

Appendix B

Ecological assessment – Cumberland Ecology

B

17 October 2013

Associate Director
Duncan Peake
EMGA Mitchell McLennan
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St Lennards NSW 2065

**ECOLOGICAL ASSESSMENT OF S75W MODIFICATION FOR
WARKWORTH MINE**

Dear Duncan,

Cumberland Ecology has been requested by EMGA Mitchell McLennan (EMM), on behalf of Coal & Allied, to provide an ecological report to support a proposed modification of the Warkworth Mine 2003 Development Consent under Section 75W of the EP&A Act.

The Warkworth Extension Project was given approval by the NSW Government in February 2012 and by the Commonwealth in August 2012. However, the NSW Government approval was overturned at the NSW Land and Environment Court in April 2013, and Coal & Allied is now investigating an alternative option to enable continued mining. The Commonwealth approvals are still valid.

Coal & Allied is now proposing to conduct a minor extension to West Pit (the Modification). The Modification seeks to extend the currently approved disturbance area by approximately 31 ha to the west. In order to compensate these proposed impacts, land within the area referred to in the previous EA (EMM 2010) as the Southern Biodiversity Area would be used as a biodiversity offset.

The purpose of this letter is to present an assessment of the ecological impacts of the proposed Modification. The ecological assessment also provides an assessment of the suitability of the nominated offset area to offset the impacts of the project. The full report is contained within **Appendix A**.

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Yours sincerely

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Appendix A

Ecological Assessment of S75W Modification
for Warkworth Mine

A.1 Introduction

Approval was granted for Warkworth Mine to commence mining in 1980 with the official mine opening in 1981. Several mining extensions and approvals have been granted since that date including an approval granted in 2003 by the NSW Government (DA 300-9-2002-i) (DOP, 2004) and 2004 by the Commonwealth (EPBC 2002/629) (DEH, 2004, DOP, 2004).

A Project Approval was sought under Part 3A of the EP&A Act in 2010 to facilitate the extension of Warkworth Mine (the Warkworth Extension Project) and allow mining for a further 21 years from 2011. The Warkworth Extension Project was given approval by the NSW Government in February 2012 and by the Commonwealth in August 2012 (EPBC 2009/5081). However, the NSW Government approval was overturned in the NSW Land and Environment Court in April 2013, and therefore Warkworth Mining Limited (WML) is investigating an alternative option to enable continued mining. The Commonwealth approvals are still valid, which includes approval for disturbance of the minor extension area (EPBC 2009/5081).

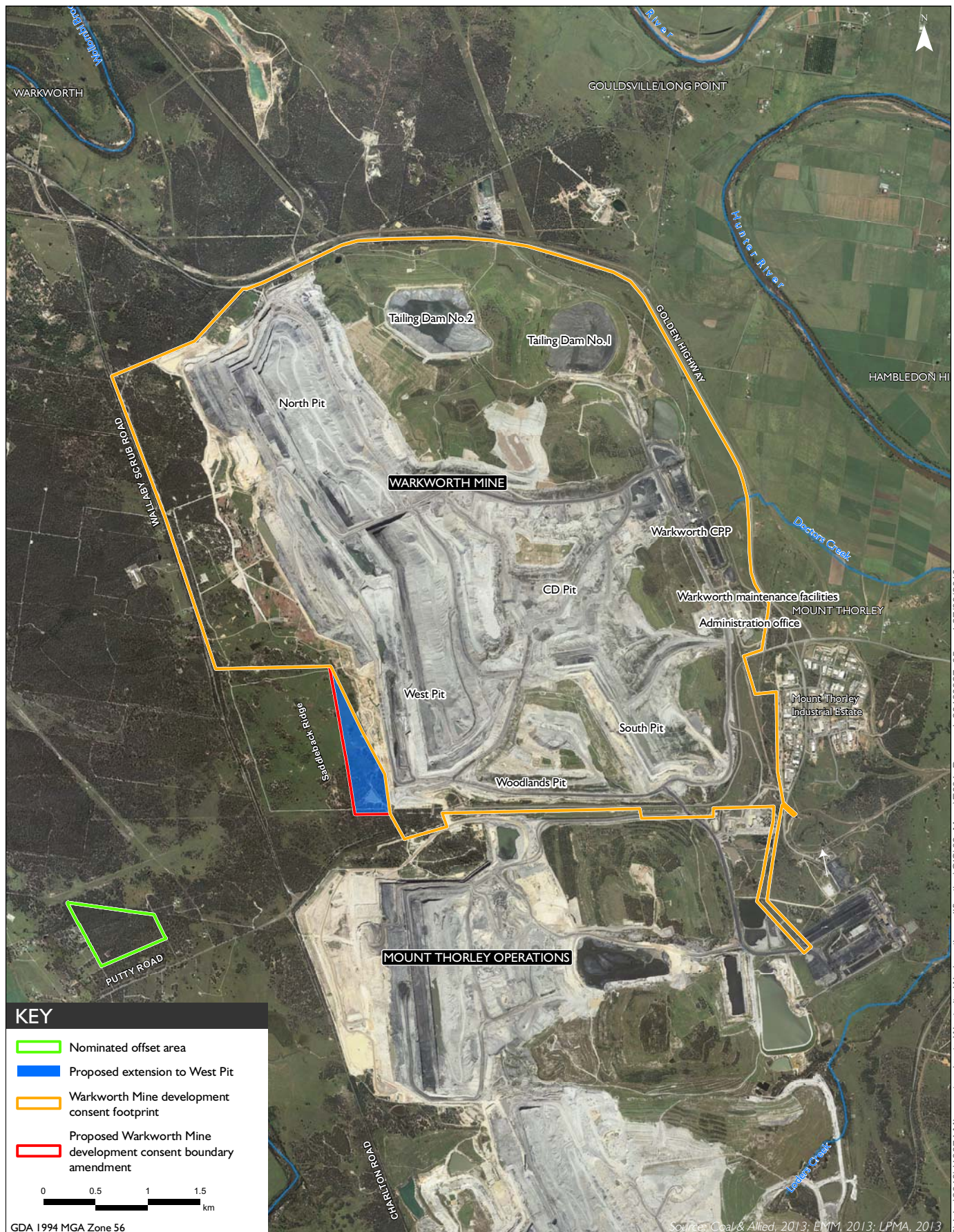
WML proposes a minor extension to West Pit (the proposed modification) in order to maintain existing production levels as close to current levels and employment of its workforce. The proposed modification seeks to extend the Warkworth disturbance area beyond the currently approved footprint to approximately the Year 2 mine plan provided in the previous Environmental Assessment (EA) (EMGA Mitchell McLennan 2010). This area is approximately 31 ha including a 1 ha dam (hereafter referred to as the "minor extension area", see **Figure 1**). In order to compensate these proposed impacts, land within the previously proposed offset lands known as the "Southern Biodiversity Area" is proposed to be used as a biodiversity offset and reserved for conservation (see **Figure 1**).

The flora and fauna of the minor extension area and the nominated offset area is well known from numerous previous studies and reports that have taken place, in particular those for the Warkworth Extension Project EA, and for the subsequent Land and Environment Court case. The reports, which incorporated the minor extension area and surrounding areas (hereafter referred to as the "study area"), have been reviewed for data relevant to the current assessment and their findings incorporated into this report. These include but are not limited to the following:

- Bell, S. (2012). *Expert Report: Bulga Milbrodale Progress Association v Minister for Planning and Infrastructure and Warkworth Mining Limited*. Land and Environment Court Proceedings No: 10224 of 2012. Prepared for EDO NSW.
- Cumberland Ecology. (2010). *Warkworth Mine Extension Ecological Assessment*. Prepared for Warkworth Mining Limited. Carlingford Court, NSW.
- EMGA Mitchell McLennan. (2010). *Proposed Warkworth Extension: Environmental Assessment* Prepared for Warkworth Mining Limited. EMGA Mitchell McLennan, St Leonards.
- Robertson, D. J. (2012). *Statement of Evidence. Land and Environment Court of NSW: Class 1, Proceedings 10224 of 2012*. Prepared for MinterEllison Lawyers on behalf of Rio Tinto Coal Australia Pty Limited. Carlingford Court, NSW.

- Umwelt (Australia). (2011). *Review of Ecological Assessments for Warkworth Extension EA and HVO South Modification Projects*. Prepared on behalf of Department of Planning & Infrastructure. Toronto, NSW.

The purpose of this report is to provide an ecological assessment to be used to support the proposed modification of the Warkworth Mine development consent under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This report provides an assessment of the ecological impacts of the proposed modification, with particular focus on threatened flora, fauna and endangered ecological communities (EEC) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A range of mitigation and compensation strategies to ameliorate the ecological impact of the proposed modification have been identified and are presented. This report also provides a description of the ecological values present in the nominated offset area and assesses the suitability of this area to offset the impacts of the proposed modification.



Proposed extension to West Pit
Warkworth Modification 6
Ecological Assessment

Figure 1

A.2 Ecology of the minor extension area

A.2.1 Vegetation

Three vegetation communities are present in the minor extension area (see **Figure 2**) (Cumberland Ecology 2010):

- Central Hunter Grey Box – Ironbark Woodland;
- Central Hunter Ironbark – Spotted Gum – Grey Box Forest; and
- Central Hunter Grey Box – Ironbark Derived Grassland.

Central Hunter Ironbark – Spotted Gum – Grey Box Forest and Central Hunter Grey Box – Ironbark Woodland are very similar communities and from an ecological perspective are considered to be largely interchangeable based on the Umwelt (2011) review of the EA, undertaken by Travis Peake.

These communities are described in more detail below.

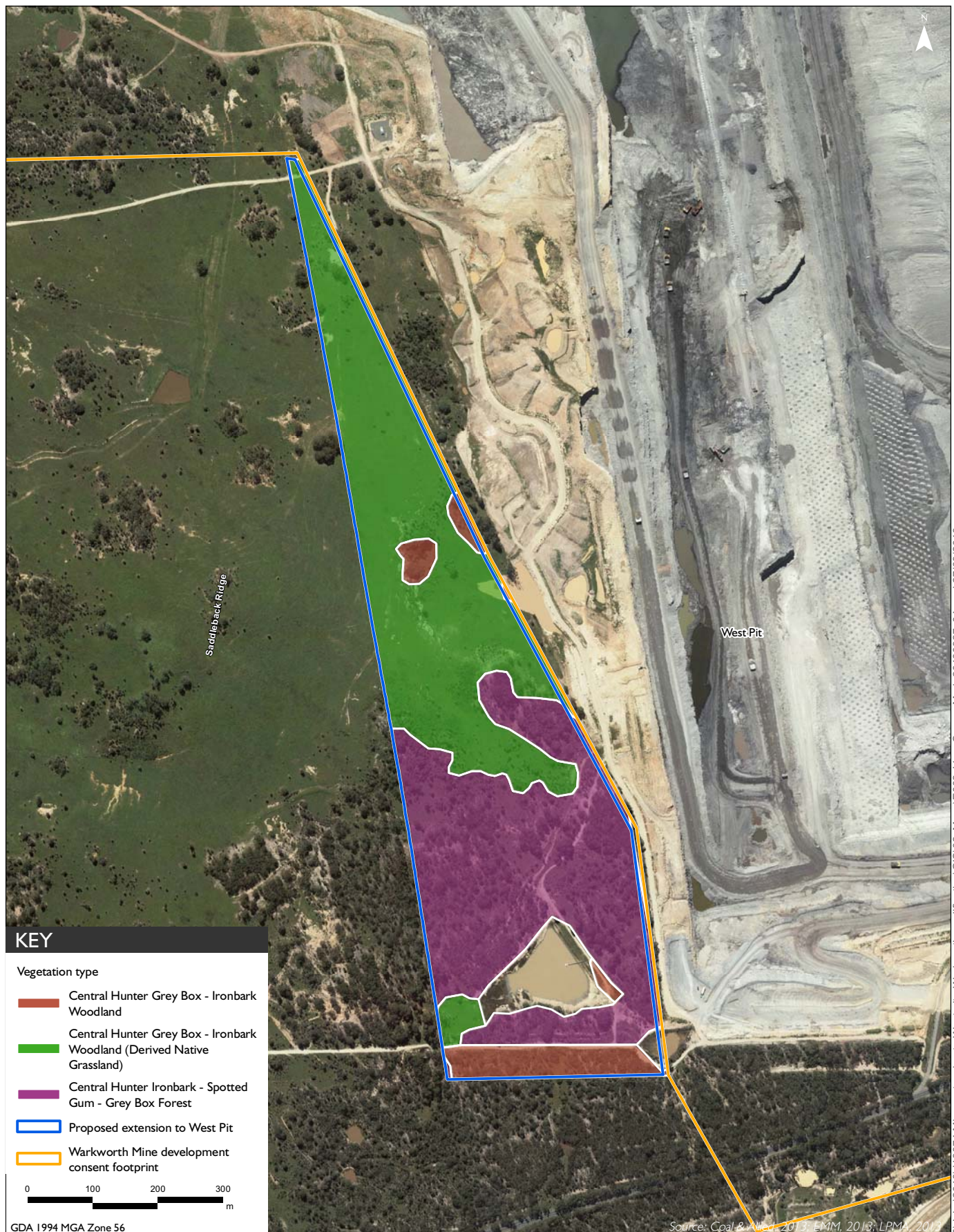
i. Central Hunter Grey Box – Ironbark Woodland

This community is listed as an EEC under the TSC Act. Approximately 3 ha of this community are present within the minor extension area (see **Figure 2**). The dominant canopy species within this community are Grey Box (*Eucalyptus moluccana*) and Narrow-leaved Ironbark (*Eucalyptus crebra*). There are also local abundances of Bullock (*Allocasuarina luehmannii*) and White Feather Honey Myrtle (*Melaleuca decora*) in the midstorey.

Common understorey species include Fan Wattle (*Acacia amblygona*), *Acacia falcata*, Native Blackthorn (*Bursaria spinosa*) and Coffee Bush (*Breynia oblongifolia*). Common groundcover species include Purple Burr-Daisy (*Calotis cuneifolia*), Blue Trumpet (*Brunoniella australis*), Kidney Weed (*Dichondra repens*), Blue Flax Lily (*Dianella revoluta*), Three-awn Speargrass (*Aristida vagans*), Wattle Matt-rush (*Lomandra filiformis*), Common Fringe-sedge (*Fimbristylis dichotoma*) and Rock Fern (*Cheilanthes sieberi*).

ii. Central Hunter Ironbark – Spotted Gum – Grey Box Forest

This community is listed as an EEC under the TSC Act. Approximately 13 ha of this community occur in the minor extension area (see **Figure 2**). Dominant canopy species in this community include Narrow-leaved Ironbark (*Eucalyptus crebra*), Spotted Gum (*Corymbia maculata*) and Grey Box (*Eucalyptus moluccana*). Bullock (*Allocasuarina luehmannii*) is a common midstorey species.



As described above, this community is essentially the same as Central Hunter Grey Box – Ironbark Woodland, and the main difference is that this community contains Spotted Gum as a dominant canopy species. The understorey is virtually identical. The common understorey species recorded in this community are Fan Wattle (*Acacia amblygona*) and Gorse Bitter Pea (*Daviesia ulicifolia*). Common groundcover species include; Blue Trumpet (*Brunoniella australis*), Common Everlasting (*Chrysocephalum apiculatum*), Wattle Matt-rush (*Lomandra filiformis*), Many-flowered Mat-rush (*Lomandra multiflora*), Blue Flax-lily (*Dianella longifolia*), Three-awn Speargrass (*Aristida vagans*), Rock Fern (*Cheilanthes sieberi*) and Variable Glycine (*Glycine tabacina*).

iii. Central Hunter Grey Box – Ironbark Derived Native Grassland

Derived Grassland is the name given to grassland vegetation that has been derived from the clearing of pre-existing trees and shrubs. In the minor extension area, the pre-existing woodland in the areas that are currently grassland would have been Central Hunter Grey Box – Ironbark (discussed above). Despite the conservation status of the intact community, the grassland community derived from it is not listed under the TSC Act as being part of the community. However, if trees and shrubs are planted within it (or encouraged to regenerate from nearby areas) then the grassland can regenerate into the EEC. Approximately 14 ha of this community occur in the minor extension area (see **Figure 2**).

This community is generally dominated by native grass species, however some herbs also occur. There is a low to moderate incursion of weed species within this community, particularly along areas that have been disturbed. Weed incursion is high where exotic species have been sown for soil stability control measures.

A.2.2 Flora

Approximately 400 flora species have been recorded on the wider study area; with over 75% of the species being native. No threatened flora species have been recorded from the minor extension area; however two threatened species have been recorded from the wider study area; Lobed Blue Grass (*Bothriochloa biloba*) and *Ancistrachne maidenii* (**Figure 3**). Lobed Blue Grass is listed as Vulnerable under the EPBC Act, and although it was previously listed as Vulnerable under the TSC Act its listing has since been removed due to a relative abundance of this species in NSW. This species was recorded at one location within a road reserve along the Golden Highway (**Figure 3**).

Ancistrachne maideni is listed as Vulnerable under the TSC Act. This species was recorded by Andrews Neil (2006) during a previous survey within Central Hunter Grey Box – Ironbark Woodland outside of the study area (**Figure 3**).

In addition to these two species, the Atlas of NSW Wildlife indicates that five individuals of Slaty Red Gum (*Eucalyptus glaucina*) have been identified adjacent to the western boundary of the study area (Cumberland Ecology 2010). This species is listed as Vulnerable under both the TSC and EPBC Act. Despite these records the species has never been confirmed in the numerous flora surveys that have been conducted within the study area since the initial recording in 1998 (Cumberland Ecology 2010).

A number of additional threatened flora species listed under the TSC Act and/or the EPBC Act are known to occur within the locality (Cumberland Ecology 2010), and several have potential to occur in the study area due to the presence of suitable habitat, however numerous flora surveys conducted in the study area over many years have failed to locate any further threatened species.

A.2.3 Fauna

The minor extension area has been substantially modified due to previous land clearing and past grazing and currently provides limited habitat for native species. Approximately half the Modification extension area consists of derived grassland. These areas constitute very poor habitat for most fauna with the exception of common widespread species such as the Eastern Grey Kangaroo (*Macropus giganteus*) and exotic fauna such as the European Rabbit (*Oryctolagus cuniculus*).

The vegetation that does occur is characterised by regrowth vegetation, and much of it is still highly fragmented with few older trees. The understorey is limited, and contains few areas of dense shrubby vegetation. This significantly limits the habitat amenity of this area for species such as woodland birds that depend on dense understorey for foraging resources and shelter. Key habitat features such as bush rock, fallen logs, leaf litter and ground vegetation, which provide shelter for many small to medium sized terrestrial fauna species are present to some degree in most of the woodland communities within the study area. Generally, the types of terrestrial native species using the study area are likely to be restricted to those that are common and well-adapted to disturbed woodland and agricultural areas.

The mature living trees and stags that remain in forest and woodland communities within the Modification extension area provide a number of small to medium-sized tree hollows for fauna species dependant on this resource as shelter and breeding habitat. However large hollows in tall trees that provide breeding and shelter habitat, particularly for large forest owls and large gliders, are relatively scarce. The scarcity of these larger hollows can be attributed to the immaturity of the vegetation as it mostly comprises regrowth following past clearing. All open forest and woodland vegetation communities within the minor extension area would provide suitable foraging habitat for a wide range of nectarivorous birds during blossom periods.

No naturally occurring wetlands and permanent streams are present within the minor extension area. However, some very small, ephemeral drainage lines and a large farm dam is present in the southern part of the area. This dam may provide some suitable habitat for some wetland-dependant species such as wetland birds and amphibians.

A total of 21 threatened fauna species including 14 bird and seven mammal species have been recorded within the study area during past work, as summarised in the EA (Cumberland Ecology 2010). The fauna of the study area is discussed in more detail below.

i. Birds

The minor extension area provides suitable foraging, shelter and breeding habitat for a range of common bird species, in addition to some threatened species listed under the EPBC Act and/or

the TSC Act. Suitable habitat is present for woodland and grassland-dependant species, as well as some open forest habitat. The threatened bird species that have been recorded within the study area and which have potential to occur in the minor extension area include the following (see **Figure 3**) (Cumberland Ecology 2010):

- Black-breasted Buzzard (*Hamirostra melanosternon*) (Vulnerable under TSC Act);
- Spotted Harrier (*Circus assimilis*) (Vulnerable under the TSC Act);
- Little Eagle (*Hieraaetus morphnoides*) (Vulnerable under the TSC Act);
- Little Lorikeet (*Glossopsitta pusilla*) (Vulnerable under the TSC Act)
- Varied Sittella (*Daphoenositta chrysoptera*) (Vulnerable under the TSC Act);
- Scarlet Robin (*Petroica boodang*) (Vulnerable under the TSC Act);
- Brown Treecreeper (*Climacteris picumnus*) (Vulnerable under the TSC Act);
- Grey-crowned Babbler (*Pomatostomus temporalis*) (Vulnerable under the TSC Act);
- Speckled Warbler (*Chthonicola sagittata*) (Vulnerable under the TSC Act);
- Hooded Robin (*Melanodryas cucullata*) (Vulnerable under the TSC Act);
- Diamond Firetail (*Stagonopleura guttata*) (Vulnerable under the TSC Act);
- Glossy Black-cockatoo (*Calyptorhynchus lathami*) (Vulnerable under the TSC Act);
- Regent Honeyeater (*Anthochaera phrygia*) (Endangered under the EPBC and TSC Acts); and
- Swift Parrot (*Lathamus discolor*) (Endangered under the EPBC and TSC Acts).

Of these species, the Little Lorikeet, the Speckled Warbler and the Grey-crowned Babbler have been recorded from within the minor extension area (see **Figure 3**). Although potential habitat for these species is present in the minor extension area, none of these species are likely be dependent on this habitat, and would use it as part of a larger foraging range.

ii. Mammals

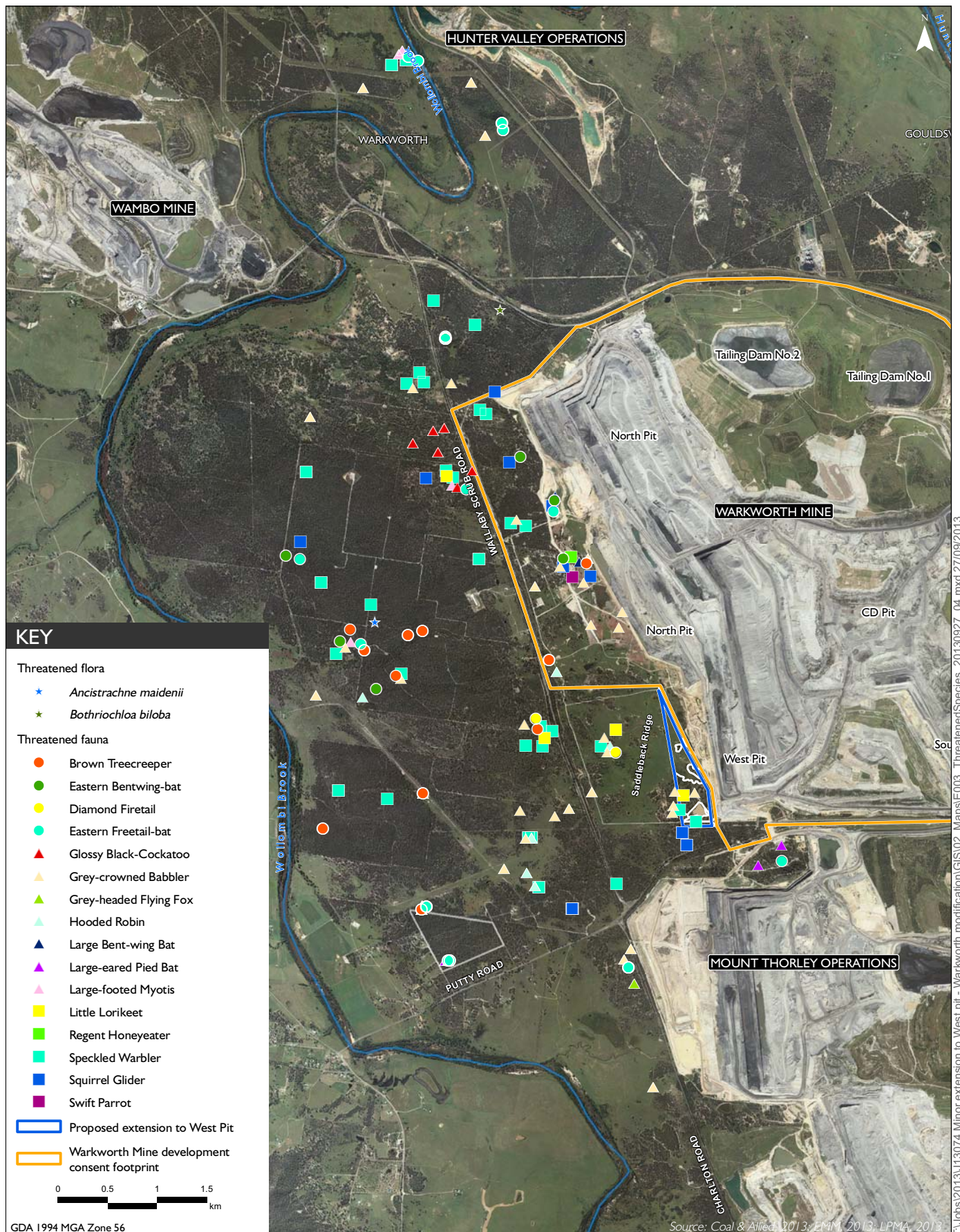
Extensive field surveys conducted in the study area show limited numbers of native small terrestrial mammals and an abundance of exotic species. The low abundance of small terrestrial native mammals is likely to be a result of the historical land use within the study area, which was maintained as predominantly cleared grazing land until the early 1990s.

That notwithstanding, seven threatened mammal species have been recorded within the study area, comprising mostly microchiropteran bats that are listed as Vulnerable under the TSC Act: Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*); Eastern Free-tail Bat

(*Mormopterus norfolkensis*); Little Bent-wing Bat (*Miniopterus australis*); Large-footed Myotis (*Myotis macropus*); and the Large-eared Pied Bat (*Chalinolobus dwyeri*) (see **Figure 3**). Of these, the Large-eared Pied Bat is also listed as Vulnerable under the EPBC Act. The Eastern Bent-wing Bat has been recorded from the minor extension area.

Other threatened mammal species recorded from the study area include the Squirrel Glider (*Petaurus norfolcensis*) (listed as Vulnerable under the TSC Act) and the Grey-headed Flying-fox (*Pteropus poliocephalus*) (listed as Vulnerable under both the EPBC and the TSC Acts) (see **Figure 3**). The Squirrel Glider has been recorded from woodland directly adjacent to the minor extension area (see **Figure 3**).

The Koala (*Phascolarctos cinerea*) is listed as Vulnerable under the TSC Act and the EPBC Act. This species has not been recorded from the study area or the minor extension area; however numerous Grey Box (*Eucalypts moluccana*) trees are present in the minor extension area. This species is considered to be a secondary feed tree for the Koala (DECC 2008), and therefore potential habitat for this species is considered to be present.



Threatened species records in the study area
Warkworth Modification 6
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Figure 3

A.3 Ecology of the nominated offset area

The nominated offset area is approximately 32 ha in size, and is approximately 2 km to the west of Warkworth Mine (see **Figure 1**). This area is proposed to be conserved for the life of the project as a biodiversity offset for the proposed modification.

A.3.1 Vegetation

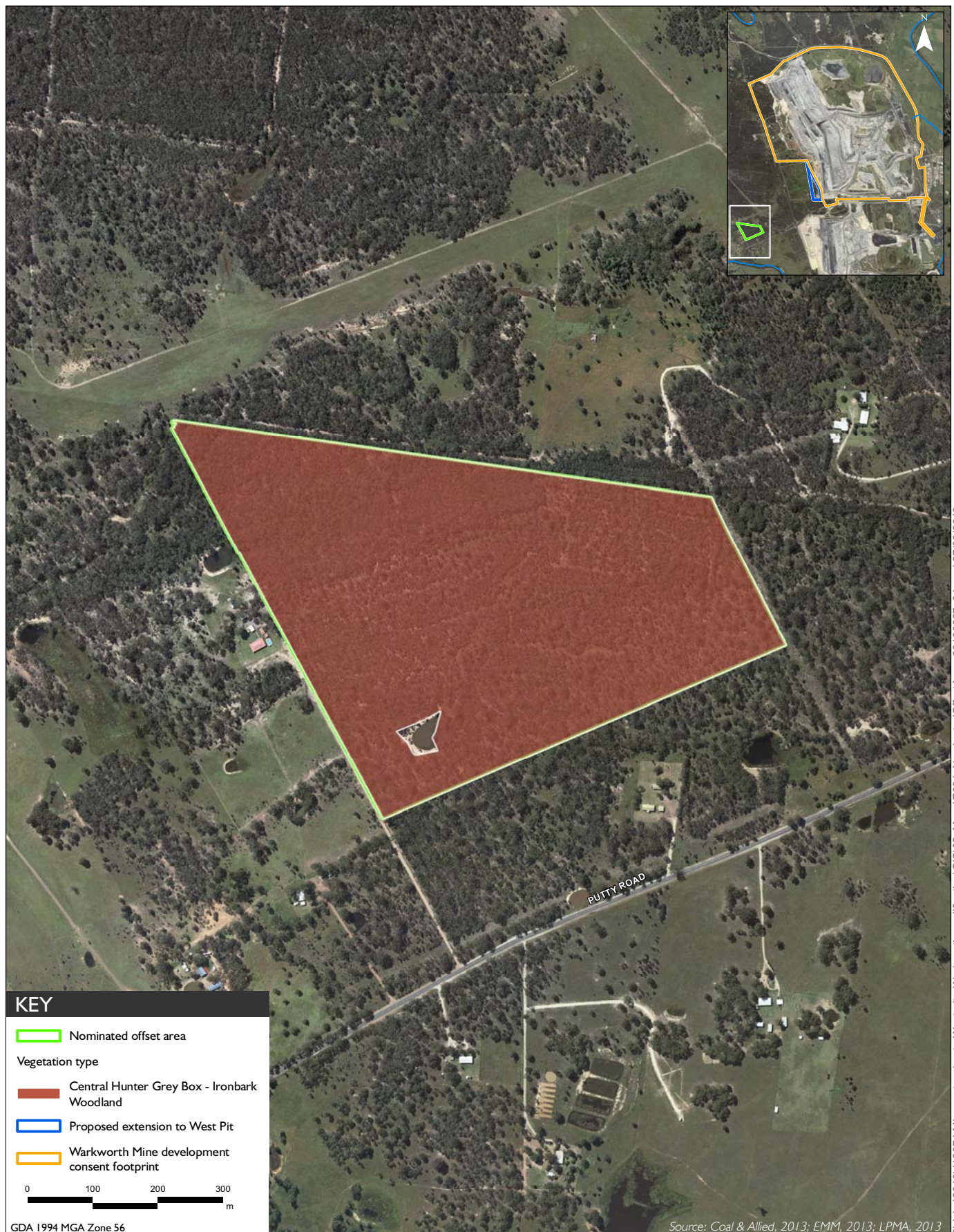
The nominated offset area contains approximately 32 ha of Central Hunter Grey Box – Ironbark Woodland on a single lot owned by WML, and includes a farm dam (see **Figure 4**). It is adjacent to other woodland and forest areas to the north and east, and good connectivity is present between this area and vegetation in the minor extension area, through a wide band of woodland and forest vegetation connecting the two areas. This is likely to be used by a range of species for foraging and dispersal.

The dominant canopy species within this community are Grey Box (*Eucalyptus molucanna*) and Narrow-leaved Ironbark (*Eucalyptus crebra*). There are also local abundances of Bulloak (*Allocuarina luehmannii*) and White Feather Honeymyrtle (*Melaleuca decora*) in the midstorey.

A.3.2 Flora

No threatened flora species have been recorded from the nominated offset area, however it is considered to have potential to support all the threatened flora species recorded in the study area. Due to the similarity of the vegetation in the nominated offset area to the woodland communities in the minor extension area and its close proximity, it is considered to provide very similar habitat for flora species.

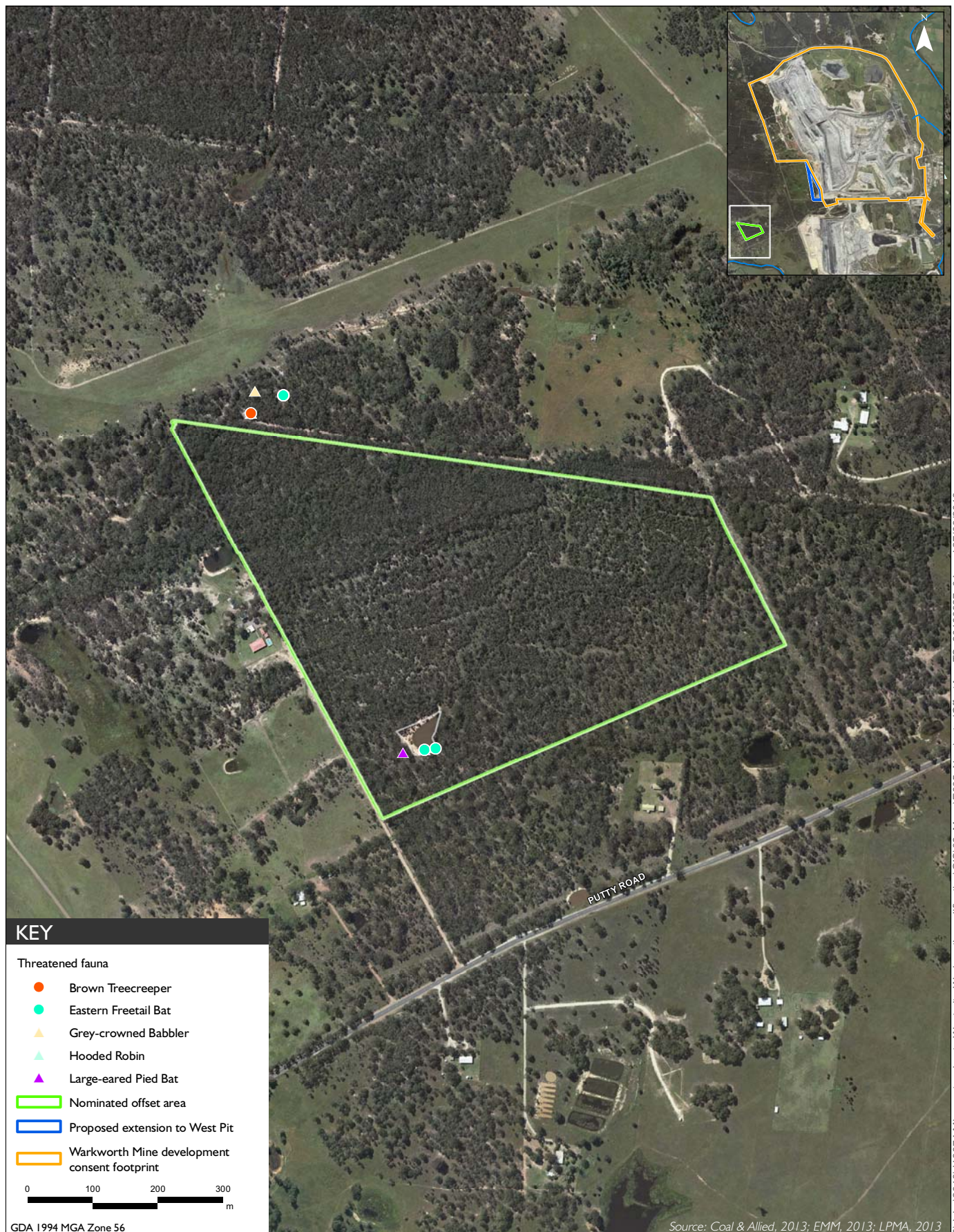
The vegetation community present in the nominated offset area is the same as that in the minor extension area (see **Section A.3.1** above), and it is in equivalent if not better condition due to lower levels of fragmentation. Three threatened flora species were recorded from in and near the study area (see **Section A.2.2**) and a number of additional threatened flora species listed under the TSC Act and EPBC Act recorded from the locality were considered to have potential to occur in the study area (Cumberland Ecology 2010). These are also considered to have potential to occur in the nominated offset area due to its close proximity and the presence of very similar habitat.



A.3.3 Fauna

As discussed above, the nominated offset area contains the same vegetation type as the minor extension area and contains the same suite of fauna habitat features such as bush rock, fallen logs, leaf litter and ground vegetation, which provide shelter for many small to medium sized terrestrial fauna species. The woodland vegetation within the nominated offset area would provide suitable foraging habitat for a wide range of nectar-feeding birds during blossom periods. Some mature living trees and stags remain within the nominated offset area that would provide a number of small to medium-sized tree hollows for fauna species dependant on this resource as shelter and breeding habitat. However, in common with the study area, large hollows are relatively scarce. No wetlands or permanent streams are present within the nominated offset area; however a large farm dam is present that may provide some habitat for some wetland-dependant species such as wetland birds and amphibians.

Two threatened microchiropteran bats have been recorded from the nominated offset area; the Eastern Freetail Bat (*Mormopterus norfolkensis*) and Large-eared Pied Bat (*Chalinobolus dwyeri*), and several other threatened species have been recorded in close proximity; the Grey-crowned Babbler, the Speckled Warbler and the Hooded Robin (*Melanodryas cucullata*) (see **Figure 4**). In addition to these species, due to the presence of high quality woodland vegetation, the nominated offset area is likely to provide suitable foraging, shelter and breeding habitat for a wide range of threatened fauna species listed under the EPBC Act and/or the TSC Act, including all the species recorded from the study area. The nominated offset area is located in close proximity to the minor extension area and is connected by a wide band of woodland and forest vegetation, and it is likely that some species currently utilise habitats in both areas.



Threatened species records in the nominated offset area

Warkworth Modification 6
Ecological Assessment

Figure 5

A.4 Impact assessment

A.4.1 Vegetation

The minor extension area will disturb approximately 31 ha of land including a 1 ha dam, and will result in the removal of approximately 16 ha of woodland and forest vegetation, which consists of two EECs listed under the TSC Act. Approximately 3 ha of Central Hunter Grey Box – Ironbark Woodland will be removed and approximately 13 ha of Central Hunter Ironbark – Spotted Gum – Grey Box Forest will be removed. As discussed previously, these two EECs are very similar and considered to be ecologically interchangeable. Approximately 14 ha of Central Hunter Grey Box – Ironbark Derived Grassland will also be removed, which is not listed as an EEC. The remaining 1 ha within the minor extension area comprises an artificially created farm dam. The minor extension area represents approximately 2.45% of the land present within the previously approved expansion – the Warkworth Extension Project. This is a small fraction of that area, for which NSW Government was previously obtained prior to the Land and Environment Court decision and for which the Commonwealth approval remains valid.

Large areas of these EECs will remain in the wider study area, and only a very small area will be removed for the proposed modification. To compensate for the removal of small areas of EEC vegetation, approximately 32 ha of Central Hunter Grey Box – Ironbark Woodland that occurs in the nominated offset area will be protected for conservation in the long term. This represents approximately a 2:1 ratio of woodland and forest vegetation being offset to that being disturbed. This ratio includes land to replace the area subject to the extension in West Pit at a ratio of 1:1 as well as compensates for loss of protected land within NDA1 (prior to the amendment to the Deed), also at a ratio of 1:1. The vegetation in the nominated offset area will further benefit from an ongoing management regime that will be implemented including weed control and supplementary planting of native species where required. Furthermore, WML will rehabilitate 32 ha of EEC woodland after mining, thereby providing further areas of this vegetation.

Taking into consideration the small size of the minor extension area and the nominated offset area, it is considered that the proposed modification is unlikely to result in a significant impact to EECs.

A.4.2 Flora

No threatened flora species have been recorded from the minor extension area, and none are expected to occur. Although three threatened flora species have been recorded from within the wider study area, these have not been recorded from the minor extension area, and are considered to be unlikely to occur. Potential habitat exists for these species in the minor extension area, as well as other threatened flora species recorded from the locality, however numerous surveys have been conducted and they have not been recorded. Large areas of potential habitat for these flora species will remain in the wider study area, and high quality flora habitat is being conserved in the nominated offset area. These areas will continue to provide high quality habitat for flora species in the long term, and no significant impact is expected to occur to threatened flora species as a result of the proposed modification.

A.4.3 Fauna

Some threatened fauna species have been recorded within the minor extension area, including the Little Lorikeet (*Glossopsitta pusilla*), the Speckled Warbler (*Pyrrholaemus sagittatus*), the Grey-crowned Babbler (*Pomatostomus temporalis*) and the Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*). Several additional threatened fauna species have also been previously recorded from the wider study area and have potential to occur in the minor extension area due to the presence of suitable habitat.

The minor extension area will remove approximately 16 ha of habitat for native species in the form of woodland or forest vegetation. The remainder of the land comprises derived grassland with very limited habitat for native fauna species, and a farm dam. The small area of woodland and forest vegetation to be removed is considered to be minor in the context of the extensive areas that will remain in the wider locality that will continue to provide habitat for fauna species. Although habitat for some threatened species is present in the minor extension area, none of these species are likely to be dependent on this habitat and they are likely to use it as part of a larger foraging range.

As compensation for this removal, approximately 32 ha of Central Hunter Grey Box Ironbark Woodland within the nominated offset area will be protected for conservation. This represents an offset ratio of 2:1 for vegetation to be provided for conservation relative to that being removed. In addition, WML will rehabilitate 32 ha of EEC woodland after mining is complete, thereby providing an additional area of woodland/forest that will be protected for conservation in the long term.

The removal of a small area of native vegetation is not expected to have a significant effect on the threatened fauna species that have potential to occur in the minor extension area. Considering the amount of retained native vegetation in the vicinity of the minor extension area, and the significant offsets and rehabilitation proposed, it is considered unlikely that the modification will result in a significant impact to threatened fauna species.

A.5 Management and mitigation

A range of measures have been considered to ameliorate the potential impacts of the proposed modification, including measures to avoid, mitigate and compensate for impacts. These measures are outlined below.

A.5.1 Avoidance

The extent and shape of the minor extension area has been modified in an effort to reduce the ecological impacts.

A.5.2 Mitigation

Warkworth Mine is a currently approved operation, a range of management strategies are currently in place to limit impacts on native flora and fauna within the area adjacent to the mine.

The strategies include the measures summarised in **Table 1**. These existing management strategies will be reviewed, updated and implemented for the proposed modification.

Table 1 Existing mitigation measures relevant to flora and fauna

Existing mitigation measures	Ecological benefits
Dust minimisation	Control of dust reduces the indirect impacts on vegetation condition and the habitat quality for all native species at Warkworth Mine.
Noise minimisation	Minimisation of noise benefits fauna by reducing the potential for disturbance of animals in habitat patches around the mine.
Weed control	Weed control helps to protect the integrity of native vegetation within the mining leases and maintains or improves the quality of habitat for plant and animal species.
Feral animal control	Feral animal control helps to control foxes, rabbits and other feral animals that are key threats to many wildlife species.
Rehabilitation of disturbed areas	Rehabilitation of disturbed areas restores forest and woodland cover to disturbed areas and adds habitat for flora and fauna in the long term.
Linkage and integration of rehabilitation areas with existing vegetated areas to improve ecological function and provide habitat	Increases the viability of the scattered patches of habitat that occur across the mining leases, connecting them and facilitating movement of native species between patches.
Creation of habitat corridors linking isolated remnant vegetation stands	Increases the viability of the scattered patches of habitat that occur mining leases, connecting them and facilitating movement of native species between patches.
Management of surface water, erosion and sedimentation	Protects the integrity of the landscape.
Ongoing monitoring and maintenance of all revegetation works and habitat enhancement activities	Maintains the viability of the rehabilitated areas in the long term and provides feedback data that can be used for adaptive management.
Pre-clearance inspections and	Provides an opportunity to avoid impacts to arboreal fauna during clearing and/or

Table 1 Existing mitigation measures relevant to flora and fauna

Existing mitigation measures	Ecological benefits
tree felling procedures	enables relocation of fauna to secure areas of vegetation.
Relocation of salvaged tree hollows and (where required) the establishment of nest boxes in adjacent vegetation communities.	Makes efficient use of tree hollows that could otherwise be destroyed. Replaces tree hollows that are to be lost from clearing operations by establishing nest boxes within secure habitat. This maintains the number of tree hollows on site in the short to medium term.
Due diligence inspections for surface infrastructure	Provides data for ongoing adaptive management and protection of adjacent landscape areas if required.
Ongoing monitoring of native flora and fauna across the Warkworth mining leases	Provides data for ongoing adaptive management of threatened and regionally significant flora and fauna.

A.5.3 Compensation

To supplement the mitigation measures, significant compensation measures are proposed to offset the potential ecological impacts from the minor extension. These compensation measures include the provision of compensatory habitat in offset areas and rehabilitation of mined areas within the minor extension to woodland after mining.

The primary compensation measure is the provision of approximately 32 ha of Central Hunter Grey Box – Ironbark Woodland in the nominated offset area. This vegetation will be managed for conservation in the long term, including weed control and feral animal management. As discussed previously, this community is considered to be equivalent to Central Hunter Ironbark – Spotted Gum – Grey Box Forest based on the Umwelt (2011) review of the EA, undertaken by Travis Peake.

Although a total of 31 ha of land with a 1 ha dam will be disturbed for the minor extension area, only 16 ha currently contains woodland or forest vegetation, and the remainder comprises derived grassland and a dam. Due to its low conservation significance, derived grassland to be impacted in the minor extension area is not proposed to be offset. This means that the proposed offset package represents an offset ratio of cleared to conserved woodland and forest of over 2:1. As described earlier, this ratio includes land to replace the area subject to the extension in West Pit at a ratio of 1:1 as well as compensates for loss of protected land within NDA1 (prior to the amendment to the Deed), also at a ratio of 1:1.

Table 2 presents a breakdown of the area of each community to be impacted in the minor extension area and the nominated offset area.

Table 2 Summary of approximate vegetation to be removed and offset

Vegetation community	Disturbance area (ha)	Nominated offset area (ha)	Initial offset ratio	Rehabilitation	Final land protected (ha)	Final offset ratio
Central Hunter Grey Box – Ironbark Woodland EEC	3					
Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC	13	32	2:1	32	64	4:1
Central Hunter Grey Box – Ironbark derived grassland	14	-		-		
Total	30	32	2:1	32	64	4:1

In addition, rehabilitation will be undertaken on all areas disturbed by the minor extension area. A Mining Operations Plan (MOP) is currently in place for Mount Thorley Warkworth (MTW) that applies to the existing West Pit. The rehabilitation of the minor extension area will be conducted as an extension of the rehabilitation designed and described in the current MOP. As described in the current MOP, the final landform for West Pit is planned to comprise an undulating landscape with final landform slopes varying according to erosion hazard, stability and drainage requirements. The minor extension area will be rehabilitated in accordance with these concepts as described in the MOP. In addition, WML will create a total of 32 ha of EEC vegetation that will be protected in the long term for conservation. There is also potential to rehabilitate areas in the minor extension area that are currently derived native grassland into woodland and forest communities, thereby providing further conservation benefits.

A.5.4 Suitability of nominated offset area

The vegetation proposed to be used as an offset is considered to be highly suitable to offset the impacts of the proposed modification. It contains the same community as that which will be impacted, and as such contains similar habitat features and supports very similar flora and fauna assemblages, including habitat for all the threatened species recorded from the minor extension area. It is in close proximity to the minor extension area (less than 2 km) and as such, many of the more mobile species recorded from this area such as birds and bats are likely to be able to utilise habitat that is present in the nominated offset area.

The proposed offset is considered to be consistent with the NSW Offset Principles for Major Projects (OEH 2013), which are reproduced below.

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.

A range of mitigation measures will be implemented for the proposed modification in addition to the provision of offsets, as outlined previously.

2. Offset requirements should be based on a reliable and transparent assessment of losses and gains.

The assessment of the losses that will take place in the minor extension area, and the gains to be made in the offset area has been made on high quality vegetation mapping data, and the results of numerous surveys conducted over several seasons and years.

3. Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.

The biodiversity values being lost are the same as those that will be provided in the proposed offset area.

4. Offsets must be additional to other legal requirements.

The nominated offset is currently required for biodiversity under the EPBC Act (EPBC 2009/5081). In accordance with the Commonwealth Department of Environment (DoE) policy guiding the use of offsets under the EPBC Act, *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy; October 2012*, a state offset and offset under the EPBC Act may be suitable to duplicate where the 'action' is the same and where the offset compensates for the residual impact to the protected matter identified under the EPBC Act. On the basis that both 'actions' involve open cut mining of the same land the nominated offset is an acceptable offset for the proposed modification.

5. Offsets must be enduring, enforceable and auditable.

The proposed offset will be subject to a suitable mechanism that will remain enforceable after mining has been completed.

6. Supplementary measures can be used in lieu of offsets.

No supplementary measures are required.

7. Offsets can be discounted where significant social and economic benefits accrue to NSW as a consequence of the proposal.

The proponent is a significant employer in the region, and the proposed modification will maintain the existing significant social or economic benefits to NSW. This includes maintaining employment levels and revenue raised from the extraction, processing and sale of coal. The proposed offset ratio is considered to be appropriate, taking the economic benefits of the integrated MTW into consideration, and the biodiversity benefits of the proposed offset lands.

A.6 Conclusion

Approximately 30 ha of vegetation will be removed by the Modification, of which approximately 3 ha comprises Central Hunter Grey Box – Ironbark Woodland, and 13 ha comprise Central Hunter Ironbark – Spotted Gum – Grey Box Forest, both of which are listed as EECs under the TSC Act. A total of 16 ha of forest and woodland communities will be impacted. The remaining 14 ha of vegetation comprise derived native grassland of minimal conservation significance.

No threatened flora species have been recorded from the minor extension area or are likely to be impacted by the proposed modification. Several threatened fauna species have been recorded from the minor extension area and others have the potential to occur due to the presence of suitable habitat. However, the vegetation of the minor extension area is relatively degraded, and it is unlikely to provide important habitat to these threatened species. Large areas of similar vegetation will remain in the wider study area and in the locality that these species will be able to utilise, and they are unlikely to be dependent on habitat present in the minor extension area.

As an offset to the clearance of approximately 16 ha of native woodland vegetation, 32 ha of native vegetation within the nominated offset area is proposed to be protected. In addition to this area, WML will revegetate 32 ha to native vegetation communities after mining is complete. Both of these areas will be managed in the long-term in accordance with appropriate management plans to maintain and increase their conservation value.

Considering the large areas of native vegetation being retained in the wider locality, and the areas of offset land proposed; it is not considered that the removal of a small area of habitat for the proposed modification will detrimentally affect the threatened species recorded or with potential to occur. No significant impact is considered likely to occur to threatened species or EECs as a result of the proposed modification. No referral to the DoE is required due to the existing EPBC approval for disturbance of this area.

A.7 References

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