MACHEnergy

Appendix D

Biodiversity Assessment

MOUNT PLEASANT OPERATION – MINE OPTIMISATION MODIFICATION ENVIRONMENTAL ASSESSMENT

BIODIVERSITY ASSESSMENT

PREPARED BY
HUNTER ECO

MAY 2017

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

TABLE OF CONTENTS

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

FIGURES

TABLES

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

1. INTRODUCTION

MACH Energy Australia Pty Ltd (MACH Energy) acquired the Mount Pleasant Operation from Coal and Allied Operations Pty Ltd (Coal & Allied) on 4 August 2016.

The approved Mount Pleasant Operation includes the construction and operation of an open cut coal mine and associated infrastructure located approximately three kilometres north-west of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW).

The Mount Pleasant Operation is currently being constructed by MACH Energy and will operate generally in accordance with a Development Consent granted by the (then) NSW Minister for Urban Affairs and Planning on 22 December 1999 (Development Consent DA 92/97), as subsequently modified.

This document is for a proposed modification to the active Mount Pleasant Operation (the Modification).

The Modification would primarily comprise two components:

- an extension to the time limit on mining operations to provide for open cut mining operations to 22 December 2026 (i.e. modify Condition 5, Schedule 2 of Development Consent DA 92/97 to add six years); and
- extensions to the Eastern Out of Pit Emplacement (Eastern Emplacement Extension) to better align with the underlying topography and facilitate development of a final landform that is more consistent with the characteristics of the local topography and incorporates additional waste rock capacity.

2. DESCRIPTION OF STUDY AREAS

Figure 1 shows the subject emplacement areas in a local context.

2.1. South Western Out of Pit Emplacement

The South Western Out of Pit Emplacement consists of a mosaic of cleared land with patches of woodland and scattered paddock trees with the main species being White Box (*Eucalyptus albens*) and Narrow-leaved Ironbark (*Eucalyptus crebra*) along with Spotted Gum (*Corymbia maculata*). In this region White Box are often referred to as White Box-Coastal Grey Box (*Eucalyptus moluccana*) hybrids (Grey Box x White Box).

2.2. Eastern Out of Pit Emplacement

The Eastern Out of Pit Emplacement primarily consists of grazed grassland with ad hoc areas of exotic pasture, predominantly native grassland, native tree plantations and dwellings with associated managed grounds and infrastructure; there are few remnant trees.

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

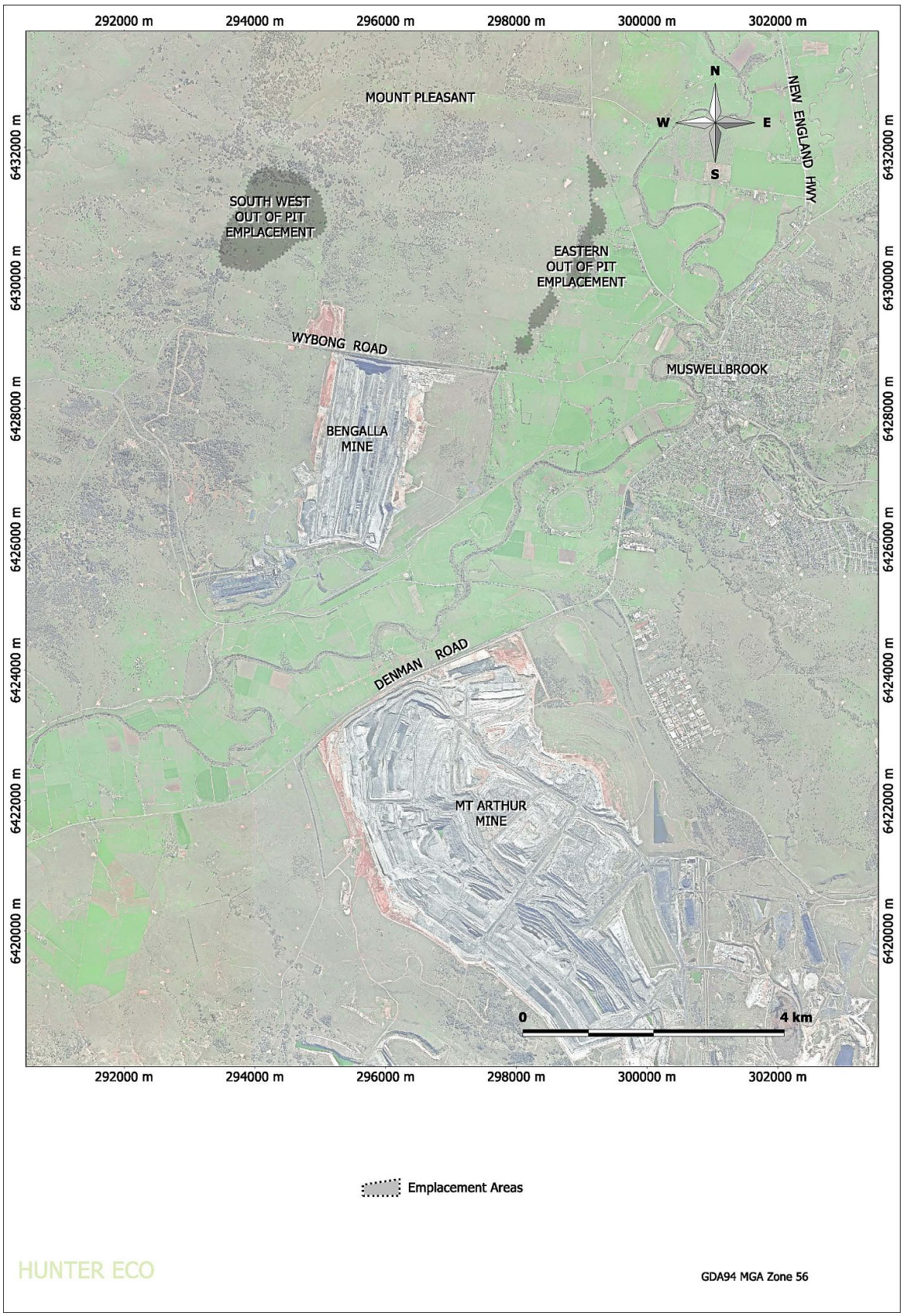

Figure 1 Subject Emplacement Areas in a Local Context

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

3. METHOD

As a guide for targeted surveying, threatened species, communities and populations known or predicted to occur in the Hunter Central Rivers Catchment Management Authority – Hunter sub-catchment were extracted from the NSW BioNET database. Further data were obtained from the Commonwealth Protected Matters Search Tool from within a 10 kilometre radius of the Mount Pleasant area. The initial data extracts were filtered to remove any marine or aquatic habitat species and communities as well as any for which the Mount Pleasant immediate region lies well outside of their geographic range.

3.1. Vegetation Communities

The entire survey areas were accessible by four-wheel drive vehicle so the approach adopted was to identify as many tree species as possible both in patches of woodland and scattered paddock trees; these data would then be used as surrogates for vegetation communities. Specifically the method consisted of having a laptop in the vehicle with a GPS (Global Positioning System) unit connected live through the laptop to GIS (Geographic Information System) software showing real-time location over an aerial photo. Trees were identified by their location in relation to the current location and their identity directly entered into a data table showing as points over the aerial photo. As there were few paddock trees in the Eastern Out of Pit Emplacement trees in a wider area were identified so as to facilitate an assessment of the derivation of the grassland in the proposed disturbance area.

Community definitions were established according to the following hierarchy based on canopy and other observed species:

- Local classification (dominant canopy species);
- NSW Plant Community Types (PCT);
- NSW BioMetric Vegetation Types (BVT);
- NSW Vegetation Formations (Keith, 2004); and
- NSW Vegetation Classes (Keith, 2004).

The final communities were compared against the determinations of listed threatened communities to determine whether any were present.

3.2. Flora

Floristic plot data (20x20m) were collected, where all species were recorded and scored according to the amount of the sampled area covered by each species (Braun-Blanquet 1-6 scale), from within representative communities in both emplacement areas in order to assess comparative diversity. Extensive meanders were also conducted as part of flora searching.

A targeted orchid survey was conducted in late September 2016 specifically searching for *Diuris tricolor* and *Prasophyllum petilum* (sp. Wybong).

3.3. Fauna

Targeted fauna surveys were not conducted. Fauna habitat data were collected during field surveys and species were assumed to use the habitat based on information from species profiles and nearby occurrence records obtained from the Atlas of NSW Wildlife.

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

4. RESULTS

Attachment 1 provides lists of threatened species, populations and communities known or predicted to occur in the immediate Mount Pleasant region. The tables also include an assessment of the likelihood of occurrence given the habitat recorded at both study areas. Any species recorded by past surveys within the Mount Pleasant mine lease are also flagged.

4.1. Vegetation Communities

Table 1 lists the vegetation communities mapped across the South Western Out of Pit Emplacement and Table 2 the communities mapped across the Eastern Out of Pit Emplacement. The assignment of derived grassland communities was made according to the nearest paddock tree species. For the Eastern Out of Pit Emplacement this was more difficult given the paucity of trees in the proposed disturbance area and surrounds.

Other habitat types mapped in the Eastern Out of Pit Emplacement were:

- Farm dams;
- Planted wind breaks;
- Pasture, dwellings and infrastructure areas. Pasture consisted primarily of either Urochloa Grass (*Urochloa panicoides*) or Kikuyu (*Pennisetum clandestinum*);
- Planted rehabilitation consisting of *Eucalyptus albens, Eucalyptus crebra, Corymbia maculata, Eucalyptus tereticornis, Eucalyptus dwyeri, Melaleuca armillaris* and *Casuarina glauca*; these were planted by Rio Tinto around year 2000.

Figures 2 and 3 show the vegetation communities mapped across the Eastern Out of Pit Emplacement and the South Western Out of Pit Emplacement, respectively. Figure 3 also shows the area within the approved South Western Out of Pit Emplacement proposed to be relinquished (the Relinquishment Area) as compensation for the Eastern Emplacement Extension.

Tree symbols mapped on Figures 2 and 3 represent either individual paddock trees or patches of trees, i.e. in the case of mapped woodland communities.

4.2. Flora

Attachment 2 provides a list of flora species recorded within the Eastern Out of Pit Emplacement, Attachment 3 provides a list of flora species recorded within the South Western Out of Pit Emplacement, and Attachment 4 provides the raw floristic plot data. Attachment 5 provides a report by Eco Logical (Australia) of the targeted orchid survey conducted on 4 October 2016.

No threatened flora species or populations were recorded.

4.3. Fauna

While no threatened fauna species were recorded during field surveys, the tables in Attachment 1 show details of threatened fauna that may be found in the habitat types present.

The Eastern Emplacement Extension (Figure 2) provides limited fauna habitat. Other than the area of rehabilitation (approximately 15 years old), trees are generally entirely absent from the Eastern Emplacement Extension with derived grasslands the only native vegetation community present (Figure 2).

Attachment 5 notes that the highly modified Eastern Out of Pit Emplacement was considered to be of limited value to fauna species due to the general absence of canopy or shrub layer resources (including food and shelter resources) and the highly modified understorey.

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

In contrast, along with derived native grassland, the Relinquishment Area (Figure 3) contains 17 ha of native woodland with mature trees providing foraging, nesting and roosting habitat for threatened fauna.

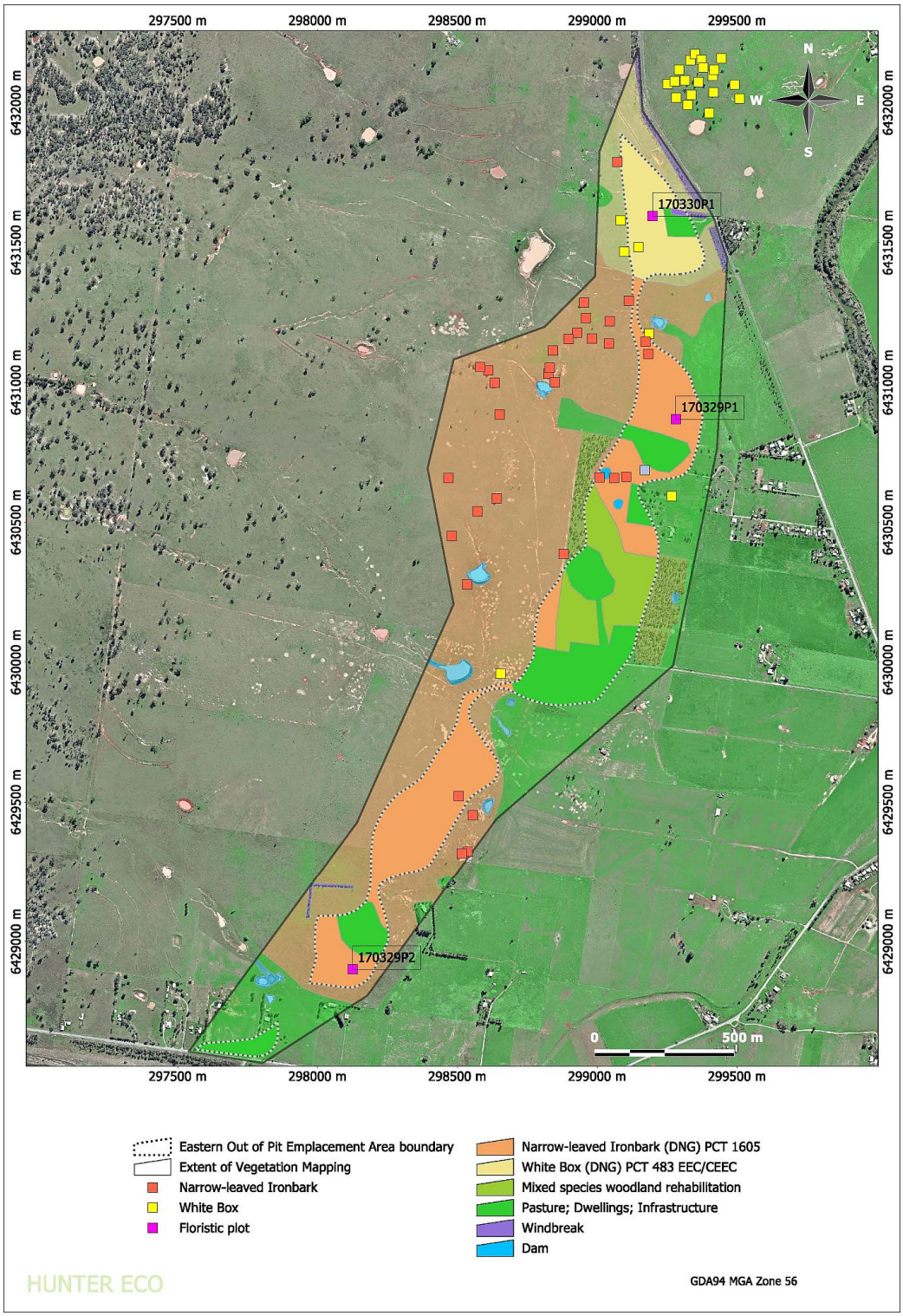

Figure 2 Vegetation Communities Mapped Across the Eastern Out of Pit Emplacement, Paddock Trees and Floristic Plots

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

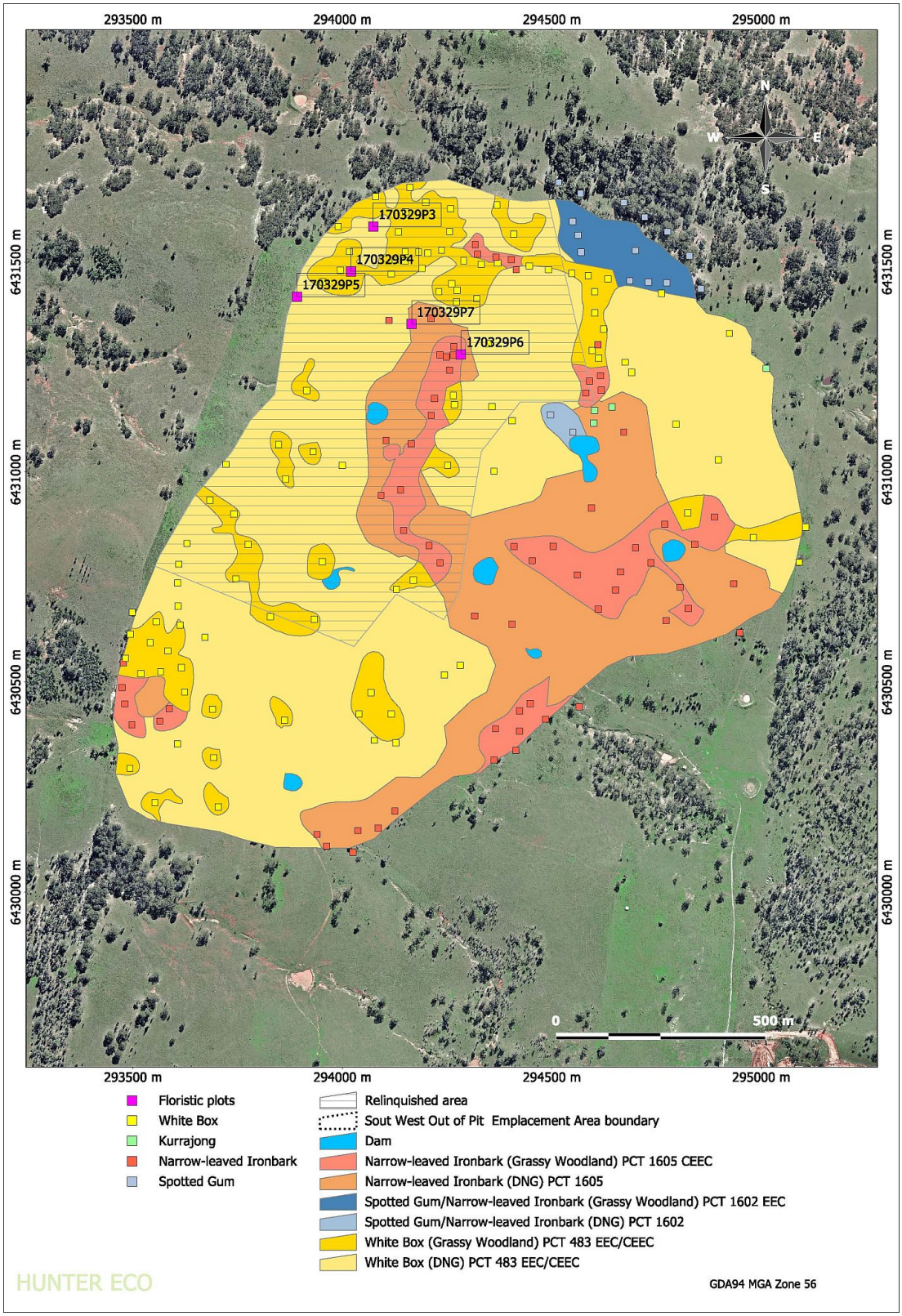

Figure 3 Vegetation Communities Mapped Across the South Western Out of Pit Emplacement Area, Paddock Trees and Floristic Plots

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Table 1 Vegetation Communities Mapped Across the South Western Out of Pit Emplacement Area

Key: DNG = derived native grassland; TEC = threatened ecological community; EPBC Act = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*; TSC Act = NSW *Threatened Species Conservation Act 1995*; CE = Critically Endangered; E = Endangered.

Habitat	PCT	BVT	PCT Name	Formation	Class	TEC
Narrow-leaved Ironbark (Grassy Woodland)	1605	HU819	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	Dry Sclerophyll Forests (Shrub/grass sub-formation)	North-west Slopes Dry Sclerophyll Woodlands	Listed **EPBC Act**, CE: Central Hunter Valley Eucalypt Forest and Woodland
Narrow-leaved Ironbark (DNG)	1605	HU819	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	Dry Sclerophyll Forests (Shrub/grass sub-formation)	North-west Slopes Dry Sclerophyll Woodlands	Not a TEC
Spotted Gum/Narrow-leaved Ironbark (Grassy Woodland)	1602	HU816	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	Listed **TSC Act**, E: Central Hunter Ironbark - Spotted Gum - Grey Box Forest; Listed **EPBC Act**, CE: Central Hunter Valley Eucalypt Forest and Woodland
Spotted Gum/Narrow-leaved Ironbark (DNG)	1602	HU816	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	Not a TEC
White Box (Grassy Woodland)	483	HU690	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Grassy Woodlands	Western Slopes Grassy Woodland	Listed **TSC Act**,E: White Box Yellow Box Blakely's Red Gum Woodland; Listed **EPBC Act**,CE: White Box Yellow Box Blakely's Red Gum Grassy Woodland and DNG
White Box (DNG)	483	HU690	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Grassy Woodlands	Western Slopes Grassy Woodland	Listed **TSC Act**,E: White Box Yellow Box Blakely's Red Gum Woodland; Listed **EPBC Act**,CE: White Box Yellow Box Blakely's Red Gum Grassy Woodland and DNG

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Table 2 Vegetation Communities Mapped Across the Eastern Out of Pit Emplacement

Key: DNG = derived native grassland; TEC = threatened ecological community; EPBC Act = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*; TSC Act = NSW *Threatened Species Conservation Act 1995*; CE = Critically Endangered; E = Endangered.

Habitat	PCT	BVT	PCT Name	Formation	Class	TEC
Narrow-leaved Ironbark (DNG)	1605	HU819	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	Dry Sclerophyll Forests (Shrub/grass sub-formation)	North-west Slopes Dry Sclerophyll Woodlands	Not a TEC
White Box (DNG)	483	HU690	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Grassy Woodlands	Western Slopes Grassy Woodland	Listed **TSC Act**,E: White Box Yellow Box Blakely's Red Gum Woodland; Listed **EPBC Act**,CE: White Box Yellow Box Blakely's Red Gum Woodland

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Table 3 provides a comparison of the floristic composition of the Eastern and South Western Out of Pit Emplacement areas showing that the South Western Out of Pit Emplacement is considerably more diverse and less dominated by weeds than the Eastern Emplacement Extension.

Table 3 Species Attribute Comparison Between Eastern and South Western Out of Pit Emplacement Areas

Attribute	Eastern Out of Pit Emplacement	South Western Out of Pit Emplacement
Weed species	17 (33%)	17 (20%)
Native non-grass species	34	69
Native grass species	14 (41%)	19 (28%)
Native families	22	33
Native genera	29	51

Table 4 presents the relative areas of native vegetation present within the Eastern Emplacement Extension and the Relinquishment Area. Vegetation mapping is provided on Figures 2 and 3.

In summary, compared to the Eastern Emplacement Extension, the Relinquishment Area[1] has the following ecological gains:

- 4 ha more native vegetation (65 ha versus 61 ha).
- 24 ha more TSC Act listed threatened ecological community (53 ha versus 29 ha).
- More abundant and complex fauna habitat, primarily due to 17 ha of native woodland vegetation in the area being relinquished compared to the majority of the Modification disturbance area being exotic pasture, grassland areas and rehabilitation approximately 15 years old.
- Connectivity values with adjacent woodland outside of approved surface development areas.

On the basis of the above, the Modification is considered to result in a net biodiversity gain and therefore a biodiversity offset is not warranted.

[1] Relinquishment excludes more flexible and relatively minor infrastructure such as light vehicle roads, disturbance associated with monitoring, water management structures and other ancillary infrastructure.

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Table 4 Comparison of Native Vegetation Communities

Vegetation Community		Status*		Native Vegetation to be Disturbed (ha) ^	Northern Portion of South West Out of Pit Emplacement (ha)
		TSC Act	EPBC Act		
Narrow-leaved Ironbark (PCT 1605)	Derived Native Grassland	-	-	31	7
	Grassy Woodland	-	CEEC[1]	1	5
White Box (PCT 483)	Derived Native Grassland	EEC[2]	CEEC[2]	29	41
	Grassy Woodland	EEC[2]	CEEC[2]	-	12
			Total	**61**	**65**

Note: Excludes non-native vegetation such as dams, exotic pastures and plantations.

* Threatened ecological community status under the TSC Act and/or EPBC Act (current as at 6 April 2017).

^ Includes areas associated with the Eastern Emplacement Extension and some provision for MACH Energy project layout refinements to account for detailed engineering since drawings were produced as part of the 1997 Environmental Impact Statement (EIS) (ERM Mitchell McCotter, 1997). Refer to the Environmental Assessment main text for further detail.

[1] Generally equates to Central Hunter Valley Eucalypt Forest and Woodland (EPBC Act). Would require further analysis to refine the association however this is not warranted as separate approval under the EPBC Act is not required for the Modification.

[2] White Box Yellow Box Blakely's Red Gum Woodland (TSC Act)/ White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act).

CEEC = Critically Endangered Ecological Community.

EEC = Endangered Ecological Community.

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

5. REFERENCES

ERM Mitchell McCotter (1997) *Mt Pleasant Coal Mine Environmental Impact Statement*.

Keith (2004a) *New South Wales Vegetation Formations*.

Keith (2004b) *New South Wales Vegetation classes*.

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

ATTACHMENT 1

Known or Predicted Threatened Species, Communities and Populations

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Threatened Flora

Scientific Name	Common Name	Status NSW	Status Commonwealth	Likelihood of Occurrence	
				Eastern Out of Pit Emplacement	South Western Out of Pit Emplacement
Diuris tricolor	Pine Donkey Orchid	V	-	**None**. No suitable habitat and impacted by long-term grazing.	Some possible habitat in woodland but none recorded during targeted survey.
Prasophyllum petilum (sp. Wybong)	*Prasophyllum* sp. Wybong	E	CE	**None**. No suitable habitat and impacted by long-term grazing.	Some possible habitat in woodland but none recorded during targeted survey.
Thesium australe	Austral Toadflax, Toadflax	V	V	**None**. No suitable habitat and impacted by long-term grazing.	**None**. No patches of the host grass *Themeda triandra*.

V = Vulnerable, E = Endangered, CE = Critically Endangered.

Endangered Populations

Population	Likelihood of Occurrence	
	Eastern Out of Pit Emplacement	South Western Out of Pit Emplacement
Acacia pendula population in the Hunter catchment	**None**. No *Acacia pendula* present.	**None**. No *Acacia pendula* present.
Cymbidium canaliculatum population in the Hunter Catchment[1]	**None.** No *Cymbidium canaliculatum* present.	**None**. No *Cymbidium canaliculatum* present.
Pine Donkey Orchid population in the Muswellbrook local government area	**None**. No suitable orchid habitat.	Some possible habitat in woodland and adjoining grassland but none recorded during targeted survey.

[1]Reported in the EIS as being recorded in the wider Mount Pleasant application area.

Threatened Communities

Community	Status NSW	Status Commonwealth	Likelihood of Occurrence	
			Eastern Out of Pit Emplacement	South Western Out of Pit Emplacement
Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	E	-	**None**. No native woodland present.	**None**. No Grey Box (*Eucalyptus moluccana*) present.
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions	E	-	**None**. No native woodland present.	**Present**
Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions	E	-	**None**. No native woodland present.	**None**. No alluvial Forest Red Gum (*Eucalyptus tereticornis*) present.
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion	V	-	**None**. No native woodland present.	**None**. No Slaty Gum (*Eucalyptus dawsonii*) present.
Hunter Valley Weeping Myall Woodland in the Sydney Basin Bioregion	CE	CE	**None**. No native woodland present.	**None**. No Weeping Myall (*Acacia pendula*) present.
Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion	E		**None**. No native woodland present.	**None**. No Red Ironbark (*Eucalyptus fibrosa*) present.
White Box Yellow Box Blakely's Red Gum Woodland	E	CE	**Present in its derived grassland form only**. No native woodland present.	**Present**
Central Hunter Valley Eucalypt Forest and Woodland	-	CE	**None**. No native woodland present.	**Present**

V = Vulnerable, E = Endangered, CE = Critically Endangered.

Threatened Fauna

Scientific Name	Common Name	Status NSW	Status Commonwealth	Likelihood of Occurrence	
				Eastern Out of Pit Emplacement	South Western Out of Pit Emplacement
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	CE	**None.** No woodland habitat	**Possible** in White Box blossom.
Artamus cyanopterus cyanopterus	Dusky Woodswallow[1]	V		**Possible** in the Rio Tinto plantation.	**Possible** in Woodland habitat.
Callocephalon fimbriatum	Gang-gang Cockatoo	V		**None.** No woodland habitat	**Possible** in Woodland habitat.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		**None.** No woodland habitat	**Unlikely** as there were few Casuarina or Allocasuarina feed tree species.
Chthonicola sagittata	Speckled Warbler	V		**None.** No woodland habitat	**Unlikely** as the woodland had a sparse shrub layer with few fallen logs.
Circus assimilis	Spotted Harrier	V		**Possible itinerant.** Foraging over grassland.	**Possible itinerant.**
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		**None.** No woodland habitat	**Unlikely** as the woodland had few fallen logs.
Daphoenositta chrysoptera	Varied Sittella	V		**None.** No woodland habitat	**Possible** in Woodland habitat.
Falco subniger	Black Falcon[1]	V		**Possible itinerant.** Foraging over grassland.	**Possible itinerant.**
Glossopsitta pusilla	Little Lorikeet	V		**None.** No woodland habitat	**Possible** in eucalypt blossom.
Grantiella picta	Painted Honeyeater	V	V	**None.** No woodland habitat	**Unlikely** as there was very little mistletoe that the bird depends on.
Hieraaetus morphnoides	Little Eagle	V		**Possible itinerant.** Foraging over grassland.	**Possible itinerant.**
Lathamus discolor	Swift Parrot	CE	CE	**None.** No woodland habitat	**Possible itinerant** in eucalypt blossom.
Lophoictinia isura	Square-tailed Kite	V		**Possible itinerant.** Foraging over grassland.	**Possible itinerant.**
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V		**Possible** winter visitor in the Rio Tinto plantation.	**Possible** winter woodland visitor.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies) [1]	V		**None.** No woodland habitat	**Possible** in woodland.

Scientific Name	Common Name	Status NSW	Status Commonwealth	Likelihood of Occurrence	
				Eastern Out of Pit Emplacement	South Western Out of Pit Emplacement
Neophema pulchella	Turquoise Parrot	V		**None.** No woodland habitat	**Possible** in woodland and adjoining grassland.
Ninox connivens	Barking Owl	V		**None.** No woodland habitat	**Possible** as part of a much larger home range (2000 – 6000 ha).
Ninox strenua	Powerful Owl	V		**None.** No woodland habitat	**Possible** but dependent on availability of prey species which is unknown.
Petroica boodang	Scarlet Robin	V		**Possible** in the Rio Tinto plantation.	**Possible** in woodland.
Petroica phoenicea	Flame Robin	V		**Possible** in the Rio Tinto plantation.	**Possible** in woodland.
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies) [1]	V		**None.** No woodland habitat	**Possible** but no evidence of the bird of nests.
Stagonopleura guttata	Diamond Firetail	V		**Possible** in the Rio Tinto plantation.	**Possible** in woodland and adjoining grassland.
Tyto novaehollandiae	Masked Owl	V		**None.** No woodland habitat	**Possible** in woodland and foraging adjoining grassland.
Tyto tenebricosa	Sooty Owl	V		**None.** No woodland habitat	**None.** Unsuitable habitat. A bird of moist to wet forest.
Marsupials					
Cercartetus nanus	Eastern Pygmy-possum	V		**None.** No woodland habitat	**None.** Unsuitable habitat with sparse shrub layer in the woodland.
Dasyurus maculatus	Spotted-tailed Quoll	V	E	**None.** No woodland habitat	**Possible** as part of a much larger home range.
Petauroides volans	Greater Glider	V	V	**None.** No woodland habitat	**None.** Unsuitable habitat. Prefers tall moist forest.
Petaurus australis	Yellow-bellied Glider	V		**None.** No woodland habitat	**Unlikely.** Prefers tall mature forest.
Petaurus norfolcensis	Squirrel Glider[1]	V		**None.** No woodland habitat	**Possible.**
Phascogale tapoatafa	Brush-tailed Phascogale	V		**None.** No woodland habitat	**Possible.**
Phascolarctos cinereus	Koala	V	V	**None.** No woodland habitat	**Possible** in White Box feed tress.

Rodents					
Pseudomys novaehollandiae	New Holland Mouse	V	V	**None.** No woodland habitat	**None.** Unsuitable habitat with sparse shrub layer in the woodland.
Microchiropteran Bats					
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	**Low Possible** if roosting in farm sheds.	**Low Possible** if roosting in farm sheds or culverts.
Falsistrellus tasmaniensis	Eastern False Pipistrelle[1]	V		**None.** Prefers tall moist forest.	**Possible.** Prefers tall moist forest.
Miniopterus australis	Little Bentwing-bat	V		**None.** Prefers tall moist forest.	**None.** Prefers tall moist forest.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat[1]	V		**Possible** if roosting in buildings or sheds.	**Possible** if roosting in buildings or sheds located nearby.
Mormopterus norfolkensis	Eastern Freetail-bat[1]	V		**Possible** if roosting in buildings, sheds or tree hollows.	**Possible** if roosting in buildings, sheds (located nearby) or tree hollows.
Myotis macropus	Southern Myotis[1]	V		**Unlikely**. Prefers habitat near water.	**Possible** but prefers habitat near water
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	**Unlikely.** Forages in forest or woodland.	**Possible**. Roosts in tree hollows and forages in woodland.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat[1]	V		**Possible**. Will roost in buildings or hollow trees. Will forage over open grassland.	**Possible**. Will roost in buildings (located nearby) or hollow trees. Will forage over open grassland
Scoteanax rueppellii	Greater Broad-nosed Bat[1]	V		**Unlikely**. Will roost in buildings or hollow trees but forages in open woodland.	**Possible**. Will roost in buildings (located nearby) or hollow trees. Forages in open woodland.
Vespadelus troughtoni	Eastern Cave Bat	V		**Possible.** Will roost in farm sheds and forage over open grassland.	**Possible**. Will roost in farm sheds (located nearby) and forage in woodland open grassland.
Megachiropteran bats					
Pteropus poliocephalus	Grey-headed Flying-fox[1]	V		**Unlikely**. May be an itinerant forager on blossom in the Rio Tinto	**Possible** itinerant forager on woodland eucalypt blossom.

				plantation.	
Reptiles					
Hoplocephalus bitorquatus	Pale-headed Snake	V		**None.** No woodland habitat	**Possible** in woodland habitat.
Hoplocephalus stephensii	Stephens' Banded Snake	V		**None.** No woodland habitat	**Possible** in woodland habitat.

[1]Species reported in the EIS as being recorded in the wider Mount Pleasant application area.

V = Vulnerable, E = Endangered, CE = Critically Endangered.

ATTACHMENT 2

Eastern Out of Pit Emplacement Area Floristic List

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Acanthaceae	*Sida corrugata*
Brunoniella australis	*Sida hackettiana*
Adiantaceae	**Oxalidaceae**
Cheilanthes sieberi	*Oxalis perennans*
Aizoaceae	**Plantaginaceae**
**Galenia pubescens*	**Plantago lanceolata*
Asclepiadaceae	**Poaceae**
**Gomphocarpus fruticosus*	**Cynodon dactylon*
Asteraceae	**Panicum antidotale*
**Carthamus lanatus*	**Paspalum dilatatum*
**Cirsium vulgare*	**Setaria parviflora*
**Senecio madagascariensis*	**Urochloa panicoides*
Chrysocephalum semipapposum	*Aristida ramosa*
Brassicaceae	*Austrostipa scabra* subsp. *falcata*
Lepidium pseudohyssopifolium	*Bothriochloa decipiens*
Campanulaceae	*Dichanthium sericeum*
Wahlenbergia luteola	*Digitaria brownii*
Chenopodiaceae	*Enteropogon acicularis*
Einadia polygonoides	*Eragrostis alveiformis*
Maireana microphylla	*Eragrostis leptostachya*
Commelinaceae	*Eriochloa pseudoacrotricha*
Commelina cyanea	*Panicum queenslandicum*
Cyperaceae	*Paspalidium constrictum*
**Cyperus aggregatus*	*Rytidosperma bipartitum*
Euphorbiaceae	*Sporobolus caroli*
Phyllanthus virgatus	*Sporobolus creber*
Fabaceae (Faboideae)	**Polygonaceae**
**Medicago polymorpha*	*Rumex brownii*
**Trifolium* sp.	**Portulacaceae**
Glycine clandestina	*Portulaca oleracea*
Glycine tabacina	**Solanaceae**
Lomandraceae	*Solanum cinereum*
Lomandra glauca	**Verbenaceae**
Malvaceae	**Verbena rigida*
**Modiola caroliniana*	**Zygophyllaceae**
**Sida rhombifolia*	*Tribulus micrococcus*

* Denotes weed species.

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

ATTACHMENT 3

South Western Out of Pit Emplacement Area Floristic List

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Acanthaceae
Brunoniella australis
Rostellularia adscendens subsp. *adscendens* var. *adscendens*
Adiantaceae
Cheilanthes sieberi
Aizoaceae
**Galenia pubescens*
Apiaceae
Hydrocotyle laxiflora
Asclepiadaceae
**Gomphocarpus fruticosus*
Asteraceae
**Carthamus lanatus*
**Cirsium vulgare*
**Conyza* sp.
**Hypochaeris radicata*
**Senecio madagascariensis*
**Silybum marianum*
**Tagetes minuta*
**Taraxacum officinale*
Calotis lappulacea
Chrysocephalum semipapposum
Cymbonotus lawsonianus
Lagenophora stipitata
Vittadinia cervicularis var. *subcervicularis*
Vittadinia cuneata var. *cuneata*
Vittadinia muelleri
Vittadinia pterochaeta
Brassicaceae
Lepidium pseudohyssopifolium
Cactaceae
**Opuntia stricta*
Campanulaceae
Wahlenbergia communis
Chenopodiaceae
Einadia hastata

Lomandraceae
Lomandra confertifolia subsp. *rubiginosa*
Lomandra filiformis subsp. *filiformis*
Lomandra glauca
Lomandra multiflora
Malvaceae
**Sida rhombifolia*
Sida corrugata
Myrtaceae
Eucalyptus albens
Eucalyptus crebra
Oleaceae
Notelaea venosa
Oxalidaceae
Oxalis perennans
Oxalis radicosa
Plantaginaceae
**Plantago lanceolata*
Plantago cunninghamii
Plantago debilis
Poaceae
Aristida ramosa
Austrostipa scabra subsp. *scabra*
Austrostipa verticillata
Bothriochloa decipiens
Chloris truncata
Chloris ventricosa
Cymbopogon refractus
Dichanthium sericeum
Digitaria brownii
Eragrostis brownii
Eragrostis lacunaria
Eragrostis leptostachya
Eragrostis parviflora
Eriochloa pseudoacrotricha
Panicum buncei

Einadia polygonoides
Maireana microphylla
Clusiaceae
Hypericum gramineum
Convolvulaceae
Convolvulus erubescens
Dichondra repens
Cyperaceae
Carex inversa
Euphorbiaceae
Euphorbia drummondii
Phyllanthus virgatus
Fabaceae (Faboideae)
**Medicago polymorpha*
**Trifolium* sp.
Desmodium varians
Glycine clandestina
Glycine tabacina
Indigofera australis
Geraniaceae
Geranium solanderi var. *solanderi*
Lobeliaceae
Pratia purpurascens

Panicum effusum
Panicum queenslandicum
Rytidosperma bipartitum
Sporobolus creber
Polygonaceae
Rumex brownii
Portulacaceae
Portulaca oleracea
Rubiaceae
Asperula conferta
Scrophulariaceae
Eremophila debilis
Myoporum montanum
Solanaceae
**Lycium ferocissimum*
Solanum cinereum
Stackhousiaceae
Stackhousia muricata
Sterculiaceae
Brachychiton populneus subsp. *populneus*
Thymelaeaceae
Pimelea curviflora var. *sericea*
Verbenaceae
**Verbena hispida*

* Denotes weed species.

ATTACHMENT 4

Floristic Plot Data

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Key: WB = White Box; NL Ironbark = Narrow-leaved Ironbark; DNG = Derived Native Grassland
Scores are Braun-Blanquet cover abundance values.

Emplacement	Eastern Out of Pit Emplacement			South Western Out of Pit Emplacement				
Habitat	DNG			WB DNG		WB woodland	NL Ironbark DNG	NL Ironbark woodland
Plot	170329P1	170329P2	170330P1	170329P3	170329P5	170329P4	170329P7	170329P6
Acanthaceae								
Brunoniella australis			1	2		1	1	1
Rostellularia adscendens subsp. *adscendens* var. *adscendens*						2	1	1
Adiantaceae								
Cheilanthes sieberi	1		1	3	1		1	
Aizoaceae								
**Galenia pubescens*	1		3			1		1
Apiaceae								
Hydrocotyle laxiflora				1				
Asclepiadaceae								
**Gomphocarpus fruticosus*		1		2	1	1		1
Asteraceae								
Calotis lappulacea				1		1		1
Chrysocephalum semipapposum		2						2
Cymbonotus lawsonianus				1		1	1	1
Lagenophora stipitata						1		
Vittadinia cervicularis var. *subcervicularis*				1		2		
Vittadinia cuneata var. *cuneata*								2
Vittadinia muelleri								1
Vittadinia pterochaeta				1				
**Senecio madagascariensis*	1		1			1		1
**Cirsium vulgare*	1	1		2	2	1	2	1

Emplacement	Eastern Out of Pit Emplacement			South Western Out of Pit Emplacement				
Habitat	DNG			WB DNG		WB woodland	NL Ironbark DNG	NL Ironbark woodland
Plot	170329P1	170329P2	170330P1	170329P3	170329P5	170329P4	170329P7	170329P6
**Carthamus lanatus*	5	3	4	5	5		6	2
**Taraxacum officinale*				1				
**Hypochaeris radicata*				1				1
**Conyza* sp.				3	2	1		
**Silybum marianum*					2			
**Tagetes minuta*								1
Brassicaceae								
Lepidium pseudohyssopifolium	1		1	1	1			1
Cactaceae								
**Opuntia stricta*						1		1
Campanulaceae								
Wahlenbergia communis				1	1	1	1	1
Wahlenbergia luteola		1						
Chenopodiaceae								
Einadia hastata					3	2		2
Einadia polygonoides			1			1		1
Maireana microphylla			1			3		1
Clusiaceae								
Hypericum gramineum				1				
Commelinaceae								
Commelina cyanea		1						
Convolvulaceae								
Convolvulus erubescens				1	2	1	1	1
Dichondra repens				2		3		3
Cyperaceae								

Emplacement	Eastern Out of Pit Emplacement			South Western Out of Pit Emplacement				
Habitat	DNG			WB DNG		WB woodland	NL Ironbark DNG	NL Ironbark woodland
Plot	170329P1	170329P2	170330P1	170329P3	170329P5	170329P4	170329P7	170329P6
Carex inversa				1	1	2		2
**Cyperus aggregatus*		1						
Euphorbiaceae								
Euphorbia drummondii						1		
Phyllanthus virgatus		1		1			1	1
Fabaceae (Faboideae)								
Desmodium varians						2		1
Glycine clandestina			1	2	1	2	1	1
Glycine tabacina		1	2	1	1		1	
Indigofera australis				1				
Trifolium sp.	2							
**Medicago polymorpha*	1							1
**Trifolium* sp.		3	1	2			4	1
Geraniaceae								
Geranium solanderi var. *solanderi*				1	4		1	1
Lobeliaceae								
Pratia purpurascens				1				1
Lomandraceae								
Lomandra confertifolia subsp. *rubiginosa*							1	
Lomandra filiformis subsp. *filiformis*				1		1		
Lomandra glauca		2				1		
Lomandra multiflora							1	
Malvaceae								

Emplacement	Eastern Out of Pit Emplacement			South Western Out of Pit Emplacement				
Habitat	DNG			WB DNG		WB woodland	NL Ironbark DNG	NL Ironbark woodland
Plot	170329P1	170329P2	170330P1	170329P3	170329P5	170329P4	170329P7	170329P6
Sida corrugata	2	1	2	2		2	1	1
Sida hackettiana			2					
**Sida rhombifolia*	2	3	2	1	2	2	2	3
**Modiola caroliniana*	2	1						
Myrtaceae								
Eucalyptus albens						5		
Eucalyptus crebra								4
Oleaceae								
Notelaea venosa						1		
Oxalidaceae								
Oxalis perennans	1		1	1		1		
Oxalis radicosa						1		
Plantaginaceae								
Plantago cunninghamii								1
Plantago debilis						1	1	1
**Plantago lanceolata*		2	1		1		1	2
Poaceae								
Aristida ramosa	3	3	1	4	3	1	2	2
Austrostipa scabra subsp. *falcata*			1					
Austrostipa scabra subsp. *scabra*								1
Austrostipa verticillata					5	4	1	1
Bothriochloa decipiens	2			3		1	1	1
Chloris truncata							1	
Chloris ventricosa				2	2	2	2	2

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Emplacement	Eastern Out of Pit Emplacement			South Western Out of Pit Emplacement				
Habitat	DNG			WB DNG		WB woodland	NL Ironbark DNG	NL Ironbark woodland
Plot	170329P1	170329P2	170330P1	170329P3	170329P5	170329P4	170329P7	170329P6
Cymbopogon refractus				1		2	1	2
Dichanthium sericeum			1		2		1	1
Digitaria brownii	3	4	4		1			
Enteropogon acicularis	1		2					
Eragrostis alveiformis	5	3						
Eragrostis brownii								1
Eragrostis lacunaria					1			
Eragrostis leptostachya			2		1			1
Eragrostis parviflora					1			
Eriochloa pseudoacrotricha	4	2	3				1	
Panicum buncei				1			1	
Panicum effusum				2				
Panicum queenslandicum	2	5	2		2		4	
Paspalidium constrictum	2	3	3					
Rytidosperma bipartitum			1			1		1
Sporobolus caroli		1						
Sporobolus creber	3	2	4			1	1	
**Cynodon dactylon*	2							
**Urochloa panicoides*	4	3	1					
**Paspalum dilatatum*		1						
**Setaria parviflora*		1						
**Panicum antidotale*			2					
Polygonaceae								
Rumex brownii		1		1	1		1	
Portulacaceae								

Emplacement	Eastern Out of Pit Emplacement			South Western Out of Pit Emplacement				
Habitat	DNG			WB DNG		WB woodland	NL Ironbark DNG	NL Ironbark woodland
Plot	170329P1	170329P2	170330P1	170329P3	170329P5	170329P4	170329P7	170329P6
Portulaca oleracea		2			1			
Rubiaceae								
Asperula conferta				3		2	2	1
Scrophulariaceae								
Eremophila debilis				2		2		2
Myoporum montanum								1
Solanaceae								
Solanum cinereum		1				1	1	1
**Lycium ferocissimum*						1		
Stackhousiaceae								
Stackhousia muricata						1		
Sterculiaceae								
Brachychiton populneus subsp. *populneus*						2		
Thymelaeaceae								
Pimelea curviflora var. *sericea*						1		1
Verbenaceae								
**Verbena rigida*		3						
**Verbena hispida*					2		1	
Zygophyllaceae								
Tribulus micrococcus	1							

ATTACHMENT 5

Targeted surveys for *Diuris tricolor* and *Prasophyllum petilum*

HUNTER ECO · ABN 25 112 984 240
PO Box 1047, Toronto, NSW 2283 **Phone/Fax** +61 2 4959 8016 **Mobile** 0438 773 029 **Email** cd_enviro@bigpond.com

Klay Marchant
MACH Energy
Delivered via email
klay.marchant@machenergyaustralia.com.au

ECO LOGICAL AUSTRALIA PTY LTD
ABN 87 096 512 088
www.ecoaus.com.au

Our ref: 5405

07 March 2017

Dear Klay,

Targeted surveys for *Diuris tricolor* and *Prasophyllum petilum* – Mount Pleasant Operation

The letter has been prepared to outline the methods and results of targeted surveys for two threatened orchid species, *Diuris tricolor* (Pine Donkey Orchid) and *Prasophyllum petilum* (Tarengo Leek Orchid, formerly known as *Prasophyllum sp. Wybong*) within two portions of the Mount Pleasant Operation owned by MACH Energy ('the study area', **Figure 1**).

D. tricolor is listed as a Vulnerable species and as an Endangered Population (within the Muswellbrook LGA) under the NSW *Threatened Species Conservation Act* 1995 (TSC Act). *P. petilum* is listed as an Endangered Species under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and the TSC Act. One additional species, *Diuris pedunculata* listed as Endangered under the TSC and EPBC Acts, was also considered as part of the planning of the targeted surveys, although this species is mostly confined to the New England Tablelands area and was considered unlikely to occur within the study area (**Figure 1**).

Methods

Targeted surveys for *D. tricolor* and *P. petilum* were undertaken within the study area on 4 and 5 October 2016 over approximately 16 hrs by Eco Logical Australia ecologist Brian Towle. Weather conditions during the survey period were fine with moderate to strong winds. A reference site of *D. tricolor* approximately 14 km south of the study area was inspected on the 4 October 2016 which confirmed that this species was flowering during the survey period (**Plate 1**). At this location *D. tricolor* was flowering abundantly which is attributed to the above average winter and spring rainfall. While no reference site was visited for *Prasophyllum petilum*, as no publicly accessible populations of this species were identified within proximity of the study area, this species was confirmed to be flowering at the Mangoola Mine site, approximately 12 km south-west of the study area, at the time of the targeted surveys (Stephen Bell *pers. comm*. 2016).

The targeted survey methodology involved a combination of random meander surveys and systematic targeted searches along parallel transects. Random meanders involving searches along meandering paths, were conducted across the study area to identify areas of potential habitat. Systematic targeted searches, involving traverses of the survey site in parallel transects, were undertaken in areas which were considered to represent potential habitat for the species, based upon evidence of lower grazing pressure.

Results

No individuals of *D. tricolor* or *P. petilum* were recorded within the study area and no species belonging to the family Orchidaceae were recorded within the study area.

Meanders across the study area identified that much of the eastern portion of the study area did not represent potential habitat for the targeted orchid species as this area was heavily modified by agricultural activities. The eastern portion of the study area was highly disturbed with few mature canopy individuals present and the majority of canopy species present within this area consisting of recent plantings. The understorey within the eastern portion was also highly modified with improved pastures dominating this area. The highly modified eastern portion of the study area was not considered to be potential habitat for the targeted orchid species and was also considered to be of limited value to fauna species due to the general absence of canopy or shrub layer resources (including food and shelter resources) and the highly modified understorey.

The western portion of the study area broadly met the habitat requirements of the two target species, although this area appears to have had a long history of disturbance associated with agricultural practices and in particular grazing. The entire study area was actively grazed at time of survey and the understorey vegetation across the study area included a very high cover of exotic species at the time of survey. Flora surveys targeted those areas which appeared to have lower grazing pressure as indicated by lower cover of annual exotic species and where native understorey diversity was greatest.

As no individuals of *D. tricolor* or *P. petilum* were recorded during targeted surveys conducted during the confirmed flowering period of these two species, it is considered unlikely that either of these species are present within the study area.

Yours sincerely,

Brian Towle

Senior Ecologist

Plate 1: *Diuris tricolor,* photo taken 4 October 2016 by Brian Towle, Muswellbrook LGA.

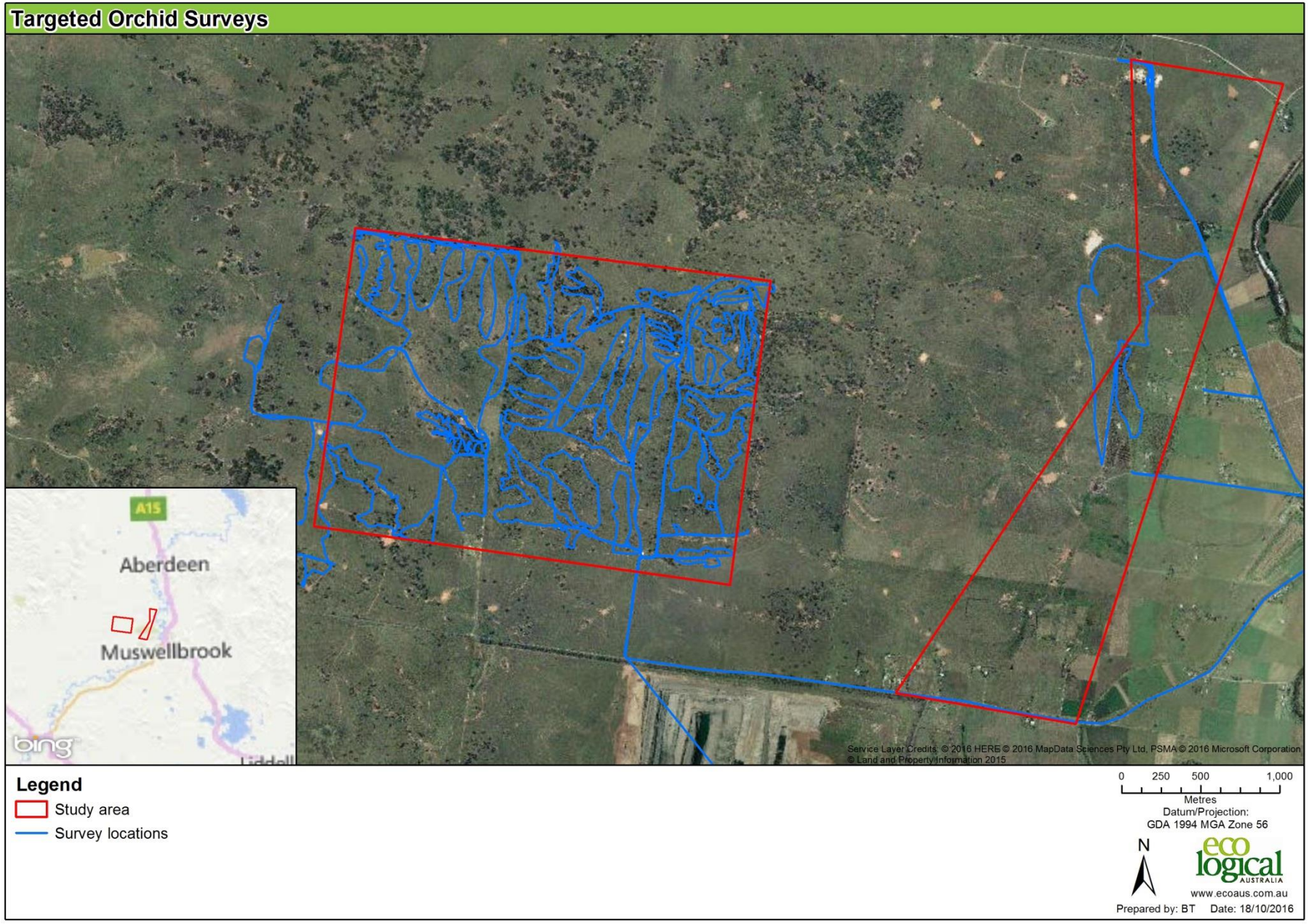

Figure 1: Study area and survey locations