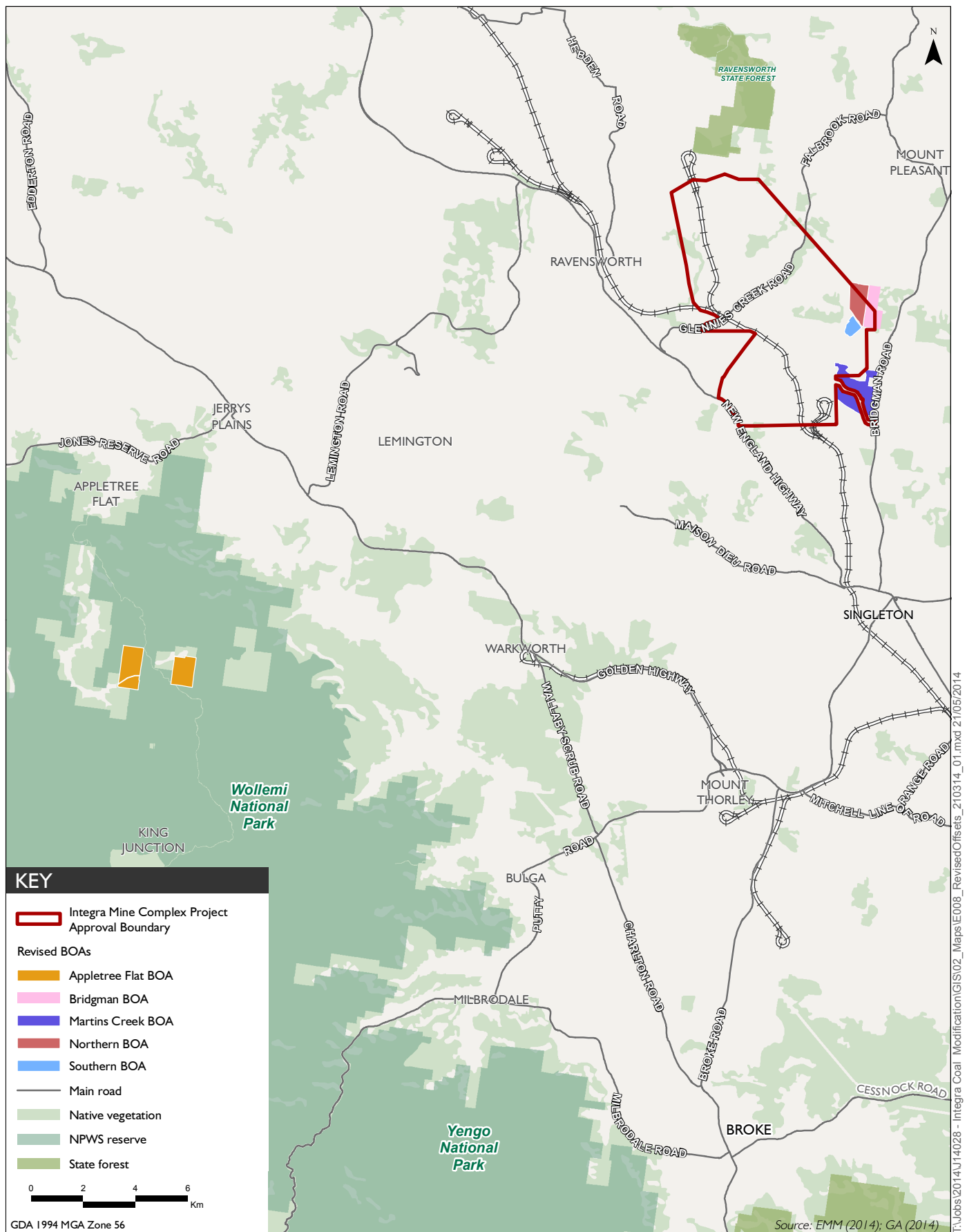
Note: 1. Native vegetation includes Derived Grassland/Native Pasture and Regenerating vegetation.

4.2 Onsite BOAs

The onsite BOAs identified surrounding the Complex on Integra-owned land, contain the same vegetation and habitat values as the approved biodiversity offset strategy.

Close to 400 ha of onsite BOAs are proposed in the revised biodiversity offset strategy comprising:

- Northern BOA: located to the north of the Complex, is bordered to the south by Stony Creek Road, to the north by Glennies Creek and Thomas Lane, and to the east by the Bridgman BOA;
- Bridgman BOA: located to the north of the Complex, is bordered to the north by Thomas Lane, to the south by Stony Creek Road, to the west by the Northern BOA and to the east by private land;
- Southern BOA: located within the Complex boundary, is bordered to the north by Stony Creek Road, and surrounded to the east, west and south by the open cut mine area; and
- Martin's Creek BOA: located on the eastern side of the Complex Open Cut access road (Figure 4.1).



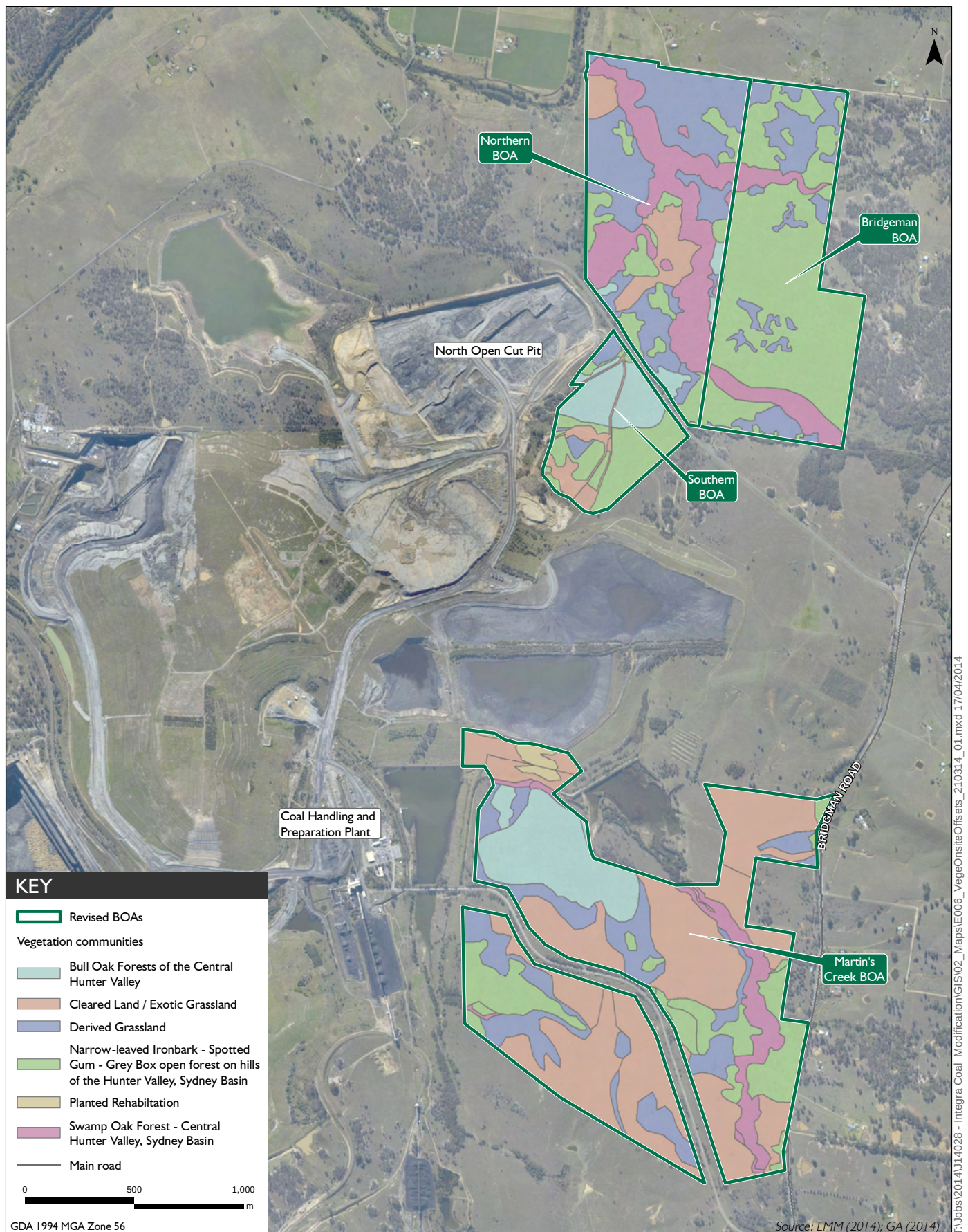
4.2.1 Vegetation communities

The vegetation communities recorded in the onsite BOAs are provided in Table 4.1 and described in the following section, with detailed descriptions of the vegetation communities provided in Table 4.3 to Table 4.7.

Of the 399 ha within the onsite BOAs, three woodland or forest communities were identified, totalling approximately 202 ha. Derived Grassland/Native Pasture, Planted Rehabilitation and Cleared Land/Exotic Grassland occur in the remaining 197 ha (Figure 4.2).

Table 4.2 Vegetation communities in the onsite BOAs

Vegetation community	Bridgman BOA	Martin's Creek BOA	Northern BOA	Southern BOA	Total
Remnant woodland and forest					
Bull Oak Forests	0.1	23.5	2.8	10.0	36.4
Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest	61.8	27.9	12.0	13.9	115.6
Swamp Oak Forest	8.9	12.4	28.4	0.0	49.7
Sub-total remnant woodland and forest	70.8	63.8	43.2	23.9	201.7
Remaining areas					
Planted Rehabilitation	0.0	2.4	0.0	0.0	2.4
Derived Grassland/Native Pasture	15.8	33.3	36.2	1.9	87.2
Cleared Land/Exotic Grassland	0.0	94.1	9.0	4.6	107.7
Sub-total remaining areas	15.8	129.8	45.2	6.5	197.3
Total	86.6	193.6	88.4	30.4	399.0



Vegetation communities in the revised onsite biodiversity offset areas
Integra Mine Complex Modification 4 Revised Biodiversity Offset Strategy

Table 4.3 Narrow-leaved Ironbark—Spotted Gum—Grey Box Open Forest

Vegetation formation (Keith 2002)	Dry Sclerophyll Forests (Shrub/grass subformation)
Vegetation class (Keith 2002)	Hunter-Macleay Dry Sclerophyll Forests
Vegetation type (Peake 2006)	MU 27 Central Hunter Ironbark – Spotted Gum – Grey Box Gum
Biometric vegetation type (BVT) ID (DECC 2008a)	HU556 Grey Ironbark–Spotted Gum–Grey Box open forest on hills of the Hunter Valley, Sydney Basin
Threatened ecological community	Central Hunter Ironbark–Spotted Gum–Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions endangered ecological community (EEC)
Dominant canopy species	The canopy is sparse, with a mixture of Forest Red Gum (<i>Eucalyptus tereticornis</i>), Grey Box (<i>E. molucana</i>), Spotted Gum (<i>Corymbia maculata</i>), Rough-barked Apple (<i>Angophora floribunda</i>), Narrow-leaved Ironbark (<i>E. crebra</i>) and Broad-leaved Ironbark (<i>E. fibrosa</i>) (PB 2012).
Dominant mid stratum species	The shrub layer includes Butterbush (<i>Pittosporum angustifolium</i>), Broom Bitter-pea (<i>Daviesia genistifolia</i>), <i>Pultenaea retusa</i> , <i>Cassinia aculeata</i> and Fan Wattle (<i>Acacia amblygona</i>) (PB 2012).
Dominant ground stratum species	The ground cover varies in density across this community and includes Slender Rats Tail Grass (<i>Sporobolus creber</i>), <i>Eragrostis cilianensis</i> , Narrawa Burr (<i>Solanum cinereum</i>), Native Bluebell (<i>Wahlenbergia gracilis</i>), <i>Lomandra longifolia</i> , Barbed Wire Grass (<i>Cymbopogon refractus</i>), <i>Stipa sp.</i> , Bristly Cloak Fern (<i>Cheilanthes distans</i>) and Kidney Weed (<i>Dichondra repens</i>) (Vale 2013).
Landscape position	Occurs on crests and ridges on undulating hills and rises of the central Hunter Valley.
Percent cleared in CMA area	60%
Condition class	Moderate-good
Description	The Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest in the BOAs was in moderate to good condition. It is largely restricted to isolated remnant patches, with the exception of the Bridgman BOA which contains a large continuous stand of the community, extending into the Northern BOA.
	

Table 4.4 Bull Oak Forest

Vegetation formation (Keith 2002)	Grassy Woodlands
Vegetation class (Keith 2002)	Coastal Valley Grassy Woodlands
Vegetation type (Peake 2006)	MU 32 Central Hunter Bulloak Forest Regeneration
Biometric vegetation type (BVT) ID (DECC 2008a)	HU668 Bull Oak Forests of the Central Hunter Valley
Threatened ecological community	None
Dominant canopy species	The canopy is 6-12 m in height and dominated by dense stands of Bull Oak (<i>Allocasuarina luehmannii</i>) with occasional Narrow-leaved Ironbark, Rough-barked Apple, Swamp Oak and Grey Box (PB 2012).
Dominant mid stratum species	The shrub layer is generally absent.
Dominant ground stratum species	A sparse ground cover of native grasses including Three-awn Speargrass (<i>Aristida ramosa</i>), Red Grass (<i>Bothriochloa macra</i>), Wallaby Grass (<i>Austrodanthonia bipartita</i>) and Shorthair Plumegrass (<i>Dichelachne micrantha</i>) (Vale 2013). The understorey has been invaded by exotic species, with <i>Melinis repens</i> , <i>Chloris gayana</i> , <i>Senecio madagascariensis</i> , and <i>Hypochaeris glabra</i> common (PB 2012).
Landscape position	On undulating Permian sediments of the central Hunter Valley.
Percent cleared in CMA area	70%
Condition class	Moderate-good
Description	The Bull Oak Forests of the BOAs are regenerating from previous clearing and are considered to be in moderate to good condition.



Table 4.5 Swamp Oak Forest

Vegetation formation (Keith 2002)	Forested Wetlands
Vegetation class (Keith 2002)	Coastal Swamp Forests
Vegetation type (Peake 2006)	MU 28 Central Hunter Swamp Oak Forest
Biometric vegetation type (BVT) ID (DECC 2008a)	HU634 Swamp Oak forest of the central Hunter Valley, Sydney Basin
Threatened ecological community	Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC
Dominant canopy species	Swamp Oak (<i>Casuarina glauca</i>) dominates the canopy, with the occasional Rough-barked Apple and Forest Red Gum.
Dominant mid stratum species	The shrub layer is sparse, with Eastern Cottonbush (<i>Maireana microphylla</i>) and Blackthorn (<i>Bursaria spinosa</i>) occurring where tree cover is sparse.
Dominant ground stratum species	Ground cover species include Three-awn Speargrass (<i>Aristida ramosa</i>) and the weed Tiger Pear (<i>Opuntia aurantiaca</i>) (Vale 2013).
Landscape position	Occurs mostly along alluvial flats and creek banks, although it may occur away from these areas in some places.
Percent cleared in CMA area	95%
Condition class	Moderate–good
Description	The Swamp Oak Floodplain Forest in the BOAs is in moderate to good condition. The canopy is generally regrowth with a dense understorey of exotic and native species in areas (PB 2012).



Table 4.6 **Derived Grassland/Native Pasture**

Vegetation formation (Keith 2002)	Dry Sclerophyll Forests (Shrub/grass subformation)—derived grassland
Vegetation class (Keith 2002)	Hunter-Macleay Dry Sclerophyll Forests—derived grassland
Vegetation type (Peake 2006)	MU 27 Central Hunter Ironbark – Spotted Gum – Grey Box Gum – derived grassland
Biometric vegetation type (BVT) ID (DECC 2008a)	HU556 Grey Ironbark–Spotted Gum–Grey Box open forest on hills of the Hunter Valley, Sydney Basin—derived grassland
Threatened ecological community	None
Dominant canopy species	Where present, the regenerating or remnant paddock trees are similar to those identified within the Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest or in some smaller areas, Bull Oak Forest.
Dominant mid stratum species	Shrubs were generally absent, however there was occasional Fan Wattle (<i>Acacia falcata</i>) and the exotic Eastern Cottonbush (<i>Gomphocarpus fruticosus</i>) in areas. Regenerating eucalypts and Bull Oak was also present in numerous locations.
Dominant ground stratum species	Groundcover is generally greater than 50% native species, with common pasture species such as <i>Paspalum dilatatum</i>) and naturalised and native grasses including Common Couch (<i>Cynodon dactylon</i>), Slender Rat's Tail Grass, Barbed Wire Grass (<i>Cymbopogon refractus</i>), Three-awn Speargrass (<i>Aristida ramosa</i>), Bristly Cloak Fern (<i>Cheilanthes distans</i>), Common Fringe Sedge (<i>Fimbristylis dichotoma</i>), Common Everlasting (<i>Chrysocephalum apiculatum</i>), Hairy Panic (<i>Panicum effusum</i>), Speargrass (<i>Stipa sp.</i>), Shorthair Plumegrass (<i>Dichelachne micrantha</i>) and Native Bluebell (<i>Wahlenbergia gracilis</i>). Exotic species were also common in some areas and included Fireweed (<i>Senecio madagascariensis</i>), Purpletop (<i>Verbena bonariensis</i>), African Feather Grass (<i>Pennisetum macrourum</i>) and Rhodes Grass (<i>Chloris gayana</i>).
Landscape position	Occurs on crests and ridges on undulating hills and rises of the BOAs that have been previously cleared and grazed.
Percent cleared in CMA area	n/a
Condition class	Moderate (50% of the groundcover is native species)
Description	Derived Grassland/Native Pasture areas within the BOAs were observed in varying stages of natural regeneration as a result of the removal of cattle. In general, these areas contain similar species composition to the Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest, with the canopy absent or in some areas, present as occasional remnant paddock trees or regenerating as juvenile saplings.
	

Table 4.7 Planted Rehabilitation

Vegetation class (Keith 2002)	None
Vegetation type (Peake 2006)	None
Biometric vegetation type (BVT) ID (DECC 2008a)	None
Threatened ecological community	None
Dominant canopy species	Grey Box (<i>E. molucanna</i>) forms a monoculture from previous planting into the overburden (note trees were juvenile with no fruit available to confirm identification).
Dominant mid stratum species	None
Dominant ground stratum species	Native and exotic groundcovers have encroached in some areas, including African Feather Grass, Rhodes Grass Slender Rat's Tail Grass and Three-awn Speargrass.
Landscape position	On an overburden slope in the Martin's Creek BOA.
Percent cleared in CMA area	n/a
Condition class	Moderate (over storey cover is greater than 25% of benchmark and 50% of the groundcover is native species)
Description	The Planted Rehabilitation area occurs in the northern part of the Martin's Creek BOA. Tree species indicative of the Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest community have been directly sown into the overburden in this location and occur with groundcover that is very sparse to absent. Grey Box is the dominant species planted, with the trees up to 15m in height, however the area lacks diversity in the understorey, most likely as a result of the lack of topsoil.



4.2.2 Regeneration of native grassland

The BMP details the methods to rehabilitate and manage land for biodiversity in the BOAs and the mine site during and post mining. The BMP will be updated in accordance with the draft guideline issued by P&I in 2014, *Hunter Valley Coal Mines – Best Practice Guidelines for Biodiversity Offset Management Plans* (Department of Planning and Infrastructure 2013), incorporating the revised BOAs and best practice regeneration methods.

Integra is committed to regenerating the Derived Grassland/Native Pasture throughout the onsite BOAs to form representative patches of Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest. A total of 87.2 ha of Derived Grassland/Native Pasture will be regenerated. The BMP will be updated to reflect this commitment.

The aim of regeneration will be to re-establish functioning ecosystems with diverse vegetation structure, and to maximise fauna habitat and ecosystem processes in the BOAs. A range of methods will be investigated to fulfil this aim, ranging from enhancing existing vegetation structure or function through source planting, to reconstructing Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest using plant species from a range of vegetation strata.

The University of Newcastle’s Centre for Sustainable Ecosystem Restoration has been researching methods for the restoration of native vegetation in the Hunter Valley, particularly areas that have been subjected to clearing, grazing and topsoil loss in the past. This research has resulted in the establishment of interim guidelines for the re-establishment of diverse and functional native vegetation communities, including EECs. These methods have proven successful at various mine sites throughout the Hunter Valley.

Recruitment of canopy species is evident in the BOAs where stock has been removed and weed competition is relatively low given the historical uses of the BOAs for grazing. It is likely that native species are still present in the soil seed bank, particularly adjacent to existing patches of remnant vegetation.

Regeneration outcomes will be closely monitored against performance indicators and completion criteria set out in the BMP.

An additional 108 ha of Cleared Land/Exotic Grassland would also be managed in the BOAs under the BMP. These areas will be managed as a buffer to reduce the introduction and spread of weeds and pests into native vegetation areas. In time, management may result in regeneration of native vegetation, as threats to regeneration are reduced and native vegetation becomes established in adjacent areas.

4.2.3 Threatened species habitat

A number of threatened fauna species have been recorded in the Complex and BOAs over the past seven years. Based on these records, the revised BOAs are likely to provide suitable habitat for the following:

- microbats: Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*), Eastern Freetail Bat (*Mormopterus norfolkensis*) and Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*);
- Grey-headed Flying Fox (*Pteropus poliocephalus*);
- Brush-tail Phascogale (*Phascogale tapoatafa*);
- Squirrel Glider (*Petaurus norfolkensis*);
- Spotted-tailed Quoll (*Dasyurus maculatus*) (K.Brickhill pers comm); and

- woodland birds: Grey-crowned Babbler (*Pomatostomus temporalis temporalis*), Speckled Warbler (*Pyrrholaemus saggitatus*) and Brown Treecreeper (*Climacteris picumnus victoriae*).

The onsite BOAs include important habitat resources for fauna including hollow-bearing trees, flowering eucalypts, riparian corridors and ecotonal areas. Such features will be managed under the BMP to improve habitat quality in the BOAs into the future.

4.2.4 Long-term conservation and management

Integra is investigating appropriate mechanisms to protect the onsite BOAs. It is likely that the onsite BOAs will be protected by a combination of options. Integra is committed to providing long-term security in accordance with condition 43 of the Project Approvals. The appropriate mechanisms for this will be determined in consultation with OEH and P&I.

As discussed in Section 4.2.2, the BMP for the onsite BOAs will be updated to reflect the changes in the revised biodiversity offset strategy.

4.3 Offsite BOA

The Appletree Flat BOA comprises two lots, approximately 30 km to the south-west of the Complex. The Appletree Flat BOA is surrounded by the Wollemi National Park (Figure 2.1).

While the Appletree Flat BOA does not contain any areas of Central Hunter Ironbark-Spotted Gum–Grey Box Forest EEC, it forms a vital part of regional remnant vegetation that links the habitats located between the Upper Hunter Valley and the coast. The conservation of the site would also assist with regional conservation aims, and will improve the quality and management of remnant vegetation at the site.

The Appletree Flat BOA occurs on the Narrabeen Sandstones common in the Wollemi National Park. Some vegetation on richer soils (shale caps and lenses) has been influenced by previous wood collection and grazing activities, with regenerating areas evident in the northern section of the eastern lot.

A transmission line easement also traverses the eastern lot. However, given the topography, dense vegetation is still present along most of the valley areas, providing connectivity for fauna species throughout the site and into the adjacent national park (see Photograph 4.1).



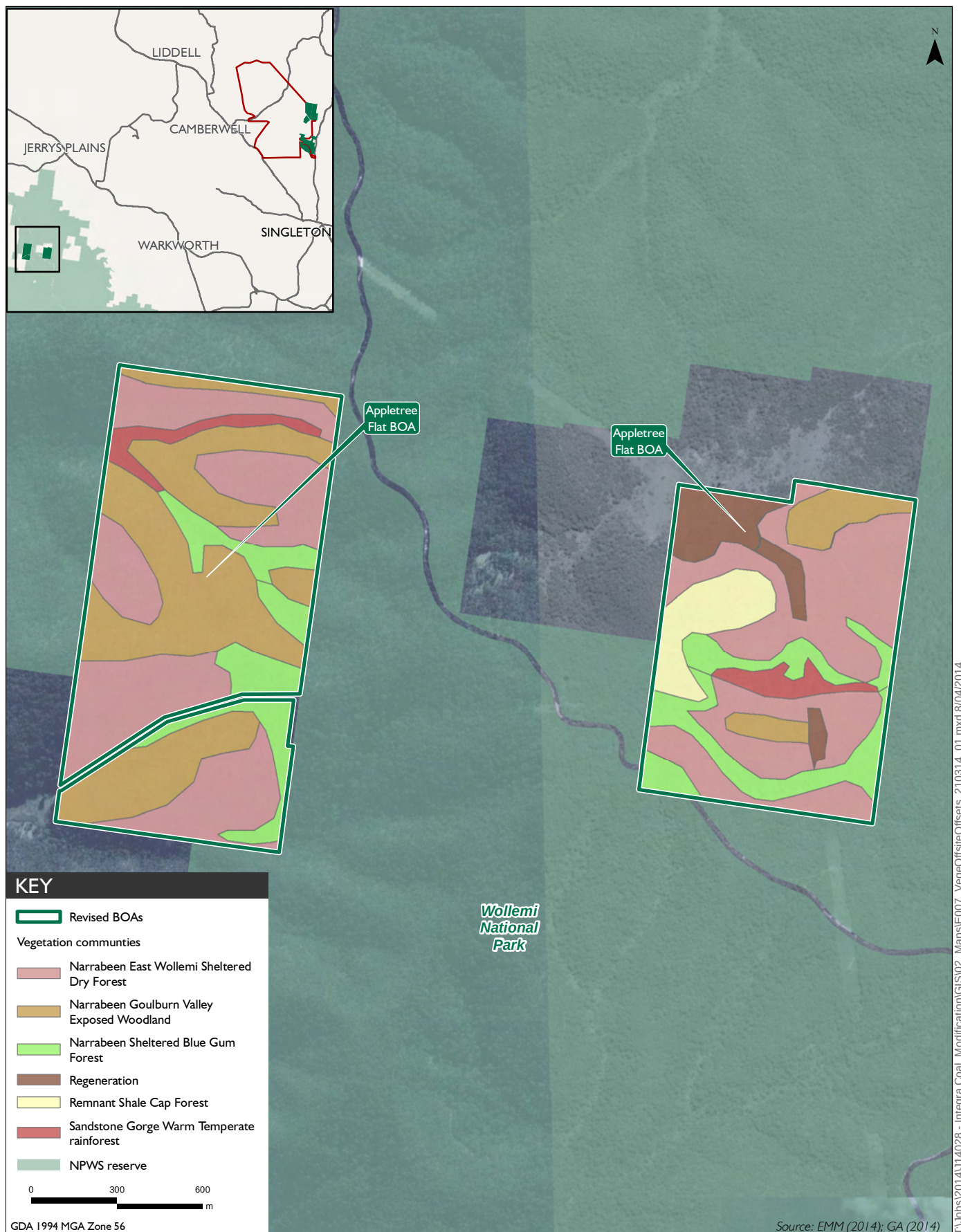
Photograph 4.1 Cleared areas around the transmission towers (mapped as Regenerating vegetation) on the eastern Appletree Flat lot, showing habitat connectivity between tower locations

4.3.1 Vegetation communities

The Appletree Flat property contains 215.9 ha of native vegetation comprising five native vegetation communities and a regenerating community (Table 4.8). The vegetation communities recorded are summarised in Table 4.1 and described in Table 4.9 to 4.13.

Table 4.8 Vegetation communities at Appletree Flat

Vegetation community	Area (ha)
Narrabeen Goulburn Valley Exposed Woodland	60.0
Narrabeen Sheltered Blue Gum Forest	32.9
Narrabeen East Wollemi Sheltered Dry Forest	96.4
Sandstone Gorge Warm Temperate Rainforest	7.8
Remnant Shale Cap Forest	9.2
Regeneration	9.6
Total	215.9



Vegetation communities in the offsite biodiversity offset area
Integra Mine Complex Modification 4 Revised Biodiversity Offset Strategy

Table 4.9 **Narrabeen Goulburn Valley Exposed Woodland**

Vegetation formation (Keith 2002)	Dry Sclerophyll Forests (Shrubby subformation)
Vegetation class (Keith 2002)	Sydney Hinterland Dry Sclerophyll Forests
Vegetation type (Bell 2005)	Narrabeen Goulburn Valley Exposed Woodland
Biometric vegetation type (BVT) ID (DECC 2008a)	HU553 Grey Gum–Narrow-leaved Stringybark heathy open forest on the hinterland ranges of the Central Coast, Sydney Basin
Threatened ecological community	None
Dominant canopy species	Narrow-leaved Stringybark (<i>Eucalyptus sparsifolia</i>), Grey Gum (<i>Eucalyptus punctata</i>) and Smooth-barked Apple (<i>Angophora costata</i>) dominate with occasional Narrow-leaved Ironbark (<i>Eucalyptus crebra</i>) in areas.
Dominant mid stratum species	Prickly Shaggy Pea (<i>Podolobium ilicifolium</i>), <i>Persoonia linearis</i> , Cycad (<i>Macrozamia sp.</i>) and Forest Oak (<i>Allocasuarina torulosa</i>).
Dominant ground stratum species	Flax-lily (<i>Dianella revoluta</i>), <i>Lepidosperma laterale</i> , <i>Poa sp.</i> , Wiry Panic (<i>Entolasia stricta</i>), Spiny-headed Mat-rush (<i>Lomandra longifolia</i>) and Blunt Beard-heath (<i>Leucopogon muticus</i>).
Landscape position	Crests, ridges exposed slopes over Narrabeen Sandstones in the Watagan and Yengo Areas.
Percent cleared in CMA area	5%
Condition class	Moderate–good
Description	Usually on the crests and northern and western slopes on Narrabeen sandstone with sandstone outcropping evident. Hollow bearing trees are common in this vegetation type, particularly in rocky areas where wood collection has been limited by the topography.



Table 4.10 **Narrabeen Sheltered Blue Gum Forest**

Vegetation formation (Keith 2002)	Wet Sclerophyll Forests (Shrubby subformation)
Vegetation class (Keith 2002)	North Coast Wet Sclerophyll Forests
Vegetation type (Bell 2005)	Narrabeen Sheltered Blue Gum Forest
Biometric vegetation type (BVT) ID (DECC 2008a)	HU571 Mountain Blue Gum–Turpentine moist shrubby open forest of the coastal ranges of the Central Coast, Sydney Basin
Threatened ecological community	None
Dominant canopy species	Sydney Blue Gum (<i>Eucalyptus saligna</i>) dominates with Rough-barked Apple (<i>Angophora floribunda</i>), occasional Grey Gum and stringybarks.
Dominant mid stratum species	Forest Oak (<i>Allocasuarina torulosa</i>) forms a sub-canopy with <i>Pittosporum undulatum</i> , and occasional <i>Acacia parramattensis</i> and Grey Myrtle (<i>Backhousia myrtifolia</i>).
Dominant ground stratum species	Groundcovers included <i>Poa</i> sp., Blue Flax-lily (<i>Dianella caerulea</i>), <i>Hydrocotyle peduncularis</i> , Common Silkpod (<i>Personia straminea</i>), Dusky Coral Pea (<i>Kennedia rubicunda</i>), Climbing Guinea Flower (<i>Hibbertia scandens</i>) and Whiteroot (<i>Pratia purpurescens</i>).
Landscape position	Occurs in sheltered locations including slopes and gullies on Narrabeen Sandstones and on shale influenced soils on ridges of the central Watagan Range. Found in gullies of Yengo National Park and western Watagan Ranges.
Percent cleared in CMA area	10%
Condition class	Moderate–good
Description	Occurs in sheltered gullies and slopes above rainforest as a tall community, but with few over-mature trees present.



Table 4.11 Narrabeen East Wollemi Sheltered Dry Forest

Vegetation formation (Keith 2002)	Dry Sclerophyll Forests (Shrubby subformation)
Vegetation class (Keith 2002)	Sydney Hinterland Dry Sclerophyll Forests
Vegetation type (Bell 2005)	Narrabeen East Wollemi Sheltered Dry Forest
Biometric vegetation type (BVT) ID (DECC 2008a)	HU554 Grey Gum–Smooth-barked Apple open forest of the dry hinterland of the Central Coast, Sydney Basin
Threatened ecological community	None
Dominant canopy species	Grey Gum and Narrow-leaved Stringybark (<i>Eucalyptus sparsifolia</i>) dominate this community, with occasional Smooth-barked Apple and Rough-barked Apple (<i>Angophora floribunda</i>)
Dominant mid stratum species	Sub-canopy and shrubs consisted of Forest Oak (<i>Allocasuarina torulosa</i>), <i>Acacia fulva</i> , Blackthorn (<i>Bursaria spinosa</i>) and Lance-leaf Geebung (<i>Persoonia lanceolata</i>).
Dominant ground stratum species	Blue Flax-lily Wiry Panic (<i>Entolasia stricta</i>), Purple Coral Pea (<i>Hardenbergia violacea</i>), Many flowered Mat-rush (<i>Lomandra multiflora</i>), Poa sp. and Rough Bush-pea (<i>Pultenaea scabra</i>) were common throughout this community.
Landscape position	Occurs on mid to upper slopes in protected locations on Narrabeen Sandstones.
Percent cleared in CMA area	5%
Condition class	Moderate -good
Description	Usually on southern steeper slopes, but also on other sloping areas in sheltered locations.



Table 4.12 Sandstone Gorge Warm Temperate Rainforest

Vegetation formation (Keith 2002)	Rainforests
Vegetation class (Keith 2002)	Northern Warm Temperate Rainforests
Vegetation type (Peake 2006)	Sandstone Gorge Warm Temperate Rainforest
Biometric vegetation type (BVT) ID (DECC 2008a)	HU529 Coachwood–Crabapple warm temperate rainforest of the North Coast and northern Sydney Basin
Threatened ecological community	None
Dominant canopy species	Sassafras (<i>Doryphora sassafras</i>) with Coachwood (<i>Ceratopetalum apetalum</i>), Grey Myrtle, <i>Ficus rubiginosa</i> , Crabapple (<i>Schizomeria ovata</i>) and Sandpaper Fig (<i>Ficus coronata</i>) dominate the canopy, with emergent Sydney Blue Gum in areas.
Dominant mid stratum species	The mid-stratum was dominated by typical canopy species, Pittosporum and vines including Water Vine (<i>Cissus hypoglauca</i>) and White Supplejack (<i>Ripogonum album</i>).
Dominant ground stratum species	Ground vegetation is sparse but diverse, often with ferns including Black Stem (<i>Adiantum formosum</i>), Eared Swamp Fern (<i>Blechnum camfieldii</i>), Gristle Fern (<i>Blechnum cartilagineum</i>), Rainbow Fern (<i>Calochlaena dubia</i>), Prickly Rasp Fern (<i>Doodia aspera</i>), Sickie Fern (<i>Pellaea falcata</i>) and Stingling Nettle (<i>Urtica incisa</i>).
Landscape position	In sheltered moist situations at low to intermediate altitudes.
Percent cleared in CMA area	30%
Condition class	Moderate–good
Description	Occurs in protected gullies on alluvial and colluvial soils.



Table 4.13 Remnant Shale Cap Forest

Vegetation formation (Keith 2002)	Wet Sclerophyll Forests (Grassy subformation)
Vegetation class (Keith 2002)	Northern Hinterland Wet Sclerophyll Forests
Vegetation type (Bell 2005)	Remnant Shale Cap Forest
Biometric vegetation type (BVT) ID (DECC 2008a)	HU601 Rough-barked Apple–Grey Gum grassy open forest of the hinterland hills of the Central Coast, Sydney Basin
Threatened ecological community	None
Dominant canopy species	Narrow-leaved Stringybark, Rough-barked Apple, Grey Gum (<i>Eucalyptus punctata</i>), with occasional White Stringybark (<i>Eucalyptus globoidea</i>) and Grey Ironbark (<i>Eucalyptus paniculata</i> subsp. <i>paniculata</i>).
Dominant mid stratum species	Shrub and sub-canopy species included Parramatta Wattle, <i>Acacia fulva</i> , Forest Oak, Blackthorn, Gorse Bitter Pea and <i>Exocarpus</i> sp..
Dominant ground stratum species	Groundcovers and climbers included Wombat Berry (<i>Eustrephus latifolius</i>), Purple Coral Pea, Wiry Panic, Shrub Violet (<i>Hybanthus floribundus</i>), Many flowered Mat-rush (<i>Lomandra multiflora</i>), Lance-leaf Geebung and Whiteroot.
Landscape position	Occurs on slopes and ridges with deeper shale lenses on Narrabeen Sandstones.
Percent cleared in CMA area	5%
Condition class	Moderate–good
Description	Occurs as a tall open forest which has been subject to grazing and firewood collection in the past.



Table 4.14 Regeneration

Vegetation formation (Keith 2002)	Wet Sclerophyll Forests (Grassy subformation)—regenerating
Vegetation class (Keith 2002)	Northern Hinterland Wet Sclerophyll Forests—regenerating
Vegetation type (Bell 2005)	Remnant Shale Cap Forest—regenerating
Biometric vegetation type (BVT) ID (DECC 2008a)	HU601 Rough-barked Apple–Grey Gum grassy open forest of the hinterland hills of the Central Coast, Sydney Basin—regenerating
Threatened ecological community	None
Dominant canopy species	None
Dominant mid stratum species	<i>Acacia fulva</i> dominates the shrub and small-tree layer.
Dominant ground stratum species	Ground covers include Wiry Panic (<i>Entolasia stricta</i>), <i>Pratia purpurascens</i> , Blue Flax-lily, <i>Billardiera scandens</i> , Bracken Fern (<i>Pteridium esculentum</i>), Kikuyu, Paspalum and occasional Kangaroo Grass (<i>Themeda australis</i>).
Landscape position	Occurs on slopes with deeper shale lenses on Narrabeen Sandstones that have been previously cleared or within the transmission line easements on ridges (where it is more representative of Narrabeen East Wollemi Sheltered Dry Forest).
Percent cleared in CMA area	5%
Condition class	Low-moderate
Description	Subject to grazing and firewood collection in the past on the productive soils of the valley floor. Areas adjacent to the transmission towers are subject to ongoing maintenance activities and the subsequent introduction of weeds.



4.3.2 Threatened species habitat

No flora species listed as threatened under the TSC AC or EPBC Act were identified during the survey of the Appletree Flat property. However, potential habitat is likely for the following:

- White-flowered Wax Plant (*Cynanchum elegans*);
- *Olearia cordata*;
- *Dillwynia tenuifolia*;
- Capertee Stringybark (*Eucalyptus cannonii*);
- *Cymbidium canaliculatum* (endangered population); and
- Hairy Geebung (*Persoonia hirsuta*).

The Rare and Threatened Australian Plant (ROTAP) *Acacia fulva* (2RC-) was identified in the regeneration area in large numbers and also throughout the Remnant Shale Cap Forest and into areas of the Narrabeen East Wollemi Sheltered Dry Forest.

The Appletree Flat property contains a range of fauna habitat. This includes areas with hollow-bearing trees, rock outcrops and cave structure, fruiting trees and flowering eucalypts, and dense shrubby understorey. Three threatened fauna species were identified at the Appletree Flat property by PB (2013b):

- Speckled Warbler (*Pyrrholaemus sagittatus*);
- Varied Sittella (*Daphoenositta chrysoptera*); and
- Turquoise Parrot (*Neophema pulchella*).

Other fauna species considered likely to occur, given the habitat present and recent nearby records, include:

- Glossy Black-cockatoo (*Calyptorhynchus lathami*);
- microbats: Large-eared Pied Bat (*Chalinolobus dwyeri*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) (recorded by EMM using an Anabat detector), Eastern Cave Bat (*Vespadelus troughtoni*);
- mammals: Koala (*Phascolarctos cinereus*), Yellow-bellied Glider (*Petaurus australis*), Spotted-tailed Quoll and Squirrel Glider (*Petaurus norfolcensis*); and
- Sooty Owl (*Tyto tenebricosa*).

4.3.3 Long-term conservation and management

The Appletree Flat BOA is proposed for dedication as a conservation reserve under the *National Parks and Wildlife Act 1974* (NPW Act). OEH has already provided in-principle agreement to the current landowners for the addition of this property to the reserve system and advised that the formal reserve referral process is not required as it is an in-holding within the Wollemi National Park.

Integra will consult with OEH and P&I regarding the long term security of the Appletree Flat BOA, which is likely to involve protection in perpetuity under the control and management of OEH and the NSW National Parks and Wildlife Service (NPWS).

5 Adequacy of revised biodiversity offset strategy

5.1 Overview

The revised biodiversity offset strategy has been compared against the Project Approval, approved project impacts and the approved BOAs to ensure that the ecological requirements have been provided in revised BOAs. The strategy has also been assessed according to relevant OEH offset policies.

The revised biodiversity offset strategy aims to provide like for like or similar vegetation and threatened species habitat when compared to the approved biodiversity offset strategy in the long-term, while also meeting the Project Approval conditions.

5.2 Comparison against approved project and approved BOAs

5.2.1 Vegetation

Offset ratios, based on the area (quantity) of each vegetation community in the BOAs compared to the area impacted by the approved project, were used to compare the outcomes of the revised biodiversity offset strategy with the approved biodiversity offset strategy.

The revised biodiversity offset strategy would result in an equivalent offset to impact ratio as the approved biodiversity offset strategy for Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest conserved in the medium to long-term (Table 5.1). A total of 202.8 ha of this community is included in the revised biodiversity offset strategy, which includes approximately 87 ha of regeneration from areas identified as containing Derived Grassland/Native Pasture. It is important to note that regeneration of this community is not mine rehabilitation, and will only occur in areas which have not been previously disturbed for mining.

The revised BOAs would result in an improved outcome for the area of native vegetation conserved and improved when compared to the approved offset areas (Table 5.1). An additional 212.6 ha of native vegetation is included in the revised biodiversity offset strategy when compared to the approved BOAs, resulting in an offset to impact ratio of 4.9:1. Some of this is a result of the reclassification of some of the 'cleared' areas to Derived Grassland/Native Pasture (up to 87 ha), but it is largely a result of the amount of native vegetation at the Appletree Flat BOA.

The revised offsets provide an improved offset outcome overall. When compared with the approved BOAs, the revised biodiversity offset strategy:

- provides similar offset to impact ratios for the vegetation communities impacted by the approved project;
- increases the percentage of native vegetation in the offsets (31% more); and
- provides an additional approximately 40 ha of offset area.

Table 5.1 Revised offset ratios for native vegetation

Vegetation community	Approved project (ha)	Approved BOAs		Revised offset strategy	
		Offset (ha) (includes regeneration) ¹	Offset to impact ratio	Offset (ha) (includes regeneration) ¹	Offset to impact ratio (includes regeneration) ¹
Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest (Central Hunter Ironbark-Spotted Gum–Grey Box Forest EEC)	87.3	213.8	2.4:1	202.8	2.3:1
Swamp Oak Forest	5.0	53.4	10.7:1	49.7	9.9:1
Shrubland	0.7	0	n/a	0	n/a
Tussock Grassland	9.1	0	n/a	0	n/a
Other woodland and forest (includes regeneration/shrubland)	0	45.0	n/a	252.3	n/a
Total native vegetation	102.1	292.2	2.9:1	504.8	4.9:1
Total area (ha)	413.7	575.3	1.4:1	614.9	1.5:1
Percent of the offset containing native vegetation	25.0%	50.8%		82.1%	

Note: 1. This is regeneration in the derived native grassland and native pasture within the BOAs (not mine rehabilitation).

Although the revised BOAs remove some of the approved offset areas from the package, these areas will remain under the management of Integra. The removed offset areas will not be lost as a result of this modification. These areas will still provide important habitat for threatened species in the locality into the future.

5.2.2 Fauna habitat

The revised BOAs provide offset to impact ratios for threatened species between 1.7:1 and 5.7:1, which is an equivalent or in most cases, improved outcome for all species when compared with the approved BOAs (Table 5.2). This has resulted from the increase in native vegetation and potential habitat provided in the revised biodiversity offset strategy.

Table 5.2 Revised biodiversity offset strategy threatened species offset ratios

Threatened fauna	Impact area (ha)	Offset area (ha)	Offset to impact ratio (includes regeneration) ¹	Biodiversity outcome of revised BOAs
Squirrel Glider (woodland habitat)	87.3	202.8	2.3:1	Equivalent
Grey-crowned Babbler (woodland habitat)	88.0	202.8	2.3:1	Equivalent
Eastern Bent-wing Bat (woodland habitat)	93.0	504.8	5.4:1	Improved
Eastern Freetail Bat (woodland habitat)	93.0	504.8	5.4:1	Improved
Yellow-bellied Sheath-tail Bat (woodland and native grassland habitat)	362.0	614.9	1.7:1	Improved
Grey-headed Flying Fox (woodland habitat)	88.0	504.8	5.7:1	Improved

Table 5.2 Revised biodiversity offset strategy threatened species offset ratios

Threatened fauna habitat)	Impact area (ha)	Offset area (ha)	Offset to impact ratio (includes regeneration) ¹	Biodiversity outcome of revised BOAs
Speckled Warbler (woodland habitat)	88.0	202.8	2.3:1	Improved
Brown Treecreeper (woodland habitat)	88.0	202.8	2.3:1	Improved
Brush-tail Phascogale (woodland habitat)	88.0	202.8	2.3:1	Improved

Note: 1. This is regeneration in the derived native grassland and native pasture within the BOAs (not mine rehabilitation).

5.3 Conditions of approval

As discussed in Section 1.1, the biodiversity offset requirements are prescribed in the Project Approvals. The revised biodiversity offset strategy meets all the conditions of the Project Approvals related to biodiversity offsets. A discussion of these is provided in Table 5.3.

Table 5.3 Comparison against conditions of approval

Condition	Discussion
41. A minimum of 373 ha of offsets	This condition has been met. The revised BOS provides a total of 614.9 ha of offset areas, which is 241.9 ha more than the approval requires. The revised BOAs also add an additional approximately 40 ha of offset area when compared with the approved BOAs, and 212.6 ha of native vegetation. Therefore the revised BOAs provide an improved outcome for native vegetation than what is required under the Project Approval.
42 (a). A minimum of 140 ha of Narrow-leaved Ironbark-Spotted Gum-Forest Red Gum Forest (or a suitable equivalent)	This condition has been met. The revised BOS provides 202.8 ha of Narrow-leaved Ironbark-Spotted Gum-Forest Red Gum Forest, comprising 115.5 ha of woodland and 87.3 ha of Derived Grassland/Native Pasture that Integra is committed to regenerated to a woodland form of this community. This is 62.8 ha more than the approval requires and will result in an increase in the amount of this community in the local area.
42 (b). An additional 6 hectares of Central Hunter Swamp Oak Forest (outside the Northern, Southern, Western, Bridgman and Supplementary BOAs which contained 31 ha of this community)	This condition has been met. The revised BOS provides 49.7 ha of this community in total, which is 12.7 ha more than the 37 ha required (31 ha in the approved BOAs plus the additional 6 ha) by the Project Approvals.

5.4 OEH offset policy

At the time of Project Approval, the *Principles for the Use of Biodiversity Offsets in NSW* would have been used by OEH to determine the adequacy of offset strategies. The policy consisted of 13 principles to be considered. For consistency these have been discussed for the revised BOAs in Table 5.4. As the project will not generate any additional disturbance or impacts as a result of the current proposal, the revised BOAs have been compared against the approved project and the approved BOAs.

Table 5.4 **Assessment against OEH 2011 policy**

Principle	Discussion
1. Impacts must be avoided first by using prevention and mitigation measures.	The avoidance and mitigation of impacts on biodiversity has been addressed in the approved environmental assessments for the underground and open cut projects and subsequent modifications. As this modification only seeks to alter the approved BOAs and does not propose any disturbance or additional impacts compared to the approved project, this principle is not applicable for the modification.
2. All regulatory requirements must be met.	The revised biodiversity offset strategy is not being used to satisfy any other assessment or approval requirements under any other legislation.
3. Offsets must never reward ongoing poor performance.	Integra is committed to the improvement of the BOAs. A BMP is in place to ensure this, with various management activities including weed and feral animal management and planting strategies being completed in the BOAs under the BMP. The revision of the BMP will include a detailed monitoring program to evaluate the performance of the management actions under the BMP.
4. Offsets will complement other government programs.	The revised biodiversity offset strategy will protect and enhance vegetation communities of conservation significance in the Hunter CMA. It will also add to current knowledge on the regeneration success for the EECs in the region. It will also assist in the conservation and management of the in-holdings of the Wollemi National Park, by adding these areas to the reserve estate.
5. Offsets must be underpinned by sound ecological principles.	Proposed offsets have been selected to ensure that the ecological requirements of the Project Approval are met and that like for like or similar equivalent vegetation and threatened species habitat have been provided when comparing the revised biodiversity offset strategy with the approved biodiversity offset strategy. As such, offset to impact ratios for threatened communities impacted by the approved project and allocated under the approved biodiversity offset strategy, have been used as a guide to ensure that the offset requirements have been met. In addition, the minimum offset requirements outlined in the Project Approval have been met and exceeded in the revised biodiversity offset strategy. As the modification will not require impacts to any native vegetation, this approach is considered to be appropriate to determine the quantum and ecological values required to replace the approved offset strategy in accordance with the Project Approval and offset requirements at the time of approval, which would have been determined using appropriate ecological principles.
6. Offsets should aim to result in a net improvement in biodiversity over time.	The revised BOAs provide a substantial commitment to the improvement of threatened ecological communities in the local area through the regeneration, management and protection of these areas. The Appletree Flat BOA will assist in meeting regional conservation and management aims for the Wollemi National Park, and significantly increase the amount of native vegetation and threatened species habitat included in the revised biodiversity offset strategy, when compared with the approved BOAs. Excised areas are not proposed to be impacted under this modification, and will remain under the management of Integra as the landowner, managed in the same manner as Integra's other land holdings at the Complex in accordance with Integra's suite of environmental management plans.
7. Offsets must be enduring – they must offset the impact of the development for the period that the impact occurs.	Integra is investigating appropriate mechanisms to protect the onsite BOAs. Integra is committed to providing long-term security in accordance with condition 43 of the Project Approvals. The appropriate mechanisms for this will be determined in consultation with OEH and P&I. The Appletree Flat BOA is proposed to be protected in perpetuity under the control and management of the NSW NPWS.
8. Offsets should be agreed prior to the impact occurring.	The current offset package was determined prior to the approved impacts occurring at the Complex.

Table 5.4 **Assessment against OEH 2011 policy**

Principle	Discussion
9. Offsets must be quantifiable – the impacts and benefits must be reliably estimated.	As the modification does not propose any impacts to any native vegetation, this approach is considered to be appropriate to determine the quantum and ecological values required to replace the approved offset strategy in accordance with the Project Approval and offset requirements at the time of approval, which would have been determined using appropriate ecological principles and would have been reliably estimated.
10. Offsets must be targeted.	As discussed above, the revised biodiversity offset strategy aims to provide similar or better values than those provided in the approved offsets. It also provides similar offset to impact ratios as the approved biodiversity offset strategy. The revised onsite BOA areas contain communities that are representative of the Integra Open Cut and Underground projects (the approved project). The Appletree Flat BOA comprises a property with high conservation significance as an addition to the reserve network and important threatened fauna habitat.
11. Offsets must be located appropriately.	The onsite BOAs occur surrounding the approved project and incorporate similar vegetation communities to those impacted. The Appletree Flat BOA has been located to provide regional biodiversity outcomes, in an in-holding that when added to the reserve network, will assist in the management and conservation of threatened species habitat in the region.
12. Offsets must be supplementary.	There are no current legal requirements for conservation management on the revised BOAs, however Integra is managing these areas for conservation under the approved biodiversity offset strategy and BMP.
13. Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.	Through the project approval as proposed to be modified, the revised biodiversity offset strategy will be enforceable. The management actions in the revised BOAs will be detailed under the revised BMP which will form part of the Integra Environmental Management System for the Complex.

The *Draft NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014) has been recently released to determine the adequacy of offset strategies for major projects. This draft policy is not yet in force, nevertheless, the revised BOAs have been assessed against this policy (Table 5.5).

The principles have been developed for assessing impacts on biodiversity and determining acceptable offsets for state significant development and state significant infrastructure projects. As the project will not generate any additional disturbance or impacts as a result of the current proposal, the comparison against the approved project and the approved BOAs has been included in the discussion of adequacy.

Table 5.5 **Assessment against OEH 2014 policy**

Principle	Discussion
1. Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.	The avoidance and mitigation of impacts on biodiversity has been addressed in the approved environmental assessments for the underground and open cut projects and subsequent modifications. As this modification only seeks to alter the approved BOAs and does not propose any disturbance or additional impacts compared to the approved project, this principle is not applicable for the modification.

Table 5.5 **Assessment against OEH 2014 policy**

Principle	Discussion
2. Offset requirements should be based on a reliable and transparent assessment of losses and gains.	Losses and gains are not applicable, as the modification will not result in any impacts. The modification is only seeking to replace the approved biodiversity offset strategy by providing an equivalent or improved package. As the consolidated approvals date from 2007 to 2012, a range of techniques has been employed previously to determine the suitability of offsets for each stage of the project. As the area and vegetation types required to compensate for the project's impacts has been approved, it is assumed that an adequate assessment of the losses and gains was completed. The revised biodiversity offset strategy aims to provide similar or better values than those provided in the approved BOAs. An equivalent or better outcome for EEC, native vegetation and threatened species habitat has been provided in the revised biodiversity offset strategy. As the modification will not generate any impacts to any native vegetation, this approach is considered to be appropriate to determine the quantum and ecological values required to replace the approved offset strategy in accordance with the Project Approval and offset requirements at the time of approval, which would have been determined using appropriate ecological principles.
3. Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.	As discussed above, the revised biodiversity offset strategy aims to provide similar or better values than those provided in the approved offsets. It also provides similar offset to impact ratios as the approved biodiversity offset strategy. The revised onsite BOA areas contain communities that are representative of the Integra Open Cut and Underground projects (the approved project). The Appletree Flat BOA comprises a property with high conservation significance as an addition to the reserve network and important threatened fauna habitat.
4. Offsets must be additional to other legal requirements.	There are no current legal requirements for conservation management on the revised BOAs, however Integra is managing these areas for conservation under the approved biodiversity offset strategy and BMP. The revised biodiversity offset strategy includes the regeneration of a significant area of Narrow-leaved Ironbark–Spotted Gum–Grey Box Open Forest, part of the Central Hunter Ironbark–Spotted Gum–Grey Box Forest EEC. It also includes the active management of the onsite BOA areas to improve the conservation values present.
5. Offsets must be enduring, enforceable and auditable.	Integra is investigating appropriate mechanisms to protect the onsite BOAs. Integra is committed to providing long-term security in accordance with condition 43 of the Project Approvals. The appropriate mechanisms for this will be determined in consultation with OEH and P&I. The Appletree Flat BOA will be protected in perpetuity under the control and management of OEH and the NSW NPWS.
6. Supplementary measures can be used in lieu of offsets.	The revised offset strategy comprises entirely of land-based offsets, with no supplementary measures.
7. Offsets can be discounted where significant social and economic benefits accrue to NSW as a consequence of the proposal.	Economic and social benefits will be realised as a result of the modification, as the approved biodiversity offset strategy would sterilise potential future coal resources. Despite this, the revised biodiversity offset strategy has not been discounted. The changes to the offset strategy have assessed for adequacy against the approved project impacts and approved biodiversity offset strategy and are justified in the absence of discounting.

6 Conclusion

Integra intends to request the Minister for Planning and Infrastructure to modify its Project Approvals under section 75W of the EP&A Act for the Complex. The proposed modification relates exclusively to alterations to the approved biodiversity offset strategy for the Complex. It is important to note that no additional mining, disturbance, physical changes, vegetation clearing or any other changes are proposed as part of the modification.

The revised biodiversity offset strategy incorporates onsite and offsite BOAs. The onsite BOAs are a modified version of the approved BOAs which surround the Complex and contain the same vegetation and habitat values as the approved biodiversity offset strategy. The Appletree Flat BOA represents an offsite property surrounded by the Wollemi National Park, which provides important habitat and connectivity for threatened fauna species and the reserve network.

The revised biodiversity offset strategy has been developed to ensure an improved biodiversity outcome. The adequacy of the revised biodiversity offset strategy has been assessed against the Project Approval, the impacts of the approved project, the approved biodiversity offset strategy, the *Principles for the Use of Biodiversity Offsets in NSW* (OEH 2011) and the seven principles in the *Draft NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014).

The revised biodiversity offset strategy contains vegetation and habitat values similar to those in the approved offset areas and in the approved project areas. This includes an equivalent amount of Central Hunter Ironbark–Spotted Gum–Grey Box Forest EEC with the inclusion of specific regeneration activities in the offset areas, and an equivalent amount of Swamp Oak Floodplain Forest EEC. It also provides a similar, or in some cases improved, outcome for threatened species habitat.

The revised offsets provide an improved offset outcome overall. When compared with the approved BOAs, the revised biodiversity offset strategy:

- provides similar offset to impact ratios for the vegetation communities impacted by the approved project;
- increases the percentage of native vegetation in the offsets (31% more); and
- provides an additional approximately 40 ha of offset area.

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Appendix A

Flora and fauna recorded by EMM

Table A.1 **Flora species recorded by EMM**

Common name	Scientific name	Onsite BOAs					Appletree Flat BOA			
		Derived Grassland	Derived Grassland	Derived Grassland	Derived Grassland	Additional species recorded	Narrabeen East Wollemi Sheltered Dry Forest	Remnant Shale Cap Forest	Sandstone Gorge Warm Temperate Rainforest	Additional species recorded
		RA1	RA2	RA3	RA4		RA1	RA2	RA3	
Fan Wattle	<i>Acacia ambygona</i>									X
-	<i>Acacia falcata</i>	X								
Velvet Wattle	<i>Acacia fulva</i>						X	X		X
Parramatta Wattle	<i>Acacia parramattensis</i>							X		X
Black Stem	<i>Adiantum formosum</i>								X	
Bull Oak	<i>Allocasuarina luehmannii</i>					X				
Forest Oak	<i>Allocasuarina torulosa</i>						X	X		X
Sydney Red Gum	<i>Angophora costata</i>						X			X
Rough-barked Apple	<i>Angophora floribunda</i>						X	X		X
Three-awn Speargrass	<i>Aristida ramosa</i>		X	X	X					
Wallaby Grass	<i>Austrodanthonia bipartita</i>	X								
Grey Myrtle	<i>Backhousia myrtifolia</i>								X	X
Hairy Apple Berry	<i>Billardiera scandens</i>									X
Eared Swamp Fern	<i>Blechnum camfieldii</i>								X	
Gristle Fern	<i>Blechnum cartilagineum</i>								X	
Red-leg Grass	<i>Bothriochloa macra</i>	X	X							
Blackthorn	<i>Bursaria spinosa</i>						X	X		
Rainbow Fern	<i>Calochlaena dubia</i>								X	
-	<i>Cassinia aculeata</i>									X

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		Derived Grassland	Derived Grassland	Derived Grassland	Derived Grassland	Additional species recorded	Narrabeen East Wollemi Sheltered Dry Forest	Remnant Shale Cap Forest	Sandstone Gorge Warm Temperate Rainforest	Additional species recorded
		RA1	RA2	RA3	RA4		RA1	RA2	RA3	
Swamp Oak	<i>Casuarina glauca</i>					X				
Coachwood	<i>Ceratopetalum apetalum</i>								X	
Bristly Cloak Fern	<i>Cheilanthes distans</i>		X	X						
Mulga Fern	<i>Cheilanthes sieberi</i>									X
Rhodes Grass	<i>Chloris gayana*</i>	X								
Common Everlasting	<i>Chrysocephalum apiculatum</i>			X	X					
Water Vine	<i>Cissus hypoglauca</i>								X	
Fleabane	<i>Conyza sp*</i>		X							
Spotted Gum	<i>Corymbia maculata</i>					X				
Barbed Wire Grass	<i>Cymbopogon refractus</i>	X	X	X	X					
Couch	<i>Cynodon dactylon</i>					X				
Broom Bitter Pea	<i>Daviesia genistifolia</i>									X
Gorse Bitter Pea	<i>Daviesia ulicifolia</i>							X		
Slender Tick Trefoil	<i>Desmodium gunnii</i>			X						
Slender Tick-trefoil	<i>Desmodium varians</i>									X
Blue Flax-lily	<i>Dianella caerulea</i>						X			X
Blueberry Lily	<i>Dianella revoluta</i>									X
Shorthair Plumegrass	<i>Dichelachne micrantha</i>									X
Kidney Weed	<i>Dichondra repens</i>									X

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		RA1	RA2	RA3	RA4		RA1	RA2	RA3	
Prickly Rasp Fern	<i>Doodia aspera</i>								X	
Sassafras	<i>Doryphora sassafras</i>								X	
Hedgehog grass	<i>Echinopogon sp.</i>					X				X
Wiry Panic	<i>Entolasia stricta</i>						X	X		X
-	<i>Eragrostis cillianensis</i>									X
Narrow-leaved Ironbark	<i>Eucalyptus crebra</i>					X				X
Broad-leaved Ironbark	<i>Eucalyptus fibrosa</i>									X
White Stringybark	<i>Eucalyptus globoidea</i>							X		
Grey Box	<i>Eucalyptus microcarpa</i>					X				
Grey Ironbark	<i>Eucalyptus paniculata subsp. Paniculata</i>							X		
Grey Gum	<i>Eucalyptus punctata</i>						X	X		X
Sydney Blue Gum	<i>Eucalyptus saligna</i>								X	X
Narrow-leaved Stringybark	<i>Eucalyptus sparsifolia</i>						X	X		X
Forest Red Gum	<i>Eucalyptus tereticornis</i>									X
Wombat Berry	<i>Eustrephus latifolius</i>							X		
	<i>Exocarpus sp.</i>							X		X
Sandpaper Fig	<i>Ficus coronata</i>								X	
Port Jackson Fig	<i>Ficus rubiginosa</i>								X	
Fig	<i>Ficus sp.</i>									X

Table A.1 **Flora species recorded by EMM**

Common name	Scientific name	Onsite BOAs					Appletree Flat BOA			
		Derived Grassland	Derived Grassland	Derived Grassland	Derived Grassland	Additional species recorded	Narrabeen East Wollemi Sheltered Dry Forest	Remnant Shale Cap Forest	Sandstone Gorge Warm Temperate Rainforest	Additional species recorded
		RA1	RA2	RA3	RA4		RA1	RA2	RA3	
Common Fringe Sedge	<i>Fimbristylis dichotoma</i>	X	X							
Eastern Cottonbush	<i>Gomphocarpus fruticosus</i>					X				
-	<i>Hakea decurrens</i>					X				
Purple Coral Pea	<i>Hardenbergia violacea</i>						X	X		
Climbing Guinea Flower	<i>Hibbertia scandens</i>									X
Yorkshire Fog	<i>Holcus lanatus*</i>					X				
Shrub Violet	<i>Hybanthus floribundus</i>							X		
-	<i>Hydrocotyle peduncularis</i>									X
Small St John's Wort	<i>Hypericum gramineum</i>					X				
-	<i>Hypochaeris glabra</i>									X
Blady Grass	<i>Imperata cylindrica</i>									X
Australian Indigo	<i>Indigofera australis</i>									
Sharp Rush	<i>Juncus acutus</i>					X				
Dusky Coral Pea	<i>Kennedia rubicunda</i>									X
	<i>Kennedia sp.</i>									X
-	<i>Lepidosperma laterale</i>									X
Tantoon	<i>Leptospermum polygalifolium</i>						X			
Blunt Beard-heath	<i>Leucopogon muticus</i>									X
Spiny-headed Mat-rush	<i>Lomandra longifolia</i>									X

Table A.1 **Flora species recorded by EMM**

Common name	Scientific name	Onsite BOAs					Appletree Flat BOA			
		Derived Grassland	Derived Grassland	Derived Grassland	Derived Grassland	Additional species recorded	Narrabeen East Wollemi Sheltered Dry Forest	Remnant Shale Cap Forest	Sandstone Gorge Warm Temperate Rainforest	Additional species recorded
		RA1	RA2	RA3	RA4		RA1	RA2	RA3	
Many flowered Mat-rush	<i>Lomandra multiflora</i>						X	X		
Holly Lomatia	<i>Lomatia ilicifolia</i>						X			
Cycad	<i>Macrozamia sp.</i>									X
Small-leaf Bluebush	<i>Maireana microphylla</i>					X				
-	<i>Melinis repens</i>					X				
Tree Broom-heath	<i>Monotoca elliptica</i>							X		
Western Boobialla	<i>Myoporum montanum</i>					X				
Tiger Pear	<i>Opuntia aurantiaca*</i>					X				
Common Prickly Pear	<i>Opuntia stricta*</i>		X	X						
Hairy Panic	<i>Panicum effusum</i>	X	X							
Common Silkpod	<i>Parsonsia straminea</i>									X
Paspalum	<i>Paspalum dilatatum*</i>		X							X
Sickle Fern	<i>Pellaea falcata</i>								X	
Kikuyu Grass	<i>Pennisetum clandestinum*</i>					X				X
African Feather Grass	<i>Pennisetum macrourum*</i>	X	X			X				
Lance-leaf Geebung	<i>Persoonia lanceolata</i>						X	X		
Narrow-leaved Geebung	<i>Persoonia linearis</i>									X
Butterbush	<i>Pittosporum angustifolium</i>					X				
Pittosporum	<i>Pittosporum undulatum</i>								X	X

Table A.1 **Flora species recorded by EMM**

Common name	Scientific name	Onsite BOAs					Appletree Flat BOA			
		Derived Grassland	Derived Grassland	Derived Grassland	Derived Grassland	Additional species recorded	Narrabeen East Wollemi Sheltered Dry Forest	Remnant Shale Cap Forest	Sandstone Gorge Warm Temperate Rainforest	Additional species recorded
		RA1	RA2	RA3	RA4		RA1	RA2	RA3	
Lambs Tongue	<i>Plantago lanceolata*</i>	X				X				
	<i>Poa sp.</i>					X	X			X
Prickly Shaggy Pea	<i>Podolobium illcifolium</i>									X
Netted Shaggy Pea	<i>Podolobium scandens</i>							X		
Whiteroot	<i>Pratia purpurascens</i>							X		X
Common Bracken	<i>Pteridium esculentum</i>									X
Tender Brakefern	<i>Pteris tremula</i>								X	
Large Bronze Bush-pea	<i>Pultenaea ferruginea</i>							X		
-	<i>Pultenaea retusa</i>					X				
Rough Bush-pea	<i>Pultenaea scabra</i>						X			
White Supplejack	<i>Ripogonum album</i>								X	
Crabapple	<i>Schizomeria ovata</i>								X	
Fireweed	<i>Senecio madagascariensis*</i>	X								
Sprawling Cassia	<i>Senna aciphylla</i>									X
Narrawa Burr	<i>Solanum cinereum</i>					X				
	<i>Solanum sp.</i>									X
Slender Rat's Tail Grass	<i>Sporobolus creber</i>		X		X					
Creamy Candles	<i>Stackhousia monogyna</i>	X	X					X		
Speargrass	<i>Stipa sp.</i>					X				

Table A.1 **Flora species recorded by EMM**

Common name	Scientific name	Onsite BOAs					Appletree Flat BOA			
		Derived Grassland	Derived Grassland	Derived Grassland	Derived Grassland	Additional species recorded	Narrabeen East Wollemi Sheltered Dry Forest	Remnant Shale Cap Forest	Sandstone Gorge Warm Temperate Rainforest	Additional species recorded
		RA1	RA2	RA3	RA4		RA1	RA2	RA3	
Dandelion	<i>Taraxacum officinale</i>	X	X							X
Kangaroo Grass	<i>Themeda australis</i>									X
Austral Sunray	<i>Triptilodiscus pygmaeus</i>			X						
Stingling Nettle	<i>Urtica incisa</i>								X	
Purpletop	<i>Verbena bonariensis</i> *		X	X						
Narrow-leaved New Holland Daisy	<i>Vittadinia muelleri</i>	X								
	<i>Vittadinia sp.</i>		X							
Native Bluebell	<i>Wahlenbergia gracilis</i>			X				X		
-	<i>Woollsia pungens</i>							X		

Notes: * denotes an exotic species.

Table A.2 Fauna species recorded by EMM

Common Name	Scientific Name	Appletree Flat BOA	Onsite BOAs
Birds			
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	X	
Yellow Thornbill	<i>Acanthiza nana</i>	X	
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	X	
Australian King-Parrot	<i>Alisterus scapularis</i>	X	
Red Wattlebird	<i>Anthochaera carunculata</i>	X	
Wedge-tailed eagle	<i>Aquila audax</i>		X
Grey Heron	<i>Ardea cinerea</i>		X
Rufous Fieldwren	<i>Calamanthus campestris</i>	X	
Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>	X	
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	X	
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>		X
White-throated Treecreeper	<i>Cormobates leucophaea</i>	X	
Australian Raven	<i>Corvus coronoides</i>	X	
Quail	<i>Coturnix spp.</i>		X
Pied Butcherbird	<i>Cracticus nigrogularis</i>	X	
Australian Magpie	<i>Cracticus tibicen</i>	X	X
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	X	
Galah	<i>Elophus roseicapilla</i>		X
Eastern Yellow Robin	<i>Eopsaltria australis</i>	X	
Eurasian Coot	<i>Fulica atra</i>		X
Welcome Swallow	<i>Hirundo neoxena</i>		X
Wonga Pigeon	<i>Leucosarcia picata</i>	X	
Wonga Pigeon	<i>Leucosarcia picata</i>	X	
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	X	
Yellow-tufted Honeyeater	<i>Lichenostomus melanops</i>	X	
Superb Fairy-wren	<i>Malurus cyaneus</i>	X	
Noisy Miner	<i>Manorina melanocephala</i>		X
Bell Miner	<i>Manorina melanophrys</i>	X	
Lewin's Honeyeater	<i>Meliphaga lewinii</i>	X	
Superb Lyrebird	<i>Menura novaehollandiae</i>	X	
Rufous Whistler	<i>Pachycephala rufiventris</i>	X	
Spotted Pardalote	<i>Pardalotus punctatus</i>	X	X
Striated Pardalote	<i>Pardalotus striatus</i>	X	
Australian Pelican	<i>Pelicanus conspicillatus</i>		X
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>		X
Crimson Rosella	<i>Platycercus elegans</i>	X	
Eastern Rosella	<i>Platycercus eximius</i>	X	X
Eastern Whipbird	<i>Psophodes olivaceus</i>	X	
Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>	X	

Table A.2 Fauna species recorded by EMM

Common Name	Scientific Name	Appletree Flat BOA	Onsite BOAs
Grey Fantail	<i>Rhipidura albiscapa</i>	X	
Pied Currawong	<i>Strepera graculina</i>	X	X
Masked Lapwing	<i>Vanellus miles</i>		X
Silvereye	<i>Zosterops lateralis</i>	X	
Mammals			
Brown Antechinus	<i>Antechinus stuartii</i>	X	
Brown Hare	<i>Lepus capensis</i>	X	
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	X	X
Common Wallaroo	<i>Macropus robustus</i>	X	
Red-necked Wallaby	<i>Macropus rufogriseus</i>	X	
Common Wombat	<i>Vombatus ursinus</i>	X	
Microbats			
Chocolate Wattled Bat	<i>Chalinolobus morio</i>	X	
Little Bentwing Bat	<i>Miniopterus australis</i>	X	
Eastern Bentwing Bat	<i>Miniopterus schreibersii oceanensis</i> ¹	X	
Long-eared Bat	<i>Nyctophilus spp.</i>	X	
White-striped Freetail Bat	<i>Tadarida australis</i>	X	
Large Forest Bat	<i>Vespadelus darlingtoni</i>	X	
Reptiles			
Lace monitor	<i>Varanus varius</i>	X	

Notes: 1. Listed as a threatened species under the TSC Act.

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