Appendix 3

Biodiversity Development Assessment Report

prepared by

AREA Environmental Consultants and Communication Pty Limited

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Tomingley Gold Extension Project – RSF2

Biodiversity Development Assessment Report

Narromine LGA NSW

November 2020

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ENVIRONMENTAL CONSULTANTS & COMMUNICATION

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Document controls

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Clients Representative Managing this Document	Mitchell Bland
AREA Person(s) Managing this Document	Phil Cameron (PJC)
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Executive summary

AREA Environmental Consultants & Communication (AREA) was engaged by R. W. Corkery & Co. Pty Limited (the client) on behalf of Tomingley Gold Operations Pty Ltd (the proponent – a fully owned subsidiary of Alkane Resources Ltd) to compete a biodiversity impact assessment and prepare a Biodiversity Development Assessment Report (BDAR) (this report) for the proposed construction of a residue storage facility as a modification (MOD5) to development consent PA 09_0155.

Tomingley Gold Operations (TGO) is located on the southern edge of Tomingley, in the central west of NSW.

This BDAR has been prepared as part of an Environmental Impact Statement (EIS) for the proposal. A full site-based assessment has been undertaken using the Biodiversity Assessment Methodology 2020 (BAM).

This BDAR supports an application for a modification to MP09_0155 (MOD5) to permit construction of the initial stages of the Residue Storage Facility 2 (RSF2).

The proponent has elected to make this separate application for the RSF2 to permit early construction of this facility, ahead of the more extensive Project. MP09_0155 would be surrendered following receipt of the consent and all required approval for the Project.

The proposed RSF2 would be constructed to store process residues, with a maximum approved elevation of 291.5 metres AHD. The proposed RSF2 would be of be of sufficient capacity for the existing TGO mining operations.

The RSF2 stages 1 and 2 would have the following design criteria:

- Maximum crest elevation ..... 272.0m AHD
- Crest width, including safety bund 6m
- Slope of outer face (except northern embankment) ..... 1:3 (V:H)
- Slope of inner face ..... 1:2(V:H)
- Assumed residue density..... 1.4t/m3
- Liner material..... minimum 1m compacted clay
- Liner permeability..... maximum 1 x 10-9m/s
- Residue deposition ..... Perimeter discharge
- Decant system..... current central decant towers
- Dambreak Consequence Category (ANCOLD)..... Significant
- Environmental Spill Consequence Category (ANCOLD)..... Medium
- Decant pond capacity..... 1:10,000-year AEP flood event

The proponent would seek consent only for the initial stages of RSF2, with sufficient capacity for the proposed TGO life of mine production schedule. Application for the remaining stages of RSF2 would be sought as part of the TGEP application.

The RSF2 development site (Figure 1-1) includes construction of:

- a residue storage facility
- surface water drains

- access tracks to and around the facility.

Two Plant Community Types (PCT's) were recorded in the development site based on vegetation assessment plot results and landscape features matched against the VIS classification database:

- PCT82 - Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
- PCT201 Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion.

PCT201 is a Threatened Ecological Community (TEC) under the BC Act and is listed as a potential Serious and Irreversible Impact (SAII) candidate. Further discussion on this matter has been provided in Section 5 and concludes the proposal would not cause a SAII to PCT201.

The impact to threatened flora and fauna species was informed by targeted surveys undertaken in accordance with relevant guidance documents. Predicted species are those which are predicted to occur based on their known presence in the Interim Biogeographic Regionalisation for Australia (IBRA) subregion, the presence of associated PCTs, the size and condition of the vegetation patches on the site and listed species identified by the NSW Department of Planning Industry & Environment (DPIE) in the BAM Calculator (BAMC) as ecosystem credit species or species credit species.

Predicted species were not afforded any further assessment if they are a vagrant in the IBRA subregion or if none of the habitat constraints for the species are present in the development site. The list of predicted species generated in the BAMC was considered using these criteria which identified that the proposal would impact 13 ecosystem credit species and 11 species credit species.

Ecosystem credit species are those that can be reliably predicted based on the habitat surrogates and DPIE state no survey is required for these as they are assumed to occur.

The 11 species credit species are referred to as candidate species, these cannot be reliably predicted from the habitat surrogates and their presence is to be assessed through habitat assessment and targeted surveys. These are also assumed to occur unless survey effort has been undertaken in accordance with the guidance material proving otherwise.

Survey effort in the development site and as assessment for the TGEP was conducted in June, September, and October 2020. Survey included search transect, diurnal hollow observation and bird searches, baited camera traps and nocturnal frog survey. Ultrasonic bat recording was conducted immediately adjacent to the development site in December 2019.

Two candidate species were excluded based on habitat or geographic constraints and the above survey effort following requisite guidelines was applied to the remaining candidate species requiring targeted survey.

As a result of the survey effort applied the BAMC determined the proponent will need to retire:

- 103 ecosystem credits for PCT82
- 49 ecosystem credits for PCT201
- No species credits retired for candidate species.

Credit classes allocated to the proposal are outlined at the end of this BDAR.

Contents

Figures:

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1 Introduction

1.1 Requirement of assessment under the BAM

This Biodiversity Development Assessment Report (BDAR) has been prepared as the proposal will impact native vegetation and exceed the area threshold for clearing under section 7.2 (2)(b) *Biodiversity Conservation Regulation 2017* (Table 1-1). The minimum lot size for the development site is 400 hectares. As the area of native vegetation clearing for this proposal is more than one hectare, assessment under the Biodiversity Offsetting Scheme is required. This BDAT has been prepared to meet this assessment requirement.

Table 1-1: Area Clearing Thresholds (section 7.2 *Biodiversity Conservation Regulation 2017*)

Minimum lot size of land	Threshold for clearing
Less than 1 hectare	0.25 hectare or more
Less than 40 hectares but not less than 1 hectare	0.5 hectare or more
Less than 1,000 hectares but not less than 40 hectares	1 hectare or more
1,000 hectares or more	2 hectares or more

The total impact of the development site is approximately 85.59 hectares, of which 85.15 hectares is impact to native vegetation. As the threshold is one hectare or more, the proposal triggers assessment by the Biodiversity Assessment Method (BAM). This is a site-based assessment.

AREA Environmental Consultants & Communication (AREA) was engaged by R. W. Corkery & Co. Pty Limited (the client) on behalf of Tomingley Gold Operations Pty Ltd (the Proponent – a fully owned subsidiary of Alkane Resources Ltd) to compete a biodiversity impact assessment and prepare a BDAR (this report) for the proposed construction of a residue storage facility as a modification to development consent PA 09_0155.

This BDAR has been prepared as part of an Environmental Impact Statement (EIS) which is being prepared for this proposal. A full site-based assessment has been undertaken using the BAM. The following guidance materials were followed during field assessments:

- Biodiversity Assessment Methodology (DPIE, 2020)
- Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (2020)
- NSW Survey Guide for Threatened Frogs A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (2020)
- ‘Species credit’ threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (2018)
- Guide to Surveying Threatened Plants (OEH, 2015).
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004)
- Survey requirements (birds, bats, reptiles, frogs, fish and mammals) for species listed under the EPBC Act.

1.2 Description of the proposed development

This BDAR supports an Environmental Impact Statement (EIS) and application for a proposed modification to PA 09_0155 (MOD5) to permit:

- construction of Stage 1 and Stage 2 of the Residue Storage Facility 2 (RSF2)
- extension of mine life from 31 December 2022 to 31 December 2025; and
- extension of the Mine Site boundary to incorporate RSF2
- use the existing Caloma 2 pit for backfilling operations.

The RSF2 stages 1 and 2 would have the following design criteria:

- Maximum crest elevation ..... 272.0m AHD
- Crest width, including safety bund 6m
- Slope of outer face (except northern embankment) ..... 1:3 (V:H)
- Slope of inner face ..... 1:2(V:H)
- Assumed residue density..... 1.4t/m3
- Liner material..... minimum 1m compacted clay
- Liner permeability..... maximum 1 x 10-9m/s
- Residue deposition ..... Perimeter discharge
- Decant system..... current central decant towers
- Dambreak Consequence Category (ANCOLD)..... Significant
- Environmental Spill Consequence Category (ANCOLD)..... Medium
- Decant pond capacity..... 1:10,000-year AEP flood event

The RSF2 development site (Figure 1-1) includes construction of:

- a residue storage facility
- surface water drains
- access tracks to and around the facility.

This BDAR assesses the potential biodiversity impacts from construction of the proposed RSF2 and associated infrastructure and addresses requirements of the following legislative frameworks:

- *NSW Environmental Planning and Assessment Act 1979* (EP&A Act)
- *NSW Biodiversity Conservation Act 2016* (BC Act)
- N*SW Local Land Services Act 2013* (LLS Act)
- *State Environmental Planning Policy (Koala Habitat Protection) 2019*.

Figure 1-1: Tomingley Gold Extension Project

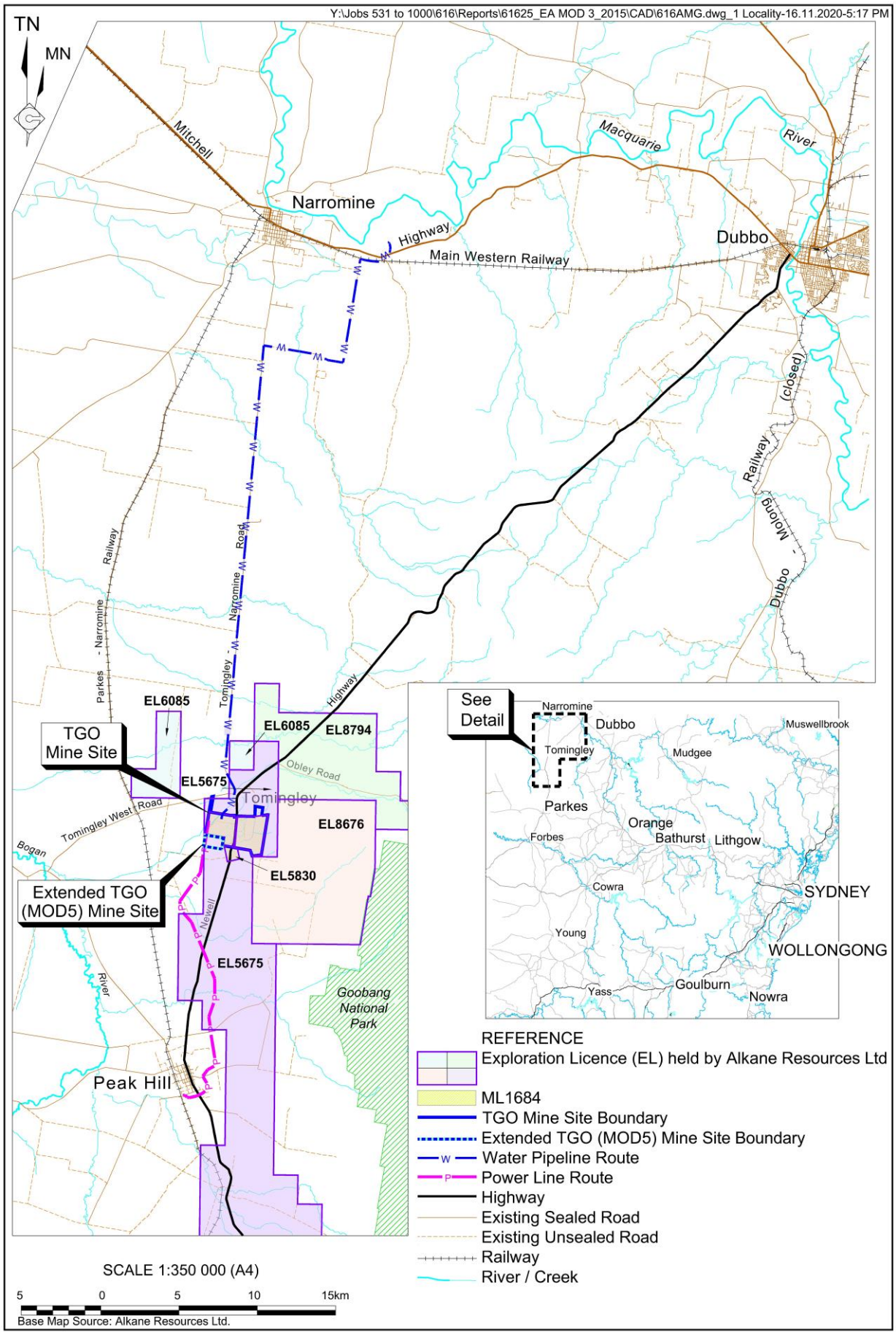
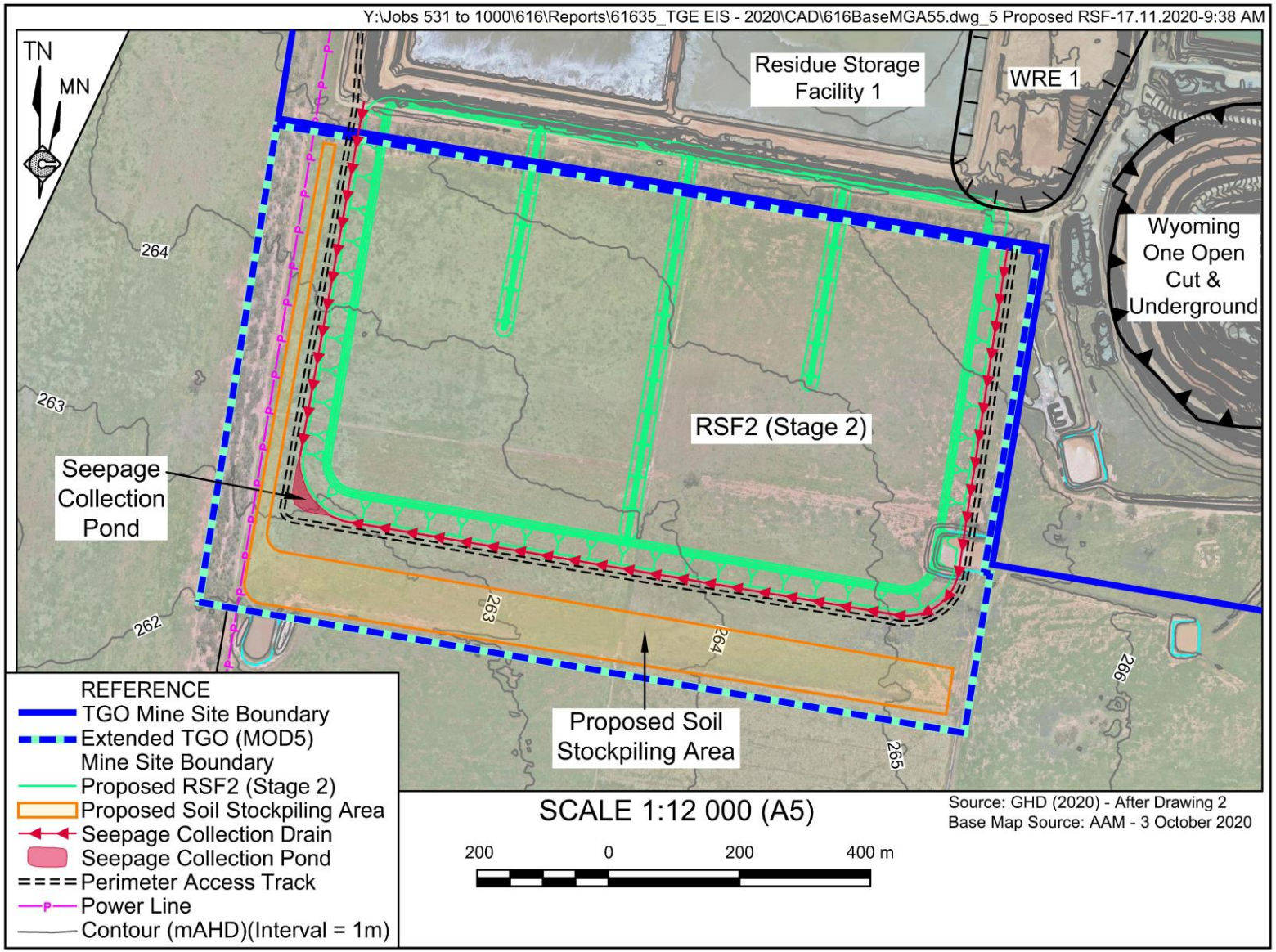


Figure 1-2: RSF2 design detail



1.3 The subject land

The development site is located approximately 1.4 kilometres south of the village of Tomingley, NSW in the Narromine Local Government Area (Figure 1-3). The development site is Lot 156 DP755093 and Lot 1623 DP1178801 (Figure 1-4). The development site includes all land which may be disturbed by this proposal. 81.01 hectares of land is on Lot 156 DP755093 and 4.58 hectares on Lot 1623 DP1178801, including impact associated with construction (Figure 1-4).

Tomingley is a cropping and grazing agricultural area, and tracks of land in the development site have been historically cleared for intensive agricultural purposes.

NSWLanduse2017v1p2 maps the land in the development site as 2.1.0 Grazing native vegetation and 3.3.0 Cropping (Figure 1-5). Field assessment and author familiarity with this site is consistent with this mapping, however the entire area has more recently been used for grazing (due to the severe drought making cropping not viable for the last four years).

3.2.0 Grazing modified pastures, 5.7.0 Transport and communication, 5.8.0 Mining, 6.5.0 Marsh/wetland, 6.2.0 Reservoir/ dam, 3.2.0 Grazing modified pastures and 5.4.0 Residential and farm infrastructure are mapped within 1500 metres of the development site.

In October 2020, the development site did not contain a crop nor stock. The groundcover was mostly exotic pasture species including Barley Grass and Rye Grass and other exotic weed species including Patterson's Curse and Saffron Thistle with some native grass, forb and shrub (chenopod) species. The groundcover under the tree canopy had a greater native groundcover and species richness with a lower weed burden however pasture species including rye grass were dominant in some areas (Plate 1-1).

Figure 1-3: Local Government Area

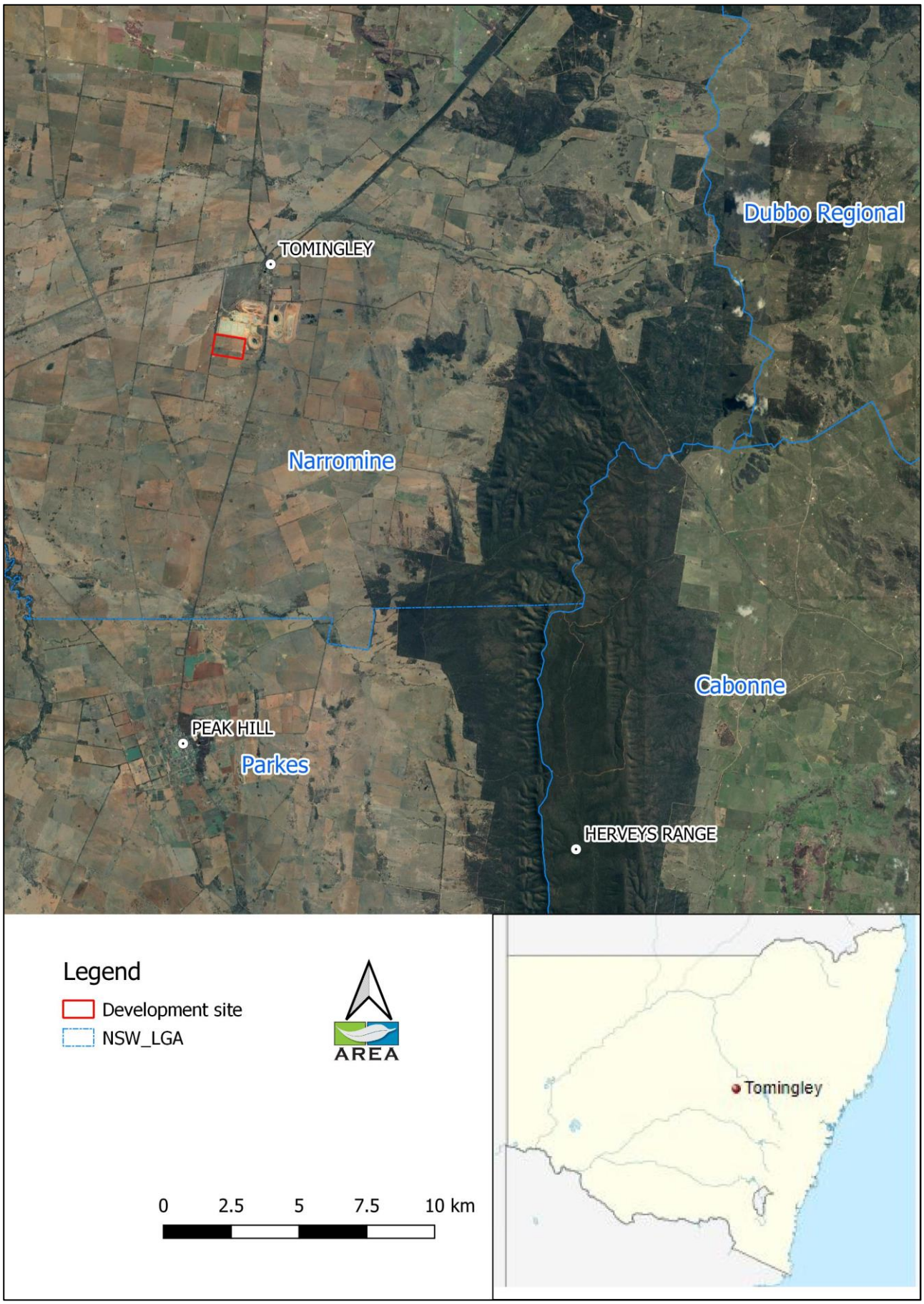


Figure 1-4: Lot and DP

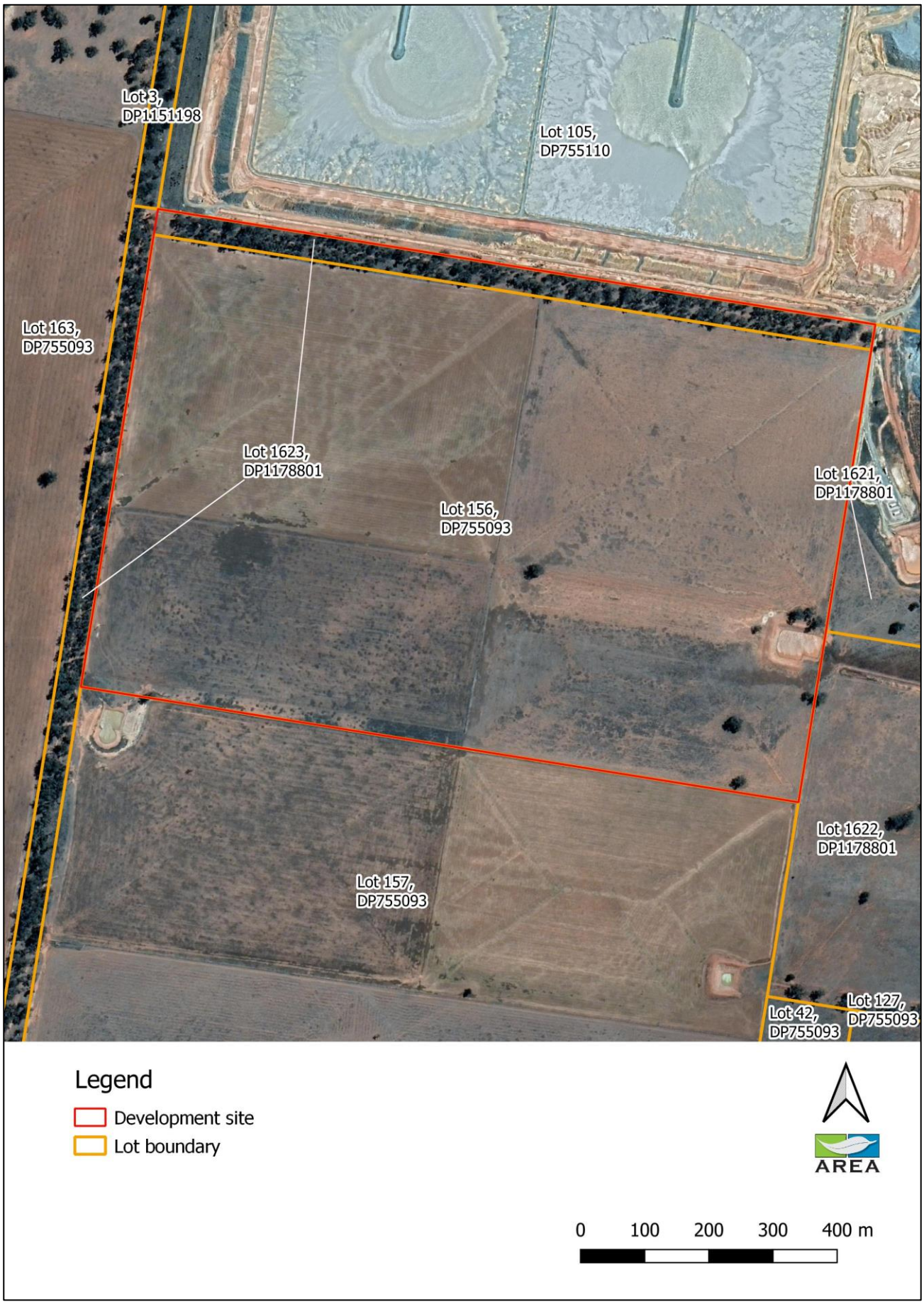
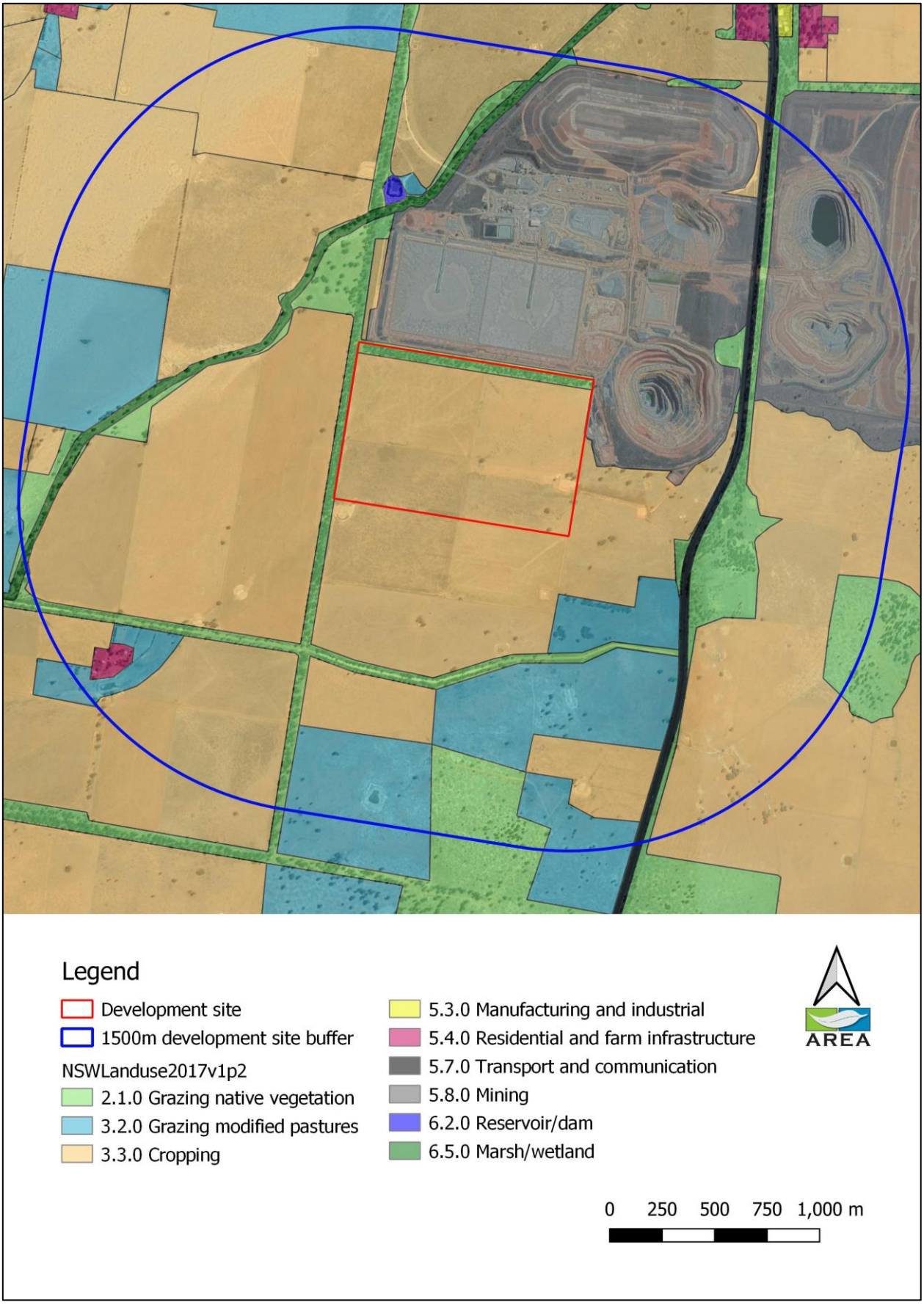


Plate 1-1: General pictures of the development site in October 2020

Figure 1-5: NSWLanduse2017v1p2 map



1.4 Personnel contributing to this document

This assessment and Biodiversity Development Assessment Report has been completed and certified by suitably experienced ecologists and accredited biodiversity assessors (Table 1-2).

Table 1-2: Summary of AREA project teams' qualifications

Name	Position	CV Details	Role in this ecology report and experience
Addy Watson	Principal Environment and Community Consultant	• Grad. Dip. Captive Vertebrate Management, Charles Sturt University • Grad. Cert. Social Impact, University of NSW • B. Env. Sc. University of New England. • Diploma Project Management • NSW Biodiversity Assessment Method Assessor: accreditation number BAAS19066).	**Role** Project management Field assessment Report writing Certification. **Experience** Addy has 15 years' experience implementing biodiversity assessments and monitoring operations pre and post approval for projects including linear developments, mining operations, quarry expansions and conservation projects. Addy has a conservation, regulation and mining background.
Phillip Cameron	Principal consultant	• BSc. Macquarie University • Ass Dip App Sci. University of Queensland. • Certified Environmental Practitioner (EIANZ) and practicing member. • NSW OEH BioBanking and Bio-certification Assessor: accreditation number 0117. • NSW Biodiversity Assessment Method Assessor: accreditation number BAAS17082). • Cert III Captive Animal Management • NSW DPIE Scientific License: 101087. • NSW DPI Ethics Approval 17/459 (3). • Practicing member of the NSW Ecological Consulting Association. • WHS White Card, Blue Card and RIW. • Apply First Aid (Parasol) ID: 6007221.	**Role** Quality assurance. **Experience** Phil has 30 years of experience implementing biodiversity assessments and monitoring operations pre and post approval for projects including solar farms, linear developments, mining operations, quarry expansions and conservation projects. Phil has experience overseeing the environmental aspects of green field mining clearing and construction projects as well as site rehabilitation.
Dave Sturman	Ecologist	• B. Env. Sc. University of New England • Cert III (horticulture)	**Role** Field work – threatened species searches and vegetation plots **Experience** Dave has four years of experience implementing biodiversity assessments and has robust experience in and monitoring operations pre and post approval for projects including solar farms, linear developments, mining operations, quarry expansions and conservation projects.
Dr Heidi Kolkert	Principal Ecologist	• PhD (Science) University of New England 2013 to current • BSc. (Hons) and Bachelor of Arts University of Tasmania Graduated 2005 • NSW DPIE BioBanking and Bio-certification Assessor TAFE NSW • Practicing member of the NSW Ecological Consulting Association • WHS White Card and Blue Card • Apply First Aid (Medilife), Remote First Aid (St John)	**Role** Bat call analysis **Experience** Heidi has 15 years of experience implementing biodiversity assessments and has extensive experience in bat call analysis. Her PhD focussed on microbat, insects and bird interactions in agricultural ecosystems.

Name	Position	CV Details	Role in this ecology report and experience
Genevieve Peel	Ecologist	• Bachelor of Science, Environmental (Hons) UNSW • Cert III Captive Animal Management • Cert IV Veterinary Nursing	**Role** Field work – threatened species searches
Gabbi Green	Cadet Ecologist	• B. Env. Sc. University of New England (in prep)	**Role** Field work assistant – threatened species searches (Frogs) and vegetation plots **Experience** Gabbi has 1.5 years of experience implementing biodiversity assessments and is learning from other team members how to implement survey effort following requisite guidelines for proposals.
Anna Darby	Archaeologist	• Bachelor of Arts and Bachelor of Science (Archaeology, Palaeoanthropology and Forensic Science). University of New England • Bachelor of Science (Honours). University of New England	**Role** Field work assistant – Vegetation plots **Experience** Anna has six months of experience implementing biodiversity assessments (eight years of experience as an archaeologist), assisting with vegetation plots and is learning from other team members how to implement survey effort following requisite guidelines for proposals.

1.5 Sources of information

Information sources used to inform this BDAR have been provided in the following sections.

1.5.1 Spatial Data

Table 1-3: Spatial data used in this report

GIS layer name	Reference
IBRA bioregions and subregion	NSW data porthole
NSW landscape regions	Mitchell Landscapes V3
Rivers and streams	Six Viewer / SEED WMS topographic layer
Wetlands	Directory of Important Wetlands
Waterways	Waterway NSW Final
Key Fish Habitat	DPI Key Fish Habitat GIS layer
Connectivity of different areas of habitat	Central West Lachlan SVM 4468 veg map and Six Viewer
Native vegetation extent	Central West Lachlan SVM 4468 veg map and Six Viewer

1.5.2 Websites (and links to documents)

Table 1-4: Websites and links to documents used in this report

Title	Web address
Legislation	
Commonwealth Environment Protection & Biodiversity Conservation Act 1999	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Fisheries Management Act 1994	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
National Parks and Wildlife Act 1974	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Biodiversity Conservation Act 2016	https://www.legislation.nsw.gov.au/~/view/act/2016/63

Title	Web address
Water Management Act 2000	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
Local Land Services Act 2013	https://www.legislation.nsw.gov.au/~/view/act/2013/51
Biodiversity	
Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (2020)	
NSW Survey Guide for Threatened Frogs A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (2020)	
'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (2018)	
Biodiversity Assessment Methodology (OEH, 2017)	
Guide to Surveying Threatened Plants (OEH, 2015)	
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004)	
Survey requirements (birds, bats, reptiles, frogs, fish and mammals) for species listed under the EPBC Act	
BAM Credit Calculator	http://www.environment.nsw.gov.au/biobanking/calculator.htm
Survey requirements (birds, bats, reptiles, frogs, fish and mammals) for species listed under the EPBC Act	http://www.environment.gov.au/topics/environmentprotection/environment-assessments.
Guide to Surveying Threatened Plants (OEH, 2015)	
Threatened biodiversity profile search	http://www.environment.nsw.gov.au/threatenedspeciesapp/
NSW BioNet	http://www.bionet.nsw.gov.au/
Vegetation Types databases	http://www.environment.nsw.gov.au/biobanking/vegtypedatabase. htm
PlantNET	http://plantnet.rbgsyd.nsw.gov.au/
Online Zoological Collections of Australian Museums	http://www.ozcam.org.au/
Threatened Species Assessment Guideline - The Assessment of Significance (DECCW, 2007)	http://www.environment.nsw.gov.au/resources/threatenedspecies/tsaguide07393.pdf
Significant Impact Guidelines 1.1 - Matters of National Environmental Significance	http://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance
Principles for the use of biodiversity offsets in NSW	http://www.environment.nsw.gov.au/biodivoffsets/oehoffsetprincip .htm

1.5.3 Reports and books

Various plant identification books were used during the vegetation assessment.

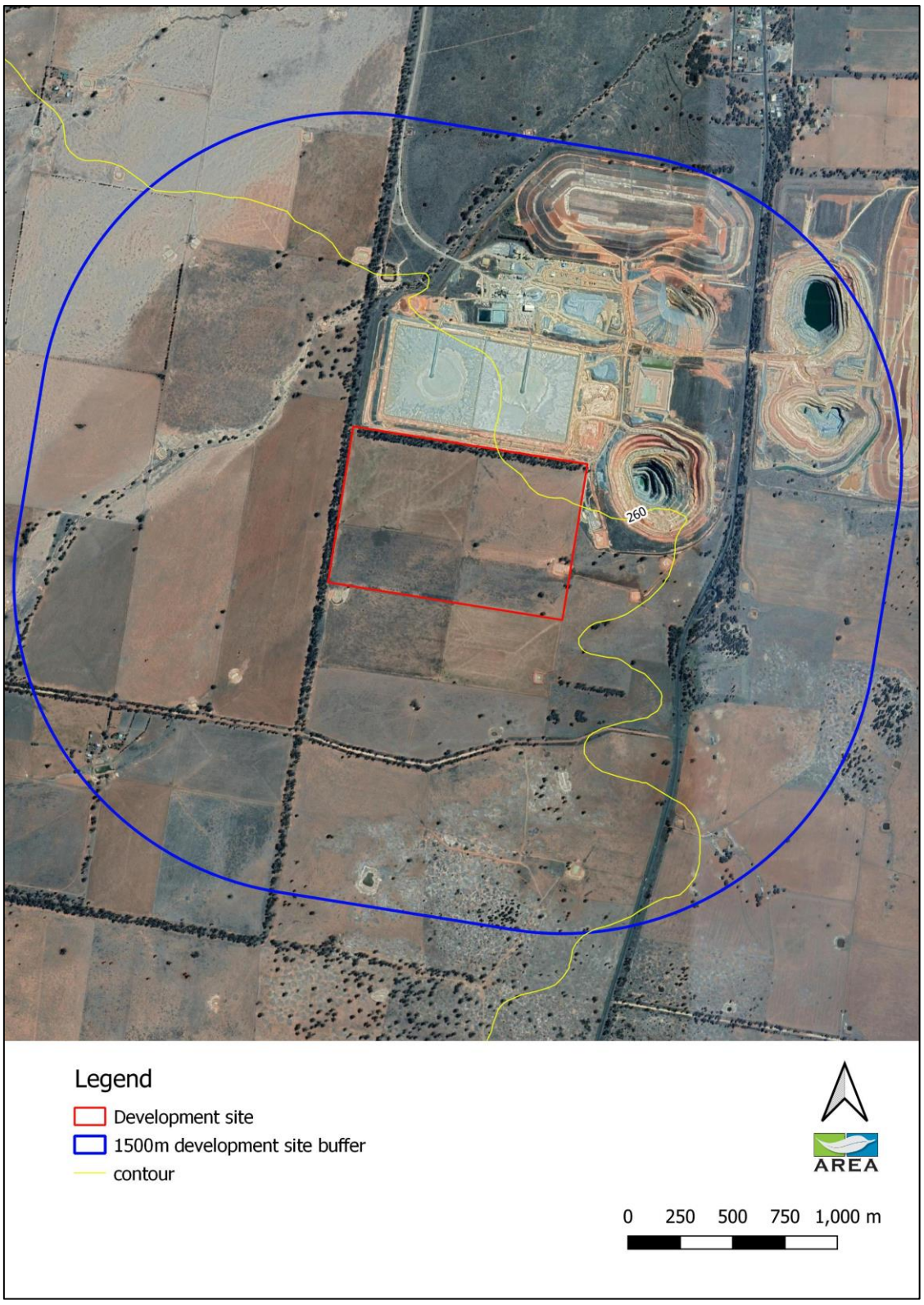
No other reports or books were used for this assessment.

2 Landscape context

2.1 Topography

Topography of the development site is virtually flat and around 260 metres Australian Height Datum, slightly falling from north east to south west (Figure 2-1).

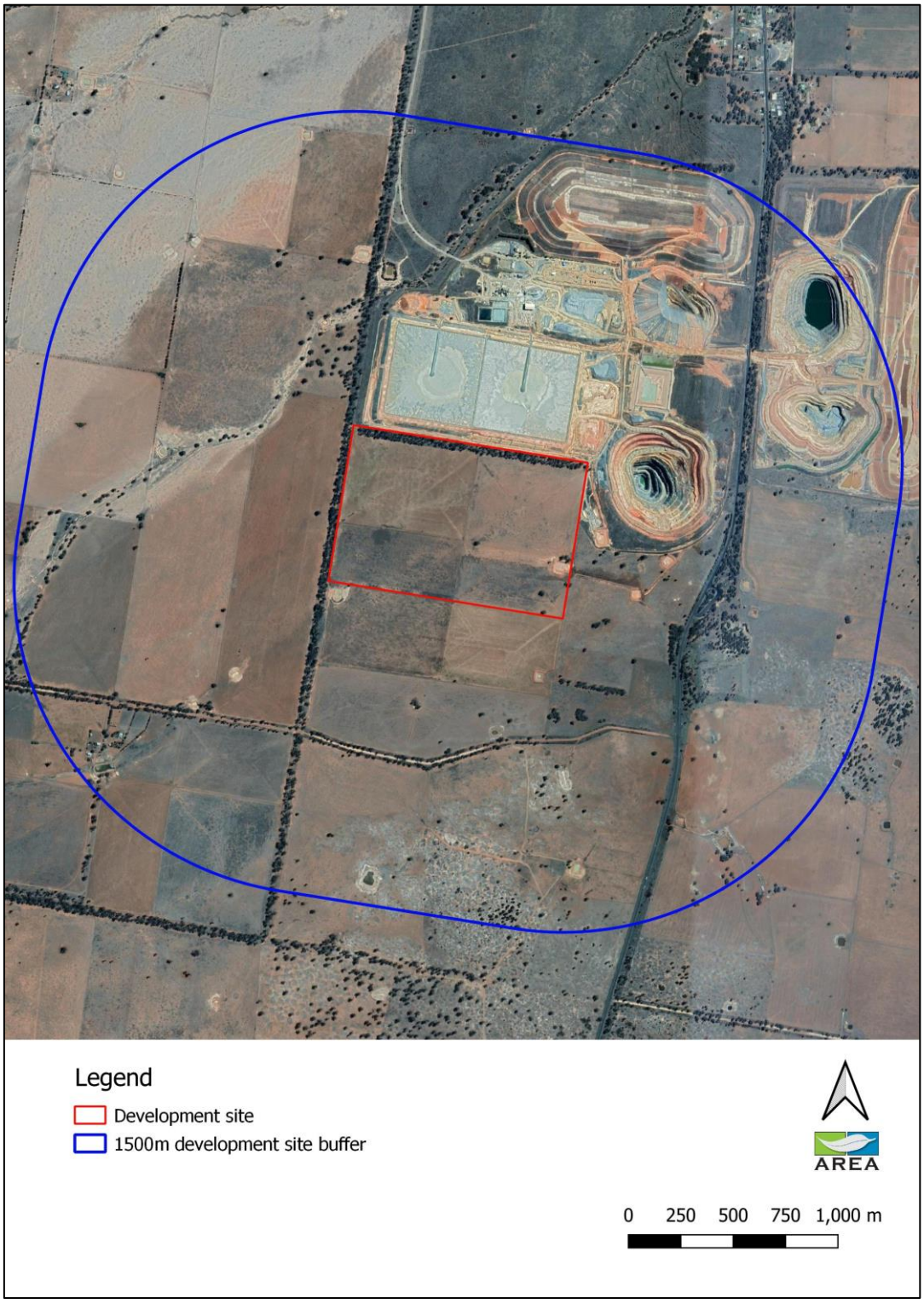
Figure 2-1: Contours



2.2 Vegetation cover

The development site is in an agricultural region which has been historically cleared, cropped and grazed by sheep and horses. More recently, clearing has been associated with the development of the Tomingley Gold Mine. Biodiversity Offset Areas established for the mine are allowing native vegetation to re-establish were cropping and grazing once occurred. Remnant vegetation within 1500 metres of the development site is predominantly tree corridors along paddock edges or roads including the Newell Highway. Treed vegetation comprises approximately eight percent of the vegetation cover within 1500 metres (Figure 2-2).

Figure 2-2: Aerial – Vegetation cover within 1500 metres



2.3 IBRA bioregions and subregions

The proposal is entirely within the Darling Riverine Plains Bioregion and Bogan-Macquarie subregion. The boundaries to the NSW South Western Slopes Bioregion, Lower Slopes and Inland Slopes subregions are within five kilometres of the development site (Figure 2-3).

The Darling Riverine Plains Bioregion occupies a total area of 10,651,748 hectares in northern NSW and Qld. The majority of the bioregion, 88.19 per cent (9,394,263 hectares), is in NSW and it occupies 11.74 per cent of the state.

The bioregion is surrounded by six others in both NSW and Qld, including the Brigalow Belt South Bioregion to the east, the Mulga Lands Bioregion to the northwest, and the NSW Southwestern Slopes, Cobar Peneplain, Murray Darling Depression and Broken Hill Complex bioregions in the south and southwest.

The bioregion forms a bulky shape that extends into Qld, with a long, narrow riverine corridor that runs southwest along the Darling River. The main body of the bioregion extends from east of Boggabilla to Weilmoringle on the Qld border, south almost to Peak Hill and west to Nyngan and Bourke. The bioregion is traversed by the Western Division boundary.

In central north NSW, the Darling Riverine Plains Bioregion includes the lower reaches and alluvial fans of the Bogan, Macquarie, Castlereagh, Namoi, Barwon, Culgoa, Bokhara, Narran, Gwydir and Macintyre Rivers (Morgan and Terrey 1992).

The Darling River corridor extends from Bourke almost to the southern edge of the Menindee Lakes, and south through the Murray Darling Depression Bioregion to the Victorian border where the Darling joins the Murray River.

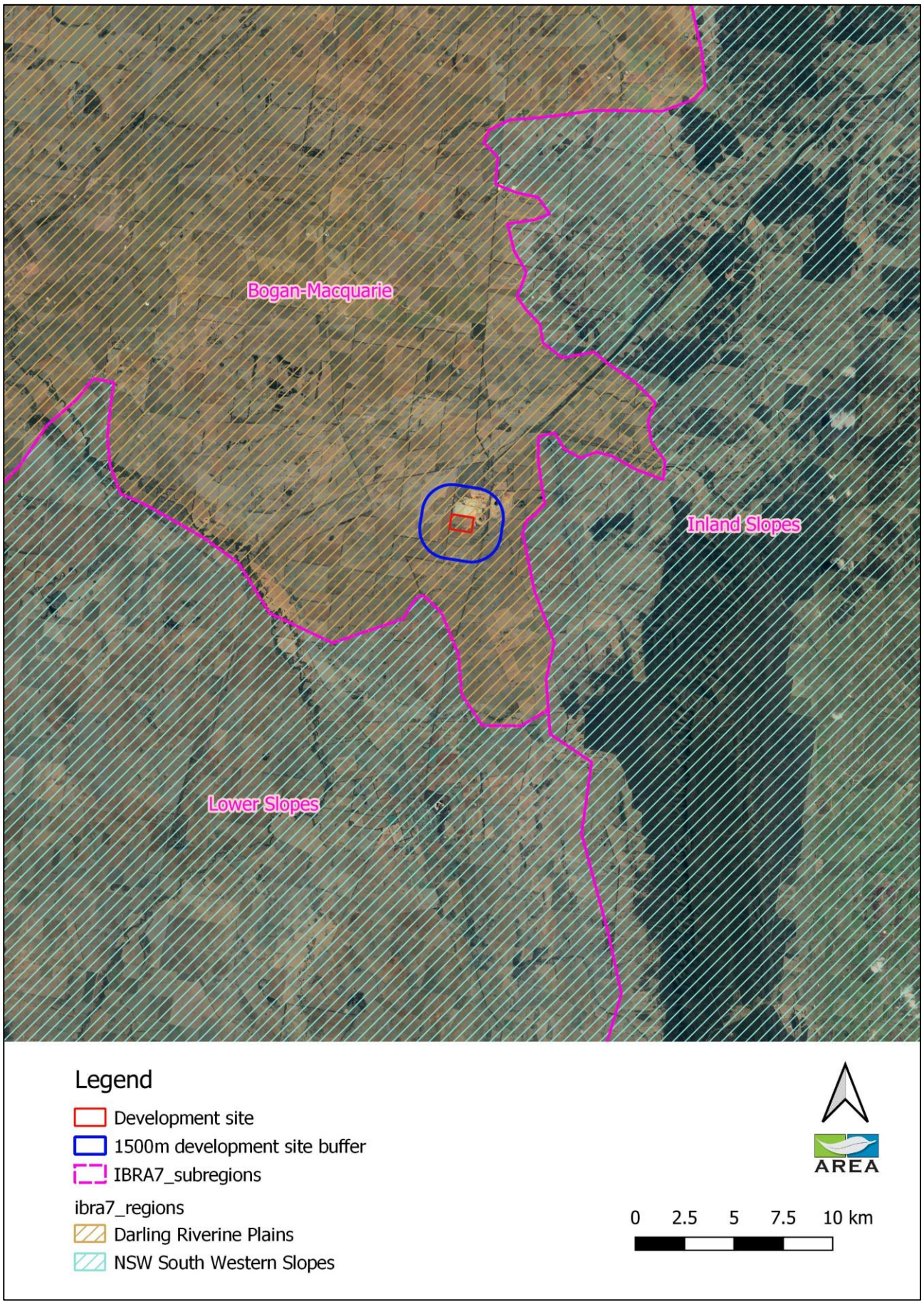
The bioregion falls entirely in the Murray-Darling Basin and includes the Macintyre-Dumaresq, Culgoa, Narran, Warrego, Paroo, Moonie, Barwon, Gwydir, Namoi, Macquarie, Yanda, Castlereagh and Darling catchments.
(https://www.environment.nsw.gov.au/bioregions/DarlingRiverinePlainsBioregion.htm)

In the Bogan-Macquarie subregion, the Bogan and Macquarie River alluvial fans of Quaternary age occur. The western margin is bedrock of the Cobar bioregion and alluvial sediments from mixed Palaeozoic bedrock bury basement rock occur to 100 metres. Underlying sediments of Cretaceous and Jurassic age form part of the Great Artesian Basin.

Waterways are predominantly channels, floodplains, and through flow swamps of past and present river systems. Grey and brown clays exist on the plains and depressions with texture contrast soils on the low rises of former levees and channels.

Vegetation consists of river red gum and river cooba on the channels. White cypress pine and poplar box occur on coarser levees. Black box, belah, myall and lignum occur on floodplains. Complex patterns of common reed, cumbungi, and water couch occur, depending on water levels, in marshes. Poplar box woodland with wilga, budda, white pine, grey box, yellow box and Blakely's red gum occur on red soils on fan margins.

Figure 2-3: IBRA bioregion boundaries



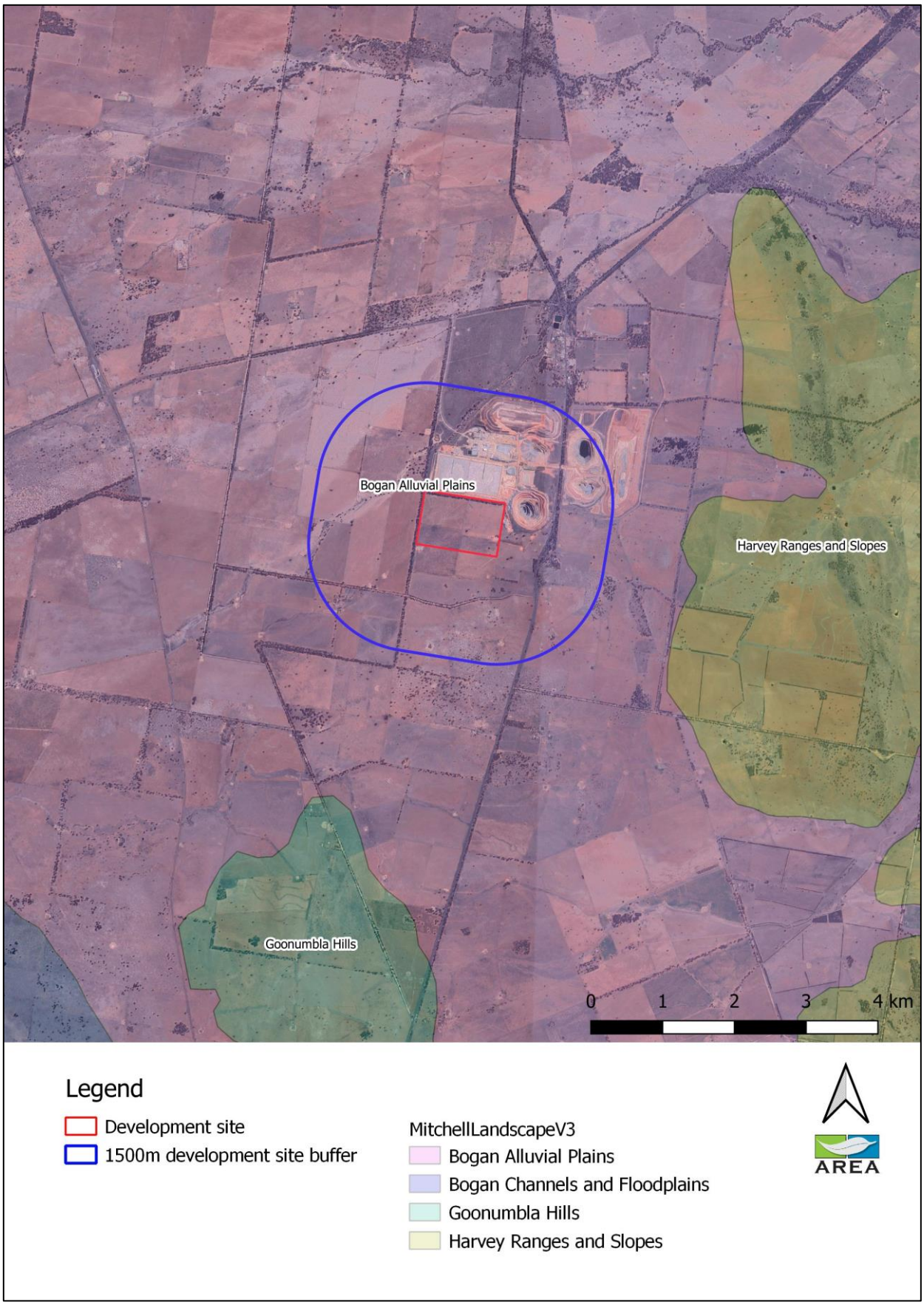
2.4 NSW Landscapes

The development site occurs entirely within the Bogan Alluvial Plains NSW Landscape (Table 2-1 and Figure 2-4).

Table 2-1: NSW Landscape description

Landscape	Landscape characteristics (geomorphic, pedologic and vegetation)	Per cent of landscape cleared
Bogan Alluvial Plains	Partly scalded, higher level plains along the Bogan River of Holocene alluvium represented by the meander plain and backplain facies of the Marra Creek Formation. Narrow, defined drainage lines and swamps, extensive gilgai in grey and brown clays, occasional lagoons, swamps and remnant lakes, some with low lunettes, relief to 3m. Red brown texture-contrast soils on plains with brown and grey cracking clays in sinuous patterns on backplains and light orange-brown fine to medium sands in channels and occasional source bordering dunes. Scattered to moderate coolibah (*Eucalyptus microtheca*), black box (*Eucalyptus largiflorens*), whitewood (*Atalaya hemiglauca*), leopardwood (*Flindersia maculosa*), myall (*Acacia pendula*), bimble box (*Eucalyptus populnea*), belah (*Casuarina cristata*), wilga (*Geijera parviflora*), budda (*Eremophila mitchellii*), nepine (*Capparis lasiantha*), warrior bush (*Apophyllum anomalum*) with grasses and some saltbushes (*Atriplex* sp.) on plains. Belah (*Casuarina cristata*), bimble box, river cooba (*Acacia stenophylla*), eurah (*Eremophila bignoniflora*), lignum (*Muehlenbeckia cunninghamii*), neverfail (*Eragrostis setifolia*), Warrego summer-grass (*Paspalidium jubiflorum*), windmill grasses (*Chloris* sp.), copperburr (*Sclerolaena* sp.) and forbs on brown and grey clays. Black box, eurah and lignum in depressions. White cypress pine (*Callitris glaucophylla*) on sandy soils.	63

Figure 2-4: NSW Landscapes



2.5 Rivers, streams, wetlands

There are no mapped rivers, streams or wetlands in the development site. The Gundong Creek lies to the north west of the development site, approximately 375 metres from the development site at its closest, and a first Strahler Order waterway occurs within 1500 metres of the development site. Surface water flow moves across the landscape from the north east to the south west and flows into the mapped unnamed waterway in the south west corner of the 1500 metre buffer. One farm dam is within the development site and numerous other mine and farm dams exist within 1500 metres (Figure 2-5).

Figure 2-5: Rivers, streams and wetlands

2.5.1 Groundwater dependent ecosystems

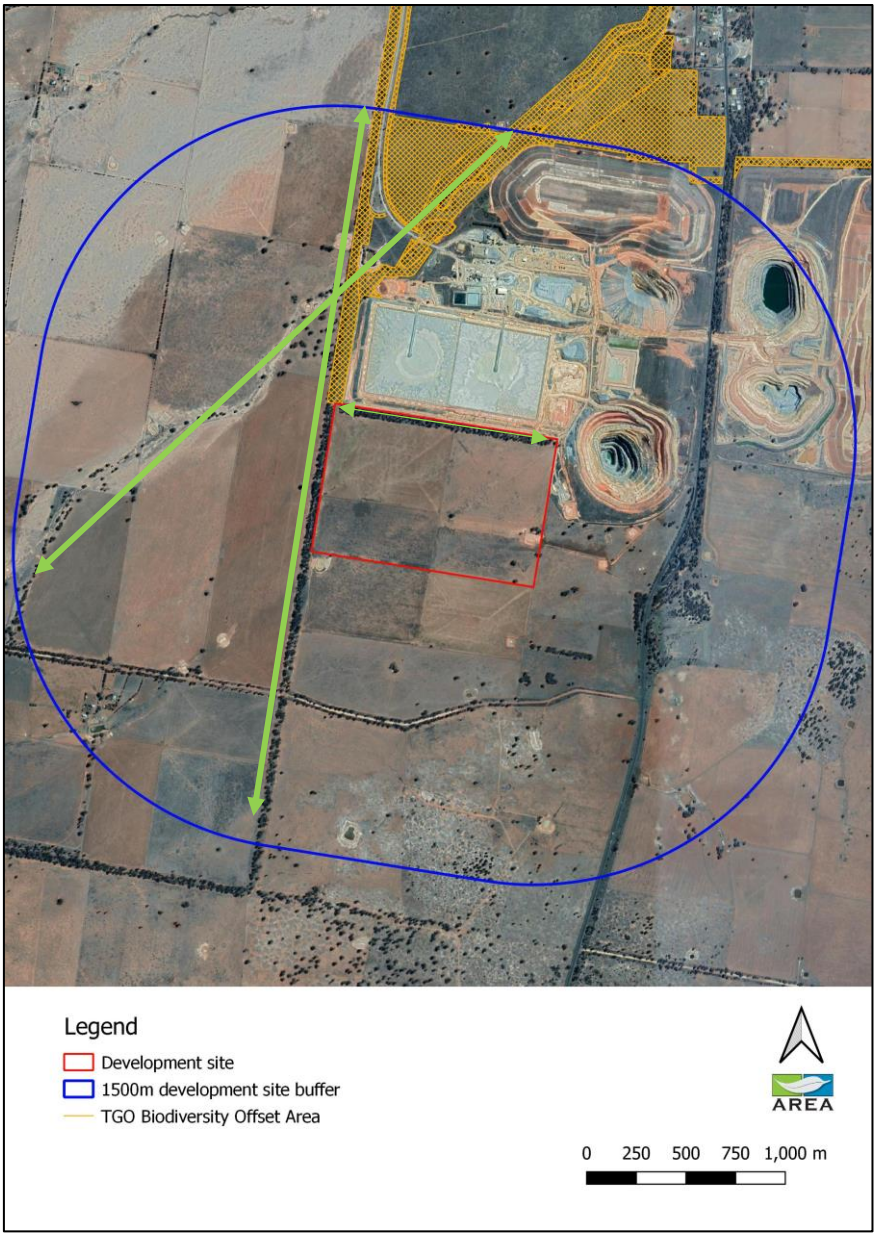
Groundwater plays an important ecological role in directly and indirectly supporting terrestrial and aquatic ecosystems. Groundwater sustains terrestrial and aquatic ecosystems by supporting vegetation and providing discharge to channels, lacustrine and palustrine wetlands, and both the estuarine and marine environment. Aquifer ecosystems are inherently groundwater dependent (DEHP, 2017). Groundwater maps covering the development site are included in Appendix A.

The Bureau of Meteorology maps no Groundwater Dependent Ecosystems (aquatic, terrestrial or subterranean) within 1500 metres of the development site (Appendix A).

2.6 Habitat connectivity

Connectivity of the east – west orientated remnant tree corridor in the development site is low as it is surrounded by cleared land either side (indicated by a thin green line in Figure 2-6). The north south oriented tree corridor and vegetation along Gundong Creek (indicated by thick green lines in Figure 2-6) have high connectivity value and will not be impacted by this proposal. The Biodiversity Offset Area for the existing Tomingley Gold Mine is immediately north of the development site. The adjacent paddock is managed as agricultural land which provides limited connectivity (Figure 2-6).

Figure 2-6: Habitat connectivity



2.7 Karst, caves and other rock features

There are no karst, caves, crevices, cliffs, rocks or other geological features of significance within 1500 metres of the development site. Some rock piles exist in the operational TGO mine site within 1500 metres of the development site however these provide very little useable habitat given the high level of disturbance of and around the rock areas. Old mine shafts associated with the historic McPhail's mine (within 1500m) were all filled in after WW2 and those that subsided again in 1990s.

2.8 Soils hazard features

The DPIE eSPADE spatial viewer provided mapped soil and geology information. In the development site, this mapping showed:

- No acid sulfate soil risk mapping
- Sodosal and chromosol soil
- pH between 5.6 and 6
- High erosion hazard (data point within 1550 metres)

No areas of other geological significance or soil hazards are known in the development site.

2.9 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value mapped within 1500 metres of the development site.

3 Native vegetation

3.1 Vegetation survey

Addy Watson, GradDip. CapVertMan, GradCert Social Impact. BEnvSc, BAM accredited assessor (BAAS19066) / Principal Environment and Community Consultant from AREA led the vegetation assessment for the proposal on 14 and 15 October 2020 following guidance materials listed in Section 1.1 of this BDAR. Addy also led other survey effort associated with another SSD BDAR (in prep) on adjoining paddocks within 1500 metres of the development site from June 2018 to current.

Eight 20x20 metre in 20x50 metre plots following BAM (2020) collectively known as a 'nested plots' were placed in the development site. The field data collected using eight BAM (2020) plots is presented in Appendix A. Pictures taken at each plot area are presented in Table 3-1.

The 20x20 metre area measures biodiversity (plant composition or floral biodiversity, hence evidence to identify the PCT and its quality) and the 20x50 metre structure plot, including the 1x1 metre leaf litter plots measure the function of the same area. Function includes an assessment of size classes of trees and tree hollows, which are both indicative of the age of trees assessed, ground logs and the amount of leaf litter. These attributes indicate the quality of habitat present and influences what species of listed fauna or flora can use the vegetation.

AREA's team observed and recorded characteristics of each plot including species composition and abundance for each layer (including upper/canopy, mid-storey/shrub stratum, and groundcover/ orbs and grasses). The number of species and height of all flora observed the percentage groundcover and signs of disturbance were recorded. Field data sheets in Appendix B provide the completed template of data collected (BAM plot sheets). Using this data, PCTs in the development site were identified.

If the presence of a listed threatened species was detected in a plot, relevant NSW or Commonwealth guidelines were employed to find others in or next to the plot to indicate the extent of the local viable population. No threatened species were identified in the development site.

BAM (2020) is approved by the NSW government as it is scientifically robust and transparent. BAM (2020) ensures all accredited assessors can assess the same location and with the BAM credit calculator get the same or very similar score. The BAM Credit Calculator generates a number against a benchmark to indicate quality i.e. a Vegetation Integrity Score of 67 = 67 percent of the benchmark for the described PCT.

Figure 3-1: BAM plot locations

Table 3-1: Plot pictures

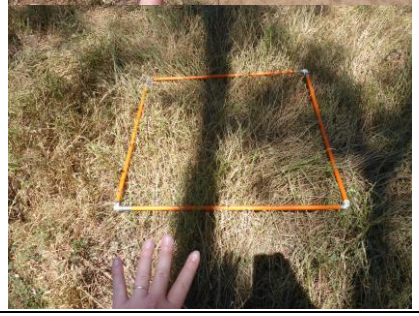
Plot ID	PCT	Pictures
Plot 1 Zone 2	PCT82 Cleared	      

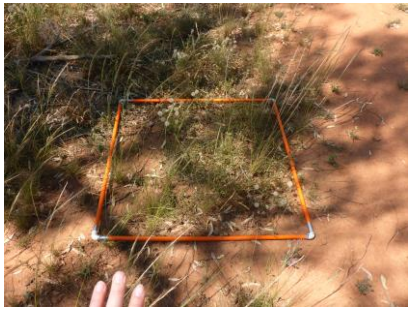
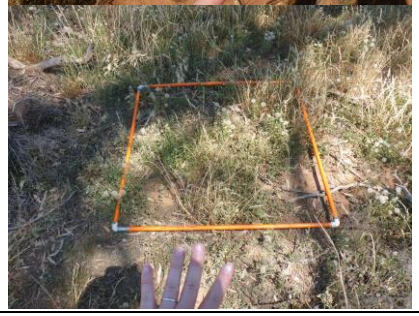
Plot ID	PCT	Pictures
Plot 2 Zone 2	PCT82 Cleared	      

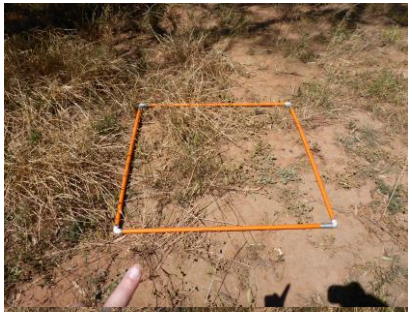
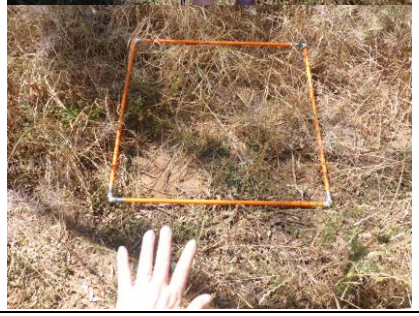
Plot ID	PCT	Pictures
Plot 3 Zone 2	PCT82 Cleared	      

Plot ID	PCT	Pictures
Plot 4 Zone 2	PCT82 Cleared	      

Plot ID	PCT	Pictures
Plot 5 Zone 2	PCT82 Cleared	     

Plot ID	PCT	Pictures
Plot 6 Zone 1	PCT82	      

Plot ID	PCT	Pictures
Plot 7 Zone 1	PCT82	      

Plot ID	PCT	Pictures
Plot 8 Zone 3	PCT201	      

3.2 Plant Community Types

The Central West Lachlan State Vegetation Map, v1p4 PCT4468 maps the following PCTs within 1500 metres of the development site:

- PCT36 - River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion
- PCT 76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- PCT 248 - River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW
- PCT 250 - Derived tussock grassland of the central western plains and lower slopes of NSW
- PCT 356 - Blakely's Red Gum x Dirty Gum - White Cypress Pine tall riparian woodland, NSW South Western Slopes Bioregion.

Some patches of vegetation within 1500 metres of the development site have been secured as the TGO biodiversity offset area or have been removed under the existing TGO approvals.

Two PCTs were confirmed to exist in the development site. These are:

1. PCT82 - *Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion*
2. PCT201 - *Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion*.

One TEC listed as Endangered under the BC Act occurs in the development site - *Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions (Part).* The Threatened Ecological Community (TEC) Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Part) is not present in the development site as it does not apply to the Darling Riverine Plains IBRA Bioregion.

Table 3-2: Plant Community Types

PCT ID	PCT name	Vegetation class	Vegetation formation	Estimate percent cleared in NSW	Extent in development site	Associated with TEC
82	*Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion*	Floodplain Transition Woodlands	Grassy Woodlands	75	83.80	Listed as Endangered under the BC Act: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Part) Listed as Endangered under the EPBC Act: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Part)
201	*Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion*	Western Slopes Grassy Woodland	Grassy Woodlands	94	1.35	Listed as Endangered under the BC Act: Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions (Part);
0	*Existing farm dam*	N/A	N/A	N/A	0.44	N/A
				Total	**85.59**	

PCT82 JUSTIFICATION:

- **Bioregion and subregion** – consistent: included on the PCT description Darling Riverine Plains – Bogan Macquarie
- **Local Government Area** – consistent: Narromine)
- **Upper stratum species** mostly consistent - *Eucalyptus macrocarpa, Eucalyptus populnea subsp. bimbil, Callitris glaucophylla, Allocasuarina luehmannii, Brachychiton populneus subsp. populneus*
- **BioNet vegetation classification tool** – consistent: listed PCT82 in the top five results. The top five included:
    - PCT201 which in this development site has a consistent understory with this PCT, however *Eucalyptus conica* is only present in two small patches in the development site
    - PCT267, a White Box community which is inconsistent with PCT82 based on the absence of White Box
    - PCT80 which is not present on the site based on the clear dominance of *Eucalyptus microcarpa*, and not a co-dominance with *Callitris glaucophylla*
    - PCT81 which is not present as PCT81 lists occasional tree species such as *Angophora floribunda, Eucalyptus crebra, Callitris endlicheri* and *Eucalyptus melliodora* which are not present in or around the development site.

PCT201 JUSTIFICATION:

- **Bioregion and subregion** – consistent: included on the PCT description – Darling Riverine Plains – Bogan Macquarie
- **Upper stratum species** mostly consistent - *Eucalyptus conica, Eucalyptus macrocarpa, Allocasuarina luehmannii, Brachychiton populneus subsp. populneus, Eucalyptus populnea subsp. bimbil; Callitris glaucophylla*
- **BioNet vegetation classification tool** listed PCT201 as the top result based on IBRA subregion and floristics recorded in the vegetation plots:

Figure 3-2: Central West Lachlan State Vegetation Map

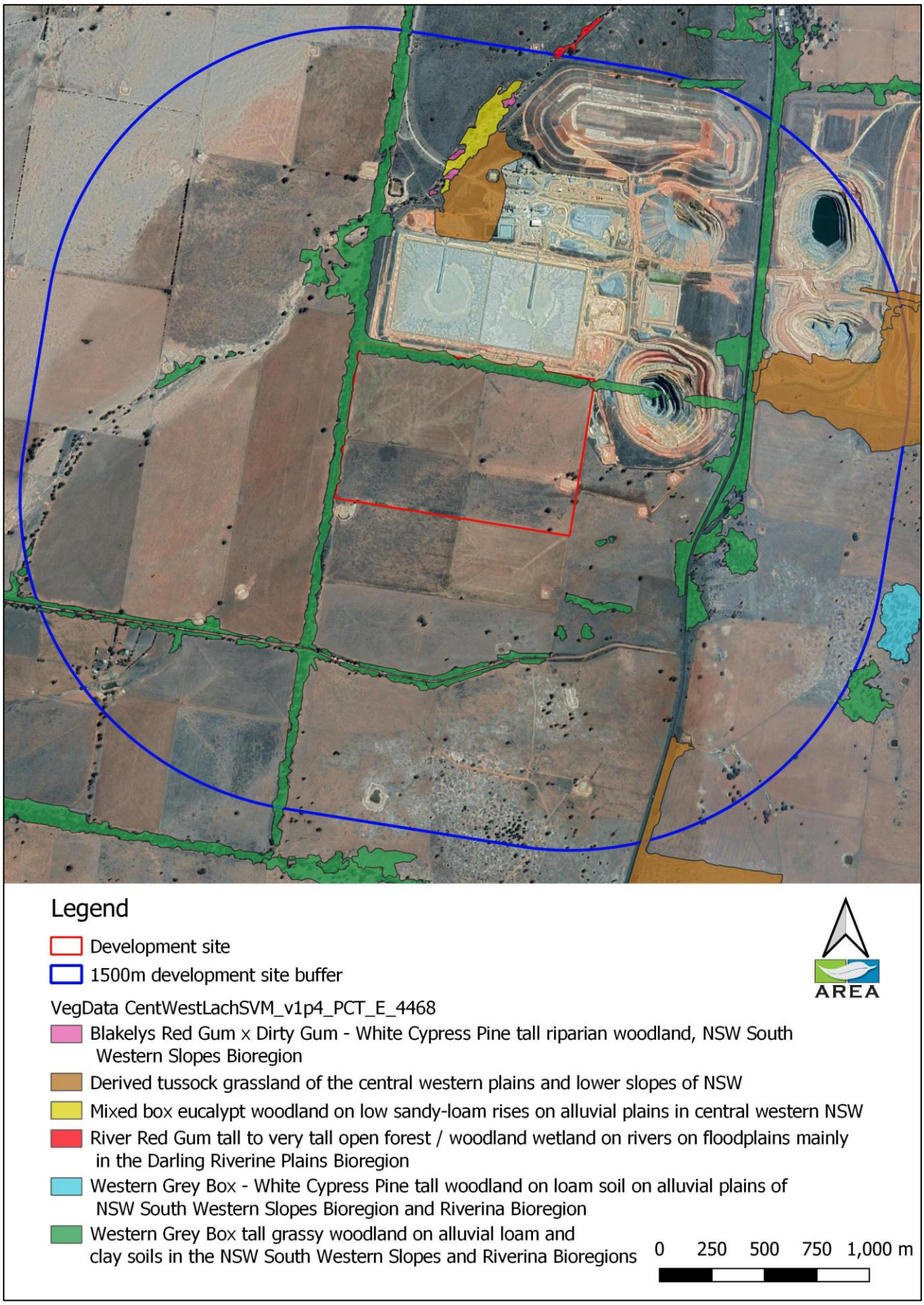
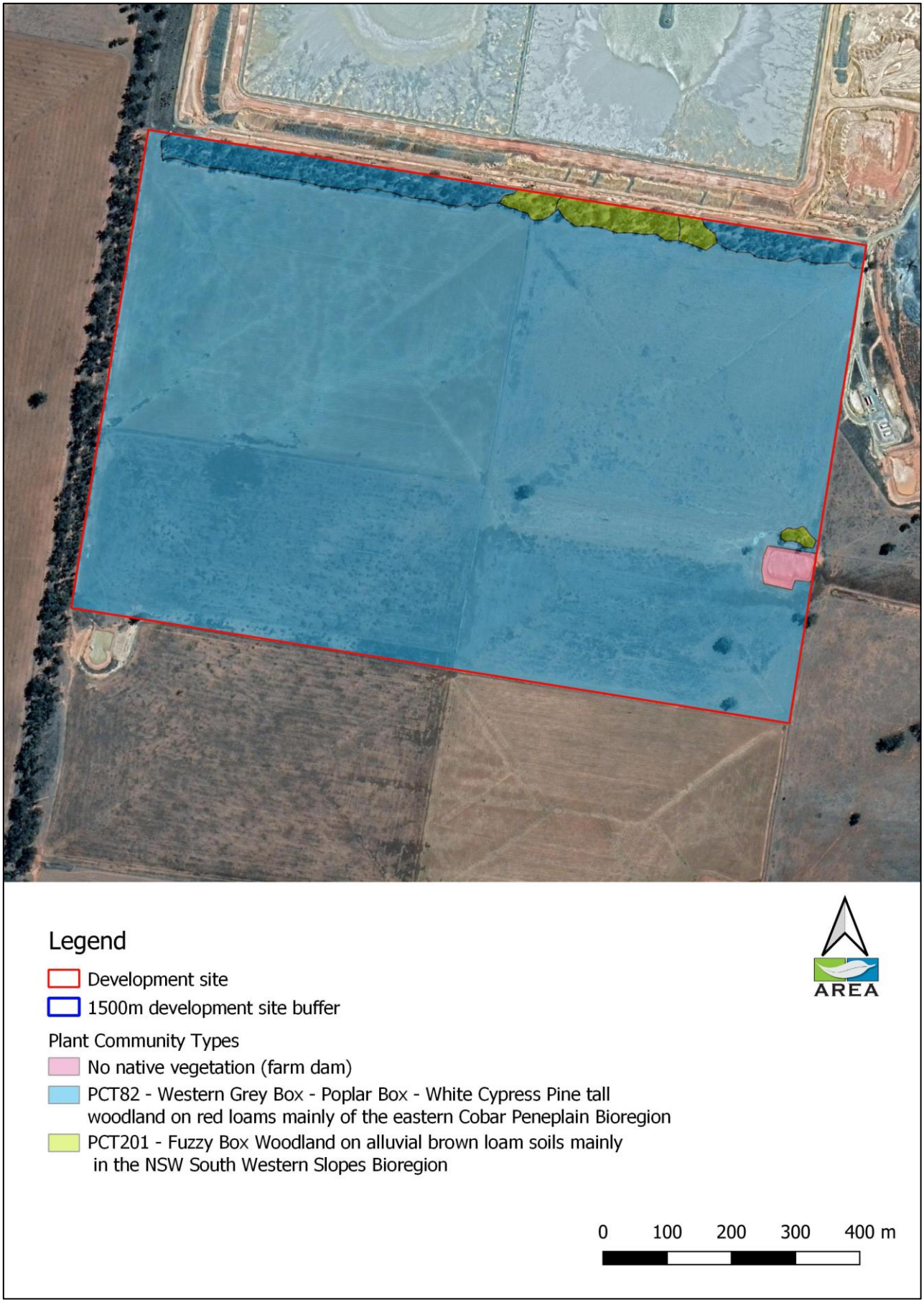


Figure 3-3: Plant community Types (ground truthed)



3.3 Vegetation zones

Vegetation zones are defined as a 'relatively homogeneous area of native vegetation within a proposal that is the same PCT and broad condition state' (OEH 2014a).

The development site has been stratified into three zones:

- Zone 1 – PCT82 – Grazed, Moderate condition
- Zone 2 – PCT82 – Cleared, Poor condition
- Zone 3 – PCT201 – Grazed, Moderate condition.

The patch size extends a minimum of approximately 765 hectares through the extensive tree corridors around agricultural paddocks.

No local or other benchmarks were used in the analysis of the vegetation zones.

Vegetation plot data from each zone is present in Table 3-3, Table 3-4 and Table 3-5.

Table 3-3: BAM plots measured against PCT benchmarks – Zone 1

PCT82: Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion - Grazed moderate condition					
Vegetation Class	Floodplain Transition Woodlands				
IBRA	Darling Riverine Plains				
Benchmark Calculation Level	**Benchmark value**	25% of BM	Plot 6	Plot 7	Plot Av
Tree Richness	**3**	0.75	3	3	3
Shrub Richness	**6**	1.5	0	3	1.5
Grass and Grass Like Richness	**5**	1.25	3	4	3.5
Forb Richness	**7**	1.75	13	10	11.5
Fern Richness	**0**	0	0	0	0
Other Richness	**1**	0.25	0	0	0
Tree Cover	**22**	5.5	9	12	10.5
Shrub Cover	**5**	1.25	0	0.4	0.2
Grass and Grass Like Cover	**18**	4.5	2.2	20.2	11.2
Forb Cover	**5**	1.25	1.5	2.2	1.85
Fern Cover	**0**	0	0	0	0
Other Cover	**0**	0	0	0	0
Total length of fallen logs	**55**	13.75	37	28	32.5
Litter Cover	**36**	9	13	20.8	16.9
Number of Large Trees	**3**	0.75	5	1	3
Large Tree Threshold Size	**50**				
Benchmark Confidence	**Composition: High** **Structure: Moderate** **Function:** **Logs: High** **Litter: High** **Large Trees: High**		Note: Green fill = within benchmark (i.e. at or more than 25% of the BM value)		

Table 3-4: BAM plots measured against PCT benchmarks – Zone 2

	PCT82: Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion – Cleared poor condition							
Vegetation Class	Floodplain Transition Woodlands							
IBRA	Darling Riverine Plains							
Benchmark Calculation Level	Benchmark value	25% of BM	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot Av
Tree Richness	3	0.75	0	0	0	0	0	0
Shrub Richness	6	1.5	0	0	1	1	1	0.6
Grass and Grass Like Richness	5	1.25	1	3	1	2	5	2.4
Forb Richness	7	1.75	2	2	7	7	5	4.6
Fern Richness	0	0	0	0	0	0	0	0
Other Richness	1	0.25	0	0	0	0	0	0
Tree Cover	22	5.5	0	0	0	0	0	0
Shrub Cover	5	1.25	0	0	0.1	0.1	0.1	0.06
Grass and Grass Like Cover	18	4.5	0.1	0.4	1	2.3	11.7	3.1
Forb Cover	5	1.25	0.2	0.2	2.5	1.2	1.3	1.08
Fern Cover	0	0	0	0	0	0	0	0
Other Cover	0	0	0	0	0	0	0	0
Total length of fallen logs	55	13.75	0	0	0	0	0	0
Litter Cover	36	9	88	71.8	52	52	45	61.76
Number of Large Trees	3	0.75	0	0	0	0	0	0
Large Tree Threshold Size	50							
Benchmark Confidence Composition: High Structure: Moderate Function: Logs: High, Litter: High, Large Trees: High								
Note: Green fill = within benchmark (i.e. at or more than 25% of the BM value)								

Table 3-5: BAM plots measured against PCT benchmarks – Zone 3

PCT201: Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion - Grazed moderate condition				
Vegetation Class	Western Slopes Grassy Woodlands			
IBRA	Darling Riverine Plains			
Benchmark Calculation Level	Benchmark value	25% of BM	Plot 8	Plot Av
Tree Richness	3	0.75	2	2
Shrub Richness	4	1	3	3
Grass and Grass Like Richness	7	1.75	6	6
Forb Richness	9	2.25	12	12
Fern Richness	1	0.25	0	0
Other Richness	1	0.25	0	0
Tree Cover	11	2.75	20	20
Shrub Cover	2	0.5	0.4	0.4
Grass and Grass Like Cover	20	5	3.5	3.5
Forb Cover	5	1.25	4.1	4.1
Fern Cover	0	0	0	0
Other Cover	0	0	0	0
Total length of fallen logs	34	8.5	17	17
Litter Cover	35	8.75	33.5	33.5
Number of Large Trees	2	0.5	3	3
Large Tree Threshold Size	50			
Benchmark Confidence	Composition: High Structure: Moderate Function: Logs: Moderate, Litter: Moderate, Large Trees: Low			
Note: Green fill = within benchmark (i.e. at or more than 25% of the BM value)				

Figure 3-4: Vegetation zones

4 Threatened species

The following section addresses the potential presence of threatened flora and fauna species to be considered in the assessment of impacts and targeted surveys.

4.1 Database searches

Table 4-1: Wildlife databases used to identify potentially occurring threatened species

Database / resource	Search area	Date accessed
BAM credit calculator (BAMC)	Darling Riverine Plains IBRA Subregion > Bogan-Macquarie subregion > PCT82 and 201	October 2020
DPIE NSW Atlas of Wildlife	More than 10 X10 kilometres centred on the development site	October 2020
Protected Matters Search Tool (DEE)	One kilometre radius around the development site	November 2020
DPIE Threatened Species Profile Database (TSPD)	IBRA sub region filtered by PCT vegetation class	April and November 2020

4.1.1 BioNet species records

A BioNet species record search was conducted for all listed species, including species listed under international bilateral agreements. The BioNet data for all records within 10 kilometres of the development site is provided in Appendix A and a figure showing records within 1500 metres of the development site is shown in Figure 4-1 and Figure 4-2.

Table 4-2: BioNet species records within 10 kilometres of the development site.

Scientific Name	Common Name	NSW Status	Comm Status
Mammals			
Chalinolobus picatus	Little Pied Bat	Vulnerable	Not listed
Phascolarctos cinereus	Koala	Vulnerable	Vulnerable
Birds			
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Vulnerable	Not listed
Lophoictinia isura	Square-tailed Kite	Vulnerable	Not listed
Circus assimilis	Spotted Harrier	Vulnerable	Not listed
Polytelis swainsonii	Superb Parrot	Vulnerable	Vulnerable
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable	Not listed
Petroica phoenicea	Flame Robin	Vulnerable	Not listed
Hieraaetus morphnoides	Little Eagle	Vulnerable	Not listed
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not listed

Species shaded in green have been recorded within 1500 metres

Figure 4-1: BioNet species records within 1500 metres

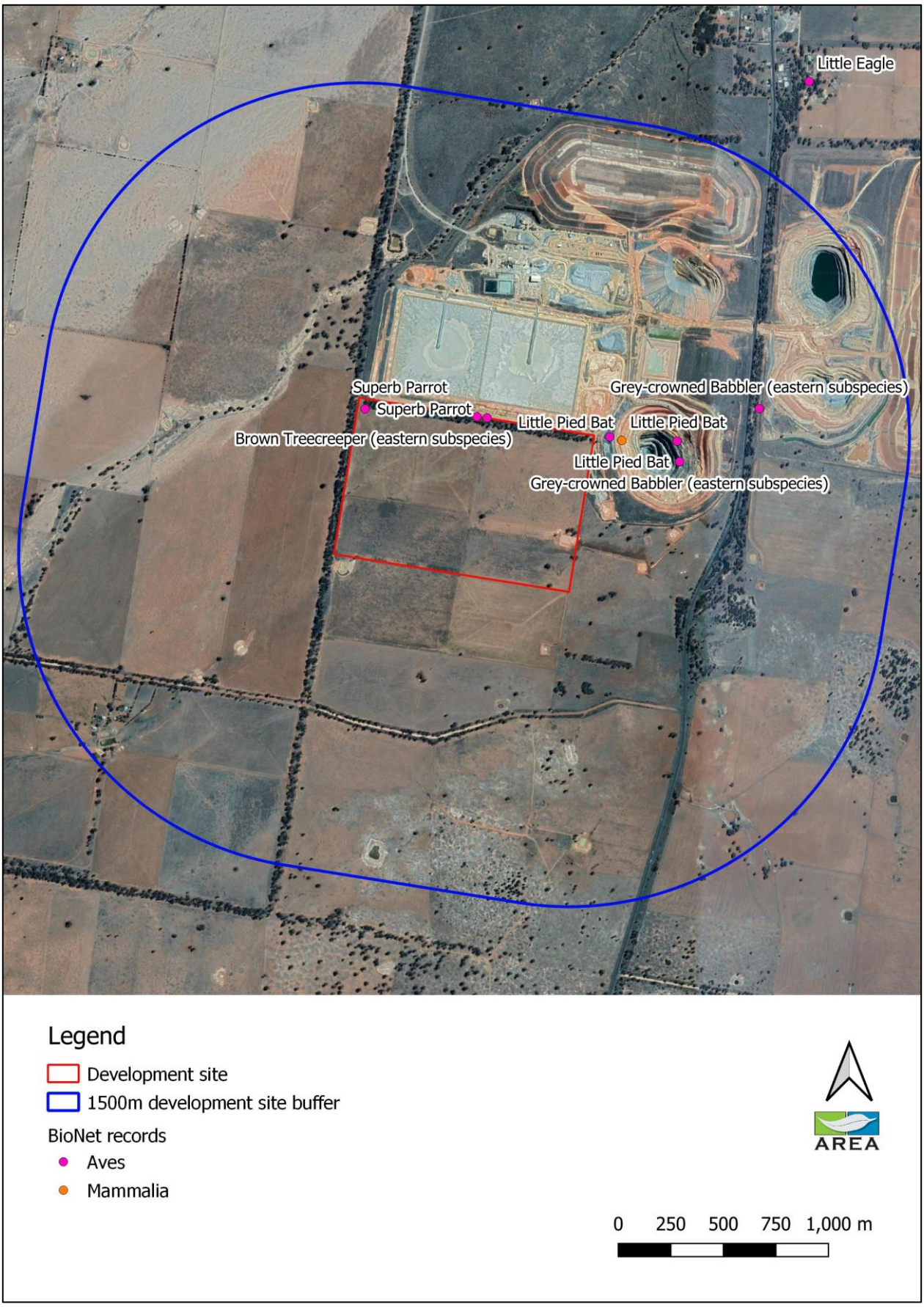
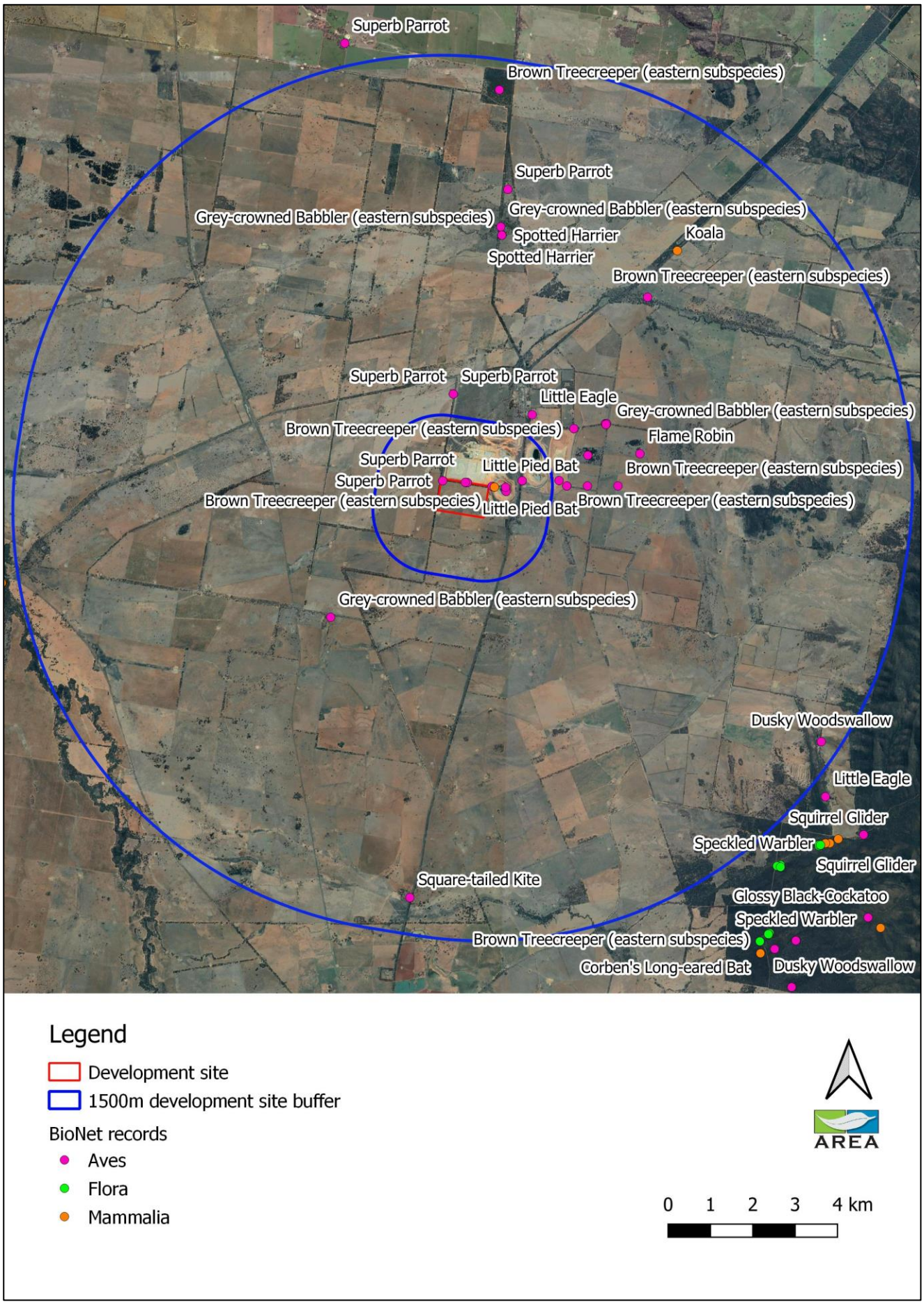


Figure 4-2: BioNet species records within 10 kilometres



4.1.2 EPBC Act Protected Matters Report

The EPBC Act Protected Matters Report, generated for a one kilometre buffer around the development site is provided in Appendix A. A summary of the matters identified in that report is provided in Table 4-3.

Table 4-3: EPBC Act Protected Matters Report – summary

Matter of National Environmental significance	Report results	Implication for this assessment
World Heritage Properties	None	Nil
National Heritage Places	None	Nil
Wetlands of International Importance	3	Nil – all three are more than 600km upstream
Great Barrier Reef Marine Park	None	Nil
Commonwealth Marine Area	None	Nil
Listed Threatened Ecological Communities	5	Yes – Field assessment confirmed none of these communities occur in the development site
Listed Threatened Species	19	Yes – likelihood of occurrence considered
Listed Migratory Species	10	Yes – Proposal is unlikely to impact these species
Commonwealth Land	None	Nil
Commonwealth Heritage Places	None	Nil
Listed Marine Species	16	Yes – Proposal is unlikely to impact these species
Whales and Other Cetaceans	None	Nil
Critical Habitats	None	Nil
Commonwealth Reserves Terrestrial	None	Nil
Australian Marine Parks	None	Nil
State and Territory Reserves	None	Nil
Regional Forest Agreements	None	Nil
Invasive Species	19	Yes – Species listed are either already present in the region or their presence will not be increased by this proposal, or they are unlikely to be introduced.
Nationally Important Wetlands	None	Nil
Key Ecological Features (Marine)	None	Nil

4.2 Field survey

4.2.1 Survey for habitat constraints and microhabitat

Habitat search included identification and mapping of the large hollows (greater than 20 centimetres Diameters at Breast Height). Figure 4-3 shows the location of the large hollows, with 'FB' showing Fuzzy Box trees, 'IGB' showing Inland Grey Box trees, 'H' showing a large hollow and '>5m' indicating the hollow is more than five metres from the ground. These trees were also observed for use by threatened species requiring further assessment in the BAMC.

One farm dam exists within the development site. This dam has extensively been used by sheep and no vegetation exists in the dam or on the inner surface of its banks.

Figure 4-3: Large hollows present in the development site.

4.2.2 Targeted threatened species survey

Targeted threatened species survey effort was conducted in the development site in June and October 2020, and within 1500 metres of the development site in December 2019 and June, August, and September 2020.

Search transects:
Search transects conducted across the site in June and October 2020 (Figure 4-5 and Table 4-4). Search transects were used to search for:

- flora species including *Dichanthium setosum* (Bluegrass), *Diuris tricolor* (Pine Donkey Orchid), *Swainsona murrayana* (Slender Darling Pea) and *Swainsona recta* (Small Purple-pea). This survey effort followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (2020)*
- Bird species including *Geophaps scripta scripta* (Squatter Pigeon (southern subspecies)). This survey effort followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (2020).*

Table 4-4: Survey timing – Search transects

Scientific name	Common name	Specified survey months	Months surveyed	Justification
Dichanthium setosum	Bluegrass	January February March April May November December	June and October	Recorded by AREA in Coonabarabran, flowering in early August (RBG Sydney provided conformation). Other species of bluegrass flowering in August.
Diuris tricolor	Pine Donkey Orchid	September October	October	Recorded by AREA flowering elsewhere in the central west at the time of survey (Dubbo and Gulgong)
Swainsona murrayana	Slender Darling Pea	September	October	Recorded by AREA in flowering elsewhere in the central west at the time of survey (Forbes)
Swainsona recta	Small Purple-pea	September October November	October	Recorded by AREA flowering elsewhere in the central west at the time of survey (Mudgee, Kandos, Wellington)
Geophaps scripta scripta	Squatter Pigeon	All year	June and October	Survey possible any time

Camera traps:
Four camera traps were set up in the patch of PCT201 following DPIE guidelines (per BioNet data Collection) for surveying for *Phascogale tapoatafa* (Brush-tailed Phascogale) (Figure 4-5 and Table 4-5). To meet the guidelines, four traps were set for a patch of up to one hectare. These traps were left in position for four weeks, with the cameras checked and the lures rebaited with honey and peanut butter after two weeks. Traps were positioned on trees with hollows on alluvial soils and as high as possible in the tree.

Table 4-5: Survey timing – Camera traps

Scientific name	Common name	Specified survey months	Months surveyed	Justification
Phascogale tapoatafa	Brush-tailed Phascogale	January February March April May June December	October	2020 has provided an abundant spring, meaning animals are likely to be active. Similar trapping but with 16 cameras was implemented by AREA within 1500 metres is more intact vegetation along the Newel Highway in May and June 2020 (allowable detection seasons) and Brush-tailed Phascogales were not recorded.

Ultrasonic bat recording:
No bat species were predicted by the BAMC.

Ultrasonic bat recording was conducted as part of the TGO fauna monitoring requirements from 16 December 2020 to 18 December 2020. One of the ultrasonic bat recorders used for this monitoring was set approximately 130 metres from the development site amongst connected vegetation. Expert bat call analysis staff recorded three species, none of which are listed species under the BC Act or the EPBC Act. These species were *Chalinolobus gouldii* (Gould's wattled bat), *Scotorepens balstoni* (Inland broad-nosed bat) and *Scotorpens greyii* (Little broad-nosed bat).

Figure 4-4: Location of ultrasonic bat recorder

Taken from TGO 2019 Monitoring report with the development site added as red polygon.

Frog searches:
Evening frog searches following *NSW Survey Guide for Threatened Frogs A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (2020)* were conducted on 20 August 2020 by three AREA ecologists, within two kilometres of the development site in suitable habitat for the Sloane's Froglet *(Crinia sloanei)*. No suitable habitat (aquatic vegetation) is present in the one farm dam in the development site.

Suitable habitat included gilgais and farm dams containing substantial aquatic vegetation.

Table 4-6: Survey timing – Frog searches

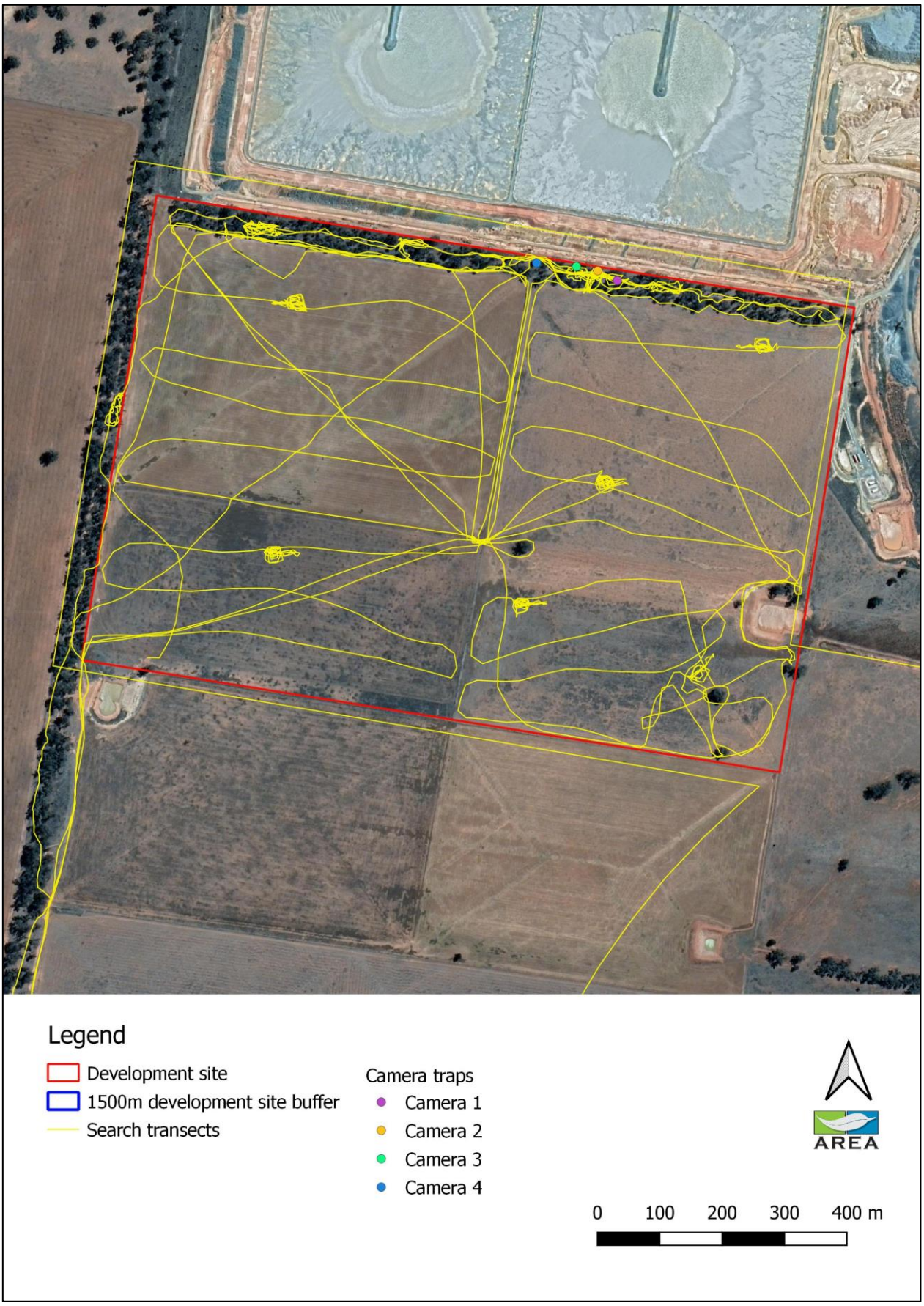
Scientific name	Common name	Specified survey months	Months surveyed	Justification
Crinia sloanei	Sloane's Froglet	July August	August	Advice regarding survey timing and likelihood of species presence was sought form DPIE staff. An August survey was agreed to be sufficient.

Bird searches at and around the development site:
Presence of bird species predicted by the BAMC. The targeted searches followed *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft* (DEC, 2004) and were searched for during field assessment in and within 1500 metres of the development site during June, August, September and October 2020. These species were all large conspicuous species and included *Ardeotis australis* (Australian Bustard), *Calyptorhynchus lathami* (Glossy Black-Cockatoo), *Lophochroa leadbeateri* (Major Mitchell's Cockatoo) and *Polytelis swainsonii* (Superb Parrot).

Table 4-7: Survey timing – Bird searches

Scientific name	Common name	Specified survey months	Months surveyed	Justification
Ardeotis australis	Australian Bustard	All year	June and October also, September in similar habitat within 1500 metres of the development site.	Suitable timing
Calyptorhynchus lathami	Glossy Black-Cockatoo	April May June July August	June and October	Suitable timing A lone Glossy Black Cockatoo was recorded within two kilometres of the development site in June 2020. No birds were using the hollows in the development site in June 2020. Locally many GBCs were observed feeding by surrounding landholders off Goobang NP after fires earlier in summer had affected feeding resources.
Lophochroa leadbeateri	Major Mitchell's Cockatoo	September October November December	October	Suitable timing Hollow breeding
Polytelis swainsonii	Superb Parrot	September October November	October	Suitable timing Superb Parrots recorded within three kilometres of the development site in June and more broadly this species is often observed in monitoring events feeding and resting in the treed corridors (but never along the highway). Survey in October confirmed no birds were nesting in the development site.

Figure 4-5: Search transects and camera traps



4.3 Ecosystem credit species

Ecosystem credit species (predicted species) are predicted to occur based on their known presence or predicted presence in the IBRA subregion, the known association with PCTs and the size and condition of the vegetation patches on the site, as determined by the BAMC. Ecosystem credit species may be excluded from this list where they require specific habitat or geographic features (as prescribed by the BAMC) which are not present.

4.3.1 List of ecosystem credit species derived

The BAMC assessment tool identified 15 threatened species (Table 4-8) reliably predicted to use the development site. Two of the species *Climacteris picumnus victoriae* (Brown Treecreeper (eastern subspecies)) and *Haliaeetus leucogaster* (White-bellied Sea-Eagle (Foraging)) can be excluded because they are outside the geographical limitations or the required habitat constraints are not present (Table 4-9). Ecosystem credits apply to the remaining 13 species. No surveys are required to confirm presence of these species.

Table 4-8: Predicted species

Species	Habitat constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status.
Artamus cyanopterus cyanopterus Dusky Woodswallow	--	--	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed
Calyptorhynchus lathami Glossy Black-Cockatoo (Foraging)	Other Presence of Allocasuarina and casuarina species	--	High Sensitivity to Potential Gain	Vulnerable	Not Listed
Chthonicola sagittate Speckled Warbler	--	--	High Sensitivity to Potential Gain	Vulnerable	Not Listed
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	--	East of the Newell Highway	High Sensitivity to Potential Gain	Vulnerable	Not Listed
Dasyurus maculatus Spotted-tailed Quoll	--	--	High Sensitivity to Potential Gain	Vulnerable	Endangered
Falco hypoleucos Grey Falcon	--	--	Moderate Sensitivity to Potential Gain	Endangered	Not Listed
Grus rubicunda Brolga	--	--	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed
Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	N/A Waterbodies Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	--	High Sensitivity to Potential Gain	Vulnerable	Not Listed
Lophochroa leadbeateri Major Mitchell's Cockatoo (Foraging)	--	--	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed
Melanodryas cucullata cucullate Hooded Robin (south-eastern form)	--	--	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed
Petroica phoenicea Flame Robin	--	--	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed
Phascolarctos cinereus Koala (Foraging)	--	--	High Sensitivity to Potential Gain	Vulnerable	Vulnerable
Polytelis swainsonii Superb Parrot (Foraging)	--	--	Moderate Sensitivity to Potential Gain	Vulnerable	Vulnerable
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)	--	--	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed
Stagonopleura guttata Diamond Firetail	--	--	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed

4.3.2 Justification for exclusion of ecosystem credit species

Two ecosystem species were excluded as habitat constraints were not present or geographic limitations applied (Table 4-9).

Table 4-9: Ecosystem credit species excluded

Scientific Name	Common Name	Habitat constraints	Geographic limitations	Justification for exclusion
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	N/A	East of the Newell Highway	Development site is not east of the Newell Highway. The targeted searches followed Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004) did not detect them.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	Within 1km of a river, lake, large dams or creek, wetland or coastline	N/A	No suitable waterbodies are within one kilometre of the development site. The targeted searches followed Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004) did not detect them.

4.4 Candidate species credit species

Species credit species (candidate species) are those that cannot be reliably predicted from the habitat surrogates and their presence is to be assessed through habitat assessment and targeted surveys. When species credit species have habitat constraints within the development site, they require further consideration. When a species credit species is known to occur, assumed to occur, they require offsetting. The candidate species credit species are listed in Table 4-10.

Table 4-10: Candidate species credit species (full list)

Scientific name	Common name	Habitat constraints	Sensitivity to gain class	BC Act listing status	EPBC Act listing status.
Ardeotis australis	Australian Bustard		High Sensitivity to Potential Gain	Endangered	Not Listed
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Hollow bearing trees Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground	High Sensitivity to Potential Gain	Vulnerable	Not Listed
Crinia sloanei	Sloane's Froglet		Moderate Sensitivity to Potential Gain	Vulnerable	Endangered
Dichanthium setosum	Bluegrass		High Sensitivity to Potential Gain	Vulnerable	Vulnerable
Diuris tricolor	Pine Donkey Orchid		Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed
Geophaps scripta scripta	Squatter pigeon		High Sensitivity to Potential Gain	Critically Endangered	Vulnerable
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	High Sensitivity to Potential Gain	Vulnerable	Not Listed
Lophochroa leadbeateri	Major Mitchell's Cockatoo (Breeding)	Hollow bearing trees Living or dead tree with hollows greater than 10cm diameter	High Sensitivity to Potential Gain	Vulnerable	Not Listed

Scientific name	Common name	Habitat constraints	Sensitivity to gain class	BC Act listing status	EPBC Act listing status.
Phascogale tapoatafa	Brush-tailed phascogale		High Sensitivity to Potential Gain	Vulnerable	Not Listed
Phascolarctos cinereus	Koala (Breeding)	Areas identified via survey as important habitat	High Sensitivity to Potential Gain	Vulnerable	Vulnerable
Polytelis swainsonii	Superb Parrot (Breeding)	Hollow bearing trees Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5cm diameter greater than 4m above ground or trees with a DBH of greater than 30cm	High Sensitivity to Potential Gain	Vulnerable	Vulnerable
Swainsona murrayana	Slender Darling Pea		High Sensitivity to Potential Gain	Vulnerable	Vulnerable
Swainsona recta Small	Purple-pea		Moderate Sensitivity to Potential Gain	Endangered	Endangered

4.4.1 Justification for exclusion and inclusion of species credit species

The above list of species credit species was assessed to identify if habitat constraints for species are present; if habitat constraints are not present the species can be excluded from further survey. Eleven of the 13 identified species credit species require further assessment (Table 4-11)

Table 4-11: Justification of exclusion of species credit species

Species	Justification
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	Excluded based on habitat constraints: No living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines. Noting there are creeks such as Gundong Creek within 1km of the development site, however these only flow during times of very high rainfall or flood.
Phascolarctos cinereus Koala (Breeding)	Excluded based on habitat constraint: Area is unlikely to be identified as important habitat. One Koala record from 1986 exists on BioNet within 10km of the development site. There is not a resident local population of Koalas present. The development site is adjacent to a major regional highway and surrounded by long operational rural activities both increasing the risk of mortality by vehicle strike or dog attack. Three species of Koala habitat trees listed in the Koala Habitat Protection SEPP occur in the development site (*Callitris glaucophylla, Eucalyptus microcarpa* and *Eucalyptus conica*).

4.4.2 Description of targeted threatened species surveys

The eight remaining species credit species listed in were excluded because survey confirmed the species was:

- Not present or
- Unlikely to be present or
- Unlikely to use the suitable habitat in the development site.

No species credit spies were assumed to be present in the development site.

Descriptions of targeted survey is provided in section 4.2.2 and Table 4-12.

Table 4-12: Species requiring additional survey

Species	Habitat constraints	Survey effort
Ardeotis australis Australian Bustard	--	The targeted searches followed Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004) did not detect them. AREA has been present in suitable in and around the development site Bustard habitat during implementation of vegetation plots for the TGEP for nine days in 2020. Further, AREA staff completed annual fauna monitoring for TGO in 2019. No Bustards or evidence of Bustard occupation have been found. Search transects were implemented across the development site, and much of the area around the development site for the TGEP assessment.
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	Hollow bearing trees Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground	The targeted searches followed Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004) did not detect them. A full day was spent in the development site in June 2020. No Glossy Black Cockatoos were recorded and no evidence of nesting or foraging Glossy Black Cockatoos was recorded in the development site.
Crinia sloanei Sloane's Froglet	--	The targeted searches followed NSW Survey Guide for Threatened Frogs A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (2020) and did not detect them. Advice as also sought from an DPIE SoS subject matter specialist. A frog survey was conducted in August 2020 by three AREA ecologists which focussed on the gilgais and vegetated dams to the south and south east of the development site. Frogs were present at the surveyed area however no Slone's Froglet was recorded. The proposal will not impact a waterbody, noting two farm dams exist within 100m of the development site. Both these farm dams have experienced heavy use by sheep and contain no aquatic vegetation.
Dichanthium setosum Bluegrass	--	Assessment followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (2020).* Search transects across the development site and the proposed TGEP land during June, September and October 2020. During the June and September *Dichanthium setosum* was recorded (with Royal Botanic Gardens, Sydney confirming the record) flowering to the north near Coonabarabran. Two samples of a bluegrass species were collected from approximately 2.5km from the development site in June and September. Both these sample were sent to the Royal Botanic Gardens, Sydney and both were confirmed to be *Dichanthium sericeum* (not the listed species).
Diuris tricolor Pine Donkey Orchid	--	Assessment followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (2020).* Search transects were conducted across the development site in October 2020. No orchids of any species were recorded. A long grazing history is consistent with the absence of orchid species.
Geophaps scripta scripta Squatter pigeon	--	The targeted searches followed Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004). Search transects were conducted across the development site in October 2020 to flush this target species from the grassy/ weedy groundcover. No Squatter Pigeons were recorded.
Lophochroa leadbeateri Major Mitchell's Cockatoo (Breeding)	Hollow bearing trees Living or dead tree with hollows greater than 10cm diameter	The targeted searches followed Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004). Presence of AREA staff in and around hollow bearing trees in the development site during field survey for this proposal and the TGEP in June, September and October 2020, fauna monitoring in November 2019 and other work in previous years have not recorded the presence of Major Mitchell's Cockatoo.

Species	Habitat constraints	Survey effort
Phascogale tapoatafa Brush-tailed phascogale	--	The targeted searches followed the BioNet Data Collection survey requirements for the species. Four motion sensing cameras were positioned facing lures baited with honey within the 0.89ha section of PCT201. As required by the survey guidelines for this species, these cameras were in position for four weeks in October 2020, with rebaiting and camera battery check after two weeks. No Brush tailed Phascogales were recorded. Further, cameras surveying for Brush-tailed Phascogales were set up in the Newell Highway corridor for four weeks during May and June 2020 within the 1500 metre circle. No Brush-tailed Phascogales were recorded on these cameras.
Polytelis swainsonii Superb Parrot (Breeding)	Hollow bearing trees Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5cm diameter greater than 4m above ground or trees with a DBH of greater than 30cm	The targeted searches followed Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004). Two days were spent in the development area in October 2020. No Superb Parrots were recorded. No evidence of nesting Superb Parrots was recorded.
Swainsona murrayana Slender Darling Pea	--	Assessment followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (2020).* Search transects were conducted across the development site in October 2020 when this species was known to be flowering and recorded by AREA at numerous locations across the central west (AREAs records were south of Forbes). A long grazing history is consistent with the absence of *Swainsona* species.
Swainsona recta Small Purple-pea	--	Assessment followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (2020).* Search transects were conducted across the development site in October 2020 when this species was known to be flowering at numerous locations across the central west. AREA recorded this species in about 40 locations while ground truthing a model for the species and undertaking annual monitoring at know locations. A long grazing history is consistent with the absence of *Swainsona* species.

4.4.3 Species credit species

No species credit species were identified in this assessment.

4.5 State Environmental Planning Policy

The State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2019 came into force on 1 March 2020 and was amended on 7 October 2020.

The SEPP (Koala Habitat Protection) 2019 does not apply to proposals which do not require consent from local council.

This proposal forms part of a State Significant Development and does not require consent from council and therefore the SEPP (Koala Habitat Protection) 2019 does not apply to this proposal.

5 Assessment of impacts

5.1 Serious and irreversible impacts

One SAII candidate was highlighted in the BAMC – PCT201 Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion. Impact to this SAII is described in more detail in section 5.1.1.

5.1.1 Candidate SAII Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion is listed as Endangered under the BC Act. It is listed as a candidate Serious and Irreversible Impact for principles 1, 2 and 3 (highlighted in grey below) as set out in clause 6.7 of the *Biodiversity Conservation Regulation 2017*.

The principles for determining serious and irreversible impacts are:

1. *it will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline*
2. *it will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size*
3. *it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution*
4. *the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.*

These three principles are discussed below.

Principle 1: *a. evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW* ***AND*** *the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)*

For PCT201 - Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, the TBDC provides the following insight to estimate the PCT extent cleared 94 percent with an accuracy of +/- 60 percent since European settlement

> **Pre-European comments:**
> *Kerr et al. 2003) map 28650 ha as pre-clearing extent around Dubbo but it extends to the south of there. Prior to clearing this community would have occupied large areas from south of Dubbo to Forbes.*
>
> *Pre-European extent 100,000 hectares*
> *Percent accuracy 30*
>
> **Current extent comments:**
> *Estimated to occupy less than 10% of the 36000ha mapped as Poplar Box map unit P4 in Sivertsen & Metcalfe (1995). Seddon et al. (2002) calculated that only 3% (366 ha of an original 13865 ha) of Fuzzy Box remains in the Little River Catchment in central NSW. Kerr et al. (2003) estimate 5% (1330 ha) remains near Dubbo. Also occurs to the south of this mapping.*
>
> *Current extent: 6,000 hectares*
> *Percent accuracy: 30*

Currently, 14258.34 hectares of Fuzzy Box Woodland as PCT201 and PCT202 area mapped on the Central West Lachlan State Vegetation Map v1p4 PCT 4469 spatial layer.

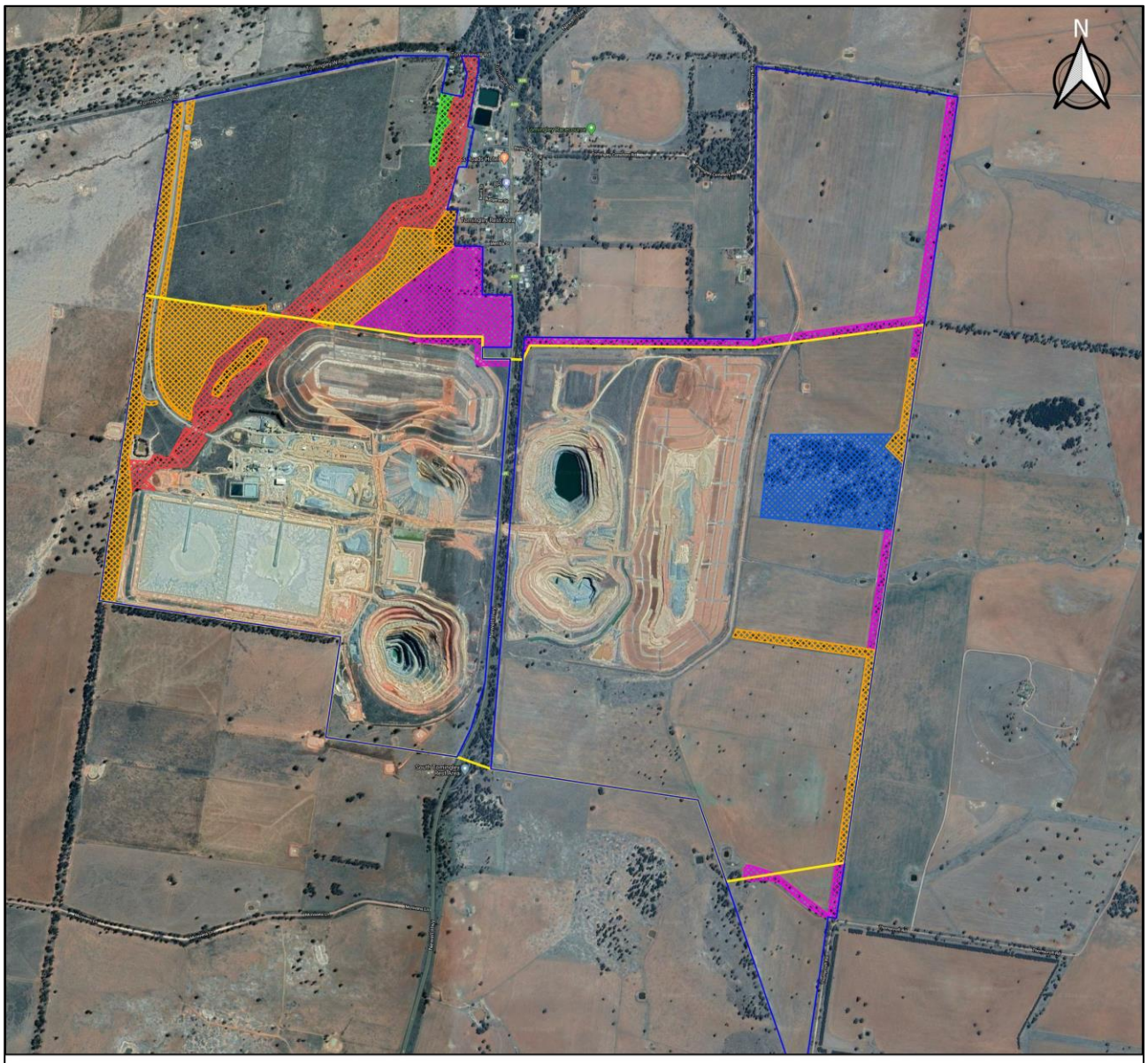
24.46 hectares of PCT201 is mapped within 10 kilometres of the development site.

These numbers also do not include the patch of PCT201 mapped in the development site by AREA. This patch is mapped on the State Vegetation Map as PCT76 - *Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions*

Results from the State Vegetation Map are expected to be a significant underestimation as AREA has mapped this PCT in the Newel Highway corridor east of the development site within 1500 metres and south east of the development site within 10 kilometres. Also, AREA is aware of populations of Fuzzy Box existing along and near the Newel Highway to the north of Tomingley, within 10 kilometres of the development site resulting from property inspections for offsetting purposes. In each case, the State Vegetation Map maps these areas as a variety of Western Grey Box communities.

Tomingley Gold Operations has secured areas of remnant Fuzzy Box Woodland as corridors, and have been planting them (sourced from local seed stock) in biodiversity offset area areas where active restoration actions were undertaken establishing new areas (See the largest patch size on Figure 5-1).

Figure 5-1: Tomingley Gold Operations Biodiversity Offset Plan



Principle 2: extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by:

i. change in community structure
ii. change in species composition
iii. disruption of ecological processes
iv. invasion and establishment of exotic species
v. degradation of habitat, and
vi. fragmentation of habitat

The Threatened Biodiversity Profile Data Collection provides the following insight to estimate the PCT reduction in ecological function:

Less than 5% of Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South bioregions is estimated to remain compared to pre-European times due to past clearing (Austin et al. 2000, Seddon et al. 2002).

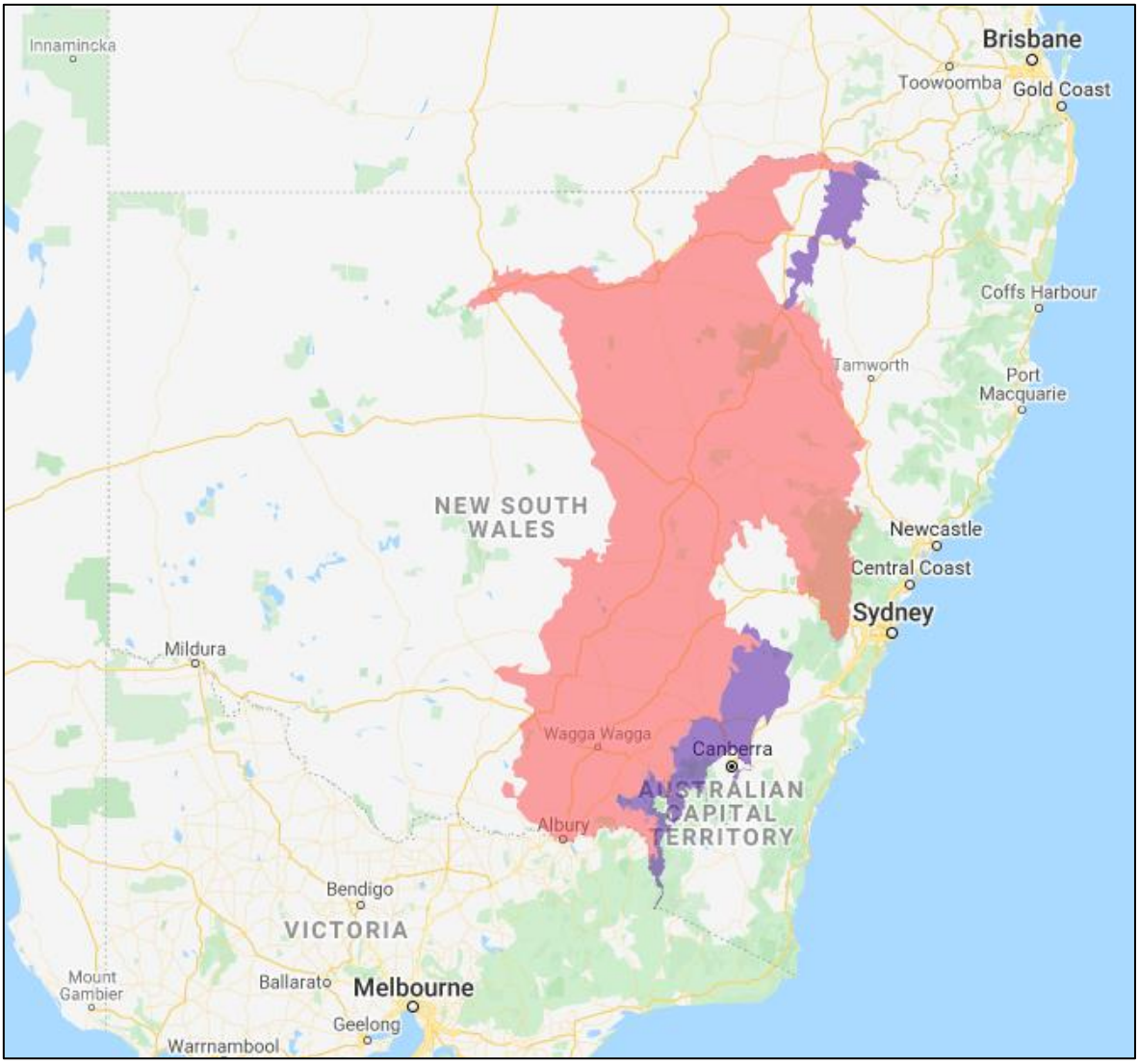
Fuzzy Box was considered a plentiful tree along the Lachlan River plains west of Forbes at the start of the 20th century (Cambage 1902). While broadscale clearing has now largely ceased in these areas, clearing of isolated paddock trees and further clearing of remnants, including regrowth, remain threats.

Other symptoms of degradation prevail, including the senescence of relict plants, lack of regeneration due to grazing, lack of fire and weed invasion. Weeds may be very common at some sites. They include the forb species Plantago lanceolata, Verbena bonariensis and Marrubium vulgare and the grass species Bromus diandrus, Vulpia myuros, Lolium perenne, Paspalum dilatatum and Hyparrhenia hirta. Clearing of native vegetation and Invasion of native plant communities by exotic perennial grasses are listed as Key Threatening Processes under the (now repealed) *Threatened Species Conservation Act (1995).*

Principle 3: evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC's geographic range in NSW according to the:
i. extent of occurrence
ii. area of occupancy, and
iii. number of threat-defined locations

Figure 5-2: Known and predicted distribution of Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions

(DPIE profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10335)

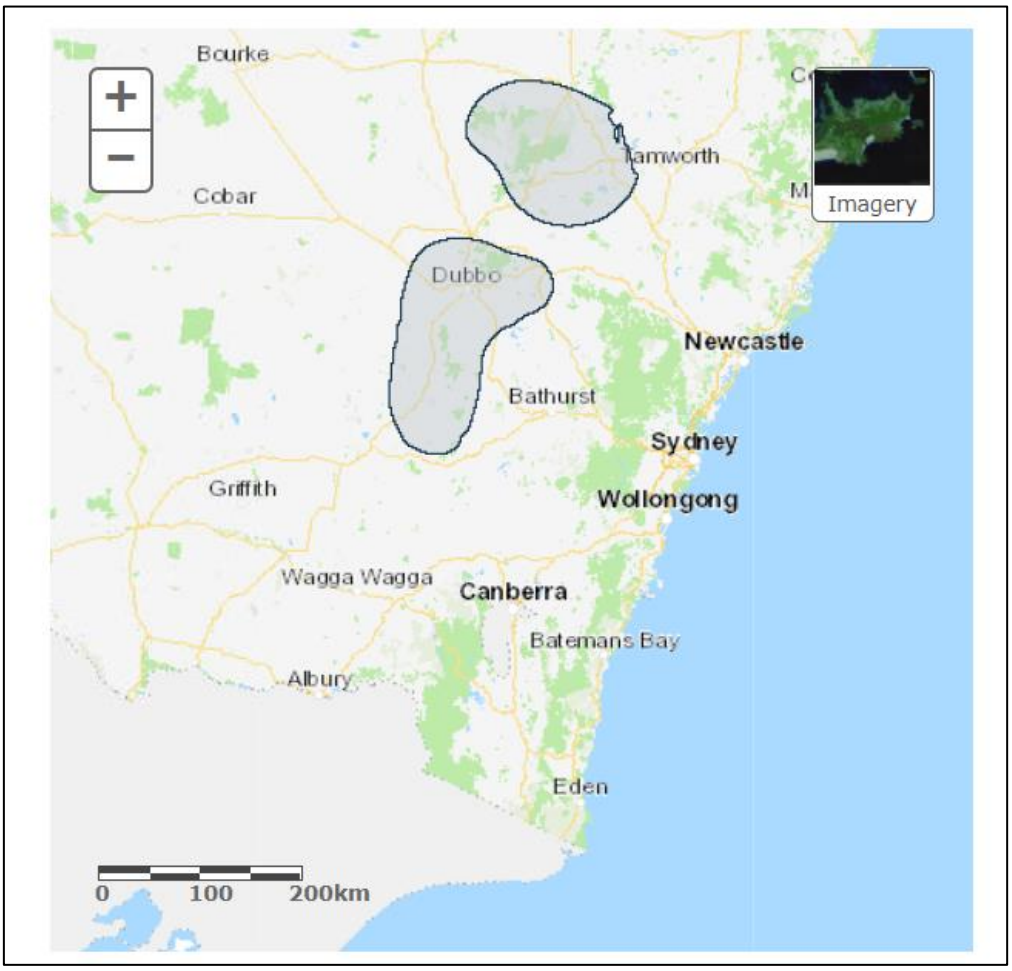


Principle 4: evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation).

This principle is not relevant to this candidate SAII. However, the BioNet TBDC indicates this community will respond to management in the form of application of ecological fire management. This management type is unlikely to be implemented in tree corridors of agricultural land. There is no known occurrence of fire impacting the vegetation in the development site in recent time.

Tomingley is within a management area for this TEC (Saving our Species Strategies) (Figure 5-3). Clearing this TEC is not consistent with the management strategy however offsetting impact by securing an area of this TEC elsewhere, and protecting and enhancing patches of this TEC is consistent with the strategy.

Figure 5-3: Management areas and sites across NSW



5.2 Prescribed impact

The prescribed impacts which may be associated with the proposal are discussed below.

Figure 5-4: Prescribed impacts relevant to the development site

Feature	Present	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of the BAR where prescribed impact is addressed
Karst, caves, crevices, cliffs or other geologically significant feature	☐ Yes / ☒ No	N/A	No karsts, caves, cliffs or other rock areas present in the development site.	N/A	Section 2.7
Rocks	☐ Yes / ☒ No	N/A	No rock areas present in the development site.	N/A	Section 2.7
Human-made structure	☐ Yes / ☒ No	N/A	No human-made structures will be impacted	N/A	Section 2.7
Non-native vegetation	☒ Yes / ☐ No	Non-native vegetation provides some cover and food resources and includes only ground stratum species of pasture grass, thistle, and Patterson's Curse for example. These species are mostly perennial, and the paddock has been subject to intensive sheep grazing and cropping in the recent past. Habitat provided is therefore transient at best.	Exotic groundcover may provide shelter for some species however given the agricultural management of this land historically including intensive grazing and cropping, this shelter has not been continuous for decades.	N/A	Section 1.3
Habitat Connectivity	☐ Yes / ☒ No	Connectivity of native vegetation in the development site is low. Connectivity value will be retained to the east of the development site.	The proposal will remove a remnant tree corridor; however, the connectivity value of this corridor is low as one end abuts the existing operation mining area. A tree corridor running along the western boundary of the development site has a high connectivity value and will not be impacted by this proposal.	N/A	Section 2.6
Hydrological process sustaining/interacting with rivers, streams or wetlands	☐ Yes / ☒ No	One farm dam may be removed or impacted as part of this proposal. Changes to surface water flow will be addressed in detailed construction and design detail.	Surface water management structures will be constructed as part of the RSF2 which contribute to surface water management requirements provided by the NSW Environment Protection Authority.	N/A	Section 2.5

Feature	Present	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of the BAR where prescribed impact is addressed
Wind farm development	☐ Yes / ☒ No	N/A	No wind farm proposed on site	N/A	N/A
Vehicle Strike	☒ Yes / ☐ No	Risk of vehicle strike is currently low; however, some risk of vehicle strike exists within 1500 metres of the development site along the Newel Highway, McNiven's Lane and around the mine site and adjacent properties.	The design of the RSF2 includes a vehicle access track around its rim and base which will result in increased, but slow moving, traffic in the development site.	N/A	See mitigation measures, Section 5.4

5.3 Avoid and minimise impacts

The design of the RSF2 has been undertaken to:

- minimise to the greatest extent possible the overall footprint of the facility, while maximising the residue storage capacity
- minimise the amount of borrow material and mine waste required to construct Stage 1 and Stage 2, by using the existing embankment of RSF1
- allow for future lifts of both RSF1 and RSF2 should they be required and subject to approval

The design of the RSF2 avoids impact to the tree corridor to the west of the development site. In October 2020, the design of the RSF2 was shifted at least 50 metres to the east to ensure the tree corridor to the west would not be impacted during construction of the RSF2, and would be significantly less likely to be impacted directly or indirectly by future developments or lifts to the RSF2.

5.4 Mitigation and management of impacts

A list of recommended mitigation measures is summarised in Table 5-1. These are designed to provide guidance on recommended measures to further avoid and mitigate impact to biodiversity.

Table 5-1: Recommended mitigation measures

Item	Timing	Recommended mitigation measures
Site personnel induction	Pre-construction	Ensure all construction staff working on the proposal are inducted on: • Site environmental procedures (i.e. vegetation management, sediment and erosion control, protective fencing, noxious weeds, hygiene protocols, ethical procedures for handling fauna displaced on the site) • What to do in case of environmental emergency (chemical spills, fire, injured fauna) • Key contacts in case of environmental emergency • How to reduce the risk of vehicle strike to fauna.
Site planning	Pre-construction	• Locate temporary infrastructure (set down areas, access tracks etc.) in cleared areas (existing access tracks, existing mine operational area) away from vegetation to minimise vegetation removal and indirect effects.
Identification of clearing limits	Pre-construction	• Accurately and clearly mark out the limits of clearing (where appropriate) and the vegetation to be retained outside of the development site. • Regular inspections should be undertaken to ensure all retained vegetation/fauna habitat is clearly marked and that fencing is in place, where appropriate.

Protection of fauna during clearing of vegetation, rock removal and crevice disturbance	Pre-construction and during clearing works	• Avoid clearing native vegetation in Spring.
		• Implement staged habitat removal to allow fauna to vacate if present. Habitat trees should be felled carefully using equipment that allows habitat trees to be lowered to the ground with minimal impact and hollows inspected. Respond to (e.g. rescue, relocate) fauna detected during the clearing process (refer to Fauna Handling and Rescue Procedure in Appendix A)
		• Salvage and relocate tree hollows from trees cleared as part of the proposal. Salvaging and relocating hollows and large wooden debris can increase the biodiversity and habitat values:
		  ○ Lengths of tree trunk or branches containing hollows, particularly large established hollows, should not be woodchipped and instead should be placed in an area of native vegetation outside the clearing area.
		  ○ Depending on the equipment and budget available, tree trunks can be trimmed, transported and positioned in an alternate location (the entire tree does not need to be relocated – just the section containing the hollow, and as much length as feasible).

Item	Timing	Recommended mitigation measures
		○ Salvaged hollows can be placed on the ground or if equipment is available, longer tree trunk lengths can be rested against a tree so the salvaged hollow is off the ground.
Loss of hollow bearing trees	Pre-and during construction	• The pre-clearing work is recommended above to salvage and relocate tree hollows affected by the proposal. This process will also address other threatened species mitigation requirements for potentially occurring hollows dwelling microbat species. • Spotter/catcher presence is recommended during removal of hollow bearing trees in relocated magazine location
Management of erosion and sediment control	Pre-and during construction	• Provide sediment and erosion controls to manage exposed soil surfaces and stockpiles to prevent sediment discharge into vegetation and fauna habitat. • Clearly identify stockpile and storage locations and provide erosion and sediment controls around stockpiles.
Weed management	Pre-and during construction	• Ensure that any machinery arriving on site be inspected for any foreign soil or plant matter/weed material and be washed down before entering the site. • Weeds should be controlled within the work area according to the requirements of the *Biosecurity Act 2016* • Any significant weeds which are identified as part of the proposal must be disposed of appropriately.
Vehicle Strike	Operation	• Low speed limits in place • Install warning signs of known wildlife crossings • Reporting requirements for any incidents of vehicle strikes • Ensure staff are inducted on how to reduce risk to fauna from vehicle strike
Revegetation and landscaping	Operation	• Minor landscaping around may be required. Where this occurs, there are two options 1) either allow the area to naturally regenerate or 2) to plant species. Natural regeneration in arid areas is typically more successful than planting vegetation. • If planting is chosen, then all species planted for any purpose should be consistent with those Plant Community Types described in this report. • Shrubby vegetation layers can be planted on the project boundaries to screen and provide habitat.
Monitor and review	All stages	• A review of mitigation measures (including a checklist) should be developed to ensure that all measures proposed have been undertaken. • Review of the impact of this proposal to the native vegetation would be useful to justify continuation of the activity, and to inform future applications of this nature. • Adaptive management is recommended to be able to respond to changing circumstances.

6 Biodiversity credit summary

As the proposal seeks approval as a State Significant Development the NSW EPA&A Act the need for offsetting has been considered. The BAMC has been used to determine the offsetting requirements for the proposal. BAMC outputs area provided in Appendix C which includes current price to fulfil this credit requirement by paying directly to the Biodiversity Conservation Trust. Biodiversity Offsetting for impact to PCT82 and PCT201 is triggered by this proposal, see below.

6.1 Vegetation scores

Table 6-1: Current vegetation integrity scores

Zone	BAM item number	PCT ID	Condition	Area (ha)	Composition condition score	Structure condition score	Function condition score	Vegetation integrity (VI) score
1	1	82	Grazed_mod	3.09	70.4	59.2	71.7	66.9
2	2	82	Cleared_poor	80.72	42.6	5.9	15	15.5
3	3	201	Grazed_mod	1.35	83.8	64	70.6	72.4

6.2 Credits required

Table 6-2: Ecosystem credit summary from BAMC

Zone	BAM item number	Matter requiring offsetting	Vegetation integrity loss	Area	Sensitivity to Potential Gain	Number of credits
1	1	PCT82	66.9	3.1	High Sensitivity to Potential Gain	103
2	2	PCT82	15.5	80.7	High Sensitivity to Potential Gain	0
3	3	PCT201	72.4	1.4	High Sensitivity to Potential Gain	49
		Total				**152**

6.3 Credit classes

Credit classes allocated to the proposal are outlined below.

Table 6-3: Credit summary – ecosystem credits

PCT	TEC	Area	HBT Cr	No HBT Cr	Credits
82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	Not a TEC	83.8	103	0	103
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	1.4	49	0	49

Table 6-4: Credit classes for PCT82 - Like-for-like options

Class	Trading group	HBT	Credits	IBRA region
Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands - ≥ 70% - <90% cleared group (including Tier 2 or higher threat status).	Yes	103	Bogan-Macquarie, Boorindal Plains, Canbelego Downs, Castlereagh-Barwon, Inland Slopes, Lower Slopes, Nymagee and Pilliga or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site

Table 6-5: Credit classes for PCT201 - Like-for-like options

Class	Trading group	HBT	Credits	IBRA region
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions This includes PCT's: 201, 202, 1384	N/A	Yes	49	Bogan-Macquarie, Boorindal Plains, Canbelego Downs, Castlereagh-Barwon, Inland Slopes, Lower Slopes, Nymagee and Pilliga. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site

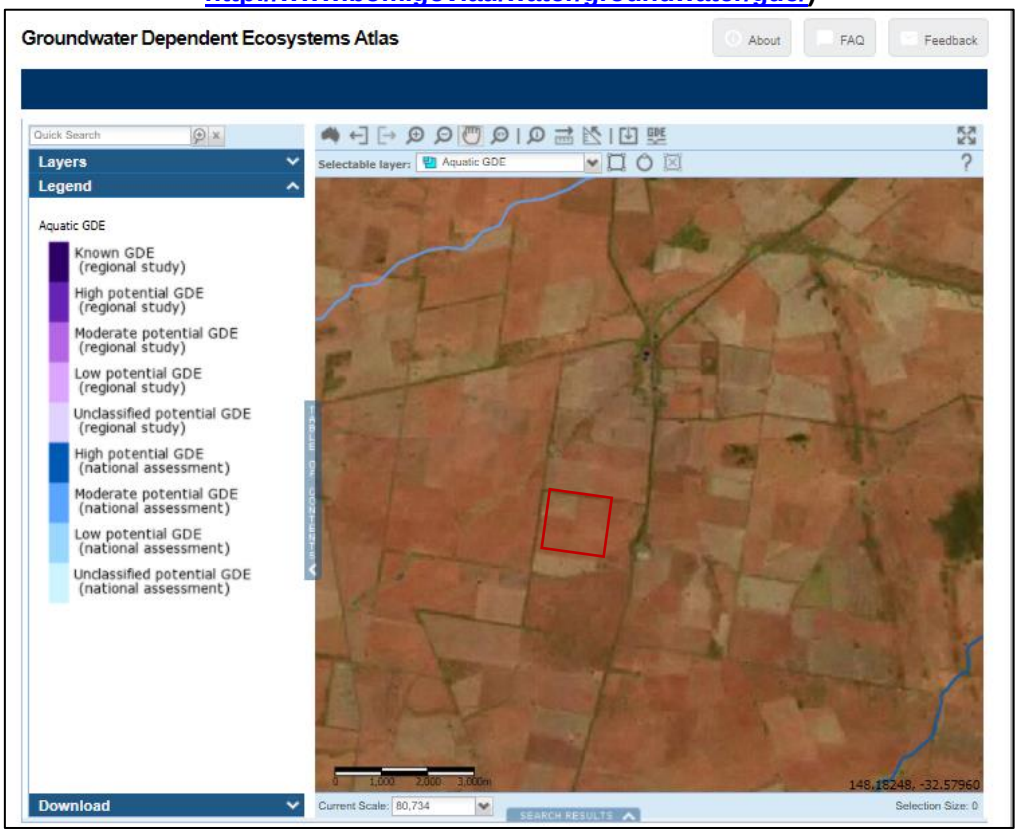
Species credit classes

There are no species credits.

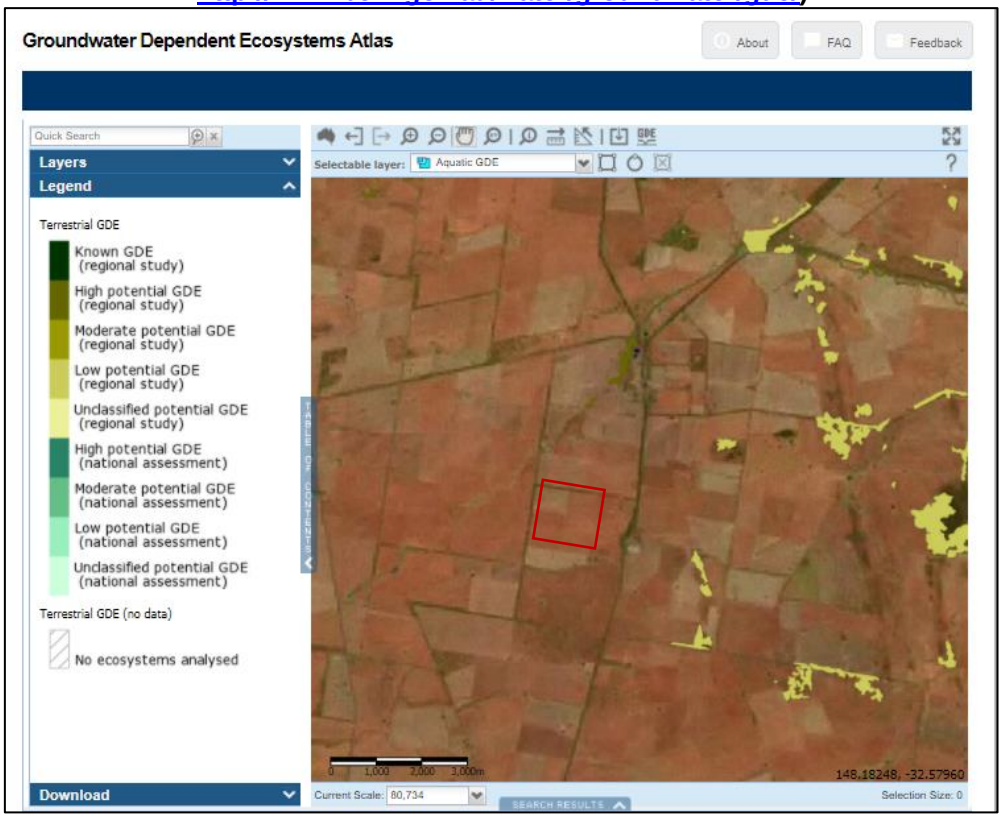
Appendix A – Database search

Groundwater Dependent Ecosystems

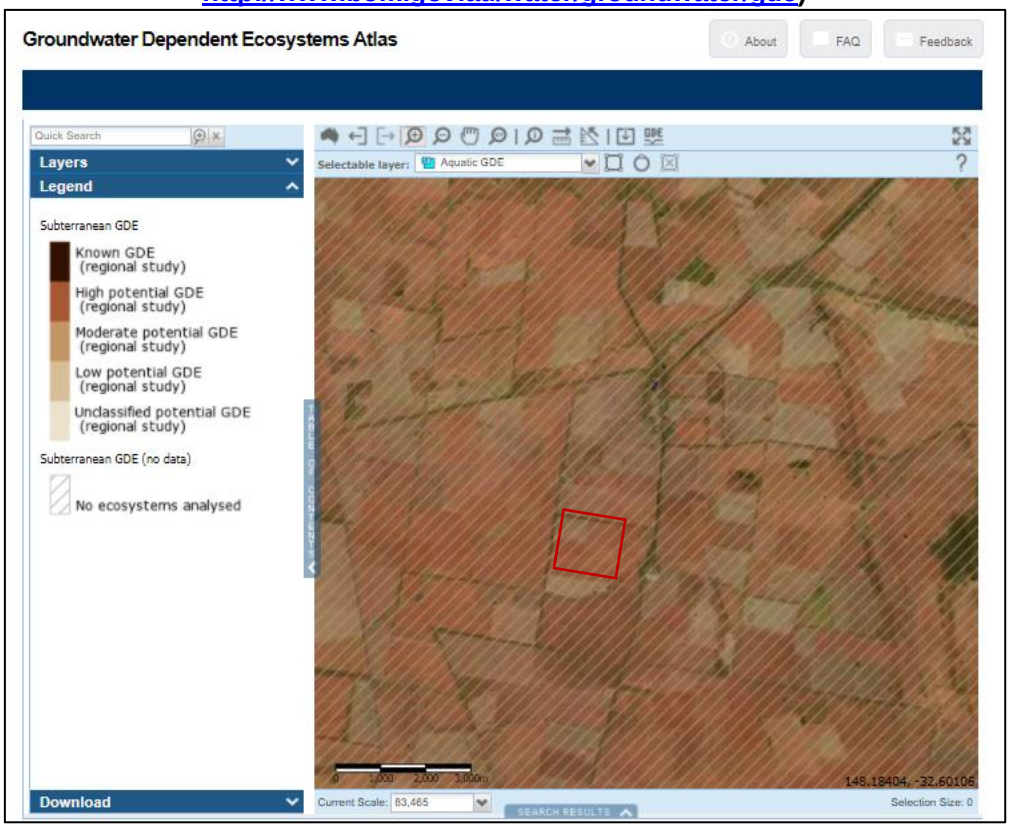
Aquatic GDE (Red polygon represents approximate location of the development site) (Source: http://www.bom.gov.au/water/groundwater/gde/)



Terrestrial GDE (Red polygon represent approximate location of the development site) (Source: http://www.bom.gov.au/water/groundwater/gde/)



Subterranean GDE (Red polygon represent approximate location of the development site) (Source: http://www.bom.gov.au/water/groundwater/gde)



DPIE Predicted threatened species for Darling Riverine Plains Bioregion, Bogan-Macquarie subregion, filtered by vegetation classes Floodplain Transition Woodlands and Western Slopes Grassy Woodlands

Scientific Name	Common Name	NSW Status	Commonwealth status
Amphibians			
Crinia sloanei	Sloane's Froglet	Vulnerable	Endangered
Birds			
Ardeotis australis	Australian Bustard	Endangered	Not listed
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not listed
Burhinus grallarius	Bush Stone-curlew	Endangered	Not listed
Calyptorhynchus banksii samueli	Red-tailed Black-Cockatoo (inland subspecies)	Vulnerable	Not listed
Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable	Not listed
Certhionyx variegatus	Pied Honeyeater	Vulnerable	Not listed
Chthonicola sagittata	Speckled Warbler	Vulnerable	Not listed
Circus assimilis	Spotted Harrier	Vulnerable	Not listed
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable	Not listed
Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not listed
Falco hypoleucos	Grey Falcon	Endangered	Not listed
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	Critically Endangered	Vulnerable
Grantiella picta	Painted Honeyeater	Vulnerable	Vulnerable
Grus rubicunda	Brolga	Vulnerable	Not listed
Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not listed
Hamirostra melanosternon	Black-breasted Buzzard	Vulnerable	Not listed
Hieraaetus morphnoides	Little Eagle	Vulnerable	Not listed
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Vulnerable	Not listed
Lophoictinia isura	Square-tailed Kite	Vulnerable	Not listed
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Vulnerable	Not listed
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Vulnerable	Not listed
Neophema pulchella	Turquoise Parrot	Vulnerable	Not listed
Ninox connivens	Barking Owl	Vulnerable	Not listed
Pachycephala inornata	Gilbert's Whistler	Vulnerable	Not listed
Petroica phoenicea	Flame Robin	Vulnerable	Not listed
Polytelis swainsonii	Superb Parrot	Vulnerable	Vulnerable
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Vulnerable	Not listed
Stagonopleura guttata	Diamond Firetail	Vulnerable	Not listed
Turnix maculosus	Red-backed Button-quail	Vulnerable	Not listed
Tyto novaehollandiae	Masked Owl	Vulnerable	Not listed
Mammals			
Chalinolobus picatus	Little Pied Bat	Vulnerable	Not listed
Myotis macropus	Southern Myotis	Vulnerable	Not listed
Nyctophilus corbeni	Corben's Long-eared Bat	Vulnerable	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Vulnerable	Not listed
Antechinomys laniger	Kultarr	Endangered	Not listed
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Endangered
Phascogale tapoatafa	Brush-tailed Phascogale	Vulnerable	Not listed
Phascolarctos cinereus	Koala	Vulnerable	Vulnerabel
Sminthopsis macroura	Stripe-faced Dunnart	Vulnerable	Not listed
Reptiles			
Aspidites ramsayi	Woma	Vulnerable	Not listed
Hoplocephalus bitorquatus	Pale-headed Snake	Vulnerable	Not listed
Plants			
Dichanthium setosum	Bluegrass	Vulnerable	Vulnerable
Lepidium monoplocoides	Winged Peppercress	Endangered	Endangered
Swainsona murrayana	Slender Darling Pea	Vulnerable	Vulnerable
Swainsona recta	Small Purple-pea	Endangered	Endangered
Diuris tricolor	Pine Donkey Orchid	Vulnerable	Not listed
Pterostylis cobarensis	Greenhood Orchid	Vulnerable	Not listed

Scientific Name	Common Name	NSW Status	Commonwealth status
Communities			
Artesian Springs Ecological Community in the Great Artesian Basin		Critically Endangered Ecological Community	Endangered
Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions		Endangered Ecological Community	Endangered
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions		Endangered Ecological Community	Not listed

BioNet Atlas species records within 10 km of proposed development site

Scientific Name	Common Name	NSW Status	Comm Status	Date First	Number Individuals	Estimate Type Code	Observation Type	Description	Zone	Easting	Northing	Accuracy
Mammals												
Chalinolobus picatus	Little Pied Bat	V P		3/05/2009	1		U	Wyoming Lot 1 DP824086 adjacent to Newell Hwy 2.7km sth of Tomingley NSW. Narromine	55	613996	6393598	10
Chalinolobus picatus	Little Pied Bat	V P		4/05/2009	1	E	W	Tomingley Mine site (west)	55	613997	6393598	10
Chalinolobus picatus	Little Pied Bat	V P		5/05/2009	1		U	Wyoming Lot 1 DP824086 adjacent to Newell Hwy 2.7km sth of Tomingley NSW. Narromine	55	613996	6393598	10
Phascolarctos cinereus	Koala	V P	V	1/01/1986	0		O	2869 Specified Map No: 8532	55	618313	6399184	1000
Birds												
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Lots 160 & 161 DP 755110 c. 2 km sth of Tomingley Narromine	55	615522	6393753	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Lots 160 & 161 DP 755110 c. 2 km sth of Tomingley Narromine	55	614272	6393497	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	6		O	Wyoming Lot 1 DP824086 adjacent to Newell Hwy 2.7km sth of Tomingley NSW. Narromine	55	614651	6393749	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	5		O	Lots 160 & 161 DP 755110 c. 2 km sth of Tomingley Narromine	55	613939	6393615	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Lots 160 & 161 DP 755110 c. 2 km sth of Tomingley Narromine	55	614260	6393594	10

Scientific Name	Common Name	NSW Status	Comm Status	Date First	Number Individuals	Estimate Type Code	Observation Type	Description	Zone	Easting	Northing	Accuracy
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Lots 160 & 161 DP 755110 c. 2 km sth of Tomingley Narromine	55	613307	6393711	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Lots 160 & 161 DP 755110 c. 2 km sth of Tomingley Narromine	55	613356	6393705	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	4		O	Lots 160 & 161 DP 755110 c. 2 km sth of Tomingley Narromine	55	614172	6399550	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		10/10/2008	8		O	Tomingley to Narromine Rd corridor Narromine	55	614147	6399747	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Wyoming Lot 1 DP824086 adjacent to Newell Hwy 2.7km sth of Tomingley NSW. Narromine	55	616192	6393625	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Wyoming Lot 1 DP824086 adjacent to Newell Hwy 2.7km sth of Tomingley NSW. Narromine	55	615705	6393626	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Wyoming Lot 1 DP824086 adjacent to Newell Hwy 2.7km sth of Tomingley NSW. Narromine	55	616644	6395098	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Wyoming Lot 1 DP824086 adjacent to Newell Hwy 2.7km sth of Tomingley NSW. Narromine	55	616201	6394350	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler	V P		7/07/2009	8		O	Wyoming Lot 1 DP824086 adjacent to Newell Hwy 2.7km	55	615871	6394981	10

Scientific Name	Common Name	NSW Status	Comm Status	Date First	Number Individuals	Estimate Type Code	Observation Type	Description	Zone	Easting	Northing	Accuracy
	(eastern subspecies)							sth of Tomingley NSW. Narromine				
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		7/07/2009	8		O	Wyoming Lot 1 DP824086 adjacent to Newell Hwy 2.7km sth of Tomingley NSW. Narromine	55	616629	6395077	10
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V P		17/05/2018 8:28	0		O	Tomingley	55	610129	6390523	5
Lophoictinia isura	Square-tailed Kite	V P 3		9/04/2009	1		O	Newell Highway about 5km north of Peak Hill	55	612000	6383900	100
Circus assimilis	Spotted Harrier	V P		4/05/2009	1	X	O	Tomingley to Narromine pipeline	55	614172	6399550	10
Circus assimilis	Spotted Harrier	V P		10/07/2009	1		O	Tomingley to Narromine Rd corridor Narromine	55	614172	6399550	10
Polytelis swainsonii	Superb Parrot	V P 3	V	3/05/2009	60	E	O	Tomingley mine site (west)	55	612775	6393748	10
Polytelis swainsonii	Superb Parrot	V P 3	V	10/07/2009	1		O	Tomingley to Narromine Rd corridor Narromine	55	613026	6395799	10
Polytelis swainsonii	Superb Parrot	V P 3	V	3/05/2009	2	X	O	Tomingley Mine site (west)	55	613026	6395798	10
Polytelis swainsonii	Superb Parrot	V P 3	V	10/07/2009	60		O	Tomingley to Narromine Rd corridor Narromine	55	612775	6393748	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	Tomingley mine site (west)	55	613939	6393614	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	Tomingley mine site (west)	55	614260	6393594	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	Tomingley mine site (west)	55	613308	6393710	10

Scientific Name	Common Name	NSW Status	Comm Status	Date First	Number Individuals	Estimate Type Code	Observation Type	Description	Zone	Easting	Northing	Accuracy
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	Tomingley mine site (west)	55	613356	6393705	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	Tomingley to Narromine pipeline	55	614172	6399550	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	E	O	Tomingley mine site (East)	55	615522	6393753	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	South of Tomingley on mine site	55	616913	6393625	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	South of Tomingley on mine site	55	615706	6393625	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	South of Tomingley on mine site	55	616614	6395098	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	South of Tomingley on mine site	55	616201	6394349	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	South of Tomingley on mine site	55	615872	6394980	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	South of Tomingley on mine site	55	616629	6395076	10
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	Tomingley mine site (west)	55	614271	6393496	10

Scientific Name	Common Name	NSW Status	Comm Status	Date First	Number Individuals	Estimate Type Code	Observation Type	Description	Zone	Easting	Northing	Accuracy
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		3/05/2009	8	X	O	Newell Highway	55	614652	6393749	10
Petroica phoenicea	Flame Robin	V P		24/07/1988	1		O	Clagger State Forest (Revoked?) Specified Map No: 8532	55	617432	6394386	10000
Hieraaetus morphnoides	Little Eagle	V P		17/09/2010	1		O	Tomingley	55	614888	6395308	100
Polytelis swainsonii	Superb Parrot	V P 3	V	29/08/1997	2		O	Peak Hill Road between Narromine and Tomingley between Fiddlers Creek and Tomingley adjacent to Oondooroo. Specified Map No: 8532	55	614313	6400634	100
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		14/07/1997	2		O	Remnant bush on Fiddlers Creek Peak Hill Rd Specified Map No: 8532	55	614113	6402984	100
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V P		16/01/1997	1		O	Tomingley dump(1999-WRBIO) Specified Map No: 8532	55	617613	6398084	100
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V P		29/01/1998	4		O	rd. to brownies cottage(2887-WRBIO) Specified Map No: 8532	55	621713	6387584	100

EPBC Act Protected Matters Report
On next page.

Australian Government

Department of Agriculture, Water and the Environment

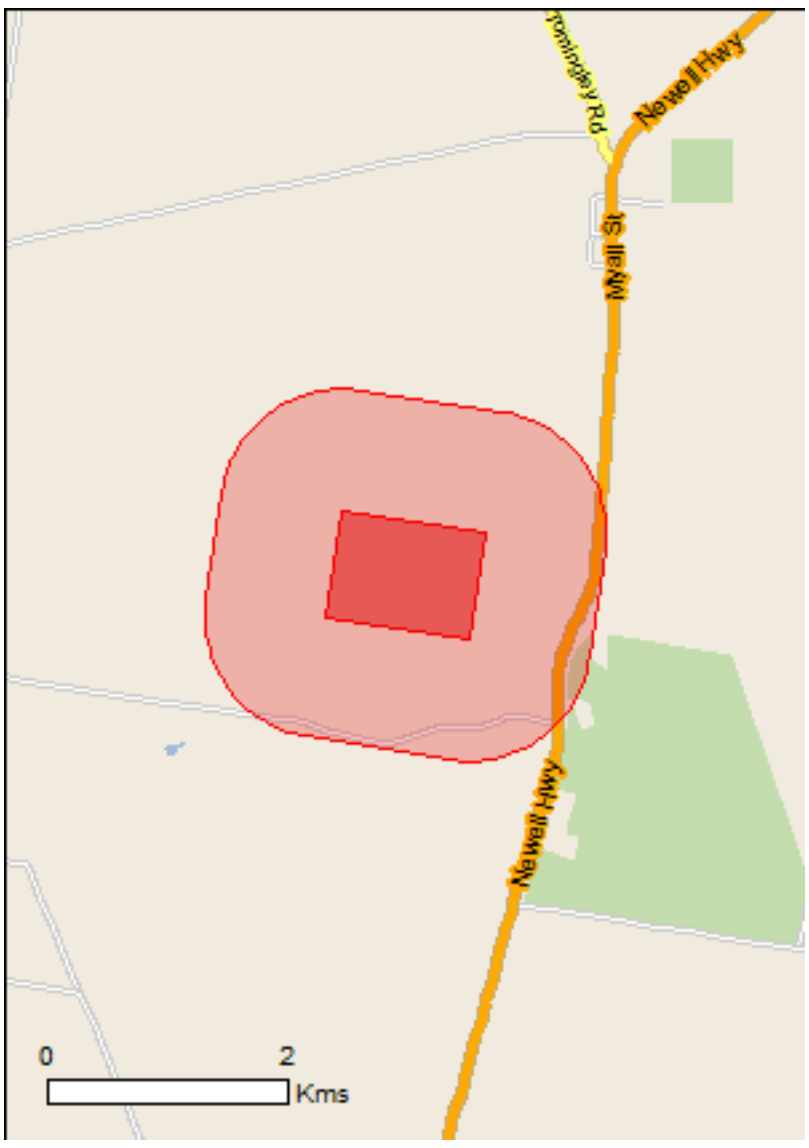
EPBC Act Protected Matters Report

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: 03/11/20 11:03:00



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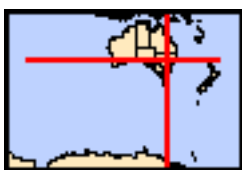
Coordinates

Buffer: 1.0Km



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:	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	19
Listed Migratory Species:	10

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:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	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:	None
Regional Forest Agreements:	None
Invasive Species:	19
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	700 - 800km upstream
Riverland	600 - 700km upstream
The coorong, and lakes alexandrina and albert wetland	800 - 900km upstream

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
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to 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	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Polytelis swainsonii		
Superb Parrot [738]	Vulnerable	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
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may 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 may occur within area
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	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 may occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Androcalva procumbens		
[87153]	Vulnerable	Species or species habitat likely to occur within area
Austrostipa wakoolica		
[66623]	Endangered	Species or species habitat may occur within area
Swainsona murrayana		
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Tylophora linearis		
[55231]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Aprasia parapulchella		
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	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		
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

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 may 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]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

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		
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
Passer domesticus House Sparrow [405]		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

Name	Status	Type of Presence
		within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		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
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		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 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		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		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

-32.587444 148.201825,-32.588782 148.212554,-32.595652 148.211396,-32.594206 148.200667,-32.587444 148.201825

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix B – BAM plot sheets

On next page.

BAM Plot – Field Survey Form

Site Sheet no:

Survey Name	Plot Identifier	Recorders
TCEP RSF	1	Addy Watson

Date	Zone	Datum	IBRA region	Photo #	Zone ID
14/10/20	55		DRP		

Easting	Northing	Plot Dimensions (e.g. 20 x 20 in 20 x 50)	Orientation of midline from the 0 m point.
612923	6393225	20 x 20 in 20 x 50	65 Magnetic °

Likely Vegetation Class		Confidence: H M L
Plant Community Type	PCT82 - Poor	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	0
	Grasses etc.	1
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0
	Grasses etc.	0.1
	Forbs	0.2
	Ferns	0
	Other	0
High Threat Weed cover %		0.5

This table may be completed after entering data into available tools. It is not required while in the field.

BAM Attribute (20 x 50 m plot) dbh	Stem Classes and Hollows: Euc*	Non Euc	Hollows†
80 + cm			0
50 – 79 cm			
30 – 49 cm			Hollows 20cm+
20 – 29 cm			0
10 – 19 cm	tick	tick	
5 – 9 cm	tick	tick	
< 5 cm	tick	tick	This size class records tree regeneration
Length of logs (m) (≥10 cm diameter, >50 cm in length)			total: 0

Record **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

Data needed is presence only (tick) unless a 'large tree' for that veg class.

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

Each size class is noted as present by the **living tree stems** only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.

Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 95 95 80 90	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	88			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code
Clearing (inc. logging)	3	O
Cultivation (inc. pasture)	3	O
Soil erosion	0	–
Firewood / CWD removal	0	–
Grazing (identify native/stock)	3	–
Fire damage	0	–
Storm damage	0	–

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Free Text Section for brief site description

Site selected to be representative of the paddock, not close to fenceline

Leaf Litter and end point GPS

ID	Easting	Northing
End point	612975	6393225

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14/10/20	TGEP RSF	1	Addy Watson

ID	BAM Code	GF Code	Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.	N, E or HTE	Cover	Abund	stratum	voucher	Height (m)
1	—		Lolium rigidum Rye Gross	E	30	5000+	G		0.4
2	—		Carthamus lantanus Safron thistle.	HTE	0.5	200	G		0.6
3	—		Echium plantagineum Pattersons curse	E	0.2	20	G		0.5
4	—		Trifolium spp. Clover spp.	E	85	5000+	G		0.1
5	GG	g	Austrostipa nodosa	N	0.1	50	G		0.4
6	—		Arctotheca calendula Cape Weed	E	5	1000	G		0.1
7	FG	f	Convulvulus erubescens	N	0.1	50	G		0.2
8	—		Medicago sp	E	0.2	100	G		0.1
9	FG	f	Vittadinia cuneata	N	0.1	10	G		0.2
10	—		Avena fatua Oats	E	0.1	10	G		0.4
11									
12									
13									
14			Count Cover						
15		TG	0 0						
16		SG	0 0						
17		GG	1 0.1						
18		FG	2 0.2						
19		EG	0 0						
20		OG	0 0						
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. **N:** native, **E:** exotic, **HTE:** high threat exotic.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

BAM Plot – Field Survey Form

Site Sheet no:

Survey Name	Plot Identifier	Recorders
TGEP RSF 2	2	Addy Watson

Date	Zone	Datum	IBRA region	Photo #	Zone ID
14/10/20	55				1

Easting	Northing	Plot Dimensions	Orientation of midline from the 0 m point.
612982	6393626	20 x 20 in 20 x 50	264 Magnetic °

Likely Vegetation Class		Confidence: H M L
Plant Community Type	PCT 82 – Poor	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline. Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	0
	Grasses etc.	3
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0
	Grasses etc.	0.4
	Forbs	0.2
	Ferns	0
	Other	0
High Threat Weed cover %		0.3

This table may be completed after entering data into available tools. It is not required while in the field.

BAM Attribute (20 x 50 m plot)	Stem Classes and Hollows		
dbh	Euc*	Non Euc	Hollows†
80 + cm	tick	tick	0
50 – 79 cm	tick	tick	
30 – 49 cm	tick	tick	Hollows 20cm+
20 – 29 cm	tick	tick	0
10 – 19 cm	tick	tick	
5 – 9 cm	tick	tick	
< 5 cm	tick	tick	This size class records tree regeneration
Length of logs (m) (≥10 cm diameter, >50 cm in length)			total 0

Record **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

Data needed is presence only (tick) unless a 'large tree' for that veg class.

* includes all species of *Eucalyptus, Corymbia, Angophora, Lophostemon* and *Syncarpia*

† For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

Each size class is noted as present by the **living tree stems** only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.

Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	95 99 30 60 75	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	71.8			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code
Clearing (inc. logging)	3	O
Cultivation (inc. pasture)	3	O
Soil erosion	0	–
Firewood / CWD removal	0	–
Grazing (identify native/stock)	3	–
Fire damage	0	–
Storm damage	0	–

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Free Text Section for brief site description

Seleded to be representative of the paddock.

Leaf Litter and end point GPS		
ID	Easting	Northing
End point	612932	6393629

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14/10/20	TAEP RSF	2	Addy Watson

ID	BAM Code	GF Code	Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.	N, E or HTE	Cover	Abund	stratum	voucher	Height (m)
1	—	—	Echium plantagineum	E	2	250	G	—	0.5
2	—	—	Lolium rigidum	E	2	2000+	G	—	0.4
3	—	—	Carthamus lantanus Safranthistle	HTE	0.2	50	G	—	0.5
4	—	—	Trifolium spp. Clovers spp.	E	90	5000+	G	—	0.1
5	FG	f	Convolvulus erubescens	N	0.1	100	G	—	0.2
6	GG	g	Austrostipa nodosa	N	0.2	100	G	—	0.4
7	—	—	Arctotheca calendula Cape weed	E	1	100+	G	—	0.1
8	—	—	Chondrilla juncea Skeleton weed	HTE	0.1	50	G	—	0.3
9	GG	g	Austrostipa ? Native grass	N	0.1	5	G	—	0.2
10	—	—	Medicago sp.	E	1	100	G	—	0.1
11	GG	g	Austrostipa scabra	N	0.1	5	G	—	0.3
12	FG	f	Calotis cuneifolia	N	0.1	1	G	—	0.2
13									
14									

	count	cover
TG	0	0
SG	0	0
GG	3	0.4
FG	2	0.2
EG	0	0
OG	0	0

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. **N:** native, **E:** exotic, **HTE:** high threat exotic.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

BAM Plot – Field Survey Form

Site Sheet no:

Survey Name	Plot Identifier	Recorders
TGEP RSF	3	Addy Watson.

Date	Zone	Datum	IBRA region	Photo #	Zone ID
14/10/20	55				1

Easting	Northing	Plot Dimensions (e.g. 20 x 20 in 20 x 50)	Orientation of midline from the 0 m point.
673733	6393555	20 x 20 in 20 x 50	284 Magnetic °

Likely Vegetation Class		Confidence: H M L
Plant Community Type	PCT 82 Poor.	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline. Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	1
	Forbs	7
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0.1
	Grasses etc.	1
	Forbs	2.5
	Ferns	0
	Other	0
High Threat Weed cover %		0.1

This table may be completed after entering data into available tools. It is not required while in the field.

BAM Attribute (20 x 50 m plot)	Stem Classes and Hollows		
dbh	Euc*	Non Euc	Hollows†
80 + cm			0
50 – 79 cm			
30 – 49 cm			Hollows 20cm+
20 – 29 cm			0
10 – 19 cm	tick	tick	
5 – 9 cm	tick	tick	
< 5 cm	tick	tick	This size class records tree regeneration
Length of logs (m) (≥10 cm diameter, >50 cm in length)			total 0

Record **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

Data needed is presence only (tick) unless a 'large tree' for that veg class.

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

Each size class is noted as present by the **living tree stems** only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.

Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	40	80	70	60	10	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	52																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code
Clearing (inc. logging)		
Cultivation (inc. pasture)		
Soil erosion		
Firewood / CWD removal		
Grazing (identify native/stock)		
Fire damage		
Storm damage		

Free Text Section for brief site description

Selected to be representative of slightly high native cover in the paddock.

Leaf Litter and end point GPS

	ID	Easting	Northing
End point		613681	6393561

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14/10/20	TQEP RSF	3	Addy Watson.

ID	BAM Code	GF Code	Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.	N, E or HTE	Cover	Abund	stratum	voucher	Height (m)
1	—		Echium plantagineum	E	2	500	G	—	0.6
2	—		Lolium rigidum	E	3	1000*	G	—	0.6
3	FG	f	Vittadinia cuneata	N	1	300	G	—	0.3
4	FG	f	Convulvulus erubescens	N	1	100	G	—	0.2
5	FG	f	Helichrysum bracteatum everlasting	N	0.1	5	G	—	0.6
6	—		Arctotheca calendula	E	5	300	G	—	0.7
7	FG	f	Calotis lappulacea Yellow burr	N	0.1	20	G	—	0.2
8	FG	f	Wahlenbergia sp	N	0.1	100	G	—	0.3
9	—		Lepidium bonariense Peppercress	E	0.2	40	G	—	0.3
10	GG	J	Chloris truncata	N	1	200	G	—	0.2
11	FG	f	Sida corrugata	N	0.1	5	G	—	0.1
12	FG	f	Einadia nutans	N	0.1	10	G	—	0.2
13	SG		Salsola kali	N	0.1	5	G	—	0.1
14	—		Trifolium spp Clover spp	E	5	1000	G	—	0.1
15	—		Carthamus lanatus safranthistle	HTE	0.1	2	G	—	0.7
16	—		Avena fatua Wild oats	E	0.1	10	G	—	0.5
17									
18									
19									

	Count	Cover
TG	0	0
SG	1	0.1
GG	1	1
FG	7	2.5
EG	0	0
OG	0	0

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. **N:** native, **E:** exotic, **HTE:** high threat exotic.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

BAM Plot – Field Survey Form

Site Sheet no: 01

Survey Name	Plot Identifier	Recorders
TGEP RSF	4	Addy Watson

Date	Zone	Datum	IBRA region	Photo #	Zone ID
14/10/20	55				1

Easting	Northing	Plot Dimensions (e.g. 20 x 20 in 20 x 50)	Orientation of midline from the 0 m point.
613451	6393335	20 x 20 in 20 x 50	70 Magnetic °

Likely Vegetation Class		Confidence: H M L
Plant Community Type	PCT 82 Poor	EEC: Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	2
	Forbs	7
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0.1
	Grasses etc.	2.3
	Forbs	1.2
	Ferns	0
	Other	0
High Threat Weed cover %		2

This table may be completed after entering data into available tools. It is not required while in the field.

BAM Attribute (20 x 50 m plot) dbh	Euc*	Non Euc	Stem Classes and Hollows: Hollows†
80 + cm	tick	tick	0
50 – 79 cm	tick	tick	
30 – 49 cm	tick	tick	Hollows 20cm+
20 – 29 cm	tick	tick	0
10 – 19 cm	tick	tick	
5 – 9 cm	tick	tick	
< 5 cm	tick	tick	This size class records tree regeneration
Length of logs (m) (≥10 cm diameter, >50 cm in length)			total 0

Record **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

Data needed is presence only (tick) unless a 'large tree' for that veg class.

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

Each size class is noted as present by the **living tree stems** only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.

Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	55 50 50 80 25	10 5 5 0 0	15 5 2 0 0	0 0 0 0 0
Average of the 5 subplots	52			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description.

52
52
26

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code
Clearing (inc. logging)	3	0
Cultivation (inc. pasture)	3	0
Soil erosion	0	–
Firewood / CWD removal	0	–
Grazing (identify native/stock)	3	0
Fire damage	0	–
Storm damage	0	–

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Free Text Section for brief site description

Selected to be representative of the paddock

Leaf Litter and end point GPS

	ID	Easting	Northing
End point		613507	6393336

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14/10/20	TGEP RSF	6	Addy Watson

ID	BAM Code	GF Code	Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.	N, E or HTE	Cover	Abund	stratum	voucher	Height (m)
1	—	—	Lolium rigidum	E	1	100	G		0.5
2	—	—	Carthamus lantanus	HTE	2	200	G		0.7
3	FG	f	Vittadinia cuneata	N	0.5	40	G		0.3
4	—	—	Arctotheca calendula	E	60	1000	G		0.1
5	GG	g	Austrostipa ramosa	N	0.3	15	G		0.5
6	FG	f	Wahlenbergia sp.	N	0.1	100	G		0.2
7	—	—	Lepidium bonarense	E	0.1	20	G		0.4
8	—	—	Echium plantagineum	E	0.2	10	G		0.5
9	SG	s	Salsola kahli	N	0.1	20	M		0.3
10	—	—	Hypochaeris radicata Flatweed	E	0.1	5	G		0.2
11	FG	f	Calotis lappulaceae	N	0.2	100	G		0.2
12	—	—	Sonchus oleraceus Sow thistle	E	0.1	5	G		0.3
13	FG	f	Convolvulus erubescens	N	0.1	5	G		0.2
14	GG	g	Chloris truncata	N	2	1000	G		0.2
15	—	—	Trifolia sp Clover sp.	E	1	100	G		0.1
16	FG	f	Goodenia	N	0.1	5	G		0.2
17	FG	f	Euchiton sphaericus Cudweed	N	0.1	5	G		0.2
18	FG	f	Swainsona sp. Not T.S	N	0.1	5	G		0.2
19									
20									
21			Count	cover					
22		TG	0	0					
23		SG	1	0.1					
24		GG	2	2.3					
25		FG	7	1.2					
26		EG	0	0					
27		OG	0	0					
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. **N:** native, **E:** exotic, **HTE:** high threat exotic.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

BAM Plot – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
TGEP RSF	5	Addy Watson

Date	Zone	Datum	IBRA region	Photo #	Zone ID
14/10/20	55				

Easting	Northing	Plot Dimensions (e.g. 20 x 20 in 20 x 50)	Orientation of midline from the 0 m point.	Magnetic °
613321	6393143	20 x 20 in 20 x 50	55	

Likely Vegetation Class		Confidence: H M L
Plant Community Type	PCT 82 - Poor	EEC: / Confidence: H M L

Record easting and northing from the plot marker, if applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	5
	Forbs	5
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0.1
	Grasses etc.	11.7
	Forbs	1.3
	Ferns	0
	Other	0
High Threat Weed cover %		0.1

This table may be completed after entering data into available tools. It is not required while in the field.

BAM Attribute (20 x 50 m plot)	Stem Classes and Hollows		
dbh	Euc*	Non Euc	Hollows†
80 + cm	tick	tick	0
50 – 79 cm	tick	tick	
30 – 49 cm	tick	tick	Hollows 20cm+
20 – 29 cm	tick	tick	0
10 – 19 cm	tick	tick	
5 – 9 cm	tick	tick	
< 5 cm	tick	tick	This size class records tree regeneration
Length of logs (m) (≥10 cm diameter, >50 cm in length)			total: 0

Record **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately.

Data needed is presence only (tick) unless a 'large tree' for that veg class.

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

Each size class is noted as present by the **living tree stems** only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.

Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 45 50 25 25	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	45			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code
Clearing (inc. logging)		
Cultivation (inc. pasture)		
Soil erosion		
Firewood / CWD removal		
Grazing (identify native/stock)		
Fire damage		
Storm damage		

Free Text Section for brief site description

Leaf Litter and end point GPS	ID	Easting	Northing
	End point	613372	6393146

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14/10/20	TGEP RSF	5	Addy Watson

ID	BAM Code	GF Code	Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.		N, E or HTE	Cover	Abund	stratum	voucher	Height (m)
1	—		Lolium rigidum	Rye grass	E	25	5000	G	-	0.5
2	GG	r	Juncus sp	Tussock rush	N	0.5	500	G	-	0.5
3	—		Trifolium sp	Clover sp	E	40	1000	G	-	0.2
4	—		Arctotheca calendula	Cape weed	E	0.8	20	G	-	0.2
5	—		Carthamus lantanus	Saffron thistle	HTE	0.1	5	G	-	0.3
6	GG	r	Carex sp.		N	0.1	20	G	-	0.2
7	FG	f	Lythrum hyssopifolia		N	0.5	100	G	-	0.1
8	—		Soliva sp	Bindi	E	0.1	5	G	-	0.1
9	FG	f	Centapeda cunninghamii	Sneeze weed	N	0.5	400	G	-	0.2
10	FG	f	Wahlenbergia sp		N	0.1	10	G	-	0.2
11	GG	g	Paniacum effusum		N	10	5000	G	-	0.2
12	FG	f	Euchiton sphaericus	Cudweed	N	0.1	5	G	-	0.2
13	GG	g	Chloris truncata		N	1	100	G	-	0.2
14	FG	f	Convulvulus erebescens		N	0.1	10	G	-	0.2
15	—		Echium plantagineum		E	0.3	10	G	-	0.5
16	GG	g	Microlaena stipoides		N	0.1	20	G	-	0.6
17	SG	s	Sclerolaena semibarcata		N	0.1	5	G	-	0.3
18										
19										

	count	cover
TG	0	0
SG	1	0.1
GG	5	11.7
FG	5	1.3
EG	0	0
OG	0	0

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. **N:** native, **E:** exotic, **HTE:** high threat exotic.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

BAM Plot – Field Survey Form

Site Sheet no:

Survey Name	Plot Identifier	Recorders
TQEP RSF	RSF 6	Addy Watson, Anna Darby

Date	Zone	Datum	IBRA region	Photo #	Zone ID
15/10/20	55				

Easting	Northing	Plot Dimensions	Orientation of midline from the 0 m point.	Magnetic °
612891	6393755	20 x 20 in 20 x 50	77	

Likely Vegetation Class		Confidence: H M L
Plant Community Type	PCT 82	EEC: Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	3
	Shrubs	0
	Grasses etc.	3
	Forbs	13
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	9
	Shrubs	6
	Grasses etc.	2.2
	Forbs	1.5
	Ferns	0
	Other	0
High Threat Weed cover %		0

This table may be completed after entering data into available tools. It is not required while in the field.

BAM Attribute (20 x 50 m plot) dbh	Euc*	Non Euc	Stem Classes and Hollows: Hollows†
80 + cm	2		1
50 – 79 cm	2	1	
30 – 49 cm	1	1	Hollows 20cm+
20 – 29 cm	1	7	
10 – 19 cm	✓ tick	✓ tick	
5 – 9 cm	tick	tick	
< 5 cm	tick	tick	This size class records tree regeneration
Length of logs (m) (≥10 cm diameter, >50 cm in length)			total: 37

Record **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

Data needed is presence only (tick) unless a 'large tree' for that veg class.

* Includes all species of *Eucalyptus, Corymbia, Angophora, Lophostemon* and *Syncarpia*

† For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

Each size class is noted as present by the **living tree stems** only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.

Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	25 5 5 10 20	50 5 0 0 30	1 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	13	17	0.2	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code
Clearing (inc. logging)	1	O
Cultivation (inc. pasture)	2	O
Soil erosion	0	—
Firewood / CWD removal	0	—
Grazing (identify native/stock)	1	O
Fire damage	0	—
Storm damage	0	—

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Free Text Section for brief site description

Selected to be representative of the corridor.

Leaf Litter and end point GPS

ID	Easting	Northing
End point	612939	6393753

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 15/12/20	TGEP RSF	RSF 6	Addy Watson Anna Darby

ID	BAM Code	GF Code	Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.	N, E or HTE	Cover	Abund	stratum	voucher	Height (m)
1	TG	t	Eucalyptus microcarpa	N	5	3	U	–	15
2	TG	t	Casuarina cristata	N	3	13	U	–	10
3	TG	t	Callitris glaucophylla	N	1	2	U	–	10
4	–		Lolium rigidum	E	65	5000*	G	–	0.3
5	FG	f	Einadia nutans	N	0.2	50	G	–	0.2
6	–		Sonchus oleraceus Sow thistle	E	0.2	20	G	–	0.4
7	FG	f	Oxalis perennis	N	0.1	50	G	–	0.1
8	–		Arctotheca calendula	E	0.1	10	G	–	0.1
9	FG	f	Glycine tabacina glycine	N	0.1	10	G	–	0.1
10	–		Lepidium bonariense	E	0.1	20	G	–	0.3
11	FG	f	Rumex brownii	N	0.1	15	G	–	0.3
12	GG	g	Rytidosperma sp	N	2	1000	G	–	0.3
13	GG		Carex sp.	N	0.1	100	G	–	0.2
14	–		Urtica dioica Stinging nettle.	E	0.1	20	G	–	0.2
15	–		Bromus catharticus Prairie grass	E	1	200	G	–	0.4
16	–		Solanum nigra	E	0.1	5	G	–	0.3
17	–		Medicago sp.	E	1	200	G	–	0.1
18	–		Hordeum vulgare Barley grass	E	0.5	100	G	–	0.3
19	FG	f	Myoporum debile	N	0.2	10	G	–	0.1
20	FG	f	Wahlenbergia sp	N	0.1	10	G	–	0.1
21	FG	f	Alternanthera denticulata	N	0.1	5	G	–	0.1
22	FG	f	Callotis cuneifolia Purple burr daisy	N	0.1	15	G	–	0.2
23	FG	f	Helichrysum bracteatum	N	0.1	10	G	–	0.3
24	FG	f	Senta annighamii (?)	N	0.1	10	G	–	0.2
25	–		Hypochaeris radulata Flat weed	E	0.1	10	G	–	0.2
26	FG	f	Maireana enchylaenoides Wingless fissure	N	0.1	20	G	–	0.2
27	FG	f	Dichondra repens	N	0.1	50	G	–	0.1
28	GG	g	Enteropogon acicularis	N	0.1	50	G	–	0.2
29	FG	f	Goodenia sp	N	0.1	5	G	–	0.2
30									
31									

	count	cover
32		
TG	3	9
SG	0	0
GG	3	2.2
FG	13	1.5
EG	0	0
OG	0	0
39		
40		

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. **N:** native, **E:** exotic, **HTE:** high threat exotic.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

BAM Plot – Field Survey Form

Site Sheet no:

Survey Name	Plot Identifier	Recorders
TCEP RSF	7	Addy Watson Anna Darby

Date	Zone	Datum	IBRA region	Photo #	Zone ID
15/10/20	55	GDA			

Easting	Northing	Plot Dimensions	Orientation of midline from the 0 m point.
613135	6393730	20 x 20 in 20 x 50 (e.g. 20 x 20 in 20 x 50)	98 Magnetic °

Likely Vegetation Class		Confidence: H M L
Plant Community Type	PCT 82	EEC: Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	3
	Shrubs	3
	Grasses etc.	4
	Forbs	10
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	12
	Shrubs	0.4
	Grasses etc.	20.2
	Forbs	2.2
	Ferns	0
	Other	0
High Threat Weed cover %		0.1

This table may be completed after entering data into available tools. It is not required while in the field.

BAM Attribute (20 x 50 m plot) dbh	Stem Classes and Hollows: Euc*	Non Euc	Hollows†
80 + cm	1		
50 – 79 cm			
30 – 49 cm		5	Hollows 20cm+
20 – 29 cm	2	11	1
10 – 19 cm	tick	✓tick	
5 – 9 cm	tick	tick	
< 5 cm	tick	tick	This size class records tree regeneration
Length of logs (m) (≥10 cm diameter, >50 cm in length)			total 28

Record **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

Data needed is presence only (tick) unless a 'large tree' for that veg class.

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

Each size class is noted as present by the **living tree stems** only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.

Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	8 | 60 | 15 | 20 | 1	80 | 0 | 30 | 10 | 80	7 | 0 | 1 | 2 | 10	1 | 0 | 0 | 0 | 0
Average of the 5 subplots	20.8	40	4	0.2

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code
Clearing (inc. logging)	1	O
Cultivation (inc. pasture)	2	O
Soil erosion	O	—
Firewood / CWD removal	O	—
Grazing (identify native/stock)	O	—
Fire damage	O	—
Storm damage	O	—

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Free Text Section for brief site description

Selected to be representative of the corridor

Leaf Litter and end point GPS

ID	Easting	Northing
End point	613184	6393722

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 15/10/20	TGEP	7	Addy Watson Anna Darby

ID	BAM Code	GF Code	Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.	N, E or HTE	Cover	Abund	stratum	voucher	Height (m)
1	TG	T	Eucalyptus microcarpa	N	2	1	V	—	20
2	TG	T	Callitris glaucophylla	N	5	7	U	—	15
3	TG	T	Casuarina cristata	N	5	3	V	—	5
4	GG	g	Austrostipa scabra	N	15	5000	G	-	0.6
5	GG	g	Rytidosperma sp	N	5	1000	G	-	0.3
6	FG	f	Calotis cuneifolia Purple burr daisy	N	1	2000	G	-	0.2
7	—	—	Hypochaeris radulata	E	0.1	20	G	-	0.3
8	FG	f	Bulbinopsis	N	0.1	100	G	-	0.3
9	FG	f	Helichrysum bracteatum	N	0.1	5	G	-	0.3
10	FG	f	Vittadinia cuneata	N	0.3	100	G	-	0.2
11	SG	s	Atriplex semibaccata	N	0.1	15	G	-	0.3
12	—	—	Lolium rigidum	E	40	5000	G	—	0.3
13	—	—	Hordeum vulgare Barley Grass	E	0.5	1000	G	-	0.3
14	FG	f	Maireana enchylaenoides Wingless fissure	N	0.1	50	G	-	0.1
15	—	—	Arctotheca calendula	E	0.5	20	G	-	0.2
16	—	—	Sonchus oleraceus sow thistle	E	0.1	20	G	-	0.3
17	SG	s	Maireana microphylla Blue cotton bush	N	0.2	5	G	-	0.3
18	—	—	Carthamus lanatus saffron thistle	E	0.1	10	G	-	0.3
19	FG	f	Sida corrugata	N	0.2	25	G	—	0.1
20	—	—	Lepidium bonariensis	E	0.2	50	G	-	0.5
21	FG	S	Dysphania melanocarpa Black crumbweed	N	0.1	5	G	-	0.1
22	FG	f	Erodium cicutarium Blue stalksbill	N	0.1	5	G	-	0.3
23	—	—	Medicago sp	E	0.1	10	G	-	0.1
24	FG	f	Rumex brownii	N	0.1	5	G	-	0.2
25	FG	f	Einadia nutans	N	0.1	5	G	-	0.1
26	—	—	Sysimbrium officinale Hedge mustard	E	0.1	5	G	-	0.4
27	SG	s	Sasola kali	N	0.1	5	G	-	0.2
28	GG	r	Lomandra glauca	N	0.1	5	G	-	0.2
29	—	—	Echium plantagineum	E	0.1	5	G	-	0.2
30	GG	g	Enteropogon acicularis	N	0.1	10	G	-	0.2
31			Count / Cover						
32		TG	3	12					
33		SG	3	0.4					
34		GG	4	20.2					
35		FG	10	2.2					
36		EG	0	0					
37		OG	0	0					
38									
39									
40									

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. **N:** native, **E:** exotic, **HTE:** high threat exotic.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

Form version designed 15 September 2017 Printed 4 August 2020

GCB babbler nest just outside plot — active

BAM Plot – Field Survey Form

Site Sheet no:

Survey Name	Plot Identifier	Recorders
TREP RSF	8	Addy Watson Anna Darby

Date	Zone	Datum	IBRA region	Photo #	Zone ID
15/10/20	55	GDA			

Easting	Northing	Plot Dimensions	Orientation of midline from the 0 m point.
613443	6393671	20 x 20 in 20 x 50 (e.g. 20 x 20 in 20 x 50)	92 ° Magnetic

		Confidence: H M L
Likely Vegetation Class		
Plant Community Type	PCT 201	EEC: Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	3
	Grasses etc.	6
	Forbs	12
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	20
	Shrubs	0.4
	Grasses etc.	3.5
	Forbs	4.1
	Ferns	0
	Other	0
High Threat Weed cover %		

This table may be completed after entering data into available tools. It is not required while in the field.

BAM Attribute (20 x 50 m plot)	Stem Classes and Hollows		
dbh	Euc*	Non Euc	Hollows†
80 + cm	3		
50 – 79 cm			
30 – 49 cm	2	1	Hollows 20cm+
20 – 29 cm		2	1
10 – 19 cm	tick	tick	
5 – 9 cm	tick	tick	
< 5 cm	tick	tick	This size class records tree regeneration
Length of logs (m) (≥10 cm diameter, >50 cm in length)			total 17

Record **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

Data needed is presence only (tick) unless a 'large tree' for that veg class.

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

Each size class is noted as present by the **living tree stems** only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.

Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	10 30 2 5 20	50 0 0 0 20	1 0 0 0 2	1 0 0 0 0
Average of the 5 subplots	33.5	14	0.6	0.2

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code
Clearing (inc. logging)		
Cultivation (inc. pasture)		
Soil erosion		
Firewood / CWD removal		
Grazing (identify native/stock)		
Fire damage		
Storm damage		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Free Text Section for brief site description

Selected to be representative of tree corridor

Leaf Litter and end point GPS

ID	Easting	Northing
End point	613485	6393670

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 15/10/20	TGEP	8	Addy Watson Anna Darby

ID	BAM Code	GF Code	Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.	N, E or HTE	Cover	Abund	stratum	voucher	Height (m)
1	TG	E	Eucalyptus conica	N	15	1	U	—	20
2	TG	E	Casuarina cristata	N	5	4	U	—	15
3	—		Sysimbrium officinale	E	1	200	G	—	0.8
4	—		Lolium rigidum	E	55	5000	G	—	0.3
5	FG	f	Einadia nutans	N	2	100	G	—	0.1
6	—		Sonchus oleraceus	E	0.1	30	G	—	0.6
7	FG	f	Rumex brownii	N	0.1	5	G	—	0.2
8	—		Hordeum vulgare Barley Grass	E	1	100	G	—	0.2
9	—		Echium plantagineum	E	0.2	5	G	—	0.5
10	—		Malva parviflora	E	0.1	5	G	—	0.5
11	GG	g	Austrostipa scabra	N	1	1000	G	—	0.5
12	FG	f	Callotis cuneifolia purple burr	N	1	200	G	—	0.2
13	FG	f	Sida corrugata	N	0.1	20	G	—	0.1
14	FG	f	Euchiton sphaericus cudweed	N	0.1	5	G	—	0.2
15	FG	f	Bulbine bulbosa	N	0.2	100	G	—	0.3
16	SG	s	Salsola kali	N	0.1	20	m	—	0.2
17	GG	g	Rytidosperma sp	N	1	500	G	—	0.3
18	—		Arctotheca calendula	E	0.1	15	G	—	0.1
19	SG	s	Maireana microphylla	N	0.2	5	m	—	0.3
20	—		Lepidium bonariense	E	0.1	30	G	—	0.4
21	—		Medicago sp	E	1	100	G	—	0.1
22	FG	f	Dysphania melanocarpa Crumbweed	N	0.1	5	G	—	0.1
23	FG	f	Maireana enchylaenoides Wingless fissure	N	0.1	20	G	—	0.1
24	FG	f	Alternanthera denticulata	N	0.1	5	G	—	0.1
25	FG	f	Tilycine tabacina	N	0.1	5	G	—	0.1
26	GG	g	Paspalidium constrictum	N	0.1	5	G	—	0.2
27	SG	s	Scleolaena brachii	N	0.1	5	m	—	0.2
28	GG	g	Elymus scaber Wheat grass	N	0.2	20	G	—	0.5
29	FG	f	Helichrysum bracteatum	N	0.1	5	G	—	0.3
30	GG	g	Lomandra glauca	N	0.1	5	G	—	0.2
31	GG	g	Enteropogon acicularis	N	0.1	50	G	—	0.2
32	FG	f	Myoporum debile	N	0.1	1	G	—	0.1
33									
34			COUNT / COVER						
35		+G	2 / 20						
36		SG	3 / 0.4						
37		GG	6 / 3.5						
38		FG	12 / 4.1						
39		EG	0 / 0						
40		OG	0 / 0						

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. **N:** native, **E:** exotic, **HTE:** high threat exotic.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

Appendix C – BAMC reports

On next page.

BAM Vegetation Zones Report

Proposal Details

Assessment Id
00022291/BAAS19066/20/00022292

Assessment name
TGEP_RSF expansion

BAM data last updated *
21/10/2020

Assessor Name
Addy Watson

Report Created
17/11/2020

BAM Data version *
31

Assessor Number
BAAS19066

Assessment Type
Part 5 Activities

BAM Case Status
Open

Assessment Revision
0

Date Finalised
To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	82_Zone1_Grazed_Mod	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	Zone1_Grazed_Mod	3.09	2	

2	82_Zone2_Cleared_Poor	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	Zone2_Cleared_Poor	80.72	5	
3	201_Zone3_Grazed_Mod	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Zone3_Grazed_Mod	1.35	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00022291/BAAS19066/20/00022292	TGEP_RSF expansion	21/10/2020
Assessor Name	Report Created	BAM Data version *
Addy Watson	17/11/2020	31
Assessor Number	Assessment Type	BAM Case Status
BAAS19066	Part 5 Activities	Open
Assessment Revision		Date Finalised
0		To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Brolga	Grus rubicunda	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
Diamond Firetail	Stagonopleura guttata	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Flame Robin	Petroica phoenicea	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Grey Falcon	Falco hypoleucos	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Koala	Phascolarctos cinereus	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Major Mitchell's Cockatoo	Lophochroa leadbeateri	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Speckled Warbler	Chthonicola sagittata	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Superb Parrot	Polytelis swainsonii	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

White-bellied Sea-Eagle	Haliaeetus leucogaster	82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id 00022291/BAAS19066/20/00022292	Proposal Name TGEP_RSF expansion	BAM data last updated * 21/10/2020
Assessor Name Addy Watson	Report Created 17/11/2020	BAM Data version * 31
Assessor Number BAAS19066	Assessment Type Part 5 Activities	BAM Case Status Open
Assessment Revision 0	Date Finalised To be finalised	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Ardeotis australis Australian Bustard	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☑ Jun ☑ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Crinia sloanei Sloane's Froglet	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Dichanthium setosum Bluegrass	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Diuris tricolor Pine Donkey Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Geophaps scripta scripta Squatter Pigeon (southern subspecies)	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophochroa leadbeateri Major Mitchell's Cockatoo	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Phascogale tapoatafa Brush-tailed Phascogale	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☑ Survey month outside the specified months?
Polytelis swainsonii Superb Parrot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Swainsona murrayana Slender Darling Pea	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Swainsona recta Small Purple-pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Koala	Phascolarctos cinereus	Habitat constraints
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00022291/BAAS19066/20/00022292

Proposal Name
TGEP_RSF expansion

BAM data last updated *
21/10/2020

Assessor Name
Addy Watson

Assessor Number
BAAS19066

BAM Data version *
31

Proponent Names

Report Created
17/11/2020

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 5 Activities

Date Finalised
To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Endangered Ecological Community	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Species
Nil

BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Climacteris picumnus victoriae / Brown Treecreeper (eastern subspecies)
Haliaeetus leucogaster / White-bellied Sea-Eagle

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	Not a TEC	83.8	103	0	103
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	1.4	49	0	49

BAM Biodiversity Credit Report (Like for like)

82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	82_Zone1_Grazed_Mod	Yes	103	Bogan-Macquarie, Boorindal Plains, Canbelego Downs, Castlereagh-Barwon, Inland Slopes, Lower Slopes, Nymagee and Pilliga. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	82_Zone2_Cleared_Poor	No	0	Bogan-Macquarie, Boorindal Plains, Canbelego Downs, Castlereagh-Barwon, Inland Slopes, Lower Slopes, Nymagee and Pilliga. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions This includes PCT's: 201, 202, 1384	-	201_Zone3_Grazed_Mod	Yes	49	Bogan-Macquarie, Boorindal Plains, Canbelego Downs, Castlereagh-Barwon, Inland Slopes, Lower Slopes, Nymagee and Pilliga. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00022291/BAAS19066/20/00022292

Proposal Name
TGEP_RSF expansion

BAM data last updated *
21/10/2020

Assessor Name
Addy Watson

Assessor Number
BAAS19066

BAM Data version *
31

Proponent Name(s)

Report Created
17/11/2020

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 5 Activities

Date Finalised
To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Endangered Ecological Community	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

BAM Biodiversity Credit Report (Variations)

Predicted Threatened Species Not On Site

Name
Climacteris picumnus victoriae / Brown Treecreeper (eastern subspecies)
Haliaeetus leucogaster / White-bellied Sea-Eagle

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	Not a TEC	83.8	103	0	103.00
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	1.4	49	0	49.00

82-Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	82_Zone1_Grazed_Mod	Yes	103	Bogan-Macquarie,Boorindal Plains, Canbelego Downs, Castlereagh-Barwon, Inland Slopes, Lower Slopes, Nymagee and Pilliga. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	82_Zone2_Cleared_Poor	No	0	Bogan-Macquarie,Boorindal Plains, Canbelego Downs, Castlereagh-Barwon, Inland Slopes, Lower Slopes, Nymagee and Pilliga. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Grassy Woodlands	Tier 2 or higher threat status	82_Zone1_Grazed_Mod	Yes (including artificial)	103	IBRA Region: Darling Riverine Plains, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Grassy Woodlands	Tier 2 or higher threat status	82_Zone2_Cleared_Poor	No	0	IBRA Region: Darling Riverine Plains, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions This includes PCT's: 201, 202, 1384	-	201_Zone3_Grazed_Mod	Yes	49	Bogan-Macquarie,Boorindal Plains, Canbelego Downs, Castlereagh-Barwon, Inland Slopes, Lower Slopes, Nymagee and Pilliga. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Grassy Woodlands	Tier 1	201_Zone3_Grazed_Mod	Yes (including artificial)	49	IBRA Region: Darling Riverine Plains, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like options

BAM Credit Summary Report

Proposal Details

Assessment Id
00022291/BAAS19066/20/00022292

Proposal Name
TGEP_RSF expansion

BAM data last updated *
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Assessor Name
Addy Watson

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Assessment Type
Part 5 Activities

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion											
3	201_Zone3_Grazed_Mod	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	72.4	72.4	1.4	Endangered Ecological Community	Not Listed	High Sensitivity to Potential Gain	2.00	TRUE	49
										Subtotal	**49**
Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion											
1	82_Zone1_Grazed_Mod	Not a TEC	66.9	66.9	3.1			High Sensitivity to Potential Gain	2.00		103
2	82_Zone2_Cleared_Poor	Not a TEC	15.5	15.5	80.7			High Sensitivity to Potential Gain	2.00		0
										Subtotal	**103**
										Total	**152**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00022291/BAAS19066/20/00022292		0	17/11/2020

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Addy Watson	BAAS19066	TGEP_RSF expansion	Open

Assessment Type	Date Finalised
Part 5 Activities	To be finalised

PCT list

Price calculated	PCT common name	Credits
Yes	**82 -** Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	103
Yes	**201 -** Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	49

Species list

Price calculated	Species	Credits

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

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Bogan-Macquarie	**82 -** Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	No	Floodplain Transition Woodlands >=70% and <90%	19.23%	$128.63	2.1840	$3,962.83	103	$408,171.41
Bogan-Macquarie	**201 -** Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Yes	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	19.38%	$287.12	2.3389	$8,856.14	49	$433,950.65

Subtotal (excl. GST)	**$842,122.06**
GST	**$84,212.21**
Total ecosystem credits (incl. GST)	**$926,334.27**

Biodiversity payment summary report

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price

No species available

Grand total **$926,334.27**

Appendix D – Fauna Handling and Rescue Procedure

Purpose

This procedure explains the actions to be taken if an animal or eggs are discovered on the site that require handling or rescue during vegetation and soil clearance and ongoing construction activities. The procedure relates primarily to injured shocked and juvenile individuals but also applies to nocturnal fauna or slow-moving species that may not be capable of moving away from mobile plant and equipment.

Scope

This procedure is applicable to all native and introduced species that are found on the site. Attendee construction staff and contractors will attend a project induction, which will include a section on fauna.

Procedure

In the event wildlife (including shocked, juvenile animals or eggs) are discovered on the site during vegetation and soil clearance and ongoing construction activities the following steps shall be taken:

1. STOP ALL WORK in the vicinity of the fauna and immediately notify the work supervisor, who will then notify a member of the Environmental/ management team.

2. If required, contact project ecologist to obtain positive identification of the subject species.

3. Preferably allow fauna to leave the area without intervention.

4. If immediately available, use a licensed fauna ecologist or wildlife carer with specific animal handling experience to carry out any fauna handling.

5. To minimise stress to native fauna and remove the risk of further injury an appropriately competent person shall:

    a. If time permits call ecologist or fauna rescue for advice.

    b. Attempt to herd animal into adjoining forest, outside construction area.

    c. If capture is necessary cover larger animals with a towel or blanket and place in a large cardboard box and/or cotton/calico bag

    d. Place smaller animals in a cotton/calico bag tied at the top

    e. Keep the animal in a quiet, warm, ventilated and dark place away from noisy construction activities.

    f. Aquatic fauna are to be placed in plastic aquaria or a moistened plastic bag. Frogs will be transported in moistened plastic bags (1 frog/bag) with a small amount of leaf litter. Handling and translocation of frogs shall be in accordance with the Hygiene Protocol for the Control of Disease in Frogs (DECC 2008).

Appendix E – Glossary of terms from BAM (2020)

BAM definitions and acronyms used in this document

Definitions

Accredited person: has the same meaning as in the BC Act, referred to in the BAM as 'assessor'.
Ancillary rules: has the same meaning as set out in clause 6.5 of the BC Regulation.
Annual probability of decline in vegetation and habitat condition: an estimate of the average probability of decline of each attribute through clearing, stochastic factors or ongoing degrading actions (firewood removal, weed invasion, livestock grazing).
Areas of geological significance: geological features such as karst, caves, crevices, cliffs.
Assessment area surrounding the subject land: the area of land in the 1500m buffer zone around a Development Site, or land to be biodiversity certified or a biodiversity stewardship site, that is determined in accordance with Subsection 4.3.2.
Assessor: the person accredited under the BC Act referred to in Subsection 2.1.2 and who has been engaged by the proponent.
Averted loss: the gain in vegetation and habitat condition that arises from managing the proposed land as an offset compared to the probable future vegetation condition if the land was to be left unmanaged (see *Annual probability of decline*).
Avoid: measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity. Refer to the BAM for operational guidance.
BAM: the Biodiversity Assessment Method.
BC Act: the Biodiversity Conservation Act 2016.
BC Regulation: the Biodiversity Conservation Regulation 2017.
Benchmark data: for a PCT, vegetation class or vegetation formation benchmark data is contained in the BioNet Vegetation Classification. A local reference site may also be used to establish benchmark data for a PCT that may be used in a BAM assessment.
Benchmarks: the quantitative measures that represent the 'best-attainable' condition, which acknowledges that native vegetation within the contemporary landscape has been subject to both natural and human-induced disturbance. Benchmarks are defined for specified variables for each PCT. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, is not subject to high frequency burning, and has evidence of recruitment of native species.
Biodiversity certification: has the same meaning as in the BC Act.
Biodiversity Certification Assessment Report (BCAR): has the same meaning as in the BC Act.
Biodiversity credit report: the report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a Development Site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity Development Assessment Report (BDAR): has the same meaning as in the BC Act.
Biodiversity offsets: management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development.
Biodiversity Stewardship Agreement: has the same meaning as in the BC Act.
Biodiversity Stewardship Assessment Report (BSAR): the report that must be prepared in accordance with the BAM and submitted as part of an application for a biodiversity stewardship agreement.
Biodiversity values: has the same meaning as clause 1.5(2) of the BC Act.
Biodiversity values map: is established according to clause 7.3 of the BC Regulation. Development within an area identified on the map requires assessment using the BAM.
BioNet Atlas: the DPIE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish.
BioNet Vegetation Classification: the master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by DPIE and available at www.environment.nsw.gov.au/research/Visclassification.htm.
Broad condition state: areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Certified more appropriate local data: has the same meaning as set out in Subsection 2.2.2.
Change in vegetation integrity score for a biodiversity stewardship site: the difference (gain) between the estimated vegetation integrity score without management at a biodiversity stewardship site and the predicted future vegetation integrity score with management at a biodiversity stewardship site, calculated in accordance with Equation 28.
Class of biodiversity credit: as defined in Section 11.3.
Clearing site: the site proposed to be cleared of native vegetation where approval is sought under Part 5A of the *Local Land Services Act 2013* or the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*.
Clonal species: flora species that propagate asexually at a site or have a limited degree of sexual reproduction, either within or between sites. Modes of asexual reproduction will include vegetative reproduction such as by rhizomes, root suckers or bulb replication.
Connectivity: the measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator: the computer program that provides decision support to assessors and proponents by applying the BAM, in particular by using the data required to be entered and the equations in Appendix 6 and Appendix 9 to calculate the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Critically endangered ecological community (CEEC): an ecological community specified as critically endangered in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).
Crown cover: the vertical projection of the periphery of tree crowns within a designated area.
Derived vegetation: PCTs that have changed to an alternative stable state as a consequence of land management practices since European settlement. Derived communities can have one or more structural components of the vegetation entirely removed or severely reduced (e.g. over-storey of grassy woodland) or have developed new structural components where they were previously absent (e.g. shrubby mid-storey in an open woodland system).
Development footprint: the area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials. The term *Development Footprint* is also taken to include clearing footprint except where the reference is to a small area development or a major project development.

Development Site: an area of land that is subject to a proposed development that is under the EP&A Act. The term *Development Site* is also taken to include clearing site except where the reference is to a small area development or a major project development.
Ecosystem credits: a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a Development Site and the gain in biodiversity values at a biodiversity stewardship site.
Endangered ecological community (EEC): an ecological community specified as endangered in Schedule 2 of the BC Act, or listed under the EPBC Act.
Environment Agency Head: has the same meaning as in the BC Act.
EP&A Act: the NSW Environmental Planning and Assessment Act 1979.
EPBC Act: the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
Ephemeral flora species: flora species where the abundance of the species above ground fluctuates in response to the plant life history in combination with environmental conditions and/or disturbance regimes. Fluctuations in abundance may be short-term (seasonal) or long-term (yearly to decadal). Many ephemeral species persist underground through unfavourable conditions via soil seed banks or dormant vegetative organs (bulbs, tubers, rootstocks).
Estuarine area: a semi-enclosed body of water having an open or intermittently open connection with the ocean, in which water levels do not vary with the ocean tide (when closed to the sea) or vary in a predictable, periodic way in response to the ocean tide at the entrance (when open to the sea).
Expert: a person who has the relevant experience and/or qualifications to provide expert opinion in relation to the biodiversity values to which an expert report relates.
Foliage cover: the percentage of a plot area that would be covered by a vertical projection of the foliage and branches and trunk of a plant, or plants or a growth form group. Foliage cover can also be referred to as percent foliage cover.
Gain: the gain in biodiversity values at a biodiversity stewardship site, over time from undertaking management actions at a biodiversity stewardship site. Gain in biodiversity values is the basis for creating biodiversity credits at the biodiversity stewardship site.
Grassland: native vegetation classified in the vegetation formation 'Grasslands' in Keith (2004)[2]. Grasslands are generally dominated by large perennial tussock grasses, lack of woody plants, the presence of broad-leaved herbs in inter-tussock spaces, and their ecological association with fertile, heavy clay soils on flat topography in regions with low to moderate rainfall.
Growth form: the form that is characteristic of a particular flora species at maturity. Growth forms are set out in Appendix 4.
Habitat: an area or areas occupied, or periodically or occasionally occupied, by a species or ecological community, including any biotic or abiotic component.
Habitat component: the component of habitat that is used by a threatened species for either breeding, foraging or shelter.
Habitat surrogates: measures of habitat that predict the occurrence of threatened species and communities: IBRA subregion, PCT, percent vegetation cover and vegetation condition.
Herbfield: native vegetation which predominantly does not contain an over-storey or mid- storey and where the ground cover is dominated by non-grass species.
High threat exotic plant cover: plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species. Also referred to as high threat weeds.
Hollow bearing tree: a living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground. Trees must be examined from all angles.
IBRA region: a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system[3], which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.
IBRA subregion: a subregion of a bioregion identified under the IBRA system.
Impact assessment: an assessment of the impact or likely impact of a development on biodiversity values which is prepared in accordance with the BAM.
Impacts on biodiversity values: loss in biodiversity values from direct or indirect impacts of development in accordance with Chapters 8, 1 and 10.
Important wetland means:
(a) a wetland that is listed in the Directory of Important Wetlands of Australia
(DIWA) from time to time, and
(b) for the purposes of all paragraphs except 4.2.1.6 the actual location on the
ground that corresponds to a SEPP 14 Coastal wetland
(c) for the purposes of Paragraph 4.2.1.6:
(i) a SEPP 14 Coastal Wetland, and
(ii) the actual location on the ground that corresponds to a SEPP 14 Coastal
Wetland.
Individual: in relation to organisms, a single, mature organism that is a threatened species, or any additional threatened species listed under Part 13 of the EPBC Act.
Intact vegetation: vegetation where all tree, shrub, grass and/or forb structural growth form groups expected for a plant community type are present.
Intrinsic rate of increase (*ir*): an estimate of the rate of gain for an attribute at a biodiversity stewardship site from actions undertaken as part of the management plan. The intrinsic rate of increase is specified for an attribute according to the formation of the PCT being assessed (see Appendix 8).
Landscape attributes: in relation to a Development Site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site.
Large tree benchmark: is the largest stem size class for a PCT as determined by the benchmark for the PCT.
Life cycle: the series of stages of reproduction, growth, development, aging and death of an organism.
Life form: the form that is characteristic of a particular species at maturity. In the BAM, life form has the same meaning as growth form for flora species.
Linear shaped development: development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length.
Litter cover: the percentage ground cover of all plant material that has detached from a living plant, including leaves, seeds, twigs, branchlets and branches (<10cm in diameter).
Local population: the population that occurs in the study area. In cases where multiple populations occur in the Development Site or a population occupies part of the Development Site, impacts on each subpopulation must be assessed separately.
Local wetland: any wetland that is not identified as an important wetland (refer to definition of *Important wetland*).
Loss of biodiversity: the loss of biodiversity values from a Development site, native vegetation clearing site or land where biodiversity certification is conferred.
Major project: State Significant Development and State Significant Infrastructure.

Minimise: a process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of development on biodiversity values.
Mitchell landscape: landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Multiple fragmentation impact development: developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines.
Native ground cover: all native vegetation below 1m in height, including all such species native to NSW (i.e. not confined to species indigenous to the area).
Native ground cover (grasses): native ground cover composed specifically of native grasses. **Native ground cover (other):** native ground cover composed specifically of non-woody
native vegetation (vascular plants only) <1m in height that is not grass (e.g. herbs, ferns).
Native ground cover (shrubs): native ground cover composed specifically of native woody vegetation <1m in height.
Native mid-storey cover: all vegetation between the over-storey stratum and a height of 1m (typically tall shrubs, under-storey trees and tree regeneration) and including all species native to NSW (i.e. native species not local to the area can contribute to mid-storey structure).
Native over-storey cover: the tallest woody stratum present (including emergent) above 1m and including all species native to NSW (i.e. native species not local to the area can contribute to over-storey structure). In a woodland community, the over-storey stratum is the tree layer, and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum.
Native plant species richness: the number of different native vascular plant species that are characteristic of a PCT.
Native vegetation: has the same meaning as in section 1.6 of the BC Act.
Native vegetation cover: the percentage of native vegetation cover on the subject land and the surrounding buffer area. Cover estimates are based on the cover of native woody and
non-woody vegetation relative to the approximate benchmarks for the PCT, taking into
account vegetation condition and extent. Native over-storey vegetation is used to determine
the percent cover in woody vegetation types, and native ground cover is used to assess cover in non-woody vegetation types.
Number of trees with hollows: a count of the number of living and dead trees that are hollow bearing.
Offset rules: are those established by the BC Regulation.
Onsite measures: measures and strategies that are taken or are proposed to be taken at a Development site to avoid and minimise the direct and indirect impacts of the development on biodiversity values.
Operational Manual: the Operational Manual published from time to time by DPIE, which is a guide to assist assessors when using the BAM.
Patch size: an area of intact native vegetation that:
a) occurs on the Development site or biodiversity stewardship site, and
b) includes native vegetation that has a gap of less than 100m from the next area of
moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).
Patch size may extend onto adjoining land that is not part of the Development site or biodiversity stewardship site.
PCT classification system: the system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification.
Percent cleared value: the percentage of a PCT that has been cleared as a proportion of its pre-1750 extent, as identified in the BioNet Vegetation Classification.
Plant community type (PCT): a NSW plant community type identified using the PCT classification system.
Plot: an area within a vegetation zone in which site attributes are assessed.
Population: a group of organisms, all of the same species, occupying a particular area.
Probability of reaching benchmark: the probability of a specific attribute or growth form group reaching benchmark conditions in the vegetation zone at the end of the management timeframe.
Proponent: a person who intends to apply for consent or approval to carry out development, clearing, biodiversity certification or for approval for infrastructure.
Reference sites: the relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration: the proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5cm within a vegetation zone.
Residual impact: an impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits: the retirement of biodiversity credits from a biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer: an area of land determined according to Appendix 3.
Risk of extinction: the likelihood that the local population or CEEC or EEC will become extinct either in the short term or in the long term as a result of direct or indirect impacts on the viability of that population or CEEC or EEC.
SEPP 14 Coastal wetland: a wetland to which *State Environmental Planning Policy No 14 – Coastal Wetlands* applies or an area that is identified as a coastal wetland within the meaning of the term *coastal wetlands and littoral rainforests area* for the purposes of *Coastal Management Act 2016*.
Site attributes: the matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development: a development other than a linear shaped development, or a multiple fragmentation impact development.
Site context: the value given to landscape attributes of a Development Site or biodiversity stewardship site after an assessment undertaken in accordance with Section 4.3.
Species credit species: are threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.
Species credits: the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
State Significant Development: has the meaning given by Division 4.1 of Part 4 of the EP&A Act.
State Significant Infrastructure: has the meaning given by Part 5.1 of the EP&A Act. **Stream order:** has the same meaning as in Appendix 3.

Subject land: is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a Development Site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threat status class: the extent to which a species or ecological community is threatened with extinction, or the extent to which a PCT is estimated to have been cleared (see *Percent cleared value*).
Threatened Biodiversity Data Collection: part of the BioNet database, published by DPIE and accessible from the BioNet website at www.bionet.nsw.gov.au.
Threatened ecological community (TEC): means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act.
Threatened species: critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.
Threatened species survey: a targeted survey for threatened species undertaken in accordance with Section 6.5.
Threatened species survey guidelines: survey methods or guidelines published by DPIE from time to time at www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/surveys-and-assessments.
Total length of fallen logs: the total length of logs present in a vegetation zone that are at least 10cm in diameter and at least 0.5m long.
Transect: a line or narrow belt along which environmental data is collected.
Upland Swamp Policy: the document entitled *Addendum to NSW Biodiversity Offsets Policy for Major Projects: Upland swamps impacted by longwall mining subsidence* as in force on the day when the BAM is published until such time as the Environment Agency Head publishes any further document for the purpose of it being adopted by the BAM as the Upland Swamp Policy.
Vegetation Benchmarks Database: a database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by DPIE and is part of the BioNet Vegetation Classification. It is available at www.environment.nsw.gov.au/research/Visclassification.htm.
Vegetation class: a level of classification of vegetation communities defined in Keith (2004)[4]. There are 99 vegetation classes in NSW.
Vegetation formation: a broad level of vegetation classification as defined in Keith (2004)[4]. There are 16 vegetation formations and sub-formations in NSW.
Vegetation integrity: the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.
Vegetation integrity score: the quantitative measure of vegetation condition calculated in accordance with Equation 15 or Equation 16.
Vegetation zone: a relatively homogenous area of native vegetation on a Development Site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Viability: the capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.
Vulnerable ecological community (VEC): an ecological community specified as vulnerable in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.
Wetland: an area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water (see also *Important wetland* and *Local wetland*).
Woody native vegetation: native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

Acronyms

Acronym	Definition
BAR	Biodiversity Assessment Report
BAMC	Biodiversity Assessment Method Calculator
BASSR	Biodiversity Steward Site Assessment Report
BOM	Bureau of Meteorology
BC Act	Biodiversity Conservation Act 2016
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
DAWE	Department of Agriculture, Water and the Environment
DPIE	Department of Planning, Industry and Environment
DPI	Department of Primary industries
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC	Environment Protection and Biodiversity Conservation Act 1999
FBA	Framework of Biodiversity Assessment
GDE	Groundwater dependent ecosystems
GIS	Geographic information system
GPS	Global positioning system
IBRA	Interim Biogeographic Regionalisation for Australia
KTP	Key threatening process
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NP&W Act	National Parks and Wildlife Act 1974
NPWS	National Parks and Wildlife Services
NSW	New South Wales
OEH	Office of Environment and Heritage (Now DPIE)
PCT	Plant Community Types
PMST	Protected Matters Search Tool
SAT	Scat Assessment Technique
SEARS	Secretary's Environmental Assessment Requirement
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TAFE	Technical and Further Education Institute
TEC	Threatened Ecological Community
TSPD	Threatened Species Profile Database
VEC	Vulnerable Ecological Community
VIS	Vegetation Information System
WIRES	Wildlife Information, Rescue and Education Services

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