Appendix D

Biodiversity Assessment

Appendix D Biodiversity Assessment

Biodiversity assessment report

Modification 4 works | Bloomfield Colliery

Prepared for The Bloomfield Group | 1 November 2017

Biodiversity assessment report

Modification 4 works | Bloomfield Colliery

Prepared for The Bloomfield Group | 14 November 2017

Suite 6, Level 1, 146 Hunter Street
Newcastle NSW 2300

T +61 (0)2 4907 4800
F +61 (0)2 4926 1312
E info@emmconsulting.com.au

www.emmconsulting.com.au

Biodiversity assessment report

Final

Report J17089RP2 | Prepared for The Bloomfield Group | 14 November 2017

Prepared by	**Erin Lowe**	Approved by	**Nathan Garvey**
Position	Senior Ecologist	Position	Associate Ecologist
Signature		Signature	
Date	14/11/2017	Date	14/11/2017

Document Control

Version	Date	Prepared by	Reviewed by
1	10/11/2017	Erin Lowe	Nathan Garvey
2	14/11/2017	Erin Lowe	Nathan Garvey

T +61 (0)2 4907 4800 | F +61 (0)2 4926 1312

Suite 6 | Level 1| 146 Hunter Street | Newcastle | New South Wales | 2300 | Australia

www.emmconsulting.com.au

Table of contents

Table of contents *(Cont'd)*

Appendices

Tables

Figures

1 Introduction

1.1 Project background

The Bloomfield Open Cut Colliery is an existing open cut coal mine located south of East Maitland, approximately 20 km north-west of Newcastle (Figure 1.2). The Colliery is owned and operated by Bloomfield Group (Bloomfield).

Mining has occurred at the Bloomfield Open Cut Colliery for over 100 years and the mine currently operates in accordance with Project Approval (PA) 07_0087, which was originally granted in 2009 under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

PA 07_0087 has received three previous modifications under section 75W of the EP&A Act. These are:

- Modification 1, granted in May 2011, which extended the project approval area by 259 ha to allow for additional out-of-pit overburden emplacement, relocation of a power line corridor, and the upgrade and use of an alternative haul road;
- Modification 2, a minor administrative modification approved in March 2012 to amend the required date for submission of management plans; and
- Modification 3, which changed the areas of vegetation clearing covered by the mine's biodiversity offset area.

Bloomfield is currently seeking an additional modification (Mod 4) to facilitate the recovery of additional coal resources within the approved extraction area, and to extend the operational life of the mine from 2021 to 2030 (the proposal). As a part of the proposal, Bloomfield proposes to clear approximately 3.5 ha of rehabilitated landform, including 0.34 ha of native vegetation, for the proposed widening of a haul road and upgrade of a watercourse, and an additional 6.12 ha of vegetation for the facilitation of further extraction of coal resources within the Bloomfield Open Cut Colliery.

This Biodiversity Assessment Report (BAR) forms part of the application for consent modification (Mod 4). It documents the biodiversity assessment methods and results, the initiatives built into the proposal design to avoid and minimise biodiversity impacts, and the additional mitigation and management measures proposed, including offsets, to address any residual impacts not able to be avoided.

1.2 Assessment guidelines

On 22 March 2017, the Department of Planning and Environment (DPE) provided Secretary's Environmental Assessment Requirements (SEARs) for Mod 4. In relation to biodiversity, the SEARs require:

- *an assessment of any likely biodiversity impacts of the project having regard to any advice and/or guidelines (eg. the Framework for Biodiversity Assessment) from OEH or the Commonwealth Department of Environment and Energy, and*
- *any resulting offset strategy, prepared in accordance with OEH and DoEE requirements.*

1.3 Previous assessments summary

Previous ecological assessments have been undertaken to support the previous applications to modify Bloomfield's Project Approval (Hunter Eco 2010 & 2012). One of these assessments (Hunter Eco 2010) covered the 6.12 ha of vegetation proposed to be cleared to facilitate the further extraction of coal resources. This area is defined as the MNES study area and is shown in Figure 1.1. The MNES study area is located within the approved extraction footprint and was approved under Modification 1. Given that no vegetation clearing over and above that approved under PA 07_0087, as modified, it is considered that no further assessment under the NSW *Threatened Species Conservation Act 1995* (TSC Act) (now the *Biodiversity Conservation Act 2016* (BC Act)) is required to support the application for the MNES study area. Further assessment would only be required if the project is likely to cause additional impacts compared to that which has previously been assessed and approved.

Notwithstanding this, the previous ecology impact assessments for the MNES study area did not adequately assess protected matters listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Therefore EMM prepared an assessment of the potential impacts of vegetation clearance on Matters of National Environmental Significance (MNES) (EMM 2017), as listed under the EPBC Act, to support the Mod 4 application. For the purposes of a consolidated report as part of the application for Mod 4, the assessment of the potential impacts of the 6.12 ha of vegetation clearance on MNES within the MNES study area has been included within this BAR (Appendix A).

The remaining 3.5 ha of rehabilitated landform (including 0.34 ha of native vegetation) to be impacted by the proposed widening of a haul road and upgrade of a watercourse was rehabilitated before the existing PA 07_0087 was granted in 2009. Whilst this area is within the existing approval area for the mine, it is not part of the approved extraction or disturbance footprint. The PA area of approved disturbance, as modified, only included those areas of the larger existing Bloomfield Colliery site that were specifically required for active mining and other activities associated with the winning of coal. Rehabilitated areas that were within the existing mine lease and adjacent to the open cut pits were not included.

Because native vegetation will be cleared, consent modification (Mod 4) is required to permit additional clearing beyond the approved extraction or disturbance footprint. As this modification will increase the mine's approved disturbance footprint, further assessment of any likely biodiversity impacts of the project, having regard to guidelines such as the Framework for Biodiversity Assessment (FBA), is required to support the application (as per the SEARs). Hence the 3.5 ha of rehabilitated landform to be impacted by the proposal is assessed within this BAR.

1.4 Development proposal

1.4.1 Haul road and watercourse upgrade

Bloomfield proposes to clear approximately 3.5 ha of rehabilitated landform for the proposed widening of a haul road and upgrade of a watercourse, within the Bloomfield Open Cut Colliery. Bloomfield has identified the two areas, located within the north west of the Development site (Figure 1.1), that require upgrade comprising:

- upgrade of the haul road (widening) to allow for two way travel of large rear dump trucks. This will impact upon 0.8 ha of rehabilitated landform that is located to the north of the current haul road; and

- upgrade of the same haul road (widening) and adjacent previously rehabilitated watercourse. This will impact upon 2.7 ha of rehabilitated landform located to the south of the current haul road.

The study area is defined as the maximum area to be directly impacted by the proposal and any additional areas likely to be indirectly affected by the development. The development site is defined as the entire PA 07_0087 area. Both the study area and the development site are shown on Figure 1.1.

1.4.2 Further extraction of coal resources

Bloomfield proposes to clear an additional 6.12 ha of vegetation to facilitate the further extraction of coal resources. This area is defined as the MNES study area and is shown on Figure 1.1. The MNES study area has been assessed only for potential impacts of the vegetation clearance on MNES, as outlined in Section 1.3.

1.5 Site description

The development site is located south of East Maitland, within the Cessnock City Council Local Government Area (LGA) (refer to Figure 1.1). Mining has occurred on the development site for over 100 years, and the site contains haul roads, open pits, a coal handling and preparation plant, overburden dumps, a tailings dam, coal stockpiles, water storage facilities and a range of other surface infrastructure associated with the operating coal mine. The development site also contains areas of previously rehabilitated mining landform.

The study area, as shown in Figure 1.1, is within the existing approval area of the mine (the development site), but is not part of the approved extraction or disturbance footprint. The study area covers approximately 3.5 ha and is located north-east of the operating Creek Cut pit, as shown in Figure 1.1. The study area is bound by rehabilitated landform and haul roads associated with the current mine operations. The Bloomfield Colliery has undergone a staged process of rehabilitation since 1988. Some areas have been sown with native plant species while other areas have been sown with exotic grasses for stabilisation or to produce pasture. Within the study area, areas to the north-west of the haul road were rehabilitated to pasture in 1999, while areas to the south were rehabilitated in 1999 using native species. A patch of native forest occurs to the north of the study area, beyond the existing haul road and outside of the study area and development site.

Due to the long history of disturbance, there is a lack of natural watercourses within the development site. There are a series of diversion banks and channels that direct water into the main natural drainage system that runs through the development site, Four Mile Creek. Most of the operational mining areas at the development site are located within the catchment of Four Mile Creek. Within the study area, a previously rehabilitated watercourse occurs; the upgrade of this watercourse is proposed as a part of Mod 4.

The development site is within the:

- Sydney Basin Biogeographic Regionalisation for Australia (IBRA) region;
- Hunter IBRA subregion;
- Hunter-Central Rivers Catchment Management Area (CMA), and
- Cessnock City Council LGA.

1.6 Information sources

1.6.1 Publication and databases

In order to provide context for the development site, information about flora and fauna species, populations, communities and habitats from within 10 km (the locality) was obtained from the following databases:

- Office of Environment and Heritage (OEH) *BioNet Atlas of NSW Wildlife* (Bionet) for previous threatened species records (search undertaken 07/09/2017);
- Commonwealth Department of Environment and Energy (DoEE) *Protected Matters Search Tool* (PMST) for MNES, including threatened species likely to occur within the study area (search undertaken 07/09/2017); and
- The NSW Plant Community Types, as held within the Vegetation Information System (VIS) Classification 2.1 database.

The following reports were also reviewed:

- Bloomfield Colliery MNES Assessment (EMM 2017); and
- previous ecological assessments conducted for the Bloomfield Colliery (Hunter Eco 2010 & 2012, Australian Museum Consulting 2014).

1.6.2 Spatial data

Mapping was conducted using a hand-held GPS unit (GDA94), mobile table computers and aerial photo interpretation.

Aerial photography was supplied by NSW Land and Property Information (LPI) (dated 2016) and by Bloomfield.

Base map data was obtained from DFSI NSW databases, with cadastral data obtained from DFSI digital cadastral database. Mapping for stream orders was obtained from DPI (2015).

The following spatial datasets were utilised during the development of this report:

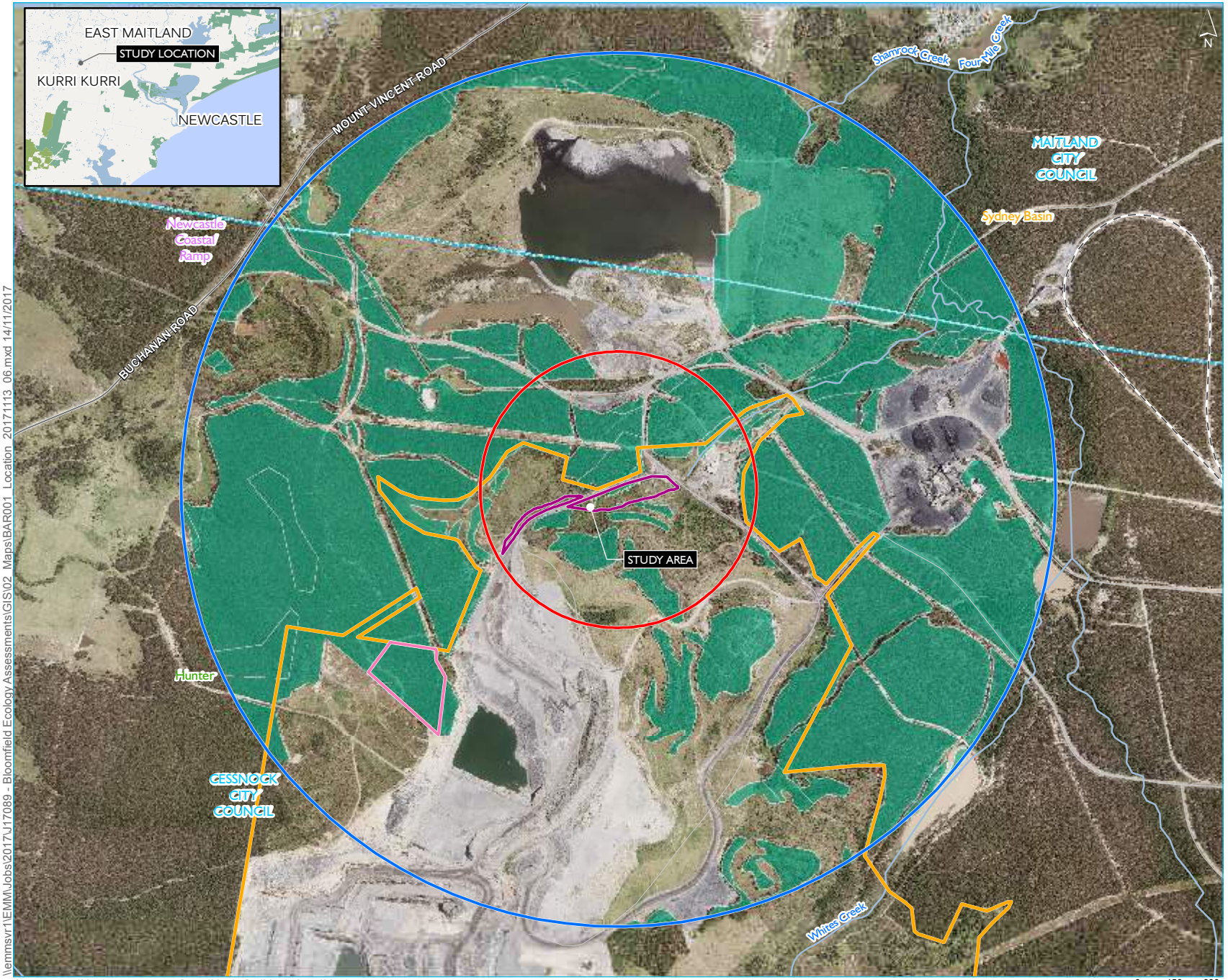
- Mitchell Landscapes Version 3.1 (OEH 2016a);
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7 (OEH 2016b); and
- State Environmental Planning Policy (SEPP) 14 Wetlands.

Mapping has been produced using a Geographic Information System (GIS; ArsGIS 10.5).

1.7 Additional legislative requirements

The project has been assessed against the key biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 199* (EPBC Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Threatened Species Conservation Act 1995* (TSC Act);
- *Biodiversity Conservation Act 2017* (BC Act);
- *Fisheries Management Act 1994* (FM Act), and
- *Biosecurity Act 2015* (BS Act).



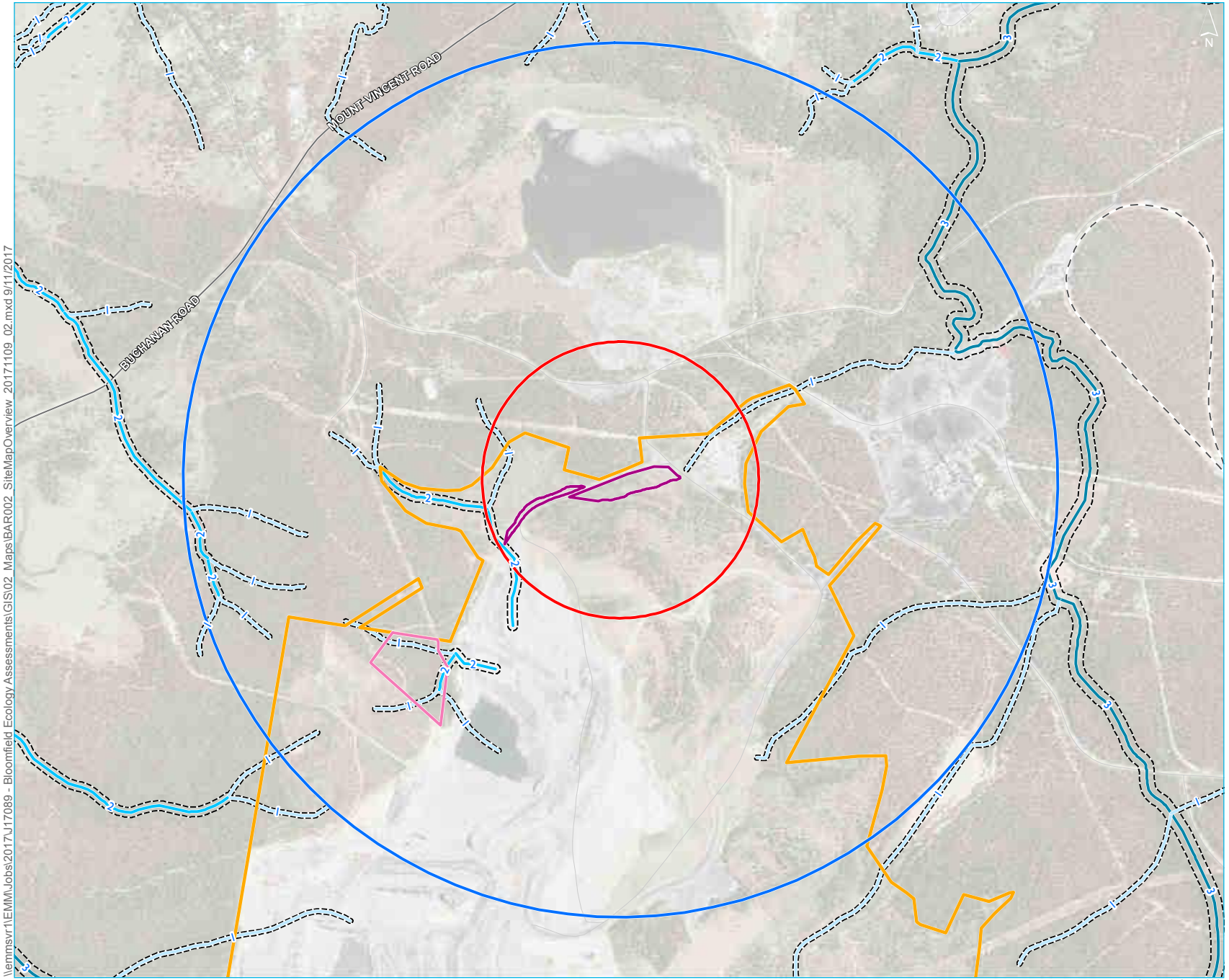
\\emmsvr1\EMM\Jobs\2017\J170089 - Bloomfield Ecology Assessments\GIS\02 Maps\BAR001 Location 20171113 06.mxd 14/11/2017

Source: EMM (2017); The Bloomfield Group (2017); GA (2017); OEH (2017)

Location map

Bloomfield Colliery
Biodiversity assessment report
Figure 1.1

EMM



Source: EMM (2017); The Bloomfield Group (2017); GA (2017); DPI (2015)

Site map

Bloomfield Colliery
Biodiversity assessment report
Figure 1.2

2 Legislative context

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as MNES (Matters of National Environmental Significance) under the EPBC Act. These are:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- nuclear actions (including uranium mining), and
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have a significant impact on a MNES is to be referred to DoEE for determination as to whether or not it is a controlled action.

The proposal is unlikely to have a significant impact on MNES and, therefore, is not required to be referred to DoEE for approval from the Commonwealth Minister for the Environment, as explained in Section 8.1 of this report.

Further, the MNES study area, as outlined within Section 1.4.2, was assessed only for impacts to MNES to accompany the Mod 4 application. This assessment can be found within Appendix A. Although it is concluded that this portion of the proposal is also unlikely to significantly impact upon MNES and is therefore not required to be referred to DoEE, a number of recommendations in regards to mitigation and management are described in Appendix A, for the MNES study area.

2.2 State

2.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community. The EP&A Act is administered by the NSW Department of Planning and Environment (DPE).

The EP&A Act provides the overarching structure for planning in NSW; however is supported by other statutory environmental planning instruments. Sections of the EP&A Act of primary relevance to the natural environment are outlined further below.

Biodiversity impacts arising from the major project are assessed under the FBA (OEH 2014a). Project Approval (PA) 07_0087 was originally granted in 2009 under Part 3A of the EP&A Act; this includes the proposed clearing of 6.12 ha of vegetation to facilitate the further extraction of coal resources. Therefore, this BAR only considers the impacts to biodiversity arising from the proposed clearing of 3.5 ha of rehabilitated landform (including 0.34 ha of native vegetation) for the proposed widening of a haul road and upgrade of a watercourse.

i State Environmental Planning Policies (Part 3 Division 2)

State Environmental Planning Policies (SEPPs) outline policy objectives relevant to state wide issues. The SEPP relevant to the current development is *SEPP No. 44 Koala Habitat Protection.*

SEPP 44 aims to encourage the conservation and management of natural vegetation areas that provide habitat for koalas to ensure permanent free-living populations will be maintained over their present range and to reverse the current trend of koala-population decline. It applies to areas of native vegetation greater than one hectare and in Councils listed in Schedule 1 of the SEPP. The study area is located in the Cessnock City Council LGA, which is listed in Schedule 1; therefore Koala habitat has been considered within this assessment.

2.2.2 Threatened Species Conservation Act 1995

The TSC Act was the key piece of legislation providing for the protection and conservation of biodiversity in NSW through the listing of threatened species, populations and ecological communities and the declaration and mapping of their critical habitats, as well as the identification of key threatening processes.

The TSC Act also established a system for biodiversity certification and established the Biodiversity Banking and Offsets Scheme. For all major projects, impacts to biodiversity are assessed in accordance with the FBA.

The TSC Act was replaced by the BC Act on 25 August 2017; however, it is still relevant for this proposal, as outlined in the following section.

2.2.3 Biodiversity Conservation Act 2016

In August 2017 the BC Act commenced operation. This new Act changes the way impacts to biodiversity are assessed and offset in NSW, with offsetting required for any projects exceeding certain clearing thresholds outlined in the *Biodiversity Conservation Regulation 2017* (BC Regulation).

Concurrent with the commencement of the BC Act, the NSW Government released the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (Savings and Transitional Regulation). This Regulation sets out a number of transitional arrangements, including arrangements for Major Projects. Under this section of the Savings and Transitional Regulation, development applications can be considered under the previous legislation if assessment requirements have been issued or substantial environmental assessment was undertaken before the 25 August 2017. These development applications must be submitted within 18 months of 25 August 2017.

As the SEARs related to the proposal were issued on 22 March 2017 (referring to the FBA), this section of the Savings and Transitional Regulation is relevant, and the application for Mod 4 can be made within 18 months of the BC Act commencing and will be considered under the previous legislation.

These deadlines can be extended by the Department of Planning and Environment to up to 3 years from 25 August 2017 by reissuing the assessment requirements

2.2.4 Fisheries Management Act

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened species, populations and communities, and critical habitats listed under the FM Act must be assessed through the Assessment of Significance process under Section 220ZZ of the FM Act and Section 5A of the EP&A Act.

Two key objectives of the FM Act are to conserve fish stocks and key fish habitats, and conserve threatened species, populations and ecological communities of fish and marine vegetation. When reviewing applications, the Department of Primary Industries (DPI) will assess the likelihood of impacts to waterways in relation to their sensitivity (TYPE) and waterway class (CLASS).

Buttai Creek to the south-west and Four-mile Creek to the north-west of the study area are mapped as Key Fish Habitat by DPI. Most of the operational mining areas at the development site are located within the catchment of Four Mile Creek. However, no impacts to any drainage lines that drain into these identified waterways will result from the proposal and no further consideration is required.

2.2.5 Biosecurity Act 2015

The NSW Biosecurity Act 2015 (BS Act) has superseded the Noxious Weeds Act 1993, which has now been repealed.

The primary object the BS Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The BS Act stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about;
- applies to all land within NSW and all waters within the limits of the State; and
- local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan.

The *Hunter Regional Strategic Weed Management Plan* (Hunter Local Land Services 2017) outlines how government, industry, and the community will share responsibility and work together to identify, minimise, respond to and manage weeds. The plan also supports regional implementation of the BS Act. The study area contains priority weeds as listed within the plan and this is discussed further in Section 8.3.

3 Landscape

3.1 Bioregions and landscapes

The study area occurs within the Sydney Basin IBRA Bioregion and the Hunter IBRA sub-region, which covers the entire development site and is the subregion used in this assessment, as shown in Figure 1.1.

The study area occurs within the Hunter Coastal Ramp Mitchell Landscape, which covers the entire development site and is the Mitchell Landscape used in this assessment.

3.2 Waterways and wetlands

The development site is located within the Hunter catchment, east of the Great Dividing Range in eastern NSW. The Hunter catchment is bound by the Manning and Karuah catchments in the north, and by the Lake Macquarie and Hawkesbury-Nepean catchments in the south.

Due to the long history of disturbance, there is a lack of natural watercourses within the development site and study area. There are a series of diversion banks and channels that direct water into the main natural drainage system that runs through the development site, Four Mile Creek. Most of the operational mining areas at the development site are located within the catchment of Four Mile Creek. Within the development footprint, a previously rehabilitated watercourse occurs, that is subject to the current Mod 4. Strahler stream order classes within the study area are mapped within Figure 1.2.

3.3 Native vegetation extent

The smallest allowable combination of an inner assessment circle of 100 ha and an outer assessment circle of 1000 ha were used. This combination was sufficient to allow the inner and outer assessment circles to cover the entire study area, which contains all the vegetation that will be impacted by the project (Figure 3.1).

Mapping of vegetation within the inner and outer assessment circles was undertaken using aerial mapping interpretation and Lower Hunter Vegetation mapping (Parsons Brinkerhoff 2013). This mapping was modified using the vegetation extent as mapped by EMM (see Section 4). Vegetation within the inner and outer assessment circles is shown in Figure 3.1.

Regional mapping of the native vegetation communities within the outer assessment circles includes:

- Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast;
- Disturbed – Rehabilitation;
- Grey Gum – Smooth-barked Apple – Blue-leaved Stringybark shrub – grass open forest on coastal ranges of the Sydney Basin;
- Smooth-barked Apple – Red Bloodwood - Brown – Hairpin Banksia heathy open forest of coastal lowlands;
- Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter;
- Spotted Gum – Red Ironbark – Grey Gum shrub – grass open forest of the Lower Hunter;

- Spotted Gum – Red Ironbark – Narrow-leaved Ironbark – Grey Box shrub-grass open forest of the lower Hunter, and
- White Mahogany – Spotted Gum – Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley.

3.4 Assessment of landscape value

Landscape value has been calculated using the method for site-based developments, outlined in Appendix 4 of the FBA (OEH 2014a).

3.4.1 Assessment of the current extent of native vegetation cover

The extent of native vegetation cover before development for both the inner and outer assessment circles was determined as the sum of areas of the native vegetation map units listed above.

To determine the extent of native vegetation cover after development, the extent of native vegetation to be removed for the development (0.34 ha) was subtracted from the extent of native vegetation cover before development. Table 3.1 provides a summary of the extent of native vegetation cover in the inner and outer assessment circles, before and after development.

Table 3.1 Extent of native vegetation cover before and after development

Assessment circle	Before development		After development	
	Area (ha)	%	Area (ha)	%
Outer assessment circle	465.69	47	465.35	47
Inner assessment circle	37.86	38	37.52	38

There will be no significant change in the extent of native vegetation in either the inner or outer assessment circles as a result of the development.

3.4.2 Assessment of connectivity value

The study area does not contain the following:

- an area identified as being part of a state significant biodiversity link;
- a riparian buffer 50 metres (m) either side of a 6th order stream;
- a riparian buffer 50 m around an important wetland or estuarine area;
- an area identified as being part of a regionally significant biodiversity link; or
- a riparian buffer either side of a 4th or 5th order stream.

Therefore the proposed development will not impact upon any state significant biodiversity links or regionally significant biodiversity links.

The study area was assessed as being part of a single connective link (see Figure 3.1) and the connectivity width category before and after the development will remain at >5-30 m. The development will not result in a linkage width threshold being crossed.

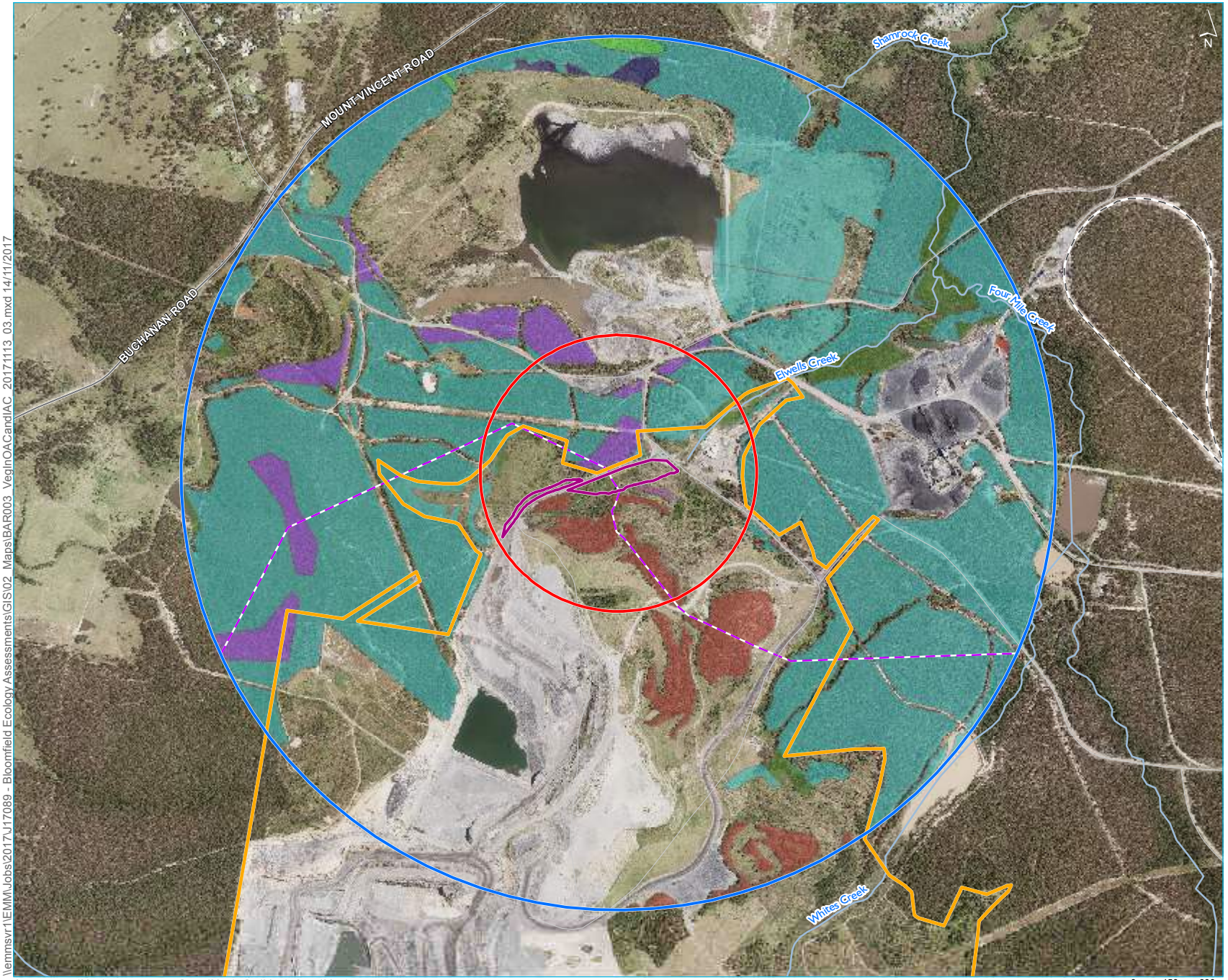
Overstorey condition for the connective link was assessed based on aerial photo interpretation and onground assessment. Overstorey vegetation within the connective link was assessed as being in benchmark condition. No change in overstorey condition will result from the proposal. Midstorey/groundcover condition was assessed based on a rapid assessment of vegetation within the locality, with vegetation reviewed from roadsides. Midstorey vegetation within the connective link was assessed as being less than 50 per cent of benchmark condition. No change to midstorey/groundcover condition will result from the LSF.

The proposed development will not result in any change in linkage condition classes.

3.4.3 Assessment of patch size

Patch size was assessed using a select process in ArcGIS, using existing vegetation mapping (Parsons Brinkerhoff 2013) and aerial imagery. All vegetation not defined as low condition and separated by a distance of less than 100 m (woody vegetation types) and 30 m (non woody vegetation types) was mapped sequentially. This process showed that the vegetation within the development footprint forms part of a very large patch of connecting vegetation with a patch size larger than 1,000 hectares (ha).

The Newcastle Coastal Ramp Mitchell Landscape is estimated to be 54 per cent cleared. A patch size of >200 ha fits into the 'Extra Large' patch size class; therefore, the patch size is Extra Large.



KEY

- Outer assessment circle
- Inner assessment circle
- Study area
- Development site
- Main road
- Local road
- Watercourse
- Rail line

Native vegetation - plant community type

- Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
- Disturbed - Rehabilitation
- Grey Gum - Smooth-barked Apple - Blue-leaved Stringybark shrub - grass open forest on coastal ranges of the Sydney Basin
- Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands
- Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter
- Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
- Untitled Polygon
- White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley
- Connective links

\\emmsvr1\EMM\Jobs\2017\J170089 - Bloomfield Ecology Assessments\GIS\02 Maps\BAR003 VegInOACandIAC 20171113 03.mxd 14/11/2017

Source: EMM (2017); The Bloomfield Group (2017); GA (2017); OEH (2017)

0 150 300 m

GDA 1994 MGA Zone 56

Vegetation in the inner and outer assessment circles, including connective links - overview map

Bloomfield Colliery
Biodiversity assessment report
Figure 3.1

EMM

4 Native vegetation

The extent of native vegetation within the development site was determined using Section 5 of the FBA (OEH 2014), as summarised within this chapter.

4.1 Background review

A review of regional vegetation mapping (Parsons Brinkerhoff 2013) was undertaken to inform the site investigation. Parsons Brinkerhoff identifies three vegetation communities within the inner assessment circle including:

- Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast;
- Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia heathy open forest of coastal lowlands, and
- Spotted Gum – Red Ironbark – Grey Gum shrub - grass open forest of the Lower Hunter.

4.2 Methods

4.2.1 Site investigation

An initial investigation of the study area was conducted by two senior EMM ecologists on Thursday 24 August 2017. The purpose of this assessment was to gain an understanding of the vegetation structure and dominant flora species within the study area. Floristic plot and transects, as well as Rapid Data Points (RDPs) to record dominant species in each vegetation layer (ground, shrub and canopy), were undertaken to identify vegetation communities. The above aided in identifying plant community types (PCTs), whether those communities may be representative of EECs, and to identify potential habitat for threatened flora and fauna species.

Detailed mapping of vegetation communities was conducted using hand-held GPS units (GDA94), mobile table computers and aerial photo interpretation. Where possible, vegetation communities were classified into PCTs using the vegetation information system (VIS) classification database version 2.1. The VIS database contains descriptions of PCTs and was established as the NSW standard community level vegetation classification for use in site based planning processes and standardised vegetation mapping. Areas of native vegetation for which a PCT could be assigned were then identified and delineated in the field.

Through an iterative design process, which considered biodiversity values, Bloomfield reduced the initial area of the proposed development and restricted it to the current study area. EMM used the data in the initial assessment to inform the current biodiversity assessment.

Following the stratification of Vegetation Zones, site value was assessed using data obtained via plots and transects, as per the methodology outlined in Section 5 of the FBA (OEH 2014). Plot and transect data was collected from the development site on 11 October 2017 and included:

- 20 m x 50 m quadrats and 50 m transects for assessment of site attributes, and
- 20 m x 20 m quadrats, nested within the larger quadrats outlined above, for full floristic survey to determine native plant species richness.

The minimum number of plots and transects per Vegetation Zone was determined using Table 3 of the FBA (OEH 2014a). A total of four plots and transects were completed within the study area (Figure 4.1).

Floristic data, including plot and transect data, is included within Appendix B.

The site investigation methods undertaken within the MNES study area to assess the vegetation present are included within Appendix A.

4.3 Results

4.3.1 Vegetation description

The study area is currently used as part of the operating Bloomfield Open Cut Colliery and contains rehabilitated landform and haul roads associated with past and current mine operations. The study area has been historically cleared for open cut mining and occurs on heavily disturbed land that is rehabilitated landform. Within the study area, this rehabilitation occurs as:

- patches of regenerating forest, consisting of stands of regenerating trees of a similar size, no very large trees, a sparse mid storey and grassy understorey; and
- exotic grassland dominated by grass species that are common to mine rehabilitation, especially Rhodes Grass (*Chloris gayana*), with *Acacia* sp. regrowth in the mid storey and no canopy layer.

It is noted that the landform is very disturbed. As a result, regenerating woodland within the study area may be a result of planted revegetation, natural regeneration from the existing seed bank, natural regeneration as a result of seeds from the surrounding vegetation types that contain older trees, or a combination of these. PCTs have been assigned based on best possible fit, considering past land use and adjacent PCTs.

The study area supports 0.34 ha of native vegetation, occurring as small patches. The vegetation identified within the study area with descriptions and photographs of each is provided in the following section.

The two plots and transects completed within the exotic grassland resulted in a site value score of less than 17, therefore there is no requirement to determine an offset. The following section describes the exotic grassland, however it is not considered further within the impact assessment.

The vegetation description for the MNES study area is included within Annex A.

4.3.2 Plant community types

Site investigations, including determination of vegetation communities using the methods described in Section 4.2.1, identified the presence of two PCTs within the study area (Figure 4.1). The PCT, vegetation formation and vegetation class (Keith 2004) are described in Table 4.1.

Table 4.1 Plant community types of the study area and corresponding formation and class

Plant community type	Vegetation formation	Vegetation class	Area (ha
PCT 1590 - Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	0.05
PCT 1592 – Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	0.29

The two PCTs identified within the study area were assessed as being in moderate/good condition in accordance with the FBA. One area of non-native vegetation, dominated by exotic grasses, was also identified (Figure 4.1). This area had a site value score of less than 17, and is not considered further for offsets.

As there are only two PCTs, with each one having no change in condition across the study area, no further stratification of PCTs was required nor the use of an ancillary code. This has resulted in two vegetation zones identified for the study area; one for each PCT, as outlined in Table 4.2.

Table 4.2 Vegetation zones mapped within the study area

Vegetation zone	Plant community type	Condition	Ancillary code	Area (ha)
1	PCT 1590 - Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	Moderate/Good	-	0.05
2	PCT 1592 – Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter	Moderate/Good	-	0.29

Descriptions of each vegetation zone are provided in Tables 4.3 and 4.4 and a description of the exotic grassland is provided within Table 4.5. The PCTs and exotic grassland are mapped within Figure 4.1.

Table 4.3 Vegetation zone 1 description

Vegetation zone 1 –Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	
PCT ID	1590
Biometric vegetation type ID	HU804
Common name	Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest
Condition class	Moderate/good
Extent within study area	0.05 ha (Figure 4.1)
Description	The canopy layer of this community is dominated by Spotted Gum (*Corymbia maculata*) with Forest Red Gum (*Eucalyptus tereticornis*) also present. Both canopy species were to approximately 16 m in height. Native Mistletoe (*Dendrophthoe vitellina*) was also recorded at low abundance within the canopy. The mid storey is sparse containing the non-indigenous Golden Wreath Wattle (*Acacia saligna*). This species is from Western Australia and has become naturalised along parts of the coast of NSW and is common to revegetation plantings. Sydney Golden Wattle (*Acacia longifolia*) and Swamp Wattle (*Acacia elongata*) are also present within the mid-storey in low abundance. The ground layer is dominated by exotic Rhodes Grass (*Chloris gayana*), a widely cultivated pasture species, also used as a soil stabilizer. Native grass species Wiry Panic (*Entolasia stricta*) and Blady Grass (*Imperata cylindrica*) are also present at much lower abundance. Other native species in the ground layer, also recorded at low abundance, included Many-flowered Mat-rush (*Lomandra multiflora*) and Whiteroot (*Pratia purpurascens*) Other exotic species present in the ground layer include Fireweed (*Senecio madagascariensis*), Red Natal Grass (*Melinis repens*), Black-berry Nightshade (*Solanum nigrum*), Lantana (*Lantana camara*), Scarlet Pimpernel (*Lysimachia arvenses*) and African Daisy (*Senecio pterophorus*).
Survey effort	2 plots, one within the study area and one adjacent due to changes during detailed design.
Condition description	This community is generally in poor condition with a high cover of introduced grasses due to the surrounding land use and associated edge impacts. Based on the community composition, it is concluded that this community is planted revegetation.
Characteristic species used for identification of PCT	According to the NSW VIS Classification Version 2.1, the canopy layer species recorded within this community that align with the dominant species listed as characteristic of this PCT include Spotted Gum. Aligning ground layer species include Blady Grass, White Root and Many-flowered Mat-rush.
Justification of evidence used to identify the PCT	Apart from the species composition, the stated distribution is low ranges of the lower Hunter Valley and Central Coast including within the Hunter IBRA subregion and the Newcastle Coastal Ramp Mitchell Landscape. The occurrence of the community on a low rise (hillslope) is also consistent with Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest PCT. The characteristic species, as listed above, are consistent with the PCT, particularly in less disturbed parts of the community adjacent to the study area. This vegetation is planted revegetation, and PCT 1590 is considered best fit.
Status	Commonwealth EPBC Act: not listed NSW TSC Act: listed as Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion endangered ecological community.
Estimate of percent cleared value of PCT in the major catchment area	48%

Table 4.3 Vegetation zone 1 description

Vegetation zone 1 –Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest

Photograph 1: Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest Plot 1	
Photograph 2: Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest Plot 5 (outside of study area due to changes during detailed design)	

Table 4.4 Vegetation zone 2 description

Vegetation zone 2 – Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter	
PCT ID	1592
Biometric vegetation type ID	HU806
Common name	Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter
Condition class	Moderate/good
Extent within study area	0.29 ha (Figure 4.1)
Description	This community has a mixed canopy of Smooth-barked Apple (*Angophora costata*), Grey Gum (*Eucalyptus punctata*), Spotted Gum, White Stringybark (*Eucalyptus globoidea*) and Broad-leaved White Mahogany (*Eucalyptus umbra*) to approximately 16 m in height. Cheese Tree (*Glochidion ferdinandi*) was also present in this layer. The mid storey is relatively sparse, with Blackthorn (*Bursaria spinosa*) being the most dominant native species. Black Wattle (*Acacia decurrens*) and non-indigenous Golden Wreath Wattle are also present and sub-dominant in the mid storey. Native Silver-stemmed wattle (*Acacia parvipinnula*) is present in low abundance. The ground layer is dominated by native Threeawn Speargrass (*Aristida vagans*). Other native ground layer species include Speargrass (*Austrostipa* sp.), Wiry Panic, Wattle Mat-rush (*Lomandara filiformis*), Purple Coral Pea (*Hardenbergia violacea*), Whiteroot, Wonga Wonga Vine (Pandorea pandorana), Blue Flax-Lily (*Dianella longifolia*), Apple Berry (*Billardiera scandens*), Hairy Bush Pea (*Pultenaea villosa*), Prickly Beard-heath (*Leucopogon juniperinus*), Old Man's Beard (*Clematis aristata*) and Rockfern (*Cheilanthes sieberi*). Exotic species within the ground layer include Fleabane (*Conyza* sp.), Scarlet Pimpernel, Lantana and Plantain (*Plantago lanceolata*). Exotic grasses Whisky Grass (*Andropogon virginicus*), Rhodes Grass and Pampas Grass (*Cortaderia selloana*) were more abundant on the edge of community.
Survey effort	One plot/transect within the study area (plot 2)
Condition description	This community is generally in good condition with a moderately diverse ground and mid layer within the mapped occurrence. However, a high cover of introduced grasses occurs on the edges of the community due to the surrounding land use and associated edge impacts. Based on the community composition, it is concluded that this community is planted revegetation with some natural regeneration influenced from the stand of native vegetation upslope of the haul road.
Characteristic species used for identification of PCT	According to the NSW VIS Classification Version 2.1, the canopy layer species recorded within this community that align with the dominant species listed as characteristic of this PCT include Spotted Gum and Grey Gum. Aligning mid storey and ground layer species include Native Blackthorn, Threeawn Speargrass and Whiteroot.
Justification of evidence used to identify the PCT	Apart from the species composition, the stated distribution is the lower Hunter Valley including within the Hunter IBRA subregion and the Newcastle Coastal Ramp Mitchell Landscape. The occurrence of the community on a hillslope is also consistent with Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter PCT. The characteristic species, as listed above, are consistent with the PCT. This vegetation is a mix of revegetation and natural regeneration, and PCT 1592 is considered best fit based on a natural form of this PCT being located upslope.
Status	Commonwealth EPBC Act: not listed NSW TSC Act: listed as Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion endangered ecological community.
Estimate of percent cleared value of PCT in the major catchment area	44%

Table 4.4 Vegetation zone 2 description

Vegetation zone 2 – Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter

Photograph 1: Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter Plot 2	
Photograph 2: Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter Plot 2	

Table 4.5 Exotic grassland description

Exotic grassland	
PCT ID	N/A
Biometric vegetation type ID	N/A
Common name	Exotic grassland
Condition class	N/A
Extent within study area	3.2 ha (Figure 4.1)
Description	This community does not have a canopy layer. The mid layer is open and contains scattered Sydney Golden Wattle (*Acacia longifolia*), non-indigenous Golden Wreath Wattle and Swamp Wattle (*Acacia elongata*). Hairy Bush-pea (*Pultenaea villosa*), Large-leaf Hop-bush (*Dodonaea triquetra*) and Cheese Tree are present in low abundance. The ground layer is dominated by exotic Rhodes grass, seeded as mine site rehabilitation. Exotic Whiskey Grass is the sub-dominant species in this layer. Other exotic grasses include Quaking Grass (*Briza maxima*), Couch (*Cynodon dactylon*) and Perennial Ryegrass (*Lolium perenne*). Other exotic species in the ground layer include Fireweed, Fleabane, Cobblers Pegs (*Bidens pilosa*), Plantain, Crofton Weed (*Ageratina adenophora*), Catsear (*Hypochaeris radicata*), Scotch Thistle (*Onopordum acanthium*), African daisy (*Senecio pterophorus*), Purpletop (*Verbena bonariensis*) Exotic Lantana was also present in this layer in low abundance. Some native species were recorded within the ground layer in low abundance, namely Indian Pennywort (*Centella asiatica*), Pennywort (*Hydrocotyle tripartite*), Pimpernel (*Lysimachia arvensis*) Small St. John's Wort (*Hypericum gramineum*) and Whiteroot.
Survey effort	Two plot/transects within the study area (plot 3 and plot 4)
Condition description	This community has a very high cover of exotic grass species, has a mid layer dominated by non-indigenous wattle species, has no canopy layer and is on highly disturbed landform that is unlikely to have a seed bank. It is concluded that this community is planted revegetation (using exotic Rhodes Grass) with some natural regeneration influenced from the stands of native vegetation upslope.
Characteristic species used for identification of PCT	N/A
Justification of evidence used to identify the PCT	N/A
Status	Commonwealth EPBC Act: not listed NSW TSC Act: not listed
Estimate of percent cleared value of PCT in the major catchment area	N/A

Table 4.5 Exotic grassland description

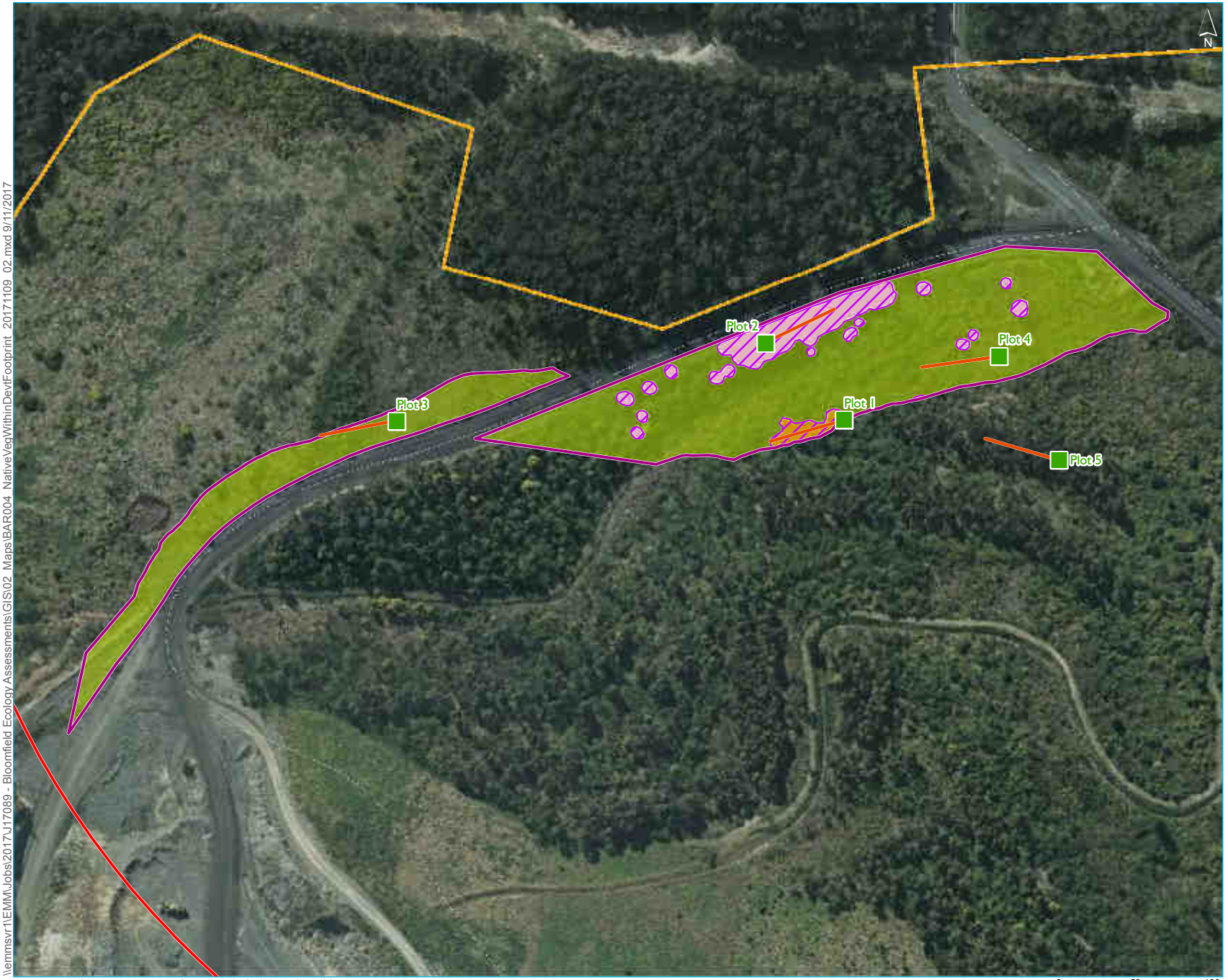
Exotic grassland	
Photograph 1: Exotic grassland Plot 3	
Photograph 2: Exotic grassland Plot 4	

4.3.3 Site value scores

Site value scores for each vegetation zone are presented in Table 4.5.

Table 4.6 Site value score for the Vegetation Zones

Vegetation zone	Plant community type	Area (ha)	Site value score
1	PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	0.05	30.21
2	PCT 1592 Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter	0.29	35.42



KEY

- Plots
- Transect
- Inner assessment circle
- Study area
- Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion Endangered Ecological Community
- PCT 1590 - Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest
- PCT 1592 – Spotted Gum – Red Ironbark – grass open forest of the Lower Hunter
- Exotic grassland
- Development site

\\emmsvr1\EMM\Jobs\2017\J17089 - Bloomfield Ecology Assessments\GIS\02 Maps\BAR004 NativeVegWithinDevtFootprint 20171109 02.mxd 9/11/2017

Source: EMM (2017); The Bloomfield Group (2017); GA (2017); OEH (2017)

0 50 100 m

GDA 1994 MGA Zone 56

Native vegetation within the development footprint, including flora survey effort

Bloomfield Colliery
Biodiversity assessment report
Figure 4.1

EMM

5 Threatened species

5.1 Methods

Flora and fauna assessments of the study area were undertaken on 24 August and 11 October 2017.

Targeted flora surveys were undertaken in accordance with OEH (2016) and involved walking parallel transects approximately 5 m apart through all native vegetation within the study area (refer to Figure 5.1). Targeted flora surveys were undertaken for the following species:

- Black-eyed Susan (*Tetratheca juncea*);
- Netted Bottle Brush (*Callistemon linearifolius*);
- Scant Pomaderris (*Pomaderris queenslandica);*
- Singleton Mint Bush *(Prostanthera cineolifera);*
- Small-flower Grevillea (*Grevillea parviflora* subsp. *parviflora),* and
- White-flowered Wax Plant (*Cynanchum elegans).*

Fauna species were recorded opportunistically as they were encountered during the field survey. Any evidence of fauna such as tracks, scats, scratches on and around trees, and any potential fauna habitat features were also noted, including:

- the presence of nesting/sheltering/basking sites such as tree hollows, litter, fallen timber and logs and rocks;
- the cover/abundance of ground, shrub and canopy layers;
- drainage and the presence of freshwater habitats noting their permanency (ie permanent, semi-permanent or ephemeral);
- connectivity to adjacent areas of habitat;
- the extent and nature of previous disturbances, including the presence of fire scars and dieback;
- vegetation assemblage and structure;
- soil type and topography; and
- habitat surveys for Koala habitat and feed trees, including opportunistic surveys for individuals and scats (faeces).

The primary purpose of the fauna habitat assessment was to consider the potential for any listed species to occur within the study area.

5.2 Fauna habitat assessment results

The regenerating forested areas within the study area are likely to provide habitat for a range of common fauna species. No tree hollows were observed within the forested patches in the study area, as a result of the relatively young canopy. Therefore, it is unlikely that the study area provides shelter for arboreal mammals or nesting habitat for hollow dependant birds. These species may occasionally forage in these areas.

The terrestrial habitat in the regenerating forested areas have limited shelter provided by occasional fallen trees and other woody debris and may provide habitat for small mammals and reptiles. However, the scarcity of fallen timber and other debris, combined with the small patch size and fragmented landscape means the habitat is insufficient and suboptimal for larger mammals such as the Spotted-tailed Quoll (*Dasyurus maculatus*).

The regenerating forested areas may provide foraging habitat for a number of threatened bird species that are associated with the PCTs recorded within and nearby to the study area. These bird species include the Speckled Warbler (*Chthonicola sagittata),* Varied Sittella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang)* and the Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*).

The regenerating forested areas may also provide foraging habitat for a number of threatened forest owls that are associated with the vegetation types recorded within and nearby to the study area. These include the Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua)* and Masked Owl (*Tyto novaehollandiae).* These species are unlikely to utilise the study area for roosting and nesting due to lack of suitable hollows due to the age of regeneration; however, it is possible that they may forage in the study area, considering the larger intact areas of vegetation in the locality that may support these species.

The regenerating forested areas may also provide foraging habitat for a number of threatened cave roosting and hollow roosting micro bats as identified in Table 5.2. These species are unlikely to utilise the study area for roosting due to lack of suitable habitat, however it is possible that they may forage in the study area, considering the larger intact areas of vegetation in the locality that may provide suitable roosting habitat for these species.

Two Koala (*Phascolarctos cinereus)* feed tree species, as listed under SEPP 44, were recorded within the study area; namely, the Forest Red Gum and Grey Gum. Forest Red Gum comprised a small proportion of the canopy (5%) in PCT 1590 and Grey Gum a small proportion of the canopy (10%) in PCT 1592. The study area is included within the north coast Koala Management Area (KMA) (OEH 2017) which lists three tiers of koala feed tree; Primary, Secondary and Stringybarks/supplementary species. The primary feed tree Forest Red Gum was recorded within PCT 1590 and no secondary feed trees listed for the KMA were found. Stringybark/supplementary species White Stringybark was recorded within PCT 1592. No Koala scats were detected during searches around the base of primary and supplementary feed tree species and due to the lack of records, small proportion of Forest Red Gum and Grey Gum in the canopy, as well as the fragmented and disturbed nature of the study area, it is unlikely that there are sufficient foraging resources to support the Koala within the Study area.

Spotted Gum occurs within the study area, which is a favoured foraging resource for BC Act and EPBC Act listed Regent Honeyeater (*Anthochaera Phrygia)* and Swift Parrot (*Lathamus discolour)*. Relatively young trees, such as those within the study area, do not produce as high nectar yields compared to larger and older trees; and therefore these species would only be considered vagrant in the study area, as per Section 6.5.1.3 of the FBA (OEH 2014a) and are unlikely to use the habitat within the study area.

Other threatened species, namely the Little Lorikeet (*Glossopsitta pusilla)* and Turquoise Parrot (*Neophema pulchella)* may utilise the forested areas of study area as a seasonal foraging resource.

The exotic grassland habitat has a dense grassy ground layer that may be suitable habitat for a range of common grassland fauna species, but provides very little habitat value in terms of mid storey or canopy structure. As the canopy layer is absent there is no opportunity for species that use tree hollows for shelter and nesting or the canopy layer for foraging, shelter and roosting.

Aquatic habitat within the study area is minimal and limited to the existing modified drainage line. The drainage line is ephemeral and contained no water at the time of the field survey, and is highly disturbed and infested with exotic grass species. The study area does not contain suitable breeding habitat for any BC Act or EPBC Act listed frog species.

Two migratory species, the Fork-tailed Swift and White-throated Needletail, will possibly occur within the study area. However, due to their almost exclusive aerial nature, potential impacts are unlikely to occur.

Targeted survey effort

Bloomfield Colliery
Biodiversity assessment report
Figure 5.1

EMM

5.3 Geographical habitat features

An assessment of the occurrence of geographic habitat features, in accordance with Section 6.3 of the FBA (OEH 2014) was undertaken, along with the determination of whether impacts to these habitat features will result from the proposal. The results of this assessment, along with the species generated by the calculator associated with the FBA are shown in Table 5.1.

Table 5.1 Assessment of geographical features within the development site

Common name	Scientific name	Feature	Present in development site	Justification
Green and Golden Bell Frog	*Litoria aurea*	Land within 100 m of emergent aquatic or riparian vegetation.	No	The study area is not within 100 m of emergent aquatic or riparian vegetation. The rehabilitated watercourse within the study area is dominated by exotic Rhodes Grass and does not contain emergent aquatic vegetation or riparian vegetation.
Green-thighed Frog	*Litoria brevipalmata*	Land within 100 m of semi-permanent or ephemeral ponds or depressions containing leaf litter.	No	The study area is not within 100 m of a semi-permanent or ephemeral pond or depression. The rehabilitated watercourse within the study area does not contain leaf litter as it is dominated by exotic Rhodes Grass.
Large-eared Pied Bat	*Chalinolobus dwyeri*	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels.	No	The study area does not contain escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels.
Heath Wrinklewort	*Rutidosis heterogama*	Heath on sandy soils, or moist areas in open forest.	No	The study area does not contain heath on sandy soils, or moist areas in open forest.
Pale-headed Snake	*Hoplocephalus bitorquatus*	Land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber.	No	The study area is not within 40 m of a watercourse.
Brush-tailed Rock-wallaby	*Petrogale penicillata*	Land within 1 km of rock outcrops or cliff lines.	No	The study area is not within 1 km of rock outcrops or cliff lines.
Common Planigale	*Planigale maculata*	Rainforest, eucalypt forest, heathland, marshland, grassland or rocky areas.	Yes	The study area contains small patches of eucalypt forest.
-	*Eucalyptus parramattensis subsp. decadens*	Deep, low-nutrient sands.	No	The study area is not on deep, low-nutrient sand.

The study area supports suitable geographic features for one species; the Common Planigale. Further consideration is given to this species in Section 5.6.

5.4 Targeted survey results

No target species were recorded within the study area during targeted survey.

5.5 Ecosystem credit species

A list of ecosystem credit species predicted to occur within the study area, based on the PCTs present and generated by the calculator associated within the FBA (OEH 2014) is provided in Table 10. The potential for these species to occur within the study area was assessed in accordance with Section 6.3 of the FBA (OEH 2014).

Table 5.2 Assessment of ecosystem credit species within the development site

Scientific name	Common name	TS Offset multiplier
Barking Owl	*Ninox connivens*	3.0
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	1.3
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	2.0
Bush-stone Curlew	*Burhinus grallarius*	2.6
Diamond Firetail	*Stagonopleura guttata*	1.3
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	2.2
Eastern Freetail-bat	*Mormopterus norfolkensis*	2.2
Gang-gang Cockatoo	*Callocephalon fimbriatum*	2.0
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	1.8
Greater Broad-nosed Bat	*Scoteanax rueppellii*	2.2
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	1.3
Hooded Robin (south-eastern form)	*Melanodryas cucullata subsp. cucullata*	1.7
Little Eagle	*Hieraaetus morphnoides*	1.4
Little Lorikeet	*Glossopsitta pusilla*	1.8
Masked Owl	*Tyto novaehollandiae*	3.0
Painted Honeyeater	*Grantiella picta*	1.3
Powerful Owl	*Ninox strenua*	3.0
Scarlet Robin	*Petroica boodang*	1.3
Speckled Warbler	*Chthonicola sagittata*	2.6
Spotted-tailed Quoll	*Dasyurus maculatus*	2.6
Square-tailed Kite	*Lophoictinia isura*	1.4
Squirrel Glider	*Petaurus norfolcensis*	2.2
Swift Parrot	*Lathamus discolor*	1.3
Turquoise Parrot	*Neophema pulchella*	1.8
Varied Sittella	*Daphoenositta chrysoptera*	1.3
Yellow-bellied Glider	*Petaurus australis*	2.3
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	2.2

Notes: 1.The threatened species offset multiplier is the inverse of the species Tg value. The Tg value is the ability of a species to respond to improvements in site value at an offset site. The species with the highest threatened species offset multiplier determines the multiplication factor on the number of ecosystem credits.

The presence of these species could not be discounted using the methodology outlined in Section 6.3 of the FBA (OEH 2014). It was therefore assumed that these species may occur within the study area. The Barking Owl, Masked Owl and Powerful Owl have the lowest Tg value and therefore the highest threatened species (TS) offset multiplier. No adjustment to the TS offset multiplier value has been undertaken.

5.6 Species credit species

A list of species credit species predicted to occur within the study area, based on the PCTs present, along with an assessment of whether the study area provides suitable habitat and whether the species will be impacted by the development is provided within Table 5.3. The potential for a species to occur within the study area was assessed in accordance with Section 6.5 of the FBA (OEH 2014).

Table 5.3 Species credit species and status within the development site

Scientific name	Common name	Habitat present within the development site	Recorded during field surveys	Impacted by development	Justification
Flora					
Black-eyed Susan	*Tetratheca juncea*	Yes	No	No	The species has been recorded 2.2 km to the east of the development site. This species is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover (OEH 2017a), and potential habitat exists in the study area within PCT1592. The species has not been recorded during previous field surveys conducted within the development site (Hunter Eco 2010), nor in adjacent communities (Hunter Eco 2012). The targeted survey failed to detect this species, and it is considered unlikely that the species is present within the study area.
Bynoe's Wattle	*Acacia bynoeana*	No	–	No	This species has been recorded within the locality, approximately 5 km to the west of the study area. Occurs in heath or dry sclerophyll forest on sandy soils. Prefers open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood (*Corymbia gummifera*), Scribbly Gum (*Eucalyptus sclerophylla*), Parramatta Red Gum (*Eucalyptus parramattensis)*, Saw Banksia (*Banksia serrata*) and Narrow-leaved Apple (*Angophora bakeri)* (OEH 2017a). There are no sandy soils within the study area and none of the associated canopy species were recorded. There is no suitable habitat for this species within the study area therefore it is unlikely to occur.
Large-leafed Monotaxis	*Monotaxis macrophylla*	No	–	No	The species has not been recorded within the locality. The distribution and rarity of *Monotaxis macrophylla* within NSW is related to the occurrence of fire. At least within NSW, the species has not been found in the absence of fire. There is a great diversity in the associated vegetation within NSW, encompassing coastal heath, arid shrubland, forests and montane heath from almost sea level to 1300 m altitude. Grows on rocky ridges and hillsides. Displays the properties of a fire ephemeral species in many ways. Germination is stimulated by the passage of fire, individual plants have a short life span, a large biomass is produced in a short period of time, flowering occurs shortly after germination, and populations do not persist in the absence of fire. It is considered unlikely that the species is present within the study area considering the history of disturbance.
Leafless Tongue-orchid	*Cryptostylis hunteriana*	No	–	No	The species has not been recorded within the locality. Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland (OEH 2017a). The larger populations typically occur in woodland dominated by Scribbly Gum, Silvertop Ash (*E. sieberi*), Red Bloodwood and Black Sheoak (*Allocasuarina littoralis*). Preferred habitat for this species does not exist within the study area and the species is considered unlikely to occur.
Netted Bottle Brush	*Callistemon linearifolius*	Yes	No	No	There are records of this species within the locality, the closest being approximately 6 km to the south-east of the study area. Netted Bottlebrush grows in dry sclerophyll forest on the coast and adjacent ranges, and suitable marginal habitat is considered present. The species was not detected during targeted surveys therefore is considered unlikely to occur.

Table 5.3 Species credit species and status within the development site

Scientific name	Common name	Habitat present within the development site	Recorded during field surveys	Impacted by development	Justification
North Rothbury Persoonia	*Persoonia pauciflora*	No	–	No	The species has not been recorded within the locality. It is found in dry open forest or woodland dominated by Spotted Gum (*Corymbia maculata*), Broad-leaved Ironbark (*Eucalyptus fibrosa*) and/or Narrow-leaved Ironbark (*E. crebra*) and supporting a moderate to sparse shrub layer and grassy groundcover. The majority of the population is known to occur on silty sandstone soils derived from the Farley Formation. Preferred habitat for this species does not exist within the study area (Broad-leaved Ironbark and/or Narrow-leaved Ironbark are absent) and is considered unlikely to occur.
-	*Ozothamnus tesselatus*	No	-	No	The species has not been recorded within the locality, and is restricted to a few locations in an east-west zone south of Bunnan and between west Bylong and east Ravensworth. The study area is well outside the known range of the species and is therefore considered unlikely to occur.
Rough Doubletail	*Diuris praecox*	No	-	No	The species has not been recorded within the locality. Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Suitable habitat is not present within the study area and as the study area is outside the known range of the species it is considered unlikely to occur.
Scant Pomaderris	*Pomaderris queenslandica*	Yes	No	No	The species has not been recorded within the locality. Found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks. The species was not recorded during targeted surveys.
Singleton Mint Bush	*Prostanthera cineolifera*	Yes	No	No	The species has not been recorded within the locality. Grows in open woodlands on exposed sandstone ridges. Usually found in association with shallow or skeletal sands. Fire response is unknown, but other *Prostanthera* species are fire sensitive, with recruitment occurring from the soil seed bank following a fire. Known to be associated with the PCTs within the study area. However, was not recorded during surveys.
Slaty Red Gum	*Eucalyptus glaucina*	No	–	No	Records exist within the locality, with the closest being approximately 4.5 km to the north-east. Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest in deep, moderately fertile and well-watered soils. It is likely that the soils of the study area are too shallow and infertile to be optimal for this species.
Small Snake Orchid	*Diuris pedunculata*	No	–	No	The species has not been recorded within the locality. Grows on grassy slopes or flats, often on peaty soils in moist areas. Also on shale and trap soils, on fine granite, and among boulders. Although it is known to be associated with the PCTs in the study area, it is not known or predicted within the Hunter IBRA subregion. It is considered unlikely that the study area provides suitable habitat.

Table 5.3 Species credit species and status within the development site

Scientific name	Common name	Habitat present within the development site	Recorded during field surveys	Impacted by development	Justification
Small-flower Grevillea	*Grevillea parviflora subsp. parviflora*	Yes	No	No	In the Hunter this species has been recorded in Kurri Sand Swamp Woodland and many records exist within the locality. Occurs in a range of vegetation types from heath and shrubby woodland to open forest (OEH 2017). Targeted survey failed to detect this species, and it is considered unlikely that the species is present within the study area.
White-flowered Wax Plant	*Cynanchum elegans*	Yes	No	No	The species has not been recorded within the locality. Usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree *Leptospermum laevigatum* – Coastal Banksia *Banksia integrifolia* subsp. *integrifolia* coastal scrub; Forest Red Gum *Eucalyptus tereticornis* aligned open forest and woodland; Spotted Gum *Corymbia maculata* aligned open forest and woodland; and Bracelet Honeymyrtle *Melaleuca armillaris* scrub to open scrub. Although the species is known to be associated with the PCTs within the study area, targeted survey failed to detect this species, and it is considered unlikely that the species is present within the study area.
Fauna					
Brush-tailed Phascogale	*Phascogale tapoatafa*	No	–	No	This species has not been recorded in the locality. Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. It is an agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater for invertebrates, nectar and small vertebrates. The species nests and shelters in tree hollows with entrances 2.5 – 4 cm wide. Although vegetation formations associated with this species are within the study area, it is regrowth with a limited potential for the species. Nectivorous resources within the study area are sparse, due to a limited mid stratum and young age of trees, with a paucity of tree hollows which the species requires for shelter. This is likely to correspond with a limited ecological function and lower abundance of invertebrates too. This, combined with the fragmented and partially cleared nature of the study area, means that species is considered unlikely to occur.
Common Planigale	*Planigale maculata*	No	–	No	This species has not been recorded in the locality. Inhabits rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. Nests in crevices, hollow logs, beneath bark or under rocks. Preys on insects and small vertebrates. This species is known to be associated with the PCTs recorded within the study area. However, the fragmented and partially cleared nature of the vegetation within the study area, as well as the young age of the regrowth vegetation means that there is limited habitat for this species. Further, the study area is not close to a permanent water source and lacks hollow logs, rocks and other woody debris that is suitable as shelter for the species. It is unlikely that the species is likely to occur within the study area.

Table 5.3 Species credit species and status within the development site

Scientific name	Common name	Habitat present within the development site	Recorded during field surveys	Impacted by development	Justification
Eastern Pygmy-possum	*Cercartetus nanus*	No	-	No	This species has not been recorded in the locality. Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts). Tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 ha and females about 0.35 ha. Although vegetation formations associated with this species occur within the study area, it is regrowth with a limited potential for the species. Nectivorous resources within the study area are sparse, due to a limited mid stratum and young age of trees, with a paucity of tree hollows which the species requires for shelter. This is likely to correspond with a limited ecological function and lower abundance of invertebrates too. This combined with the, fragmented and partially cleared nature of the study area, means that species is unlikely to occur.
Emu population, NSW North Coast Bioregion and Port Stephens Local Government Area	*Dromaius novaehollandiae* - endangered population	No	-	No	The study area is located in the Sydney Basin Bioregion and Cessnock LGA. The study area is outside the distribution of the threatened population.
Koala	*Phascolarctos cinereus*	Yes	No	No	There are records of this species within the study area, the closest being approximately 2 km to the south-east. This species inhabits eucalypt woodlands and forests and feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species (OEH 2017a). Two Koala feed tree species, as listed under SEPP 44, were recorded within the study area; namely, the Forest Red Gum and Grey Gum. Forest Red Gum comprised a small proportion of the canopy (5%) in PCT 1590 and Grey Gum a small proportion of the canopy (10%) in PCT 1592. The study area is included within the north coast Koala Management Area (KMA) (OEH 2017) which lists three tiers of koala feed tree; Primary, Secondary and Stringybarks/supplementary species. The primary feed tree Forest Red Gum was recorded within PCT 1590 and no secondary feed trees listed for the KMA were found. Stringybark/supplementary species White Stringybark was recorded within PCT 1592. No Koala scats were detected during searches around the base of primary and supplementary feed tree species and due to the small proportion of Forest Red Gum and Grey Gum in the canopy, as well as the fragmented and disturbed nature of the study area, it is unlikely that there are sufficient foraging resources to support the Koala within the Study area.

Table 5.3 Species credit species and status within the development site

Scientific name	Common name	Habitat present within the development site	Recorded during field surveys	Impacted by development	Justification
Regent Honeyeater	*Anthochaera phrygia*	No	-	No	The Regent Honeyeater has a patchy distribution and is highly mobile, occurring only irregularly in most sites, and in variable numbers, often with long periods with few observation anywhere. Within the current distribution there are four known key breeding areas where the species is regularly recorded. These are the Bundarra-Barraba, Capertee Valley and Hunter Valley districts in New South Wales, and the Chiltern area in north-east Victoria (DoE 2016). Key eucalypt species identified in the National Recovery Plan for the Regent Honeyeater (DoE 2016) comprise Mugga Ironbark (*Eucalyptus sideroxylon*), Yellow Box (*E. Melliodora*), White Box (*E. albens*), Yellow Gum (*E. leucoxylon*), Spotted Gum *(Corymbia maculata*) (recorded in the study area), Swamp Mahogany (*E. robusta*), Needle-leaf Mistletoe (*Amyema cambagei*) which grows on River Oak (*Casuarina cunninghamiana)*, Box Mistletoe (*A. miquellii*) and Long-flower Mistletoe (*Dendropthoe vitellina)* (recorded in the study area). Other tree species may be regionally important. For example the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events of Regent Honeyeaters. Flowering of associated species such as thin-leaved stringybark (*E. eugenioides*) and other stringybark species, and broad-leaved ironbark (*E. fibrosa*) can also contribute important nectar flows at times. Two records exist within the locality, with the closest record located approximately 7 km to the west of the study area. Additionally, more records exist just outside of the locality, approximately 10 km to the south-west of the project area within the Tomalpin Woodlands, south-west of Kurri Kurri in the Lower Hunter Valley Important Bird Area (IBA). These records are associated with a known breeding event that occurred in this woodland during 2007 and 2008 (Roderick et al. 2014, Birdlife Australia 2014). The study area does not comprise breeding habitat. Suitable foraging species (Spotted Gum and Long-flower Mistletoe) occur within the study area however the Spotted Gum trees are young. The area has been historically cleared, and has a lack of large trees and many trees of a similar size, indicating a single regeneration event. Considering this vegetation is regrowth, it is unlikely to provide masses of nectar resources due to its younger age. Regent Honeyeaters prefer taller and larger diameter trees for foraging, as these typically produce more nectar (Franklin et al., 1989; Webster & Menkhorst 1992; Menkhorst et al., 1999; Oliver 2000, in DoE 2016). With the smaller trees having limited fruiting resources and limited nectar it is unlikely that the species is reliant on foraging resources within the study area, nor are any substantial numbers of the species likely to occur within the study area. Therefore the Regent Honeyeater would only be considered vagrant in the study area, as per Section 6.5.1.3 of the FBA (OEH 2014a) and is unlikely to use the habitat within the study area.

No threatened flora or fauna species were recorded during targeted surveys.

6 Impact assessment (biodiversity values)

This chapter identifies the potential impacts of the proposal on the biodiversity values of the study area. Measures taken to date to minimise impacts are summarised and recommendations to assist Bloomfield to design a development that further avoids and minimises impacts are provided.

6.1 Impact summary

The proposal has potential for both direct and indirect impacts. The direct impacts arising from the proposal include:

- the removal of 0.05 ha of PCT 1590 - *Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest* in moderate/good condition, and
- the removal of 0.29 ha of PCT 1592 – *Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter* in moderate/good condition.

Potential indirect impacts arising from the proposal include:

- temporarily increased noise levels from construction equipment, leading to disturbance of fauna, especially during breeding seasons; and
- temporary slight increase of traffic volume (during construction) resulting from the upgrade of the haul road, leading to higher chance of fauna strike and increased noise levels leading to disturbance of fauna.

The study area already occurs as small patches of vegetation and edge already heavily impacted by edge effects. The proposal will not significantly increase edge effects given the high level of existing clearance.

6.1.1 Recommendations to avoid, minimise and mitigate impacts

The principal means to reduce impacts to biodiversity values within the study area has been to minimise the removal of native vegetation and fauna habitat. Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered. Recommendations are broken down into site selection and planning, construction and operation.

i Site selection and planning

The site selection is based upon the need to upgrade the haul road and adjacent previously rehabilitated watercourse. Bloomfield has considered all biodiversity values and sought advice from EMM in the planning stages of the proposal to avoid, where possible, direct impacts to identified biodiversity values.

The study area contains and is bound by rehabilitated landform and haul roads associated with the current mine operations, and thus has a long history of disturbance. As a result, removal of native vegetation is limited to small patches surrounded by previously disturbed land. Refinements Bloomfield has made to the proposed development footprint, as far as reasonably practical for the proposed project, have further minimised impacts on PCT 1590, reducing the proposed area of clearance from 0.54 ha to 0.05 ha, thus also reducing any impacts on the fauna species that may utilise this PCT.

ii Construction

No additional direct impacts are expected to occur as a result of the construction phase, as site access for the construction of the proposal will occur along the existing haul roads that have current frequent vehicle movement.

However, indirect impacts may occur on retained biodiversity values. Additional mitigation measures to avoid and minimise impacts include:

- installation of appropriate exclusion fencing around vegetation to be retained directly adjacent to the development footprint;
    - appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' should be installed;
    - identify the location of any 'No Go Zone' in site inductions;
    - fencing should be secured with star pickets and use high visibility bunting;
- all material stockpiles, vehicle parking and machinery storage will be located within cleared areas or areas proposed for clearing, and not in areas of retained native vegetation;
- a licenced wildlife salvage team should be on-site during vegetation removal to catch and relocate (if appropriate) any wildlife encountered;
- where appropriate, native vegetation cleared from the development site should be mulched for re-use on the site, to stabilise bare ground;
- implementation of temporary stormwater controls during construction is necessary to ensure that discharges to the drainage channels are consistent with existing conditions; and
- sediment and erosion control measures should be implemented prior to construction works commencing (e.g. silt fences, sediment traps), to protect drainage channels. These should conform to relevant guidelines, should be maintained throughout the construction period and should be carefully removed following the completion of works.

The Bloomfield Open Cut Colliery has established clearing practices in place, as part of their Environmental Management Strategy (Bloomfield 2011). These include minimisation of disturbance areas, pre-clearance surveys, salvaging and reusing material on site for habitat enhancement, conserving and reusing topsoils, and weed management. These clearing practices will be implemented for the project in accordance with Bloomfield's management strategy.

iii Operation

The upgrade of the haul road will not result in a permanent increase in traffic volume and therefore any impacts on biodiversity arising from the operation of the proposed upgrade are negligible, considering the proposal will not alter, in any way, the current daily operations of the open cut coal mine.

6.1.2 Residual impacts

Residual impacts arising from the proposal include loss and minor increases in fragmentation of native vegetation and species habitat and potential for species to no longer utilise potential habitat within the study area.

6.2 Thresholds for assessment and offsetting

This section outlines the thresholds for assessment and offsetting in accordance with Section 9 of the FBA (OEH 2014a).

6.2.1 Impact requiring further consideration

This section provides an assessment of impacts requiring further consideration in accordance with Section 9.2 of the FBA (OEH 2014a).

i Landscape features

The study area does not support any 4th, 5th or 6th order streams, estuarine areas, important wetlands, or state or regional biodiversity links. The study area does not support any important wetlands. Therefore there are no impacts to the landscape features that require further consideration.

ii Native vegetation

One TSC Act listed EEC, *Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion,* occurs within the study area. The proposal will clear 0.34 ha of this EEC. However, as this EEC was not nominated within the SEARs, there are no impacts to native vegetation requiring further consideration.

iii Species and populations

The study area does not include any areas of critical habitat. No impacts on critically endangered or endangered species will result from the proposal, and there are no impacts on species or populations requiring further consideration.

6.2.2 Impacts requiring offsets

i Impacts on native vegetation

This section provides an assessment of the impacts on native vegetation requiring offsetting in accordance with Section 9.3.1 of the FBA (OEH 2014a).

The proposal will result in the removal of the following:

- 0.05 ha of PCT 1590 *Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest* (HU804), and
- 0.29 ha of PCT 1592 *Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter* (HU806).

Impacts upon these PCTs will require offsetting. The remainder of the development site contains non-native vegetation. No further consideration of these areas is required.

ii Impacts on species and populations

The project will not result in any impacts on species and populations that require offsetting.

6.2.3 Impacts not requiring offsets

A 3.2 ha area of non-native vegetation, dominated by exotic grasses, was identified within the study area (Figure 4.1). Two plots/transects were completed in this area. This area had a site value score of less than 17. As such, under Section 9.4 of the FBA (OEH 2014a) offsets are not required.

7 Biodiversity credits

This chapter provides a summary of biodiversity credits required from impacts on the biodiversity values within the study area, following consideration of measures to avoid, minimise and mitigate impacts.

Table 7.1 provides a summary of the ecosystem and species credits from the proposed development. The full credit profile is provided in Appendix C.

Table 7.1 Summary of ecosystem credits for all management zones

Vegetation zone	PCT code	PCT name	Management zone area (ha)	Loss in landscape value	Loss in site value score	EEC offset multiplier	Credits required for TS	TS with highest credit requirement	TS offset multiplier	Ecosystem credits required
1	HU804	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	0.05	15	30.21	3.0	2	Barking Owl	3.0	1
2	HU806	Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	0.29	15	35.42	3.0	9	Barking Owl	3.0	9

8 Assessment of biodiversity legislation

8.1 Environment Protection and Biodiversity Conservation Act 1999

An assessment of the impacts of the proposed development on MNES within the study area was prepared to determine whether referral of the proposal to the Commonwealth Minister for the Environment is required. Matters of MNES relevant to the study area are summarised in Table 8.1.

Table 8.1 Assessment of the proposal against the EPBC Act

MNES	Proposal specifics	Potential for significant impact
Threatened species	16 flora species and 28 fauna species have been recorded or are predicted to occur within the locality. The majority of these species are considered unlikely to occur within the study area. Potential seasonal foraging habitat for the Regent Honeyeater, Swift Parrot, Large-eared Pied Bat and Grey-headed Flying Fox has been identified within the study area. However, the study area does not provide habitat for an ecology significant proportion of any of these species.	Significant impact unlikely to result from the proposed development.
Threatened ecological communities	No threatened ecological communities, as listed under the EPBC Act, were recorded within the study area.	Significant impact unlikely to result from the proposed development.
Migratory species	33 migratory species have been recorded or are predicted to occur within the locality. The study area does not provide important habitat for an ecologically significant proportion of any of these species.	Significant impact unlikely to result from the proposed development.
Wetlands of international importance	The study area does not flow directly into a Ramsar site and the development is not likely to result in a significant impact.	Significant impact unlikely to result from the proposed development.

Similarly, the habitat within the MNES study area is unlikely to support important populations of MNES or be critical to the survival of a population or the species. Impact assessments have been undertaken for each of the identified species against EPBC Act significant impact criteria. These assessments concluded that it is unlikely that significant impacts to MNES will occur as a result of the proposal, within the MNES study area. Refer to Appendix A for full conclusions of assessment of MNES within the MNES study area.

8.2 Environmental Planning and Assessment Act 1979

8.2.1 SEPP No 44

Two Koala feed trees, as defined within Schedule 1 of the SEPP were identified within the study area. However, they do not make up greater than 15 percent of the tree species within the study area. Therefore, the vegetation within the study area is not considered potential Koala habitat as defined under SEPP 44. Additional assessment of habitat within the study area further ruled out the area as potential habitat for the Koala.

One Koala feed tree, as defined within Schedule 1 of the SEPP was identified within the MNES study area. However, it does not make up greater than 15 percent of the tree species within the MNES study area. Therefore, the vegetation within the MNES study area is also not considered potential Koala habitat as defined under SEPP 44 (refer to Appendix A).

8.3 Biosecurity Act 2015

A number of state level and regional level priority weeds, as identified within the *Hunter Regional Strategic Weed Management Plan* (Hunter Local Land Services 2017) occur within the study area. These include Fireweed, Lantana and Pampas Grass

Bloomfield Open Cut Colliery has an active weed management program, as covered by the Bloomfield Environmental Management Strategy (Bloomfield 2011a) and the Bloomfield Rehabilitation Management Plan (Bloomfield 2011b).

9 Biodiversity offset strategy

Ten ecosystem credits are required to offset the impacts arising from the proposal.

A biodiversity offset strategy has been prepared to identify how offsets to compensate for the project's impacts will be delivered. Preparation of this strategy has involved the following steps:

- attempt to identify like-for-like offsets. Like-for-like offsets are identified as the same PCT, or a PCT in the same vegetation class that has been cleared to an equal or greater extent (OEH 2014b). Offsets must be provided in the same or an adjacent IBRA subregion;
- if, after undertaking "reasonable steps", a proponent is unable to identify like-for-like credits, then the variation rules may be applied. The variation rules allow impacts on a PCT to be offset with a PCT from the same vegetation formation that has been cleared to an equal or greater extent anywhere in NSW;
- supplementary measures may apply where offsets are not feasible and other options are needed; and
- payment into the Biodiversity Conservation Trust, with costs determined using the Biodiversity Offsets Payment Calculator.

In the first instance, every effort to obtain like-for-like offsets was explored. The BioBanking public register has been checked for the availability of credits of the same PCT as that being impacted or those listed in the credit profile report (Appendix C). At the time of writing, there are credits for PCT 1592 (HU806) available on the public register. There are no matching ecosystem credits for PCT 1590 (HU804) available on the public register; however, the credit profile report includes PCT 1592 as an offset option for this PCT.

As credits are available, variation rules and supplementary measures are not warranted.

The PCTs and corresponding number of credits generated under the FBA were entered into the online Biodiversity Offset Payment Calculator on 9 November 2017. The calculator estimates a price of $2,000.64 per credit. The total payment required for the project is $22,007.08 (including GST). For a more detailed breakdown per PCT, refer to Appendix D.

Due to the small number of credits to be offset, payment into the BCT is the preferred option to secure offsets for this project, based on current payment requirements.

10 Conclusions

This assessment has been completed in accordance with the NSW *Biodiversity Offsets Policy for Major Projects* (OEH 2014a) and FBA (OEH 2014b) on behalf of Bloomfield.

The site assessment identified areas of PCT 1590 *Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest* (HU804) and PCT 1592 *Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter* (HU806) within the study area. These PCTs represent *Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion*, an EEC listed under BC Act.

Measures to avoid and minimise impacts to vegetation were considered during the design and planning stage of the proposal, resulting in minimisation of impacts on native vegetation. Additional recommendations to mitigate any minor residual impacts are provided in Section 6.1.3. Through an iterative design process, which considered the above biodiversity values, the residual impact of the proposal will be limited to removal of 0.34 ha of native vegetation.

Residual impacts to native vegetation will require retirement of 10 ecosystem credits, as outlined in Table 10.1.

Table 10.1 Summary of credits to be retired

PCT code/species name	PCT name/common name	Credits required
1590	*Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest*	1
1592	*Spotted Gum – Red Ironbark – Grey Gum - grass open forest of the Lower Hunter*	9
	Total	**10**

Residual impacts will be offset in accordance with the Biodiversity Offset Strategy.

References

Australian Museum Consulting 2014, *Stony Pinch Fauna Study,* prepared for the Stony Pinch Consortium.

Birdlife Australia 2014, *IBAs in Danger Report, The state of Australia's Important Bird and Biodiversity Areas*, November 2014.

Bloomfield 2011a, *Mining Operations (Bloomfield) Environmental Management Strategy*, Revised Final Draft, August 2011.

Bloomfield 2011b, *Mining Operations (Bloomfield) Rehabilitation Management Plan*, Revised Final Draft, June 2011.

DoE 2013, *Matters of National Environmental Significance – Significance Impact Guidelines 1.1,* Department of the Environment.

DoE 2016, *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygria)*, Commonwealth of Australia Department of the Environment, April 2016.

DoEE 2017a, *Protected Matters Search Tool*, Department of Environment and Energy, search undertaken 07/09/2017, http://www.environment.gov.au/epbc/protected-matters-search-tool

DoEE 2017b, *Species Profile and Threats Database,* Department of Environment and Energy, viewed June 2017, http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

EMM 2017, *MNES Assessment – Terrestrial Ecology, Bloomfield Colliery*, prepared by EMM Consulting Pty Limited for the Bloomfield Group.

Hunter Eco 2010, *Bloomfield Colliery East Maitland, Part 3A variation ecology report*, prepared for the Bloomfield Group.

Hunter Eco 2012, *Bloomfield Colliery East Maitland, Biodiversity Assessment – Creek Cut Highwall*, prepared for the Bloomfield Group.

Hunter Local Land Services 2017, *Hunter Regional Strategic Weed Management Plan 2017-2022,* published June 2017, State of NSW through Local Land Services.

OEH 2014a, *Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Projects*, NSW Office of Environment and Heritage, Sydney.

OEH 2014b, *NSW Biodiversity offsets policy for major projects.* NSW Office of Environment and Heritage, Sydney.

OEH 2016a, *Mitchell Landscapes Version 3.1*, State Government of NSW and NSW Office of Environment and Heritage.

OEH 2016b, *Interim Biogeographic Regionalisation of Australia (IBRA) Version 7*, NSW Office of Environment and Heritage, Sydney.

OEH 2016c, *NSW Guide to Surveying Threatened Plants,* NSW Office of Environment and Heritage, Sydney.

OEH 2017a, *BioNet Atlas of NSW Wildlife*, search undertaken 07/09/2017, http://www.bionet.nsw.gov.au/

OEH 2017b, *Threatened Species Profile Database,* viewed August 2017 http://www.environment.nsw.gov.au/threatenedspeciesapp/

Parsons Brinkerhoff 2013, *Lower Hunter Vegetation mapping,* prepared for Department of Sustainability, Water, Population and Communities.

Roderick, M, Geering D.J and Ingwersen, D.A 2014, *Significant breeding event of Regent Honeyeaters Anthochaera phrygia near Kurri Kurri, New South Wales, during spring 2007*, Australian Field Ornithology 2014, 31, 113–121.

TSSC 2015, *Approved Conservation Advice (including listing advice) for the Central Hunter Valley eucalypt forest and woodland ecological community*, Threatened Species Scientific Committee, Canberra: Department of the Environment.

Appendix A

MNES Report

MNES Assessment - Terrestrial Ecology

Bloomfield Colliery

Prepared for The Bloomfield Group | 3 May 2017

MNES Assessment - Terrestrial Ecology

Bloomfield Colliery

Prepared for The Bloomfield Group | 19 July 2017

Level 5, 21 Bolton Street
Newcastle NSW 2300

T +61 (0)2 4927 0506
F +61 (0)2 4926 1312
E info@emmconsulting.com.au

www.emmconsulting.com.au

MNES Assessment - Terrestrial Ecology

Final

Report J17089RP1 | Prepared for The Bloomfield Group | 19 July 2017

Prepared by	**Erin Lowe**	Approved by	Nicole Armit
Position	Senior Ecologist	Position	Associate
Signature		Signature	
Date	19 July 2017	Date	19 July 2017

Document Control

Version	Date	Prepared by	Reviewed by
1	23/06/2017	Erin Lowe	K. Diver N. Armit
2	19/07/2017	Erin Lowe	N. Armit

T +61 (0)2 4927 0506 | F +61 (0)2 4926 1312

Level 5 | 21 Bolton Street | Newcastle | New South Wales | 2300 | Australia

www.emmconsulting.com.au

Table of contents

Table of contents

Appendices

Tables

Figures

1 Introduction

1.1 Background

Bloomfield Open Cut Colliery operates in accordance with its existing Part 3A project approval (PA 07_0087), granted in 2009. The Bloomfield Group (Bloomfield) proposes to modify their existing project approval to extend the lifespan of the colliery and extract further coal resources within the approved extraction area (the project).

Project Approval PA 07_0087 has been modified on three occasions. Mod 1 enabled an increase in the Project Approval area by 259 hectares (ha) for additional out-of-pit overburden emplacement, relocation of a powerline corridor, and the upgrade and use of an alternative haul road. Mod 2 was a minor administrative modification to amend the required date for submission of management plans, and Mod 3 allowed a change to areas of vegetation clearing covered by the mine's biodiversity offset area.

Bloomfield is seeking a further modification to PA 07_0087 (Mod 4) under section 75W of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to extend the operational life of the mine from 2021 to 2030, and to recover additional coal resources available within the existing approved extraction area. No additional clearing of native vegetation is proposed as part of the modification.

Previous ecological assessments have been undertaken to support the applications to modify Bloomfield's Project Approval. Given that no vegetation clearing over and above that approved under PA 07_0087, as modified, is proposed as part of Mod 4, it is considered that no further assessment under the NSW *Threatened Species Conservation Act 1995* (TSC Act) is required to support the application for the project. Further assessment would only be required if the project is likely to cause additional impacts compared to that which has previously been assessed and approved.

Notwithstanding, the previous ecology impact assessments did not adequately assess protected matters listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A protected matters search was not undertaken to determine if any species or ecological community listed under the EPBC Act was likely to be present. Assessments of significance were not undertaken to determine the likelihood that the project would significantly impact species and/or communities listed under the EPBC Act, or if a referral was required. Therefore, EMM Consulting (EMM) has been engaged by Bloomfield to undertake an assessment of Matters of National Environmental Significance (MNES) under EPBC Act for the project to determine if significant impacts are likely to occur.

1.2 Location, project description, and study area

Bloomfield Open Cut Colliery is an existing open cut coal mine, located to the north of John Renshaw Drive, Buttai and east of Buchanan Road, Buchanan, approximately 20 km north-west of Newcastle (refer to Figure 1.1). Mining has occurred on the site for approximately 170 years and the current project is part of a modification for the continued operation of the mine within the existing approved extraction area.

A study area for which this assessment of MNES is to be undertaken has been defined, as illustrated in Figure 1.1. This area is within the Project Approval area and approved disturbance footprint of the mine, and was approved to be cleared as part of Mod 1 for the relocation of a powerline corridor and associated infrastructure. However, the ecological assessment for Mod 1 which covered this area did not address MNES, as described above in Section 1.1.

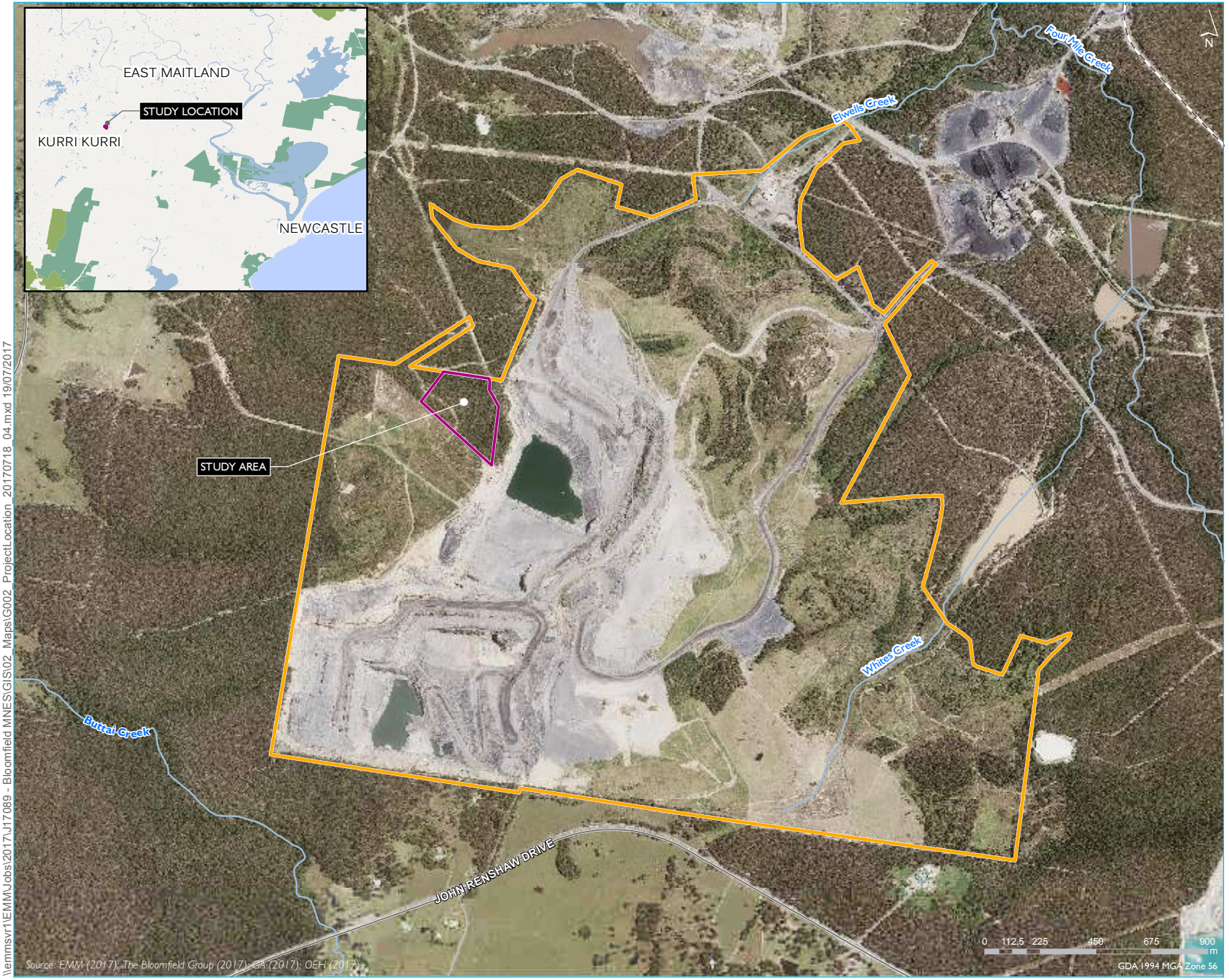
The study area covers 6.12 ha and is south-west of the operating Creek cut pit, as shown in Figure 1.1. To the south and south-west of the study area is cleared land, also associated with the mine. To the north and north-west, the study area is bound by forest. The 6.12 ha of forest within the study area will be cleared as part of activities approved under PA 07_0087.

1.3 Purpose of this report

The purpose of this report is to provide an assessment of potential impacts of the project on MNES.

The scope of the assessment comprises:

- review of existing reports and mapping for the project;
- desktop assessment of the likely presence of MNES in the study area;
- field survey targeting MNES with potential to occur in the study area, and
- assessment of potential impacts of the project on MNES, and their level of significance.



\\emmsvr1\EMMJobs\2017\J17089 - Bloomfield MNES\GIS\02 Maps\G002 ProjectLocation 20170718 04.mxd 19/07/2017

Project location

Bloomfield Colliery
MNES assessment
Terrestrial ecology
Figure 1.1

EMM

2 Legislative framework

2.1 EPBC Act

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as MNES (Matters of National Environmental Significance), as defined under the EPBC Act as:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- nuclear actions (including uranium mining); and
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have an impact on a MNES is to be referred to Commonwealth Department of the Environment and Energy (DoEE) for determination as to whether or not it is a controlled action.

The project is unlikely to have a significant impact on MNES and, therefore, is not required to be referred to DoEE for approval from the Commonwealth Minister for the Environment, as explained in the following sections of this report. Although it is concluded that the project is unlikely to significantly impact upon MNES, a number of recommendations in regards to mitigation and management are described in Section 6.

3 Methods

3.1 Desktop review

3.1.1 Previous local studies

Two ecological assessments have been conducted on which included the current study area (Hunter Eco2009 & 2010). These assessments focussed upon species and communities listed under the TSC Act, with no detailed assessment of EPBC listed species and communities conducted. Field survey methods included:

- threatened flora transects;
- terrestrial and arboreal mammal trapping (Elliot's and cage trapping);
- collection of mammal hair samples from hair tubes;
- spotlighting for nocturnal mammals and birds;
- call broadcasting for threatened owls;
- harp trapping and Anabat survey for microbats;
- diurnal bird surveys;
- funnel traps along a drift line targeting reptiles; and
- assessment of hollow bearing trees and other habitat surveys.

3.1.2 Database searches

Background literature reviews and database searches were conducted by EMM prior to the field survey to obtain recent data on flora and fauna species, populations, communities and habitats. The search area included the study area and the locality (defined as within 10 km of the study area). Background information reviewed included:

- topographic map, aerial photograph and geographic information system (GIS) interpretations;
- the NSW OEH Atlas of NSW Wildlife database (Bionet 2017) to identify threatened and migratory species records. The search was limited to include species listed under the EPBC Act only; and
- the Commonwealth Department of the Environment's (DoE) online Protected Matters Search Tool (PMST) to identify species and ecological community habitat listed under the EPBC Act (refer to Appendix A for the full report).

The results of the literature review and database search informed field survey effort and design through the identification of threatened species, populations and ecological communities as listed under the EPBC Act that may occur in the study area.

3.2 Field survey

The field investigation was targeted at identifying species and communities listed under the EPBC Act in the study area, with survey effort tailored correspondingly. The fauna surveys were not designed to detect all resident and transitory species within the study area. Instead, it aimed to provide an overall assessment of the ecological features and habitat of the study area, building on and updating the previous ecological surveys completed. Two senior EMM ecologists conducted a field survey on Wednesday 19 April 2017. The methods used are described in the following sections.

3.2.1 Flora and vegetation

Vegetation structure and dominant flora species were recorded within the study area. Notes were taken describing any disturbances (such as weed invasion, human disturbance) to assess the vegetation condition. Dominant species in each vegetation layer (ground, shrub and canopy) were recorded to identify vegetation communities, particularly that representative of EECs, and to identify potential habitat for threatened flora species. Meander searches were conducted through native vegetation to target threatened flora species.

Where possible, vegetation communities were classified into PCTs described by OEH. The vegetation information system (VIS) classification database (OEH 2016) contains descriptions of all Plant Community Types (PCTs) identified. The database was established as the NSW standard community level vegetation classification for use in site based planning processes and standardised vegetation mapping.

3.2.2 Fauna

Targeted fauna surveys were not undertaken and fauna species were recorded opportunistically as they were encountered during the field survey. Any evidence of fauna such as tracks, scats, scratches on and around trees, and any potential fauna habitat features were also noted, including:

- the presence of nesting/sheltering/basking sites such as tree hollows, litter, fallen timber and logs and rocks;
- the cover/abundance of ground, shrub and canopy layers;
- drainage and the presence of freshwater habitats noting their permanency (ie permanent, semi-permanent or ephemeral);
- connectivity to adjacent areas of habitat;
- the extent and nature of previous disturbances, including the presence of fire scars and dieback;
- vegetation assemblage and structure;
- soil type and topography; and
- habitat surveys for Koala habitat and feed trees, including opportunistic surveys for individuals and scats (faeces).

4 Results

4.1 Previous local studies

Hunter Eco (2009 & 2010) listed the dominant vegetation community within the study area as Lower Hunter Spotted Gum – Ironbark Forest, which meets the TSC Act listed EEC, Lower Hunter Spotted Gum – Ironbark Forest. This community may also meet the EPBC listed CEEC Central Hunter Valley Eucalypt Forest and Woodland (CHVEFW); depending on the composition of key dominants and contraindicative canopy species. The potential occurrence of CHVEFW within the study area is considered in Section 4.3.1 and Appendix B.

Hunter Eco (2009 & 2010) recorded the following ecological features within their studies, which included the current study area:

- a total of 54 flora species were recorded during field surveys, although none were listed under either the TSC or EPBC Act;
- a total of 23 hollow bearing trees were mapped within the current study area; and
- a total of 2 amphibian, 7 reptile, 12 mammal and 45 bird species were recorded during field surveys. Of these, six are threatened fauna species listed under the NSW TSC Act - *Ninox strenua* (Powerful Owl), *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat), *Mormopterus norfolkensis* (East Coast Freetail Bat), *Miniopterus australis* (Little Bent-wing Bat), *Miniopterus schreibersii* (Large Bent-wing Bat), and *Scoteanax rueppellii* (Greater Broad-nosed Bat).

No EPBC listed species were recorded during the previous field surveys, however suitable habitat was considered present for two TSC listed species that were not recorded, which are also listed under the EPBC Act. These are the Swift Parrot and Grey-headed Flying-fox (*Pteropus poliocephalus*). Assessments of significance under TSC Act concluded that there would not be a significant impact for either of these species. Both of these species area are considered in this assessment under the EPBC Act Significant Impact Guidelines (DoE 2013).

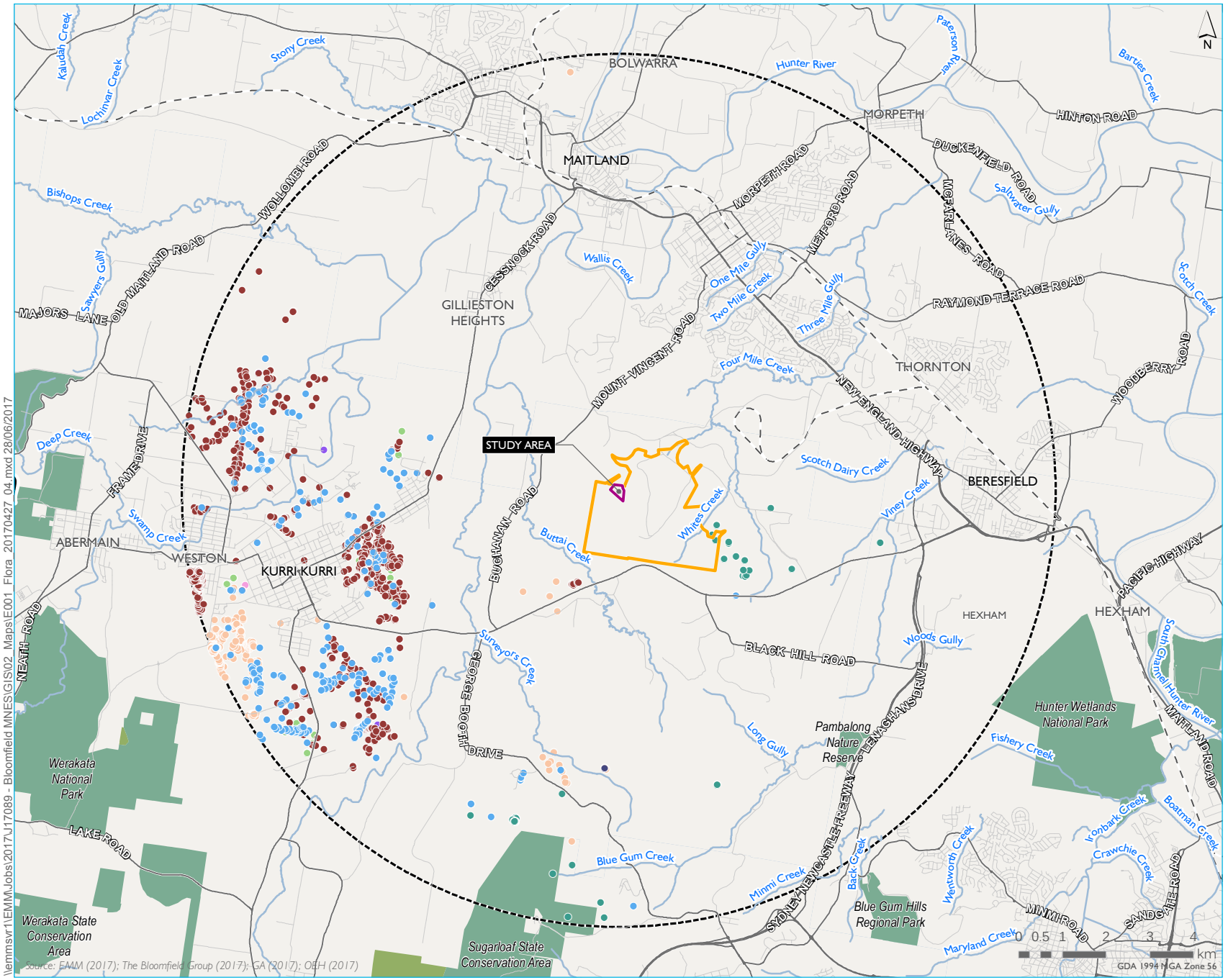
4.2 Database searches

The PMST tool identified the following Matters of National Environmental Significance (MNES) which may occur within, or in the vicinity of the study area (refer to Appendix A):

- one wetland of international importance;
- three threatened ecological communities, which may occur within the area;
- 44 listed threatened species which may occur within the area or have suitable habitat within the area; and
- 33 listed migratory species which may occur within the area.

The Bionet (2017) search identified eight EPBC listed threatened plant species within the locality (Figure 4.1). A total of 11 EPBC listed threatened fauna species have also been recorded within the locality, consisting of six mammals, two frogs and three birds (Figure 4.2). An additional five migratory species were also recorded (Figure 4.2).

None of these entities were located within the study area itself, rather recorded within the locality (10 km radius of the site). Refer to Appendix B for the list of species recorded within the locality, their listing status and likelihood of occurrence assessment.

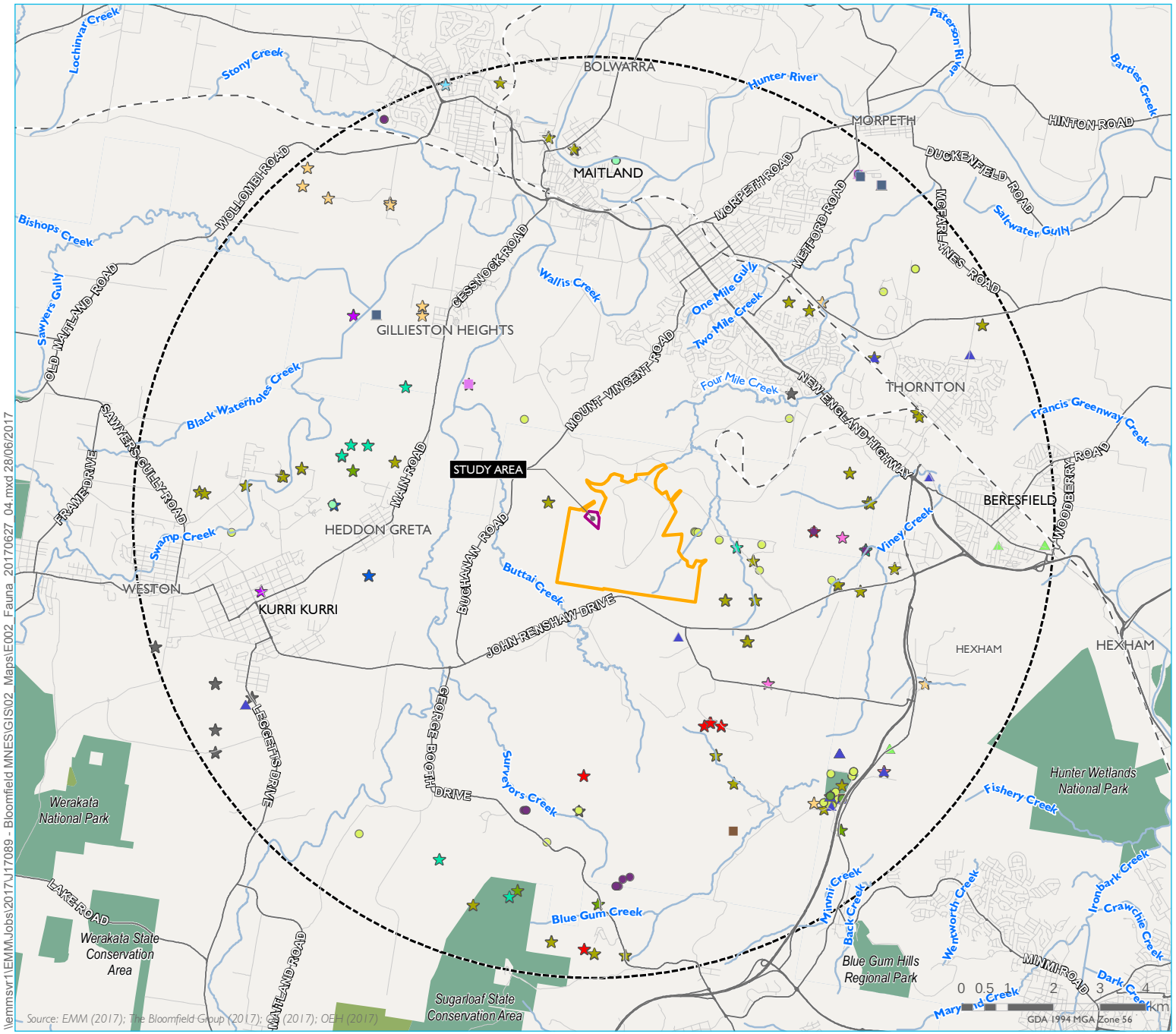


\\emmsvr1\EMMJobs\2017\J17089 - Bloomfield MNES\GIS\02 Maps\E001 Flora 20170427 04.mxd 28/06/2017

Threatened species records – flora

Bloomfield Colliery
MNES assessment
Terrestrial ecology
Figure 4.1

EMM



KEY

- Study area
- Approval area
- 10 km buffer

Migratory species

- Common Greenshank
- Glossy Ibis
- Gull-billed Tern
- Latham's Snipe
- Little Curlew
- Little Tern
- Marsh Sandpiper
- Pectoral Sandpiper
- Red-necked Stint
- Sharp-tailed Sandpiper
- Wedge-tailed Shearwater
- White-bellied Sea-Eagle
- White-throated Needletail
- White-winged Black Tern
- Wood Sandpiper

Threatened fauna

- Australian Painted Snipe
- Greater Glider
- Green and Golden Bell Frog
- Grey-headed Flying-fox
- Koala
- Large-eared Pied Bat
- Littlejohn's Tree Frog
- New Holland Mouse
- Regent Honeyeater
- Spotted-tailed Quoll
- Swift Parrot

- NPWS reserve
- State forest
- Main road
- Local road
- Rail line
- Watercourse

Threatened species records – fauna

Bloomfield Colliery
MNES assessment
Terrestrial ecology
Figure 4.2

EMM

\\emmsvr1\EMMJobs\2017\J17089 - Bloomfield MNES\GIS\02 Maps\E002 Fauna 20170627 04.mxd 28/06/2017

4.3 Field survey

4.3.1 Flora and vegetation

The entire study area is forested, although it appears to have been historically cleared as there is a lack of large trees and a large number of trees of a similar size, indicating a single regeneration event. In several areas, ground disturbance was also evident with contour banks and a drainage line. A single vegetation type was identified within the study area (Figure 4.3) which is described below.

i PCT 1590 Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest

Three co-dominant trees species were recorded; Spotted Gum (*Corymbia maculata*), Broad-leaved Mahogany (*Eucalyptus umbra*) and Forest Oak (*Allocasuarina torulosa*), with the percentage abundance at 22%, 25% and 24% respectively. Other canopy species recorded were White Stringybark (*E. globoidea*) (11%), Broad-leaved Ironbark (*E. fibrosa*) (10%), Grey Gum (*E. punctata*) (4%), Smooth-barked Apple (*Angophora costata*) (3%) and Red Bloodwood (*Corymbia gummifera*). The canopy of this community was dense, with on average 52 trees per 20 m x 20 m plot.

The mid-storey was relatively sparse with dominant species including Native Blackthorn (*Bursaria spinosa*), Gorse Bitter Pea (*Daviesia ulicifolia*), Narrow-leaved Geebung (*Persoonia linearis*), and Slender Wattle (*Acacia elongata*).

The ground layer was dominated by grasses including Kangaroo Grass (*Themeda aus*tralis), Wallaby Grass species (*Rytidosperma sp.*) and Wiry Panic (*Entolasia stricta*). Other ground cover species included White Root (*Pratia purpurescens*), Variable Sword Sedge (*Lepidosperma laterale*) and Pastel Flower (*Pseuderanthemum variabile*). Few weed species were present within the community with no Weed of National Environmental Significance (WoNS) recorded. Photograph 4.1 shows an example of the vegetation community within the study area.

Photograph 4.1 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest

This community does not meet the listing of the CEEC Central Hunter Valley eucalypt forest and woodland (CHVEFW). This is due to the frequent occurrence of contraindicative canopy species, as described in the scientific determination; including Red Ironbark and Forest Oak (refer to Appendix B).

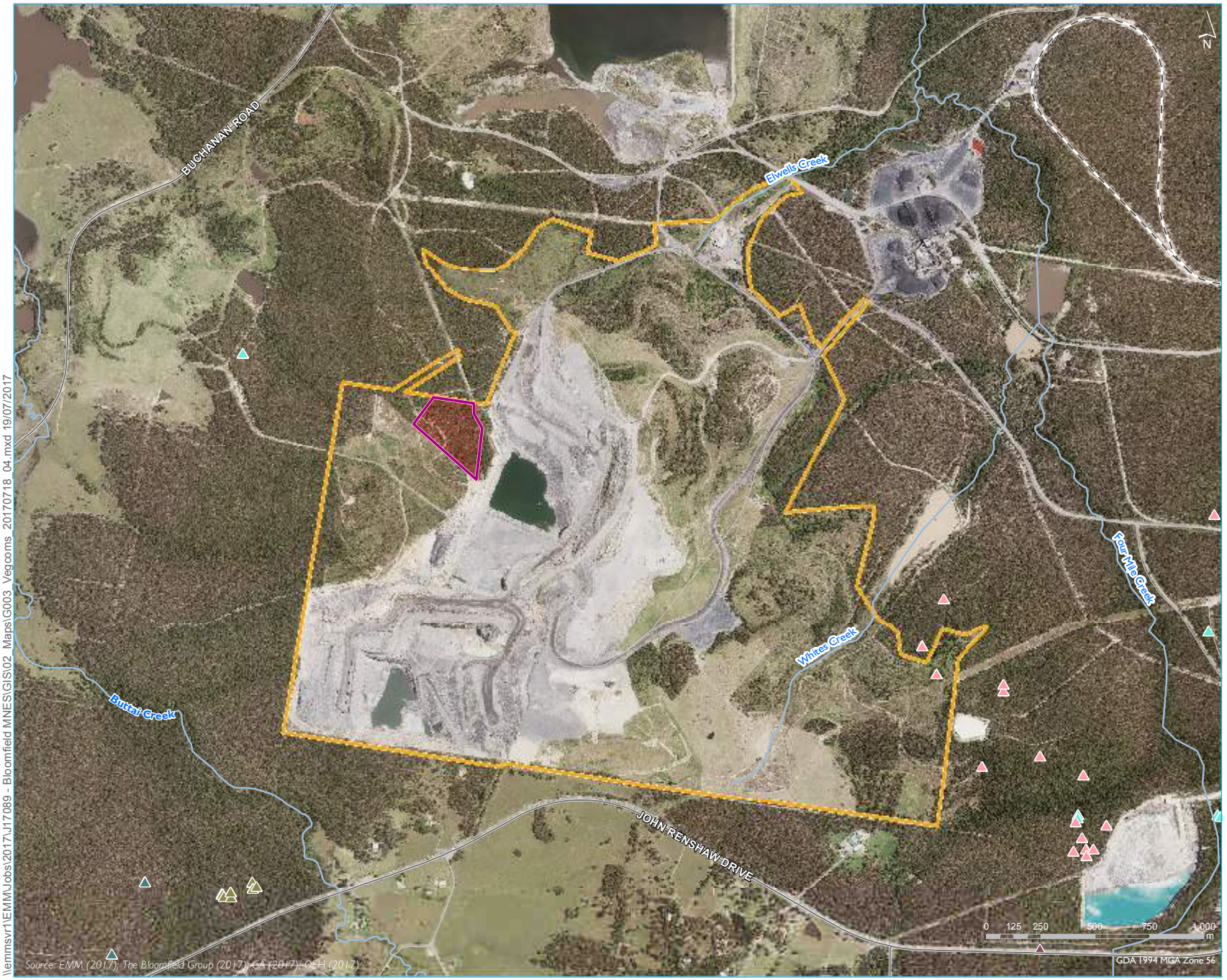
ii Flora

The vegetation within the study area represents potential habitat for Black-eyed Susan (*Tetratheca juncea*), however targeted flora surveys did not detect the species, nor any other threatened flora listed under the EPBC act.

4.3.2 Fauna

Fauna observed during the field survey were limited to common bird species including the Laughing Kookaburra (*Dacelo novaeguineae*), Yellow-tufted Honeyeater (*Lichenostomus melanops*) and Yellow-faced Honeyeater (*Lichenostomus chrysops*). The latter two species were observed foraging within flowering Spotted Gum. No EPBC listed threatened species or migratory species were recorded.

Domestic Dog (*Canis lupus familiaris*) footprints and a scat was recorded within the study area. Given the lack of surrounding residences these signs are likely to be from a feral animal.



KEY

- Study area
- Approval area

Threatened species records

- Large-eared Pied-bat
- *Eucalyptus parramattensis* subsp. *decadens*
- Grey-headed Flying Fox
- *Grevillea parviflora subsp. parviflora*
- Koala
- *Rutidosis heterogama*
- *Tetratheca juncea*

Vegetation community

- PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark open Forest
- Main road
- Local road
- Rail line
- Watercourse

\\emmsvr1\EMMJobs\2017\J170089 - Bloomfield MNES\GIS\02_Maps\G003_Vegcoms_20170718_04.mxd 19/07/2017

Vegetation communities

Bloomfield Colliery
MNES assessment
Terrestrial ecology
Figure 4.3

EMM

i Fauna habitat

The forested areas within the study area are likely to provide habitat for a range of common fauna species. The density of tree hollows is limited somewhat by the relatively young canopy, however 23 hollow bearing trees have been mapped within the study area. These are likely to provide shelter for a range of arboreal mammals and potential nesting habitat for hollow dependant birds.

The terrestrial habitat was relatively sparse with limited shelter provided by occasional fallen trees and other woody debris. Whilst this may provide habitat for small mammals and reptiles, it is likely to be insufficient and suboptimal for larger mammals such as the EPBC listed Spotted-tailed Quoll (*Dasyurus maculatus*).

One primary feed tree species listed within the North Coast Koala Management Area under SEPP 44 was recorded within the study area, the Grey Gum (*Eucalyptus punctata*). This tree species only composed small proportion (1.6%) of the canopy. The study area is included within the north coast KMA (OEH 2017) which lists three tiers of koala feed tree, Primary, Secondary and Stringybarks/supplementary species. No primary or secondary feed trees listed for the KMA were found within the study area and therefore it is unlikely that there are sufficient foraging resources to support the Koala within the Study area. No Koala scats were detected during searches around the base of Grey Gums.

Approximately a quarter of the canopy species within the study area is composed of Spotted Gum, which is a potential foraging resources for several EPBC listed species including Regent Honeyeater, Swift Parrot and the Grey-headed Flying-fox . Relatively young trees, such as those within the study area, do not produce as high nectar yields compared to larger and older trees, however given the relatively high density of feed trees and good connectivity to large areas vegetation, the study area is still considered potential habitat for the above species. Other canopy species with high nectar yields, within the study area include Smooth-barked Apple and Red Bloodwood, though these species occur less abundantly.

Aquatic habitat within the study area is minimal and limited to a drain and small dam. The drainage line is ephemeral and contained only very shallow water, with no pools present at the time of the field survey. The dam is highly turbid and disturbed with bare earth banks and no aquatic vegetation present. The study area does not contain suitable breeding habitat for any EPBC listed frog species.

5 Impact assessment

This chapter includes an assessment of the potential direct and indirect impacts of the proposed action on MNES. The direct impact of the project is the clearance of vegetation. The impact assessment for this project assumes complete disturbance/removal of PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest, which occupies an area of 6.12 ha within the study area.

The following section provides the criteria that must be considered in the assessment of all threatened species listed under the EPBC Act.

5.1 Significant impact guidelines

In determining the significance of impact associated with the project, the relevant criteria listed in the Matters of National Environmental Significance – Significance Impact Guidelines 1.1 (DoE) dated 2013 was applied. This assessment has been undertaken for the following MNES values:

- Critically endangered species: Regent Honeyeater and Swift Parrot;
- Vulnerable species: Large eared Pied Bat and Grey Headed Flying Fox; and
- Migratory species: Satin Flycatcher and Rufous Fantail.

Two migratory species, the Fork-tailed Swift and White-throated Needletail, will possibly occur within the study area. However due to their almost exclusive aerial nature, potential impacts are unlikely to occur and no further assessment has been completed.

5.1.1 Significant impact criteria for critically endangered and endangered species

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

5.1.2 Significant impact criteria for vulnerable species

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of an important population of a species;
- reduce the area of occupancy of an important population;
- fragment an existing important population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of an important population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat;
- introduce disease that may cause the species to decline; or
- interfere substantially with the recovery of the species.

5.1.3 Significant impact criteria for listed migratory species

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

5.2 Assessments of Significance

Significant impact assessments have been prepared for species listed under the EPBC Act, in accordance with the criteria above.

5.2.1 Regent Honeyeater (*Anthochaera phrygia)* – critically endangered

The Regent Honeyeater (*Anthochaera phrygia*) is endemic to mainland south-east Australia and is listed as a critically endangered species under the EPBC Act. The species has a patchy distribution which extends from south-east Queensland, through New South Wales and the Australian Capital Territory, to central Victoria. However, it is highly mobile, occurring only irregularly in most sites, and in variable numbers, often with long periods with few observation anywhere. Within the current distribution there are four known key breeding areas where the species is regularly recorded.

These are the Bundarra-Barraba, Capertee Valley and Hunter Valley districts in New South Wales, and the Chiltern area in north-east Victoria (DoE 2016). The Regent Honeyeater comprises a single population, with some exchange of individuals between regularly used areas (Garnett et al., 2011, cited in DoE 2016). The species can undertake large-scale nomadic movements in the order of hundreds of kilometres (OEH 2017).

Two Bionet (2017) records exist within the locality, with the closest record located 7 km to the west of the study area. Additionally, more records exist just outside of the locality, approximately 10km to the south-west of the study area within the Tomalpin Woodlands, south-west of Kurri Kurri in the Lower Hunter Valley Important Bird Area (IBA). These records are associated with a known breeding event that occurred in this woodland during 2007 and 2008 (Roderick et al. 2014). During this time about 20 nests fledged young, the most significant known recruitment of individuals in recent years. In 2012, around 100 Regent Honeyeaters were recorded in the Lower Hunter Valley IBA, remaining in the Tomalpin Woodlands for at least six months, and they may have bred there again (birds were observed constructing nests) (Birdlife 2014).

The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regionally, the Lower Hunter Spotted Gum forest has been shown to provide a valuable resource for this species (OEH 2017). The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes, targeting those which flower most profusely.

Key eucalypt species identified in the National Recovery Plan for the Regent Honeyeater (DoE 2016) comprise Mugga Ironbark (*Eucalyptus sideroxylon*), Yellow Box (*E. Melliodora*), White Box (*E. albens*), Yellow Gum (*E. leucoxylon*), Spotted Gum , Swamp Mahogany (*E. robusta*), Needle-leaf Mistletoe (*Amyema cambagei*) which grows on River Oak (*Casuarina cunninghamiana*), Box Mistletoe (*A. miquellii*) and Long-flower Mistletoe (*Dendropthoe vitellina*). Other tree species may be regionally important. For example the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events of Regent Honeyeaters. Flowering of associated species such as thin-leaved stringybark (*E. eugenioides)* and other stringybark species, and Broad-leaved Ironbark can also contribute important nectar flows at times.

Spotted Gum is present within the study area, at a canopy cover percentage of approximately 22%, and Broad-leaved Ironbark at 10% canopy cover within the study area, and the Regent Honeyeater may forage within the study area. However, potential foraging may be limited due to lack of large mature trees within the study area. Regent Honeyeaters prefer taller and larger diameter trees for foraging, as these typically produce more nectar (Franklin et al., 1989; Webster & Menkhorst 1992; Menkhorst et al., 1999; Oliver 2000, cited in DoE 2016).

Nests are usually placed in the canopy of mature trees with rough bark, e.g. ironbarks, sheoaks (*Casuarina*) and rough-barked Apple (*Angophora*). A cup-shaped nest is constructed in which two to three eggs are laid. Nests may be near or far from food resources; one nest has been recorded 700 m from a resource tree (Geering & French, 1998, cited in DoE 2016). Pairs now mostly nest solitarily, but historical records show in the past they often nested in loose aggregations (DoE 2016). It is unlikely that the Regent Honeyeater would nest within the study area, due to relatively young stand of trees and lack of mature trees with rough bark.

Table 5.1 provides an assessment of significance for the removal of 6.12 ha of potential foraging habitat, in accordance with the relevant assessment criteria (Section 5.2.1).

Table 5.1 Assessment of significance for the Regent Honeyeater

Criteria	Discussion
1: long-term decrease in population size	An action that would lead to a long-term decrease of the Regent Honeyeater population would be one that is undertaken in a breeding area, or one that removes key feed species when foraging resources are sparse. As the proposed action is not located in a known breeding area for the species, it is not expected to result in a long-term decrease in population size. The study area includes Spotted Gum, identified as a key eucalypt species in the National Recovery Plan for the Regent Honeyeater (DoE 2016). Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events of Regent Honeyeaters. Flowering of broad-leaved ironbark can also contribute important nectar flows at times (DoE 2016). Spotted Gum is present within the study area, at a canopy cover percentage of approximately 22%, and Broad-leaved ironbark at 10% canopy cover within the study area, and the study area may provide foraging habitat for the species. However, potential foraging may be limited due to lack of large mature trees within the study area. Regent Honeyeaters prefer taller and larger diameter trees for foraging, as these typically produce more nectar (Franklin et al., 1989; Webster & Menkhorst 1992; Menkhorst et al., 1999; Oliver 2000, in DoE 2016). It is unlikely that the species is reliant on foraging resources within the study area, nor are any substantial numbers of the species likely to occur within the study area. As such, there is not likely to be any population level impacts.
2: reduce area of occupancy	A total area of 6.12 ha of potential foraging habitat that includes key tree species, Spotted Gum, as identified in the Regent Honeyeater recovery plan (DoE 2016), will be removed as a result of the project. The Regent Honeyeater is wide ranging, typically occurring in areas where profuse flowering of feed trees is occurring. It is unlikely that the loss of a small area of sub-optimal foraging habitat will significantly reduce the occupancy of the species. The study area is to the north-east of the Hunter Valley key breeding area, as identified in the recovery plan. However, the study area is unlikely to provide any potential breeding habitat, due to lack of mature rough-barked trees.
3: fragment a population	The Regent Honeyeater occurs as a single, contiguous population (DoE 2016). This species is highly mobile and able to cross open areas. As the study area would likely only form a small part of their wider occurrence, and the impact of loss of 6.12 ha of potential foraging habitat is on the edge of existing open cut mining operation (located to the east and south of the study area), fragmentation of a single contiguous population is unlikely to occur.
4: adversely affect critical habitat	Habitat critical to the survival of the Regent Honeyeater includes, any breeding or foraging habitat in areas where the species is likely to occur (as defined in Figure 1 of the National Recovery Plan (DoE 2016)); and any newly discovered breeding or foraging locations. The Lower Hunter Valley IBA is considered to include critical habitat for the species, and the study area is located approximately 10 km to the north-east of known breeding records, in the Tomalpin Woodland near Kurri Kurri, which is part of the IBA. However, the habitat which will be removed consists of sub-optimal foraging habitat only, as it is has been historically cleared, and has a lack of large trees and many trees of a similar size, indicating a single regeneration event. With limited large trees, and smaller trees having limited fruiting resources and limited nectar it is unlikely that the species is reliant on foraging resources within the study area, nor are any substantial numbers of the species likely to occur within the study area. While Spotted Gum, a key eucalypt species, is within the study area, it is unlikely to provide masses of nectar resources due to its younger age. The study area does not comprise breeding habitat. Therefore, the project will not affect any habitat critical to the survival of the Regent Honeyeater.
5: disrupt the breeding cycle of a population	The Regent Honeyeater has bred within the Tomalpin Woodland, located approximately 10 km south-west of the Study area. However, it is considered unlikely that breeding would occur within the areas to be impacted by the project, due to relatively young stand of trees and lack of mature trees with rough bark.

Table 5.1 Assessment of significance for the Regent Honeyeater

Criteria	Discussion
6: decrease availability or quality of habitat	The species have not been recorded within the study area and if it does occur, it is likely to be on a transient basis only, passing through to more optimal areas of foraging habitat. The clearance of 6.12 ha of sub-optimal foraging habitat is not likely to cause any discernible impact to the species, and the species will remain largely unaffected by the project.
7: result in invasive species	Without management, vegetation clearing and topsoil stripping are likely to lead to weed invasion in surrounding remaining habitat to the north and west (to the east and south is existing open cut operations). Weed control protocols will be undertaken, in accordance with the proponent's relevant processes and procedures, to ensure plant entering the study area is weed free. Therefore the project will not result in invasive species that are harmful to the species becoming established in the habitat to the north and west of study area.
8: introduce disease	This species is not known to be particularly susceptible to disease and the project will not introduce any disease relevant to the Regent Honeyeater.
9: interfere with recovery	The recovery of the Regent Honeyeater is closely linked the extent and quality of habitat, and actions include the protection of intact (high quality) areas of Regent Honeyeater breeding and foraging habitat (DoE 2016). The study area is not within a known breeding area, and does not provide optimal breeding habitat. The study area is on the edge of edge of existing open cut mining operation (located to the east and south of the study area), and is not considered as intact. Although the habitat within the study area to be removed provides a potential foraging resource, including key eucalypt species Spotted Gum, it is not considered high quality as the habitat is missing a likely important ecological feature, being large trees with high quality nectar flows. It is unlikely that any individuals are reliant on the habitat.
Conclusion	The habitat to be removed is unlikely to be important for these species and the project is not anticipated to have a significant impact on the Regent Honeyeater as: • the study area is not within a known breeding area, and does not provide optimal breeding habitat for the species; and • if the species does occur, it is likely to be on a transient basis only, passing through to more optimal areas of foraging habitat.

The proposed action is unlikely to result in a significant impact on the Regent Honeyeater. A precautionary assessment approach has been adopted, and the species has been assumed to occasionally forage within the study area. Accordingly, measures are proposed to mitigate potential impacts of the proposed action on potential habitat for the Regent Honeyeater (Section 6).

5.2.2 Swift Parrot (*Lathamus discolor*) – critically endangered

The Swift Parrot (*Lathamus discolor*) is listed as a critically endangered species under the EPBC Act. This species migrates from its Tasmanian breeding grounds to south-eastern Australia in the autumn and winter months. In NSW, the species mostly occurs on the coast and south-west slopes in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations (OEH 2017). Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*).

Favoured feed trees within the study area include Spotted Gum and Red Bloodwood which occur at 22.3% and 1.6% of the total canopy species respectively. The Swift Parrot is not considered to be dependent on habitat in the study area and optimal habitat is likely to include areas with a higher density of larger preferred feed trees, however the species has been assessed as having the potential to occur given the presence of feed trees and several records of this species occurring within the locality.

A total of 6.12 ha of regrowth forest habitat that includes a total canopy density of 22.3% of Spotted Gum and 1.6% of Red Bloodwood, both favoured feed trees, will be removed as part of the project. Table 5.2 provides an assessment of significance for the removal of this potential foraging habitat, in accordance with the relevant assessment criteria (Section 5.2.1).

Table 5.2 Assessment of significance for the Swift Parrot

Criteria	Discussion
1: long-term decrease in population size	The study area has been historically cleared, and has a lack of large trees and many trees of a similar size, indicating a single regeneration event following disturbance. With limited large trees, and smaller trees having limited fruiting resources and limited nectar it is unlikely that the species is reliant on foraging resources within the study area, nor are any substantial numbers of the species likely to occur within the study area. As such, there is not likely to be any population level impacts.
2: reduce area of occupancy	A total area of 6.12 ha of potential foraging habitat will be removed as a result of the project. This species is wide ranging, typically occurring in areas where profuse flowering of feed trees is occurring. It is unlikely that the loss of 6.12 ha of sub-optimal foraging habitat will significantly reduce the occupancy of the species.
3: fragment a population	This species is highly mobile and is able to cross open areas. The loss of 6.12 ha of potential foraging habitat, that occurs on the edge of an existing open cut mine working areas, where clearing has historically taken place, will not cause any fragmentation effects.
4: adversely affect critical habitat	Habitats of particular importance to the Swift Parrot are outlined in the recovery plan for the species (Birds Australia 2011); including: • for nesting; • by large proportions of the Swift Parrot population; • repeatedly between seasons (site fidelity), or • for prolonged periods of time (site persistence). As the study area is within mainland Australia, there is no potential for nesting occur. The species has not been recorded within the study area or the immediate vicinity and there is no evidence of prolonged occurrence, repeat use or large number of the species occurring. Therefore, the project will not affect any habitat critical to the survival of the Swift Parrot.
5: disrupt the breeding cycle of a population	The Swift Parrot breeds within Tasmania and has no potential to breed within the study area.
6: decrease availability or quality of habitat	The species has not been recorded within the study area and if it does occur is likely to be on a transient basis only, passing through to more optimal areas of foraging habitat. The Swift Parrot is not considered to be dependent on habitat in the study area and the clearance of 6.12 ha of sub-optimal foraging habitat is not likely to cause any discernible impact to the Swift Parrot, and the species will remain largely unaffected by the project.
7: result in invasive species	Weed invasion impacting on habitat regeneration and health, and aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners are two key threats that invasive species pose on the Swift Parrot. Noisy Miners were not recorded in the study area during any the ecological investigations. Without management, vegetation clearing and topsoil stripping are likely to lead to weed invasion in surrounding remaining habitat to the north and west (to the east and south is existing open cut operations). Weed control protocols will be undertaken, in accordance with the proponent's relevant processes and procedures, to ensure plant entering the study area is weed free. Therefore the project will not result in invasive species that are harmful to the species becoming established in the habitat to the north and west of study area.
8: introduce disease	This species is vulnerable to Psittacine Beak and Feather Disease however the proposed activity does not play a role in the introduction of this threat.

Table 5.2 Assessment of significance for the Swift Parrot

Criteria	Discussion
9: interfere with recovery	The key action within the recovery plan for the Swift Parrot (Birds Australia 2011), which is relevant to the project, is the management and protection of Swift Parrot habitat at the landscape scale. The habitat within the study area is unlikely to be important for this species and there is expected to be no impact on its recovery as the result of the project.
Conclusion	It is unlikely that the species is reliant on foraging resources within the study area, therefore the habitat to be removed is unlikely to be important for the species and the project is not anticipated to have a significant impact on the Swift Parrot.

The proposed action is unlikely to result in a significant impact on the Swift Parrot. A precautionary assessment approach has been adopted, and the species has been assumed to occasionally forage within the study area. Accordingly, measures are proposed to mitigate potential impacts of the proposed action on potential habitat for the Swift Parrot (Section 6).

5.2.3 Large-eared Pied Bat (*Chalinolobus dwyeri*) – vulnerable

The Large-eared Pied Bat (*Chalinolobus dwyeri)* is listed as a vulnerable species under the EPBC Act. This species roosts in caves, crevices in cliffs, old mine workings, frequenting low to mid-elevation dry open forest and woodland, especially in gullies. The species probably forages for small, flying insects below the forest canopy. Females have been recorded raising young in maternity roosts in roof domes in sandstone caves and overhangs.

Records of this species exist approximately 2.5 km north-east of the study area. There is no breeding habitat for this species within the study area; however several records occur within the locality and the species may have the potential to pass over or forage within the study area.

Table 5.3 provides an assessment of significance for the removal of 6.12 ha of potential foraging habitat, in accordance with the relevant assessment criteria (Section 5.2.2).

Table 5.3 Assessment of significance for Large-eared Pied Bat

Criteria	Discussion
1. Long term decrease in population size	Actions that would cause a long-term decrease in Large-eared Pied Bat population size would be the removal of roosting habitat, maternity roosts and the substantial removal of foraging habitat. The proposal will not impact any roosting habitat, however requires removal of 6.12 ha of potential foraging habitat. The foraging habitat is considered sub-optimal given that it has been historically cleared, with a lack of large trees and an abundance of trees of a similar size, indicating a single regeneration event. With limited large trees, and smaller trees having limited fruiting resources and limited nectar, the removal of this small area is not likely to cause any population level effects.
2. Reduce area of occupancy	The study area is within the known and modelled distribution of the species, as identified within the national recovery plan (DERM 2011). Within NSW, based on available records, the largest concentration of populations appears to be in the sandstone escarpments of the Sydney Basin and northwest slopes of NSW (DERM 2011). It is unlikely that an important population is reliant on the study area for foraging, as the habitat is sub-optimal due to limited large trees, and there is no roosting habitat. The area of occupancy of the species is large and the removal of 6.12 ha of potential foraging habitat is unlikely to reduce this area of occupancy significantly.

Table 5.3 Assessment of significance for Large-eared Pied Bat

Criteria	Discussion
3. Fragment a population	Modelling based on presence-only data indicates that bats forage in fertile valleys and plains, as well as areas with moderately-tall to taller trees along water courses. The majority of records are from canopied habitat, suggesting a sensitivity to clearing, although narrow connecting riparian strips in otherwise cleared habitat are sometimes quite heavily used (DECC 2007, cited in DERM 2011). However, the loss of 6.12 ha of potential foraging habitat, that occurs on the edge of an existing open cut mine working area, where clearing has historically taken place, will not cause any significant fragmentation effects for the species.
4. Adversely affect critical habitat	Any maternity roosts must be considered habitat critical to the survival of the species (DERM 2011). Sandstone cliffs and fertile wooded valley habitat within close proximity of each other should also be considered habitat critical to the survival of the Large-eared Pied Bat (DECC 2007, cited in DERM 2011). As maternity roosting habitat and any nearby sandstone cliff is absent, the study area does not contain critical habitat for the Large-eared Pied Bat.
5. Disrupt the breeding cycle of a population	Maternity roosts are absent from the study area, and the habitat does not provide any opportunity for any future maternity roosts, therefore it will not disrupt the breeding cycle of a population.
6.Decrease availability or quality of habitat	Given the small area (6.12 ha) of clearing and the abundance of potential foraging habitat in the locality, this is not expected to impact the species such that it would decline.
7. Result in invasive species	Predation by introduced predators is listed as a threat to the species (recovery plan). It is possible that mortality is a factor particularly where roosts are limited and bats are forced to roost close to the ground, making them vulnerable to attack from cats, foxes and possibly rats. However, the study area does not contain roosting habitat therefore the species, which may only forage in the study area, is not affected by this threat. Weed controls and hygiene protocols will be implemented during the construction works, reducing the chance of introducing any invasive species to surrounding bushland.
8. Introduce disease	This species is subject to Australian Bat Lyssavirus. This disease becomes more prevalent when the species is stressed. As the works are not located in a roosting colony, and result in small clearance of only potential sub-optimal foraging habitat it is unlikely to cause stress such that a disease outbreak would occur.
9. Interfere with recovery	Recovery actions for this species rely on identifying priority roost and maternity sites for protection and implementing conservation and management strategies for priority sites. Also, educating the community and industry to understand and participate in the conservation of the large-eared pied bat, research the large-eared pied bat to augment biological and ecological data to enable conservation management, and determine the meta-population dynamics throughout the distribution of the large-eared pied bat. The project does not interfere with any of these priority actions.
Conclusion	The project will not have a significant impact on the Large-eared Pied Bat as: • no roost sites or roosting habitat will be directly impacted; and • the study area represents sub-optimal potential foraging habitat only.

5.2.4 Grey-headed Flying-fox (*Pteropus poliocephalus*) – vulnerable

The Grey-headed Flying-fox is listed as a vulnerable species under the EPBC Act. Individuals are generally found within 200 km of the eastern coast of Australia, from Bundaberg, Queensland to Melbourne, Victoria. In times of natural resource shortages, they may be found in unusual locations. They occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.

The species occurs as a single, continuous population across its range and therefore important populations cannot be identified for the species. Roosting camps represent important habitat for the species, however these are absent from the study area. The species may occasionally forage within the study area as it is wide ranging and has been recorded within the locality.

Table 5.4 provides an assessment of significance potential impacts of the proposal on the Grey-headed Flying-fox, in accordance with the relevant assessment criteria (Section 5.2.2).

Table 5.4 Assessment of significance for Grey-headed Flying-fox

Criteria	Discussion
1. Long term decrease in population size	The Grey-headed Flying-fox occurs as a single population across its range, and therefore important populations cannot be identified for the species. Actions that would cause a long-term decrease in Grey-headed Flying-fox population size would be the removal of maternity camps and the substantial removal of foraging habitat. Roosting camps are absent from the study area, and therefore breeding habitat and breeding activities will not be affected by the project. However the project requires removal of 6.12 ha of potential foraging habitat. The foraging habitat is considered sub-optimal given that it has been historically cleared, with a lack of large trees and an abundance of trees of a similar size, indicating a single regeneration event. With limited large trees, and smaller trees having limited fruiting resources and limited nectar, the removal of this small area is not likely to cause any population level effects. This species is highly mobile and able to exploit foraging resources over large areas of NSW. As breeding habitat is absent from the study area, and only a small amount of sub-optimal potential foraging habitat, with a relatively young canopy, will be removed, the project will not lead to a long-term decrease in the Grey-headed Flying-fox population.
2. Reduce area of occupancy	The Grey-headed Flying-fox is a highly mobile species with a large area of occupancy along the east coast of Australia. The removal of 6.12 ha of potential foraging habitat is unlikely to reduce this area of occupancy significantly.
3. Fragment a population	The Grey-headed Flying-fox is a highly nomadic species with a wide distribution along the east coast of Australia, which occurs as a single, contiguous population. The removal of 6.12 ha of potential foraging habitat will not fragment the population.
4. Adversely affect critical habitat	Habitat critical to the survival of the species may include foraging habitat which can support 30,000 individuals within a 50 km radius, and productive habitat during seasonal bottlenecks (DECCW 2009). Roosting habitat critical to survival include those used as a camp >50% of years, or has a certain number of females during the final stages of pregnancy. As roosting camps and habitat are absent, the study area does not contain critical habitat for the Grey-headed Flying Fox.
5. Disrupt the breeding cycle of a population	Maternity roosts are absent from the study area, and the highly cleared landscape is unlikely to support any breeding in the future, therefore it will not disrupt the breeding cycle of a population.
6.Decrease availability or quality of habitat	Given the small area (6.12 ha) of clearing and the abundance of potential foraging habitat in the locality, this is not expected to impact the species such that it would decline.
7. Result in invasive species	Weed controls and hygiene protocols will be implemented during the construction works, reducing the chance of introducing any invasive species to surrounding bushland.
8. Introduce disease	This species is subject to Australian Bat Lyssavirus and Hendra virus. These diseases become more prevalent when the species is stressed. As the works are not located in a roosting colony, and result in small clearance of only potential sub-optimal foraging habitat it is unlikely to cause stress such that a disease outbreak would occur.
9. Interfere with recovery	Recovery actions for this species rely on identifying foraging resources, mapping critical habitat and documenting levels of flying-fox damage so non-invasive mitigation measures can be implemented. The project does not interfere with any of these priority actions.

Table 5.4 Assessment of significance for Grey-headed Flying-fox

Criteria	Discussion
Conclusion	The project will not have a significant impact on the Grey-headed Flying-fox as: • no roost sites or roosting habitat will be directly impacted; and • the study area represents sub-optimal potential foraging habitat only.

5.2.5 Satin Flycatcher (*Myiagra cyanoleuca*) and Rufous Fantail (*Rhipidura rufifrons*) – migratory species

The Satin Flycatcher is listed as a migratory species under the EPBC Act. It inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occurs in coastal forests, woodlands, mangroves and drier woodlands and open forests (DoE 2016). No records of this species exist within the locality, however given its wide range and forested habitat within the study area the species may occur intermittently.

The Rufous Fantail is listed as a migratory species under the EPBC Act. In east and south-east Australia, it mainly inhabits wet sclerophyll forests, and is often in gullies dominated by eucalypts; usually with a dense shrubby understorey often including ferns. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands (DoE 2017). Records of this species exist within the locality. This species has the potential to occur within study area riparian forest.

Table 5.5 provides an assessment of significance that examines potential impacts of the proposal on these migratory species, in accordance with the relevant assessment criteria (Section 5.2.3).

Table 5.5 Assessment of significance for migratory species

Criteria	Discussion
1. Substantially modify destroy or isolate an area of important habitat.	The study area does not contain important habitat for the Satin Flycatcher or Rufous Fantail. While both species have the potential to occur given they are highly mobile and have broad habitat requirements whilst on migration, neither species will breed in the site considering that they both prefer taller forests in wetter habitats such as heavily forested gullies. The species are more likely to visit drier sclerophyll forest, such as that in the majority of the study area, only when on passage. Also, Satin Flycatchers are largely absent from re-growth forests (Loyn 1980; Loyn 1985a; Smith 1984; Taylor et al. 1997b, cited in DoE 2017).
2. Result in an invasive species becoming established in an area of important habitat.	As stated above, the study area does not contain important habitat for either species. Weed controls and hygiene protocols will be included during the construction works, reducing the chance of introducing any invasive species to surrounding bushland.
3. Disrupt the breeding cycle of a population	If either species occur within the study area, is anticipated to be on an intermittent basis only, and not include significant proportions of a population at any given time. There are no attributes of the study area which would cause large aggregations of individuals to occur. These species will not breed within the study area as suitable habitat is absent, therefore disruptions to the breeding cycle are unlikely.

Table 5.5 Assessment of significance for migratory species

Criteria	Discussion
Conclusion	The project will not have a significant impact on either migratory species, as: • the area does not contain important habitat; • no breeding habitat will be impacted; • foraging habitat is sub-optimal and considered unimportant within the landscape; and • no large aggregations of either species are likely to occur.

6 Avoidance and mitigation

6.1 Avoidance

Clearing is required in the study area to enable mine plans to progress as per the existing Part 3A project approval (PA 07_0087). Avoidance is not possible due to the location of the coal resource. The following sections provide recommended mitigation measures to reduce potential biodiversity impacts of the project.

6.2 Mitigation

The Bloomfield Colliery has established clearing practices in place, as part of their Environmental Management Strategy (Bloomfield 2011). These include minimisation of disturbance areas, pre-clearance surveys, salvaging and reusing material on site for habitat enhancement, conserving and reusing topsoils, and weed management. These clearing practices will be implemented for the project in accordance with Bloomfield's management strategy.

Pre-clearance surveys of the forest to be removed will be conducted within 24 hours prior to commencement of clearing to identify any fauna species or habitat within areas of impact. Where clearing of vegetation and fauna habitats occurs, clearing protocols will be put in place, including checking trees for the presence of arboreal fauna prior to felling. Where feasible, animals found to be occupying trees will be safely relocated into nearby forest that will not be disturbed. Where feasible, transportable habitat features such as large logs and boulders will be placed in adjacent retained areas or in areas ready for seeding, to allow their continuation as potential fauna refuge sites.

6.2.1 Pre-clearance surveys for MNES

Although the project is unlikely to result in a significant impact to MNES, the Regent Honeyeater and Swift Parrot have been assumed to occasionally forage within the study area and a precautionary assessment approach has been adopted for these two species. Accordingly, measures are proposed to mitigate potential impacts of the proposed action on potential habitat for the Regent Honeyeater and Swift Parrot. As well as the above general fauna pre-clearance methodology, targeted pre-clearance surveys by a suitably qualified ecologist should be undertaken for the Regent Honeyeater and Swift Parrot, prior to clearing the vegetation within the study area, as described below.

i Regent Honeyeater and Swift Parrot

A qualified ecologist will undertake a pre-clearance survey within 24 hours prior to the commencement of removal of potential foraging habitat for the Regent Honeyeater and Swift Parrot. Potential foraging habitat includes the entire 6.12 ha study area.

Pre-clearance surveys will be undertaken over a period of two days and surveys will be undertaken in the morning (ie within 3 hours of sunrise) to target the species highest activity period. Dependent on the clearing schedule, the survey effort will comprise:

- 20 minute searches in areas up to 5 ha; or
- 40 minute searches in areas of 6-30 ha.

If Regent Honeyeaters or Swift Parrots **are not found** within the clearance area, then searches for Regent Honeyeater or Swift Parrot habitat trees (foraging trees) are not required.

If Regent Honeyeaters or Swift Parrots **are found** within the clearance area, targeted searches for Regent Honeyeater or Swift Parrot habitat trees will be undertaken by a qualified ecologist.

If habitat trees are found within the clearance area, a qualified ecologist will mark the trees with flagging tape and spray paint (eg with a 'H', denoting habitat tree).

The two-stage clearance protocol for habitat trees comprises:

- Stage 1: Non-habitat trees will be cleared 24 hours prior to any habitat trees being cleared, to encourage Swift Parrots to move out of the habitat area.
- Stage 2: When Stage 1 is complete, habitat trees can be removed.

6.2.2 Weed control, microhabitat retention and demarcation

Other management strategies should include:

- appropriate weed controls to avoid incursion of exotic weed species into the remaining surrounding forest;
- salvaging microhabitat features, such as woody debris and logs, within adjacent suitable habitat, where possible to mitigate potential impacts to ground-dwelling fauna; and
- habitat adjacent to the proposed clearing should be demarcated to avoid accidental clearing. No vegetation should be cleared where it can be avoided. Areas that do not require clearing, come construction, should not be cleared. Where opportunities for reduction in clearing extents occur, these should be implemented and micro-habitat features retained.

7 Conclusion and recommendations

The study area has been subject to historical clearing and the vegetation in the study area is regrowth with a lack of large trees and a large number of trees of a similar size. In several areas, ground disturbance is also evident with contour banks and a drainage line. Although the study area has been previously degraded, the vegetation provides potential habitat for some MNES threatened species.

Potential habitat for a number of threatened species, including Regent Honeyeater, Swift Parrot, Large-eared Pied Bat and Grey-headed Flying Fox and migratory species Satin Flycatcher and Rufous Fantail has been identified within the study area. However, habitat for these species is generally of sub-optimal value, primarily due to its condition, fragmented nature, existing threats and location next to an existing operating open cut mine.

The habitat is unlikely to support important populations of MNES or be critical to the survival of a population or the species. Impact assessments have been undertaken for each of these species against EPBC Act significant impact criteria. These assessments concluded that it is unlikely that significant impacts to MNES will occur as a result of the proposed Project.

It is recommended that the mitigation and management measures described in Section 6 are implemented.

References

Bionet 2017, *Atlas of NSW Wildlife*, Office of Environment and Heritage, http://www.bionet.nsw.gov.au/, viewed April 2017.

Birds Australia 2011, *National Recovery Plan for the Swift Parrot Lathamus discolour,* Prepared by Debbie Saunders and Chris Tzaros, Swift Parrot Recovery Team.

Birdlife Australia 2014, *IBAs in Danger Report, The state of Australia's Important Bird and Biodiversity Areas*, November 2014.

Bloomfield (2011) *Mining Operations (Bloomfield) Environmental Management Strategy*, Revised Final Draft, August 2011.

Department of Environment, Climate Change and Water NSW (DECCW) 2009, *Draft National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus*, prepared by Dr Peggy Eby, Sydney.

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

DoE 2016, *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygria)*, Commonwealth of Australia, April 2016.

Department of the Environment and Energy (DoEE) 2017, *Species Profile and Threats Database,* http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl, viewed June 2017.

Department of Environment and Resource Management (DERM) 2011, *National recovery plan for the large-eared pied bat Chalinolobus dwyeri,* Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Hunter Eco 2010, *Bloomfield Colliery East Maitland, Part 3A variation ecology report*, prepared May 2010.

Hunter Eco 2012, *Bloomfield Colliery East Maitland, Biodiversity Assessment – Creek Cut Highwall*, prepared November 2012.

Office of Environment and Heritage (OEH) 2016*, Vegetation information system (VIS) classification database.*

Office of Environment and Heritage (OEH) 2017, *Threatened Species Profile Database.* http://www.environment.nsw.gov.au/threatenedspeciesapp/.

Roderick, M, Geering D.J and Ingwersen, D.A 2014, *Significant breeding event of Regent Honeyeaters Anthochaera phrygia near Kurri Kurri, New South Wales, during spring 2007*, Australian Field Ornithology 2014, 31, 113–121.

Threatened Species Scientific Committee (TSSC) 2015, *Approved Conservation Advice (including listing advice) for the Central Hunter Valley eucalypt forest and woodland ecological community*. Canberra: Department of the Environment.
http://www.environment.gov.au/biodiversity/threatened/communities/pubs/130-conservation-advice.pdf.

Appendix A

EPBC Act Protected Matters Search Tool

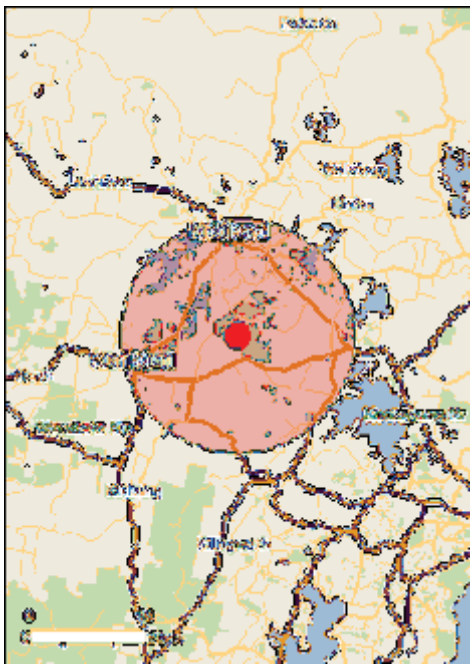
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 07/04/17 15:35:20



Coordinates
Buffer: 10.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	44
Listed Migratory Species:	33

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	7
Commonwealth Heritage Places:	1
Listed Marine Species:	42
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	3
Regional Forest Agreements:	1
Invasive Species:	46
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Hunter estuary wetlands	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area

Name	Status	Type of Presence
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat known to occur within area
Asterolasia elegans [56780]	Endangered	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus glaucina Slaty Red Gum [5670]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus parramattensis subsp. decadens Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat known to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat known to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Pelargonium sp. Striatellum (G.W.Carr 10345) Omeo Stork's-bill [84065]	Endangered	Species or species habitat likely to occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat likely to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area
Tetratheca juncea Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Airservices Australia
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Director of Defence Service Homes
Commonwealth Land - Telstra Corporation Limited

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Maitland Post Office	NSW	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
LNE Special Management Zone No1	NSW
Pambalong	NSW
Sugarloaf	NSW

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Feral deer		
Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis		
Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus		
Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus		
Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides		
Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia		
Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus		
Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides		
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cabomba caroliniana		
Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera		
Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. monilifera		
Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata		
Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius		
Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati		
Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.8019 151.5616

Appendix B

Likelihood of Occurrence Assessment

Table B.1 Likelihood of occurrence assessment

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		TSC Act	EPBC Act	Bionet	PMST		
TECs							
Central Hunter Valley eucalypt forest and woodland			CE		y	The canopy of this CEEC is dominated by one or more of the following four eucalypt species; Narrow-leaved ironbark (*Eucalyptus crebra*), Spotted Gum (*Corymbia maculata*), Slaty Gum (*E. dawsonii*) and Grey Box (*E. moluccana*) (TSSC 2015). One of the above species, Spotted Gum, occurs within the study area, representing 22% of the canopy species. However it is co-dominant with several other canopy species which are not indicative of the CEEC listing. To qualify as part of the Central Hunter Valley eucalypt forest and woodland ecological community Forest Oak (*Allocasuarina torulosa*), White Mahogany (*Eucalyptus acmenoides*) and Red Ironbark(*Eucalyptus fibrosa*) should be largely absent from the canopy. No white Mahogany were recorded within the study area, however Forest Oak and Red Ironbark were recorded with 24% and 10% of the canopy species respectively. The presence of these contraindicative species precludes the vegetation within the study area meeting the listing advice for this community.	Unlikely
Lowland Rainforest of Subtropical Rainforest			CE		y	This ecological community is generally a moderately tall (≥20 m) to tall (≥30 m) closed forest (canopy cover ≥70%). Tree species with compound leaves are common and leaves are relatively large (notophyll to mesophyll). Typically there is a relatively low abundance of species from the genera *Eucalyptus, Melaleuca* and *Casuarina*. Buttresses are common as is an abundance and diversity of vines. The tree canopy within the study area is dominated by *Eucalyptus* and *Corymbia* species with no typical rainforest trees recorded. This EEC does not occur within or adjacent to the study area.	Unlikely
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland			CE		y	The canopy stratum of this community is dominated by White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*) community, none of which occur within the study area. This EEC does not occur within or adjacent to the study area.	Unlikely
Wetlands of International Importance							
Hunter Estuary Wetlands					y	The Hunter Estuary Wetlands Ramsar site is comprised of two components, Kooragang and Hunter Wetlands Centre Australia. The Kooragang component of the Hunter Estuary Wetlands Ramsar site is located in the estuary of the Hunter River, approximately 7 km north of Newcastle on the coast of New South Wales. Hunter Wetlands Centre Australia is 2.5 km from Kooragang. Whilst the study area is within the Hunter River Catchment, there are no watercourses linking the study area to the Hunter River or any of its tributaries.	Unlikely

Table B.1 Likelihood of occurrence assessment

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		TSC Act	EPBC Act	Bionet	PMST		
Frogs							
Litoria aurea	Green and Golden Bell Frog	E	V	y	y	Inhabits marshes, dams and stream-sides, particularly those containing bulrushes *(Typha spp*.) or spikerushes (*Eleocharis spp*.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available. Some sites occur in highly disturbed areas (OEH 2017). The closest population, considered 'probably extant' (DoEE 2017), is part of the Middle Hunter Key Population, sub-population Wentworth Swamp. Individuals within this key population were last recorded in 2008, in two areas close to Gillieston Heights and Farley. No suitable breeding habitat was recorded within or adjacent to the study area and the species is unlikely to occur.	Unlikely
Litoria littlejohni	Littlejohn's Tree Frog	V	V	y	y	This species is restricted to sandstone woodland and heath communities at mid to high altitude. It forages both in the tree canopy and on the ground, with eggs and tadpoles mostly found in still or slow flowing pools that receive extended exposure to sunlight, but will also use temporary isolated pools (OEH 2017). The study area does not contain woodland or heath on sandstone and therefore no suitable habitat is likely to be present for the species.	Unlikely
Mixophyes balbus	Stuttering Frog	E	V		y	This species occurs in rainforest and wet tall open forest on plateaus, foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Eggs are laid on rock shelves or shallow riffles in small, flowing stream (OEH 2017). The species has not been recorded in the locality and no suitable habitat is present on the site.	Unlikely
Mixophyes iteratus	Giant Barred Frog	E	E		y	This species are found along freshwater streams with permanent or semi-permanent water, typically at lower elevation. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide (OEH 2017). The species has not been recorded within the locality and suitable habitat is absent from the study area.	Unlikely
Reptiles							
Hoplocephalus bungaroides	Broad-headed Snake	E	V		y	The species is largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney (OEH 2017). It occurs in sclerophyll woodland with sandstone outcrops preferring ridges, buffs and slopes with a north west aspect. Thermally suitable microhabitat may be a limiting resource for the species (DoEE 2017). The species has not been recorded within the locality and no suitable sandstone habitat exists.	Unlikely

Table B.1 Likelihood of occurrence assessment

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		TSC Act	EPBC Act	Bionet	PMST		
Birds							
Anthochaera phrygia	Regent Honeyeater	CE	CE	y	y	The species has a patchy distribution and is highly mobile, occurring only irregularly in most sites, and in variable numbers, often with long periods with few observation anywhere. Within the current distribution there are four known key breeding areas where the species is regularly recorded. These are the Bundarra-Barraba, Capertee Valley and Hunter Valley districts in New South Wales, and the Chiltern area in north-east Victoria (DoE 2016). Key eucalypt species identified in the National Recovery Plan for the Regent Honeyeater (DoE 2016) comprise Mugga Ironbark (*Eucalyptus sideroxylon*), Yellow Box (*E. Melliodora*), White Box (*E. albens*), Yellow Gum (*E. leucoxylon*), Spotted Gum (*Corymbia maculata*), Swamp Mahogany (*E. robusta*), Needle-leaf Mistletoe (*Amyema cambagei*) which grows on River Oak (*Casuarina cunninghamiana*), Box Mistletoe (*A. miquellii*) and Long-flower Mistletoe (*Dendropthoe vitellina*). Other tree species may be regionally important. For example the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events of Regent Honeyeaters. Flowering of associated species such as thin-leaved stringybark (*E. eugenioides)* and other stringybark species, and broad-leaved ironbark (*E. fibrosa)* can also contribute important nectar flows at times. Two Bionet (2017) records exist within the locality, with the closest record located 7 km to the west of the study area. Additionally, more records exist just outside of the locality, approximately 10km to the south-west of the study area within the Tomalpin Woodlands, south-west of Kurri Kurri in the Lower Hunter Valley Important Bird Area (IBA). These records are associated with a known breeding event that occurred in this woodland during 2007 and 2008 (Roderick et al. 2014). During this time about 20 nests fledged young, the most significant known recruitment of individuals in recent years. In 2012, around 100 Regent Honeyeaters were recorded in the Lower Hunter Valley IBA, remaining in the Tomalpin Woodlands for at least six months, and they may have bred there again (birds were observed constructing nests) (Birdlife Australia 2014). Suitable foraging species occur within the study area and the species has been recorded within the locality, and the species has the potential to fly over or utilise seasonal foraging resources within the study area.	Potential
Botaurus poiciloptilus	Australasian Bittern	E	E		y	This species occurs in permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). No suitable wetland habitat exists within the study area.	Unlikely
Calidris canutus	Red Knot,		E		y	In Australasia the Red Knot mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts. No such habitat occurs within the study area.	Unlikely
Calidris ferruginea	Curlew Sandpiper	CE	E		y	The Curlew Sandpiper is a small, highly-gregarious, migratory shorebird. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. No suitable habitat for this species exists within the vicinity of the study area.	Unlikely
Charadrius leschenaultii	Greater Sand Plover	V	V		y	This species is almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks (OEH 2017). No such habitat occurs within the study area.	Unlikely
Charadrius mongolus	Lesser Sand Plover	V	E		y	This species is almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats (OEH 2017). No such habitat occurs within the study area.	Unlikely

Table B.1 Likelihood of occurrence assessment

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		TSC Act	EPBC Act	Bionet	PMST		
Dasyornis brachypterus	Eastern Bristlebird	E	E		y	This species typically occurs in dense, coastal vegetation. The distribution has contracted to three disjunct areas of south-eastern Australia, none of which are close to the study area (OEH 2017).	Unlikely
Erythrotriorchis radiatus	Red Goshawk	CE	V		y	Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers (OEH 2017). This species is now restricted to northern NSW and the preferred habitat does not exist within the study area.	Unlikely
Grantiella picta	Painted Honeyeater	V	V		y	The species inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens. The species exhibits seasonal north-south movements governed principally by the fruiting of mistletoe, with many birds moving after breeding to semi-arid regions such as north-eastern South Australia, central and western Queensland, and central Northern Territory (DoEE 2017). The species has not been recorded within the study area or locality and there is a lack of preferred tree species within the study area.	Unlikely
Lathamus discolor	Swift Parrot	E	CE	y	y	This species migrates in the autumn and winter months to south-eastern Australia. In NSW, mostly occurs on the coast and south-west slopes in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations (OEH 2017). Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). Favoured feed trees within the study area include Spotted Gum and Red Bloodwood which occur at 22.3% and 1.6% of the total canopy species respectively. Optimal habitat is likely to include areas with a higher density of larger preferred feed trees, however the species has been assessed as having the potential to occur given the presence of feed trees and several records of this species occurring within the locality.	Potential
Limosa lapponica baueri	Bar-tailed Godwit (baueri)		V		y	This migratory species is typically forages on intertidal mudflats and sandflats. No Such habitat occurs within the study area.	Unlikely
Limosa lapponica menzbieri	Bar-tailed Godwit (menzbieri)		CE		y	This migratory species is typically forages on intertidal mudflats and sandflats. No Such habitat occurs within the study area.	Unlikely
Numenius madagascariensis	Eastern Curlew	-	CE, Mi		y	This migratory species is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons. No suitable habitat for this species exists within the study area.	Unlikely
Rostratula australis	Australian Painted Snipe	E	E	y	y	The species inhabits shallow terrestrial freshwater wetlands, including temporary and permanent lakes, swamps and claypans (OEH 2017). No suitable habitat for this species exists within the study area.	Unlikely

Table B.1 Likelihood of occurrence assessment

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		TSC Act	EPBC Act	Bionet	PMST		
Mammals							
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	y	y	This species roosts in caves, crevices in cliffs, old mine workings, frequenting low to mid-elevation dry open forest and woodland, especially in gullies. Females have been recorded raising young in maternity roosts in roof domes in sandstone caves and overhangs. Records of this species exist approximately 2.5 km north-east of the study area. There is no breeding habitat for this species within the study area; however several records occur within the locality and the species may have the potential to pass over or forage within the study area.	Potential
Dasyurus maculatus	Spotted-tailed Quoll	V	E	y	y	This species has been recorded from a wide range of habitats, unlogged forest or forest that has been less disturbed by timber harvesting is preferable. Habitat requirements include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves. Individuals require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage. Home ranges are estimated to be 620–2,560 ha for males and 90–650 ha for females (DoEE 2017). This species is unlikely to occur given the lack of suitable shelter and potential den sites. There are no rocky outcrops and a paucity of fallen timber and tree hollows.	Unlikely
Petauroides volans	Greater Glider		V	y	y	This species is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollow (DoEE 2017). The habitat within the study area is not suitable for this species given the low canopy heights and lack of old trees. Some hollows exist in the study area however they are not abundant.	Unlikely
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V		y	This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north (OEH 2017). This species has not been recorded in the locality and no potential habitat occurs.	Unlikely
Phascolarctos cinereus	Koala	V	V	y	y	This species inhabits eucalypt woodlands and forests and feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species (OEH 2017). One primary feed tree species listed within the North Coast Koala Management Area under SEPP 44 was recorded, Grey Gum (*Eucalyptus punctata*). This tree composed small proportion (1.6%) of the canopy however and only 33 Grey Gums were recorded of the 314 surveyed. OEH lists seven koala management areas (KMA) within NSW. The study area is included within the north coast KMA, which lists three tiers of koala feed tree, Primary, Secondary and Stringybarks/supplementary species. No primary or secondary feed trees listed for the KMA were found within the study area and therefore it is unlikely that there are sufficient foraging resources to support the Koala within the Study area.	Unlikely
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V		y	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature (OEH 2017). This species has not been recorded within the locality and it likely to be absent from the study area.	Unlikely
Pseudomys novaehollandiae	New Holland Mouse		V	y	y	This species occurs in coastal areas and up to 100 km inland on sandstone country (OEH 2017). At inland sites the species frequents heathland and open woodland with a heathland understorey. The study area does not contain a heathland understory and is considered potential habitat.	Unlikely
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	y	y	The Grey-headed Flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (OEH 2017). This species has been recorded within the locality and suitable habitat exists within the study area.	Potential

Table B.1 Likelihood of occurrence assessment

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		TSC Act	EPBC Act	Bionet	PMST		
Flora							
Acacia bynoeana	Bynoe's Wattle	E	V	y	y	Occurs in heath or dry sclerophyll forest on sandy soils. Prefers open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstory species include Red Bloodwood (*Corymbia gummifera*), Scribbly Gum (*Eucalyptus sclerophylla*), Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple (OEH 2017). There are no sandy soils within the study area and none of the associated overstory canopy species were recorded. There is no suitable habitat for this species within the study area.	Unlikely
Asterolasia elegans		E	E		y	The species occurs in wet sclerophyll forest on moist hillsides. No records exist within the locality and the study area is outside the known range for this species. No suitable habitat exists within the study area.	Unlikely
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V		y	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland (OEH 2017). The larger populations typically occur in woodland dominated by Scribbly Gum, Silvertop Ash (*E. sieberi*), Red Bloodwood and Black Sheoak (*Allocasuarina littoralis*). The species has not been recorded within the locality and the preferred habitat for this species does not exist within the study area.	Unlikely
Dichanthium setosum	Bluegrass	V	V		y	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It is associated with heavy basaltic black soils and red-brown loams with clay subsoil. The species has not been recorded within the locality and the preferred habitat for this species does not exist within the study area.	Unlikely
Eucalyptus glaucina	Slaty Red Gum	V	V	y	y	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest in deep, moderately fertile and well-watered soils. Records exist within the locality however the species was not recorded in the study area and it is likely that the soils are too shallow and infertile to be optimal for this species.	Unlikely
Eucalyptus parramattensis subsp. decadens	Earps Gum	V	V	y	y	Generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey or as an emergent in dry or wet heathland. This species was not recorded within the study area, furthermore suitable soil types do not exist within the study area.	Unlikely
Euphrasia arguta	-	CE	CE		y	The species is known from grassy areas near rivers and has not been recorded in the locality. Not recorded within the study area.	Unlikely
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	V	y	y	Occurs in a range of vegetation types from heath and shrubby woodland to open forest (OEH 2017). In the Hunter it has been recorded in Kurri Sand Swamp Woodland and records exist 340 m south-east of the study area. Not recorded within the study area.	Unlikely
Melaleuca biconvexa	Biconvex Paperbark	V	V		y	This species generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. The species has not been recorded within the locality and was not recorded within the study area.	Unlikely
Pelargonium sp. Striatellum	Omeo Stork's-bill		E		y	This species typically occurs just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities. No such habitat exists within the study area and the locality is outside the species know range.	Unlikely

Table B.1 Likelihood of occurrence assessment

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		TSC Act	EPBC Act	Bionet	PMST		
Pterostylis gibbosa	Illawarra Greenhood,	E	E		y	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark, Forest Red Gum and Black Cypress Pine (*Callitris endlicheri*.) The species has not been recorded within the locality and habitat within the study area is not suitable for this species.	Unlikely
Rhizanthella slateri	Eastern Underground Orchid	V	E		y	This species is highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Flowering occurs between September and November. Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. The closest records of this species are 75 km to the north west and 80 km to the north east and therefore it is considered that the species is unlikely to occur within the study area.	Unlikely
Rutidosis heterogama	Heath Wrinklewort	V	V	y	y	Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides (OEH 2017). Such habitat is absent from the study area and the species was not recorded.	Unlikely
Syzygium paniculatum	Magenta Lilly Pilly	E	V	y	y	The species occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. Suitable habitat for this species does not exist within the study area.	Unlikely
Tetratheca juncea	Black-eyed Susan	V	V	y	y	This species is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover (OEH 2017). The species has been recorded 2.2 km to the east of the study area and potential habitat exists within the study area. The species has not been recorded during previous field surveys conducted within the study area (Hunter Eco 2010), nor in adjacent communities (Hunter Eco 2012). The most recent field survey conducted for this report also failed to detect the species. It is considered that the species is likely to be absent based on the field surveys conducted to date.	Unlikely
Thesium australe	Austral Toadflax	V	V		y	This species occurs in grassland and woodland, often in damp sites. It is a root parasite on native grasses, most notably Kangaroo Grass (*Themeda triandra*)*. There are no records of this species within the locality and the species was not recorded within the site.	Unlikely
Terrestrial Migratory Species							
Apus pacificus	Fork-tailed Swift		Mi		y	A wide ranging species flying over almost all habitat types within NSW. No records of this species exist within the locality, however given its wide range the species may fly over the study area.	Potential
Cuculus optatus	Oriental Cuckoo		Mi		y	An uncommon non-breeding migrant to south east Australia, occurring in a wide range of habitats. Very few records exist within the locality.	Unlikely
Hirundapus caudacutus	White-throated Needletail		Mi	y	y	In Australia, the species is almost exclusively aerial. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland (DoE 2016). Records of this species exist within the locality, and the species may fly over/forage over the study area.	Potential

Table B.1 Likelihood of occurrence assessment

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		TSC Act	EPBC Act	Bionet	PMST		
Monarcha melanopsis	Black-faced Monarch		Mi		y	The species mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest (DoEE 2017). No suitable habitat exists for this species within the study area.	Unlikely
Monarcha trivirgatus	Spectacled Monarch		Mi		y	This species prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves. The species is not known from the locality and suitable habitat does not occur.	Unlikely
Motacilla flava	Yellow Wagtail		Mi		y	This species is rarely recorded within NSW and is not anticipated to occur close to the study area, given the majority of records are clustered around Newcastle and Sydney coastal regions.	Unlikely
Myiagra cyanoleuca	Satin Flycatcher		Mi		y	This species inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests (DoEE 2017). No records of this species exist within the locality, however given its wide range and forested habitat within the study area the species may occur intermittently.	Potential
Rhipidura rufifrons	Rufous Fantail		Mi		y	In east and south-east Australia, the species mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts; usually with a dense shrubby understorey often including ferns. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands (DoEE 2017). Records of this species exist within the locality. This species has the potential to occur within study area riparian forest.	Potential

SYDNEY
Ground floor, Suite 01, 20 Chandos Street
St Leonards, New South Wales, 2065
T 02 9493 9500 F 02 9493 9599

NEWCASTLE
Level 1, Suite 6, 146 Hunter Street
Newcastle, New South Wales, 2300
T 02 4907 4800 F 02 4907 4899

BRISBANE
Level 4, Suite 01, 87 Wickham Terrace
Spring Hill, Queensland, 4000
T 07 3839 1800 F 07 3839 1866

Appendix B

Flora data

Table B.1 Plot data

Species name	Common name	Cover				Abundance				Stratum	Growth habitat
		Plot 1	Plot 2	Plot 3	Plot 4	Plot 1	Plot 2	Plot 3	Plot 4		
**Ageratina adenophora*	Crofton Weed			0.1				3		G	H
**Andropogon virginicus*	Whisky Grass		1	30	2		20	>1000	25	G	G
**Bidens pilosa*	Cobblers Pegs			1				20		G	H
**Briza maxima*	Quaking Grass			2				>1000		G	G
**Chloris gayana*	Rhodes Grass	95	6	65	95	>1000	500	>1000	>1000	G	G
**Conyza sp.*	Fleabane		0.5	0.5			20	30		G	H
**Cortaderia selloana*	Pampas Grass		3				1			G	G
**Cynodon dactylon*	Couch		4	1			30	10		G	G
**Hypochaeris radicata*	Catsear			1	1			50	50	G	H
**Lantana camara*	Lantana	0.5	2	0.1	2	10	2	1	100	M	S
**Lolium perenne*	Perennial Ryegrass			1				>1000		G	G
**Lysimachia arvensis*	Scarlet Pimpernel	0.1	0.2		0.5	20	10		100	G	H
**Melinis repens*	Red Natal Grass	0.2				20				G	G
**Onopordum acanthium*	Scotch thistle			0.1	0.5			1	2	G	H
**Plantago lanceolata*	Plantain		3	0.1	1		70	20	500	G	H
**Senecio madagascariensis*	Fireweed	0.2		0.1	0.5	20		20	100	G	H
**Senecio pterophorus*	African daisy	1		2	2	15		100	100	G	H
**Senna sp.*			0.1				1			M	S
**Solanum nigrum*	Black-berry Nightshade	0.5				5				G	H
**Verbena bonariensis*	Purpletop				1				50	G	H
Acacia decurrens	Black Wattle		3				5			M	S
Acacia elongata	Swamp Wattle	1		6	4	1		20	21	M	S

Table B.1 Plot data

Species name	Common name	Cover				Abundance				Stratum	Growth habitat
		Plot 1	Plot 2	Plot 3	Plot 4	Plot 1	Plot 2	Plot 3	Plot 4		
Acacia longifolia	Sydney Golden Wattle	2		10	5	6		14	20	M	S
Acacia parvipinnula	Silver-stemmed wattle		1	2			3	2		M	S
Acacia saligna	Golden Wreath Wattle	2	2	8	5	5	8	31	6	M	S
Angophora costata	Smooth-barked Apple		5				4			O	T
Aristida vagans	Threeawn Speargrass		8				>1000			G	G
Austrostipa sp.	Speargrass		1				50			G	G
Billardiera scandens	Apple Berry		0.1				3			G	H
Bursaria spinosa	Blackthorn		10				15			M	S
Centella asiatica	Indian Pennywort			0.1				5		G	H
Cheilanthes sieberi	Rockfern		0.2				7			G	H
Clematis aristata	old man's beard		0.5				15			G	H
Corymbia maculata	Spotted Gum	20	7			6	6			O	T
Dendrophthoe vitellina	Mistletoe	3				5				O	S
Dianella longifolia	Blue Flax-Lily		0.6				6			G	G
Dodonaea triquetra	Large-leaf Hop-bush			0.5				4		M	S
Entolasia stricta	Wiry Panic	0.5	3		0.5	100	31		25	G	G
Eucalyptus globoidea	White Stringybark		7				3			O	T
Eucalyptus punctata	Grey Gum		10				8			O	T
Eucalyptus tereticornis	Forest Red Gum	20				6				O	T
Eucalyptus umbra	Broad-leaved White Mahogany		7				16			O	T
Glochidion ferdinandi	Cheese Tree		1	2	1		1	4	1	M	T
Glycine clandestina	Twining Glycine		0.1				5			G	H

Table B.1 Plot data

Species name	Common name	Cover				Abundance				Stratum	Growth habitat
		Plot 1	Plot 2	Plot 3	Plot 4	Plot 1	Plot 2	Plot 3	Plot 4		
Hardenbergia violacea	Purple Coral Pea	0.1				10				G	H
Hydrocotyle tripartita	Pennywort		1	1			>1000	500		G	H
Hypericum gramineum	Small St. John's Wort		0.2	0.1			100	20		G	H
Imperata cylindrica	Blady Grass	2			100					G	G
Leucopogon juniperinus	Prickly Beard-heath	0.1				1				G	S
Lomandara filiformis	Wattle Mat-rush	0.1		1		3		12		G	G
Pandorea pandorana	wonga wonga vine	1				30				G	H
Pratia purpurascens	Whiteroot	0.1	0.1	0.1		20	10	5		G	H
Pultenaea villosa	Hairy Bush-pea	1	1	1		10	4	10		M	S

Stratum: *O = over storey, M = mid layer, G = Ground layer*

Growth form: *T = Tree, S = Shrub, H = Herb, G = Grass*

** = introduced species*

Table B.2 Biobanking metrics

Plot	Native plant species richness	Native overstorey cover	Native midstorey cover	Native groundcover (grasses)	Native groundcover (shrubs)	Native groundcover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Length of fallen logs	Latitude	Longitude
1	8	33	0	0	2	0	78	0	0.5	21	-32.795396°	151.570821°
2	23	36	0	40	4	24	10	0	0.2	2	-32.794939°	151.570284°
3	11	0	1.2	0	0	0	98	0	0.2	2	-32.795369°	151.567714°
4	10	0	1.7	0	0	0	88	0	0.2	5	-32.795036°	151.571904°

Appendix C

Credit report

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 14/11/2017 Time: 11:09:40AM Calculator version: v4.0

Major Project details

Proposal ID:	190/2017/4632MP
Proposal name:	Bloomfield Colliery
Proposal address:	Four Mile Creek Road Ashtonfield NSW 2323
Proponent name:	The Bloomfield Group
Proponent address:	PO Box 4 East Maitland NSW 2323
Proponent phone:	02 4930 2618
Assessor name:	Erin Lowe
Assessor address:	LEVEL 4 45 WATT ST Newcaslte NSW 2300
Assessor phone:	02 4903 5500
Assessor accreditation:	190

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	0.05	1.32
Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	0.29	9.00
Total	0.34	10

Credit profiles

1. Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest, (HU804)

Number of ecosystem credits created	1
IBRA sub-region	Hunter

Offset options - Plant Community types	Offset options - IBRA sub-regions
Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest, (HU804) Melaleuca decora low forest of the central Hunter Valley, Sydney Basin Bioregion, (HU564) Slaty Red Gum grassy woodland on hinterland foothills of the southern North Coast, (HU619) Grey Ironbark - Broad-leaved Mahogany - Forest Red Gum shrubby open forest on Coastal Lowlands of the Central Coast, (HU802) Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast, (HU803) Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter, (HU806) Red Ironbark - Spotted Gum - Prickly-leaved Paperbark shrubby open forest of the Lower Hunter, (HU807) Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter, (HU814) Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter, (HU815) Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter, (HU816) Grey Box - Grey Gum - Rough-barked Apple - Blakely's Red Gum grassy open forest of the central Hunter, (HU822)	Hunter and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter, (HU806)

Number of ecosystem credits created	9
IBRA sub-region	Hunter

Offset options - Plant Community types	Offset options - IBRA sub-regions
Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter, (HU806) Melaleuca decora low forest of the central Hunter Valley, Sydney Basin Bioregion, (HU564) Slaty Red Gum grassy woodland on hinterland foothills of the southern North Coast, (HU619) Grey Ironbark - Broad-leaved Mahogany - Forest Red Gum shrubby open forest on Coastal Lowlands of the Central Coast, (HU802) Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast, (HU803) Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest, (HU804) Red Ironbark - Spotted Gum - Prickly-leaved Paperbark shrubby open forest of the Lower Hunter, (HU807) Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter, (HU814) Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter, (HU815) Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter, (HU816) Grey Box - Grey Gum - Rough-barked Apple - Blakely's Red Gum grassy open forest of the central Hunter, (HU822)	Hunter and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Appendix D

Biodiversity Offset Payment Calculator

Biodiversity Offset Payment Calculator

Version: 3.1.1.00
Last updated: 20/10/2017 23:00

Credit Offset Payment Calculator | Payments

Message!

If you would like to meet your offset obligation by making a payment to the Biodiversity Conservation Fund, please contact the BCT team at bct@environment.nsw.gov.au

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Baseline price per credit	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Hunter	**1590** - Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest ***Warning: This PCT has NO trades recorded***	$1,373.32	0.1683239	6.151898	25.00%	$20.00	1.0000	$2,000.64	1	$2,000.64
Hunter	**1592** - Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter ***Warning: This PCT has NO trades recorded***	$1,373.32	0.1683239	6.151898	25.00%	$20.00	1.0000	$2,000.64	9	$18,005.80
									Subtotal (excl. GST)	**$20,006.44**
									GST	**$2,000.64**
									Total ecosystem credits (incl. GST)	**$22,007.08**
Calculated as on: **09-11-2017 18:58:53**									**Grand total**	**$22,007.08**

SYDNEY
Ground floor, Suite 01, 20 Chandos Street
St Leonards, New South Wales, 2065
T 02 9493 9500 F 02 9493 9599

NEWCASTLE
Level 1, Suite 6, 146 Hunter Street
Newcastle, New South Wales, 2300
T 02 4907 4800 F 02 4907 4899

BRISBANE
Level 4, Suite 01, 87 Wickham Terrace
Spring Hill, Queensland, 4000
T 07 3839 1800 F 07 3839 1866