VICKERY EXTENSION PROJECT

KOALA PLAN OF MANAGEMENT

Document History

Edition	Rev.	Comments	Date
1	0	Initial Draft Document	
1	1	Final Document	October 2019

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Whitehaven obtained the Development Consent for the Vickery Coal Project (VCP) in 2014, for development of the Vickery Coal Mine (VCM). The Vickery Extension Project (the Project) is an extension of the VCM, including development of a rail spur and on-site coal handling and preparation plant (CHPP). The VCM is owned by Whitehaven Coal Limited (Whitehaven) and is located approximately 25 kilometres (km) north of Gunnedah, in New South Wales (NSW).

During fauna surveys undertaken for the Project Environmental Impact Statement (EIS) (Whitehaven 2018), Future Ecology (2018) identified potential habitat and core habitat for the Koala (*Phascolarctos cinereus*) within the Project area and wider study area. Koalas are listed as vulnerable under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In recognition of this, a Koala Plan of Management (PoM) has been prepared for the VCM.

The aim of the Koala PoM is to provide management strategies to minimise potential adverse impacts that may occur to the Koala and/or its habitat as a result of the Project. The PoM has been designed to focus on initial actions that are to be implemented for the Project, and the PoM will be reviewed within two years of Development Consent being granted for the Project. This Koala PoM has been prepared in accordance with the relevant provisions of *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44).

The Project area is located in a predominantly cleared landscape that has been subject to past and present agricultural land uses, mainly livestock grazing with some dry land cropping. As such, the extant native woodland/forest is highly fragmented with the largest continuous patches of woodland/forest immediately to the east of the proposed mining area in Vickery State Forest and to the west along the Namoi River.

Several fauna surveys have been undertaken within the Project area or nearby surrounds since 2002. Future Ecology (2018) undertook targeted surveys for the Koala and recorded the species outside the study area, most likely in vegetation adjacent to the Namoi River. A review of available data indicates that a single Koala record exists within the Project area, occurring within the footprint of the Project rail spur (Kendall & Kendall 2011). Three additional records occur within 1 kilometre of the Project area, predominantly in vegetation along the Namoi River.

Consistent with the *Archived BioMetric and Threatened Species Profiles Datasets* (NSW Office of Environment and Heritage [OEH] 2017), recovery plan (DECC 2008) and SEPP 44, the following vegetation communities were identified as providing potential Koala habitat in the study area (Whitehaven 2018):

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

Dr Colin Bower (FloraSearch) reviewed which vegetation communities in the Project area could qualify as potential Koala habitat as defined in SEPP 44. Areas of potential Koala habitat on the Project area had White Box (*E. albens*) and Poplar Box (*E. populnea*) forming at least 15% of the upper strata component. Secondary feed trees were also recorded and included Pilliga Box (*E. pilligaensis*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*) (FloraSearch 2018). Future Ecology (2018) concluded that the River Red Gum Woodland on the banks of the Namoi River constituted likely core habitat for the species.

Given the low number of Koala records within the Project area and nearby surrounds, and the highly fragmented nature of the habitats, it seems likely that usage of the habitat by Koalas is relatively low compared to other more intact habitats.

A number of management measures would be implemented throughout the Project including:

- *Project design and avoidance:* The Project has been designed to minimise impacts to areas of core Koala habitat, mature vegetation, and maximise the distance of operational areas from the Namoi River.
- *Koala Sightings and Register:* Inductions into the mine site would include education on Koala reporting. Whitehaven employees and contractors working on and adjacent to the mine would be asked to report any Koala sightings (including health/mortality observations if possible) and Whitehaven would maintain a documented Koala register.
- *Habitat management:* Measures will include pre-clearance and clearance surveys, weed mapping and control, feral animal monitoring and control, post-construction restoration of the River Red Gum Riparian Tall Woodland (NA193), and removal of unnecessary fencing. Removal of riparian vegetation will be limited to a 40m wide disturbance strip and completed within a 12-month period.
- *Sick, Injured and Relocation Management of Koalas:* Whitehaven commits to develop procedures for the handling, management of sick and/or injured Koalas identified at the VCM. A procedure would also be developed for relocation of healthy Koalas if found at the VCM.
- *Strike Management:* Whitehaven commits to implement speed limits within the VCM and install Koala warning signs, with locations based on results from the initial monitoring program and Koala sightings register.
- *Monitoring programs:* Initial monitoring would be undertaken using a range of methods, and results would inform the methods and locations of ongoing monitoring for the life of the VCM.
- *Local Koala research:* Based on the results of monitoring, the Proponent would consult with academic researchers regarding application of habitat modification in restricted Koala habitat to benefit populations by increasing the carrying capacity of the environment and/or improving the health of Koalas.

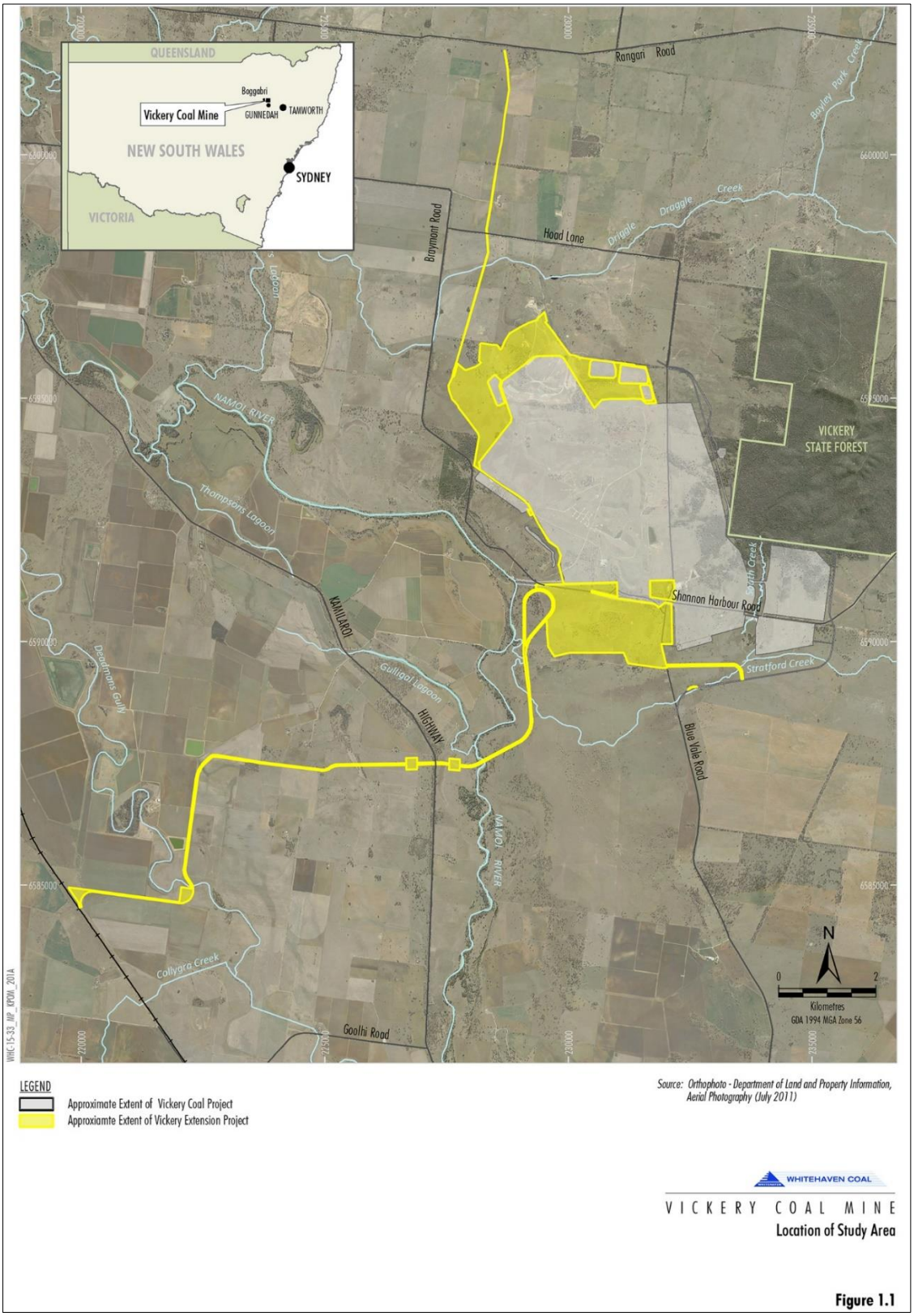
The PoM will be reviewed within two years of Development Consent being granted for the Project. A summary of Koala monitoring results will be reported within the Annual Review.

1 INTRODUCTION

Development Consent for the Vickery Coal Mine (VCM) was obtained in 2014. The Vickery Coal Mine is owned by Whitehaven Coal Limited (Whitehaven) and is located approximately 25 kilometres (km) north of Gunnedah, in New South Wales (NSW) (Figure 1.1). The Vickery Extension Project (the Project) is an extension of the approved Vickery Coal Mine.

The Project includes a physical extension to the approved VCM to gain access to additional run-of-mine (ROM) coal reserves, an increase in the footprint of waste rock emplacement areas, an increase in the approved ROM coal mining rate and construction and operation of an on-site coal handling and preparation plant (CHPP), train load-out facility and rail spur. This infrastructure would be used for the handling, processing and transport of coal from the VCM, as well as other Whitehaven mines. The Project area is the additional surface disturbance area outside of the approved VCM, an area of 775.8 hectares (ha).

During fauna surveys undertaken for the Project Environmental Impact Statement (EIS) (Whitehaven 2018), Future Ecology (2018) identified potential habitat and core habitat for the Koala (*Phascolarctos cinereus*) within the Project area (Figure 5.2). In recognition of this, Whitehaven committed to preparing a Koala Plan of Management (PoM) for the Project.


QUEENSLAND
Boggabri
Vickery Coal Mine
GUNNEDAH
TAMWORTH
NEW SOUTH WALES
SYDNEY
VICTORIA
Rangari Road
Boyley Park Creek
Braymoon Road
Hoad Lane
Draggle Creek
Draggle
Lagoon
NAMOI RIVER
VICKERY STATE FOREST
Thompsons Lagoon
KAMILAROI HIGHWAY
Shannon Harbour Road
Stratford Creek
Gulligal Lagoon
Deadmans Gully
Blue Vale Road
Collyara Creek
Goolhi Road
N
0
2
Kilometres
GDA 1994 MGA Zone 56
LEGEND
Approximate Extent of Vickery Coal Project
Approxiamte Extent of Vickery Extension Project
Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011)
WHITEHAVEN COAL
VICKERY COAL MINE
Location of Study Area
Figure 1.1

2 AIMS

The aim of the Koala PoM is to provide management strategies to minimise potential adverse impacts that may occur to the Koala and/or its habitat as a result of the Project. The PoM has been designed to initially focus on actions that are to be implemented within two years of Development Consent being granted for the Project, with additional strategies to be detailed in later versions. The PoM has been prepared in accordance with the relevant provisions of *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44).

3 METHOD

Reports and information related to the VCP and the Project were reviewed, along with relevant documents relating to the Koala in the nearby surrounds. Key sources of information utilised during preparation this PoM included:

- SEPP 44;
- Information requirements set out in clause 2.2.2 of Planning Circular B35;
- *Gunnedah Koala Strategy* (Gunnedah Council 2015);
- *Vickery Extension Project Environmental Impact Statement* (Whitehaven 2018);
- *NSW Recovery Plan for the Koala* (Department of Environment and Climate Change [DECC] 2008);
- *Gunnedah Koala Conservation Plan for the Landcare and Community Groups* (North West Ecological Services 2016);
- *NSW Koala Strategy* (NSW Office of Environment and Heritage [OEH] 2018c);
- searches of the *BioNet* database (OEH 2018a) for Koala records in the Project area or nearby surrounds;
- SPRAT Profile (DEE 2018);
- relevant scientific literature, such as Kavanagh *et al.* (2007), Lunney *et al.* (2012), Crowther *et al.* (2014); and
- other Koala PoM's in the Gunnedah LGA (e.g. Niche 2014).

Preliminary consultation with Gunnedah Shire Council was undertaken by Whitehaven to clarify the content of Koala PoM's that have been previously endorsed by Gunnedah Shire Council.

4 LEGISLATIVE CONTEXT

The Project is seeking Development Consent under Part 4 of the EP&A Act. It was referred under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and was declared a 'controlled action' on 14 April 2016 (Whitehaven 2018). The Project EIS addressed the Secretary's Environmental Assessment Requirements (SEARs), including an assessment of the likely adverse impacts on terrestrial flora and fauna in accordance with the NSW *Framework for Biodiversity Assessment* (FBA), and preparation of a Biodiversity Offset Strategy (Whitehaven 2018).

Koalas (*Phascolarctos cinereus*) are listed as vulnerable under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the EPBC Act. Due to the presence of potential and core Koala habitat within the Project area and surrounds, Whitehaven committed to preparing a Koala PoM for the Project, in accordance with SEPP 44 (Whitehaven 2018).

The SEPP 44 aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. The policy aims to achieve this by requiring:

- appropriate investigation of the presence of core Koala habitat for any development application;
- the preparation of a PoM to accompany a development application if core Koala habitat has been identified; and
- the preparation of a local environment study if a proposed rezoning of lands (other than to environmental protection) involves an area of potential or core Koala habitat.

Clause 9 of SEPP 44 (relating to the requirement to prepare a Koala PoM 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, Clause 9 of SEPP 44 does not apply to State Significant Developments, such as the Project. However, due to the presence of potential and core Koala habitat within the Project area and surrounds, Whitehaven committed to preparing a Koala PoM for the Project.

Circular B35 was issued by the then NSW Department of Planning (1995) to provide guidelines on the interpretation of SEPP 44. Table 4.1 provides a reconciliation of the requirements against this Koala PoM.

Table 4.1 Reconciliation of SEPP 44 requirements against this Koala PoM.

Koala Plan of Management Requirement*		Section Reference
I.	*An estimate of population size.*	Section 5.2
II.	*Identification of preferred feed tree species for the locality and the extent of resource available.*	Section 5.2, 5.3
III.	*An assessment of the regional distribution of koalas and the extent of alternative habitat available to compensate for that to be affected by the actions.*	Section 5.1, 5.2
IV.	*Identifications of linkages of core koala habitat to other adjacent areas of habitat and movement of koalas between areas of habitat. Provision of strategies to enhance and manage these corridors.*	Section 5.3
V.	*Identification of major threatening processes such as disease, clearance of habitat, road kill and dog attack which impact on the population. Provision of methods for reducing these impacts.*	Section 5.2 & 6
VI.	*Provision of detailed proposals for amelioration of impacts on koala populations from any anticipated development within zones of core koala habitat.*	Section 6
VII.	*Identification of any opportunities to increase size or improve condition of existing core habitat, this should include land adjacent to areas of identified core koala habitat.*	Section 6
VIII.	*The plan should state clearly what it aims to achieve (for example maintaining or expanding the current population size or habitat area).*	Section 2
IX.	*The plan should state the criteria against which achievement of these objectives is to be measured (for example, a specified population size in a specific time frame or the abatement of threats to the population).*	Section 7
X.	*The plan should also have provisions for continuing monitoring, review and reporting. This should include an identification of who will undertake further work and how it will be funded.*	Section 6 & 8

* As defined by *Circular B35 SEPP 44* (Department of Planning 1995).

In 2018, the NSW Government released the NSW Koala Strategy which aims to secure the threatened species in the wild for the next 100 years (OEH 2018c). The NSW Koala Strategy (OEH 2018c) outlines the actions to stabilise and then increase Koala numbers over the longer-term, ensuring genetically diverse and viable populations across NSW based on four key strategies of:

- Koala habitat conservation;
- conservation through community action;
- safety and health of Koala populations; and
- building our knowledge and education.

5 KOALAS IN THE GUNNEDAH LGA

5.1 SPECIES PROFILE

Koalas are tree-dwelling, medium-sized marsupials. The Koala occurs throughout eastern Australia, from north-eastern Queensland to south-eastern South Australia, and to the west of the Great Dividing Range (DECC 2008). In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range (OEH 2018b). The Koala's distribution is fragmented, occurring in a number of populations separated by cleared land or unsuitable habitat (Martin & Handasyde 1999; OEH 2018b).

The Koala is known to inhabit a range of eucalypt forest and woodland communities. These include coastal forests, the woodlands of the tablelands and slopes and riparian communities of the western plains (Phillips 2000). The quality of forest and woodland communities as habitat for Koalas is influenced by a range of factors, including species and size of trees present, structural diversity of the vegetation, soil nutrients, climate, rainfall, and size and disturbance history of the habitat patch (DECC 2008). Throughout NSW, Koalas are known to feed upon up to 70 different Eucalyptus species. In any one area, Koalas rely primarily on regionally specific primary and/or secondary food tree species (all of which are Eucalyptus species), which form the bulk of the diet (DECC 2008). They utilise other species including non-eucalypts for shelter and a supplementary diet (DECC 2008).

Koalas are solitary and occupy home ranges that vary depending on the habitat that they occupy. Some habitats are only occupied sporadically in response to background climatic conditions, stochastic events (i.e. fire) or behavioural ecology (i.e. dispersing males) (Kavanagh & Stanton 2012, Ellis *et al.* 2011, Ellis *et al.* 2010). Home ranges for the species are highly variable, even within regions. Studies investigating use of plantations in the Gunnedah LGA have observed two male Koalas with home ranges between 200 and 500 ha in area (Kavanagh & Stanton 2012). Within those reported ranges, the two male Koalas used 12 and 39 hectares of the total area more 95% of the time. Other studies north of Gunnedah report home ranges of 12 ha for males and approximately 9 ha for females (Kavanagh *et al.* 2007). In other habitats within the LGA, home ranges are smaller and overlap resulting in population densities that are much higher than home range occupancy models would suggest. For example, in the Gunnedah LGA, population densities have been estimated at 0.3 Koalas per ha in some areas (Greenloaning Biostudies 2013 in Gunnedah Council 2015).

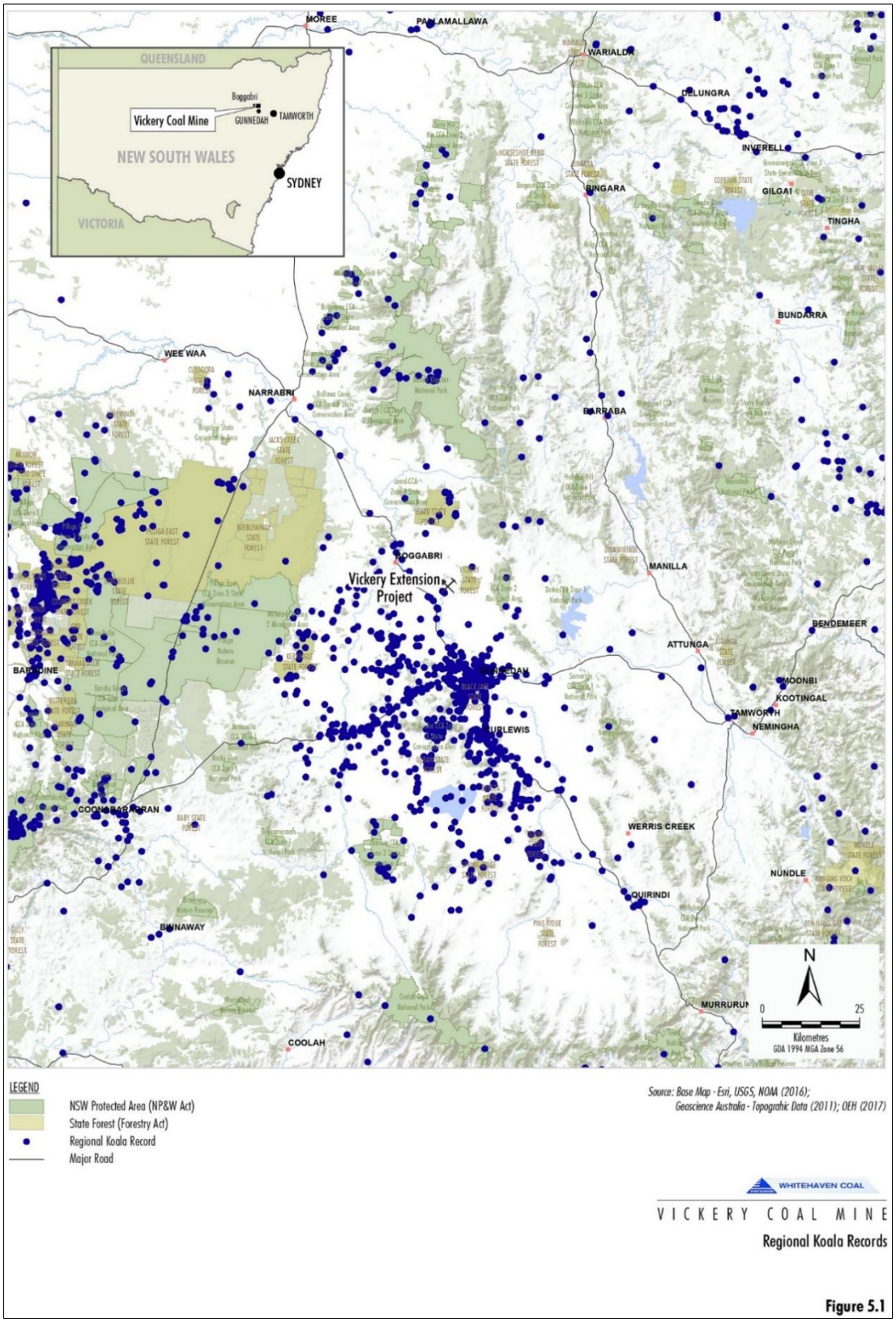
The species will breed throughout the spring and summer months. Females will reproduce from the age of two and give birth to a single joey after a 35-day gestation. Females can give birth to one joey a year. Young are usually weened by 12 months after which they will disperse. Female offspring will often form a new home range adjacent or overlapping their mothers. Male young will disperse and have been recorded traveling large distances before establishing a new home range. Koalas in the Pilliga Forest have been documented moving as far as 890 metres in a day, though the average movement was reported as 89 metres (Kavanagh *et al.* 2007).

5.2 GUNNEDAH KOALA POPULATION

There were only sporadic records of the Koala in the Gunnedah LGA in the years prior to the 1980's (Lunney *et al.* 2009). Regular detections during surveys in 1986-87 indicated that Koalas had established a population in the region and the Koala became a flagship species for revegetation programs (Lunney *et al.* 2012). The Koala population in the area steadily increased in the LGA between 1986 and 2009 (North West Ecological Services 2016). Studies conducted in areas revegetated in the LGA during the 1990's have shown that Koalas readily use replanted areas, especially if they are located close to existing remnant core habitat areas (Rhind *et al.* 2014, Kavanagh & Stanton 2012). There are now numerous records for the Koala throughout much of the Liverpool Plains (Figure 5.1). They utilise habitats ranging from riparian zones of major streams, floodplains, to lower slopes and hill remnants. However, the highest abundance appears to occur close to the township of Gunnedah, to the south and to the west (Figure 5.1). Fewer sightings of the species have been recorded in the vicinity of the Project area (north of the Namoi River) or nearby surrounds (Figure 5.1 & 5.2).

Throughout the Gunnedah LGA, there are important areas of Koala habitat under public ownership that are subject to varying levels of protection, however a greater proportion of Koala habitat is on privately owned land (Gunnedah Council 2015). Over 80 per cent of the vegetation within the LGA has been previously cleared, most of which occurred on the more fertile floodplains (Gunnedah Council 2015, Rhind *et al.* 2014). Remnant vegetation over the LGA comprises various types of eucalypt woodlands, with common tree species including White Box (*Eucalyptus albens*), Poplar Box (*E. populnea*), Tumbledown Gum (*E. dealbata*), White Cypress Pine (*Callitris glaucophylla*), ironbarks and River Red Gum (*E. camaldulensis*) along drainage lines.

Within the Gunnedah Shire, primary, secondary and supplementary species as documented for the Western Slopes and Plains Koala Management area (DECC 2008), are listed in Table 5.1.


QUEENSLAND
NEW SOUTH WALES
VICTORIA
Boggabri
Vickery Coal Mine
GUNNEDAH
TAMWORTH
SYDNEY
MOREE
PARKES
WARIALDA
DELUNGRA
INVERELL
BINGARA
GILGAI
TINGHA
BUNDARRA
WEE WAA
NARRABRI
BARRABA
BOGGABRI
Vickery Extension Project
MANILLA
BENDEMEER
ATTUNGA
BARADINE
MOONBI
KOOTINGAL
TAMWORTH
NEMINGHA
WERRIS CREEK
NUNDLE
QUIRINDI
BOOMAWAY
COOLAH
N
0
25
Kilometres
GDA 1994 MGA Zone 56
LEGEND
NSW Protected Area (NP&W Act)
State Forest (Forestry Act)
Regional Koala Record
Major Road
Source: Base Map - Esri, USGS, NOAA (2016);
Geoscience Australia - Topographic Data (2011); OEH (2017)
WHITEHAVEN COAL
VICKERY COAL MINE
Regional Koala Records
Figure 5.1

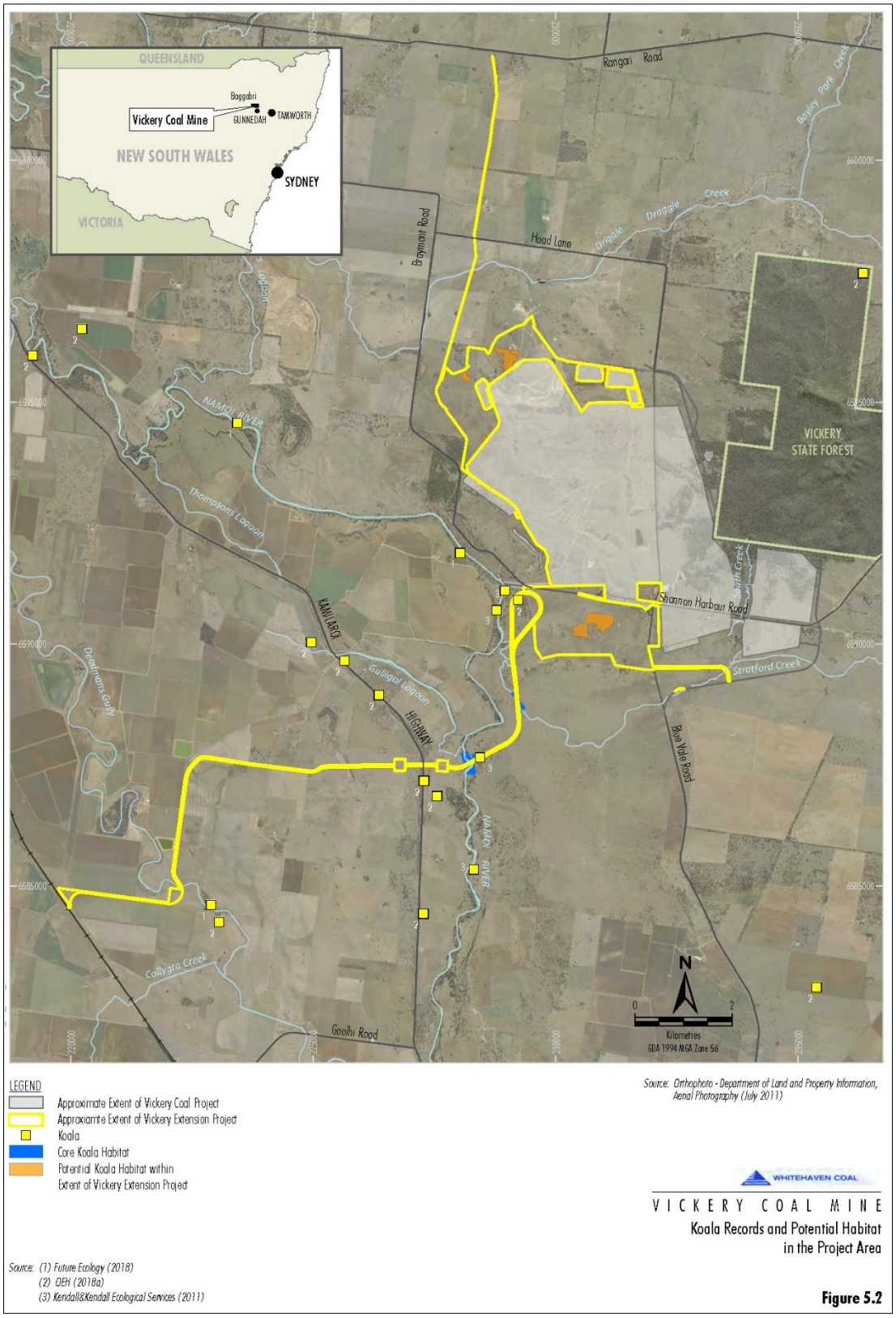

QUEENSLAND
Boggabri
Vickery Coal Mine
GUNNEDAH
TAMWORTH
NEW SOUTH WALES
SYDNEY
VICTORIA
Rangari Road
Braymont Road
Road Lane
Draggle Creek
Bayley Park Creek
VICKERY STATE FOREST
NAMOI RIVER
Thompsons Lagoon
KAMILAROI HIGHWAY
Gulligal Lagoon
Deadmans Gully
Shannon Harbour Road
Stratford Creek
Blue Vale Road
Collygra Creek
Goolhi Road
N
0
2
Kilometres
GDA 1994 MGA Zone 56
LEGEND
Approximate Extent of Vickery Coal Project
Approximate Extent of Vickery Extension Project
Koala
Core Koala Habitat
Potential Koala Habitat within Extent of Vickery Extension Project
Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011)
WHITEHAVEN COAL
VICKERY COAL MINE
Koala Records and Potential Habitat in the Project Area
Source: (1) Future Ecology (2018)
(2) OEH (2018a)
(3) Kendall&Kendall Ecological Services (2011)
Figure 5.2

Table 5.1 Koala feed tree species in the Western Slopes and Plains Koala Management Area

Food tree category	Food tree species
Primary Food Trees	River red gum *E. camaldulensis* *
	Coolabah *E. coolabah*
Secondary Food Trees	Dirty gum *E. chloroclada*
	Blakely's red gum *E. blakelyi*
	Bimble box *E. populnea* *
	Apple-topped box *E. bridgesiana*
	Pilliga box *E. pilligaensis*
	Black box *E. largiflorens*
	Fuzzy box *E. conica*
	Mallee red gum *E. nandewarica*
	Western grey box *E. macrocarpa*
	E. vicina
	Yellow box *E. melliodora*
	E. volcanica
	White box *E. albens* *
	Red box *E. polyanthemos*
	Dwyer's red gum *E. dwyeri*
	Orange gum *E. prava*
	Tumbledown gum *E. dealbata*
Supplementary Food Trees	Red Stringybark *E. macrorhyncha*
	Narrow-leaved stringybark *E. sparsifolia*

Note: * listed on Schedule 2 of SEPP 44 as a feed tree species.

In addition to the species identified in Table 5.1, studies within the region have documented use of a number of other trees species by Koalas. Kavanagh *et al.* (2007) recorded Koalas frequently in White Cypress Pine (*Callitris glaucophylla*), Pilliga Box (*Eucalyptus pilligaensis*), Narrow-leaved Ironbark (*E. crebra*), as well as Red gums (*E. blakelyi, E. camaldulensis*). Tree species such as White Cypress Pine (*C. glaucophylla*), were more frequently utilised as a day time shelter tree to escape hot weather, rather than representing an important feed tree (Kavanagh *et al.* 2007). Similarly, Crowther *et al.* (2014) found Koalas frequently utilised Kurrajong (*Brachychiton populneus*) and Belah (*Casuarina cristata*) during hotter days for shelter, and utilised box eucalypts and red gum more often at night for feeding.

Greenloaning Biostudies (2013 in Gunnedah Council 2015) undertook a detailed study of the Gunnedah Koala population, including an assessment of the extent of potential habitat throughout the Namoi Catchment Management Area (CMA) based on Regional Vegetation Mapping, as well as analysis of the approximate levels of Koala occupancy within the available habitat. The study determined eleven of the vegetation communities present within the CMA would likely qualify as Koala habitat, including areas with primary, secondary and supplementary feed trees. Data analysis generated a density estimate of approximately 0.3 Koalas per ha, implying a population size estimate of approximately 12,753 Koalas for their study area (Greenloaning Biostudies 2013 in Gunnedah Council 2015). The estimate was considered conservative given it was only based on mappable vegetation. The Gunnedah Koala population is recognised as the largest population in the western side of the Great Dividing Range (Gunnedah Council 2015, Crowther *et al.* 2009, Lunney *et al.* 2009).

Population modelling based on Koala activity data in the two focus areas at Curlewis and Gunnedah identified substantive areas of Core Koala Habitat in both areas (Greenloaning Biostudies 2013 in Gunnedah Council 2015). Much of the habitat exists as islands in a largely rural landscape, which is at risk of long-term degradation from weed invasion, grazing and subsequently low recruitment levels of food tree species. Consequently, the enhancement of existing habitat and improvement of habitat linkages to facilitate dispersal of individuals are considered crucial for increasing the likelihood of the ongoing persistence of the Gunnedah Koala population (Gunnedah Council 2015).

Throughout their range Koalas are subject to a wide range of threats, the presence and severity of which vary across their range (Threatened Species Scientific Committee 2006). The Koala Habitat Management Report (Greenloaning Biostudies 2013 in Gunnedah Council 2015) identified a number of issues that needed to be addressed within the Gunnedah Shire in order to ensure a sustainable future for Koalas inhabiting the Gunnedah area:

- *Existing fragmentation of Koala habitat;*
- *Long term degradation of Koala habitat through weed invasion and/or tree dieback;*
- *Potential lowering of the Koala carrying capacity of woodland habitat as larger trees are lost from the landscape;*
- *Isolation of the population and potential problems arising from inbreeding;*
- *The potential for increased domestic dog attack rates with increased urban development, such as in the two focus areas of west Gunnedah and Curlewis;*
- *Increasing heavy industrial development within the Gunnedah LGA and region, potentially resulting in a commensurate increase in vehicle movements and thus koala road mortalities; and*
- *Susceptibility of Koalas to stochastic events such as drought and fire, some aspects of which may be elevated by the uncertainty associated with climate change.*

The steady increase in the Koala population of the Gunnedah LGA experienced between 1986 and 2009 was halted in 2009 when a series of heatwaves hit the LGA. Studies have indicated that up to 25% of the population may have died during these heatwaves (Lunney *et al.* 2012, Mella *et al.* 2019).

5.3 KOALAS IN THE PROJECT AREA AND SURROUNDS

The Project area is located in a predominantly cleared landscape that has been subject to past and present agricultural land uses, mainly livestock grazing with some dry land cropping, historic mining and rehabilitation. As such, the extant native woodland/forest is highly fragmented with the largest continuous patches of woodland/forest immediately to the east of the proposed mining area in Vickery State Forest and to the west along the Namoi River.

For the Project, Future Ecology (2018) undertook targeted surveys for the Koala. During the surveys, Koalas were recorded calling from outside the study area, most likely within vegetation adjacent to the Namoi River. No individuals were recorded within the study area or Project area.

Several other fauna surveys associated with mineral developments have been undertaken within or close to the Project area since 2002, including surveys for the VCP (Cenwest Environmental Services 2011, Kendall & Kendall 2011, Niche 2013), Canyon Coal Mine (Countrywide Ecological Service 2004) and Rocglen Coal Mine (Countrywide Ecological Service 2007, RPS Harper Somers O'Sullivan 2010), as well as monitoring reports for the Rocglen Coal Mine (Eco Logical Australia 2017a) and Tarrawonga Coal Mine (Eco Logical Australia 2017b).

A review of available data indicates that a single Koala record exists within the Project area, occurring within the footprint of the Project rail spur (Kendall & Kendall 2011) (Figure 5.2). Three additional records occur within 1 km of the project area, predominantly in vegetation along the Namoi River (Figure 5.2).

The extent of potential Koala habitat in the Project area and surrounds is shown on Figure 5.2, along with records of the species. Consistent with the *Archived BioMetric and Threatened Species Profiles Datasets* (OEH 2017), recovery plan (DECC 2008) and SEPP 44, the following vegetation communities were identified as providing potential Koala habitat in the study area (Whitehaven 2008):

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

Dr Colin Bower (FloraSearch) reviewed which vegetation communities in the Project area could qualify as potential core Koala habitat as defined in SEPP 44. Areas of potential core Koala habitat on the Project area had White Box (*E. albens*) and Poplar Box (*E. populnea*) forming at least 15% of the upper strata component. Secondary feed trees (see Table 5.1) were also recorded and included Pilliga Box (*E. pilligaensis*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*) (FloraSearch 2018). Future Ecology (2018) concluded that the River Red Gum Woodland on the banks of the Namoi River constituted likely core habitat for the species (Whitehaven 2018).

The core Koala habitat identified on the banks of the Namoi River, which extends south and flows through the Gunnedah township, would likely provide some habitat connectivity with the Gunnedah Koala population. The Namoi River would also provide connectivity to the west, however elsewhere habitat linkages are poor.

6 KOALA MANAGEMENT STRATEGIES

The aim of this PoM is to provide management strategies to minimise potential adverse impacts that may occur to the Koala and/or its habitat as a result of the Project. Management strategies for the Koala outlined in this PoM initially focus on actions that are likely to be implemented prior to commencement of construction and within two years of Development Consent being granted for the Project. The Proponent commits to reviewing this PoM within two years of Development Consent being granted for the Project, including the analysis of outcomes and results of mitigation measures and monitoring, to inform any changes or recommendations.

6.1 PROJECT DESIGN AND AVOIDANCE

The Project had been designed to minimise impacts to areas of Core Koala Habitat. 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). Further, the Project rail spur crossing of the Namoi River would be constructed within a 40 m construction corridor length. The Project has also been designed to maximise the distance of operational areas from the Namoi River (i.e. reduced mining footprint close to the Namoi River).

There is approximately 50.3 ha of potential Koala habitat that would be impacted by the Project, of which approximately 1 ha contains primary feed trees (Whitehaven 2018). An additional 500 ha of potential Koala habitat would be retained within the wider region.

6.2 KOALA SIGHTINGS AND REGISTER

Inductions into the mine site would include education on Koala reporting. Whitehaven employees and contractors working on and adjacent to the mine would be asked to report any Koala sightings (including health/mortality observations if possible), and Whitehaven would maintain a documented Koala register. The Koala register can be made available to the DPI&E to include records into *BioNet* as required.

6.3 HABITAT MANAGEMENT

Whitehaven commits to implementing pre-clearance and clearance surveys of potential and core Koala habitat during vegetation clearance activities. If a Koala is identified during pre-clearance and clearance surveys the following habitat management measures may be applied (Department of Environment and Heritage Protection 2017):

- No trees with a Koala present will be cleared.
- Clearance of habitat would occur in stages, with a period of no clearing between each stage, to ensure Koalas have sufficient opportunity to move out of the site without human intervention.
- Appropriate habitat links will be maintained to allow for Koala movement from the sites.

Weed management is particularly important in areas with potential and core Koala habitat, new plantings (i.e. rehabilitation), and where natural regeneration may occur. For example, thick weed infestations or spiky weeds (e.g. Tiger pear [*Opuntia aurantiaca*], African Boxthorn [*Lycium ferocissimum*]) growing at the base of Koala feed trees may prevent Koalas from accessing the trees (North West Ecological Services 2016). The Proponent commits to undertaking weed mapping in potential and core Koala habitat found at the Project within two years of Development Consent being granted for the Project. The weed mapping will aim to quantify and map infestations of priority weeds listed under the *Biosecurity Act 2015*). Prioritised control will be identified from the results and will form a component of the Weed Mapping Report and will be detailed in the next review of this PoM.

Removal of riparian vegetation (i.e. core Koala habitat) at the Project rail spur crossing of the Namoi River will be limited to a 40m wide disturbance strip and completed within a 12-month period. Restoration of the River Red Gum Riparian Tall Woodland (NA193) impacted within the rail corridor would be undertaken in accordance with the VCM Biodiversity Management Plan. The revegetation process will include establishing a mix of potential feed trees as discussed in Section 5.2.

Redundant and derelict fences not required for ongoing management of the VCM would be removed (excluding fencing for stock management etc), to minimise the impacts of fences to Koala movement.

Threats to Koalas from feral/pest animals will be mitigated through the implementation of monitoring and control programs. As per the Project EIS (Whitehaven 2018), the Proponent commits to integrating the VCM into Whitehaven's routine Feral Animal Program.

In addition to the above, the following measures that relate to the VCP will also be implemented for the Project:

- vegetation clearing protocols;
- strategic fencing to exclude livestock and allow woodland regeneration;
- planting 50 trees per annum to provide woodland habitat;
- establishing 11 km of native vegetation woodland corridors;
- management of environmental and priority (formerly noxious) weeds;
- feral animal monitoring and control; and
- establishing native vegetation and fauna habitat on the mine rehabilitation.

6.4 MONITORING PROGRAMS

The Proponent commits to undertaking monitoring of Koalas in a staged approach for the Project.

Initial monitoring will expand upon baseline monitoring undertaken for the Project EIS (Whitehaven 2018), and involve a range of methods. Results of the initial monitoring will be used to inform the methods and locations of ongoing Koala monitoring throughout the life of the VCM. Ongoing monitoring would be detailed in the revision of this Koala PoM.

This staged approach to monitoring has been developed in response to the absence of Koala records identified during detailed baseline assessments; as well as low number of historical records found within the Project area.

Interpretation of monitoring results will consider the incidence of environmental conditions that could impact the local Koala population, including increased populations of feral predators and extreme heat waves.

6.5 LOCAL KOALA RESEARCH

Research has been undertaken in the Gunnedah LGA into whether Koala health improves and mortality reduces from habitat modification such as providing arboreal water sources (Mella *et. al.* in preparation/unpublished). If monitoring identifies that Koalas are being adversely impacted at the VCM, Whitehaven would consider consulting with academic researchers regarding application of habitat modification to benefit Koala populations by increasing the carrying capacity of the environment and/or improving the health of Koalas.

6.6 SICK, INJURED AND RELOCATION MANAGEMENT OF KOALAS

Whitehaven commits to developing procedures for the handling and management of sick and/or injured Koalas identified at the Project. The procedures that are developed will be detailed in the next revision of this PoM.

Whitehaven also commits to developing procedures for relocations of healthy Koalas if found at the Project, and are at risk of injury due to mining activities (e.g. vegetation clearing). These procedures would be incorporated into the next revision of this PoM.

6.7 STRIKE MANAGEMENT

The Proponent commits to implement speed limits within the Project (excludes public road and/or road diversions) to minimise the risk of Koala road injury or mortality. Speed limit signs and warning signs will be installed in suitable locations along roads to advise drivers of the speed limit and that Koalas may be present. The location of signage will be determined based on results of the initial monitoring program (Section 6.4) and Koala sightings register (Section 6.2).

7 PERFORMANCE CRITERIA

A summary of the key performance criteria is provided in Table 7.1.

Table 7.1 Key performance criteria

Mitigation Measures	Performance Criteria
Koala Sightings Register	Register established, operational, and made available to DPI&E as required.
Habitat Management	Pre-clearance surveys and monitoring programs implemented for vegetation removal. Weed mapping of potential and core Koala habitat undertaken and included within Weed Mapping Report. Restoration of River Red Gum Woodland undertaken in accordance with VCM Biodiversity Management Plan. Redundant fencing removed. Project area incorporated into Whitehaven's Feral Animal Program.
Local Koala Research	Consultation with academic researchers regarding application of habitat modification in Koala habitat, based on results of monitoring.
Sick, Injured and Relocation Management	Procedure for handling, management and relocation of sick and/or injured Koalas developed. Procedure for relocation of Koalas found within the VCM developed.
Strike Management	Implementation of speed limits. Koala warning signs installed.

7.1 CONTINGENCY MEASURES

If the monitoring program identifies that performance criteria are not being met, the relevant management strategies would be reviewed to identify potential additional measures. Additional measures could include (but are not limited to) implementing additional requirements for drivers in recorded 'high-risk' areas to prevent vehicle strikes and increasing the frequency of implementation of weed control measures in Koala habitat.

8 REVIEW OF THIS PLAN

The PoM will be reviewed within two years of Development Consent being granted for the Project. The review will consider the results of initial monitoring, success of management measures, and the Koala PoM will be revised where relevant.

9 REPORTING

A summary of Koala monitoring results will be reported within the Annual Review. Reporting will include relevant management measures, monitoring results, and any relevant improvement measures that may be proposed for the ensuing reporting period. The Annual Review is a publicly available document on the Whitehaven website.

10 REFERENCES

Cenwest Environmental Services (2011). *Vickery Coal Project Baseline Fauna Survey.* Cenwest Environmental Services, Bathurst New South Wales, September 2011.

Countrywide Ecological Service (2004). *Fauna Study and Assessment of the Proposed Canyon Extension Whitehaven Coal Mine near Gunnedah, NSW.*

Countrywide Ecological Service (2007). *Belmont Coal Project, via Gunnedah, Fauna Assessment*. Prepared for Whitehaven Coal Limited, Brisbane Queensland, August 2007.

Crowther, M. S., Lunney, D., Lemon, J., Stalenberg, E., Wheeler, R., Madani, G., Ross, K. A., and Ellis, M. (2014). Climate-mediated habitat selection in an arboreal folivore. *Ecography* **37**, 336–343.

Crowther M. S., McAlpine, C. A., Lunney, D., Shannon, I., and Bryant, J. V. (2009). Using broad-scale, community survey data to compare species conservation strategies across regions: a case study of the koala in a set of adjacent 'catchments'. *Ecological Management & Restoration* **10**, S88–S96.

Department of Environment and Climate Change (2008). *Approved NSW Recovery Plan for the Koala, November 2008*.

Department of Environment and Heritage Protection (2017). *State Government Supported Infrastructure Koala Conservation Policy July 2017*.

Department of Planning (1995). Circular B35 SEPP 44 Koala Plans of Management, 22 March 1995.

Department of the Environment and Energy (2018). SPRAT Profile: *Phascolarctos cinereus* (combined populations of Qld, NSW and the ACT) — Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory).
Website: http://www.environment.gov.au/cgi-in/sprat/public/publicspecies.pl?taxon_id=85104 [Accessed November 2018].

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.

Ellis, W., Bercovitch, F., FitzGibbon, S., Roe, P., Wimmer J., Melzer, A., & R. Wilson. (2011). Koala bellows and their association with the spatial dynamics of free-ranging koalas, *Behavioral Ecology*, Volume 22(**2**), 372–377.

Ellis, W, Melzer, A., Clifton, I., and F. Carrick (2010) Climate change and the koala *Phascolarctos cinereus*: water and energy. *Australian Zoologist,* **35** (2), 369-377.

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.

Greenloaning Biostudies Pty Ltd (2013). *Draft Gunnedah LGA (Part) Comprehensive Koala Plan of Management 2013*.

Gunnedah Council (2015). *Gunnedah Koala Strategy*. Endorsed by Council on 21 October 2015.

Kavanagh, R. P., and Stanton, M. A. (2012). Koalas use young *Eucalyptus* plantations in an agricultural landscape on the Liverpool Plains, New South Wales. *Ecological Management & Restoration* **13**, 297–305.

Kavanagh, Rod & A. Stanton, Matthew & E. Brassil, Traecey. (2007). Koalas continue to occupy their previous home-ranges after selective logging in Callitris–Eucalyptus forest. *Wildlife Research*. **34**. 10.1071/WR06126.

Kendall and Kendall (2011). *Vickery South Coal Project - Fauna Assessment Briefing Note*. Unpublished report prepared for R.W. Corkery & Co. Pty Limited. In: Whitehaven 2018.

Law, B., Brassil, T., Gonsalves, L., Roe, P., Truskinger, A. and McConville, A. (2018). Passive acoustics and sound recognition provide new insights on status and resilience of an iconic endangered marsupial (koala *Phascolarctos cinereus*) to timber harvesting. PLoS ONE 13(10): e0205075.

Law, B., Caccamo, G., Roe, P., Truskinger, A., Brassil, T., Gonsavles, L., McConville, A. and Stanton, M. (2017). Development and field validation of regional, management-scale habitat model: A koala *Phascolarctos cinereus* case study. *Ecology and Evolution,* 2017;00:1-15.

Lunney, D., Crowther M., Shannon, I., & Bryant J. V. (2009). Combining a map-based public survey with an estimation of site occupancy to determine the recent and changing distribution of the koala in New South Wales. *Wildlife Research* **36**, 262 – 273.

Lunney, D., Crowther, M., Lemon, D., Wheeler, E., Madani, G., Ross, K. A., & Ellis, M (2012). Koalas and climate change: a case study on the Liverpool Plains, north-west New South Wales Pp 150 - 168 in *Wildlife and Climate Change: towards robust conservation strategies for Australian fauna*. Ed. Daniel Lunney and Pat Hutchings. Royal Zoological Society of NSW, Mosman, NSW, Australia.

Martin, R. & Handasyde, K. (1999). The Koala: Natural history, conservation and management. Sydney, NSW: UNSW Press.

Mella, V., McArthur, C., Krockenberger, B., Frend, R., & Crowther, M. (2019). Needing a drink: Rainfall and temperature drive the use of free water by a threatened arboreal folivore. *PLoS ONE* 14(5): e0216964.

Niche Environment and Heritage (2013). *Vickery Coal Project Environmental Impact Statement. Appendix E: Ecological Assessment*. Whitehaven Coal, Sydney.

Niche Environment and Heritage (2014). *Koala Plan of Management – Mary's Mount Blue Metal Gravel Quarry*. Prepared for Quarry Products Pty Ltd.

North West Ecological Services (2016). *Gunnedah Koala Conservation Plan for the Landcare and Community Groups*. Report prepared for North West Local Land Services, October 2016.

Office of Environment and Heritage (2017). *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 (2018a). *BioNet Atlas of NSW Wildlife*.
Website: http://www.bionet.nsw.gov.au
[Accessed October 2018].

Office of Environment and Heritage (2018b). *OEH Threatened Species Profiles*.
Website: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10616
[Accessed October 2018].

Office of Environment and Heritage (2018c). *NSW Koala Strategy*, May 2018.

Phillips, S.S. (2000). Tree Species Preferences of the Koala *Phascolarctos cinereus* as a Basis for the Delineation of Management Areas for Recovery Planning in New South Wales. Unpublished report prepared for the Koala Recovery Plan. In: DECC (2008).

Rhind, S. G., Ellis, M. V., Smith, M., and Lunney, D. (2014). Do koalas *Phascolarctos cinereus* use trees planted on farms? A case study from north-west New South Wales, Australia. *Pacific Conservation Biology* **20**, 302–312.

RPS Harper Somers O'Sullivan (2010). *Flora and Fauna Assessment for Proposed Rocglen Coal Mine Extension Project*.

Threatened Species Scientific Committee (2006). Koalas – Advice to the Minister for Environment and Heritage from the Threatened Species Scientific Committee (the Committee) on Amendments to the list of Threatened Species under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), Department of the Environment and Heritage, Canberra.

Whitehaven Coal Limited (2018). *Vickery Extension Project Environmental Impact Statement, Appendix F Biodiversity Assessment Report and Biodiversity Offset Strategy*.