

4 STAGE 1 – BIODIVERSITY ASSESSMENT FOR COMMONWEALTH ASSESSMENT FOOTPRINT

In April 2017, OEH requested the OEH Credit Calculator to be separately run on the Commonwealth Assessment Footprint, noting the difference relative to the BAR Footprint in Figure 3a. This section provides information on the application of the site-based assessment on the Commonwealth Assessment Footprint associated with the mine site (Table 21). The Commonwealth Assessment Footprint associated with the Project rail is the same as that assessed/reported in Section 3.

Table 21
Commonwealth Assessment Footprint Components

Commonwealth Assessment Footprint Components	Total Disturbance Footprint (ha)	Document Reference
Commonwealth Assessment Footprint – Mine Site	901.7	Section 4.2.1
Project Rail Spur	82.7	Table 13
Commonwealth Assessment Area (Total)	984.4	

Landscape features are described in Section 4.1, native vegetation is described in Section 4.2, and threatened species relevant to the BAR Footprint are described in Section 4.3.

4.1 LANDSCAPE FEATURES

Landscape features relevant to the Project (such as regional setting and Mitchell Landscapes) are described in this sub-section.

4.1.1 Regional Setting

The regional setting described in Section 2.1.1 is relevant to the Commonwealth Assessment Footprint associated with the mining area.

4.1.2 Mitchell Landscapes

The Commonwealth Assessment Footprint associated with the mining area is predominantly within the Liverpool Alluvial Plains Mitchell Landscape (Patch Size greater than 1,001 ha, resulting in the patch size score of 12).

4.1.3 Native Vegetation Extent

For the purpose of this assessment, a 17,500 ha outer circle and a 1,750 ha inner circle was adopted (based on a ratio of 1:10 standard circle sizes in the FBA [OEH, 2014a]) (Figure 26).

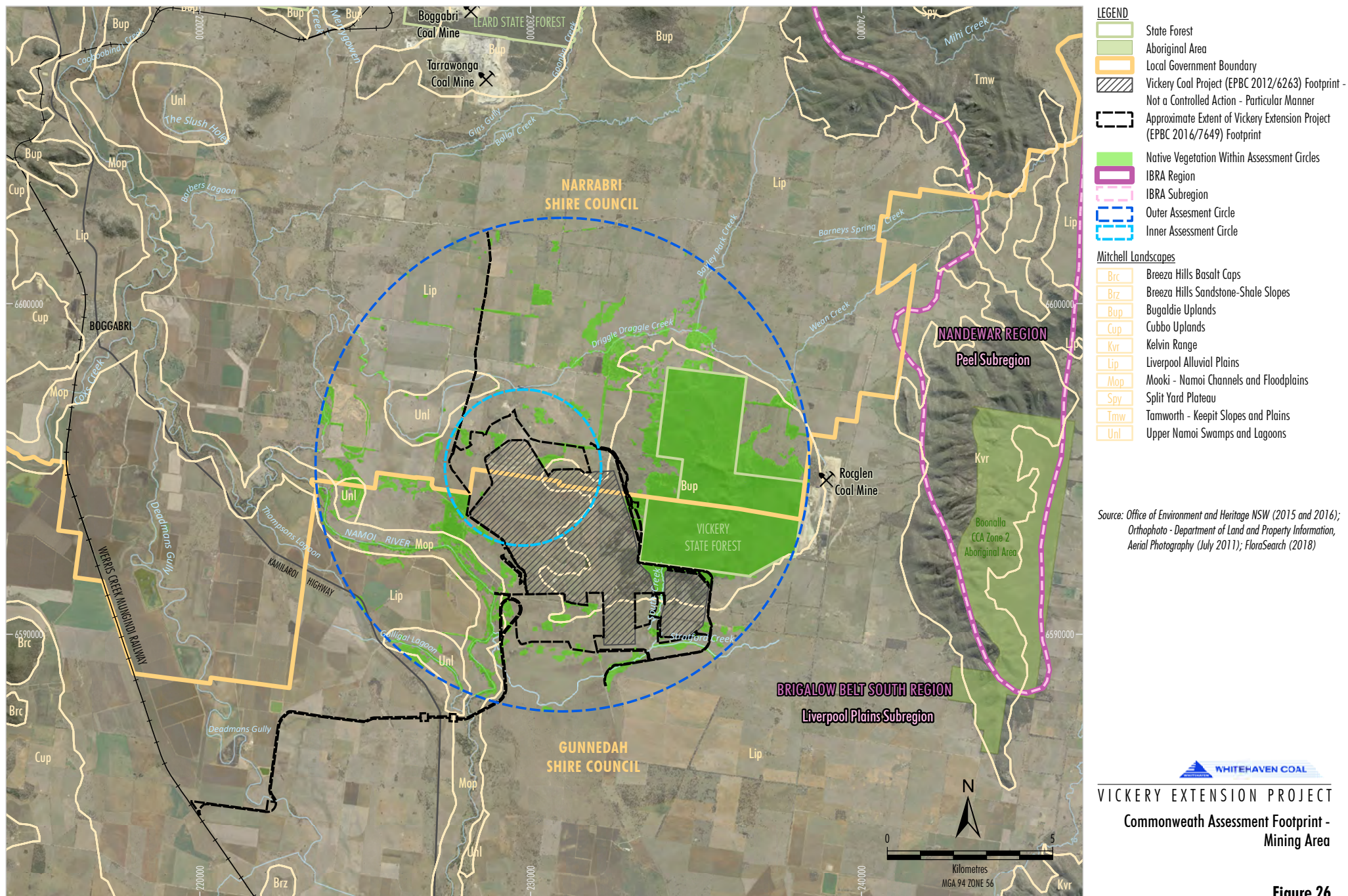


Figure 26

Despite the different circle sizes required to encompass the disturbance, the circle habitat categories for the Commonwealth Assessment Footprint associated with the mining area are the same as those in Section 2.1.3. The outer circle contains approximately 21-25% of native vegetation cover⁴ before development and 16-20% after development. The inner circle contains approximately 6-10% of native vegetation cover² before development and <5% after development.

4.1.4 Connectivity Value Score

The connectivity value score described in Section 2.1.4 is relevant to the Commonwealth Assessment Footprint associated with the mining area.

4.1.5 Impacts on Landscape Features that Require Further Consideration

The landscape features that require further consideration which are described in Section 2.1.5 are relevant to the Commonwealth Assessment Footprint associated with the mining area.

4.2 NATIVE VEGETATION

Native vegetation relevant to the Commonwealth Assessment Footprint associated with the mining area is described in this section.

4.2.1 Plant Community Types/Biometric Vegetation Types

The area of each BVT relevant to the Commonwealth Assessment Footprint associated with the mining area is provided in Table 22.

4.2.2 Threatened Ecological Communities

No threatened ecological communities listed under the BC Act or EPBC Act were mapped by FloraSearch (2018) (Attachment C) within the Commonwealth Assessment Footprint associated with the mining area.

4.2.3 Vegetation Zones

Table 23 outlines the vegetation zones present in the Commonwealth Assessment Footprint associated with the mining area, the relevant BVT, condition, site value score (i.e. the quantitative measure of vegetation condition), area and patch size. The site value score is automatically calculated in the OEH Credit Calculator based on the floristic plot data.

⁴ Excludes derived native grassland.

Table 22
Vegetation Communities in the Commonwealth Assessment Footprint Associated with the Mining Area (EPBC Act)

#	Vegetation Community	BVT	PCT		Area (ha)	% Cleared in Namoi*
Semi-arid Woodlands Formation (Grassy Sub-formation)						
2	Poplar Box Woodland on Alluvial Clay Soils	NA185	101	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	0.2	75
2a	Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)				70	
Dry Sclerophyll Forests Formation (Shrub/Grass Sub-formation)						
3	Pilliga Box – Poplar Box Shrubby Woodland	NA324	397	Poplar Box - White Cypress Pine shrub grass tall woodland of the Pilliga - Warialda region, Brigalow Belt South Bioregion	25.5	45
3a	Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)				336.5	
4	White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	594	Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	17	55
4a	White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)				38	
Dry Sclerophyll Forests Formation (Shrubby Sub-formation)						
5	Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	459	Narrow-leaved Ironbark - Black Cypress Pine - White Box shrubby woodland in sedimentary hills of the Gunnedah region, Brigalow Belt South Bioregion	60	35
5a	Narrow-leaved Ironbark – White Box Shrubby Forest (secondary/derived grassland)				148.5	
Freshwater Wetlands						
7	Mixed Marsh Sedgeland	NA201	53	Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluvial plains and floodplains	4	75
Total					699.7	-
Disturbed Land					202	
Total Commonwealth Assessment Footprint Associated with the Mining Area					901.7	

Note: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1 and 6 do not occur in the Commonwealth Assessment Footprint associated with the mining area.

* OEH (2017a).

Table 23
Vegetation Zones Associated with the Commonwealth Assessment Footprint Associated with the Mining Area

Vegetation Zone Number	Vegetation Community	BVT	Condition Class and Sub-category	Site Value Score	Area (ha)	Patch Size (ha)
<i>Semi-arid Woodlands (Grassy Sub-formation)</i>						
1	2 Poplar Box Woodland on Alluvial Clay Soils	NA185	Moderate/Good	75.41	0.2	>1,000
2	2a Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)		Moderate/Good_DNG	38.8	70	>1,000
<i>Dry Sclerophyll Forests (Shrub/Grass Sub-formation)</i>						
3	3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	Moderate/Good	70.31	25.5	>1,000
4	3a Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)		Moderate/Good_DNG	19.79	336.5	>1,000
5	4 White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	Moderate/Good	87.50	17	>1,000
6	4a White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)		Moderate/Good_DNG	25.00	38	>1,000
<i>Dry Sclerophyll Forests (Shrubby Sub-formation)</i>						
7	5 Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	Moderate/Good	47.92	60	>1,000
8	5a Narrow-leaved Ironbark – White Box Shrubby Forest (secondary/derived grassland)		Moderate/Good_DNG	18.75	148.5	>1,000
<i>Freshwater Wetlands</i>						
9	7 Mixed Marsh Sedgeland	NA201	Moderate/Good	32.38	4	>1,000
Total					699.7	

Note: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1 and 6 do not occur in the Commonwealth Assessment Footprint associated with the mining area.

4.3 THREATENED SPECIES

Threatened species relevant to the Commonwealth Assessment Footprint associated with the mining area are identified in this sub-section.

4.3.1 Habitat Features for Particular Species Credit Species

The habitat features/species listed in Table 4 were also in the OEH Credit Calculator for the Commonwealth Assessment Footprint associated with the mining area. The relevant habitat features/species in Table 4 are also relevant to the Commonwealth Assessment Footprint.

Three additional habitat features/species were also in the OEH Credit Calculator for the Commonwealth Assessment Footprint associated with the mining area (Table 24).

Table 24
Threatened (Species Credit) Species Habitat Features

Common Name	Scientific Name	Conservation Status ¹		Habitat Feature	Relevance
		BC Act	EPBC Act		
Flora					
Spiny Peppergrass	<i>Lepidium aschersonii</i>	V	V	On ridges of gilgai clays.	Potentially relevant.
Austral Toadflax	<i>Thesium australe</i>	V	V	Coastal headlands, grassland, grassy open forest or woodland on fertile or moderately fertile soils.	Not relevant. FloraSearch (2018) (Attachment C) states that the Austral Toad-flax is highly unlikely to occur on the study area as Kangaroo Grass is very uncommon.
Belson’s Panic	<i>Homopholis belsonii</i>	E	V	Dry woodland on poor soils or areas of basalt capping over sandstone.	Potentially relevant.
Cyperus conicus	<i>Cyperus conicus</i>	E	-	Wetlands and wet run on areas.	Not relevant. FloraSearch (2018) (Attachment C) states that <i>Cyperus conicus</i> grows in sandy soils which are not present.
Birds					
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	V	-	Land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts.	Potentially relevant.
Grey Falcon	<i>Falco hypoleucos</i>	E	-	Land within 100 m of riparian woodland on inland rivers containing mature living eucalypts or isolated paddock trees overhanging water or dry watercourses.	Potentially relevant.
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E	-	Land within 40 m of freshwater or saline wetlands (eg saltmarsh, mangroves, mudflats, swamps, billabongs, floodplains, watercourse pools, wet heathland and/or farm dams).	Potentially relevant.
Australasian Bittern	<i>Botaurus poiciloptilus</i>	E	E	Land containing brackish or freshwater wetlands.	Potentially relevant.
Mammals					
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels.	Habitat feature not relevant. There is no breeding habitat for the Large-eared Pied Bat within the BAR Footprint associated with the mining area.

Table 24 (Continued)
Threatened (Species Credit) Species Habitat Features

Common Name	Scientific Name	Conservation Status ¹		Habitat Feature	Relevance
		BC Act	EPBC Act		
Reptiles					
Pale-Headed Snake	<i>Hoplocephalus bitorquatus</i>	V	-	Land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber.	Potentially relevant.
Border Thick-tailed Gecko	<i>Uvidicolus sphyrurus</i>	V	V	Land within 100 m of rocky areas.	Not relevant. There are no notable rocky areas within 100 m of the BAR Footprint associated with the mining area which provide potential habitat for this species. Future Ecology (2018) (Attachment D) did not record this species during the fauna surveys.
Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	V	V	Land containing surface rocks (embedded or loose).	Not relevant. There are no notable areas of surface rocks in the BAR Footprint associated with the mining area which provide potential habitat for this species. Future Ecology (2018) (Attachment D) did not record this species during the fauna surveys.
Marsupials					
Brush-tailed Rock-Wallaby	<i>Petrogale penicillata</i>	E	V	Land within 1 km of rock outcrops or clifflines.	Not relevant. No rocky outcrops/cliffs occur within the BAR Footprint associated with the mining area. Future Ecology (2018) (Attachment D) did not record this species during the fauna surveys.

¹ Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

V = Vulnerable; E = Endangered.

4.3.2 Targeted Surveys for Threatened Species

The list of candidate species credit species requiring survey (as determined by the OEH Credit Calculator) is the same as Table 16 (for the Project rail spur). All potentially occurring threatened species listed under the EPBC Act were also targeted during the surveys as described further below as well as in Attachments C and D.

Targeted surveys were undertaken within the Commonwealth Assessment Footprint and surrounds for threatened flora and fauna species listed under the EPBC Act which were considered potential occurrences informed by past surveys and database searches (Attachments C and D). Detail regarding survey methodology employed is provided in Attachments C and D.

No threatened flora species have been recorded in the Commonwealth Assessment Footprint (Figure 17).

Two confirmed records of threatened fauna species listed under the EPBC Act have been recorded in the Commonwealth Assessment Footprint, namely the Koala and Painted Honeyeater (Figure 17). However, the following bat species have been potentially recorded within the Commonwealth Assessment Footprint (Future Ecology, 2018; Niche, 2013):

- Corben’s Long-eared Bat (this species cannot be identified to species level based on call data alone); and
- Large-eared Pied Bat (identified to genus level only, calls could not be distinguished from other potentially occurring bat species).

As these potential records could not be confirmed, they are not shown on Figures 8 and 9. The nearest confirmed records of these species are both located within the southern extent of the Leard State Forest, approximately 8 km to the north of the Project mining area (OEH, 2017c).

4.3.3 Ecosystem Credit Species

A total of 34 ecosystem credit species are listed in Table 25 from the OEH Credit Calculator. No ecosystem credit species were removed from (turned off in) the OEH Credit Calculator.

Table 25
Ecosystem Species from the OEH Credit Calculator (Mining Area)

Common Name	Scientific Name	Conservation Status ¹		TS Offset Multiplier	T _e Value*
		BC Act	EPBC Act		
Birds					
Malleefowl	<i>Leipoa ocellata</i>	E	V	2.6	0.375
Freckled Duck	<i>Stictonetta naevosa</i>	V	-	1.3	0.75
Square-tailed Kite	<i>Lophoictinia isura</i>	V	-	1.4	0.725
Spotted Harrier	<i>Circus assimilis</i>	V	-	1.4	0.725
Little Eagle	<i>Hieraaetus morphnoides</i>	V	-	1.4	0.725
Australian Bustard	<i>Ardeotis australis</i>	E	-	2.6	0.375
Brolga	<i>Grus rubicunda</i>	V	-	1.3	0.75
Australian Painted Snipe	<i>Rostratula australis</i>	E	E	1.3	0.75
Blue-billed Duck	<i>Oxyura australis</i>	V	-	1.3	0.75
Black-tailed Godwit	<i>Limosa limosa</i>	V	-	2.6	0.375
Magpie Goose	<i>Anseranas semipalmata</i>	V	-	1.3	0.75
Bush Stone-curlew	<i>Burhinus grallarius</i>	E	-	2.6	0.375
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V	-	1.8	0.55
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	-	1.8	0.575
Turquoise Parrot	<i>Neophema pulchella</i>	V	-	1.8	0.55
Swift Parrot	<i>Lathamus discolor</i>	E	CE^	1.3	0.75
Masked Owl	<i>Tyto novaehollandiae</i>	V	-	3.0	0.325
Barking Owl	<i>Ninox connivens</i>	V	-	3.0	0.325
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	V	-	2.0	0.5
Speckled Warbler	<i>Chthonicola saaiitata</i>	V	-	2.6	0.375

Table 25 (Continued)
Ecosystem Species from the OEH Credit Calculator (Mining Area)

Common Name	Scientific Name	Conservation Status ¹		TS Offset Multiplier	T _G Value*
		BC Act	EPBC Act		
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	V	-	1.3	0.75
Painted Honeyeater	<i>Grantiella picta</i>	V	V	1.3	0.75
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	V	-	1.7	0.6
Flame Robin	<i>Petroica phoenicea</i>	V	-	1.3	0.75
Scarlet Robin	<i>Petroica boodang</i>	V	-	1.3	0.75
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V	-	1.3	0.75
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	-	1.3	0.75
Diamond Firetail	<i>Stagonopleura guttata</i>	V	-	1.3	0.75
White-fronted Chat	<i>Epthianura albifrons</i>	V	-	0.8	0.75
Mammals					
Spotted-tailed Quoll (south-eastern mainland population)	<i>Dasyurus maculatus maculatus</i>	V	E	2.6	0.375
Pilliga Mouse	<i>Pseudomys pilligaensis</i>	V	V	2.6	0.375
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	-	2.2	0.45
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	V	2.1	0.475
Little Pied Bat	<i>Chalinolobus picatus</i>	V	-	2.1	0.475

TS Offset Multiplier = a species-specific multiplier used to determine the extent of habitat required to be located within the offset area.

T_G Value = the ability of a species to respond to improvement in site value or other habitat improvement at an offset site with management actions (OEH, 2016a).

* Archived BioMetric and Threatened Species Profiles Datasets (OEH, 2017b).

^ Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (14 April 2016) and therefore assessed as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).

¹ Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

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

Table 26 identifies the vegetation zones along with the associated ecosystem credit species that have been identified as having the lowest T_G value for that zone (for all zones the lowest T_G is 0.325, with the exception of zone 9, which has a T_G value of 0.375). The species with the lowest T_G value influences the offset multiplier designated to each vegetation zone. Note that in Table 27 the species with the lowest T_G are all species that are not listed under the EPBC Act.

4.3.4 Species Credit Species

No species credit species have been recorded within the Commonwealth Assessment Footprint associated with the mining area. There are, however, two species credit species (listed in the DEE comments in the SEARs for the EIS) which are in the credit calculation for the Commonwealth Assessment Footprint associated with the mining area (Table 27).

Table 27 details the area of habitat for the fauna species in the Commonwealth Assessment Footprint associated with the mining area based on vegetation communities. Species polygons (i.e. potential habitat extent) for the species credit species listed in Table 27 have been prepared in accordance with the FBA (OEH, 2014a) (Figures 10, 13 and 15).

Table 26
Vegetation Zones and Predicted Threatened Species which Influence the Offset Required for
Each Vegetation Zone Associated with the Mining Area

Vegetation Zone Number	Vegetation Community	BVT	Predicted Threatened Species with Lowest T _G Value	Species T _G Value
Semi-arid Woodlands (Grassy Sub-formation)				
1	2 Poplar Box Woodland on Alluvial Clay Soils	NA185	Masked Owl	0.325
2	2a Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)		Masked Owl	0.325
Dry Sclerophyll Forests (Shrub/Grass Sub-formation)				
3	3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	Barking Owl	0.325
4	3a Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)		Barking Owl	0.325
5	4 White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	Barking Owl	0.325
6	4a White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)		Barking Owl	0.325
Dry Sclerophyll Forests (Shrubby Sub-formation)				
7	5 Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	Barking Owl	0.325
8	5a Narrow-leaved Ironbark – White Box Shrubby Forest (secondary/derived grassland)		Barking Owl	0.325
Freshwater Wetlands				
9	Mixed Marsh Sedgeland	NA201	Australian Bustard	0.375

Note: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1 and 6 do not occur in the Commonwealth Assessment Footprint associated with the mining area.

Table 27
Vegetation Types Representing Potential Habitat for Species Credit Species in the Commonwealth
Assessment Footprint Associated with the Mining Area

Vegetation Community	BVT	Regent Honeyeater Potential Habitat (ha)	Koala Potential Habitat (ha)
2 Poplar Box Woodland on Alluvial Clay Soils	NA185	0.2	0.2
3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	0	21.5 ^a
4 White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	17	0.5 ^c
5 Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	53 ^a	53 ^d
Scattered paddock trees in secondary/derived native grassland	-	0.5	0
	Total	70.7	75.2
Credit Requirement		5,444	1,955

^a 60 ha of this BVT occurs in the Commonwealth Footprint associated with the mining area, however, 7 ha does not contain potential habitat resources for the Regent Honeyeater.

^b 25.5 ha of this BVT occurs in the Commonwealth Footprint associated with the mining area, however, 4 ha does not contain potential habitat resources for the Koala.

^c 17 ha of this BVT occurs in the Commonwealth Footprint associated with the mining area, however, 16.5 ha does not contain potential habitat resources for the Koala.

^d 60 ha of this BVT occurs in the Commonwealth Footprint associated with the mining area, however, 7 ha does not contain potential habitat resources for the Koala.

4.4 SUMMARY OF THE RESULTS FOR COMMUNITIES AND SPECIES LISTED UNDER THE EPBC ACT

This section provides a summary of the results for the entire Commonwealth Assessment Footprint (i.e. the mining area and Project rail spur).

Threatened Ecological Communities Listed under the EPBC Act

No threatened ecological communities listed under the EPBC Act are relevant to the Project. Box-Gum Woodland CEEC and Weeping Myall Woodlands (two ecological communities listed in the DEE comments in the SEARs for the EIS) are not known to occur in the Commonwealth Assessment Footprint (FloraSearch, 2018) (Attachment C).

Threatened Species Listed under the EPBC Act

Table 28 provides a list of threatened species listed under the EPBC Act which were considered in the OEH Credit Calculator for the Commonwealth Assessment Footprint (i.e. the mining area and Project rail spur). No threatened flora species listed under the EPBC Act have been recorded in the Commonwealth Assessment Footprint. Two threatened fauna species listed under the EPBC Act have been recorded in the Commonwealth Assessment Footprint, namely the Koala and Painted Honeyeater.

Swift Parrot

Table 29 provides the vegetation types in the Commonwealth Assessment Footprint (i.e. the mining area and Project rail spur) that are potential habitat for the Swift Parrot along with the ecosystem credit requirements for the Commonwealth Assessment Footprint and NSW Assessment Footprint.

Table 28
Threatened Species Listed under the EPBC Act in the OEH Credit Calculator

Species	EPBC Act Status ¹	Recorded	Potential impact	Species Type	Assessment
Flora					
Bluegrass (<i>Dichanthium setosum</i>)	V	No	Nil/negligible risk of impact	Species Credit (Table 16)	Not recorded in the Commonwealth Assessment Footprint. No species credits required.
Belson's Panic (<i>Homopholis belsonii</i>)	V	No	Nil/negligible risk of impact	Species Credit (Table 16)	Not recorded in the Commonwealth Assessment Footprint. No species credits required. An assessment is provided in Attachment B.
Slender Darling Pea (<i>Swainsona murrayana</i>)	V	No	Nil/negligible risk of impact	Species Credit (Table 16)	Not recorded in the Commonwealth Assessment Footprint. No species credits required.
<i>Tylophora linearis</i>	E	No	Nil/negligible risk of impact	Species Credit (Table 16)	Not recorded in the Commonwealth Assessment Footprint. No species credits required. An assessment is provided in Attachment B.
Austral Toadflax (<i>Thesium australe</i>)	V	No	Nil/negligible risk of impact	Species Credit (Table 16)	Not recorded in the Commonwealth Assessment Footprint. No species credits required. An assessment is provided in Attachment B.

Table 28 (Continued)
Threatened Species Listed under the EPBC Act in the OEH Credit Calculator

Species	EPBC Act Status ¹	Recorded	Potential impact	Species Type	Assessment
Flora (Continued)					
Winged Peppercress (<i>Lepidium monoplacoides</i>) [^]	E	Outside (Figure 17)	Nil/negligible risk of impact	Species Credit	Previously recorded outside of the Commonwealth Assessment Footprint. No species credits required. An assessment is provided in Attachment B.
Birds					
Malleefowl (<i>Leipoa ocellata</i>)	V	No	Nil/negligible risk of impact	Ecosystem Credit (Tables 17 and 25)	No nearby records and unlikely to be present due to lack of preferred habitat. No offset required.
Australian Painted Snipe (<i>Rostratula australis</i>)	E	No	Nil/negligible risk of impact	Ecosystem Credit (Tables 17 and 25)	No nearby records and unlikely to be present due to lack of preferred habitat. No offset required.
Swift Parrot (<i>Lathamus discolor</i>)	CE	No	Assumed significant for the purpose of the offset	Ecosystem Credit (Tables 17 and 25)	This species was not targeted but potential foraging habitat is present so it is assumed that this migratory species could occur. An assessment is provided in Attachment B.
Regent Honeyeater (<i>Anthochaera phrygia</i>)	CE	No	Assumed significant for the purpose of the offset	Species Credit (Tables 20 and 27)	Potential habitat present and species credits required (Tables 20 and 27). An assessment is provided in Attachment B.
Painted Honeyeater (<i>Grantiella picta</i>)	V	Inside (Figure 17)	Nil/negligible risk of impact	Ecosystem Credit (Tables 17 and 25)	Potential habitat would be impacted but impacts not significant. An assessment is provided in Attachment B.
Mammals					
Koala (<i>Phascolarctos cinereus</i>)	V	Inside (Figure 17)	Assumed significant for the purpose of the offset	Species Credit (Tables 20 and 27)	Species credits required (Tables 20 and 27). An assessment is provided in Attachment B.
Spotted-tailed Quoll (<i>Dasyurus maculatus maculatus</i>)	E	No	Nil/negligible risk of impact	Ecosystem Credit (Tables 17 and 25)	No nearby records. Unlikely to be present and no offset required.
Pilliga Mouse (<i>Pseudomys pilligaensis</i>)	V	No	Nil/negligible risk of impact	Ecosystem Credit (Tables 17 and 25)	No nearby records. Unlikely to be present and no offset required.
Mammals					
Brush-tailed Rock-wallaby (<i>Petrogale penicillata</i>)	V	No	Nil/negligible risk of impact	Species Credit (Table 15)	No nearby records. Unlikely to be present and no offset required.
Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>)	V	Not confirmed	Nil/negligible risk of impact	Ecosystem Credit (Tables 17 and 25)	Potential habitat would be impacted but impacts not significant. An assessment is provided in Attachment B.
Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	V	No breeding habitat	Nil/negligible risk of impact	Species Credit (Table 15)	No breeding habitat would be impacted and species credits required. Potential foraging habitat would be impacted but impacts not significant. An assessment is provided in Attachment B.

Species assumed to be impacted significantly for the purpose of the offset are in bold.

[^] The Winged Peppercress was not in the OEH Credit Calculator but it was considered none-the-less.

¹ Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

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

Table 29
Swift Parrot Ecosystem Credit Requirements for the Commonwealth Assessment Footprint

Vegetation Types	BVT	Site Value Score	Commonwealth Assessment Footprint Area (ha) (Attachments F and H)	Ecosystem Credit Requirements for the Commonwealth Assessment Footprint (Attachments F and H)	Ecosystem Credit Requirements for the NSW Assessment Footprint (which also requires credits for grassland which is not Swift Parrot potential habitat) (Table 37)
Mining Area					
3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	70.31	25.5	1,510	6,831
4 White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	87.5	17	1,226	1,795
5 Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	47.92	60	2,546	4,025
Project Rail					
3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	65.62	1.2	65	124
8 River Red Gum Riparian Tall Woodland	NA193	46.45	1	40	40
Total					
3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	-	26.7	1,575	6,955
4 White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	-	17	1,226	1,795
5 Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	-	60	2,546	4,025
8 River Red Gum Riparian Tall Woodland	NA193	-	1	40	40
Total			104.7	5,387	12,815

As shown in Table 29, the ecosystem credits required for the Swift Parrot for the Commonwealth Assessment Footprint (5,387 ecosystem credits) are only a small portion of the overall ecosystem credit requirements for the same Vegetation Types in the BAR Footprint (12,815 ecosystem credits). This is because the secondary/derived native grassland (which is not Swift Parrot potential habitat) has been assigned to the original PCT as required by the FBA (OEH, 2014a). Hence, the ecosystem credit requirements for the BAR Footprint would satisfy the ecosystem credit requirements for the Swift Parrot potential habitat in the Commonwealth Assessment Footprint.

Further to the above, the ecosystem credit calculation for the BVTs is driven by the species with the lowest T_G (i.e. the Masked Owl and Barking Owl – two NSW State listed threatened species [Tables 18 and 26]). Hypothetically, if the Credit Calculation was made assuming that the Swift Parrot was the species with the lowest T_G then the ecosystem credit requirement would be significantly less (i.e. the Swift Parrot would generate less ecosystem credits if it were driving the ecosystem credit requirements rather than the species with lower T_G values [i.e. the Masked Owl and Barking Owl]).

The OEH's comments in the SEARs for the EIS did not request further consideration of the impacts on the Swift Parrot (Section 2.3.6). Measures to avoid and/or minimise impacts on the potential foraging habitat for the Swift Parrot are provided in Attachment B, Section B4. An assessment of direct and indirect impacts on this species is provided in Attachment B, Section B3.6. There are no likely significant indirect impacts on this species.

Regent Honeyeater and Koala

The Regent Honeyeater and Koala are species credit species and the habitat to be cleared is described in Sections 3.3.4 and 4.3.4. The OEH's comments in the SEARs for the EIS did not request further consideration of the impacts on these threatened species (Section 2.3.6).

Measures to avoid and/or minimise impacts on the potential habitat for the Regent Honeyeater and Koala are provided in Attachment B, Section B4. An assessment of direct and indirect impacts on the Regent Honeyeater and Koala is provided in Attachment B, Section B3.8. There are no likely significant indirect impacts on these species.

Table 30 provides a summary of the species credit requirements for the Commonwealth Assessment Footprint. The Regent Honeyeater and Koala species credit requirements for the Commonwealth Assessment Footprint are larger than those for the NSW Assessment Footprint (Tables 10 and 20). However, as described in Section 6.2.4, the additional species credits are for the portion of the Commonwealth Assessment Footprint which was covered by the Approved Mine (SSD-5000) and therefore subject to the existing biodiversity offset strategy described in Section 6.1.

Table 30
Regent Honeyeater and Koala Species Credit Requirements for the Commonwealth Assessment Footprint

Species	Credit Requirement			Offset Location	Offset Size (ha) ^{1, 2}	Offset Ratio
	Mine Site (Table 27)	Project Rail Spur (Table 20)	Total ²			
Regent Honeyeater (<i>Anthochaera phrygia</i>)	5,444 (for clearance of 70.7 ha)	346 (for clearance of 4.5 ha)	5,790 (for clearance of 75.2 ha)	Anywhere in NSW	815.5	1:10.84
Koala (<i>Phascolarctos cinereus</i>)	1,955 (for clearance of 75.2 ha)	148 (for clearance of 5.7 ha)	2,103 (for clearance of 80.9 ha)	Anywhere in NSW	296.2	1:3.65

¹ Calculated in accordance with the *BioBanking Assessment Methodology 2014*, or its revision (OEH, 2014c) where: size of the offset area = species credits required divided by 7.1.

² The species credit requirements can overlap with other species credit requirements and the ecosystem credit requirements (i.e. the requirements are not mutually exclusive).

5 STAGE 2 – IMPACT ASSESSMENT

Stage 2 involves assessing the potential direct and indirect impacts on biodiversity, describing impact avoidance and mitigation measures and determining the offset requirements of the Project. An assessment of the likely biodiversity impacts from the Project have been undertaken below in accordance with the FBA (OEH, 2014a).

5.1 IMPACT ASSESSMENT AND MEASURES TO AVOID AND MINIMISE IMPACTS

This sub-section provides:

- a description of the existing impact avoidance measures, mitigation measures and monitoring commitments (Section 5.1.1);
- an assessment of the potential impacts and impact avoidance and mitigation measures relevant to those impacts (Sections 5.1.2 and 5.1.3);
- an assessment of the potential cumulative impacts (Section 5.1.4); and
- a summary of additional impact avoidance and mitigation measures (Section 5.1.5).

5.1.1 Existing Measures to Avoid and Minimise Impacts

There are a number of measures which will be implemented at the Approved Mine to avoid and minimise impacts on biodiversity. A summary of the existing measures is provided in Table 31 from the *Vickery Coal Project Environmental Impact Statement* (Whitehaven, 2013) and correspondence between Whitehaven and the NSW Department of Planning and Infrastructure (DP&I) (now the DP&E) (i.e. a letter dated 3 December 2013). These existing measures would be continued for the Project.

Table 31
Existing Impact Avoidance and Mitigation Measures

Measure	Commitment/Objective	Source
General		
Minimising Impacts on Fauna during Vegetation Clearance, including Pre-clearance Surveys	<p>Measures that will be used to minimise potential impacts on fauna during vegetation clearance include:</p> <ul style="list-style-type: none"> clearing of hollow bearing trees will, where practicable, be restricted to late summer and autumn; areas requiring clearing will be delineated and will be restricted to the minimum area necessary to undertake the approved activities; and suitably trained or qualified person(s) will be present during the felling of identified hollow bearing trees to provide assistance with the identification, and if necessary, rescue and care of any injured fauna. 	Whitehaven (2013)

Table 31 (Continued)
Existing Impact Avoidance and Mitigation Measures

Measure	Commitment/Objective	Source
Pre-clearance Surveys for Finger Panic Grass	<p>Pre-clearance surveys will be undertaken for Finger Panic Grass (<i>Digitaria porrecta</i>) in suitable potential habitat between the months of December and May. The surveys will be undertaken by an appropriately qualified person. If Finger Panic Grass is identified during the pre-clearance surveys, the following management measures will be evaluated and applied, where practicable:</p> <ul style="list-style-type: none"> • evaluation of whether the occurrence can be avoided (e.g. modifying a stockpile); • further survey work to evaluate the complete extent of the population; • collection and propagation of seed/vegetative material for use in revegetation and rehabilitation; and/or • conservation of Finger Panic Grass in an offset area or funds towards conservation of Finger Panic Grass in NSW. 	Whitehaven (2013)
Maximising Salvage of Resources for Reuse	Habitat features such as tree hollows, logs and stags will be salvaged from the disturbance areas where possible. Tree hollows and logs will be selectively chosen for placement in areas where habitat enhancement is required. Cleared vegetation from within areas of disturbance will be re-used in the mine rehabilitation program.	Whitehaven (2013)
Collection and Propagation of Seed	Seed collection and propagation will be undertaken for use in rehabilitation activities.	Niche (2013)
Translocation of Winged Peppergrass (<i>Lepidium monoplacoides</i>)	<p>Translocation of approximately 46 Winged Peppergrass plants from within the Approved Mine footprint to the fenced protection area to the west of the Canyon Coal Mine will be undertaken. This will include:</p> <ul style="list-style-type: none"> • collection of seed from Winged Peppergrass plants within the Approved Mine footprint, and subsequent planting of these seeds within the fenced protection area to the west of the former Canyon Coal Mine; and • translocation of individual Winged Peppergrass plants by hand from within the Approved Mine footprint, to within the fenced protection area to the west of the former Canyon Coal Mine. This will be undertaken using appropriate techniques as described in <i>Guidelines for the translocation of threatened plants in Australia</i> (Vallee et al. 2004). 	EPBC 2012/6263
Erosion Management	Staged clearing, progressive rehabilitation and management of tracks and roads (including the use of cross-banks, drains, culverts and sediment dams) will be implemented, in order to minimise sediment-laden scouring, runoff and subsequent deposition.	Niche (2013)
Bushfire Risk Management	Bushfire management measures will include clearing restrictions, controlled grazing where practicable, restricted vehicle movements, fire breaks, the use of diesel vehicles, prohibition of smoking in fire prone areas and rapid response to any outbreak of fire.	
Blue Vale Road Design	Whitehaven will design the Blue Vale Road realignment to avoid impacts on the Weeping Myall Woodland EEC, or offset the impact (Section 5.1).	Project Approval (SSD-5000)
Approved Private Haul Road and Kamilaroi Highway Overpass	The approved private haul road and Kamilaroi Highway overpass would be constructed to minimise the number of mature trees that would be felled.	Whitehaven (2013)

Table 31 (Continued)
Existing Impact Avoidance and Mitigation Measures

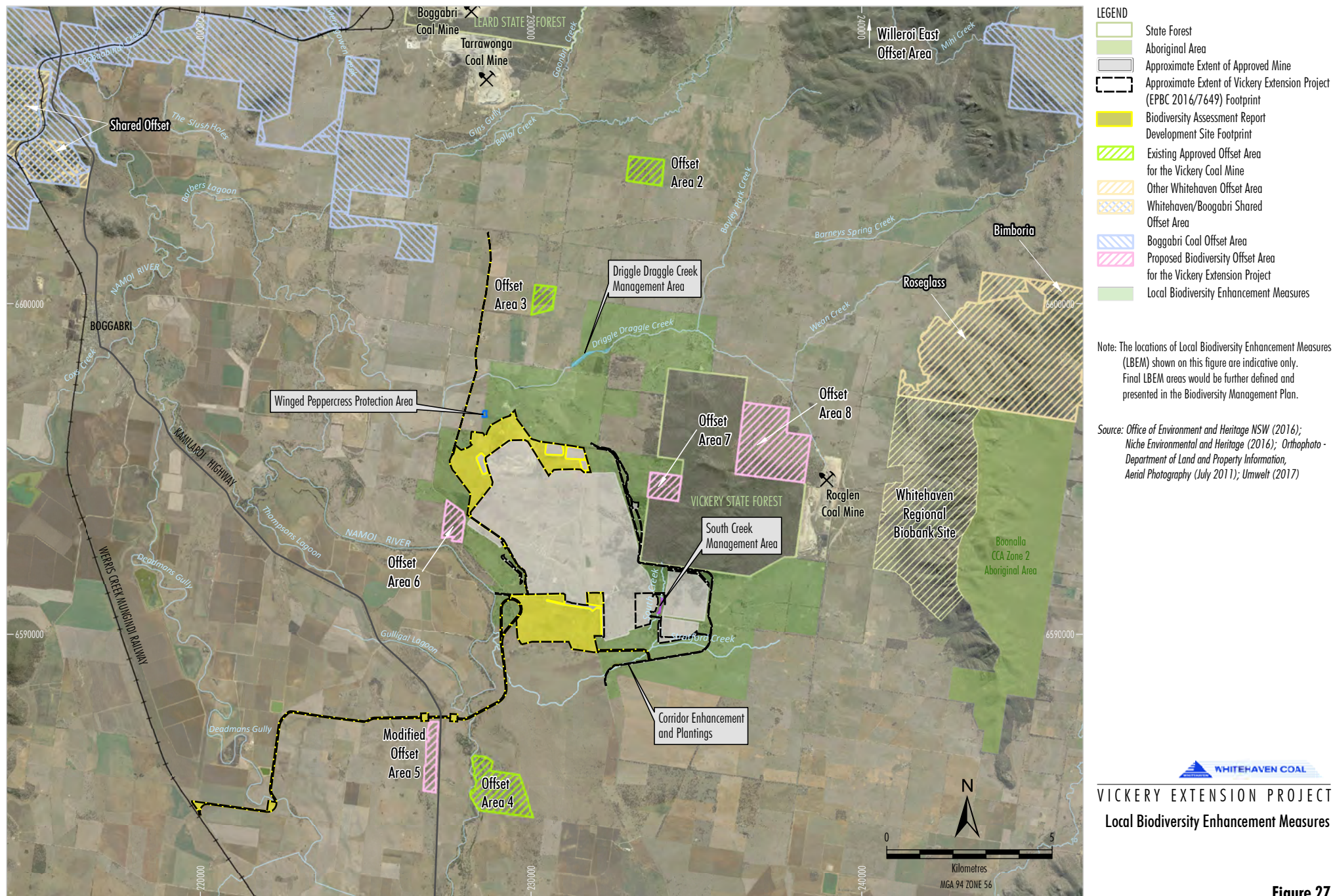
Measure	Commitment/Objective	Source
Local Biodiversity Enhancement Measures ² (Figure 27)		
Winged Peppercross Protection Area	The Winged Peppercross population (of 418 plants) to the west of the Canyon Coal Mine (Figure 7) will be managed in accordance with the EPBC Act Notification of Referral Decision (EPBC 2012/6263). The management will include fencing and signposting the patch with a 20 m buffer to exclude stock and accidental disturbance (Figure 27). The Winged Peppercross patch will also be monitored and maintained during the life of the Approved Mine.	EPBC 2012/6263
Driggle Draggie Creek Management Area	Approximately 1.2 km of Driggle Draggie Creek will be fenced to exclude grazing livestock, thereby promoting regeneration of woodland/forest during the life of the Approved Mine (Figure 27).	Whitehaven letter to DP&I dated 3 December 2013
Controlled Grazing of Native Grasslands	Grazing of native grasslands will be undertaken throughout the Local Biodiversity Enhancement Measures (LBEM) Area with the aim of maintaining groundcover in grazing paddocks during the life of the Approved Mine.	
South Creek Management Area	Approximately 5.6 ha of native vegetation along South Creek (between the open cut and the secondary infrastructure area) would be fenced to exclude grazing livestock during the life of the Project ¹ .	
Scattered Trees	A total of 50 trees per annum for the life of the mine (25 years) will be planted (from hiko) throughout the LBEM Area to provide habitat for threatened woodland birds (such as the Grey-crowned Babbler [<i>Pomatostomus temporalis temporalis</i>], Hooded Robin [<i>Melanodryas cucullata cucullata</i>] and Speckled Warbler [<i>Chthonicola sagittata</i>] (Figure 27). Native flora hiko plantings will include Poplar Box (<i>E. populnea</i>), White Box (<i>E. albens</i>) and Silver-leaved Iron Bark (<i>E. melanophloia</i>). The planted trees will be individually fenced or fenced in small clumps ¹ .	
Corridor Enhancement and Plantings	Approximately 11 km of native vegetation woodland corridors (minimum of 12 m wide) will be established beside the Blue Vale Road realignment (Figure 27) primarily for a visual screen. The corridor will comprise existing vegetation as well as plantings of native plants that are compatible with the surrounding vegetation, in a composition similar to surrounding vegetation communities.	
Weed Management	Noxious and environmental weeds within the LBEM Area (Figure 27) will be monitored and controlled during the life of the Approved Mine.	
Feral Pest Management	Feral pests within the LBEM Area (Figure 27) will be monitored and controlled (in consideration of reducing the risk of potential secondary poisoning) during the life of the Approved Mine.	
Mine Rehabilitation		
Establishing native vegetation and fauna habitat	Establishing native vegetation and fauna habitat on the mine rehabilitation through seeding/planting and introduction of naturally scarce fauna habitat.	Whitehaven (2013)
Reuse of Salvaged Resources	Reuse of vegetative material and soil resources.	

¹ All fenced areas will be signposted and new fences will be made from barbless (plain) wiring.

² **Local Biodiversity Enhancement Measures**

As part of the Approved Mine, Whitehaven developed LBEMs which are designed to increase the amount and diversity of native fauna habitat during the life of the mine in the Whitehaven-owned properties adjoining the Approved Mine, without significantly impacting the agricultural productivity of the properties (Figure 27). The locations of LBEM shown on Figure 27 are indicative only. Final LBEM areas would be further defined and presented in the Biodiversity Management Plan.

The LBEMs are not biodiversity offsets, and as a result, are not subject to conservation in perpetuity (i.e. their purpose is to mitigate short to medium term impacts, and in the longer term, their role will be in essence replaced by the on-site rehabilitation). Whitehaven may investigate undertaking further biodiversity/conservation works on these lands. Any additional commitments may be used as a biodiversity offset.



Other Existing Measures

Other existing measures which Whitehaven will implement for the Approved Mine which are relevant to reducing impacts on biodiversity include (Whitehaven, 2013):

- A noise monitoring and management system to maintain compliance with operational noise limits.
- An air quality monitoring and management system to maintain compliance with air quality limits.
- A blast monitoring system to maintain compliance with blast limits.
- Measures that would be employed to mitigate potential impacts from night-lighting, including (where practicable) the use of directional lighting techniques and implementation of light shrouds and reflectors to limit the spill of lighting.

These mitigation measures would continue to be implemented for the Project (Wilkinson Murray, 2018; Ramboll, 2018; Resource Strategies, 2018).

5.1.2 Direct Impacts and Measures to Avoid and Minimise Impacts***Vegetation Clearance***

Whitehaven has evaluated the relative costs and environmental benefits of a number of alternative mechanisms to reduce the potential additional disturbance areas associated with the Project. In accordance with the FBA (OEH, 2014a), these avoidance and minimisation strategies are described below in relation to site selection/planning, construction and operation.

Site Selection and Planning

The location of the Project has been determined by the presence of coal seams able to be economically mined in the vicinity of the Approved Mine and within Whitehaven's mining and exploration tenements. The continued development of coal resources in close proximity to Whitehaven's other mining operations (i.e. Maules Creek, Tarrawonga and Rocglen Coal Mines) maximises synergies and associated returns on existing financial investments. The new mining areas associated with the Project are largely contiguous with approved mining areas thereby potentially minimising new disturbance areas that would otherwise be associated with a separate mine.

The following refinements to the mine design have minimised impacts on flora, fauna and associated habitats:

- optimising the placement of waste rock within the footprint of the open cut void to minimise the overall mine footprint; and
- design of the Project to avoid the Winged Peppercreep Protection Area adjacent to the Canyon Coal Mine rehabilitation area (Figure 27).

After consideration of the refinements above, the NSW Assessment Footprint is 775.8 ha in size and comprises (Table 32):

- 64% (502 ha) secondary/derived native grassland land (i.e. grasslands resulting after clearance of woodland/forest for agriculture and/or regeneration following cultivation);
- 26% (196 ha) of previously cleared land comprising exotic grassland or land with no vegetation cover; and
- 10% (77.8 ha) native woodland/forest (comprising numerous fragmented patches of dry sclerophyll forests [73.2 ha], riparian forests [1 ha] and semi-arid woodlands [3.6 ha]).

Table 32
Native Vegetation Clearance for the NSW Assessment Footprint

No.	Vegetation Community	BVT	Area within NSW Assessment Footprint (ha)
Semi-arid Woodlands (Grassy Sub-formation)			
2	Poplar Box Woodland on Alluvial Clay Soils	NA185	3.6
2a	Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)		79.5
Dry Sclerophyll Forests (Shrub/Grass Sub-formation)			
3	Pilliga Box – Poplar Box Shrubby Woodland	NA324	23.2
3a	Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)		265.8
4	White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	17
4a	White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)		23
Dry Sclerophyll Forests (Shrubby Sub-formation)			
5	Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	33
5a	Narrow-leaved Ironbark – White Box Shrubby Forest (secondary/derived grassland)		130
Freshwater Wetlands			
7	Mixed Marsh Sedgeland	NA201	2
Forested Wetlands			
8	River Red Gum Riparian Tall Woodland	NA193	1
8a	River Red Gum Riparian Tall Woodland (secondary/derived grassland)		1.7
Total Woodland/Forest			77.8
Total Derived Native Grassland			502
Total Native Vegetation			579.8
Total Disturbed Land			196
Total NSW Assessment Footprint			775.8

Note: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1 and 6 do not occur in the NSW Assessment Footprint.

The native vegetation in the NSW Assessment Footprint would be progressively cleared over the life of the mine (approximately 25 years). Clearing would result in the removal of hollow-bearing trees, dead wood and trees that provide habitat for fauna. Measures to minimise impacts on fauna during vegetation clearance, including pre-clearance surveys, would be undertaken as outlined in Table 31.

The native woodland/forest vegetation within the NSW Assessment Footprint has been historically cleared and highly disturbed by grazing and cropping (FloraSearch, 2018). Much of the woodland/forest vegetation within the NSW Assessment Footprint is highly fragmented (Figures 7 and 20). It is considered that much of the native woodland/forest vegetation within the NSW Assessment Footprint once appeared similar to the vegetation that is now protected within the Vickery State Forest (east of the Project), however due to agricultural activities it is now highly disturbed and modified from its original condition (Attachment C).

Construction

The FBA (OEH, 2014a) requires consideration of measures that minimise impacts on biodiversity during construction, including the method of clearing, clearing operations, and timing of construction. Consistent with the *Vickery Coal Project Environmental Impact Statement* (Whitehaven, 2013), Whitehaven would implement vegetation clearance protocols for the Project which would include aspects such as: clearing of trees and shrubs during late summer and autumn (where practicable), the clear delineation of areas to be cleared of native remnant vegetation, having suitably qualified person(s) present during clearance of vegetation, and salvage of habitat resources and local provenance hiko for use in revegetation programs (Table 20). A 40 m construction clearance width is proposed for the Project rail spur.

Operation

The FBA (OEH, 2014a), requires consideration of measures that minimise impacts on biodiversity during operation. Over the life of the Project, Whitehaven would implement a number of mitigation measures to minimise the potential impact of the Project on native flora and fauna. This would include erosion, bushfire, and weed and feral animal management strategies (Table 31).

As described in Table 31, surface development areas would be progressively rehabilitated and revegetated with native species characteristic of the local woodland. Habitat features such as logs, fallen limbs and hollows would be collected/salvaged where practicable to provide habitat features for fauna in rehabilitation areas.

Fauna Vehicle Strike

The FBA (OEH, 2014a) states that it does not account for direct impacts on fauna from vehicle strike. During the operation phase of the Project, approximately 1,500 vehicle movements per day are forecast to be generated by the Project. This forecast total Project vehicle movements is approximately 200 movements per day higher than the Approved Mine primarily due to the larger operational workforce required for the Project (450 personnel) compared to the Approved Mine (250 personnel).

The Project would, however, result in a reduction in heavy vehicle movements on public roads as coal would be transported by rail once the Project CHPP, train load-out facility and rail spur reach full operational capacity. Approximately 1,100 fewer heavy vehicle movements per day would occur on the section of the ROM coal transport route between Blue Vale Road and the Kamilaroi Highway compared to the Approved Mine (GTA Consultants, 2018).

The on-site speed limit that would be applied to Project haul roads and internal roads may help to minimise the risk of fauna vehicle strike.

Groundwater Dependent Vegetation

The FBA (OEH, 2014a) does not account for impacts on groundwater dependent ecosystems⁵ (GDEs), however an assessment on GDEs is provided below in consideration of the *NSW State Groundwater Dependent Ecosystem Policy* (NSW Office of Water [NOW], 2012a) and *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (NOW, 2012b) (GDE guideline). Additional assessments on GDEs are provided in the *Vickery Extension Project Groundwater Assessment* (HydroSimulations, 2018) and *Vickery Extension Project Surface Water Assessment* (Advisian, 2018).

The Project includes construction and use of a water supply borefield (Figure 2). The *National Atlas of Groundwater Dependent Ecosystems* (Bureau of Meteorology [BOM], 2018) identifies some areas of vegetation within the Project locality as having a low or moderate potential for groundwater interaction (e.g. the Vickery State Forest). However, recent flora surveys have identified no woodland/forest vegetation communities in the Project locality that exhibit characteristics of groundwater dependency (Attachment C).

The Vickery State Forest consists of Dry Sclerophyll Forests that are not considered to be groundwater dependent. This is consistent with the Groundwater Assessment, which determined that the water table is typically deeper than 50 m below ground level in the Vickery State Forest (HydroSimulations, 2018).

The Namoi River is considered to be a GDE (i.e. the river and associated riparian vegetation [e.g. River Red Gum Riparian Tall Woodland - Attachment C]) because groundwater interaction between the Namoi River and the underlying alluvium varies based on rainfall conditions (HydroSimulations, 2018). However, in accordance with the GDE guideline (NOW, 2012b), the Namoi River is not considered to be a high value GDE given:

- it is not reserved as a National Estate, listed wetland or SEPP 26 (Littoral Rainforests);
- exotic species occur in large populations and multiple species; and
- it has undergone major changes in physical structure and species composition due to historical agriculture in the region.

The Project would present a low risk to the Namoi River (as defined in the GDE guideline) (NOW 2012b) because (HydroSimulations, 2018 and Advisian, 2018):

- recent drilling has confirmed that a thin veneer of alluvium on the fringes of the Namoi River floodplain is further away from the boundary of the Project mining area than previously conceptualised and modelled;
- the thin veneer of alluvium is interspersed with clays that would result in a lower yield than the highly productive alluvial aquifers associated with the Namoi River;
- the predicted river loss (baseflow reduction) due to the Project is negligible; and
- the Project is predicted to have negligible impact on water quality in the Namoi River.

⁵ Ecosystems which have their species compositions and their natural ecological processes dependent on groundwater.

5.1.3 Indirect Impacts and Measures to Avoid and Minimise Impacts

The following potential indirect impacts are assessed below:

- hydrology, sedimentation and runoff;
- introduced flora;
- feral animals;
- noise and vibration;
- dust;
- light spill;
- bush fire risk; and
- final void.

Hydrology, Sedimentation and Runoff

The Approved Mine will result in changes to flows in local watercourses due to the progressive development of the open cut and associated capture and re-use of drainage from operational disturbance areas. The FBA (OEH, 2014a) does not account for impacts on downstream hydrology and environmental flows on surface vegetation, however an assessment is provided below.

An objective of the water management system at the Approved Mine is to protect the integrity of local and regional water sources and a detailed description of the water management system is provided in the *Vickery Coal Project Environmental Impact Statement* (Whitehaven, 2013). The Project water management system would generally be based on the existing water management. Key water management system objectives include (Advisian, 2018):

- separation of undisturbed area runoff from disturbed area runoff;
- collection and reuse of surface runoff from disturbed areas;
- management and capture of sediment-laden runoff with sediment dams;
- capture of pit inflows and reuse as process water;
- containment of mine-affected water; and
- extraction of water to meet operational demands only in accordance with licences held by Whitehaven (the installation of a pumping station on the banks of the Namoi River has been approved as part of the Approved Mine [SSD-5000] and would be required for Project related water extraction [Figure 2]).

The construction of the Project rail spur would require the crossing of the Namoi River, Stratford Creek and Deadmans Gully. The proposed groundwater borefield and pipeline (Figure 2) would cross Driggle Draggie Creek (Eco Logical Australia, 2018). The Project rail spur and groundwater borefield would be designed to allow flows in the Namoi River, Driggle Draggie Creek, and other relevant watercourses, to be maintained, thereby minimising the potential impact on surface water flows (WRM, 2018; Advisian, 2018). Based on the above, the Project would have no material impact on terrestrial ecosystems from changes to surface water.

Introduced Flora

The occurrence of weeds within the NSW Assessment Footprint and surrounds is generally high, with a total of 80 introduced species recorded (Attachment C). Niche (2013) assessed the potential for weeds to spread as a result of the Approved Mine and concluded that there was a low likelihood of weeds spreading into adjoining native woodland/forest vegetation (i.e. Vickery State Forest) as weeds would be controlled at the source (the Approved Mine) and the predominantly poorer soils in Vickery State Forest are unfavourable for most weed species.

There is a low likelihood of weeds spreading into adjoining native woodland/forest vegetation as a result of the Project because, as outlined in Table 31, the control of weeds is an existing measure that would be adopted for the Project (including mine rehabilitation) and wider LBEM Area. Further, construction areas and the post-mine landforms would be progressively rehabilitated with native vegetation (limiting opportunities for weeds to grow).

Feral Animals

Feral pests such as the Red Fox (*Vulpes vulpes*) and European Rabbit (*Oryctolagus cuniculus*) are abundant in the NSW Assessment Footprint (Attachment D; Niche, 2013) and in the wider region (OEH, 2017c).

Niche (2013) assessed the potential for an increase in feral pests as a result of the Approved Mine and concluded that the risk would be sufficiently managed by a targeted control program.

The number of feral pests that would be displaced would be reduced by controlling feral pests. As outlined in Table 31, the control of feral pests is an existing measure that would be adopted for the NSW Assessment Footprint (including mine rehabilitation) and wider LBEM Area. Furthermore, the Project would be integrated into Whitehaven's Feral Animal Program, which undertakes quarterly monitoring and control of feral animals as required.

Noise and Blasting

Niche (2013) assessed the potential for noise from the Approved Mine to impact fauna and concluded that were noise to impact fauna, any impact would likely be localised and minor. The Approved Mine was approved to operate during the day and night. The Approved Mine included blasting (Whitehaven, 2013).

The noise impacts from the Project are expected to be similar in nature to the Approved Mine, that is continuous in nature, with some fluctuations in perceived noise levels due to noise enhancing meteorological conditions. The scale of noise impacts for the Project would be similar to the Approved Mine. Operational noise sources and the extent of blasting would be extended into the new open cut extension areas (Wilkinson Murray, 2018).

As outlined in Section 5.1.1, a noise monitoring and management system and blast monitoring system would be implemented for the Project to maintain compliance with operational noise and blasting limits (Wilkinson Murray, 2018).

Were noise from the Project to impact fauna (in nearby habitat such as Vickery State Forest), any impact would likely be localised and minor. This is because fauna often readily habituate to continuous (background) noise and sudden noises from blasting and train movements would be in intervals.

Dust

Niche (2013) assessed the potential for dust impacts on flora and fauna as a result of the Approved Mine and concluded that any impact from dust on flora and/or fauna is likely to be localised and minor. The Project would also result in the generation and dispersion of atmospheric dust from Project activities such as blasting, materials handling and vehicle movements (Ramboll, 2018).

As outlined in Section 5.1.1, a dust monitoring and management system would be implemented for the Project to maintain compliance with dust limits (Ramboll, 2018).

The potential dust impacts on flora and/or fauna (in nearby habitat such as Vickery State Forest) associated with the Project are expected to be similar to the Approved Mine. The potential dust impacts would be minor through the implementation of the dust management system described above.

Light Spill

Niche (2013) assessed the potential for artificial lighting from the Approved Mine to impact fauna and concluded that were artificial lighting to impact fauna, any impact would likely be localised and minor.

The Project is not likely to increase the artificial lighting impacts on fauna within the Vickery State Forest given the additional mining areas and mine infrastructure area are located further away from the Vickery State Forest in comparison with the Approved Mine. Therefore, any lighting impacts to fauna would be localised and minor.

As outlined in Section 5.1.1, the measures to minimise artificial lighting for the Approved Mine would be adopted for the Project, including (where practicable), the use of directional lighting techniques and implementation of light shrouds and reflectors to limit the spill of lighting (Whitehaven, 2013).

Bushfire Risk

Niche (2013) assessed the potential for bushfires to occur from the Approved Mine and concluded that the overall risk of increased bush fire frequency due to the Approved Mine is likely to be very low.

The Project is not likely to increase the potential for bushfires to occur within the Vickery State Forest given the mitigation and management measures which would be implemented for the Project. As outlined in Table 31, bushfire management would include clearing restrictions, controlled grazing, restricted vehicle movements, fire breaks, the use of diesel vehicles, prohibition of smoking in fire prone areas and rapid response to any outbreak of fire.

Final Void

At the cessation of mining, one final void would remain in the south-eastern corner of the open cut (in addition to the existing Blue Vale final void). The Project would therefore reduce the number of final voids in comparison to the Approved Mine which would have resulted in two final voids (Advisian, 2018). Where applicable, the final void will be revegetated with woodland/forest of Vegetation communities that occur in the surrounding sub-region, and are the same vegetation class as required to be provided (Table 42). The design and management of the final void is discussed further in Section 5 of the Main Report.

The surface catchment of the final void would be reduced as far as is reasonable and feasible (Advisian, 2018). This would be achieved by progressively placing waste rock within the footprint of the open cut void and the use of up-catchment diversions and contour drains around the perimeter of the Project final void.

5.1.4 Cumulative Impacts

Cumulative impacts are considered to be the total impact on the environment that would result from the incremental impacts of the Project added to other existing impacts. They include direct and indirect impacts. Cumulative impacts from proposed (but not yet existing) developments in the local area are also considered in this assessment.

The Approved Mine is located in a widely cleared landscape. It was approved under the EP&A Act in September 2014. The Approved Mine will clear approximately 1,748 ha of native vegetation (of which approximately 464 ha is fragmented patches of woodland/forest and 1,284 ha of secondary/derived grassland) and has an approved biodiversity offset strategy of approximately 3,422.5 ha (comprising 2,062.5 ha within offset areas and 1,360 ha of mine site rehabilitation within the Approved Mine footprint) (Table 33).

Operating mines in the vicinity of the NSW Assessment Footprint include (Figure 1):

- Rocglen Coal Mine (formerly known as the Belmont Coal Project), approximately 5 km east (Whitehaven owned);
- Tarrawonga Coal Mine, approximately 10 km north (Joint Venture between Whitehaven and Idemitsu Boggabri Coal Pty Ltd);
- Boggabri Coal Mine, approximately 12 km north (operated by Idemitsu Boggabri Coal Pty Ltd); and
- Maules Creek Coal Mine, approximately 15 km north-west (Joint Venture between Whitehaven and other parties).

The Canyon Coal Mine (Whitehaven owned) is a non-operating mine located within the northern extent of the Project area.

In addition to potential cumulative impacts, these approved or proposed mining operations also have potential cumulative benefits in the form of offset areas (Table 33).

The potential indirect impacts on the Vickery State Forest from the Project are discussed in Section 5.6. The potential cumulative indirect impacts on the Vickery State Forest (from the Project and the Rocglen Coal Mine) are unlikely to materially impact fauna within the State Forest.

The potential cumulative impact on threatened species and communities has been considered in Attachments A and B. The change in potential cumulative impacts on threatened species and communities arising from the Project is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species (their habitats) and communities.

The Project would result in the loss of 579.8 ha of native vegetation (comprising mostly secondary/derived native grassland), although the Project also includes the progressive re-establishment of native woodland/forest on mine rehabilitation (Section 6.2.2) and an augmented Biodiversity Offset Strategy to compensate for the loss (Section 6.2).

Table 33
Cumulative Disturbance and Offsets

Mine	Approximate Native Woodland/Forest Disturbance Area (ha)	Approximate Mine Rehabilitation to Native Woodland/Forest Area (ha)	Approximate Native Woodland/Forest Land-based Offset Area (ha)	Information Source
Vickery Coal Mine (Approved Mine)	464 (additional to approximately 1,284 ha of derived native grassland)	1,360	1,898 (additional to approximately 164.5 ha of derived native grassland)	Whitehaven (2013) Vickery Coal Project Development Consent SSD-5000
Rocglen Coal Mine (formerly known as the Belmont Coal Project)	62 (additional to approximately 49 ha of derived native grassland)	84	525	Countrywide Ecological Services (2007b) Belmont Coal Project Approval 06_0198 Whitehaven (2011)
Tarrawonga Coal Mine	336 (additional to approximately 61 ha of derived native grassland)	752	1,355 (additional to approximately 261 ha of derived native grassland)	Tarrawonga Coal Pty Ltd (2012) Tarrawonga Coal Project Consolidated 11_0047
Boggabri Coal Mine	1,385 (total native vegetation disturbance – unknown what portion is woodland/forest)	1,508	7,450 (total native vegetation – unknown what portion is woodland/forest)	Boggabri Coal Project Consolidated 09_0182
Maules Creek Coal Mine	1,665 (additional to approximately 431 ha of derived native grassland)	2,078	7,898.1 (additional to approximately 2,306.1 ha of derived native grassland)	Whitehaven (2015)
Total	4,112.7	5,782	19,595.6	-
Vickery Extension Project (this Project)	77.8 (additional to approximately 502 ha of secondary/derived native grassland)	1,005	Refer to Section 6.2.2	This document

5.1.5 Summary of the Additional Impact Avoidance and Mitigation Measures

Additional impact avoidance and mitigation measures associated with the Project (in addition to those already implemented at the Approved Mine [Table 31]) are described in Sections 5.1.2 and 5.1.3 and summarised in Table 34.

Table 34
Additional Impact Avoidance and Mitigation Measures

Measure	Description
Avoidance	
Project rail spur	<ul style="list-style-type: none"> The Project rail spur has been sited such that impacts on mature vegetation would be minimal (i.e. it would cross the river at a location where the coverage of large trees is sparse). The Project rail spur crossing of the Namoi River would be constructed within a 40 m construction corridor length. Construction of the spur is expected to be complete within a 12 month period. Sediment controls, including up-catchment diversions and silt fences would be used to prevent sediment being carried into the Namoi River during construction. Following construction of the Project rail spur crossing, species characteristic of the River Red Gum Riparian Tall Woodland (NA 193) would be planted in the construction corridor along the river, including River Red Gum (<i>Eucalyptus camaldulensis</i>). Weeds would be managed at the Project rail spur crossing of the Namoi River during construction.
Weeping Myall Woodland	The Project access road would avoid clearance of the Weeping Myall Woodland shown on Figure 6.
Mitigation	
Rehabilitation of the Post-mining Landform	<p>Establishing native vegetation and fauna habitat on the mine rehabilitation through seeding/planting.</p> <p>The conceptual final rehabilitation plan is described in Section 6.2. Section 6.2 describes areas within the approved and proposed disturbance areas which would be rehabilitated to woodland and mixed woodland/pasture. The majority of the area would be rehabilitated and very limited areas of final void would remain.</p>
Koala Management Plan	Whitehaven will prepare a Koala Management Plan that describes management measures applicable to the Koala (Section 5.4).

5.2 IMPACTS ON BIODIVERSITY THAT REQUIRE FURTHER CONSIDERATION

The FBA (OEH, 2014a) indicates that some impacts on biodiversity (landscape features, native vegetation, species and populations) require further consideration in addition to the OEH Credit Calculator. This includes particular landscape features, native vegetation that is critically endangered (under the BC Act or EPBC Act) and/or species and populations that are specifically nominated in the SEARs for the EIS.

Landscape Features – Riparian Vegetation

Section 9.2.3.3 of the FBA (OEH, 2014a) requires further consideration of impacts on 4th order streams (or higher) as outlined below.

(a) the name and stream order of the riparian buffer being impacted

The following 4th, 5th and 6th order (or higher) streams occur within the NSW Assessment Footprint (Figure 5) (DPI Water, 2017):

- Driggle Draggie Creek (7th order stream); and
- Namoi River (9th order stream);
- Deadmans Gully (5th order stream);
- Stratford Creek (5th order stream); and
- an unnamed 4th order stream.

(b) the total area of the riparian buffer that is impacted by the Major Project, the extent to which the width of the link will be reduced and over what length, and the size of gaps being created or expanded

The FBA (OEH, 2014a) defines riparian buffer widths for different stream orders, as follows:

- 4th and 5th order streams – 40 m buffer; and
- 6th (or higher) order streams – 50 m buffer.

The Project rail spur is approximately 40 m wide at crossings of the streams. Disturbance to the 50 m buffer (either side of the Namoi River and Driggle Draggie Creek) and 40 m buffer (either side of Deadmans Gully and Stratford Creek) would result in approximately 0.2 ha of disturbance at the Namoi River and Driggle Draggie Creek and 0.16 ha of disturbance at the crossing of the unnamed stream.

The proposed groundwater borefield and pipeline would include a pipeline up to 100 mm in diameter (predominantly above ground). The assessment corridor is conservatively approximately 10 m wide across Driggle Draggie Creek. A 50 m buffer (either side of the watercourse) would result in a 0.05 ha area at the crossing.

Approximately 1 km of the unnamed 4th order stream is within the NSW Assessment Footprint, which would result in approximately 4 ha of disturbance for a 40 m buffer.

(c) the PCT and condition of the vegetation in the riparian buffer being impacted

The riparian vegetation along the Namoi River and Stratford Creek has been mapped by FloraSearch (2018) (Attachment C) as River Red Gum Riparian Tall Woodland (NA193). As described in FloraSearch (2018) (Appendix C) the riparian woodland has a low plant species richness and midstorey cover which may reflect high levels of grazing in this community and high competition from introduced groundcover species favoured by the highly fertile alluvial soils. Overall, remnants of this community within the Project rail spur are considered to be in poor to moderate condition (FloraSearch, 2018).

No native vegetation occurs within the riparian buffer proposed to be disturbed along Driggle Draggie Creek, Deadmans Gully and the unnamed 4th order stream.

The riparian vegetation surrounding Driggle Draggie Creek, Deadmans Gully and the unnamed stream in the NSW Assessment Footprint has been mapped by FloraSearch (2018) (Attachment C) as Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland) (NA185).

(d) any indirect impacts on wetlands or watercourses downstream of the development site

It is not expected that the Project would result in any material indirect impacts (i.e. water quality or flow) to these watercourses given the implementation of the Project water management system detailed in Section 5.1.3 and proposed limited disturbance. In addition, silt curtains would be used within the Namoi River during construction of the Project rail spur to minimise any potential impacts from sedimentation associated with these works.

As described in Section 5.1.3 the Project would have no material impact on terrestrial ecosystems from changes to surface water.

(e) the mitigation measures proposed to minimise the impact on the biodiversity values of the riparian or downstream area.

The Project rail spur has been designed to minimise impacts to vegetation (including riparian vegetation) via the following mechanisms:

- The Project rail spur has been sited such that impacts on mature vegetation would be minimal (i.e. it would cross the river at a location where the coverage of large trees is sparse).
- The Project rail spur crossing of the Namoi River and other watercourses would be constructed within a 40 m construction corridor.
- Construction of the spur is expected to be complete within a 12 month period.
- Sediment controls, including up-catchment diversions and silt fences would be used to prevent sediment being carried into the Namoi River during construction.
- Following construction of the Project rail spur crossing, species characteristic of the River Red Gum Riparian Tall Woodland (NA 193) would be planted in the construction corridor along the river, including River Red Gum (*Eucalyptus camaldulensis*).
- Weeds would be managed along the Project rail spur during construction until native vegetation has re-established.

Conclusion

It is concluded that with the proposed measures to avoid and mitigate it is appropriate for the impact on the 4th, 5th or 6th order (or higher) streams traversed by the Project to occur without modifications to the Project or additional offsets. The Project would not significantly reduce the width of vegetation in the riparian buffer zone bordering the Namoi River, Driggle Draggie Creek, Deadmans Gully or Stratford Creek.

Landscape Features – Species Movement along Corridors

Given the design of the Project rail spur (i.e. it would be on a raised bridge for approximately 15 m either side of the Namoi River with a corridor width of 40 m) the Project would not result in any of the following (Section 9.2.3 of the FBA):

- (a) creates a gap greater than 100 m between two areas of moderate to good condition native vegetation with a patch size greater than 1 ha (30 m for non-woody ecosystems), or*
- (b) removes over-storey cover and mid-storey cover vegetation within the state significant biodiversity link to create a gap in over-storey cover and mid-storey cover vegetation greater than 100 m between two areas of moderate to good condition vegetation with a patch size greater than 1 ha (30 m for non-woody ecosystems), or*
- (c) creates a hostile barrier, such as a dual carriageway, wider highway, or similar hostile barrier within the state significant biodiversity link.*

As such, further consideration of species movements along corridors is not required. Regardless of this, this assessment considers potential impacts on species movement surrounding the Project.

Species and Populations

Further consideration is given to the Swift Parrot, Regent Honeyeater, Koala, Corben's Long eared Bat and Large-eared Pied Bat as these species were listed in the OEH's and DotE's comments in the SEARs for the EIS (Section 2.3.6). Threatened species are listed in the comments in the SEARs for the EIS because impacts on the species may contribute to the extinction of the species from an IBRA subregion or significantly reduce the viability of a species.

Section 9.2.5.2 of the FBA (OEH, 2014a) requires this assessment to provide the following information:

- (a) the size of the local population directly and indirectly impacted by the development*
- (b) the likely impact (including direct and indirect impacts) that the development will have on the habitat of the local population, including but not limited to:*
 - (i) an estimate of the change in habitat available to the local population as a result of the proposed development*
 - (ii) the proposed loss, modification, destruction or isolation of the available habitat used by the local population, and*
 - (iii) modification of habitat required for the maintenance of processes important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development.*

Atlas records or other documented, quantifiable means must be used by the assessor to estimate what percentage of the species' population and habitat is likely to be lost in the long term within the IBRA subregion due to the direct and indirect impacts of the development

- (c) the likely impact on the ecology of the local population. At a minimum, address the following:*
 - (i) for fauna:*
 - breeding*
 - foraging*
 - roosting, and*
 - dispersal or movement pathways*

- (ii) *for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available:*
 - *pollination cycle*
 - *seedbanks*
 - *recruitment, and*
 - *interactions with other species (e.g. pollinators, host species, mycorrhizal associations)*
- (d) *a description of the extent to which the local population will become fragmented or isolated as a result of the proposed development*
- (e) *the relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range*
- (f) *the extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population*
- (g) *the measure/s proposed to contribute to the recovery of the species in the IBRA subregion.*

The information requested above for the potential impacts on the Swift Parrot, Regent Honeyeater, Koala, Corben's Long eared Bat and Large-eared Pied Bat is provided in Attachment A. In conclusion, the Project would:

- not cause the extinction of these species from an IBRA subregion; or
- not significantly reduce the viability of these species.

5.3 ASSESSMENTS OF SIGNIFICANCE UNDER SECTION 5A OF THE EP&A ACT

Assessments of Significance are a requirement of State Significant Development with environmental approval being sought under Part 4 of the EP&A Act. Assessments of Significance, however, do not influence the assessment of a Project under the NSW Offset Policy or FBA (e.g. a significant impact finding does not increase the number of credits required).

Assessments of Significance have been prepared for the Project in accordance with section 5A of the EP&A Act and the *Threatened Species Assessment Guidelines - the Assessment of Significance* (DECC, 2007) on the threatened species known or predicted to occur in the NSW Assessment Footprint (Attachment A).

In summary, it is concluded that the Project is not likely to have a significant impact on any threatened species and communities listed under the BC Act, such that a local population would be lost.

5.4 SEPP 44 – KOALA HABITAT PROTECTION

There are two relevant definitions that apply when considering Koala (*Phascolarctos cinereus*) habitat under SEPP 44:

- 'potential koala habitat' means areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component; and

- ‘core koala habitat’ means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings and historical records of a population (Department of Planning [DoP], 1995).

Koala preferred feed tree species listed in SEPP 44 are:

- | | |
|--|---|
| ■ Grey Gum (<i>E. punctata</i>); | ■ River Red Gum (<i>E. camaldulensis</i>); |
| ■ Forest Red Gum (<i>E. tereticornis</i>); | ■ Broad-leaved Scribbly Gum (<i>E. haemastoma</i>); |
| ■ Swamp Mahogany (<i>E. robusta</i>); | ■ Scribbly Gum (<i>E. signata</i>); |
| ■ Tallowwood (<i>E. microcorys</i>); | ■ White Box (<i>E. albens</i>); and |
| ■ Ribbon or Manna Gum (<i>E. viminalis</i>); | ■ Bimble Box or Poplar Box (<i>E. populnea</i>). |

Potential Koala Habitat

Of the SEPP 44 preferred feed trees, only River Red Gum (*E. camaldulensis*), White Box (*E. albens*) and Poplar Box (*E. populnea*) are present in the NSW Assessment Footprint in the following five communities (Figures 7 and 20):

- River Red Gum Riparian Tall Woodland (NA193);
- White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349);
- Narrow-leaved Ironbark – White Box Shrubby Forest (NA311);
- Poplar Box Woodland on Alluvial Clay Soils (NA185); and
- Pilliga Box – Poplar Box Shrubby Woodland (NA324).

For areas of native vegetation to meet the definition of *potential koala habitat* (as defined by SEPP 44), the tree species identified above must constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

As described in Section 2.3.4, Dr Colin Bower (FloraSearch) assisted with reviewing which patches in the NSW Assessment Footprint provide preferred feed trees at a density of at least 15% of the total number of trees in the upper or lower strata of the tree component. Approximately 50.3 ha of vegetation which meets the definition of *potential koala habitat* would be cleared for the Project (Tables 10 and 20; Figures 13 and 23).

This estimate of potential Koala habitat also considered that in addition to the preferred tree species listed in SEPP 44 (DoP, 1995), FloraSearch (2018) (Attachment C) recorded Pilliga Box (*E. pilligaensis*), Yellow Box (*E. melliodora*) and Blakely’s Red Gum (*E. blakelyi*), which are all secondary food trees for the Koala (DECC, 2008).

Core Koala Habitat

The landscape distribution of Koala records in the *BioNet Atlas of NSW Wildlife* (OEH, 2017c) are shown on Figure 14. One Koala has been recorded in the NSW Assessment Footprint associated with the Project rail spur, in addition to several other records within the Project locality, including two recent recordings by Future Ecology (2018), one located on the western side of the Namoi River across from the mining area (identified by its call), and the other located on the eastern side of Deadmans Gully across from the Project rail spur (koala scats identified), and two database records within 1 km of the Project mining area (within vegetation along the Namoi River [Figure 23]). The two records near the Project mining area are both dated from 2011/2012.

Under SEPP 44, Core koala habitat means *an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population* (DoP, 1995).

Future Ecology (2018) has concluded that River Red Gum Riparian Tall Woodland along the Namoi River in the NSW Assessment Footprint associated with the Project rail spur is considered likely to be core habitat for the koala under the definition of SEPP 44, considering:

- the riparian vegetation contains River Red Gum which is listed as a ‘primary’ feed tree; and
- recent sightings and records of Koalas occur in the riparian habitat along the Namoi River north and south of the NSW Assessment Footprint associated with the Project rail spur (Figure 23).

Regional vegetation mapping (OEH, 2015b) shows that River Red Gum Woodland extends along the Namoi River. There are over 18,000 ha of *River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion mapped* (OEH, 2015b).

Native woodland/forest is highly fragmented in the wider landscape (due to past and present agricultural land uses). The riparian vegetation associated with the Namoi River is likely to provide a linkage between areas of koala habitat, however, the riparian vegetation associated with the Namoi River is not continuous along its length. There are various existing bridges (roads and rails) across the Namoi River and sections where the tree canopy is discontinuous.

Further assessment on the Koala is provided in Attachments A and B.

Proposed Changes to SEPP 44

The NSW Government is currently seeking to amend SEPP 44 to further align it with the *NSW State Recovery Plan for the Koala* (DECC, 2008). This would include amendments to the list of preferred tree species and definition of koala habitat.

The proposed changes to SEPP 44 (DoP, 1995) are unlikely to result in any changes to the potential impact the Project would have on the Koala as outlined above. This is because the potential impacts identified in this document already take into consideration the information outlined in the *NSW State Recovery Plan for the Koala* (DECC, 2008), including feed tree species and identification of potential habitat.

Conclusion

Whitehaven has received advice that Clause 9 of SEPP 44 (relating to the requirement to prepare a Koala Plan of Management for core koala habitat) does not apply to Part 4 development applications which are determined by a consent authority other than a local council and, more specifically, that clause 9 of SEPP 44 does not apply to State Significant Developments, such as the Project. Never-the-less, the following measures are proposed to manage the Project impact to the core koala habitat along the Namoi River:

- the Project rail spur has been sited such that impacts on mature vegetation would be minimal (i.e. it would cross the river at a location where the coverage of large trees is sparse);
- the Project rail spur crossing of the Namoi River would be constructed within a 40 m construction corridor length (the riparian zone is 1-2 trees wide at Site B [Future Ecology, 2018][Attachment D]);
- pre-clearance surveys would be undertaken for the Koala to minimise impacts during clearance (Section 5.1.1);

- construction of the spur is expected to be complete within a 12 month period;
- weeds would be managed at the Project rail spur crossing of the Namoi River during construction until native vegetation has re-established;
- following construction of the Project rail spur crossing, species characteristic of the River Red Gum Riparian Tall Woodland (NA193) would be planted in the construction corridor along the river, including River Red Gum (*Eucalyptus camaldulensis*); and
- residual impacts on the River Red Gum Riparian Tall Woodland (NA 193) and the Koala from the Project would be offset (equating to 40 ecosystem credits for NA193 and approximately 1,308 credits for the Koala) (Section 5.8).

Whitehaven will prepare a Koala Management Plan that describes the above management measures.

5.5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The EPBC Act Referral lodged in February 2016 described the extent of proposed disturbance as 1,371 ha, however further refinements have been made to the Project. The EPBC Act Referral lodged in February 2016 presented two Rail Spur Investigation Corridors (Northern Rail Investigation Corridor and Western Rail Investigation Corridor).

Subsequent to the lodgement of the Vickery Extension Project Referral and Controlled Action decision, Whitehaven has undertaken detailed design of the rail spur and determined that, based on operational cost forecasts, landholder restrictions and ecological considerations (i.e. the Boggabri Coal Mine biodiversity offset area), a third rail spur corridor, not described in the Vickery Extension Project Referral, is the preferred route.

In 2018, Whitehaven notified the Department of the Environment and Energy (DEE) of a variation to the Action, to reflect the final proposed approximate extent of the Vickery Extension Project (EPBC 2016/7649) (Figures 3a and 3b).

Native Vegetation Clearance in the Commonwealth Assessment Footprint

The refined Commonwealth Assessment Footprint is 984.4 ha in size (386.6 ha less than the extent of disturbance described in the EPBC Act Referral) (Figures 7 and 20). The refined Commonwealth Assessment Footprint is 208.6 ha larger than the NSW Assessment Footprint (Table 35).

The native woodland/forest vegetation within the Commonwealth Assessment Footprint has been historically cleared and highly disturbed by grazing and cropping (FloraSearch, 2018). Much of the woodland/forest vegetation within the Commonwealth Assessment Footprint is highly fragmented (Figures 7 and 20). It is considered that much of the native woodland/forest vegetation within the Vickery Extension Project (EPBC 2016/764a) Footprint once appeared similar to the vegetation that is now protected within the Vickery State Forest (east of the Project), however due to agriculture activities it is now highly disturbed and modified from its original condition (Attachment C).

An analysis of the nature and extent of the likely impacts of the Project on all threatened species and communities listed under the EPBC Act which may be impacted is provided in Attachment B in accordance with the *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (DotE, 2013). The analysis considers threatened species and communities listed under the EPBC Act which have been recorded in the Commonwealth Assessment Footprint or surrounds (Figures 17 and 25), as well as those listed in the DotE comments in the SEARs for the EIS (Table 36).

Table 35
Additional Clearance in the Commonwealth Assessment Footprint

#	Vegetation Community	Clearance within the Commonwealth Assessment Footprint (ha)	Clearance within the NSW Assessment Footprint (Table 32)	Difference* (ha)
<i>Semi-arid Woodlands (Grassy Sub-formation)</i>				
2	Poplar Box Woodland on Alluvial Clay Soils	3.7	3.6	0.1
2a	Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)	88.5	79.5	9
<i>Dry Sclerophyll Forests (Shrub/Grass Sub-formation)</i>				
3	Pilliga Box – Poplar Box Shrubby Woodland	26.7	23.2	3.5
3a	Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)	339.3	265.8	73.5
4	White Box – Silver-leaved Ironbark Shrubby Open Forest	17	17	0
4a	White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)	38	23	15
<i>Dry Sclerophyll Forests (Shrubby Sub-formation)</i>				
5	Narrow-leaved Ironbark – White Box Shrubby Forest	60	33	27
5a	Narrow-leaved Ironbark – White Box Shrubby Forest (secondary/derived grassland)	148.5	130	18.5
<i>Freshwater Wetlands</i>				
7	Mixed Marsh Sedgeland	4	2	2
<i>Forested Wetlands</i>				
8	River Red Gum Riparian Tall Woodland	1	1	0
8a	River Red Gum Riparian Tall Woodland (secondary/derived grassland)	1.7	1.7	0
Total Woodland/Forest		108.4	77.8	30.6
Total Secondary/Derived Native Grassland		620	502	118
Total Native Vegetation		728.4	579.8	148.6
Total Disturbed Land		256	196	60
Total Footprint (Native Vegetation and Disturbed Land)		984.4	775.8	208.6

Note: Numbering of vegetation communities as per Attachment C.

* The additional Commonwealth Assessment area at the mine site outside of the BAR footprint was previously approved under the NSW Vickery Coal Project, and hence not included in the NSW Assessment footprint.

Table 36
Relevant Matters of National Environmental Significance - Potential Habitat Clearance

Vegetation Community		Potential Habitat Clearance (ha)					
		Swift Parrot (Table 29)	Regent Honeyeater (Tables 20 and 27)	Painted Honeyeater *	Koala (Tables 20 and 27)	Corben's Long-eared Bat*	Large-eared Pied Bat*
<i>Semi-arid Woodlands (Grassy Sub-formation)</i>							
2	Poplar Box Woodland on Alluvial Clay Soils	0	3.7	3.7	3.7	3.7	3.7
2a	Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)	0	0	0	0	88.5	0
<i>Dry Sclerophyll Forests (Shrub/Grass Sub-formation)</i>							
3	Pilliga Box – Poplar Box Shrubby Woodland	26.7	0	26.7	22.7	26.7	26.7
3a	Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)	0	0	0	0	339.3	0
4	White Box – Silver-leaved Ironbark Shrubby Open Forest	17	17	17	0.5	17	17
4a	White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)	0	0	0	0	38	0
<i>Dry Sclerophyll Forests (Shrubby Sub-formation)</i>							
5	Narrow-leaved Ironbark – White Box Shrubby Forest	60	53	60	53	60	60
5a	Narrow-leaved Ironbark – White Box Shrubby Forest (secondary/derived grassland)	0	0	0	0	148.5	0
<i>Freshwater Wetlands</i>							
7	Mixed Marsh Sedgeland	0	0	0	0	4	0
<i>Forested Wetlands</i>							
8	River Red Gum Riparian Tall Woodland	1	1	1	1	1	1
8a	River Red Gum Riparian Tall Woodland (secondary/derived grassland)	0	0	0	0	1.7	0
	Scattered paddock trees in secondary derived grassland	0	0.5	0	0	0	0
Habitat in the Commonwealth Assessment Footprint		104.7	75.2[^]	108.4[^]	80.9[^]	728.4^{>}	108.4[^]

* Figures 28, 29 and 30 show the landscape distribution of the Painted Honeyeater, Corben's Long-eared Bat and Large-eared Pied Bat, respectively.

[^] Potential foraging habitat.

[>] Potential foraging and breeding habitat.

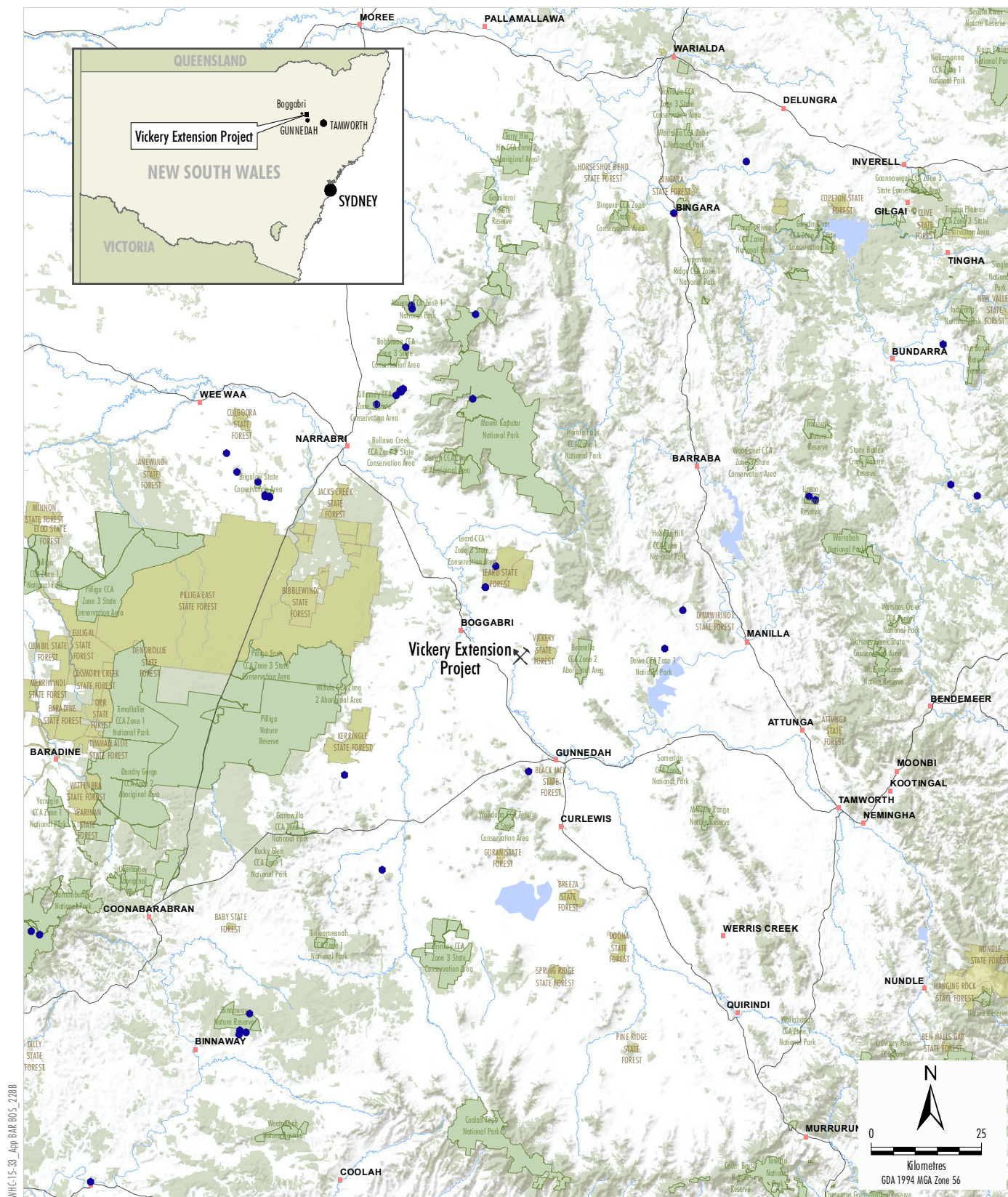


Figure 28

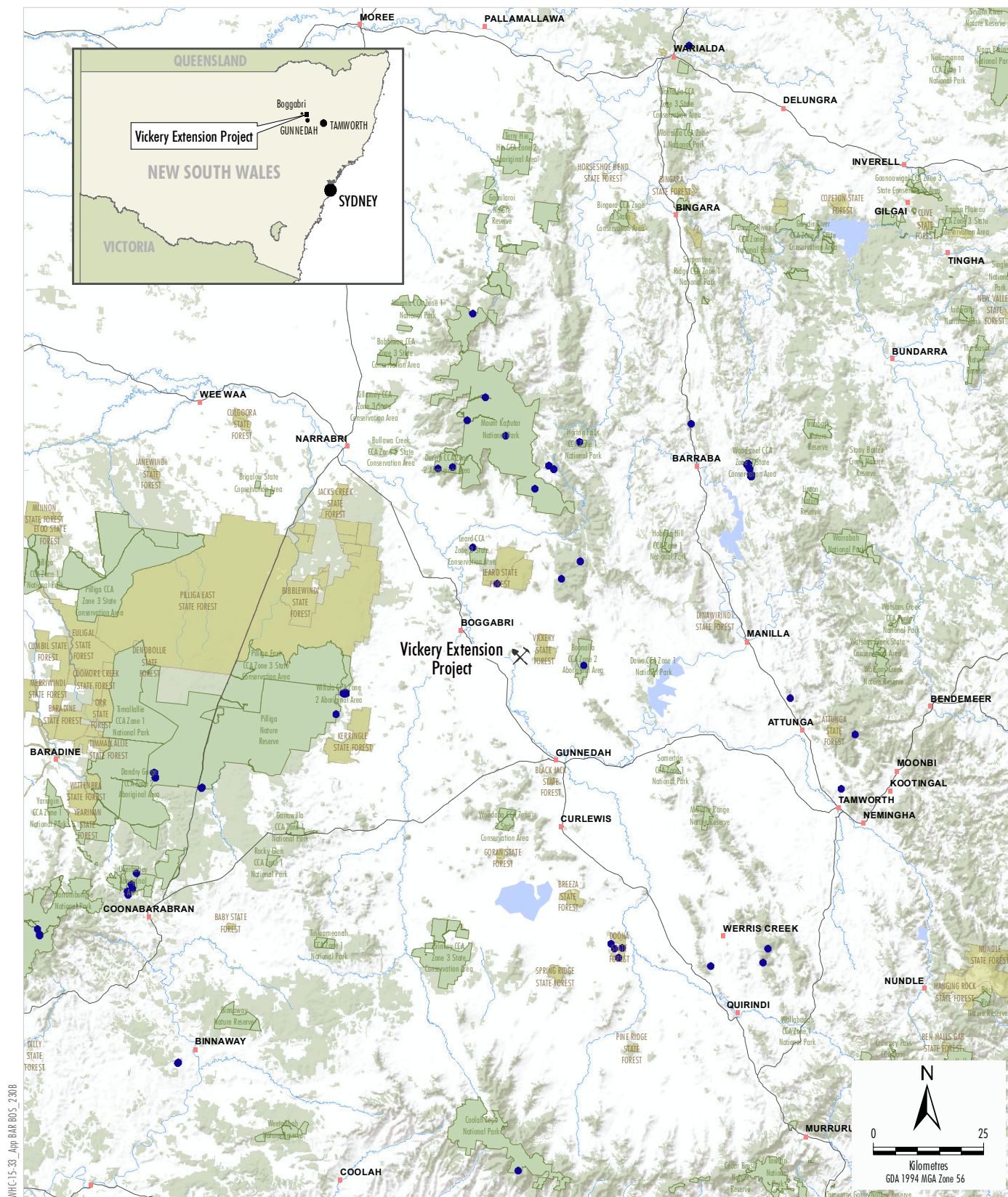


Figure 30

The impacts on MNES would be localised and negligible on a regional, state and national scale. The Project would not have a significant negative impact on the conservation status, condition or trend of any MNES at a local or regional scale.

The DotE comments in the SEARs for the EIS indicate that DotE (now DEE) considers that there are likely to be significant impacts to:

- Regent Honeyeater (*Anthochaera phrygia*);
- Swift Parrot (*Lathamus discolor*); and
- Koala (*Phascolarctos cinereus*).

DotE (now DEE) also indicates that there is some risk that there may be significant impacts on:

- Corben's Long-eared Bat (*Nyctophilus corbeni*);
- Large-eared Pied Bat, Large Pied Bat (*Chalinolobus dwyeri*); and
- Murray cod (*Maccullochella peelii*).

The DotE comments in the SEARs for the EIS indicate that DotE (now DEE) considers that there are not likely to be significant impacts to:

- Box-Gum Woodland CEEC;
- Weeping Myall Woodland EEC;
- Winged Peppercreep (*Lepidium monoplacoides*); and
- Painted Honeyeater (*Grantiella picta*).

Conclusion

The results of the site survey (Attachments C and D) indicate that the Project would clear mostly secondary/derived native grasslands and smaller quantities of fragmented woodland/forest. As such, the Project is unlikely to have a significant residual impact on any threatened species or community listed under the EPBC Act. Despite this, clearance of habitat would be offset as described in Section 6.

5.6 VICKERY STATE FOREST

Vickery State Forest, a relatively large area of native woodland/forest vegetation covering approximately 1,942 ha, is located directly east of the Approved Mine (Figure 3a and 3b). The Vickery State Forest is a forestry resource managed by Forestry Corporation of NSW. Forestry, recreation and mineral extraction are permissible land use categories within Vickery State Forest (*Brigalow and Nandewar Community Conservation Area Act, 2005*). Despite its size, the Vickery State Forest has limited connectivity with other remnant vegetation in the region. The nearest woodland/forest vegetation (of similar size) is the Boonalla Aboriginal Area (previously Kelvin State Forest), approximately 3.5 km to the east and mostly separated by private farmland (and the Rocglen Coal Mine) (Figure 4). Further away is Leard State Forest, approximately 12 km to the north of the Project mining area (Figure 1).

Niche (2013) assessed the potential indirect impacts of the Approved Mine, in conjunction with the Rocglen Coal Mine, on the Vickery State Forest. Niche (2013) concluded that although the Approved Mine does not involve any clearance of the Vickery State Forest, it may result in indirect impacts on the flora and fauna of the Vickery State Forest through increased edge effects such as weed incursion, noise and dust. Niche (2013) concluded that it is unlikely that any ecological thresholds would be crossed for affected threatened species populations within the locality such that the Approved Mine would lead to a significant loss of these species in the medium to long-term.

The Project would not involve any clearance within the Vickery State Forest and the additional clearance areas associated with the Project are located further away from the Vickery State Forest than the Approved Mine (approximately 1.5 km at the closest point).

The likelihood of indirect impacts on Vickery State Forest from the Project has been considered in Section 5.1.3. In summary:

- there is a low likelihood of weeds spreading into Vickery State Forest as a result of the Project;
- feral animals would be controlled to reduce the likelihood of them increasing in abundance due to the Project;
- the Project would have no material impact on Vickery State Forest from changes to surface water;
- were noise from the Project to impact fauna during the life of the mine, any impact would likely be localised and minor;
- the potential dust impacts during the life of the mine would be localised and minor due to the implementation of the dust mitigation measures; and
- potential Offset areas 7 and 8 would increase the total area of habitat available for species in the Vickery State Forest.

There is currently no linkage between the habitat in Vickery State Forest and the Namoi River. The rehabilitation strategy for the Project includes the establishment of native woodland/forest on the final mine landform, creating an almost continuous linking corridor of native woodland/forest vegetation from the Vickery State Forest to the Namoi River.

In conclusion, the Project would avoid direct impacts on the Vickery State Forest and minimise potential indirect impacts that would be temporary in nature. In the long-term the Project would improve the connectivity of the Vickery State Forest through the rehabilitation of the Project mine landforms to provide an almost continuous linkage to the Namoi River (Section 6.2.2).

5.7 IMPACT SUMMARY

The likely direct, indirect and cumulative impacts on biodiversity have been assessed and impact avoidance and mitigation measures are described. A number of measures to avoid and minimise impacts on biodiversity will be implemented at the Approved Mine and these would be continued for the Project (e.g. vegetation clearance protocols and weed management). Additional measures to avoid and minimise impacts on biodiversity are proposed (e.g. alignment of the Project rail spur to be constructed in predominantly disturbed land).

Table 14 identifies the site value score of each vegetation zone prior to vegetation clearance and after vegetation clearance these site value scores would become zero. Approximately 25% (196 ha) of the NSW Assessment Footprint is previously cleared land comprising exotic grassland or land with no vegetation cover, and hence does not require offsetting.

Further consideration has been given to the impacts on the 4th, 5th and higher order streams, and clearance of potential habitat for the Swift Parrot, Regent Honeyeater, Koala, Corben's Long-eared Bat and Large-eared Pied Bat (Section 5.2).

Assessments of Significance in accordance with section 5A of the EP&A Act have been undertaken and it is concluded that the Project would not result in a significant impact to any listed threatened species or ecological community located within the BAR Footprint. Similarly, an assessment of impacts on the relevant threatened species and communities listed under the EPBC Act has been undertaken and it is concluded that none would be significantly impacted.

5.8 BIODIVERSITY CREDIT REPORT – SUMMARY OF CREDIT REQUIREMENTS

The credit reports (outputs of the OEH Credit Calculator) for the NSW Assessment Footprint are provided in Attachments E and F. The credit reports provide the credit profile for each ecosystem credit BVT.

The result of running the OEH Credit Calculator for the NSW Assessment Footprint is that the Project requires a Biodiversity Offset Strategy which accounts for a total of 16,401 ecosystem credits (Table 37) and species credits for the Regent Honeyeater, Squirrel Glider and Koala (Table 39).

Table 37
Project Ecosystem Credit Requirements

No.	Vegetation Community	BVT	Credit Requirement (Attachments E and F)			BVTs able to be retired to address the Ecosystem Credit Requirement (Attachments E and F)
			Mine Site	Project Rail Spur*	Total	
2	Poplar Box Woodland on Alluvial Clay Soils	NA185	2,159 (for clearance of 0.1 ha of woodland and 61 ha of secondary/derived native grassland)	1,381 (for clearance of 3.5 ha of woodland and 18.5 ha of secondary/derived native grassland)	3,540 (for clearance of 3.6 ha of woodland and 79.5 ha of secondary/derived native grassland)	NA185, NA117
3	Pilliga Box – Poplar Box Shrubby Woodland	NA324	6,831 (for clearance of 22 ha of shrubby woodland and 263 ha of secondary/derived native grassland)	124 (for clearance of 1.2 ha of shrubby woodland and 2.8 ha of secondary/derived native grassland)	6,955 (for clearance of 23.2 ha of shrubby woodland and 265.8 ha of secondary/derived native grassland)	NA324, NA135, NA179, NA189, NA227, NA265
4	White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	1,795 (for clearance of 17 ha of open forest and 23 ha of secondary/derived native grassland)	0	1,795 (for clearance of 17 ha of open forest and 23 ha of secondary/derived native grassland)	NA349, NA164, NA206, NA222, NA225, NA232, NA242, NA343, NA407, NA397, NA305, NA393, NA408, NA398, NA396, NA347
5	Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	4,025 (for clearance of 33 ha of shrubby forest and 130 ha of secondary/derived native grassland)	0	4,025 (for clearance of 33 ha of shrubby forest and 130 ha of secondary/derived native grassland)	NA311, NA106, NA109, NA116, NA124, NA160, NA165, NA224, NA228, NA229, NA231, NA405, NA314, NA338, NA307, NA306, NA411, NA329, NA259, NA298, NA340, NA313, NA391, NA283, NA404, NA373, NA316
7	Mixed Marsh Sedgeland	NA201	46 (for clearance of 2 ha of shrubby forest)	0	46 (for clearance of 2 ha of shrubby forest)	NA201, NA217, NA218, NA345
8	River Red Gum Riparian Tall Woodland	NA193	0	40 (for clearance of 1 ha of woodland and 1.7 ha of secondary/derived native grassland)	40 (for clearance of 1 ha of woodland and 1.7 ha of secondary/derived native grassland)	NA193
Total			14,856 (for clearance of 72.1 ha of woodland and 479 ha of secondary/derived native grassland)	1,545 (for clearance of 5.7 ha of woodland and 23 ha of secondary/derived native grassland)	16,401 (for clearance of 77.8 ha of woodland/forest and 502 ha of secondary/derived native grassland)	-

Notes: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1 and 6 do not occur in the BAR Footprint.

Offset Location: Liverpool Plains (Part B) IBRA subregion; Liverpool Range IBRA subregion; Pilliga IBRA subregion; Pilliga Outwash IBRA subregion; Northern Outwash IBRA subregion; Northern Basalts IBRA subregion; Kaputar IBRA subregion; Peel IBRA subregion; Castlereagh-Barwon IBRA subregion

Table 38 shows the Project ecosystem credit requirements for the clearance of secondary/derived native grassland versus woodland/forest vegetation within the BAR Footprint. A majority (~74%) of the ecosystem credits required for the Project are for the clearance of 502 ha of secondary/derived native grassland (i.e. 12,185 credits) (Table 38).

Table 38
Project Credit Requirements for Secondary/Derived Native Grassland versus Woodland/Forest

	Area (ha)	Proportion of Total Area (%)	Credit Requirement	Average Credits Required per ha	Proportion of Total Credit Requirement (%)
Secondary/Derived Native Grassland	502	86	12,185	24.3	74
Woodland/Forest	77.8	14	4,216	54.2	26
Total	579.8	100	16,401	28.3	100

Table 39 provides a summary of the species credit requirements based on the NSW Assessment Footprint. The species credit requirements can overlap with other species credit requirements and the ecosystem credit requirements (i.e. the requirements are not mutually exclusive). In addition, Table 39 indicates the approximate area (ha) which would be required to satisfy the credit requirement.

Table 39
Project Species Credit Requirements

Species	Credit Requirement			Offset Location	Offset Size (ha) ^{1,2}	Offset Ratio
	Mine Site	Project Rail Spur	Total ²			
Regent Honeyeater (<i>Anthochaera phrygia</i>)	3,357 (for clearance of 43.6 ha)	346 (for clearance of 4.5 ha)	3,703 (for clearance of 48.1 ha)	Anywhere in NSW	521.5	1:10.84
Squirrel Glider (<i>Petaurus norfolcensis</i>)	1,595 (for clearance of 72.5 ha)	48 (for clearance of 2.2 ha)	1,643 (for clearance of 74.7 ha)	Anywhere in NSW	231.4	1:3.1
Koala (<i>Phascolarctos cinereus</i>)	1,160 (for clearance of 44.6 ha)	148 (for clearance of 5.7 ha)	1,308 (for clearance of 50.3 ha)	Anywhere in NSW	184.2	1:3.65

¹ Calculated in accordance with the *BioBanking Assessment Methodology 2014*, or its revision (OEH, 2014c) where: size of the offset area = species credits required divided by 7.1.

² The species credit requirements can overlap with other species credit requirements and the ecosystem credit requirements (i.e. the requirements are not mutually exclusive).

The Regent Honeyeater and Koala species credit requirements for the Commonwealth Assessment Footprint (Table 30) are larger than those for the NSW Assessment Footprint (Table 39). However, as described in Section 6.2.4, the additional species credits are for the portion of the Commonwealth Assessment Footprint which was covered by the Approved Mine (SSD-5000) and therefore subject to the existing biodiversity offset strategy described in Section 6.1. For this reason, the additional species credits are not included in Table 39.

6 STAGE 3 – BIODIVERSITY OFFSET STRATEGY

The existing Biodiversity Offset Strategy for the Approved Mine is described in Section 6.1, and the Biodiversity Offset Strategy for the Project, which augments the existing strategy to account for additional residual impacts on flora and fauna, is described in Section 6.2. Measures that are proposed to avoid and mitigate impacts from the Project on terrestrial flora and fauna are described in Sections 5.1.1 and 5.1.5.

6.1 EXISTING BIODIVERSITY OFFSET STRATEGY

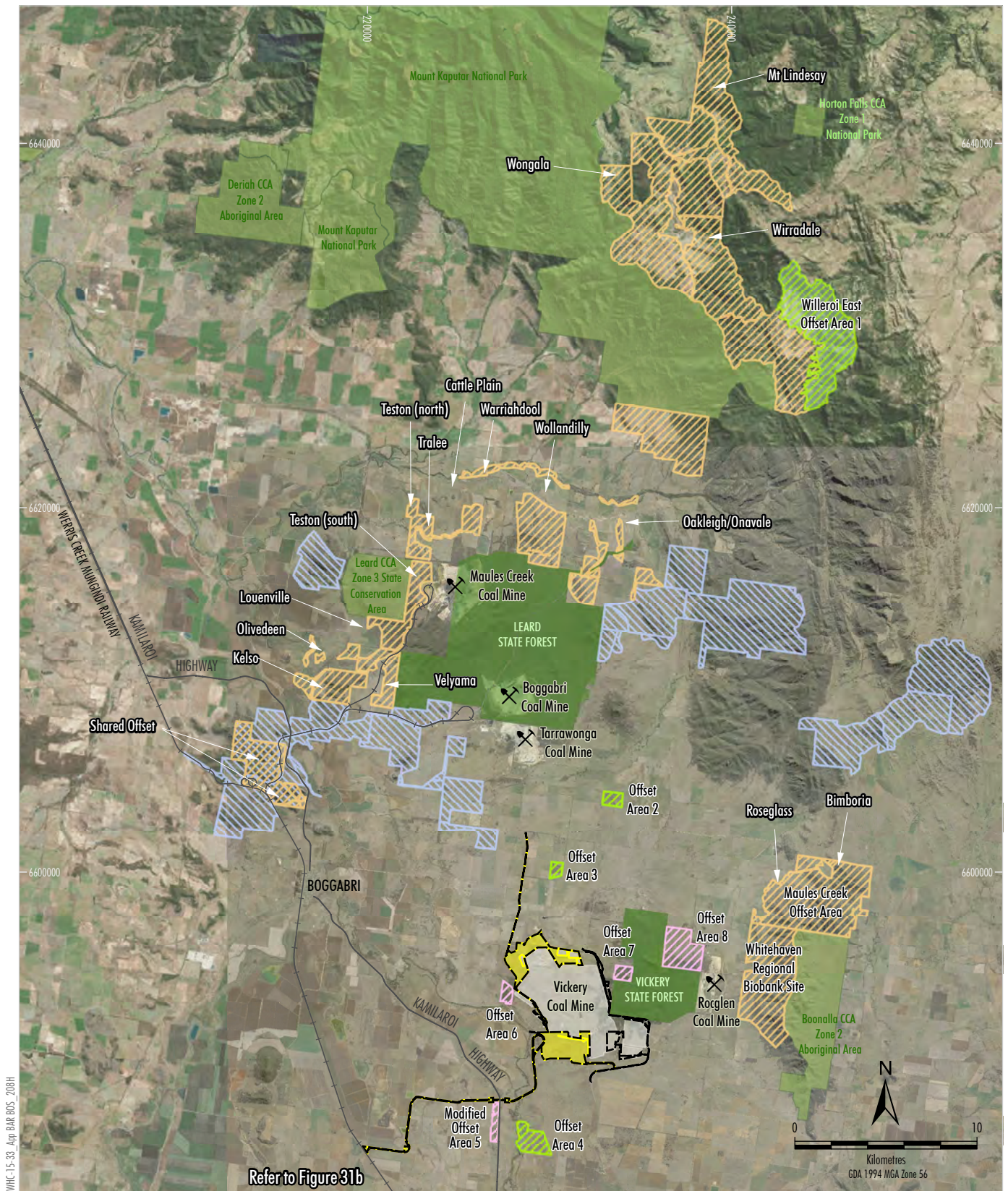
The existing Biodiversity Offset Strategy for the Approved Mine is outlined in Table 40 and shown on Figures 31a, 31b, 32 and 33. The Biodiversity Offset Areas were approved by the DP&E in September 2014. The approved Biodiversity Offset Strategy covers a total area of approximately 3,422.5 ha (2,062.5 ha of land-based offset areas on Whitehaven-owned land and 1,360 ha of mine rehabilitation to woodland/forest at the Approved Mine) (Table 40).

Table 40
Existing Biodiversity Offset Strategy

Existing Biodiversity Offset Area	Size (ha)	Location	General Description
Willeroi East (Offset Area 1)	1,671	Willeroi East is located approximately 35 km to the north-northeast of the Approved Mine within the eastern half of the former 'Willeroi' property (Figure 31a). Willeroi East is connected to Mount Kaputar National Park via offset areas for other Whitehaven projects in the region (Figure 31a).	Willeroi East contains approximately 1,396 ha of existing forest/woodland, 248 ha of secondary/derived native grasslands and 27 ha of eroded/scald land (which will be actively managed and rehabilitated) (Figure 32). This includes approximately 156 ha Box-Gum Woodland EEC, and 19 ha of <i>Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions</i> EEC.
Offset Areas 2, 3, 4 and 5*	391.5	Offset Areas 2 and 3 are located to the north of the Approved Mine, while Offset Areas 4 and 5 are located to the south (Figures 31a and 31b). All four areas are all located within approximately 10 km of the Approved Mine (Figures 31a and 31b).	Offset Areas 2 to 5 contain approximately 227 ha of existing forest/woodland and approximately 164.5 ha of native and non-native grasslands (Figure 33). This includes approximately 107 ha of Poplar Box Grassy Woodland and approximately 45 ha of Box-Gum Woodland EEC.
Mine Rehabilitation Area	1,360	The rehabilitation area is located on the post-mine landform within the Approved Mine footprint.	Approximately 1,360 ha of the Approved Mine final landforms will be revegetated to woodland/forest areas.
Total	3,422.5		

*Note Offset Area 5 is proposed to be modified (Section 6.2.2.6).

As part of the Approved Mine, Whitehaven committed to design the Blue Vale Road realignment to avoid impacts on the Weeping Myall Woodland EEC or offset the impact to the Weeping Myall Woodland at a ratio of at least 1:5, 1 ha of clearance to 5 ha of offset (SSD-5000). The Weeping Myall Woodland EEC near the Blue Vale Road realignment has been specifically avoided as part of the Project (Figure 7), and therefore no offset is required for this EEC.



LEGEND

- | | | | |
|--|--|--|---|
| | State Forest | | Existing Approved Offset Area for the Vickery Coal Mine |
| | State Conservation Area, Aboriginal Area | | Other Whitehaven Offset Area |
| | Approximate Extent of Approved Mine | | Boggabri Coal Offset Area |
| | Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint | | Proposed Biodiversity Offset Area |
| | Biodiversity Assessment Report Development Site Footprint | | Whitehaven/Booggabri Shared Offset Area |

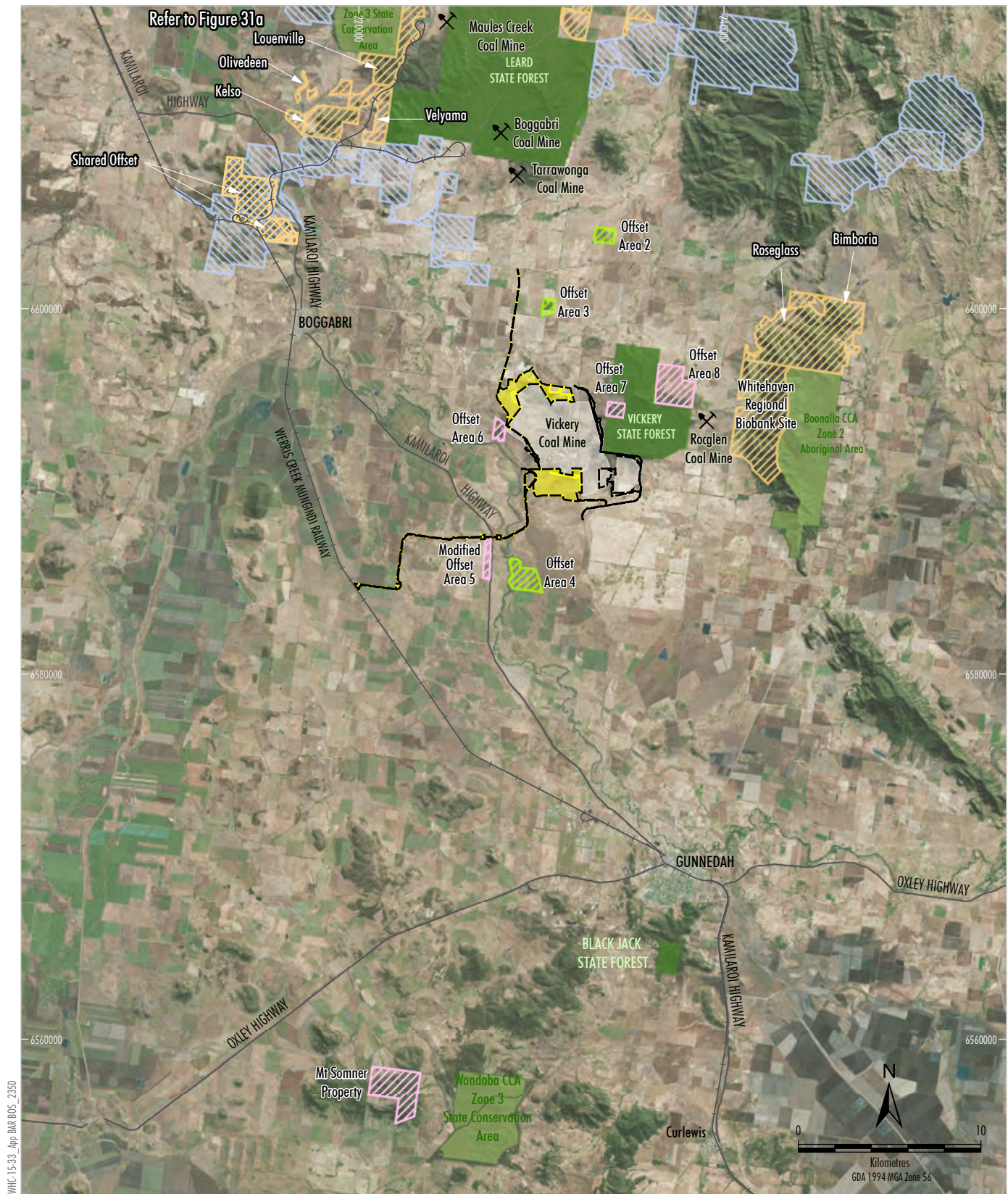
Source: Department of Land and Property Information (2015); Whitehaven Coal Limited (2015); Orthophoto: Department of Land and Property Information, Aerial Photography (Sept 2015, July 2011); Esri Mapping (2015); Umwelt (2017)



VICKERY EXTENSION PROJECT

Existing Approved and Proposed
Biodiversity Offset Areas - North

Figure 31a



WHC-15-33_Alp BAR-BOS_235D

LEGEND

- State Forest
- State Conservation Area, Aboriginal Area
- Approximate Extent of Approved Mine
- Approximate Extent of Vickers Extension Project (EPBC 2016/7649) Footprint
- Biodiversity Assessment Report Development Site Footprint

- Existing Approved Offset Area for the Vickers Coal Mine
- Other Whitehaven Offset Area
- Whitehaven/Boggabri Shared Offset Area
- Boggabri Coal Offset Area
- Proposed Biodiversity Offset Area

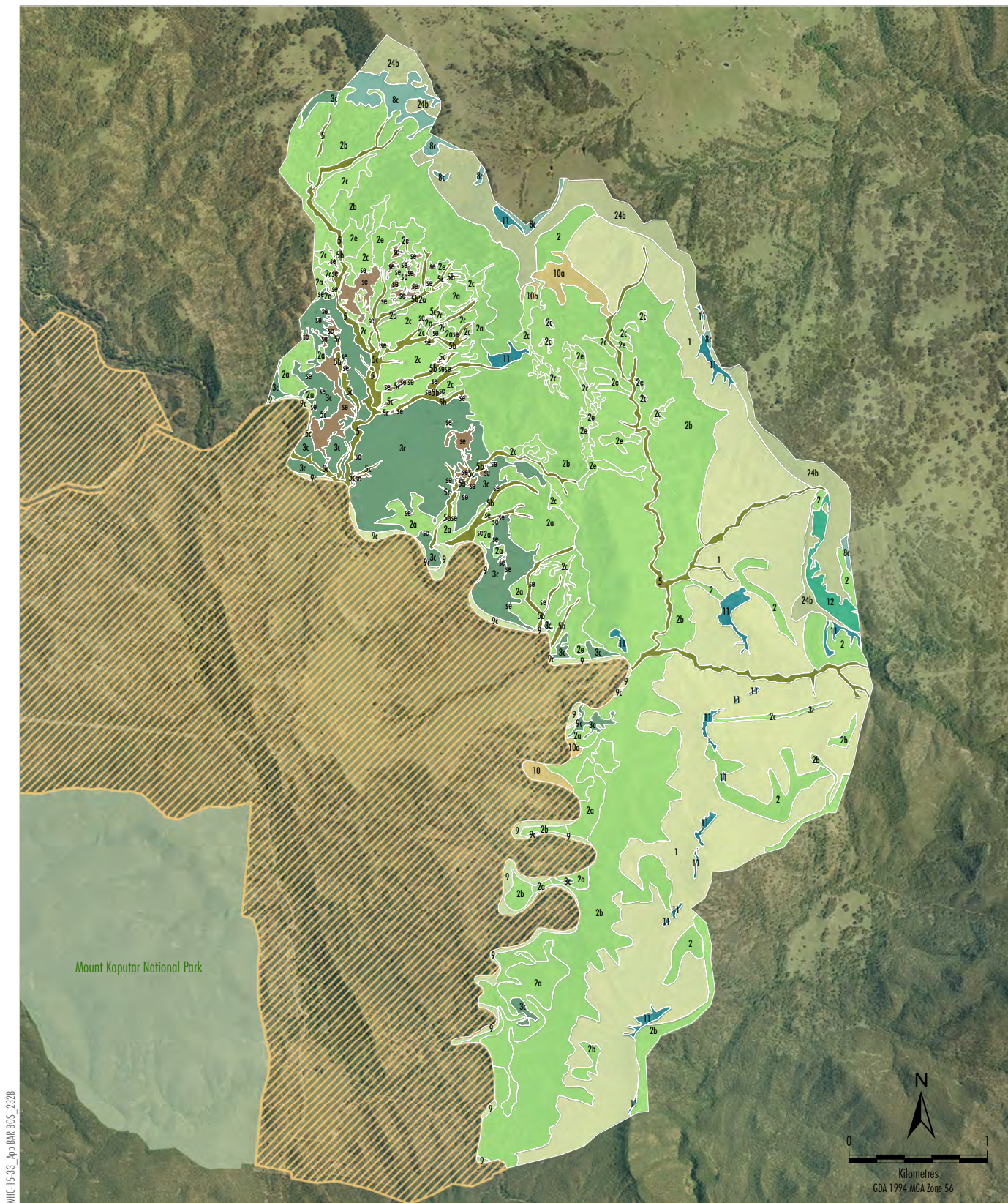
Source: Department of Land and Property Information (2015); Whitehaven Coal Limited (2015); Orthophoto: Department of Land and Property Information, Aerial Photography (Sept 2015, July 2011); Esri Mapping (2015); Umwelt (2017)



VICKERY EXTENSION PROJECT

Existing Approved and Proposed Biodiversity Offset Areas - South

Figure 31b



LEGEND

National Park

Other Whitehaven Offset Area

Vegetation Communities

1. Narrow-leaved Ironbark - White Cypress Pine shrubby open forest

2. White Box - White Cypress Pine shrubby woodland

2a. White Box - White Cypress Pine cypress regeneration

2b. White Box - White Cypress Pine semi-cleared

2c. White Box - White Cypress Pine derived native pasture

2e. White Box - White Cypress Pine derived shrubland

3c. White Box grassy woodland derived native pasture

5. Bracteate Honeymyrtle low riparian forest

5b. Bracteate Honeymyrtle low riparian forest semi-cleared and regenerating

5c. Bracteate Honeymyrtle low riparian forest derived native pasture

8c. Yellow Box - Blakely's Red Gum derived native pasture

9. River Oak - River Red Gum riparian forest

9c. River Oak - River Red Gum derived native pasture

10. Rough-barked Apple riparian open forest

10a. Rough-barked Apple riparian regeneration

11. Semi-evergreen vine thicket

12. Trachyte outcrop shrubland

24b. Red Stringybark shrubby open forest semi-cleared and regenerating

se. Scald - erosion

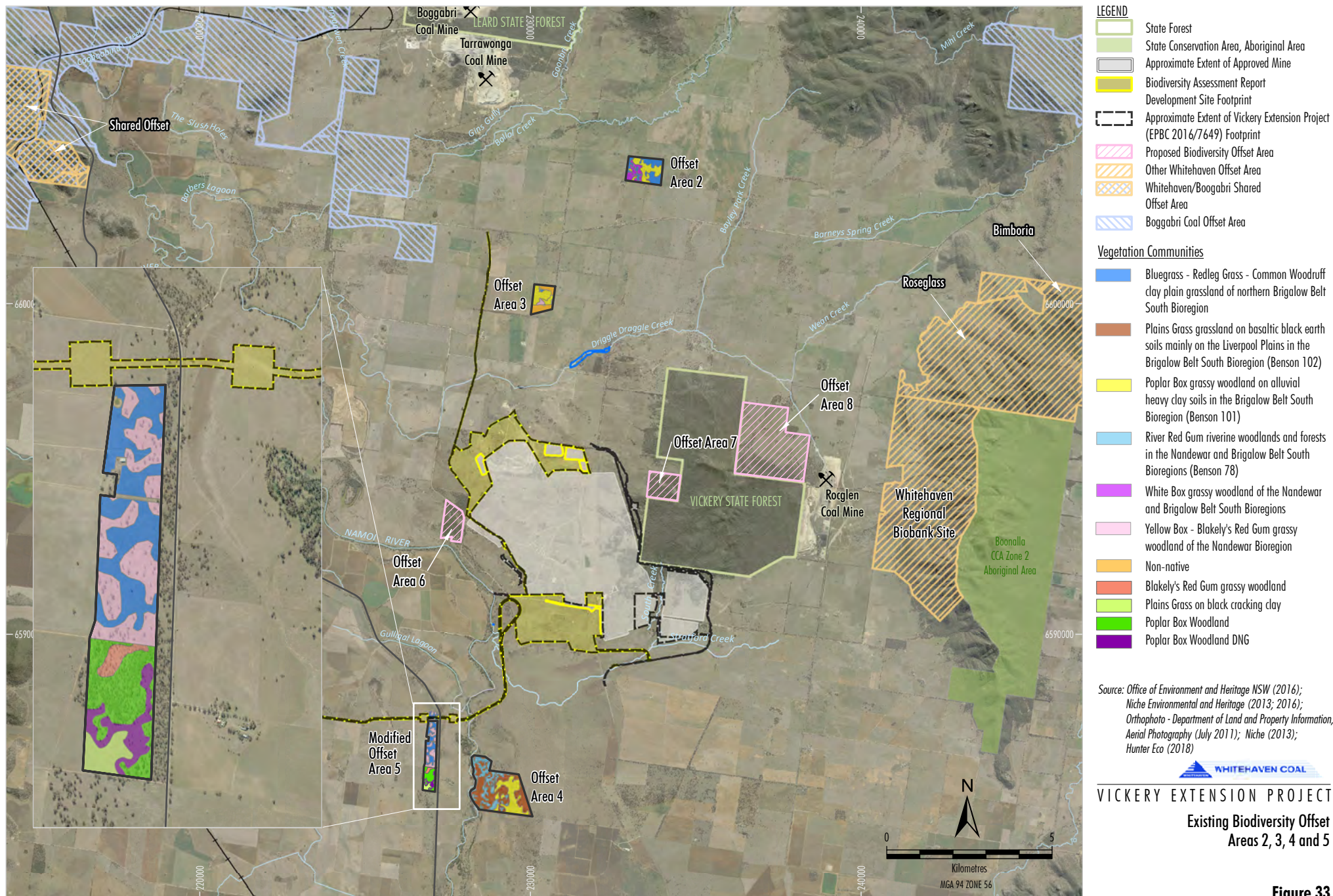
Source: Department of Land and Property Information (2015); Whitehaven Coal Limited (2015); Orthophoto: Department of Land and Property Information, Aerial Photography (Sept 2015, July 2011); Esri Mapping (2015); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Existing Biodiversity
Offset Area 1 - Willeroi East

Figure 32



Management

A Biodiversity Management Plan will be prepared for the management of the existing Biodiversity Offset Strategy (and additional offset areas from current assessment). The Biodiversity Management Plan will provide a description of measures that will be implemented in the existing offset areas, such as grazing and stock management, habitat augmentation, revegetation, weed management, vertebrate pest management and bushfire management.

Threatened Species

A total of eight threatened species listed under the BC Act have been recorded within the Willeroi East property (Offset Area 1):

- *Swainsona sericea* (Niche, 2012);
- Little Lorikeet (*Glossopsitta pusilla*) (Niche, 2012; Cenwest, 2011);
- Turquoise Parrot (*Neophema pusilla*) (Niche, 2012; Cenwest, 2011);
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*) (Niche, 2012; Cenwest, 2011);
- Speckled Warbler (*Pyrrholaemus sagittata*) (Niche, 2012);
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*) (Niche, 2012; Cenwest, 2011);
- Diamond Firetail (*Stagonopleura guttata*) (Niche, 2012); and
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (Niche, 2012);

Other threatened species listed under the BC Act have also been recorded in the surrounds of the Willeroi East property (Offset Area 1), including:

- Border Thick-tailed Gecko (*Underwoodisaurus sphyrurus*) (also listed under the EPBC Act) (Cenwest, 2011);
- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*) (Cenwest, 2011);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) (Cenwest, 2011);
- Squirrel Glider (*Petaurus norfolcensis*) (Cenwest, 2011);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*) (Cenwest, 2011);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (possible recording) (Cenwest, 2011); and
- Eastern Cave Bat (*Vespadelus troughtoni*) (Cenwest, 2011).

In addition, Niche (2012) concludes that the Regent Honeyeater, Painted Honeyeater and Koala have a moderate likelihood of occurring at the Willeroi East property. The extent of potential habitat for these species is further discussed in Section 6.2.4.

6.2 PROJECT BIODIVERSITY OFFSET STRATEGY

The existing Biodiversity Offset Strategy for the Approved Mine (Section 6.1) would be augmented to account for additional residual impacts on flora and fauna from the Project. Consistent with the SEARs for the Project, the augmented Biodiversity Offset Strategy for the Project involves:

- offsetting residual impacts of the Project by retiring credits in accordance with the NSW Offset Policy (OEH, 2014b) (Sections 6.2.1 to 6.2.3); and
- providing offsets to address additional residual significant impacts on MNES (Section 6.2.4).

6.2.1 Summary of the Offset Requirements

Table 37 (Section 5.8) provides a summary of the ecosystem credit requirements as a result of the impact assessment in Section 5. The ecosystem credit requirements can be satisfied through various BVTs in various IBRA subregions listed in Table 37. NA193 can only be offset by NA193, however this is a small credit requirement (i.e. 40 ecosystem credits).

Table 39 (Section 5.8) provides a summary of the species credit requirements as a result of the impact assessment in Section 3. The species credit requirements can overlap the ecosystem credit requirements (i.e. the requirements are not mutually exclusive). In addition, Table 39 indicates the approximate area of habitat which would be required to satisfy the credit requirement as well as the offset ratio.

6.2.2 Biodiversity Offset Strategy

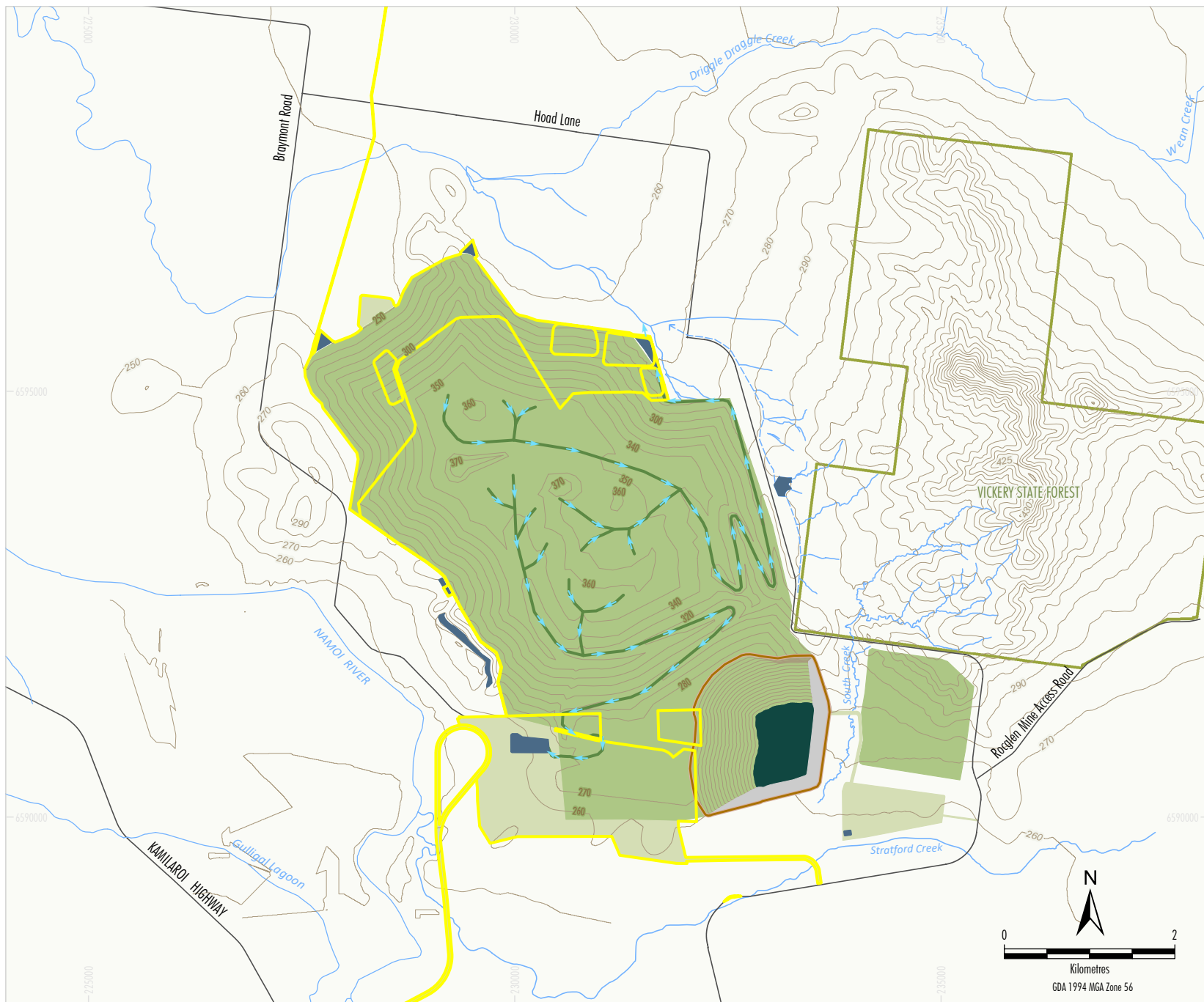
Whitehaven would retire the biodiversity offset credits for the number and class specified in Tables 39 and 40 to the satisfaction of OEH and DP&E. The Project credit requirements would be offset for the Project using mine site rehabilitation (Section 6.2.2.1) as well as one, or a combination, of the following (OEH, 2014b):

- acquiring or retiring credits under the BioBanking scheme in the BC Act (Section 6.2.2.2) by:
 - retiring existing credits on the existing Whitehaven Biobank Site;
 - purchasing existing credits on the *Biodiversity Credits Register* (OEH, 2018a); and/or
 - creating new credits by establishing a land-based offset area owned by Whitehaven or another entity.
- making payments into an offset fund (i.e. the Biodiversity Conservation Fund) (Section 6.2.2.4); and/or
- providing supplementary measures as outlined in the NSW Offset Policy (OEH, 2014b) (Section 6.2.2.3).

Each of the above offsetting methods is described in Sections 6.2.2.1 to 6.2.2.4 in relation to the Project.

6.2.2.1 Mine Site Rehabilitation

As described in Section 6.1, the approved Biodiversity Offset Strategy for the Approved Mine includes a commitment to revegetate 1,360 ha of mine rehabilitation to woodland/forest at the Approved Mine (Table 40; Figure 34).



Similarly, the NSW Offset Policy (OEH, 2014b) (and associated FBA [OEH, 2014a]) enables credits to be generated through mine site rehabilitation. Whitehaven intend to generate ecosystem credits for the Project from:

- establishing additional woodland/forest on the post mine landforms associated with the BAR Footprint (excluding the Approved Mine) (482 ha); and
- establishing additional woodland/forest on the post mine landforms associated with the Approved Mine Footprint for a portion of the areas previously proposed to be revegetated to pasture (523 ha) (i.e. establishment of woodland/forest additional to the area nominated within the approved Biodiversity Offset Strategy).

Credits Generated From Mine Rehabilitation

Rehabilitation monitoring at the former Canyon Coal Mine, Rocglen Coal Mine and Tarrawonga Coal Mine undertaken by Eco Logical (2015; 2016; 2017a; 2017b), shows that rehabilitation of woodland in these areas is successful. Given this, Whitehaven considers it is feasible to establish woodland/forest vegetation types on the post-mine landform.

The use of mine rehabilitation to satisfy approximately 24% of the ecosystem credit requirement is also reasonable given:

- Approximately 65% of the BAR Footprint is secondary/derived native grassland, which generates 74% of the ecosystem credit requirement.
- If rehabilitation is deemed unsuccessful then Whitehaven would need to retire the credits via other means (e.g. additional land-based offset areas or contribution towards the Biodiversity Conservation Fund) in accordance with the NSW Offset Policy (OEH, 2014b).
- Re-establishing local habitat is more beneficial to the local fauna (than establishing an offset in a different IBRA subregion).
- A security bond for the commitment would be provided under the *Mining Act, 1992*.

Mine rehabilitation generates less credits than a land-based offset area (credits are capped based on site value increase limits). For the purpose of the calculation, the maximum increases in site values were applied (except no increase for tree hollows or logs) (Table 41).

Table 41
Future Attribute Scores from the OEH Mine Site Rehabilitation Calculator

Attribute*	Allowable future attribute scores for mine site rehabilitation*	Future attribute score	Required completion/relinquishment standard for the increase in site attribute condition score*
Species richness	0.5 or 1	1	<i>The rehabilitation will achieve >50% of the native plant species richness benchmark for the nominated PCT. Only plant species characteristic of the target PCT may be counted towards native plant species richness.</i>

Table 41 (Continued)
Future Attribute Scores from the OEH Mine Site Rehabilitation Calculator

Attribute*	Allowable future attribute scores for mine site rehabilitation*	Future attribute score		Required completion/relinquishment standard for the increase in site attribute condition score *
Over-storey cover	0.5 or 1	1		<i>The rehabilitation will achieve >25% and <200% of the percent native over-storey cover benchmark for the nominated PCT. Only over-storey plant species characteristic of the target PCT may be counted towards percent native over-storey cover.</i>
Mid-storey cover	0.5 or 1	1		<i>The rehabilitation will achieve >25% and <200% of the percent native mid-storey cover benchmark for the nominated PCT. Only mid-storey plant species characteristic of the target PCT may be counted towards percent native mid-storey cover.</i>
Native ground cover (grasses)	0.5 or 1	1		<i>The rehabilitation will achieve >25% and <200% of the percent native ground cover (grasses) benchmark for the nominated PCT. Only native ground cover (grasses) plant species characteristic of the target PCT may be counted towards percent native ground cover (grasses).</i>
Native ground cover (shrubs)	0.5 or 1	1		<i>The rehabilitation will achieve >25% and <200% of the percent native ground cover (shrubs) benchmark for the nominated PCT. Only native ground cover (shrubs) plant species characteristic of the target PCT may be counted towards percent native ground cover (shrubs).</i>
Native ground cover (other)	0.5 or 1	1		<i>The rehabilitation will achieve >25% and <200% of the percent native ground cover (other) benchmark for the nominated PCT. Only native ground cover (other) plant species characteristic of the target PCT may be counted towards percent native ground cover (other).</i>
Exotic plant cover	0.5 or 1	1		<i>The exotic plant cover will be <45%. Exotic plant cover must be calculated as a percentage of the total ground and mid-storey cover. Exotic plant cover is measured as total percent foliage cover of all exotics in all strata.</i>
Number of trees with hollow	0.5	0		N/A
Over-storey regeneration	0.5	0.5		<i>At least 25% of over-storey species for the nominated PCT are naturally regenerating. Over-storey regeneration is when a second generation of over-storey plants naturally regenerates on the site as a result of reproduction of established over-storey species. Over-storey regeneration does not include juvenile or young plants which have been planted or seeded. Over-storey regeneration must be present across the vegetation zone.</i>
Total length of fallen logs	0.5	0		N/A
Predicted site value score		15.89		
Area of rehabilitation for a single PCT (ha)		482	523	
Number of ecosystem credits created from rehabilitation		1,914	2,077	

* Calculator for "Framework for Biodiversity Assessment (FBA) section 12.2: Generating biodiversity credits for ecological rehabilitation of previously mined land"

A total of 2,385 ha of the post mine landform is proposed to be a woodland/forest domain (Figure 34; Table 42). For the purpose of the credit calculator, it is conservatively assumed that 2,365 ha of this area would contribute to ecosystem credits (i.e. approximately 20 ha may be access tracks or other vegetation such as grassed areas). The final area of woodland/forest would be subject to future detailed mine planning. Table 42 shows:

- 482 ha of woodland/forest on the post mine landforms would be associated with the BAR Footprint (excluding the Approved Mine), and would produce 1,914 ecosystem credits; and
- 523 ha of woodland/forest on the post mine landforms would be associated with previously proposed to pasture areas associated with the Approved Mine Footprint, producing 2,077 ecosystem credits (due to the change in commitment from pasture to woodland/forest).

Table 42
Summary of the Credits Generated from Mine Rehabilitation

Aspect*	Area of Mine Rehabilitation (ha)	Ecosystem Credits
Approved Mine Woodland/Forest Rehabilitation Commitment (Table 40)	1,360	0
Ecosystem Credits from Mine Rehabilitation on the BAR Footprint	482	1,914
Ecosystem Credits from Mine Rehabilitation on Additional Areas of the Approved Mine Footprint (previously proposed for pasture)	523	2,077
Total	2,365	3,991

* Refer to Figure 34.

Target Vegetation Types

The rehabilitation objectives for the Project are provided in Section 5 of the EIS (Whitehaven, 2018).

Approximately 1,005 ha is proposed to be revegetated to one or more woodland/forest vegetation types that occur in the surrounding sub-region and are the same vegetation class as required to be provided (Table 41). For example the Project rehabilitation could target the offset credit requirements for *Pilliga Box – Poplar Box Shrubby Woodland* (NA324), or related BVTs.

The woodland/forest would be a recognisable BVT that is self-sustaining as required by the NSW Offset Policy (OEH, 2014b). Native species to be planted in revegetation areas would be selected on a site by site basis depending on pre-existing vegetation, nearby remnant vegetation associations, soil types, aspect and site conditions.

Mining Operations Plan

Under the NSW Offset Policy (OEH, 2014b) (and associated FBA [OEH, 2014a]), the number of ecosystem credits produced for mine rehabilitation does not vary according to the vegetation type proposed to be established. Therefore, it is reasonable that, prior to the commencement of construction of the Project, the Mining Operations Plan (MOP) required under the NSW *Mining Act, 1992* would identify:

- the vegetation types proposed to be targeted on the mine site (that occur in the surrounding sub-region and are the same vegetation class as the vegetation types listed in Table 37);

- a list of suitable native plant species to be used in the revegetation of the post-mine landforms; and
- completion/relinquishment criteria.

The MOP would be prepared in accordance with the relevant NSW Government rehabilitation and mine closure guidelines.

Long-term Security

If rehabilitation is deemed successful, at that point, the rehabilitation could be considered for long-term security via a BioBanking Agreement which would generate additional credits in accordance with the NSW Offset Policy (OEH, 2014b).

6.2.2.2 Acquiring or Retiring Credits (Additional Offset Areas 6, 7, 8, near-by privately owned land and the Mt Somner Property)

In accordance with the NSW Offset Policy (OEH, 2014b), acquiring or retiring credits under the BioBanking scheme in the BC Act could involve:

- retiring existing credits on the existing Whitehaven Biobank Site;
- purchasing existing credits on the *Biodiversity Credits Register* (OEH, 2018a); and/or
- creating new credits by establishing a land-based offset area owned by Whitehaven or another entity.

These options are described below in relation to the Project. A minimum of 90% of the Commonwealth offset requirements (Section 6.2.4) would be satisfied through acquiring or retiring credits under the BioBanking scheme.

Retiring Existing Credits – Whitehaven BioBank Site

Whitehaven has an established BioBank site, located west of Boonalla Aboriginal Area (Figure 31a), which generated 13,754 ecosystem credits. Of the total 13,754 ecosystem credits generated, 12,885 credits have been used for other Projects (Tarrawonga Coal Mine, Rocglen Coal Mine and Canyon Coal Mine) and 869 ecosystem credits remain available for use (Table 43).

Table 43
Summary of the Mine Ecosystem Credits at the Existing Biobank Site

Aspect	Ecosystem Credits Available
Ecosystem Credits	869 credits for NA228 ¹

¹ NA228 - White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion

No species credits have been generated at the Whitehaven BioBank site. Threatened species surveys could be undertaken in the Whitehaven BioBank site to potentially generate species credits for the Regent Honeyeater, Squirrel Glider and Koala if habitat for these species is present, in consultation with OEH.

The *Biodiversity Offset Management Plan for the Whitehaven Regional Biodiversity Offset Site* (Eco Logical Australia, 2013) describes that threatened flora and fauna were not systematically surveyed as a part of the BioBanking assessment. There are records of the Koala (*Phascolarctos cinereus*) and the Regent Honeyeater near the BioBank site (Figures 8 and 31a).

Purchasing Existing Credits

OEH has developed the BioBanking Scheme to enable 'biodiversity credits' to be generated by landowners who commit to protect biodiversity values on their land so the credits can be sold to developers, generating funds for the management of the offset land in perpetuity.

Biodiversity Credits Register

The credits are advertised for sale through the OEH Biodiversity Credits Register within the BioBanking Public Registers (OEH, 2018a). According to the Biodiversity Credit Reports (Attachments E and F), credits of the type listed in Table 37 can be purchased from the following IBRA subregions:

- Liverpool Plains (Part B) IBRA subregion (covers 941,752 ha);
- Liverpool Range IBRA subregion (covers 521,960 ha);
- Pilliga IBRA subregion (covers 1,732,137 ha);
- Pilliga Outwash IBRA subregion (covers 535,392 ha);
- Northern Outwash IBRA subregion (covers 700,241 ha);
- Northern Basalts IBRA subregion (covers 624,671 ha);
- Kaputar IBRA subregion (covers 78,307 ha);
- Peel IBRA subregion (covers 1,430,562 ha); and
- Castlereagh-Barwon IBRA subregion (covers 4,500,355 ha).

Also according to the credit reports (Attachments E and F), credits from various different BVTs can be purchased to offset impacts on the BVTs in the BAR Footprint (Table 37).

As of March 2018, there are two Biobanking Agreements in the Namoi Region - Agreement 43 held by Whitehaven (see 'Retiring Existing Credits' section above) and Agreement 228.

Biobank Site Expressions of Interest

Landowners who are interested in establishing biobank sites but have not entered into a BioBanking agreement can register on the BioBank Site Expressions of Interest (EOI) Register within the BioBanking Public Registers (OEH, 2018b). There are BioBank site expressions of interest in the nine IBRA subregions (applicable to the BAR Footprint) on the *Biobank Site Expressions of Interest Register* (OEH, 2018b). Whitehaven could investigate whether these properties could satisfy the credit requirement for the Project.

Credits Wanted Register

Whitehaven placed the credits required on the *Credits Wanted Register* (OEH, 2018c) in May 2016.

Establishing a Land-Based Offset Area - Proposed Additional Offset Areas 6, 7 and 8

Three potential additional offset areas have been identified in the locality of the Project, on land owned by Whitehaven (Offset Areas 6, 7 or 8) (Figure 35; Table 44). Offset Area 6 was surveyed by FloraSearch (2018) and Future Ecology (2018) during the baseline flora and fauna surveys conducted for the Project (Attachments C and D). Dr Colin Driscoll (Hunter Eco) undertook flora and vegetation community surveys in accordance with the NSW *BioBanking Assessment Methodology 2014* at the potential additional offset areas 7 and 8 in May 2016, and January and May 2017 (Hunter Eco, 2018b).

Whitehaven may choose to substitute additional offset areas 6, 7 or 8 with alternative offset areas that produce the type and number of credits required.

Proposed Offset Area 6

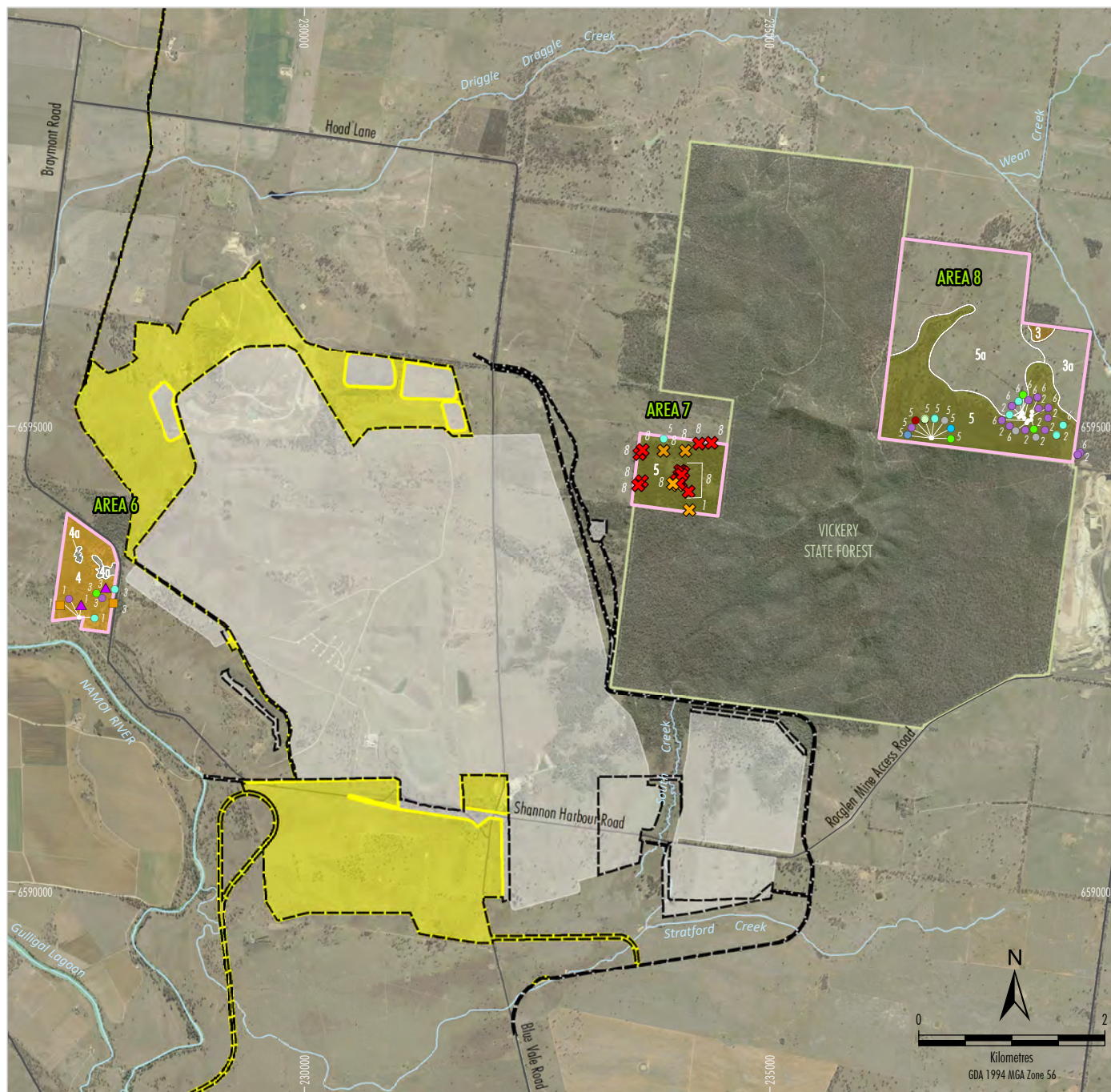
Proposed Offset Area 6 is located on Whitehaven-owned land to the west of the Project mining area, adjoining the BAR Footprint (Figure 35). This area was surveyed by FloraSearch (2018) and Future Ecology (2018) during the baseline flora and fauna surveys conducted for the Project (Attachments C and D). Proposed Offset Area 6 is a former travelling stock reserve and as such this area (similar to the BAR Footprint) has experienced heavy grazing historically and contains few shrubs (Attachment C).

Table 44
Proposed Additional Offset Areas 6, 7 and 8 – Size and Credits

No.	Vegetation Community^	BVT	Size (ha)				Credits			
			Proposed Offset Area 6*	Proposed Offset Area 7	Proposed Offset Area 8	Total	Proposed Offset Area 6*	Proposed Offset Area 7	Proposed Offset Area 8	Total
Ecosystem Credits										
Dry Sclerophyll Forests (Shrub/Grass Sub-formation)										
3	Pilliga Box – Poplar Box Shrubby Woodland (moderate to good)	NA324	0	0	3.7	3.7	0	0	333	333
3a	Pilliga Box – Poplar Box Shrubby Woodland (derived grassland) (moderate to good)		0	0	36	36				
4	White Box – Silver-leaved Ironbark Shrubby Open Forest (moderate to good)	NA349	57	0	0	57	533	0	0	533
Dry Sclerophyll Forests (Shrubby Sub-formation)										
5	Narrow-leaved Ironbark – White Box Shrubby Forest (moderate to good)	NA311	0	66.5	162.7	229.2	0	856	3,625	4,481
5a	Narrow-leaved Ironbark – White Box Shrubby Forest (derived grassland) (moderate to good)		0	5.9	200	205.9				
Total Woodland/Forest			57	66.5	166.4	289.9	-	-	-	-
Total Derived Native Grassland			0	5.9	236	241.9	-	-	-	-
Total Offset Area Size			57	72.4	402.4	531.8	-	-	-	-
Total Ecosystem Credits			-	-	-	-	533	856	3,958	5,347
Species Credits										
Regent Honeyeater			56	66.5	166.4	288.9	398	472	1,181	2,051
Squirrel Glider			56	66.5	166.4	288.9	398	472	1,181	2,051
Koala			56	66.5	166.4	288.9	398	472	1,181	2,051
Scant Pomaderris			0	4 plants	0	4 plants	0	28	0	28
Tylophora linearis			0	1400 plants	0	1400 plants	0	9,940	0	9,940

[^] Figure 35.

* Excludes approximately 4 ha of NA349 (derived grassland)



- LEGEND**
- State Forest
 - Approximate Extent of Approved Mine
 - Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint
 - Biodiversity Assessment Report Development Site Footprint
 - Proposed Biodiversity Offset Area
- Vegetation Communities**
- Dry Sclerophyll Forests (Shrub/Grass Sub-formation)
 - 3 Pilliga Box – Poplar Box Shrubby Woodland (NA324)
 - 3a Pilliga Box – Poplar Box Shrubby Woodland (derived grassland) (NA324)
 - 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
 - 4a White Box – Silver-leaved Ironbark Shrubby Open Forest (Secondary/derived grassland) (NA349)
 - Dry Sclerophyll Forests (Shrubby Sub-formation)
 - 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
 - 5a Narrow-leaved Ironbark – White Box Shrubby Forest (derived grassland) (NA311)
- Threatened Flora**
- ✕ Scant Pomaderris (*Pomaderris queenslandica*)
 - ✕ *Tylophora linearis*
- Threatened Fauna**
- Little Eagle
 - Turquoise Parrot
 - Brown Treecreeper (eastern subspecies)
 - Speckled Warbler
 - Hooded Robin (south-eastern form)
 - Grey-crowned Babbler (eastern subspecies)
 - Varied Sittella
 - Diamond Firetail
 - Squirrel Glider
 - ▲ Yellow-bellied Sheathail-bat
- Note:** 1. Only threatened species within 50 m of Potential Biodiversity Offset Areas are shown.
2. Vegetation mapping in Area 6 was produced by FloraSearch (2017), whilst vegetation mapping in Areas 7 and 8 was produced by Hunter Eco (2016)
- Source**
- | | |
|---------------------------|------------------------|
| (1) Future Ecology (2018) | (6) OEH (2017) |
| (2) RPS (2010) | (7) FloraSearch (2018) |
| (3) Cenwest (2011) | (8) Hunter Eco (2018) |
| (5) Birdlife (2016) | |
- Note:** Source 4 is not shown on this figure.

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); Hunter Eco (2018)



VICKERY EXTENSION PROJECT

Proposed Biodiversity Offset Areas 6, 7 and 8- Vegetation Communities & Species Records

Figure 35

Proposed Offset Area 6 is comprised of approximately 57 ha of White Box – Silver-leaved Ironbark Shrubby Open Forest (Plate 8; Table 44; Figure 35). This area contains known Squirrel Glider habitat, with the species having been recorded on two occasions (Figure 35).

Proposed Offset Area 7

Proposed Offset Area 7 is located approximately 2 km to the east of the BAR Footprint, adjoining the Vickery State Forest (Figure 18). Floristic surveys were conducted over this area by Hunter Eco (2018a) in May 2016, and January and May 2017.

The overall condition of the vegetation within Proposed Offset Area 7 was *moderate/good* with evidence that it had all once been cleared and was well into regeneration (Hunter Eco, 2018a). Vegetation mapping produced by Hunter Eco (2018a) shows that Proposed Offset Area 7 is comprised entirely of approximately 72.4 ha of Narrow-leaved Ironbark – White Box Shrubby Forest (Plate 9; Table 44; Figure 35).



Plate 8 Potential Offset Area 6 - Example of the Vegetation



Plate 9 Potential Offset Area 7 - Example of the Vegetation

Proposed Offset Area 8

Proposed Offset Area 8 is located approximately 4 km to the east of the BAR Footprint, adjoining the Vickery State Forest (Figure 35). Floristic surveys were conducted over this area by Hunter Eco (2018a) from 4 to 6 May 2016.

The overall condition of the vegetation within Proposed Offset Area 8 was *moderate/good* (Hunter Eco, 2018a). Vegetation mapping produced by Hunter Eco (2018a) shows that Proposed Offset Area 8 is comprised of approximately 3.7 ha of Pilliga Box – Poplar Box Shrubby Woodland, with a further 36 ha of Pilliga Box – Poplar Box Shrubby Woodland (derived grassland), and approximately 162.7 ha of Narrow-leaved Ironbark – White Box Shrubby Forest, with a further 200 ha of Narrow-leaved Ironbark – White Box Shrubby Forest (derived grassland) (Plate 10; Table 44; Figure 35).



Plate 10 Potential Offset Area 8 - Example of the Vegetation

Table 44 provides an indication of the credits that would be generated from the proposed offset areas as reported by Hunter Eco (2018a) and assessed in accordance with the *BioBanking Assessment Methodology 2014* (OEH, 2014c).

The following threatened species have been recorded during previous surveys within the three potential additional offset areas (Figure 35):

- Scant Pomaderris (Proposed Offset Area 7);
- *Tylophora linearis* (Proposed Offset Area 7);
- Speckled Warbler;
- Grey-crowned Babbler (eastern subspecies);
- Varied Sittella;
- Diamond Firetail;
- Squirrel Glider (Proposed Offset Area 6); and
- Yellow-bellied Sheathtail-bat.

Management measures to be implemented by Whitehaven within the three potential additional offset areas would be described in a management plan (or plans). Proposed management measures would include (but not be limited to) weed and feral animal control.

Establishing a Land-Based Offset Area - Mount Somner Proposed Additional Offset Area

The Mount Somner Property is a landholding owned by Whitehaven, located approximately 30 km south-west of the BAR Footprint and 20 km south-west of Gunnedah (Figure 31b). In June 2016, Dr Colin Driscoll (Hunter Eco) undertook flora and vegetation community surveys in accordance with the NSW *BioBanking Assessment Methodology 2014* at the Mount Somner Property (Hunter Eco, 2018b).

The surveys detailed in this report confirmed that two main vegetation communities are present within the study area, with one derived native grassland type: White Box Shrubby Forest (approximately 416 ha), White Box Shrubby Forest Derived Native Grassland (approximately 65 ha) and Semi-evergreen Vine Thicket (approximately 45 ha) (Table 45; Figure 36). The Semi-evergreen Vine Thicket community is listed as Endangered under the BC Act and EPBC Act.

Whitehaven may choose to substitute the Mount Somner property with alternative offset areas that produce the type and number of credits required.

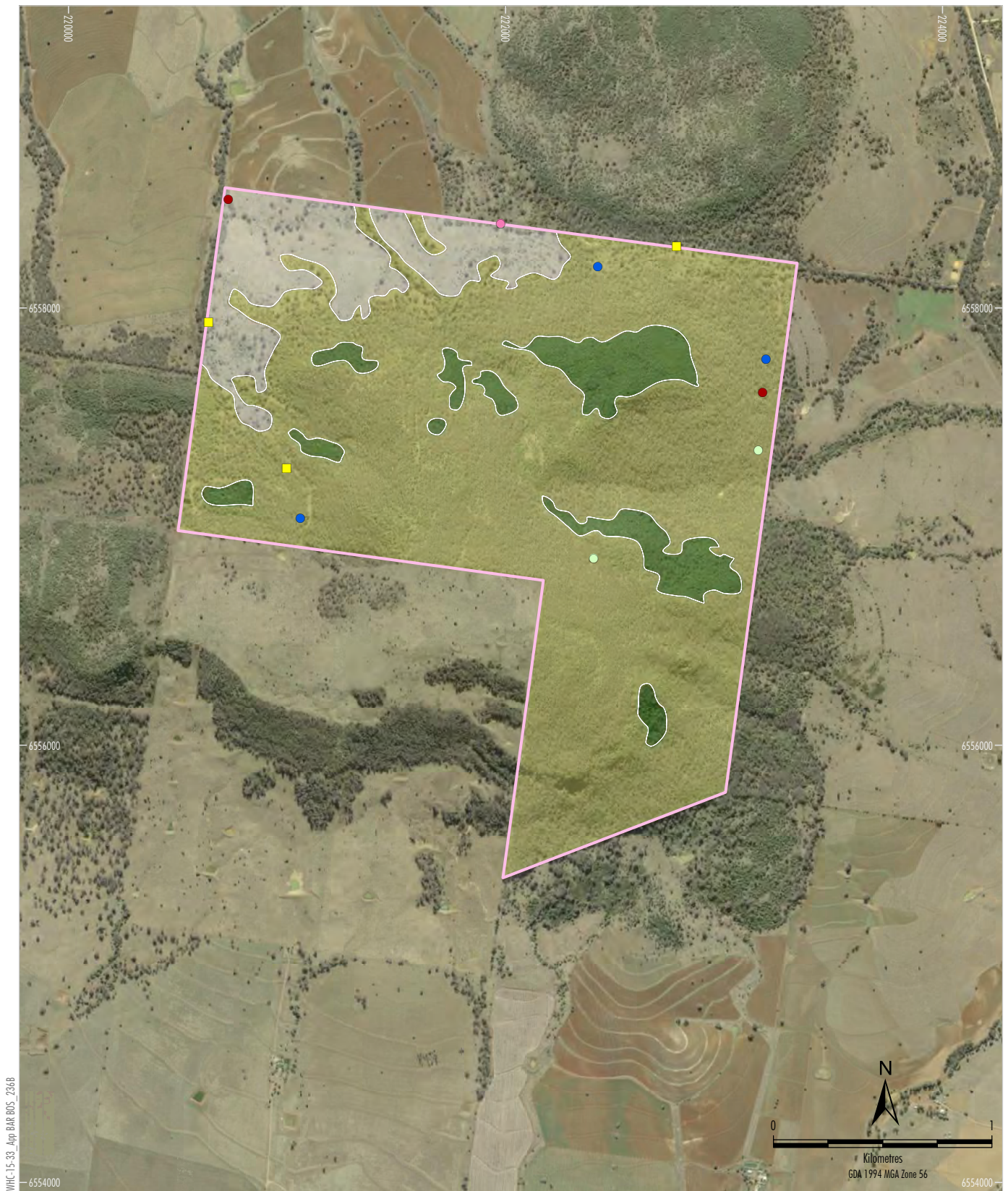
Table 45
Mount Somner Property – Size and Credits

Credit Type	Size (ha)	Total Credits Generated
<i>Ecosystem Credits</i>		
White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion (NA398)	416	3,102
White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion (NA398) (derived grassland)	65	501
Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion (NA199)	45	429
Total Woodland/Forest	461	-
Total Derived Native Grassland	65	-
Total Property Size	526	-
Total Ecosystem Credits	-	4,032
<i>Species Credits</i>		
Regent Honeyeater	416	2,954
Koala	416	2,954

Almost 90% of the Mt Somner property is uncleared and the vegetation is almost completely undisturbed, with large areas exhibiting old growth characteristics. However, there is evidence of a substantial pig and deer population that has a detrimental impact on ground cover.

The following threatened species have been recorded during previous surveys within the Mount Somner property (Niche, 2012):

- Brown Treecreeper (eastern subspecies);
- Turquoise Parrot;
- Little Lorikeet;
- Scarlet Robin; and
- Koala.



LEGEND

Proposed Biodiversity Offset Area

Vegetation Communities

Dry Sclerophyll Forests (Shrub/Grass Sub-formation)

White Box - White Cypress Pine Shrubby Hills

Open Forest mainly in the Nandewar Bioregion (NA398)

White Box - White Cypress Pine Shrubby Hills Open Forest mainly in the Nandewar Bioregion (derived grassland) (NA398)

Rainforests

Mock Olive - Wilga - Peach Bush - Carissa Semi-evergreen Vine Thicket (Dry Rainforest) mainly on Basalt Soils in the Brigalow Belt South Bioregion (NA199)

Threatened Fauna

● Scarlet Robin

● Little Lorikeet

● Turquoise Parrot

● Brown Treecreeper (eastern subspecies)

■ Koala

Source: Department of Land and Property Information (2015);
Hunter Eco (2018); Niche Environment & Heritage (2012)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Mount Somner Property -
Vegetation Communities and
Species Records

Figure 36

Management measures that would be implemented by Whitehaven on the Mount Somner property would be described in a management plan (or plans). Proposed management measures would include (but not be limited to) weed and feral animal control.

Other Proposed Additional Offset Areas

Other potential additional offset areas could be sought from within the relevant IBRA subregions listed in Table 37. There is a large amount of native vegetation (of the various BVTs listed in Table 37) in the relevant IBRA subregions which could be used to satisfy the credit requirements for the Project.

Proposed additional offset areas could be established on existing company-owned landholdings or on other private landholdings, subject to relevant landholder consent(s).

6.2.2.3 Contributing Money to Supplementary Measures

If appropriate land-based offsets are not feasible⁶, Whitehaven could provide funds for ‘supplementary measures’. A supplementary measure would involve actions to benefit the relevant species in order to fulfil the offset requirement (e.g. a financial contribution to a monitoring program benefiting a species potentially impacted by the Project).

The ‘reasonable steps’ detailed in the NSW Offset Policy (OEH, 2014b) (e.g. placing the Project credit requirements online, consulting with OEH, considering properties for sale in the area) must be satisfied before supplementary measures can be considered. Whitehaven has begun satisfying the reasonable steps to allow supplementary measures to be implemented if required (e.g. Whitehaven placed an expression of interest for the credits required on the OEH BioBanking public register in May 2016).

A maximum of 10% of the Commonwealth offset requirements (Section 6.2.4) could be satisfied through supplementary measures.

6.2.2.4 Contributing to a Fund

Whitehaven could make a financial contribution to the Biodiversity Conservation Fund to allow the Biodiversity Conservation Trust to locate and secure appropriate offsets to fulfil a portion of the Project’s offsetting requirements. Whitehaven notes that the calculator required to determine the financial contribution to the fund necessary to satisfy the Project’s credit requirements (Credits calculated using the FBA) has not yet been developed.

6.2.2.5 NSW Offset Summary Table

A portion of the ecosystem credits required for the Project (~24%) would be satisfied by the proposed creation of credits from mine rehabilitation (Section 6.2.2.1). Table 46 shows how the residual ecosystem credit requirements (and the species credit requirements) could be satisfied through:

- retiring existing credits on the existing Whitehaven Biobank Site (Section 6.2.2.2);
- creating new credits by establishing potential offset areas 6, 7 and 8;
- purchasing existing credits at near-by privately owned land;

⁶ As stated in Section 6c of the FBA.

Table 46
NSW Summary of Credit Requirements and Proposed Offset Methods[#]

Credit Type	Project Credit Requirements (Tables 38 and 39)	Credits Gained from Mine Rehabilitation* (Table 42)	Credits Required from Proposed Offsets			Additional credits acquired, retired, converted to the fund or supplementary measures	Offset Requirement Met
			Existing Credits in the Regional Biobank Site* (Table 43)	Proposed Offset Areas 6, 7 and 8* (Table 44)	Mount Somner Property* (Table 45)		
NA185	3,540	-	-	-	-	3,540 (100%)	Yes
NA324	6,955	3,991 (~57%) [^]	-	333 (~5%)	-	2,631 (~38%)	Yes
NA349	1,795	-	-	533 (~30%)	1,262 (~70%)	0	Yes
NA311	4,025	-	869 (~21%)	3,156 (~79%)	-	0	Yes
NA201	46	-	-	-	-	46 (100%)	Yes
NA193	40	-	-	-	-	40 (100%)	Yes
Ecosystem Credits	16,401	3,991 (~24%)	869 (~5%)	4,022 (~25 %)	1,262 (~8 %)	6,257 (~38%)	Yes
Regent Honeyeater Species Credits	3,703 (due to clearance of 48.1 ha)	-	A	2,051 (~55%)	1,652 (~45%)	0	Yes
Squirrel Glider Species Credits	1,643 (due to clearance of 74.7 ha)	-	A	1,643 (100%)	-	0	Yes
Koala Species Credits	1,308 (due to clearance of 50.3 ha)	-	A	1,308 (100%)	-	0	Yes

[#] There is optionality around fulfilling the offset requirement for the Project, however Whitehaven would commence the mechanism for securing the offset requirements (regardless of the offset mechanism) within 5 years of commencement of clearing native woodland/forest (or to a timeframe specified by DP&E).

* Whitehaven-owned land.

[^] Example rehabilitation credit allocation, the vegetation type proposed to be rehabilitated would be specified in the MOP.

A This property is likely to contain potential habitat for this species. No species credits have yet been generated at the Whitehaven biobank site.

- creating new credits by establishing a potential offset area at the Mount Somner property; and
- satisfying the residual credit requirement through additional credits acquired, retired, converted to the Biodiversity Conservation Fund, or supplementary measures.

There is a large amount of suitable vegetation in the relevant IBRA subregions and habitat in NSW (for the species credit species and relevant MNES), such that it would be feasible for Whitehaven to fulfil the offset requirements for the Project within a reasonable timeframe.

A much greater area of habitat would be conserved in perpetuity as a result of the Project than the area of habitat that would be disturbed by the Project. For example, the Project would conserve in the order of 510 ha of habitat for the Regent Honeyeater (~1:10.84 disturbance to offset ratio), 231.4 ha of habitat for the Squirrel Glider (~1:3 ratio) and 184 ha of habitat for the Koala (~1:3.65 ratio) (Table 39).

6.2.2.6 Modified Offset Area 5

The Project rail spur would traverse the northern portion of Offset Area 5 (Figure 19). It is proposed that the boundary of Offset Area 5 is revised to include further habitat to the south of the approved Offset Area 5 boundary (Figure 19). Table 47 provides a comparison of the vegetation communities in the approved, versus modified Offset Area 5. The modified Offset Area 5 is 13 ha larger than the approved Offset Area 5.

Table 47
Comparison of the Vegetation Communities in the Approved and Modified Offset Area 5

BVT	Vegetation Community	Original Area (ha)*	Modified Area (ha)^	Difference (ha)
NA114	Bluegrass - Redleg Grass - Common Woodruff clay plain grassland of northern Brigalow Belt South Bioregion	27	21	-6
NA185	Poplar Box Woodland on Alluvial Clay Soils	-	14	14
	Poplar Box Woodland on Alluvial Clay Soils (Derived Native Grassland)	0	6	6
NA237	Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion	25	20	-5
NA181	Plains Grass on black cracking clay	-	4	4
Total		52	65	13

* Based on vegetation mapping by Niche in correspondence between Whitehaven and the NSW Department of Planning and Infrastructure (DP&I) (now the NSW Department of Planning and Environment [DP&E]) (i.e. a letter dated 3 December 2013).

^ Based on vegetation mapping by Niche in correspondence between Whitehaven and the NSW Department of Planning and Infrastructure (DP&I) (now the NSW Department of Planning and Environment [DP&E]) (i.e. a letter dated 3 December 2013) and Hunter Eco (2018c).

6.2.3 NSW Offset Policy Principles

Table 48 provides a reconciliation of the Biodiversity Offset Strategy against the offset principles from the NSW Offset Policy (OEI, 2014b).

Table 48
Reconciliation of the Offset Areas against the NSW Offset Policy Principles

NSW Offset Policy Principles	Elements of the Project Offset that Address these Requirements
<i>Principle 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.</i>	Impact avoidance and mitigation measures are described in Section 5.1.
<i>Principle 2: Offset requirements should be based on a reliable and transparent assessment of losses and gains.</i>	The offset requirements have been calculated using the OEH Credit Calculator and the FBA (OEH, 2014a).
<i>Principle 3: Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.</i>	The offset strategy described for the Project (i.e. use of mine site rehabilitation, acquisition and retirement of credits, additional land-based offsets, supplementary measures and/or contribution to a fund) has been developed in accordance with the requirements of the FBA to target biodiversity values that would be lost as a result of the Project.
<i>Principle 4: Offsets must be additional to other legal requirements.</i>	The implementation of the offset strategy is beyond existing requirements.
<i>Principle 5: Offsets must be enduring, enforceable and auditable.</i>	The implementation of the offset strategy is likely to be a condition of Development Consent. Any offset areas would be secured by BioBanking agreements, unless any of the offset areas are deemed suitable for transfer to the State of NSW.
<i>Principle 6: Supplementary measures can be used in lieu of offsets.</i>	The use of supplementary measures is described in Section 6.2.2.3.

6.2.4 Commonwealth Offset Requirements

The bilateral agreement made under section 45 of the EPBC Act between the Commonwealth of Australia and the State of NSW relating to environmental assessment (the NSW Assessment Bilateral Agreement – dated 26 February 2015), enables the Commonwealth Minister for the Environment to rely on assessment processes of the State of NSW in assessing actions referred under the EPBC Act.

As previously described, the NSW and Commonwealth assessment footprints/areas are slightly different because a portion of the Approved Mine (previously assessed under the State) is being assessed under the Commonwealth because it was not previously referred. As a result, the OEH Credit Calculator has calculated a larger Regent Honeyeater and Koala credit requirement for the Commonwealth Assessment Footprint (Table 30) compared to the NSW Assessment Footprint (Table 39).

In regard to the offset for the Project, the portion of the Approved Mine (previously assessed under the State) has already been offset. It is reasonable that the existing biodiversity offset strategy applies to this portion of the Commonwealth Assessment Footprint because:

- the existing biodiversity offset strategy was provided for the same disturbance footprint;
- the existing biodiversity offset strategy was not relevant to the previously referred Vickery Coal Project (EPBC 2012/6263) (outside of the Commonwealth Assessment Footprint) as it was determined to be not a Controlled Action if implemented in a particular manner; and
- the existing biodiversity offset strategy provides for the enhancement and conservation of habitat for the threatened fauna relevant to the Project.

Table 49 summarises the potential habitat clearance for the Swift Parrot, Regent Honeyeater and Koala in the Commonwealth Assessment Footprint, as well as the proposed method of meeting the offset requirements.

Table 49
Commonwealth Summary of Credit Requirements and Proposed Offset Methods

Species	Conservation Status ¹		Potential Habitat Clearance within the Commonwealth Assessment Footprint (ha) (Tables 29 and 30)	Proportions of the Potential Habitat Clearance Inside and Outside the NSW Assessment Footprint	Offset Requirement ²	Proposed Offset Areas 6, 7 and 8* (Tables 46 and 48)	Mount Somner Property* (Tables 47 and 48)	Existing Offset Strategy (Section 6.1)*	Offset Requirement Met
	BC Act	EPBC Act							
Swift Parrot	E	CE	104.7	N/A	Ecosystem credits (Table 29)	Ecosystem credits	Ecosystem credits	N/A	Yes
Regent Honeyeater	CE	CE	75.2	48.1 ha inside NSW Assessment Footprint	3,703 species credits (Table 48)	2,051 (~55%) (Table 48)	1,652 (~45%) (Table 48)	N/A	Yes
				27.1 ha outside NSW Assessment Footprint	2,087 species credits (293.9 ha)	-	-	293.9 ha ³	Yes
Koala	V	V	80.9	50.3 ha inside NSW Assessment Footprint	1,308 species credits (Table 48)	1,308 (100%) (Table 48)	-	N/A	Yes
				30.6 ha outside NSW Assessment Footprint	795 species credits (112 ha)	-	-	112 ha ⁴	Yes

* Whitehaven-owned land.

+ Source: Whitehaven letter to DP&I dated 3 December 2013; Niche (2013).

¹ Threatened species status under the BC Act and EPBC Act (current as at July 2018).

² Species credit equation in the FBA used to calculate offset ratio.

³ Approximately 1,256 ha of habitat for the Regent Honeyeater is within the existing biodiversity offset areas.

⁴ Approximately 1,224 ha of habitat for the Koala is within the existing biodiversity offset areas.

In regard to the existing biodiversity offset strategy, Equation 6 of the FBA was applied to determine the offset ratio relevant to the Swift Parrot, Regent Honeyeater and Koala to estimate the area of land (ha) that would be required to offset the clearance within this additional area.

Commonwealth Offset Principles

A reconciliation of the Biodiversity Offset Strategy against the Commonwealth offset principles is presented in Table 50.

Table 50
Reconciliation of the Biodiversity Offset Strategy against the Commonwealth Offset Principles

Offset Principles ¹	Elements of the Project Offset that Address these Requirements
<i>Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environmental law and affected by the action.</i>	<p>NSW Offset Policy (OEH, 2014b) aims to provide security and certainty for offsets, ensure adequate funding for offset site management and have clear monitoring and reporting requirements. This allows agreed management actions to be undertaken and conservation outcomes achieved.</p> <p>The offset credit requirement calculation accounts for the Commonwealth Assessment Footprint where it coincides with the BAR Footprint. The woodland/forest within the portion of the Commonwealth Assessment Footprint outside of the BAR Footprint was covered by the Approved Mine (SSD-5000) and therefore subject to the existing biodiversity offset strategy.</p> <p>The Biodiversity Offset Strategy would therefore deliver an overall conservation outcome that improves or maintains the viability of the protected matters.</p>
<i>Be built around direct offsets but may include other compensatory measures.</i>	<p>A minimum of 90% of the Commonwealth offset requirements (Table 49) would be satisfied through acquiring or retiring credits under the BioBanking scheme, or via the existing Biodiversity Offset Strategy which incorporated land-based offsets. A maximum of 10% of the Commonwealth offset requirements (Table 49) would be satisfied through a contribution to the fund or supplementary measures.</p>
<i>Be in proportion to the level of statutory protection that applies to protected matters.</i>	<p>The NSW Offset Policy (OEH, 2014b), which was applied for the Project, accounts for the level of statutory protection (vulnerable to critically endangered) of the relevant protected matters in calculating the offset requirement. Similarly, the existing Biodiversity Offset Strategy accounted for the level of statutory protection to the matters which are relevant to the Commonwealth Assessment Footprint additional to the BAR Footprint.</p> <p>The land-based offset areas would satisfy at least 90% of the offset requirements for each threatened species and community potentially impacted by the Project.</p>
<i>Be of a size and scale proportionate to the impacts on the protected matter.</i>	<p>The size and scale of the offset would be determined using the NSW Offset Policy (OEH, 2014b). This would take into consideration specific attributes of the relevant protected matters and its habitat and the quality and importance of the habitat.</p> <p>In addition, the existing Biodiversity Offset Strategy is greater than 30 times the size of the impact on each matter relevant to the Commonwealth Assessment Footprint additional to the BAR Footprint.</p>
<i>Effectively account for and manage the risks of the offset not succeeding.</i>	<p>Measures to manage the biodiversity offset areas would provide for ongoing adaptive management in the unlikely event that the offset is not succeeding. The implementation of the offset strategy is likely to be a condition of Development Consent.</p>
<i>Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs.</i>	<p>The implementation of the offset strategy is beyond existing requirements, in that it is not part of any private conservation reserve system. The enduring protection that would be applied to the biodiversity offset areas are new and additional under duty of care or any environmental planning laws.</p>

Table 50 (Continued)
Reconciliation of the Biodiversity Offset Strategy
against the Commonwealth Offset Principles

Offset Principles ¹	Elements of the Project Offset that Address these Requirements
<i>Be efficient, effective, transparent, proportionate, scientifically robust and reasonable.</i>	<p>The offset areas would efficiently and effectively compensate for the impacts on the protected matters and help maintain the viability of the protected matters.</p> <p>Flora and fauna surveys of the offset areas would be, or have already been, undertaken to determine:</p> <ul style="list-style-type: none"> the area of the offset in comparison to the area of impact; the nationally threatened fauna and flora species present (or predicted to occur) and their conservation status; the connectivity and condition of the native vegetation/fauna habitat; and management actions and security for the biodiversity offset areas.
<i>Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.</i>	<p>Whitehaven intends to reach an agreement with the NSW Government so that the proposed biodiversity offset areas would be managed and protected long-term. Measures to manage and monitor offset areas would be provided and the implementation of the offset strategy is likely to be a condition of Development Consent.</p>

¹ SEWPaC, 2012a.

7 CONCLUSION

The impact avoidance, mitigation and offset hierarchy has been applied to the Project and the credit calculation has determined the offset requirement for clearance of native vegetation (woodland, forest and secondary/derived native grasslands) (ecosystem credit requirement) and the offset requirement for clearance of potential habitat for the Regent Honeyeater, Squirrel Glider and Koala (species credit requirements).

An offset strategy is described within this report that explains the ways in which the offset requirement can be met under the NSW Offset Policy (OEH, 2014b). OEH describes an objective of the NSW Offset Policy (OEH, 2014b) is to provide greater flexibility for proponents to meet their offset requirements while ensuring that the best and most credible offsets are provided.

8 REFERENCES

- Advisian (2018) *Vickery Extension Project Surface Water Assessment*. Prepared for Whitehaven Coal Limited.
- Benson JS (1996) *What is a Native Grassland?* National Herbarium of New South Wales.
- Birdlife Australia (2017) *Birdlife Australia database search within the following area: -30.7, 150.2; -30.7, 150.4; -30.9, 150.2; -30.9, 150.4*. Data Received: November 2017.
- Bureau of Meteorology (2018) *Atlas of Groundwater Dependent Ecosystems*.
- Cenwest Environmental Services (2011) *Vickery Coal Project Baseline Fauna Survey*, Cenwest Environmental Services, Bathurst New South Wales, September 2011.
- Countrywide Ecological Service (2004) *Flora Study of 'The Canyon' Area Extension Whitehaven Coal Mine via Gunnedah NSW*.
- Countrywide Ecological Service (2006) *Whitehaven Canyon Extension: Pre-start Fauna Survey Early Autumn 2006*.
- Countrywide Ecological Service (2007a) *Whitehaven Coal Mine Canyon Extension Pre-start Survey Late-Summer 2007*.
- Countrywide Ecological Service (2007b) *Belmont Coal Project, via Gunnedah, Flora Assessment*. Prepared for Whitehaven Coal Limited, Brisbane Queensland, August 2007.
- Countrywide Ecological Service (2007c) *Belmont Coal Project, via Gunnedah, Fauna Assessment*. Prepared for Whitehaven Coal Limited, Brisbane Queensland, August 2007.
- Countrywide Ecological Service (2008) *Flora Monitoring Report Whitehaven Coal Mine – 2008*.
- Countrywide Ecological Service (2009a) *Flora Monitoring Report Canyon Coal Mine – 2009*.
- Countrywide Ecological Service (2009b) *Fauna Monitoring Report Canyon Coal Mine – 2009*.
- Countrywide Ecological Service (2010) *Flora Monitoring Report Canyon Coal Mine – 2010*.
- Department of Environment and Climate Change (2007) *Threatened Species Assessment Guidelines: The Assessment of Significance*, New South Wales Department of Environment and Climate Change, Hurstville.
- Department of Environment and Climate Change (2008) *NSW State Recovery Plan for the Koala*.
- Department of Environment and Climate Change (2009) *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians*, New South Wales Department of Environment and Climate Change, Hurstville.
- Department of Environment and Conservation (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft*, New South Wales Department of Environment and Conservation, Sydney.

Department of Environment, Water, Heritage and the Arts (2010a) *Survey Guidelines for Australia's Threatened Bats*.

Department of Environment, Water, Heritage and the Arts (2010b) *Survey Guidelines for Australia's Threatened Birds*.

Department of Environment, Water, Heritage and the Arts (2010c) *Survey Guidelines for Australia's Threatened Frogs*.

Department of Planning (1995). *Circular B35 State Environmental Planning Policy no. 44 – Koala Habitat Protection*.

Department of Primary Industries Water (2017) *Strahler Stream Order Mapping*.

Department of Sustainability, Environment, Water, Population and Communities (2011a) *Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*.

Department of Sustainability, Environment, Water, Population and Communities (2011b) *Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*.

Department of Sustainability, Environment, Water, Population and Communities (2012a) *Environment Protection and Biodiversity Conservation Act, 1999 Environmental Offsets Policy*.

Department of the Environment (2013) *Matters of National Environmental Significance Significant Impact Guidelines 1.1*.

Department of the Environment (2014b) *EPBC Act Referral Guidelines for the Vulnerable Koala (Combined Populations of Queensland, New South Wales and the Australian Capital Territory)*.

Department of the Environment (2016) *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia)*.

Department of the Environment and Energy (2017) *Protected Matters search for the following area: -30.45, 150.64; -30.45, 149.89; -31.02, 149.89; 31.02, 150.64*. Data received: August 2017.

Eco Logical Australia (2013) *Biodiversity Offset Management Plan for the Whitehaven Regional Biodiversity Offset Site*. Prepared for Whitehaven Coal Limited.

Eco Logical Australia (2015) *Canyon Coal Mine Rehabilitation Monitoring Report*. Report prepared for Whitehaven Coal Limited.

Eco Logical Australia (2016) *Canyon Coal Mine Rehabilitation Monitoring Report*. Report prepared for Whitehaven Coal Limited.

Eco Logical Australia (2018) *Vickery Extension Project - Aquatic Ecology Assessment*. Prepared for Whitehaven Coal Limited.

Eco Logical Australia (2017a) *Rocglen Coal Mine Rehabilitation Monitoring Report*. Report prepared for Whitehaven Coal Limited.

- Eco Logical Australia (2017b) *Tarrawonga Coal Mine Rehabilitation Monitoring Report*. Report prepared for Whitehaven Coal Limited.
- FloraSearch (2018) *Vickery Extension Project Baseline Flora Report*. Prepared for Whitehaven Coal Pty Ltd.
- Future Ecology (2018) *Vickery Extension Project Threatened Fauna Survey Report*. Prepared for Whitehaven Coal Limited.
- Geoff Cunningham Natural Resource Consultants (2004) *Flora Study of 'The Canyon' Area Extension Whitehaven Coal Mine via Gunnedah NSW*.
- Geoff Cunningham Natural Resource Consultants (2006) *Whitehaven Coal Mine, Gunnedah Third Monitoring Report – May, 2006*.
- Geoff Cunningham Natural Resource Consultants (2007) *Whitehaven Coal Mine, Gunnedah Fourth Monitoring Report – May, 2007*.
- Geoff Cunningham Natural Resource Consultants (2008) *Flora Monitoring Report Whitehaven Coal Mine – 2008*.
- Geoff Cunningham Natural Resource Consultants (2009) *Flora Monitoring Report Canyon Coal Mine – 2009*.
- Geoff Cunningham Natural Resource Consultants (2010) *Flora Monitoring Report Canyon Coal Mine – 2010*.
- GTA Consultants (2018) *Vickery Extension Project Gunnedah Basin, NSW Road Transport Assessment*. Prepared for Whitehaven Coal Limited.
- Hunter Eco (2018a) *Offset Areas 6, 7, and 8 BioBanking Assessment Report*. Prepared for Whitehaven Coal.
- Hunter Eco (2018b) *Mount Somner Property Flora Report*. Prepared for Whitehaven Coal.
- Hunter Eco (2018c) *Ingleburn Property Flora Report*. Prepared for Whitehaven Coal.
- HydroSimulations (2018) *Vickery Extension Project Groundwater Assessment*. Prepared for Whitehaven Coal Limited.
- Keith DA (2004). *Ocean Shores to Desert Dunes. The Native Vegetation of New South Wales and the ACT*. Department of Environment and Conservation, Sydney.
- Kendall and Kendall (2011) *Vickery South Coal Project - Fauna Assessment Briefing Note*. Unpublished report prepared for R.W. Corkery & Co. Pty Limited.
- Mitchell, P.B. (2002) *NSW Ecosystems Study: Background and Methodology* (Unpublished).
- Niche Environment and Heritage (2012) *Willeroi East Offset Area Flora and Fauna Assessment*. Prepared for Whitehaven Coal Limited.
- Niche Environment and Heritage (2013) *Vickery Coal Project Environmental Impact Statement. Appendix E: Ecological Assessment*. Whitehaven Coal, Sydney.
- Niche Environment and Heritage (2014) *Boggabri Coal Mine - Biodiversity Offsets Audit*. Report to Boggabri Coal Pty Ltd.

- New South Wales Office of Water (2012a) *New South Wales State Groundwater Dependent Ecosystem Policy*.
- New South Wales Office of Water (2012b) *Risk Assessment Guidelines for Groundwater Dependent Ecosystems*.
- Office of Environment and Heritage (2014a) *Framework for Biodiversity Assessment. NSW Biodiversity Offsets Policy for Major Projects*.
- Office of Environment and Heritage (2014b) *NSW Biodiversity Offsets Policy for Major Projects*.
- Office of Environment and Heritage (2014c) *BioBanking Assessment Methodology 2014*. September 2014.
- Office of Environment and Heritage (2015a) *Framework for Biodiversity Assessment – Linear Module*.
- Office of Environment and Heritage (2015b) *Border Rivers Gwydir / Namoi Regional Native Vegetation Mapping. Technical Notes*. NSW Office of Environment and Heritage, Sydney.
- Office of Environment and Heritage (2016a) *Credit Calculator for Major Projects and BioBanking Operational Manual*
- Office of Environment and Heritage (2017a) *NSW Vegetation Information System: Classification*.
- Office of Environment and Heritage (2017b) *Archived BioMetric and Threatened Species Profiles Datasets*.
Website: <http://www.environment.nsw.gov.au/projects/biometric-dataset.htm>
[Accessed January 2018].
- Office of Environment and Heritage (2017c) *BioNet Atlas of NSW Wildlife – Database Records for the Following Area: -30.45, 150.64; -30.45, 149.89; -31.02, 149.89; 31.02, 150.64*
- Office of Environment and Heritage (2018a) *Biodiversity Credits Register*.
- Office of Environment and Heritage (2018b) *Biobank Site Expressions of Interest Register*.
- Office of Environment and Heritage (2018c) *Credits Wanted Register*.
- Parsons Brinckerhoff (2010) *Continuation of Boggabri Coal Mine – Biodiversity Impact Assessment*.
- Phillips, S and Callaghan, J. (2011) *The Spot Assessment Technique: A Tool for Determining Localised Levels of Habitat Use by Koalas Phascolarctos cinereus*. Australian Zoologist, Volume 35(3).
- Ramboll Group (2018) *Vickery Extension Project Air Quality and Greenhouse Gas Assessment*. Prepared for Whitehaven Coal Limited.
- Resource Strategies (2018) *Vickery Extension Project Visual Assessment*. Report prepared for Whitehaven Coal Limited.
- RPS Harper Somers O'Sullivan (2010) *Flora and Fauna Assessment for Proposed Rocglen Coal Mine Extension Project*.
- Tarrawonga Coal Pty Ltd (2012) *Tarrawonga Coal Project Environmental Assessment*.
- Vallee, L., Hogbin, T., Monks, L. Makinson, B., Matthes, M. and Rossetto, M. (2004) *Guidelines for the Translocation of Threatened Plants in Australia*. Australian Network for Plant Conservation, Canberra.
- Whitehaven Coal Limited (2011) *Rocglen Coal Mine Extension Project Environmental Assessment*.

Whitehaven Coal Limited (2013) *Vickery Coal Project Environmental Impact Statement*.

Whitehaven Coal Limited (2015) *Maules Creek Coal Mine Revised New South Wales Biodiversity Offset Strategy*.

Whitehaven Coal Limited (2018) *Vickery Extension Project Environmental Impact Statement*.

Wilkinson Murray Pty Limited (2018) *Vickery Extension Project Environmental Impact Statement Noise and Blasting Assessment*. Prepared for Whitehaven Coal Limited.