



Biodiversity Development Assessment Report

WOLLAR SOLAR FARM



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ACRONYMS AND ABBREVIATIONS

BAM	Biodiversity Assessment Methodology
BC Act	Biodiversity Conservation Act 2016 (NSW)
BDAR	Biodiversity Development Assessment Report
BGW	Box Gum Woodland
BOM	Australian Bureau of Meteorology
CEEC	Critically Endangered Ecological Community (CW listing)
DBH	Diameter at Breast Height
DNG	Derived Native Grassland
DPE	(NSW) Department of Planning and Environment
EEC	Endangered Ecological Community (NSW listing)
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Cwth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
GHG	Greenhouse Gases
ha	hectares
HBT	Hollow-bearing Tree
km	kilometres
LRET	Large-scale renewable energy target
m	Metres
MNES	Matters of National environmental significance under the EPBC Act (<i>c.f.</i>)
NSW	New South Wales
REAP	Regional Environmental Action Plan (NSW)
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
PV	Photovoltaic
SSD	State Significant Development
SEARS	Secretary's Environmental Assessment Requirements
SAII	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy (NSW)
sp/spp	Species/multiple species
TEC	Threatened Ecological Community (can refer to either CW or NSW listing)

EXECUTIVE SUMMARY

The proposed Wollar Solar Farm is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP). This Biodiversity Development Assessment Report (BDAR) assesses the impacts of the proposed Wollar Solar Farm (the proposal) according to the NSW Biodiversity Assessment Methodology (BAM) as required by the Secretary's Environmental Assessment Requirements (SEARs) and supplementary SEARs issued for the proposal. NGH Environmental has prepared this report on behalf of the proponent, Wollar Solar Development Pty Ltd.

The proposed Wollar Solar Farm involves the construction, operation and decommissioning of a ground-mounted PV solar array. The study area is approximately 878 ha and would consist of associated infrastructure occupying around half the area. Approximately 290MW (AC) of renewable energy would be generated and supplied directly to the national electricity grid.

Consideration has been given to avoid and minimise impacts to native vegetation where possible. Site design options have been assessed against key environmental, social and economic criteria. Identifying the final development footprint (461.7 ha) has been iterative, informed by site surveys and assessments. Mitigation and management measures will be put in place to adequately address direct and indirect impacts associated with the proposal.

Biodiversity impacts have been assessed through comprehensive survey, mapping and assessment completed in accordance with the BAM. Regarding onsite surveys, three targeted survey programs were undertaken to address all candidate species. Three candidate species were confirmed onsite: the Large-eared Pied Bat (*Chalinolobus dwyeri*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) and Eastern Cave Bat (*Vespadelus troughtoni*). Although detected onsite, it was concluded after extensive inspection of rocky scarp habitat that no specialised breeding/roosting/refuge habitat was present inside the development footprint, as such no species credits would be generated.

For biodiversity impacts that are unavoidable, 370 ha out of the 461.7 ha comprises native vegetation with impacts to:

- 29 ha of structural woodland, the remainder being derived grasslands and cultivated low condition area.
- 343 ha of vegetation that meets the NSW criteria for Endangered Ecological Communities, most (92%) in degraded condition that does not generate offsets.
- 232 ha of vegetation that meets the Commonwealth criteria for Critically Endangered Ecological Communities, most (88%) in degraded condition.

The areas above include nine hollow-bearing trees (HBTs) that would need to be removed. An additional five paddock trees (as defined under BAM) will also be removed in addition to the native vegetation above.

The majority of the development footprint (55%) will consist of solar panels. The impacts of shading and diversion of rainfall runoff from the panels themselves is largely unknown. For the purpose of this BDAR report, the entire development footprint is assumed to be removed however, as the indicative layout shows, substantial peripheral areas are likely to be unimpacted and it is likely that a number of perennial native species will persist underneath the solar arrays. Certainly, only a minor proportion of the seed bank will be impacted, given the limited excavation proposed. This is therefore a 'worst case' conservative approach. There is currently limited ability to vary this assumption without specific scientific data to justify a lesser impact; such as the results of ground cover monitoring beneath the solar array.

As such, the NSW credit requirement for the 'worst case' impact has been defined as:

- 826 ecosystem credits (5 of these credits generated by paddock tree removal)
- 0 species credits

The retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets Scheme (BOS).

The project is subject to a Commonwealth 'streamlined assessment'¹, to capture MNES, as well as NSW matters. Regarding MNES, potential impacts on White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland – Critically Endangered Ecological Community are considered likely to be significant and warrant offsets. No other Commonwealth entity was assessed to have potential for a significant impact by the project.

In advance of the NSW BOS being endorsed by the Commonwealth (as of 15 March 2019 it is on public exhibition), the Wollar Solar Farm offset strategy retains flexibility. The strategy demonstrates that:

- Securing in perpetuity physical offsets within the study area are likely to be feasible.
- Similar vegetation occurs in the locality and could also be considered, if required, for physical offsets.

Payment options may also be considered, such as making payments into the NSW Biodiversity Conservation Fund using the offset payments calculator, or funding a biodiversity action.

¹ This is not related to the NSW Biodiversity Offset Scheme streamlined assessment, rather it represents concurrent Commonwealth and state assessment of all relevant MNES.

1 INTRODUCTION

The proposed Wollar Solar Farm is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP). This Biodiversity Development Assessment Report (BDAR) assesses the impacts of the proposed Wollar Solar Farm (the proposal) according to the NSW Biodiversity Assessment Methodology (BAM) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal. NGH Environmental has prepared this report on behalf of the proponent, Wollar Solar Development Pty Ltd.

The following terms are used in this document, as required for a BDAR:

- **Development footprint** – The area of land that is directly impacted on by the proposal. Including, solar array design, perimeter fence, access roads, transmission line footprint and temporary areas used to store construction materials etc. This is mapped on Figure 1-1.
- **Development site** – The broader area of land that may be affected by the proposal and to which the BAM is applied. For the purposes of conducting this BDAR, the development site extends 200m out from the development footprint where legal access to land could be obtained. This is mapped on Figure 2-7.
- **Study area** – The broader area of land surveyed as part of the assessment. In this case, all land within the affected lot boundaries. This is mapped on Figure 1-1 and referred to in the Environmental Impact Statement as the 'proposal site'.
- **Buffer area** – Land extending 1500m out from the development site used to assess native vegetation extent and other landscape features. This is mapped on Figure 3-1.

1.1 THE PROPOSAL

The proposed Wollar Solar Farm involves the construction, operation and decommissioning of a ground-mounted PV solar array. The study area is approximately 878 ha and would consist of associated infrastructure occupying around half the area (461 ha). Approximately 290MW (AC) of renewable energy would be generated and supplied directly to the national electricity grid. This would provide enough clean, renewable energy for about 104,926 average NSW homes while displacing approximately 515,564 metric tons of carbon dioxide annually.

Key development and infrastructure components would include:

- Approximately 922,432 PV solar panels mounted on either fixed or tracking systems, both of which are considered feasible:
 - Fixed-tilted structures in a north orientation at an angle of 32 degrees or
 - East-west horizontal tracking systems.
- Approximately 58 PCU composed of two inverters, a transformer and associated control equipment to convert DC energy generated by the solar panels to 33kV AC energy.
- Steel mounting frames with driven or screwed pile foundations.
- An onsite 330kV substation containing two transformers and associated switchgear to facilitate connection to the national electricity grid via the existing 330kV transmission line onsite.
- Underground power cabling to connect solar panels, combiner boxes and PCUs.
- Underground auxiliary cabling for power supplies, data services and communications.

- Buildings to accommodate a site office, indoor 33kV switchgear, protection and control facilities, maintenance facilities and staff amenities.
- Up to 1km of access track off Barigan Road to the site via the existing TransGrid substation access road, which would require construction of an access road between the Wollar substation and the proposed onsite substation.
- Internal access tracks for construction and maintenance activities.
- Space for a future energy storage facility with a capacity of up to 30MWh and comprising of lithium ion batteries with inverters.
- Perimeter security fencing up to 2.3m high.
- Native vegetation planting to provide visual screening for specific receivers, if any are required.

The construction phase of the proposal would take about 12 – 18 months and is anticipated to be operational for 30 years. When the solar farm is no longer viable, all above ground infrastructure, with the possible exception of the onsite substation, would be removed. Any cabling more than 500mm underground may be left in place as it would not impact future agricultural activities following rehabilitation of the site.

1.2 THE STUDY AREA

1.2.1 Site location

The Wollar Solar Farm proposal is within the Mid-Western Regional Local Government Area (LGA). Mudgee is the closest regional centre to Wollar, located approximately 38km south west of the study area. Owners of the study area are outlined in Table 1-1.

Table 1-1 Lots associated with potential development of the proposed Wollar Solar Farm

Lots and DP	Owner
Lots 22 - 25, 27, 30, 45, 49-51, 60-63, 69-80, 92, 105-107, 119 and 152-154 of DP 755430 and Lot 1 DP650653	Currently owned by one private landowner
Lots 46 and 84 of DP755430 and Lots 10 and 11 DP1090027	Peabody Energy Pty Ltd
Lots 1, 2, 4, 6, 8 DP1090027	TransGrid
Lot 7303 DP1139558	Crown Land
Lot 80 DP755430 and Lot 11 DP1090027	<ul style="list-style-type: none"> - Private land owner - Peabody Energy - TransGrid

1.2.2 Site description

The Wollar Solar Farm proposal is located on the western side of Barigan Road, approximately 7km south of Wollar Village. The proposal would be located on a property of about 878 ha of freehold land. The development site comprises mostly paddocks within flatter land or footslopes, which have been cleared for agricultural purposes, and an existing TransGrid 330kV transmission line that crosses the study area in the north eastern corner.

Key features of the development site include:

- Woodlands and hollow bearing trees of high conservation value.
- Areas of woodland and derived native grassland with high diversity in the groundcover stratum which are classified as Critically Endangered under the EPBC.
- Highly disturbed native vegetation that lacks native understory and forb diversity due to grazing practices (Not critically endangered).
- Fifteen dams.
- Two ephemeral watercourses and approximately eight other tributaries.
- Rocky outcrops

The proposed solar farm would connect to the existing TransGrid 330kV transmission line located to the north eastern corner of the development site. Refer to Figure 1-1 below.

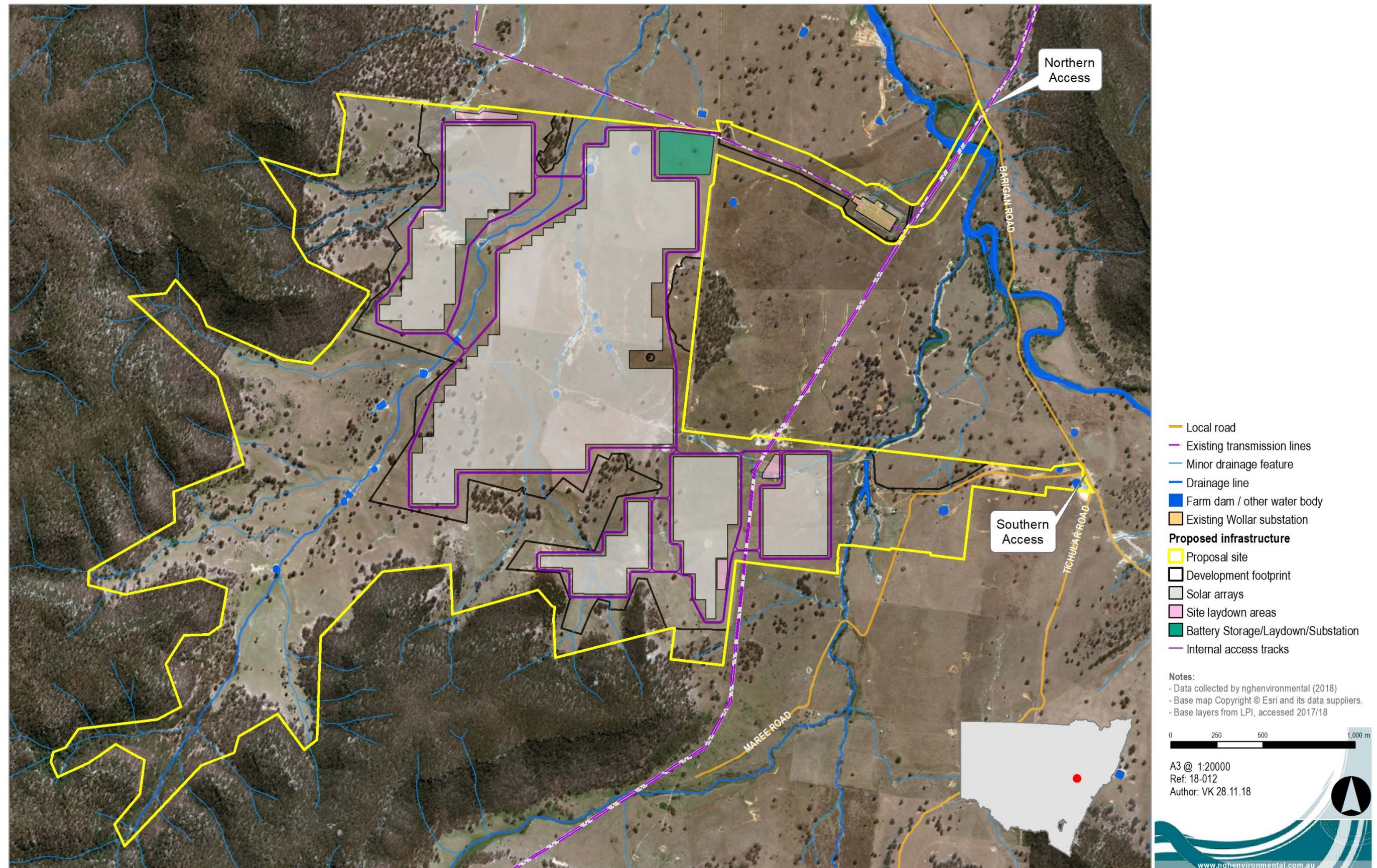


Figure 1-1 Study Area and Development Footprint Map

1.3 STUDY AIMS

This BDAR has been prepared by NGH Environmental on behalf of Wollar Solar Development Pty Ltd.

The aim of this BDAR is to address the requirements of the NSW *Biodiversity Conservation Act 2016* (BC Act), as required in the Secretary's Environmental Assessment Requirements (SEARs) and summarised below.

Secretary's Environmental Assessment Requirement	Where addressed
<p>The EIS must address the following specific issues:</p> <ul style="list-style-type: none"> • Biodiversity – including an assessment of the biodiversity values and the likely biodiversity impacts of the development in accordance with the Biodiversity Conservation Act 2016 (NSW), a detailed description of the proposed regime for minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy to offset any residual impacts of the development in accordance with the Biodiversity Conservation Act 2016 (NSW). 	Sections 7.1

No additional or specific threatened species, populations or communities were specified in the SEARs or by the NSW Office of Environment and Heritage (OEH) for consideration.

This BDAR also addresses the assessment requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Provided in Appendix B.

1.4 SOURCES OF INFORMATION USED IN THIS ASSESSMENT

The following information sources were used in this BDAR:

- Proposal layers, construction methodology and concept designs provided by Green Switch.
- Australian Government's Species Profiles and Threats (SPRAT) database
<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- NSW OEH's Threatened Species Profiles
<http://www.environment.nsw.gov.au/threatenedspeciesapp/>
- DPI profiles of threatened species, population, and ecological communities
Commonwealth Department of Environment and Energy Protected Matters Search Tool
Accessed online at <http://environment.gov.au/epbc/protected-matters-search-tool>
- Clean Energy Council of Australia website accessed online at
<https://www.cleanenergycouncil.org.au/technologies/geothermal.html>
- Windpower Engineering and Development website accessed online at
<https://www.windpowerengineering.com/projects/guidelines-selecting-sites/>
- Australia's IBRA Bioregions and sub-bioregions. Accessed
<http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps>
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- Lumsden L.F & Micaela J.L (2015). National Recover Plan for Southern Bent-wing Bat. Dept of Land, Water and Planning, Melbourne.

- NSW Government SEED Mapping
- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method.
- NSW OEH's Biodiversity Assessment Method (BAM) calculator (<http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx>).
- NSW Biodiversity Values Map
<https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap>
- NSW OEH's BioNet threatened biodiversity database
Accessed online via login at <http://www.bionet.nsw.gov.au/>.
- NSW OEH Threatened Species Profiles
<http://www.environment.nsw.gov.au/threatenedSpeciesApp/> and
www.environment.nsw.gov.au/AtlasApp/UI_Modules/
- OEH BioNet Vegetation Classification Database (OEH 2017)
Accessed online via login at <http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx>
- OEH VIS Mapping
- Mitchell, P. 2002 Descriptions for NSW Mitchell Landscapes version 2, NSW National Parks and Wildlife Service, Hurstville.
- NSW Planning portal online <https://www.planningportal.nsw.gov.au/find-a-property>

1.5 CONSULTATION

Table 1-2 Consultation with relevant departments.

Date	Contact	Reason	Outcome
24/09/18	Shannon Simpson, OEH Ecosystem Assessment Project Officer	To determine areas of mapped 'important areas' for the Swift Parrot and Regent Honeyeater.	'Important areas' for the Swift Parrot do not occur near to the site. The development footprint was refined to ensure no 'important areas' for the Regent Honeyeater would be impacted.

2 LANDSCAPE FEATURES

2.1 IBRA BIOREGIONS AND SUBREGIONS

Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features, and flora and fauna communities. The development site is located within the NSW Sydney Basin Bioregion, in the Kerrabee subregion. The bioregion is characterised by warm summers and no dry season. The geology is characteristic of the Sydney-Bowen Basin, comprised of Carboniferous and Triassic marine volcanic sediments, creating a landscape of elevated plateaued sandstone for the most part of the basin, and sandstone and conglomerate cliff lines of Permian sediments to the south and west.

The dominant IBRA subregion impacted by the proposal is the Kerrabee subregion. This was entered into the BAM Calculator for the proposal.

2.2 NSW LANDSCAPE REGIONS AND AREA

The development site is in the Upper Goulburn Valleys and Escarpment Landscape. This landscape as described by Mitchell, 2002 is distinguished by steep hills and escarpments with rock outcrops on a mix of quartz sandstone, lithic sandstone and conglomerate and shale, making up harsh texture-contrast soils. Woodland in this area generally consists of grey box (*Eucalyptus moluccana*), forest red gum (*Eucalyptus tereticornis*), white box (*Eucalyptus albens*) and yellow box (*Eucalyptus melliodora*).

Upper Goulburn Valleys and Escarpment Landscape was entered into the BAM Calculator for the proposal.

2.3 NATIVE VEGETATION

As determined by GIS mapping from aerial imagery, approximately 3408 ha of native vegetation occurs in the 1500m buffer area. The native vegetation in the landscape surrounding the development is considered to be predominantly grassy woodland on the Wollar Valley flats comprising White Box (*Eucalyptus albens*), Blakely's Red gum (*Eucalyptus blakelyi*), Rough-barked Apple (*Angophora floribunda*), Grey Box (*Eucalyptus moluccana*) and Yellow Box (*Eucalyptus melliodora*). Black Cypress (*Callitris endlicheri*) as well as White Box (*Eucalyptus albens*) dominate the foot slopes and steeper hilly terrain. Vegetation zones containing derived native grasslands inside the development footprint were also added to the figure above.



Figure 2-1 Example of native vegetation found within the Development Site

2.4 CLEARED AREAS

Cleared areas in the development site is primarily land where there is evidence of past ploughing/cultivation and where infrastructure is located (i.e. the substation and farm buildings). These areas provide limited foraging habitat for native species. Grass and weed seeds would provide some food for parrots and rodents which in turn would provide foraging habitat for raptors. Introduced species such as foxes and rabbits also occur. Around 423 ha (41%) of cleared areas exists within the development site with photographic examples illustrated within Figure 2-2 Example of cleared areas within the development site below. Cleared areas also include farm houses, sheds and the substation.



Figure 2-2 Example of cleared areas within the development site

2.5 RIVER AND STREAMS

Spring Flat Creek (Figure 2-3) traverses the middle of the development site in a south-west to north-east direction and discharges into Wollar Creek approximately 2.5km north of the development site. This creek is also a fourth order stream under the Strahler stream classification system (Strahler, 1952). There are eight unnamed tributaries of Spring Flat Creek which traverse throughout the development site. The development site also contains fifteen farm dams; four to the south west, nine to the centre and two to the south east. According to Mid-Western Regional Council online mapping, the development site is not subject to flooding or groundwater vulnerability.

Wollar Creek (Figure 2-4) dissects the western portion of the development site. This creek is a fourth order stream under the Strahler stream classification system (Strahler, 1952).



Figure 2-3 Left: Spring Flat Creek south west of the development site leading into a dam; Right: Spring Flat Creek within north of portion of the development site



Figure 2-4 Left: Wollar Creek directly south of property access track creek crossing, Right; Wollar creek running underneath access track creek crossing to electricity substation.

2.6 WETLANDS

No wetlands occur in or adjacent to the development site. The nearest important wetland listed under the EPBC Act is the Hunter estuary wetlands, which is 150 – 200 km upstream of the locality.

A search of the 1:25000 topographic map reveals no wetlands in or adjacent to the development site.

2.7 CONNECTIVITY FEATURES

There are no significant connectivity features within the development site.

Small patches of treed Box Gum Woodland directly south of the development site provide some minor connectivity value, mainly for highly mobile species such as birds. Tree canopy connectivity is broken by open paddocks devoid of trees, which are mainly used for grazing and cultivation.

The connectivity of native grasslands is more significant for the site. The Wollar Valley has a patchy distribution of both exotic and native pastures. The proposed solar farm is not expected to disrupt connectivity of native grasslands when consideration is given the large area of native grasslands surrounding the development site that exist within Wollar Valley (~8000ha). Also native groundcover will not be specifically targeted for removal underneath the solar panel arrays.

Spring Flat Creek, although a fourth order watercourse, is largely ephemeral and did not contain much tree cover. There was no observed ponded water at the time of inspection in May 2018. The creek appears to have a wide flat area for distribution of water where much of it would lie underground. The designated 40 metre buffer zone either side of the bank was largely devoid of trees and shrubs and is considered highly degraded (see Figure 2-3).

2.8 AREAS OF GEOLOGICAL SIGNIFICANCE

There are no karsts, caves, crevices or cliffs or other areas of geological significance within the development site. These features do occur in the surrounding vegetated ridgelines but will not be directly or indirectly impacted. There is a distinct band of Narabeen Sandstone outcropping along the 70-80m contour line south and west of the development site as can be seen in Figure 2-5 below.



Figure 2-5 Sandstone outcropping found adjoining the development site to the south and west.

2.9 AREAS OF OUTSTANDING BIODIVERSITY VALUE

Two areas of Outstanding Biodiversity Value occur within the development site (NSW Biodiversity Values Map); Spring Flat Creek in the centre of the site and Wollar Creek to the south-east (Figure 2-6). The development layout avoids placement of solar panels inside the 40m buffer on either side of Spring Flat Creek. There will be up to two waterway crossings to cross the creek, however. No impacts are required for the use of an existing crossing over Wollar Creek.



Figure 2-6 Map of biodiversity values sourced from NSW Government online showing Spring Flat Creek as having biodiversity value.

For Spring Flat Creek, erosion and waterway protection would be ensured by designing waterway crossings in accordance with the following:

- *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge, 2003).*
- *Policy and Guidelines for Fish Friendly Waterway Crossings (NSW DPI, 2003).*
- *Guidelines for Watercourse Crossings on Waterfront Land (NSW DPI, 2012).*

2.10 SITE CONTEXT COMPONENTS

Method applied

The proposal conforms to the definition of a *site-based development* under the Biodiversity Assessment Methodology. The site-based development assessment methodology has been used in this BAM assessment.

Percent Native Vegetation Cover

The Percent Native Vegetation Cover within the 1500 m buffer area surrounding the development site prior to the development was calculated to be 74%. This was entered into the BAM calculator for the proposal.

Percent Native Vegetation was calculated by estimating the presence of any native vegetation based on aerial imagery within the 1500m buffer. Unless verified by visual inspection, areas containing grasslands inside the 1500 m buffer were assumed to be non-native grasslands because of existing farming operations in the surrounding landscape and because it could not be verified by site survey. The landscape surrounding the Wollar property contained similar land management practises and it was therefore assumed that groundcover was primarily dominated by native species.

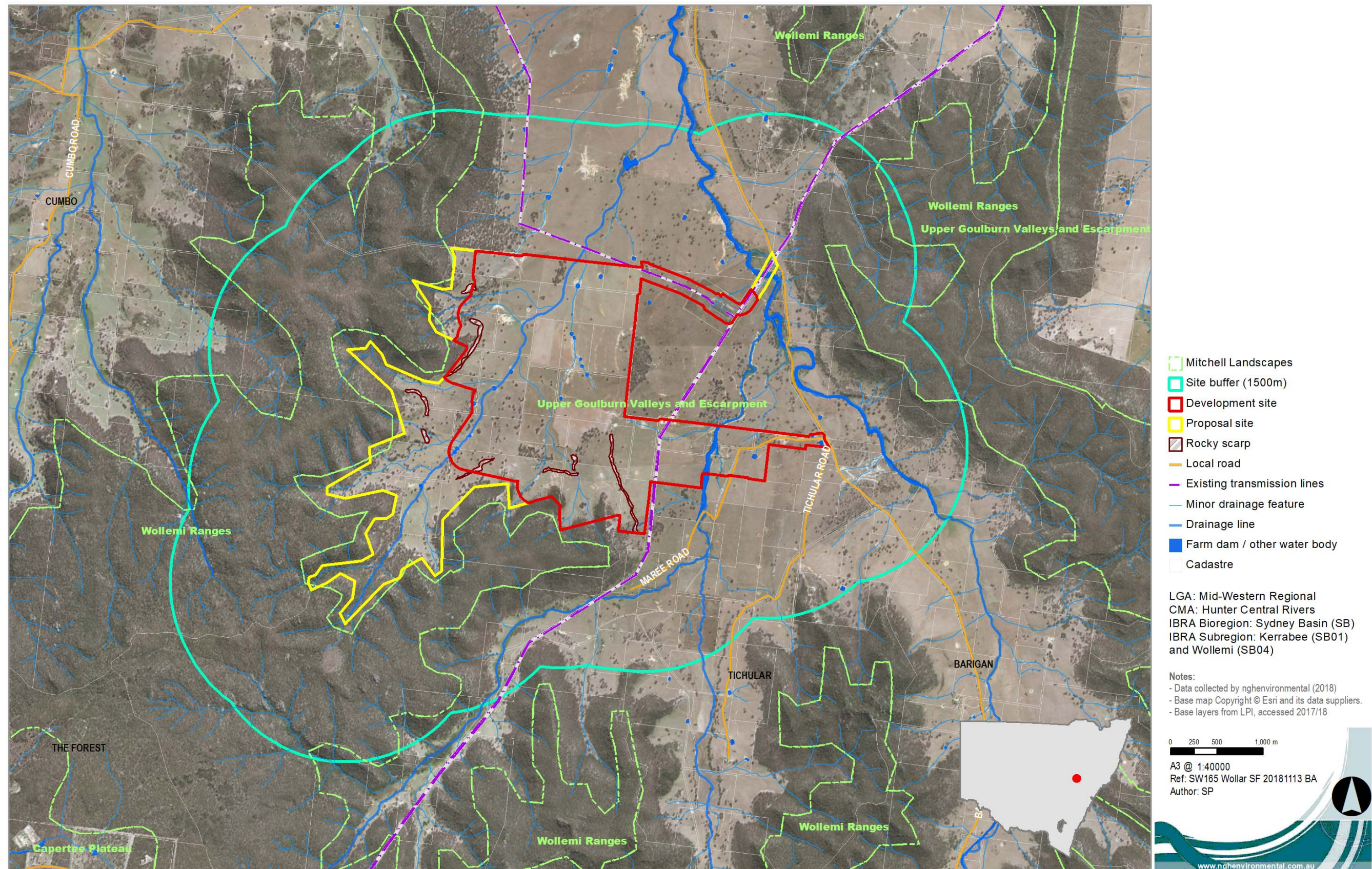


Figure 2-7 Location map, showing development site and proposal site (study area)

3 NATIVE VEGETATION

3.1 NATIVE VEGETATION EXTENT

Approximately 537 ha (86%) of native vegetation occurs within the development site in two main condition states being remnant Box Gum Woodland and derived native grassland (of varying conservation value).

The remaining 87ha (14%) of the development site either contains non-native vegetation or infrastructure (such as Wollar substation, ploughed paddocks with no trees, farm houses and farm sheds). For areas not containing infrastructure, exotic species such as Lucerne (*Medicago sativa*), Rye Grass (*Lolium perene*), Wild Oats (*Avena fatua*) and Barley Grass (*Hordeum leporinum*) were observed growing in cultivated paddocks. Other areas were observed to contain freshly ploughed country that did not contain any groundcover (May and August 2018). These areas do not contain native vegetation or provide any threatened species habitat and are not assessed further.

Five paddock trees occur throughout the development site (see Table 3-4 zones 4 & 7). These trees were assessed using the Paddock Trees module because the vegetation met the following definition:

- I. In terms of the groundcover, there was less than 50% cover of indigenous species, and
- II. greater than 10% of the area was covered with vegetation (whether dead or alive), and
- III. the assessment was made at the time of year suitable for groundcover assessment (Spring), and
- IV. foliage cover for the tree growth form group was less than 25% of the benchmark for tree cover for the most likely PCT (See Zone 4 & 7 of Table 3-4).

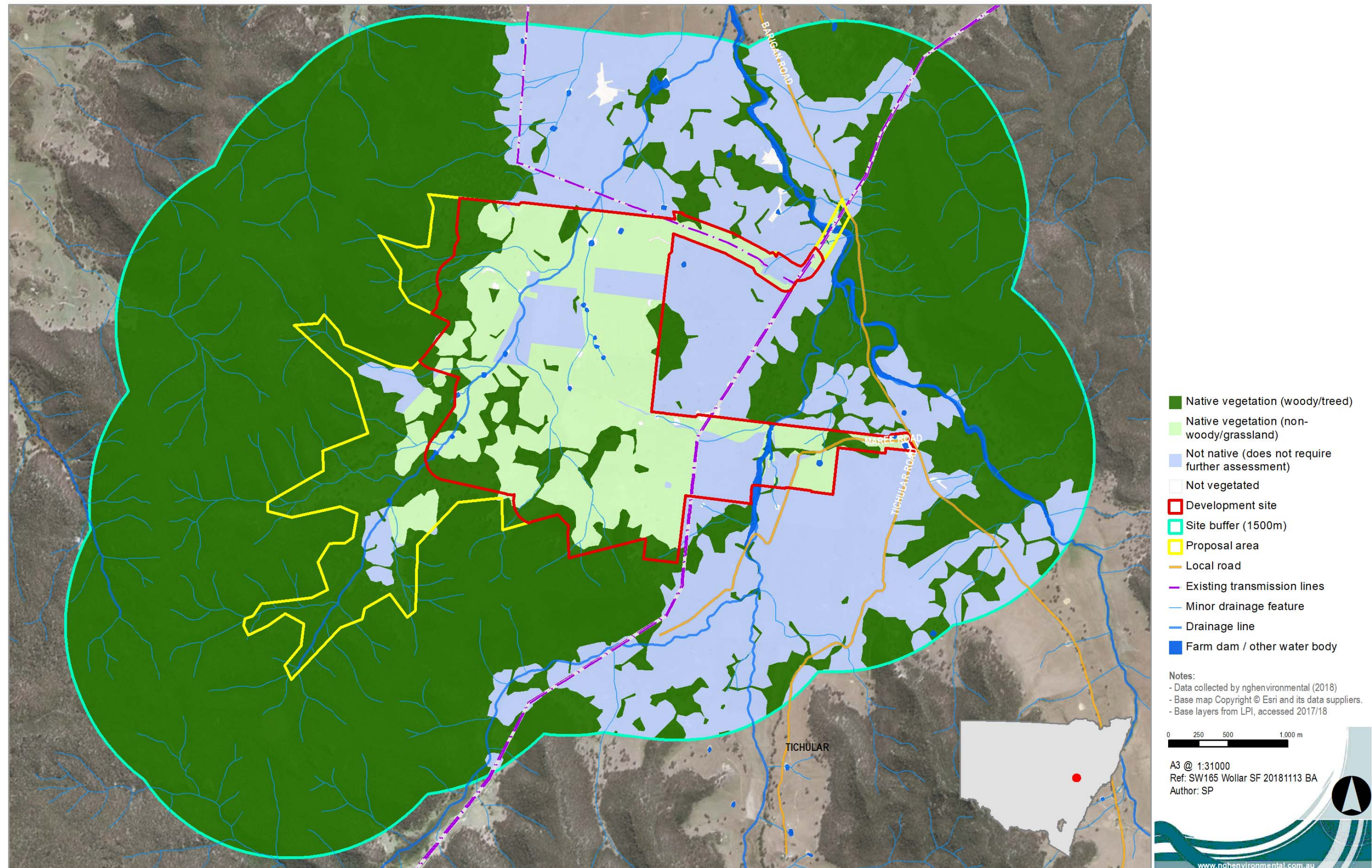


Figure 3-1 Native vegetation extent within the development site

3.2 PLANT COMMUNITY TYPES (PCTS)

3.2.1 Methods to assess PCTs

Review of existing information

A search was undertaken of OEH Vegetation Information System (VIS) database and NSW SEED mapping to access existing vegetation mapping information within the development site. One relevant vegetation map was found covering the Development site.

- *SEED Mapping – Sharing and Enabling Environmental Data (2017).*
 - o Central Tablelands Vegetation [API. VIS_ID 4163]

Existing vegetation mapping is largely absent in covering the Wollar Valley. Therefore PCT classification primarily relied on;

- Species noted during survey in May and August 2018,
- Landscape setting and whether the vegetation was found on a valley floor, foot slope or steeper hilly terrain,
- Geology and observation of soils onsite.

Floristic survey

A preliminary environmental assessment involving field work was conducted within the Wollar property on the 6th and 7th of February 2018. The site was surveyed by a senior ecologist accredited under the BAM. The inspection involved identifying biodiversity constraints and vegetation mapping within the study area. PCTs were determined based on the presence of diagnostic species via a rapid assessment and recording of dominant species within each stratum. No floristic plots were undertaken.

Following the initial site inspection, the client requested additional areas for assessment outside of the original survey area. A desktop assessment was carried out and compared to adjacent areas surveyed to stratify the vegetation within new areas based on landscape morphology such as topography and aspect.

A second survey was conducted from the 22nd to the 24th May 2018 by two ecologists accredited under the BAM and one graduate ecologist. The field work involved carrying out final stratification of vegetation onsite to adequately inspect areas not inspected from the initial site inspection. Collection of vegetation integrity plot data commenced. Six vegetation integrity plots, of 20m by 50m were established in homogenous vegetation zones. Data was collected on the composition, structure and function of the vegetation. The methodology conducted was consistent with the methodology presented in the BAM 2017 by persons trained in the BAM.

The number of plots undertaken did not meet the minimum number of plots required by the BAM. Therefore further surveys were conducted onsite in October to complete the density of plot survey required for each validated vegetation zone inside the development footprint. A total of thirty-two plots were collected to adequately survey for all eight validated vegetation zones onsite.

3.2.2 PCTs identified on the development site

Three PCTs were identified within the development site:

- White Box – Grey Gum – Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion, White Box - Grey Gum - Kurrajong grassy woodland on northern Capertee Valley, Sydney Basin Bioregion (PCT 1303)
- Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (PCT 281), and
- White Box - Black Cypress Pine shrubby woodland of the Western Slopes (PCT 1610).

A description of each PCT follows in Table 3-1 to Table 3-3. See Figure 3-2 for mapping of PCTs within the development site.

Table 3-1 Description of PCT 1303 within the development site

PCT name White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion		
Vegetation formation	Grassy Woodlands	
Vegetation class	Western Slopes Grassy Woodlands	
Vegetation type	PCT ID	1303
	Common Name Community	White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion
Approximate extent within the development site	<p>Overall, 309 ha of PCT 1303. There are three broad condition states;</p> <p>1) 49 ha of 1303_Box Gum Woodland (Zone 1)</p> <p>2) 225 of 1303_Derived Native Grassland (Zone 2)</p> <p>3) 336 of 1303_Cultivated Low Condition (Zone 3)</p> <p>4) 12.8 ha of 1303_Exotic (1 paddock tree) (Zone 4)</p>	
Species relied upon for PCT identification	Species name	
	<i>Eucalyptus moluccana</i> (observed outside plot)	
	<i>Eucalyptus albens</i> (present within two plots)	
	<i>Bursaria spinosa</i> (observed outside plot)	
	<i>Brachychiton populneus</i> subsp. <i>populneus</i> (present within one plot)	
	<i>Austrostipa scabra</i> (present in three plots)	
Justification of evidence used to identify the PCT	<p>This Box Gum Woodland occurs on lower slopes of the Wollar Valley and is generally associated with a north westerly aspect. It has been subjected to past disturbances caused by land clearing and farming practises. <i>Eucalyptus albens</i> was dominant over the landscape with lesser dominant <i>E. moluccana</i>. Groundcover species diversity was high with the most prevalent groundcover species being <i>Bothriochloa macra</i>. This PCT, although not known to occur in Kerrabee Subregion is the best PCT match based on site observations, plot data, landscape setting and soils. PCT 1303 occurs within Capertee Valley which occurs on Narrabeen Sandstone geology of which Wollar Valley has very similar traits.</p> <p>A shortlist of other PCTs revealed;</p>	

PCT name White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion

PCT 483

- This PCT contains the best floristic match however, landscape position and distribution of Wollar Valley did not match with descriptions for this PCT. Wollar Valley does not contain black earths or chocolate soils derived from Basalt. Wollar Valley contains sandy alluvium derived from Narabeen Sandstone geology which is more closely related to PCT 1303 (similar landscape to Capertee Valley).

PCT 496

- Equal floristic matches but weak distribution.

PCT 266

- *Eucalyptus moluccana* absent in the upper stratum which was observed to be associated within the zone (although not captured in plots).

TEC Status

This vegetation forms part of the listed EEC: White Box Yellow Box Blakely's Red Gum Woodland listed under the BC Act.

Estimate of percent cleared

90%

Examples



VI Plot 1

PCT name White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion



VI Plot 4

Table 3-2 Description of PCT 281 inside the development site.

PCT name: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion		
Vegetation formation	Grassy Woodlands	
Vegetation class	Coastal Valley Grassy Woodlands	
Vegetation type	PCT ID	281
	Common Name	Community Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Approximate extent within the development site	Overall, 296 ha of PCT 281. There are three broad condition states; 1) 40 ha of 281_Box Gum Woodland (Zone 5) 2) 224 ha of 281_Derived Native Grassland (Zone 6) 3) 32 ha of 281_Exotic (4 Paddock trees) (Zone 7)	
	Species name	

PCT name: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Species relied upon for PCT identification

Eucalyptus blakelyi (2 plots)

Eucalyptus albens (one plot)

Angophora floribunda (outside plot)

Eucalyptus melliodora (outside plot)

Microlaena stipoides (2 plots)

Bothriochloa macra (one plot)

Justification of evidence used to identify the PCT

This Box Gum Woodland occurs on the Wollar Valley and is generally associated with Spring Flat Creek. It has been subjected to past disturbances caused by land clearing and farming practises. *Angophora floribunda* was dominant over the landscape with equal numbers of *Eucalyptus blakelyi* and lesser dominant *Eucalyptus melliodora*. Groundcover species diversity was high with the most prevalent groundcover species being *Microlaena stipoides* and *Bothriochloa macra*. This PCT is known to occur in Kerrabee Subregion and was the best PCT match based on site observations and comparison to plot data.

A shortlist of other PCTs revealed;

PCT 618 - *White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley*

- Strong floristic match but *Eucalyptus blakelyi* was not present in the upper stratum.

PCT 85 - *River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion*

- Strong floristic match but PCT not found inside Kerrabee subregion.

PCT 266 - *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*

- Strong floristic match but no *Angophora floribunda*, the key dominant species in the upper stratum for this vegetation zone.

TEC Status

This vegetation forms part of the listed EEC: White Box Yellow Box Blakely's Red Gum Woodland.

Estimate of percent cleared

94%

PCT name: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Examples




VI Plot 2



VI Plot 5

Table 3-3 Description of PCT 1610 in the development site

PCT name White Box - Black Cypress Pine shrubby woodland of the Western Slopes		
Vegetation formation	Dry Sclerophyll Forest	
Vegetation class	Western Slopes Dry Sclerophyll Forests	
Vegetation type	PCT ID	1610
	Common Name Community	White Box - Black Cypress Pine shrubby woodland of the Western Slopes
Approximate extent within the development site	<p>Overall, 77.5 ha of PCT 1610. There were two broad condition states within the development site;</p> <p>1) 61.3 ha of 1610_Degraded (Zone 8)</p> <p>2) 16.2 ha of 1610_Forested (0 ha found inside the development footprint but present inside the development site)</p>	
Species relied upon for PCT identification	Species name	
	<i>Eucalyptus albens</i> (observed outside plot)	
	<i>Callitris endlicheri</i> (observed outside plot)	
	<i>Calotis lappulacea</i> (inside one plot)	
	<i>Vittadinia cuneata</i> (inside one plot)	
	<i>Cassinia arcuata</i>	
Justification of evidence used to identify the PCT	<p>This PCT occurs on the steeper foothills of the Wollar Valley above a distinct sandstone escarpment. The lower parts of this PCT have been subjected to past land clearing and farming practises. <i>Eucalyptus albens</i> was the dominant tree with disturbed areas being dominated by thick regeneration of <i>Callitris endlicheri</i> and <i>Acacia ixiophylla</i>. Groundcover species diversity was high with the prevalence of <i>Calotis lappulacea</i>, <i>Vittadinia cuneata</i> and <i>Bothriochloa macra</i>, <i>Themeda australis</i> and <i>Stipa sp.</i> This PCT is known to occur in Kerrabee Subregion and was the best PCT match based on site observations during field survey.</p> <p>A shortlist of other PCTs revealed;</p> <ul style="list-style-type: none"> • PCT 281 - <i>Rough-Barked Apple</i> - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion -The upper stratum species did not contain <i>Callitris endlicheri</i> which was a dominant species within disturbed parts of this vegetation zone. • PCT 412 - <i>White Box</i> - Black Cypress Pine shrubby hill woodland in the east Pilliga - Mendooran - Gulgong regions, mainly Brigalow Belt South Bioregion. 	

PCT name White Box - Black Cypress Pine shrubby woodland of the Western Slopes	
	<ul style="list-style-type: none"> - Incorrect distribution of this PCT. It was not found within Sydney Basin Bioregion. • PCT 434 - <i>White Box grass shrub hill woodland on clay to loam soils on volcanic and sedimentary hills in the southern Brigalow Belt South Bioregion</i> <ul style="list-style-type: none"> - PCT not distributed within Kerrabee Subregion.
TEC Status	Not associated with a TEC.
Estimate of percent cleared	40%
Examples	 <p>PCT 1610_Forest</p>

PCT name White Box - Black Cypress Pine shrubby woodland of the Western Slopes



PCT 1610_Degraded

3.3 VEGETATION INTEGRITY ASSESSMENT

3.3.1 Vegetation zones and survey effort

The random meander, overview inspection and detailed floristic plots have been used to assist in the delineation of vegetation zones. Three PCTs were identified in the development site. Each of the PCTs were further stratified into additional zones on the basis of their condition or other environmental variables. All three PCTs were further stratified and this was on the basis of presence/absence of trees and noticeable differences in groundcover composition, especially the abundance of native species. All vegetation zones including photos of each are shown in Table 3-1 to Table 3-3 and mapped in Figure 3-2.

The number of plots undertaken meets the minimum number of plots required by the BAM for vegetation zones 1-7. A total of thirty-two plots were collected to adequately survey for all eight validated vegetation zones onsite.

Representative plots were undertaken within 'exotic/paddock tree' areas to confirm that the vegetation integrity score was less than 15 and did not require offsetting.

3.3.2 Paddock trees

Five paddock trees occur inside the development site within 'Exotic groundcover' within Zone 4 & 7 (see Table 3-4 below). Tree species included White Box (*Eucalyptus albens*) which was assigned to PCT 1303. Remaining species included Rough-barked Apple (*Angophora floribunda*), Blakley's Red Gum (*Eucalyptus blakelyi*) and Yellow-box (*E. melliodora*) which were assigned to PCT 281. As none of the paddock trees had hollows, most of the threatened candidate species identified by the BAM Calculator are not considered to utilise these trees. The only exception would be the Little Eagle where there is evidence of these birds utilising paddock trees as potential nesting areas. Where targeted fauna surveys were required for the BAM Calculations, paddock trees were also included in surveys for inspection of raptor nests. More details are included under Section 4 and 5.

All paddock trees were mapped in the field using a handheld GIS Tablet. Trees were identified to genus and species. The Diameter at Breast Height (DBH) of the tree was assessed and assigned a paddock tree class relevant to the large tree benchmark. The Large tree benchmark for PCTs 1303 and 281 is 50cm DBH. The trees were visually assessed from the ground to determine whether any hollows were present. The paddock trees occurring in the development site are shown within zones 4 and 7 in Table 3-4 below.

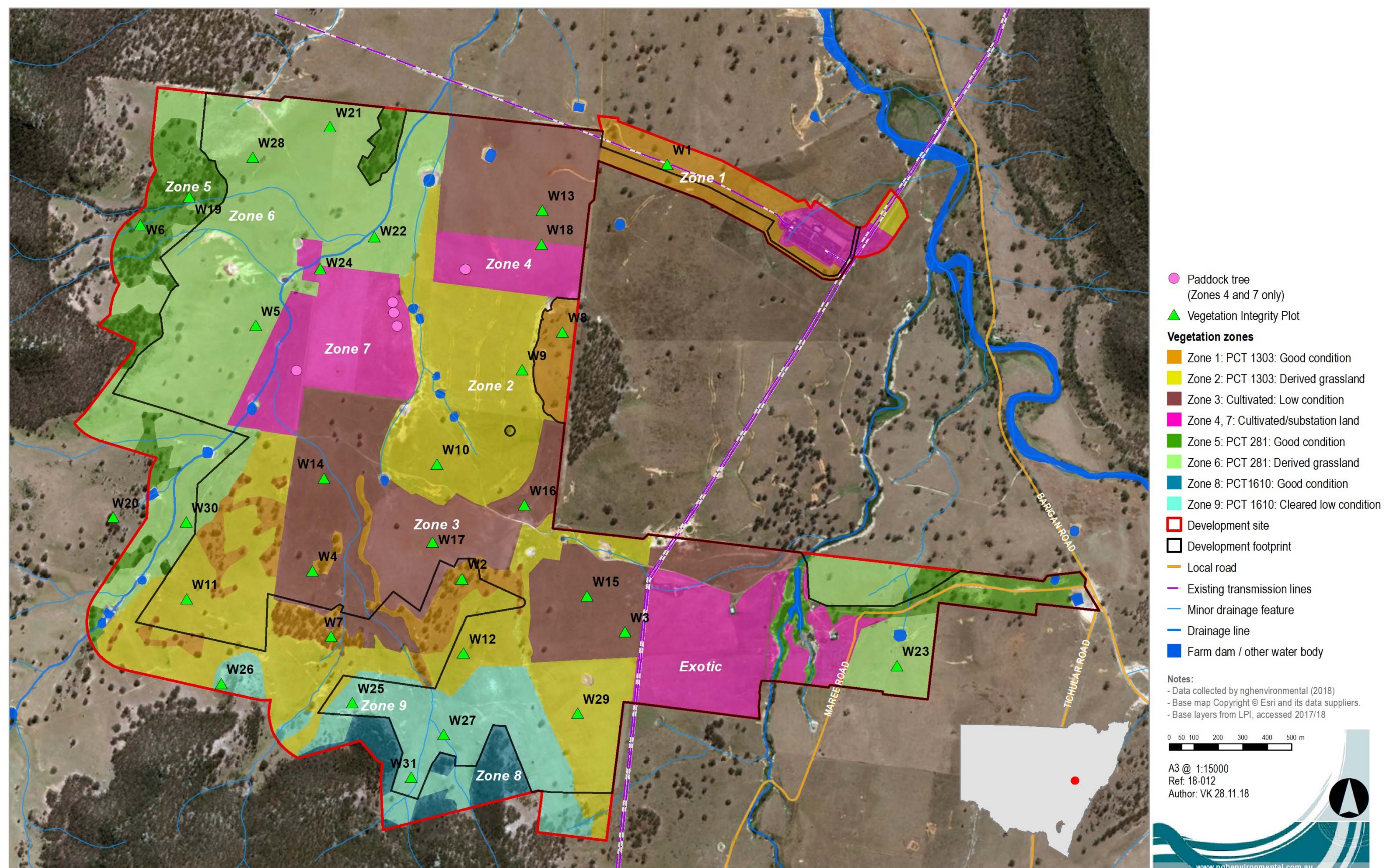










Figure 3-2 Vegetation zones, PCTs and representative Vegetation Integrity plots for development site

Table 3-4 Vegetation zones within the development footprint (impact area)

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (Number of plots)	Patch size (ha)	Examples
1	1303	Box Gum Woodland PCT containing tree cover (although sparse in some sections) and with diverse mix of native and exotic groundcovers. Considered to be in moderate condition. This woodland is a TEC under EPBC and BC Act.	16.45	3 plots required (4 plots collected on site includes W1, W6, W7, W8)	101	
2	1303	Derived Native Grassland PCT lacking most trees and with a mix of native and exotic groundcovers. Considered to be in moderate to low condition. This zone is still classified as a TEC under the EPBC and BC Act.	102.3	6 plots required (6 collected including W4, W9, W10, W11, W12, W29)	101	

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (Number of plots)	Patch size (ha)	Examples
3	1303	<p>Cultivated Low Condition</p> <p>This vegetation zone has been cultivated in the past and Red Grass (<i>Bothriochloa macra</i>) now colonises this zone. High threat weed Saffron (<i>Carthamus lanatus</i>) also dominated this area. This zone is degraded in diversity but still classified as TEC under the BC Act, because it achieves a vegetation integrity score greater than 15.</p>	110.8	6 Plots required (6 collected including plots W3, W13, W14, W15, W16, W17).	101	
4	1303	<p>Exotic Ground Cover – 1 Paddock tree</p> <p>This zone comprised of 1 mature non-hollow bearing White Box tree (<i>Eucalyptus albens</i>) existing within cultivated land containing exotic groundcover (photos illustrates the paddock tree). The overall canopy cover for this vegetation zone was less than 25% of the lower benchmark for PCT 1303. This tree was classified as class 3. This vegetation zone is not classified as TEC. This paddock tree is classified as a class 3 tree and assessed accordingly with use of the paddock tree tool. The trees are not seen to provide habitat for any species credit species generated within BAM assessment.</p>	12.83	One Plot (W18) carried out to confirm groundcover species composition dominated by exotics (>80%) and lack of native groundcover.	NA	

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (Number of plots)	Patch size (ha)	Examples
5	281	Box Gum Woodland PCT containing tree cover of Rough-barked Apple (<i>Angophora floribunda</i>) (although sparse in some sections) and with diverse mix of native and exotic groundcovers. Considered to be in moderate condition. This woodland is a TEC under EPBC and BC Act.	12.61	3 Plots required. (3 collected including W2, W19 and W20)	101	
6	281	Derived Native Grassland PCT lacking most trees and with a mix of native and exotic groundcovers. Considered to be in moderate to low condition. This zone is still classified as a TEC under EPBC and BC Act.	101.5	6 Plots required. (6 collected including W5, W21, W22, W23, W28 and W30)	101	

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (Number of plots)	Patch size (ha)	Examples
7	281	Exotic Groundcover – 4 paddock trees This zone comprised of 4 mature non-hollow bearing paddock trees (2 x Eucalyptus melliodora, 1 x E. blakelyi, 1 x Angophora floribunda) existing within cultivated land containing exotic groundcover. The overall canopy cover for this vegetation zone was less than 25% of the lower benchmark for PCT 281. These paddock trees are classified as class 3 trees and assessed accordingly with use of the paddock tree tool. The trees are not seen to provide habitat for any species credit species generated within BAM assessment. Photo illustrates the two Yellow-Box gums assessed as paddock trees.	34.64	One Plot (W24) carried out to confirm groundcover species composition dominated by exotics (>80%) and lack of native groundcover.	NA	
	1610	Good This vegetation zone is not a TEC under EPBC or BC Act. This zone is not within the development footprint but is within the development site. As such it is not considered as a vegetation zone for assessment in BAM C.	0	NA	NA	


Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (Number of plots)	Patch size (ha)	Examples
9	1610	Degraded PCT subjected to past clearing and is now is regenerating thickly with Black Cyprus Pine (<i>Callitris endlicheri</i>) and Sticky-leaved Wattle (<i>Acacia ixiophylla</i>). This vegetation zone is not a TEC under EPBC or BC Act.	26.86	4 collected including W25, W27, W31 and W32.	101	

Table 3-5 Paddock trees within the development site

ID	Easting	Northing	Species	Common Name	DBH(cm)	DBH above benchmark (50cm)	Paddock Tree Class	Hollows Present	Impacted by proposal	Vegetation Zone/PCT
1	776316	6410068	<i>E. albens</i>	White Box	82	Yes	3	no	Yes	4/1303
2	776042	6409984	<i>E. blakelyi</i>	Blakely's Red Gum	72	Yes	3	no	Yes	7/281
3	776015	6400957	<i>E. melliodora</i>	Yellow Box	70	Yes	3	no	Yes	7/281
4	776024	6409856	<i>E. melliodora</i>	Yellow Box	95	Yes	3	no	Yes	7/281
5	775585	6409691	<i>A. floribunda</i>	Rough-barked Apple	76	Yes	3	no	Yes	7/281

3.3.3 Vegetation integrity assessment results

The results of the plot field data can be found in Appendix A.

The plot data from the vegetation integrity survey plots were entered into the BAM calculator. The results of the vegetation integrity assessment are provided in Table 3-5.

Table 3-6 Data used in BAM Calculator for this BDAR assessment based on current development proposal

Vegetation Zone	Plot collected during May 18	Plots collected during Oct 18	Number of plots required by BAM	Approach taken BAM calculator (BAM C)
Veg zone 1 1303_BoxGumWL	2	2	3	4 plots entered.
Veg zone 2 1303_DerivedNativeGL	1	5	6	All plots entered into BAM C
Veg Zone 3 1303_Cultivated Low	1	5	6	All plots entered into BAM C
Veg Zone 4 1303 Exotic (Paddock trees)	0	1	NA	Paddock tree data entered into BAM C. One plot confirmed exotic groundcover
Veg Zone 5 281 BoxGumWL	1	2	3	All plots entered into BAM C
Veg Zone 6 281 DerivedNativeGL	1	5	6	All plots entered into BAM C
Veg Zone 7 281 Exotic (paddock trees)	0	1	NA	Paddock tree data entered into BAM C. One plot confirmed exotic groundcover
Veg Zone 8 1610 Degraded	0	4	4	All plots entered into BAM C

Field plot data collected in May 2018 can be found in Appendix A.1.2 and representative photos of each plot are shown in Appendix A.1.1. Data from the vegetation integrity survey plots (where collected onsite) was entered into the BAM calculator. Sources of data used for the BAM calculator can be seen in table 3-6 above. The results of the vegetation integrity assessment are provided in Table 3-7 below.

Table 3-7 Table of current vegetation integrity scores for each vegetation zone within the development site.

Zone ID	Composition score	Structure score	Function score	Vegetation Integrity Score
Veg zone 1 1303_BoxGumWL	60.2	83.6	20.9	47.2
Veg zone 2 1303_DerivedNativeGL	59	38.3	0.4	9.4
Veg Zone 3 1303_Cultivated Low	39.4	15.3	2.5	11.4
Veg Zone 4 1303 Exotic (Paddock trees)	NA	NA	NA	NA
Veg Zone 5 281 BoxGumWL	71	62.3	73.3	68.7
Veg Zone 6	58.7	27.1	1.1	11.9

Zone ID	Composition score	Structure score	Function score	Vegetation Integrity Score
281 DerivedNativeGL				
Veg Zone 7 281 Exotic (paddock trees)	NA	NA	NA	NA
Veg Zone 8 1610 Forest	35.7	4.7	0.1	2.3

4 THREATENED SPECIES

4.1 ECOSYSTEM CREDIT SPECIES

The following ecosystem credit species were returned by the calculator as being associated with the PCTs present on the development site.

Table 4-1 Ecosystem Credit Species assessed.

Ecosystem credit species	Vegetation type(s)	NSW Status	National Status
<i>Anthochaera phrygia</i> Regent Honeyeater (Foraging)	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Critically Endangered	Critically Endangered
<i>Callocaphalon fibbriatum</i> Gang-gang Cockatoo (Foraging)	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
<i>Chthonicola sagittata</i> Speckled Warbler	281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Vulnerable	Not Listed
<i>Climacteris picumnus victoriae</i> Brown Treecreeper	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Vulnerable	Not Listed
<i>Daphoenositta chrysoptera</i> Varied Sittella	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion	Vulnerable	Not Listed

Ecosystem credit species	Vegetation type(s)	NSW Status	National Status
	281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes		
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Vulnerable	Endangered
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion	Vulnerable	Not Listed
<i>Glossopsitta pusilla</i> Little Lorikeet	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Vulnerable	Vulnerable
<i>Grantiella picta</i> Painted Honeyeater	1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Vulnerable	Vulnerable
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
<i>Hieraaetus morphnoides</i> Little Eagle (Foraging)	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed

Ecosystem credit species	Vegetation type(s)	NSW Status	National Status
<i>Lathamus discolor</i> Swift Parrot (Foraging)	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Endangered	Critically Endangered
<i>Lophoictinia isura</i> Square-tailed Kite (Foraging)	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Vulnerable	Not Listed
<i>Melanodryas cucullata cucullata</i> Hooded Robin	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Vulnerable	Not Listed
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
<i>Miniopterus schreibersii oceanensis</i> Eastern Bent-wing Bat (Foraging)	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion	Vulnerable	Not Listed

Ecosystem credit species	Vegetation type(s)	NSW Status	National Status
<i>Neophema pulchella</i> Turquoise Parrot	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Vulnerable	Not Listed
<i>Ninox connivens</i> Barking Owl (Foraging)	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion 1610 - White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Vulnerable	Not Listed
<i>Ninox strenua</i> Powerful Owl (Foraging)	281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
<i>Petroica boodang</i> Scarlet Robin	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
<i>Petroica phoenicea</i> Flame Robin	281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
<i>Phascolarctos cinereus</i> Koala (Foraging)	281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Vulnerable
<i>Pomatostomus temporalis temporalis</i> Grey-crowned Babbler	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in	Vulnerable	Not Listed

Ecosystem credit species	Vegetation type(s)	NSW Status	National Status
	the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion		
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Vulnerable
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheathtail-bat	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Vulnerable
<i>Stagonopleura guttata</i> Diamond Firetail	1303 -White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion 281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
<i>Tyto novaehollandiae</i> Masked Owl (Foraging)	281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
<i>Varanus rosenbergi</i> Rosenberg's Goanna	281 – Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed

4.1.1 Species excluded from the assessment

Only one ecosystem credit species was partially excluded from the assessment. This was Painted Honeyeater (*Grantiella picta*). This was due to there being less than five mistletoes per hectare within all vegetation zones with exception for PCT 1610_Forest. This was based on the observation of some mistletoes within White Box Trees within PCT 1610_Forest (Veg zone 9)

All other ecosystem credit species were included in the BAM assessment.

4.2 SPECIES CREDIT SPECIES

4.2.1 Candidate species to be assessed

The BAM Calculator predicted the following species credit species to occur at the development site as can be seen in Table 4-2 below.

Table 4-2 Candidate species credit species requiring assessment

Species Credit Species	Habitat components	Sensitivity to gain class	NSW Listing status	National listing status	Presence of habitat onsite	Include/exclude from assessment	Action undertaken
FAUNA							
<i>Anthochaera phrygia</i> Regent Honeyeater (Breeding)	Mapped Important areas (OEH)	High	Critically Endangered	Critically Endangered	Outside mapped important areas (OEH)	Included	Parts of the development site and footprint contained preliminary 'important mapped areas' mapping.
<i>Aprasia parapulchella</i> Pink-tailed Legless Lizard	Rocky areas or within 50 m of rocky area	High	Vulnerable	Vulnerable	Optimal habitat within the development site	Included	Survey required and undertaken
<i>Burhinus grallarius</i> Bush Stone-curlew	Fallen/standing dead timber including logs	High	Endangered	Not Listed	Distinct lack of fallen timber resources inside the development site.	Excluded	No suitable habitat in development site due to the absence of preferred timber resources
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo (Breeding)	Living or dead tree with hollows greater than 10 cm diameter and greater than 9 m above ground.	High	Vulnerable	Not Listed	Suitable Hollow-bearing Trees (HBTs) present within development site	Included	Survey required and undertaken
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	Very High	Vulnerable	Not Listed	No suitable habitat in development site however suitable habitat is located within surrounding sandstone ridgelines	Included	Survey required and undertaken

Species Credit Species	Habitat components	Sensitivity to gain class	NSW Listing status	National listing status	Presence of habitat onsite	Include/exclude from assessment	Action undertaken
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle (Breeding)	Living or dead trees within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines (Bionet).	High	Vulnerable	Not Listed	Large trees exist near large dams along Spring Creek Flat.	Included	Survey required and undertaken
<i>Hieraaetus morphnoides</i> Little Eagle	Nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	High	Vulnerable	Not Listed	Woodland and paddock trees present inside the development site.	Included	Survey required and undertaken
<i>Lathamus discolor</i> Swift Parrot	Mapped Important areas (OEH)	Moderate	Endangered	Critically Endangered	Outside mapped important areas (OEH)	Excluded	Outside mapped important area (OEH)
<i>Lophoictinia isura</i> Square-tailed Kite (Breeding)	Nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	High	Vulnerable	Not listed	Large waterbody within 1 km of development site	Included	Survey required and undertaken
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat (Breeding)	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Very High	Vulnerable	Not listed	Potential habitat within areas containing rocky outcrops, farm sheds, road culverts.	Included	Survey required and undertaken
<i>Ninox connivens</i> Barking Owl (Breeding)	Hollow-bearing trees. Woodland and open forest, including fragmented remnants and partly cleared	High	Vulnerable	Not listed	Suitable HBTs present within development site	Included	Survey required and undertaken

Species Credit Species	Habitat components	Sensitivity to gain class	NSW Listing status	National listing status	Presence of habitat onsite	Include/exclude from assessment	Action undertaken
	farmland. Known in subregion.						
<i>Ninox strenua</i> Powerful Owl (Breeding)	Large mature trees likely to contain large hollows.	High	Vulnerable	Not listed	Suitable HBTs present within development site	Included	Survey required and undertaken
<i>Petaurus norfolcensis</i> Squirrel Glider	Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	High	Vulnerable	Not listed	Suitable HBTs present within development site	Included	Survey required and undertaken
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	High	Endangered	Vulnerable	Distinct lack of suitable rocky outcrop within the development site. More suitable habitat on the north facing southern ridgeline outside of the development site	Excluded	No suitable habitat to be impacted.
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	Hollows with entrances 2.5 - 4 cm wide	High	Vulnerable	Not listed	Suitable HBTs present in development site	Included	Survey required and undertaken
<i>Phascolarctos cinereus</i>	Areas identified via survey as important habitat based on density	High	Vulnerable	Vulnerable	Survey required to identify	Included	Survey required and undertaken

Species Credit Species	Habitat components	Sensitivity to gain class	NSW Listing status	National listing status	Presence of habitat onsite	Include/exclude from assessment	Action undertaken
Koala (Breeding)	of Koalas and quality of habitat.						
<i>Polytelis swainsonii</i> Superb Parrot (Breeding)	Living or dead <i>E. blakelyi</i> , <i>E. melliodora</i> , <i>E. albens</i> , <i>E. camaldulensis</i> , & <i>E. polyanthemos</i> with hollows greater than 5 cm diameter; greater than 4 m above ground or trees with a DBH of greater than 30 cm.	High	Vulnerable	Vulnerable	Suitable HBTs present in development site	Included	Survey required and undertaken
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox (Breeding)	Breeding camps. Breeding camps will need to be identified by survey	High	Vulnerable	Vulnerable	Suitable vegetation and riparian areas for camps not within development site	Excluded	No suitable habitat to be impacted.
FLORA							
<i>Acacia ausfeldii</i> Ausfeld's Wattle	Associated species include <i>Eucalyptus albens</i> , <i>E. blakelyi</i> and <i>Callitris</i> spp. Although killed by fire, the seedbank will be stimulated.	Moderate	Vulnerable	Not listed	PCTs 1303, 281 & 1610 known habitat for this species. <i>E. albens</i> present within Development site.	Included	Survey required and undertaken
<i>Commersonia procumbens</i>	Often found as a pioneer species of disturbed sandy habitats. It has been recorded colonising disturbed areas such as	Moderate	Vulnerable	Vulnerable	PCT 1610 known habitat for this species. <i>E. albens</i> present within Development site	Included	Survey required and undertaken

Species Credit Species	Habitat components	Sensitivity to gain class	NSW Listing status	National listing status	Presence of habitat onsite	Include/exclude from assessment	Action undertaken
	roadsides, the edges of quarries and gravel stockpiles and a recently cleared easement under power lines. Associated species include <i>E. dealbata</i> , <i>E. sideroxylon</i> , <i>E. albens</i> , <i>Calytrix tetragona</i> , <i>Callitris spp.</i>						
<i>Eucalyptus cannonii</i> Capertee Stringybark	Capertee Stringybark has a broad altitudinal range, from around 450m to 1,050m. Within this range, the species appears to tolerate most situations except the valley floors.	Moderate	Vulnerable	Not listed	Entire development footprint is located on valley floor <450m in elevation. Inappropriate habitat for this species.	Excluded	No suitable habitat to be impacted.
<i>Prostanthera cryptandriodes</i> subsp. <i>cryptandroides</i> Wollemi Mint-bush	Associated with rocky ridgelines on sandstone in a range of vegetation	Moderate	Vulnerable	Vulnerable	PCT 1303 known habitat for this species. Rocky outcrop sites exist within PCT 1610 & 1303.	Included	Survey required and undertaken

4.2.2 Exclusions based on habitat features

Under Section 6.4.1.17 of the BAM, a species credit species can be considered unlikely to occur on a development site (or within specific vegetation zones) if following field assessment, it is determined that the habitat is substantially degraded such that the species is unlikely to utilise the development site (or specific vegetation zones). These species are identified in Table 4-3 along with justification regarding the habitats present.

Table 4-3 Species credit species excluded based on habitat

Species Credit Species	Zones excluded	Reason for exclusion
<i>Eucalyptus cannonii</i>	All zones	The development footprint is located on valley floor <450m in elevation and therefore considered unlikely to occur. No further assessment required
<i>Burhinus grallarius</i> Bush Stone-curlew <i>Lathamus discolor</i> Swift Parrot <i>Petrogale penicillata</i> Brush-tailed Rock-wallaby <i>Pteropus poliocephalus</i> Grey-headed Flying-fox (Breeding)	All zones	<p>These zones are excluded, as there is no suitable habitat that occurs within the impacted native vegetation zones. The species are unlikely to utilise these zones on a regular basis for breeding due to a lack of relevant critical habitat required for that species i.e. fallen timber, large rocky escarpments.</p> <p>Habitat assessment of the likelihood of a breeding camp for the Grey-headed Flying Fox was undertaken and considered unlikely due to the presence of fragmented vegetation within the development site and the lack of good condition riparian vegetation. Additionally, surveys undertaken in May, August and October did not locate any evidence of individuals or camps within the development site.</p> <p>Consultation with OEH confirmed that there are no 'important mapped areas' for Swift Parrot within the development site. Site surveys confirmed that vegetation located within the development site is unlikely to be utilised by Swift parrots during migration with better more suitable habitat located in the broader locality.</p>

4.2.3 Candidate species requiring confirmation of presence or absence

The species listed in Table 4-4 are those that are considered to have habitats present at the development site and where targeted surveys are required within suitable habitat. Targeted survey for Koala and all Owls onsite commenced in May 2018. Targeted surveys in August and October 2018 were also undertaken for all potential threatened flora species, as well as diurnal and nocturnal fauna where the timing of survey was appropriate. The results of the targeted survey are summarised in Table 4-4. Where the timing of survey was inappropriate, the species and its suitable habitat will be assumed to occur onsite to allow progression of the assessment.

Details of the survey methodologies and results are provided for each species below. Targeted survey locations are mapped on Figure 4.1. Species polygons have been defined for the species present on the site as mapped on Figure 4.1.

Table 4-4 Summary of species credit species surveyed at the development site.

Species Credit Species	Biodiversity risk weighting	Survey Period ²	Assumed to occur/survey/ expert report	Present on site?	Species polygon/ area (ha) assumed habitat (Veg Zone)
FLORA					
<i>Acacia ausfeldii</i> Ausfeld's Wattle	2	Aug - Oct	Surveyed August 2018	No	0 ha Not recorded during survey
<i>Commersonia procumbens</i>	2	Jan – May Aug to Dec	Surveyed August 2018	No	0 ha Not recorded during survey
<i>Monotaxis macrophylla</i> Large-leafed Monotaxis	2	Aug only	Surveyed August 2018	No	0 ha Not recorded during survey
<i>Prostanthera cyrtandriodes</i> subsp. <i>cryptandroides</i> Wollemi Mint-bush	2	Anytime	Surveyed August 2018	No	0 ha Not recorded during survey
FAUNA					
<i>Anthochaera phrygia</i> Regent Honeyeater	3	Sept-Dec	Important mapped habitat areas surveyed May, August & October 2018	Not recorded during survey. Mapped important habitat occurs survey indicated non-optimal habitat	0 ha Not recorded during survey
<i>Aprasia parapulchella</i> Pink-tailed Legless Lizard	2	Sept-Nov	Surveyed October 2018	Not recorded during survey. Suitable habitat has been avoided.	0 ha Not recorded during survey
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo (breeding)	2	Oct-Jan	Surveyed October 2018	No	0 ha Not recorded during survey
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	3	Sept-Mar	Surveyed October 2018	Yes	0 ha Recorded during survey however no impacts to optimal breeding and or foraging habitat)
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	2	July-Dec	Surveyed August and October 2018	No	0 ha

² As prescribed in the BAM calculator.

Species Credit Species	Biodiversity risk weighting	Survey Period ²	Assumed to occur/survey/ expert report	Present on site?	Species polygon/ area (ha) assumed habitat (Veg Zone)
					Not recorded during survey
<i>Hieraaetus morphnoides</i> Little Eagle	1.5	Aug-Oct	Surveyed August and October 2018	No	0 ha Not recorded during survey
<i>Lophoictinia isura</i> Square-tailed Kite (Breeding)	1.5	Sept-Jan	Surveyed October 2018	No	0 ha Not recorded during survey
<i>Miniopterus schreibersii oceanensis</i> Eastern Bent-wing Bat (Breeding)	3	Nov-Feb	Surveyed October 2018	Probable, therefore assumed present. (Anabat recording)	0 ha Recorded during survey however no impacts to optimal breeding and or foraging habitat
<i>Ninox connivens</i> Barking Owl (Breeding)	2	May-Dec	Surveyed May & August and October 2018	No	0 ha Not recorded during survey
<i>Ninox strenua</i> Powerful Owl (Breeding)	2	May-Aug	Surveyed May & Aug 2018	No	0 ha Not recorded during survey
<i>Petaurus norfolcensis</i> Squirrel Glider	2	Anytime	Surveyed August and October	No	0 ha Not found during survey
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	2	Anytime	Surveyed August and October 2018	No	0 ha Not recorded during survey
<i>Phascolarctos cinereus</i> Koala (Breeding)	2	Anytime	Surveyed May	No	0 ha Not recorded during survey
<i>Tyto novaehollandiae</i> Masked Owl (Breeding)	2	May-Aug	Surveyed May & Aug 2018	No	0 ha Not recorded during survey
<i>Vespadelus troungtoni</i> Eastern Cave Bat	3	Nov-Jan	Surveyed October 2018	Possible, therefore assumed present. (Anabat recording)	0 ha Recorded during survey however no impacts to optimal breeding and or foraging habitat

4.3 THREATENED SPECIES SURVEY

General and targeted biodiversity surveys was undertaken to target NSW listed candidate species and Commonwealth listed species nominated in the Supplementary SEARs (Appendix B). surveys were undertaken in three survey sessions:

- 22nd-24th May 2018
- 27th-29th August 2018
- 22nd-26th October 2018

Methods and effort are provided below. Weather conditions recorded for these dates from the Bureau of Meteorology (BOM) at the Mudgee Weather Station are as follows:

Table 4-5 Weather Conditions onsite during targeted surveys

Date	Maximum Temperature (°C)	Minimum Temperature (°C)	Rainfall (mm)	Max Wind (km/h)	Gust
22 nd May 2018	19	6.1	0	37 (3.16pm)	
23 rd May 2018	21	3	0	24 (11.19am)	
24 th May 2018	23.3	1.0	0	22 (7.01pm)	
27 th August 2018	17.2	2.8	9.8	31 (2.47pm)	
28 th August 2018	14.7	1.6	0	24 (3.47pm)	
29 th August 2018	15.2	-2.8	0	35 (3.58pm)	
22 nd October 2018	25.8	14.5	0	24 (7.42pm)	
23 rd October 2018	29.2	11.4	0	37 (11.23pm)	
24 th October 2018	8.8	28	0	31 (12.57pm)	
25 th October 2018	27.3	14.1	0	30 (2.25pm)	
26 th October 2018	27.6	6.6	0	46 (11.57am)	

Diurnal Woodland Birds (Regent Honeyeater, Swift Parrot, Gang-gang Cockatoo, White-bellied Sea Eagle, Little Eagle, Square-tailed Kite)

SURVEY EFFORT

May 2018

A woodland bird census consisting of a five (5) transect and five (5) 20 minute point opportunistic surveys were completed on the mornings and evenings of the 22-24 May for a total of seven (7) hours. Five one kilometre transect surveys targeting swift parrot as well as general avifauna were walked over one hour, as well as one 20 minute point opportunistic survey at the centre of each transect. Remnant trees were surveyed for evidence of stick nests used by raptors. Weather conditions recorded at Mudgee weather station included minimum temperature 1.0°C, maximum temperature 23.3°C, and 0 mm of rainfall.

August 2018

Three (3) 20 minute two (2) ha diurnal bird surveys were completed on the mornings of the 28th and 29th August over a total one hour survey time. Targeted hollow-bearing tree surveys as well as surveys for large stick nests were carried out for evidence of suitable breeding habitat. All paddock trees within the development footprint were surveyed for the presence of hollows. The number, size and height of hollows were recorded for each tree along with any evidence of use. Hollows were categorised as small (< 10 cm), medium (10 – 20 cm), and large (> 20 cm).

October 2018

Six (6) 20 minute two (2) ha diurnal bird surveys as well as area searches and call playback were completed within mapped regent honeyeater habitat and undertaken early mornings between the 23rd-26th October. Additionally, any suitable Eucalypt species in flower within the development site were also observed for a period for 20 mins to monitor avifauna activity. Targeted hollow-bearing tree surveys and opportunistic surveys were also undertaken for evidence Gang-gang cockatoo within the development site.

SURVEY RESULTS

None of the targeted candidate diurnal avifauna species or evidence of breeding (i.e. large stick nests for raptors) were observed during the surveys.

No regent honeyeater or swift parrots were observed during the targeted surveys. Approximately 0.34ha of regent honeyeater mapped important habitat is predicted to occur within the development site. Generally, habitat within the development site is fragmented and consisted of isolated individuals or small remnant clumps without a consistent shrub layer or complex structure. Therefore, fragmented habitat throughout the majority of the development site is dominated by more common and disturbance tolerant native and exotic species as well as aggressive native species such as noisy miners and noisy friarbirds. Vegetation throughout the site is recovering from a recent bushfire with large amounts of epicormic growth and very little evidence of flowering. However, the vegetation on the lower slopes that occur on the boundaries of the development site and study area contain more complex structure and contain a high abundance of common and threatened woodland avifauna. Sporadic *E.melliodora* were observed to be flower at the far southern end of the development site, however limited avifauna species were observed utilising these blossoming individuals. Vulnerable listed Grey-crowned Babbler, Speckled Warbler, Diamond Firetail were detected directly south of the development footprint within vegetation equivalent of PCT 1610 forest (Zone 8). Dusky Woodswallow and Brown Treecreeper were also detected within PCT 1610 forest/disturbed (Zone 8 and 9). Refer to Appendix A.1.3 for a complete list of species observed.

Hollow bearing trees inspected during targeted surveys did had no evidence of use by any threatened flora. More common species such as galahs and red rump parrots were observed utilising hollow bearing trees within the development footprint.

The development would impact nine (9) paddock trees containing suitable hollows that may be utilised for various threatened species. In accordance with the BAM paddock trees assessed under the streamlined paddock tree assessment are not considered as species credit polygons.

Nocturnal Birds (Barking Owl, Masked Owl & Powerful Owl)

SURVEY EFFORT

May 2018

Three (3) separate targeted species surveys were completed on the nights between 22nd - 24th May for a total of 4 hours. Call playback with a megaphone was used from the vehicle along remnant vegetation, followed by a period of listening for responses and spotlighting.

August 2018

An additional four separate sites were surveyed above on the nights of the 27th-28th August 2018 for a total of three (3) hours. Spotlighting in addition to call playback with a megaphone and Bluetooth speakers were used from the vehicle and whilst walking through patches of remnant vegetation and isolated paddock trees, followed by a period of listening for responses in accordance with OEH threatened species guidelines.

SURVEY RESULTS

During the May survey, no threatened birds were seen or heard during the survey. One Southern Boobook, (*Ninox novaeseelandiae*) and Barn Owl (*Tyto alba*) were seen in open farmland in the north of the development footprint. During August survey, no threatened birds were seen or heard during the survey. One Barn Owl (*Tyto alba*), Tawny Frogmouth (*Podargus strigoides*) and Owlet Nightjar (*Aegotheles cristatus*) were observed during spotlighting.

Microbats (Eastern Cave Bat, Eastern Bent-wing Bat, Large-eared Pied Bat)

SURVEY EFFORT

October 2018

A targeted Anabat survey was completed for the nights of 22nd – 25th October. One (1) Anabat Swift unit was placed at two locations within the development site and surrounding areas for two separate nights at each location (Figure 4-1). The Anabat was placed outside of the development site within suitable habitat for cave dwelling microbats including sandstones caves and overhangs approximately 400m from the development site on the 22nd – 23rd October. The Anabat was relocated to within management zone 1 in the central eastern boundary of the development site on the 24th – 25th October. Recordings produced were filtered and analysed by NGH Environmental ecologists.

SURVEY RESULTS

Numerous microbats species were identified from the Anabat recordings, including the Large-eared Pied Bat and potentially the Eastern Cave Bat and Eastern Bent-wing Bat. Definite calls from the Large-eared Pied Bat were recorded whilst calls from at the Eastern Bent-wing Bat and Eastern Cave Bat were deemed as probable and possible respectively when compared to reference calls. Difficulties in differentiating calls from other sympatric species such as Little Forest Bat (*Vespadelus vulturnus*) resulted in lower confidence in identification for the Eastern Cave Bat. It therefore has been assumed as present within the study area.

Nocturnal Mammals (Squirrel Glider, Brush-tailed Phascogale, Koala)

SURVEY EFFORT

May 2018

Targeted spotlighting surveys were undertaken at night during the 22nd - 24th May over four (4) separate areas (Figure 4.1) for approximately one hour each night (30 mins per area). A 100-watt spotlight was used in both vehicle-based and foot surveys within remnant woodland patches and isolated paddock trees prior to nocturnal owl call playback surveys. Seven separate scat surveys were completed for Koalas on the 23rd and 24th May 2018, with mature feed trees searched for signs of Koalas for approximately 8 person hours.

August 2018

An additional four surveys were undertaken via spotlighting from a vehicle and on foot on the 30th and 31st August for approximately two hours each night. A 100-watt spotlight was used in both vehicle-based and

foot surveys within remnant woodland patches and isolated paddock trees prior to nocturnal owl call playback surveys.

SURVEY RESULTS

None of the targeted arboreal mammals were detected during spotlighting in May or August. No Koalas were observed or their evidence of use were recorded during the surveys. Multiple wombats (*Vombatus ursinus*), Eastern Grey Kangaroos (*Macropus giganteus*), Wallaroos (*Macropus robustus*), and Red-necked Wallabies (*Macropus rufogriseus*) were detected during the August survey and were generally confined to the southern sites (see Appendix A.1.3).

Reptiles (Pink-tailed Legless Lizard)

SURVEY EFFORT

Areas of rocky outcrop were assessed and surveyed by two ecologists on the 24th and 25th October 2018 for approximately 30 minutes at each site within and surrounding the development site. This included traversing the rocky outcrop area and randomly turning and inspecting loose rocks and partially embedded rock that occurred before being placed back into their original position. Where practicable, between 100-150 rocks were turned and inspected at each surveyed area.

SURVEY RESULTS

The vast majority of the rocky outcrops consist of embedded rock and occasional loose rock within paddocks containing improved pastures species with little or no native grasses or forb presence. These were considered non-optimal habitat for the Pink-tailed Legless Lizard. One identified area development site contains optimal habitat (Figure 4.1) with an abundance of partially embedded rock and loose rock surrounded by high cover of native grasses occur within the development site however has been largely avoided. A further two areas are considered to contain potential habitat based on the availability of rock outcrop, however has a low abundance of native grass and subject to consistent disturbance. Of the areas surveyed, one common species, Two-clawed worm-skink (*Anomalopus leuckartii*), was observed. Small areas of rock outcrop were observed within remnant woodland areas and surveyed accordingly. No threatened species were observed during the survey and in addition of avoiding and minimise better quality habitat within the development site, it is considered that this species would not be impacted.

Threatened flora (*Acacia ausfeldii*, *Monotaxis macrophylla*, *Commersonia procumbens*, *Prostanthera cryptandroides*)

SURVEY EFFORT

Suitable habitat for these species occurs in the small remnant patches of moderate to good condition vegetation associated with PCT 1303, PCT 281 and PCT 1610 (vegetation zones 1, 2, 5 and 8). Areas of vegetation within the development site that had been recently burnt and recovering following the 2017 bushfire were also surveyed. Areas of suitable habitat within the development site were surveyed using the parallel field traverse survey technique were practicable in conjunction with random meander where vegetation became more degraded and less optimal during suitable survey periods in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016).

SURVEY RESULTS

No threatened flora were detected within the survey area. Although not required to be surveyed based on PCTs present and on distribution limitations, a potential observation of *Swainsona sericea*, listed as

vulnerable within the BC Act, was observed and sent to the National Herbarium of New South Wales for confirmation. It was confirmed on the 13th November that species identified was *S.behriana*, an uncommon observation of the region, and not *S.sericea*.

Considering the extensive survey effort undertaken in suitable habitat during flowering season, targeted threatened flora species are not considered to occur within the development site.

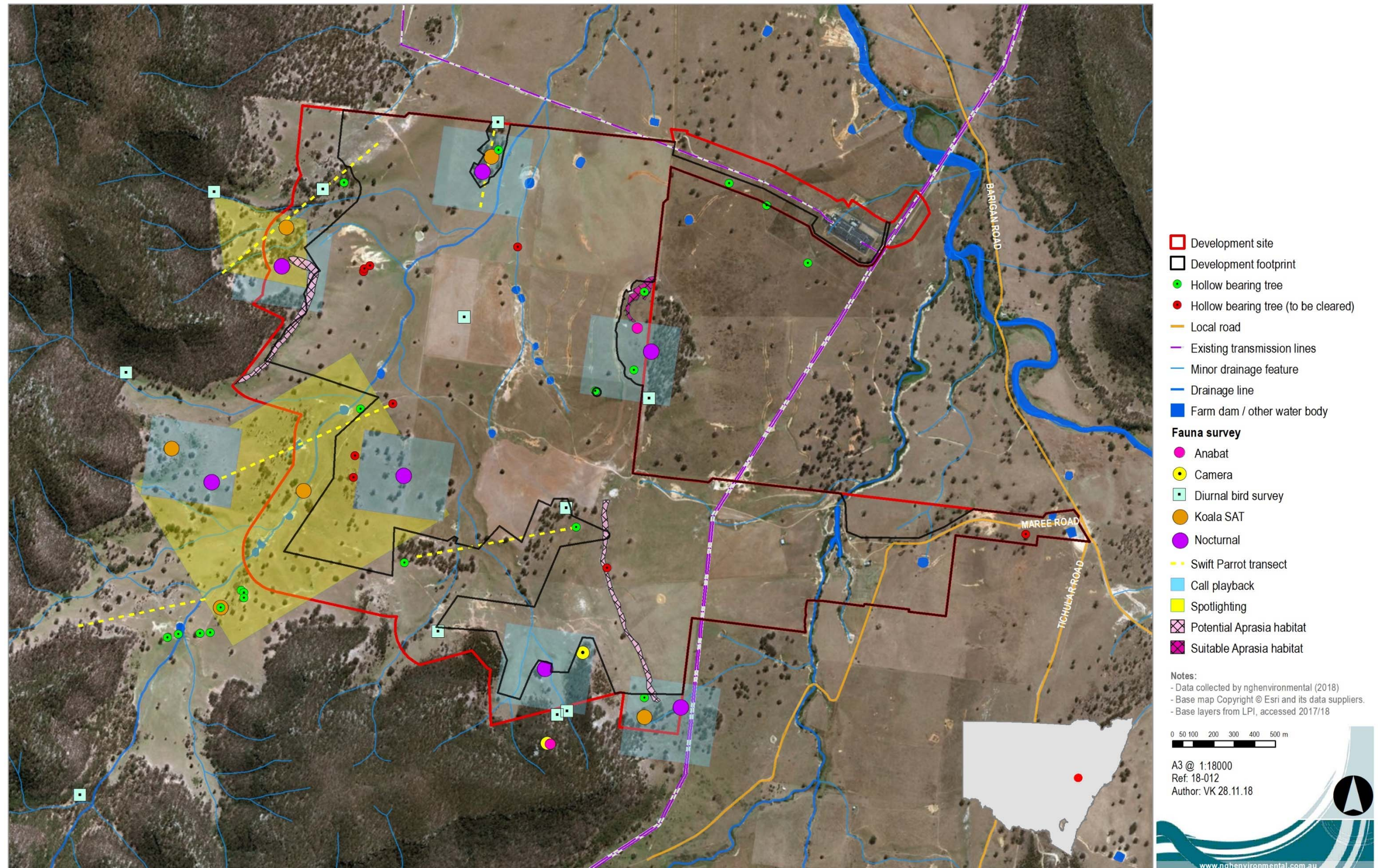


Figure 4-1 Threatened fauna targeted survey locations

4.4 ADDITIONAL HABITAT FEATURES RELEVANT TO PRESCRIBED BIODIVERSITY IMPACTS

4.4.1 Occurrences of karst, caves, crevices and cliffs

There are several occurrences of largely embedded linear rock outcrop that contain shallow crevices within the development site as illustrated on Figure 4-2 below and Figure 4-3. Rocky outcrops may provide candidate species habitat for Pink-tailed Legless Lizard, Large-eared Pied Bat, Eastern Bent-wing Bat and Eastern Cave Bat and therefore targeted surveys for these species were undertaken in these areas. Vegetated sandstone ridgelines surrounding the development site contain suitable roosting habitat such as caves, crevices and overhangs for the Microchiroptera bats mentioned above. Although outside of the development site and would not be impacted, ridgelines at the southern end of the study area were surveyed via with remote camera and Anabat ultrasonic detectors for baseline data.

There are no known biological processes onsite that are known to preserve these features in their current state, other than the site being largely undisturbed farming land.

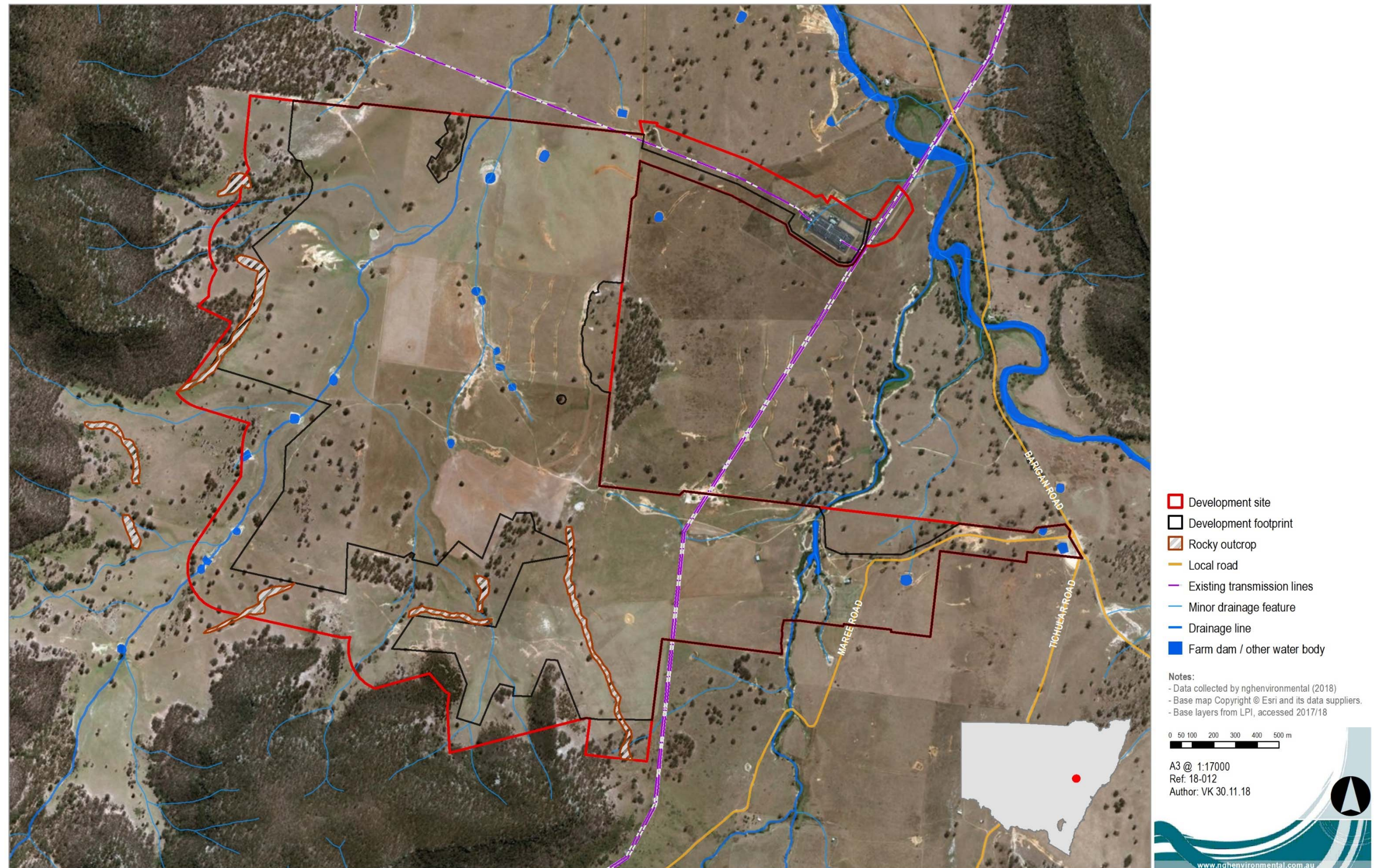


Figure 4-2 Rocky crevice habitat present within and close to the Development footprint



Figure 4-3 Examples of rocky crevices found within the development site.

4.4.2 Occurrences of rock

There are several distinct bands of Narrabeen Sandstone outcropping along the 70-80m contour line south and west of the development site as can be seen in Figure 4-4. In total, there are five separate areas consisting of rocky outcrops/crevices that required targeted survey for the following candidate species;

- Pink-tailed Legless Lizard (*Aprasia parapulchella*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*)
- Eastern Cave Bat (*Vespadelus troughtoni*)
- *Monotaxis macrophylla*
- Wollemi Mint Bush (*Prostanthera cryptandroides*)



Figure 4-4 Examples of rocky outcrops within the development site.

4.4.3 Occurrences of human made structures and non-native vegetation

There is one large agricultural building within the development footprint used to store farm machinery and one small tin shed within some stockyards located within the centre of the property. There is also one culvert within Wollar Creek on the substation access track near the intersection of Barigan Road (Figure 4-4 below). No evidence of use by Microchiroptera bats was observed during the field surveys. The culvert (Figure 4-5) is unlikely to provide suitable roosting habitat for Eastern Bentwing-bat because the culvert is quite short in length and exposed to the outdoor elements. The existing tunnel is not likely to allow any build up of heat or humidity thus not providing ideal maternity habitat for the Eastern Bent-wing Bat (Bionet).



Figure 4-5 Small Culvert under access road to substation which is unlikely to provide any roosting habitat for Eastern Bent-wing Bat.

4.4.4 Hydrological processes that sustain and interact with the rivers, streams and wetlands

There are two main hydrological habitats within the Wollar Study Area. Spring Flat Creek (a fourth order watercourse) dissects through the middle of the development site (refer to Figure 4-7). Spring Flat Creek did not contain any ponded water at the time of inspection during May 2018. The creek is ephemeral, only flowing during periods of high rainfall where it is presumed that much of this water lies under the ground within the sandy soils present. Several lesser order streams flow into Spring Flat Creek. All appeared dry at the time of inspection in May, August and October 2018.

There are numerous farm dams within the development footprint that provide water resources to sheep grazing over the land (Figure 4-6).

A review of the candidate species (as listed in Table 4-3) indicates that some birds of prey like White-bellied Sea Eagle and Square-tail Kite may utilise hydrological habitats. Targeted surveys were carried out onsite that involved opportunistic survey of trees near water bodies and diurnal bird surveys (see Chapter 4.2.1).



Figure 4-6 Examples of hydrological habitats that are found within the development footprint. Farm dam (left) and dry creek bed (right).

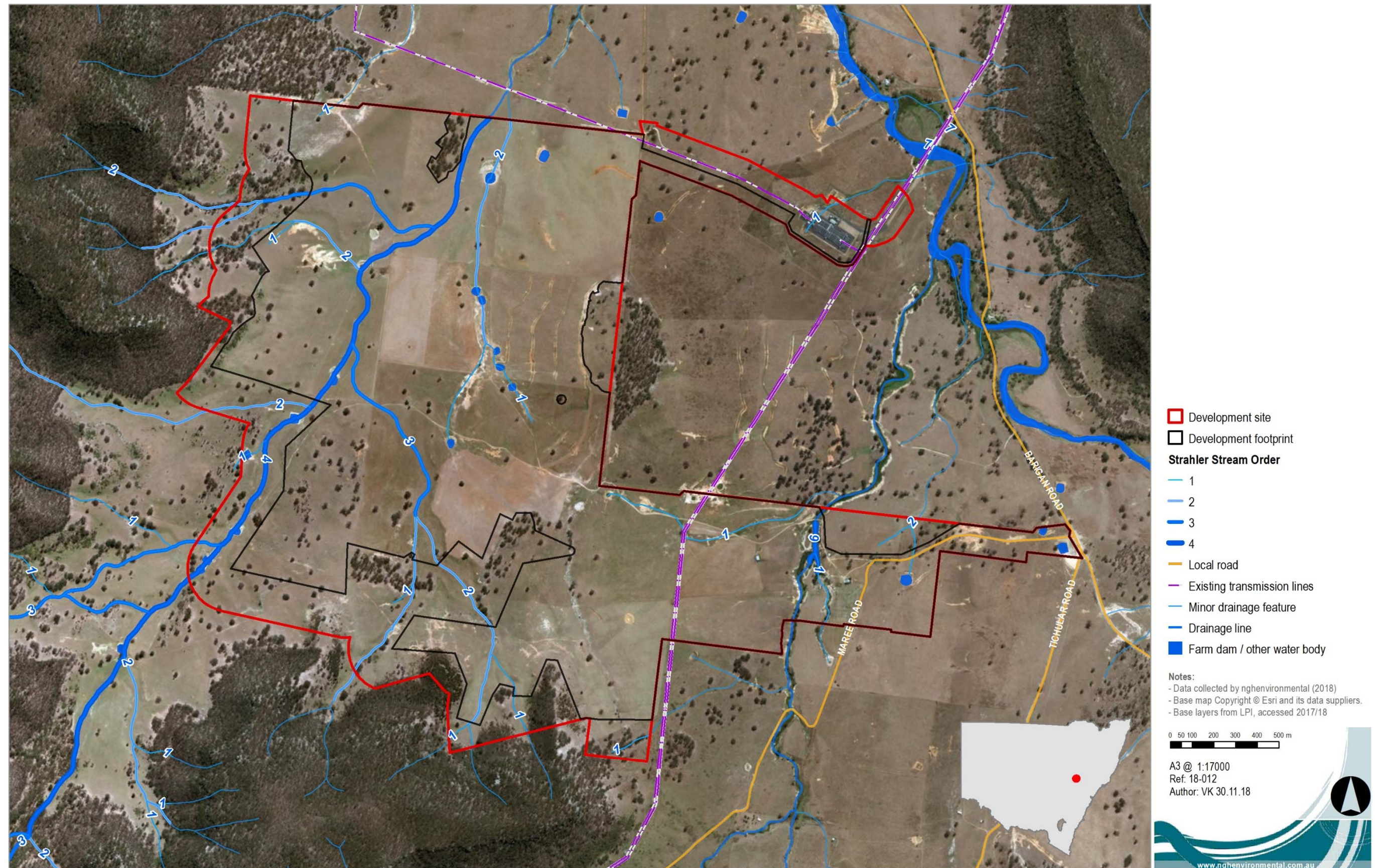


Figure 4-7 Riparian habitat within Wollar development site

5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on the 25th Jan 2018 (10 km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (refer to Appendix C). Relevant to Biodiversity these include:

- Wetlands of International Importance
- Threatened Ecological Communities
- Threatened species
- Migratory species

Section 5.1 to 5.4 set out relevant matters to be considered under the Act.

Incorporation of MNES assessment in this BDAR

Following data collected during initial site surveys in May 2018, a referral to the Commonwealth Department of Environment and Energy commenced in July 2018. On 3 October 2018, the proposed Wollar Solar Farm was determined to be a controlled action for impacts on MNES protected under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Supplementary SEARs were issued for the project (provided in Appendix B: EPBC requirements which includes a checklist of where these matters are addressed in the EIS or this BDAR).

The assessment of MNES is contained within this BDAR, as follows:

- *Sections 5.1 to 5.4 set out relevant matters to be considered under the Act.*
- *Section 7.4 examines MNES impacts in detail, with reference to the additional surveys undertaken in October 2018 to address additional MNES requirements of the Supplementary SEARs.*
- *Section 7.4 is supported by Appendix D EPBC Habitat Assessment Evaluations. This evaluation considers all entities returned in the MNES search and included in the Supplementary SEARs. In consideration of entity habitat requirements, the surveys undertaken onsite, the habitat that is available onsite and the likelihood of occurrence, the potential for impact is determined in this table.*
- *Where entities are deemed to have less than a low risk of impact, an EPBC Assessment of Significant Impact is undertaken, Appendix E. The assessments also assist to target mitigation strategies as required.*
- *Only for those entities where significant impact is evaluated likely to occur, are Commonwealth offsets required. Appendix F sets out the quantification of offsets for relevant entities.*
- *Section 10.1.4 provides an offset strategy for relevant entities, as determined above.*

5.1 WETLANDS OF INTERNATIONAL IMPORTANCE

Five wetlands of international importance were identified. The two closest wetlands (Hunter estuary wetlands & The Macquarie Marshes) are located 150-300km upstream of the Study Area. The remaining

three wetlands are greater than 800 km from the development site and are not connected to the study area.

There is no apparent connectivity between the Wollar Solar farm development site and the Macquarie River. All other wetlands returned from the search are over 500 km away.

5.2 THREATENED ECOLOGICAL COMMUNITIES

Three Threatened Ecological Communities were identified in the PMST report. These TEC's are

1. Central Hunter Valley eucalypt forest and woodland (Critically Endangered)
2. Upland Basalt Eucalypt forests of the Sydney Basin Bioregion (Endangered)
3. White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland – Critically Endangered Ecological Community.

One occurs onsite; 537 ha of remnant White Box – Yellow Box – Blakely's Red Gum Grassy Woodland (Box-gum woodland and derived native grassland) occurs within the development site. Of this approximately 232 ha will be directly impacted (development footprint). 29 ha of this is considered high diversity structural woodland and the residual areas of derived native grassland (87%) are relatively degraded.

All 232 ha meet the Commonwealth criteria due to the presence of mature trees, naturally regenerating canopy species and high abundance and cover of native forbs and grasses. Figure 5-1 illustrates the larger extent of Box-gum woodland/derived native grassland assumed to occur inside Wollar Valley. It was not possible to access these areas due to private property however trees and groundcovers were observed from public roads where possible to do so inside Wollar Valley.

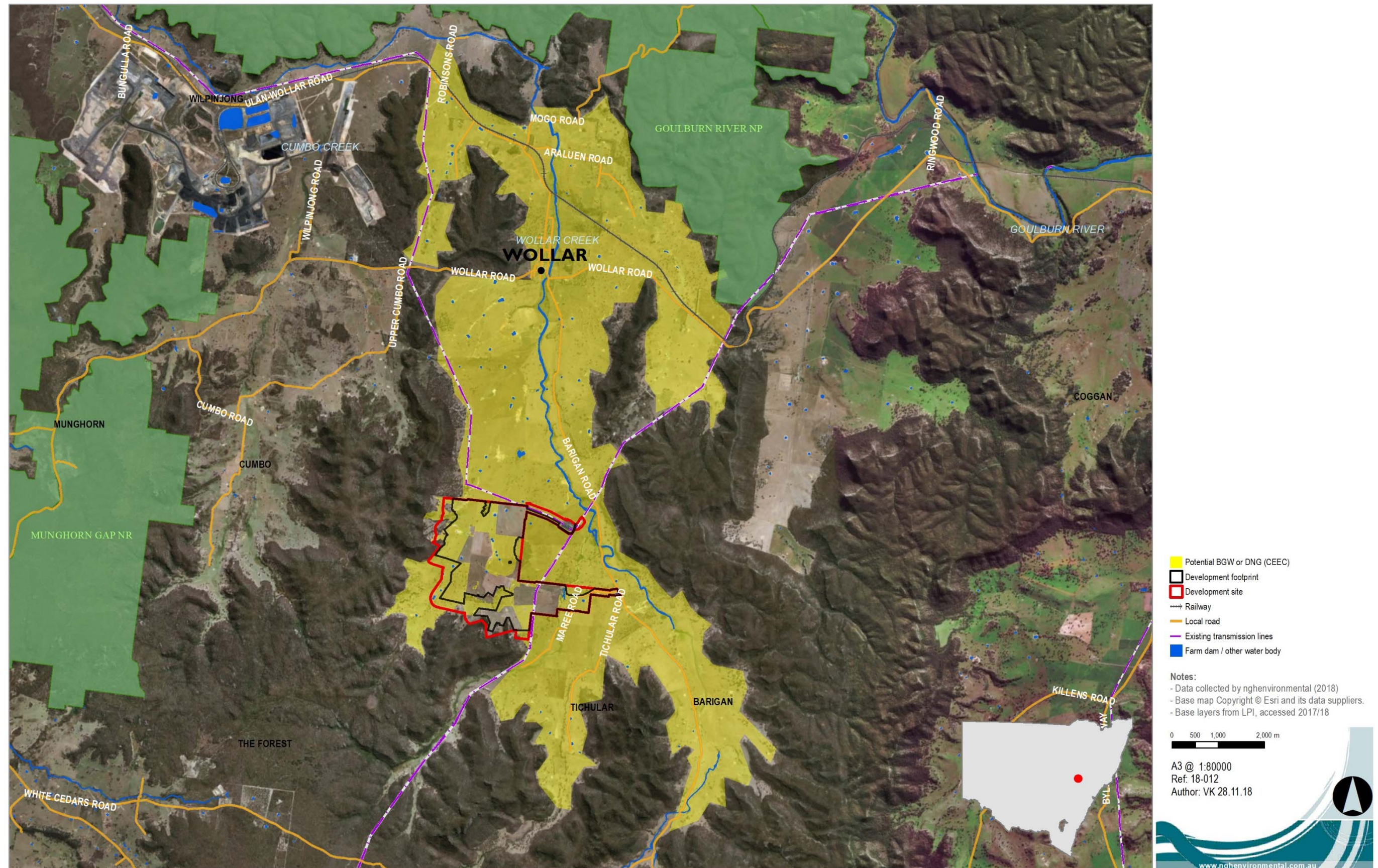


Figure 5-1 Larger extent of assumed box gum woodland inside Wollar Valley in relation to the development footprint.

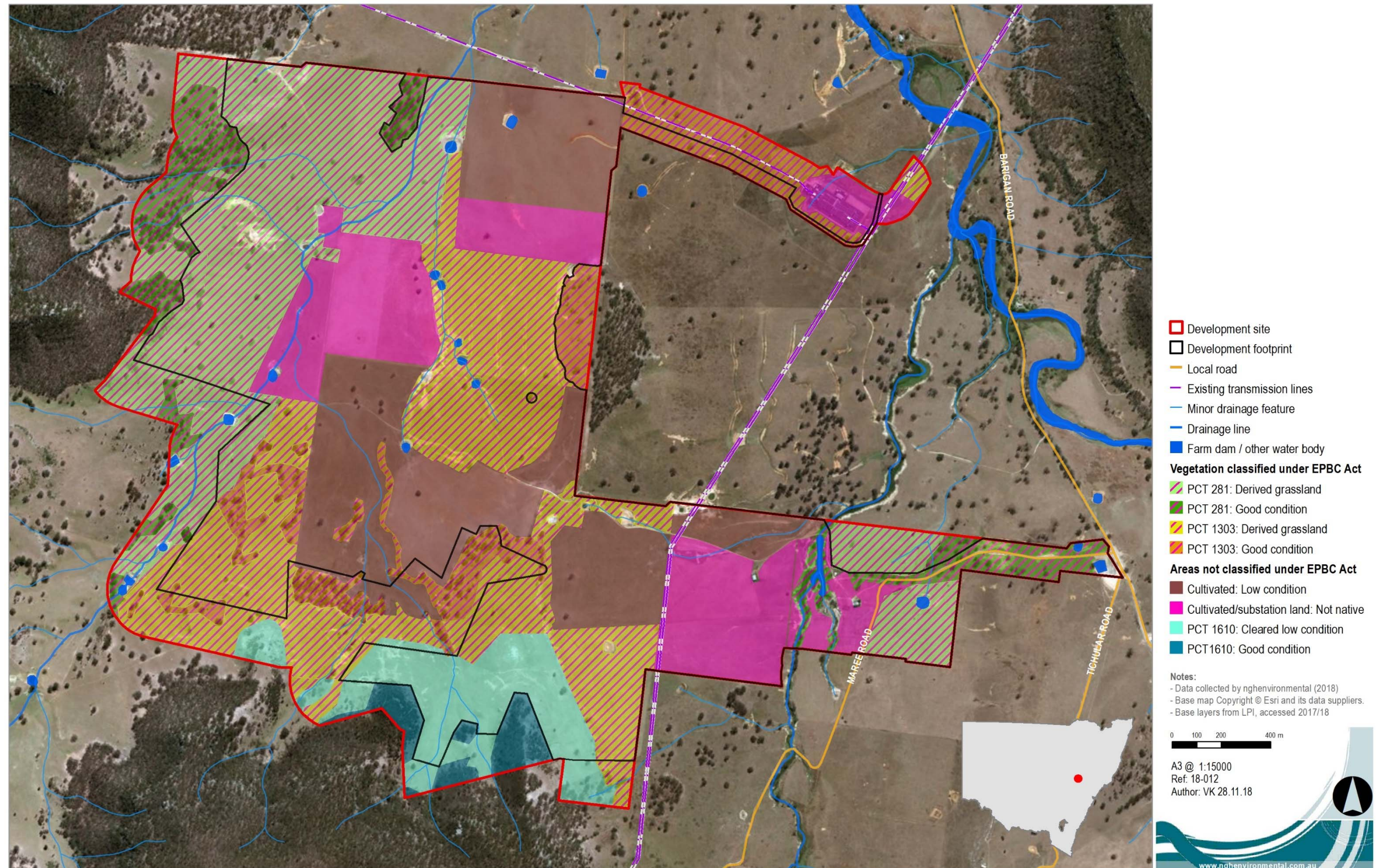


Figure 5-2 Confirmed extent of Box-Gum Woodland and Derived Native Grassland EPBC listed CEEC inside the development site.

5.3 THREATENED SPECIES

Thirty-three threatened species were returned from the protected matters report. Of these, nine are considered to have the potential to utilise the habitats at the development site of which all have been adequately surveyed for to determine potential presence ;

- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered EPBC Act
- Spotted-tailed Quoll (*Dasyurus maculatus*) – Endangered EPBC Act
- Painted Honeyeater (*Grantiella picta*) – Vulnerable EPBC Act
- Pink-tailed Legless Lizard (*Aprasia parapulchella*) – Vulnerable EPBC Act
- Brush-tailed Rock-wallaby (*Petrogale penicillata*) – Vulnerable EPBC Act
- Swift Parrot (*Lathamus discolor*) – Critically Endangered EPBC Act
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable EPBC Act
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – Vulnerable EPBC Act
- Koala (*Phascolarctos cinereus*) – Vulnerable EPBC Act

Based on the survey results, three were considered to have potential for greater than low impacts:

- Large-eared Pied Bat
- Regent Honeyeater
- Pink-tailed worm-lizard

The Large-eared Pied Bat was recorded via ultrasonic detector during the October surveys with further assessment of potential impacts undertaken and discussed in Section 7.

Based on the comprehensive reptile, mammal and bird surveys undertaken (in accordance to EPBC threatened survey guidelines and habitat evaluation), no other listed MNES are considered likely to occur in the development site regularly or rely on the habitats present.

5.4 MIGRATORY SPECIES

Eleven listed migratory species were returned from the protected matters report. Two of these species may utilise box gum woodland habitat within the development site.

- Satin Flycatcher (*Myiagra cyanoleuca*)
- Rufous Fantail (*Rhipidur rufifrons*)

None of these species were detected during diurnal bird surveys undertaken. It is concluded that they are unlikely to occur within the development site regularly or would rely on the habitats present.

6 AVOID AND MINIMISE IMPACTS

6.1 AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT

6.1.1 Site selection – consideration of alternative locations/routes

Photovoltaic solar technology was chosen because it is cost-effective, low profile, durable and flexible regarding layout and siting. It is a proven and mature technology which is readily available for broad scale deployment at the site. In terms of its impacts on biodiversity, PV solar installation creates minimal ground disturbances where footprint, mounts being either pile driven or on small footings.

However, the impacts of shading on groundcover species composition over the long term is largely unknown. Solar panels will cause extensive shading over the site. Seventy-four percent of the development footprint contains TEC. It is not known whether shading would lead to a change in groundcover species composition so in taking a precautionary approach it would have to be assumed to be an impact unless proven otherwise. The layout can be flexible to minimising impacts on site constraints and therefore avoid areas of better quality TEC. The Wollar Study Area was considered to be feasible because:

- It has been established within a landscape with little or sparse tree cover which is disturbed by farming practices, including cultivation and grazing,
- It has excellent solar exposure
- It has excellent access to local and major roads
- It has excellent access to the grid transmission network
- There are a low number of non-involved neighbouring dwellings
- It has favourable, low relief terrain

The Draft Large Scale Solar Energy Guideline for State Significant Development (SSD) provides recommendations regarding selection of suitable solar farm sites and areas of constraint that should be identified. These are addressed in Table 6-1 and Table 6-2 for the site.

Table 6-1 Site selection criteria: preferable site conditions

Preferable site condition	Site observation
Optimal solar resources	Good solar irradiance observed
Suitable Land	Low relief land far from existing development.
Local impacts minimised	Consultation underway.
Capacity to rehabilitate	Minimal site disturbance, if using pile driven array mounts.
Community support	Consultation underway
Proximity to electrical network	Close to existing substation. Connection point crosses site.
Connection capacity	Optimal location to connect to the existing transmission network with high grid system strength

Table 6-2 Site selection criteria: Areas of constraint

Areas of constraint	Site observation
Native vegetation	Much of the site is devoid of trees and has been subjected to past agricultural use.
Potential residences	Few residential receivers.
Waterways	Few permanent waterways.
Aboriginal/Heritage significance	Requires investigation.
Important agricultural land	Not mapped as Biophysical Strategic Agricultural Land (BSAL)
Residential zones	No residential zones.
Resource developments	No current mineral leases.

Photovoltaic solar technology was chosen because it is cost effective, low profile, durable and flexible regarding layout and siting. It is a proven and mature technology which is readily available for broad scale deployment at the site.

The mixture of fixed and tracking panels is to be determined after further analysis.

6.1.2 Proposal components – consideration of alternate modes or technologies

Other alternative sources of energy generation include coal mining, hydro-electric, wind, tidal and thermal industries.

Coal is a finite resource and contributes to green-house gas emissions. Mudgee and Wollar Valley surrounds are known areas containing coal seams with Wilpinjong open cut mine to the north west of the development site. Establishing new coal mines is likely to generate more direct and indirect impacts as a result of extracting ore and the need for stockpiling the waste in tailings ponds.

For hydro-electric industries to work, they require specialised landscapes and large water bodies . These resources are not present at Wollar Valley.

According to the Clean Energy Council of Australia, wind turbines are proving a popular renewable energy resource contributing to 5.7 percent of Australia’s electricity generation. Their success is dependent on exposure to consistent winds for the site to be feasible. According to Windpower Engineering and Development 2013, valleys (such as Wollar valley) are not optimal for wind turbines because the terrain surrounding the valley shelters the site from consistent winds leading to inefficient electricity generation.

Tidal energy requires oceanic waters to generate electricity. As Wollar Valley is inland this option is not a feasible choice for producing power at the site.

Geothermal energy uses the earth’s natural internal heat to generate electricity and heating. Geothermal energy may be stored in granite rocks or trapped in liquids such as water and brine (referred to as hydrothermal process). AREANA’s international geothermal expert group found that utility-scale generation from geothermal projects was not expected to be commercially viable by 2020. The technology

was only expected to become competitive with traditional fossil fuel power generation by 2030 with the help of a high carbon price and in the most favourable scenario for cost reductions.

6.1.3 Proposal planning phase – detailed design

A preliminary constraints analysis was conducted by NGH Environmental in April 2018, which was then followed up with further field work (to stratify the property into vegetation zones) which informed the site layout design. Vegetation constituting the highest ecological constraints such as forming high quality TECs, as well as providing key threatened flora and fauna habitat were avoided and minimised as far as practical by;

- Reducing the clearing footprint of the project and avoiding trees and woodland areas where ever possible to do so,
- Locating ancillary facilities in areas where there are minimal biodiversity values, such as where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score),
- Minimising development within areas containing high constraint vegetation (e.g. an EEC and CEEC),
- Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.

The final site layout and location has not been able to completely avoid all areas of native vegetation because of the distribution of resources over the development site. Refer to Figure 6-1 below for a map of areas which are defined as TEC onsite.

Designing a panel layout to avoid all TEC onsite would essentially render the site unfeasible for solar panels. As such, some areas of the more degraded TEC will need to form part of the development footprint. The final design footprint is detailed in Figure 6-2. Specifically it is noted that:

- Development areas maximise the use of cultivated and non native vegetation.
- Most hollow bearing trees are avoided.
- All mapped Regent Honeyeater habitat has been able to be avoided.
- Most high diversity CEEC has been avoided.
- Waterway and riparian areas are buffered and water crossings limited to the essential site requirements.

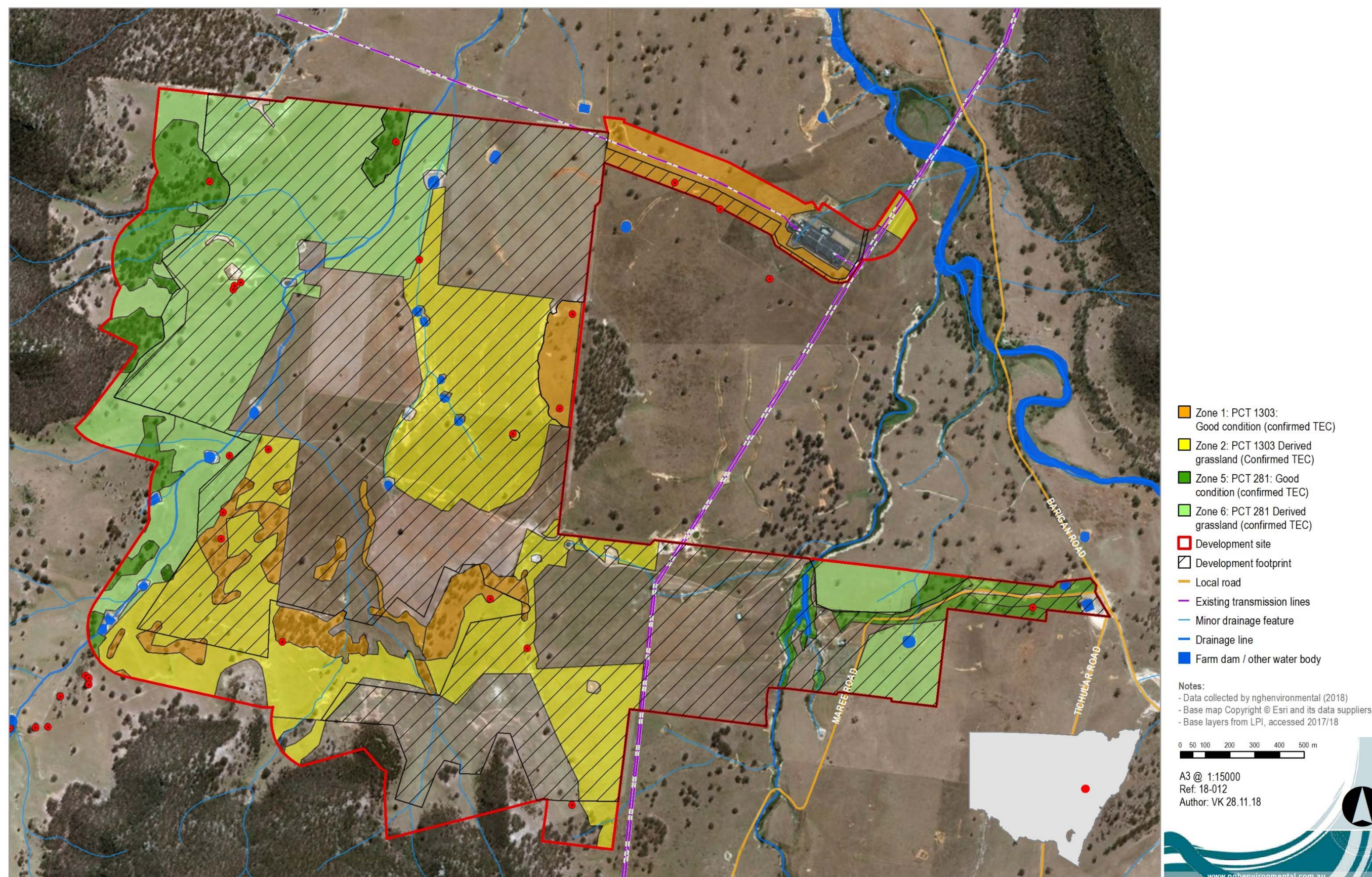


Figure 6-1 TEC (NSW EEC) within the development site (Zones 1, 2, 3, 5 and 6).

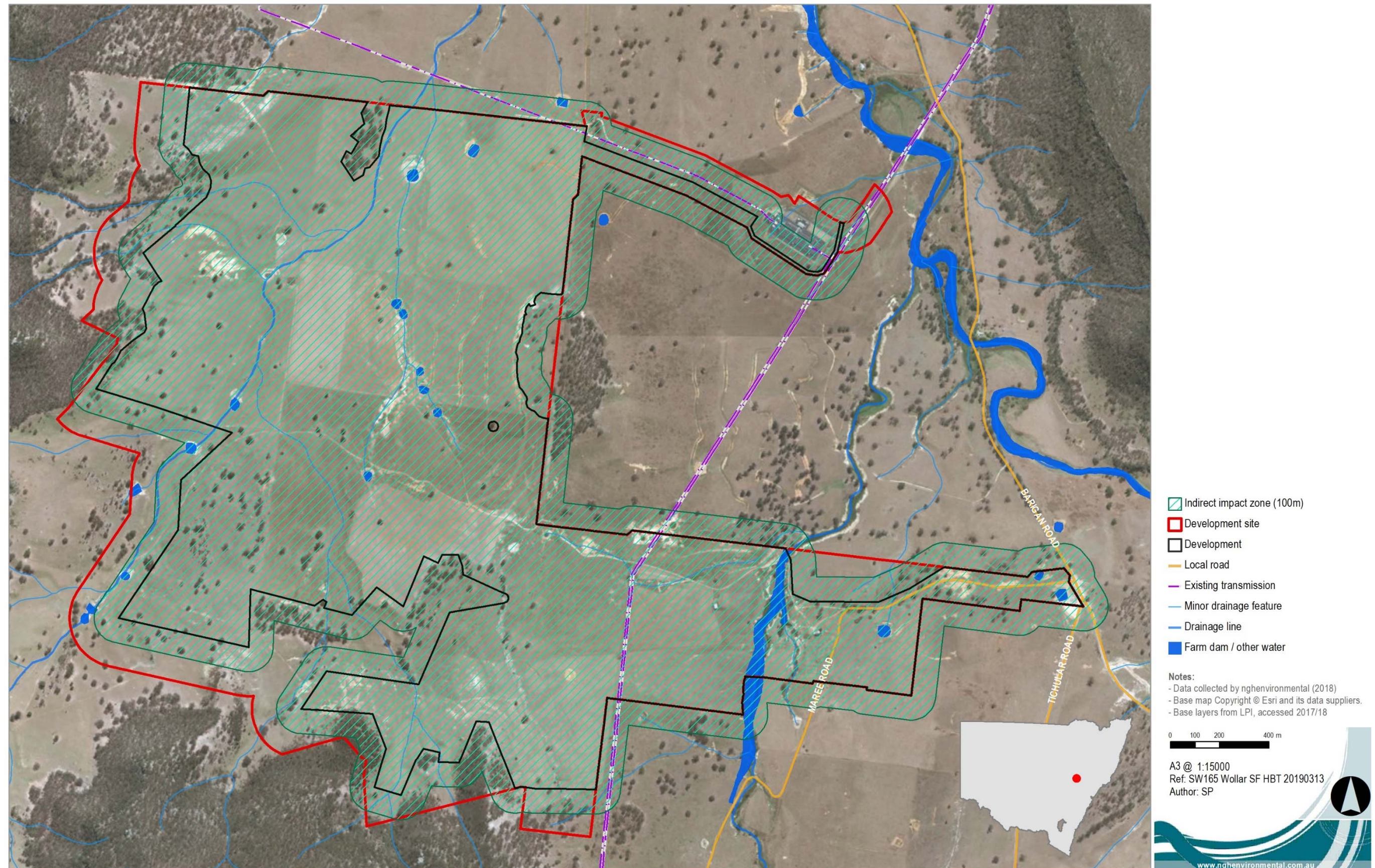


Figure 6-2 Development footprint, Development site and area of indirect impact.

6.2 AVOIDING AND MINIMISING PRESCRIBED BIODIVERSITY IMPACTS

The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme:

The following prescribed impacts are relevant to the proposal:

- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of these species across their range
- Impacts of development on movement of threatened species that maintains their life cycle
- Impacts of development on the habitat of threatened species or ecological communities associated with human made structures or non-native vegetation
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities
- Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

How these prescribed impacts have been avoided and minimised by the proposal is detailed below.

6.2.1 *Impacts of development on the connectivity of different areas of habitat or threatened species that facilitate the movement of these species across the range.*

Major habitat features within the Wollar Valley include;

- Woody and steep ridgeline vegetation with rocky scarps found above the Wollar Valley,
- Box gum woodland and derived native grasslands found on the plains of Wollar Valley,
- Rivers and streams across the Wollar Valley.

In terms of connectivity of woody vegetation, there is some minor tree connectivity (where trees are less than 50m away from each other) running east to west across the southern section of the development footprint. The connectivity of trees (off the property boundary and to the east) is already broken with a distance of greater than 100m separating isolated trees. As such the existing connection is considered very weak and generally not feasible in providing habitat links to more extensive woody vegetation that is found 2.5km east and would only provide connection habitat opportunity for highly mobile species such as birds (Parrots, Honeyeaters, Cockatoos).

In terms of native groundcover requiring assessment under the BAM, it is assumed that the development footprint will impact on 314 ha. Although the area of native grasslands to be impacted is quite large, the expanse of native grasslands remaining within the Wollar Valley (that will not be impacted) is greater than 8000ha. Also, the area of grassy groundcover within the development site has been subjected to intensive farming disturbances including cultivation and regular grazing by sheep. Vegetation integrity plots undertaken substantiate groundcover was influenced by exotic flora in many areas or compacted with many areas containing bare ground devoid of groundcover. As such, the removal of native groundcover in the context of impacting on a large quantity of derived grassland habitat is considered negligible.

6.2.2 *Impacts of development on movement of threatened species that maintains their life cycle*

In term of key habitat for threatened species onsite, they include:

- Box Gum Woodlands (where trees are less than 50m apart),
- Isolated hollow bearing trees,
- Rocky scarps,
- Areas of thick native groundcover,
- Watercourses, especially where areas contain large eucalypts.

The development footprint chosen has attempted to avoid as much key habitat as possible and where this cannot be avoided then more degraded habitat was targeted for impact. Modifications to the development footprint were undertaken to avoid important mapped areas for the regent honeyeater as well as avoiding the majority of better quality TEC that is considered to meet the requirement of MNES. No impacts would occur to the movement of threatened species across the landscape. Refer to Figure 6-3 below.

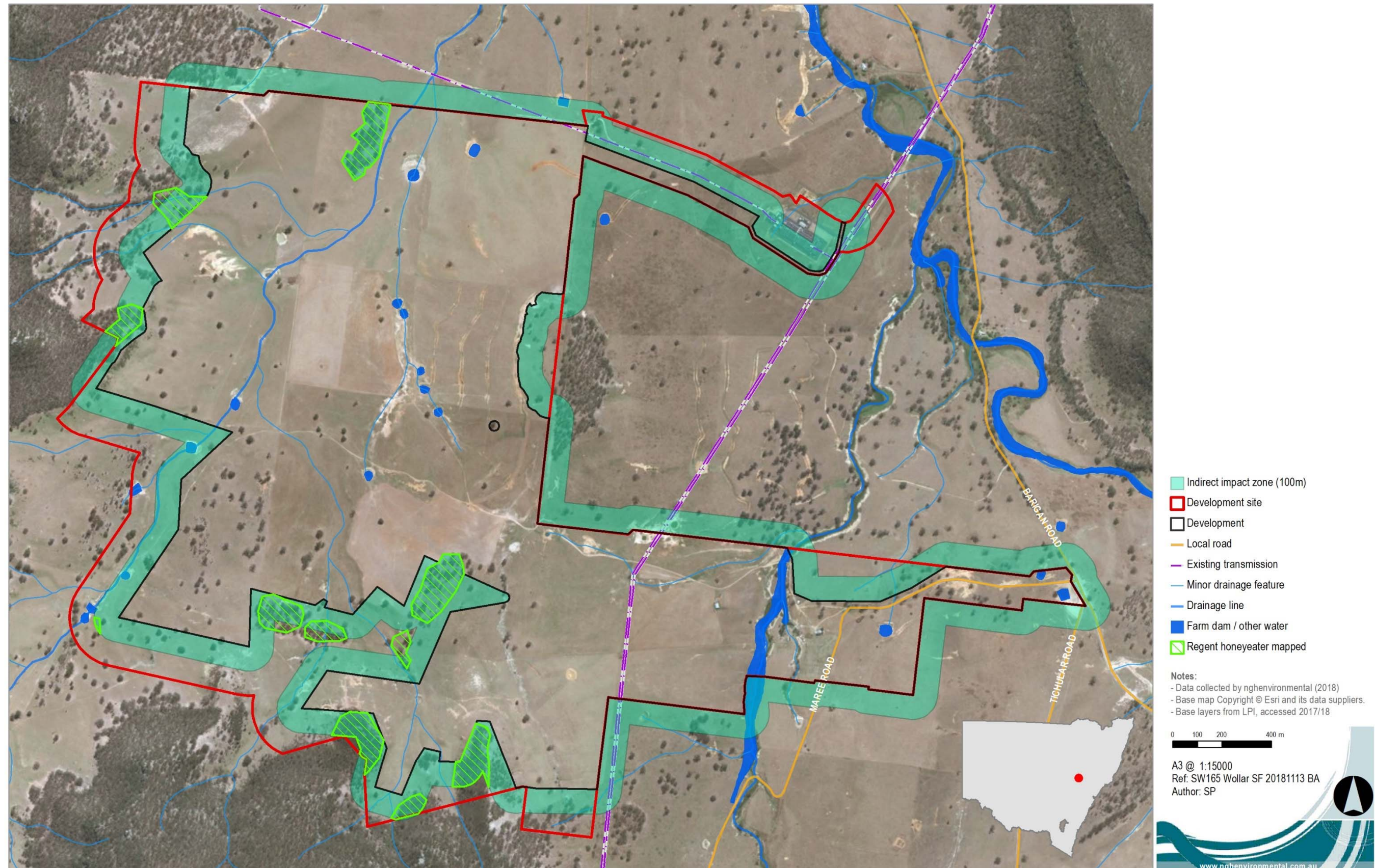


Figure 6-3 Confirmed Regent Honeyeater 'Important Habitat Mapping' as presented by LMBC/OEH in Sept 2018 (green hatching) inside the development site.

6.2.3 Impacts of development on habitat of threatened species or ecological communities associated with human made structures or non-native vegetation

An agricultural shed (within the south east corner of the development site) could provide potential roosting habitat for Eastern Bentwing-bat and other threatened bats that roost in buildings. The Eastern Bent Wing Bat was detected onsite via ultrasonic detection during targeted survey however upon inspection of the agricultural shed, and there being no evidence of use by microbats this structure was ruled out in forming potential habitat. Better quality habitat occurs in the surrounding sandstone ridgelines with abundance of crevices and overhangs present.

A road culvert is present within Wollar creek road crossing on the access track to the substation (see Figure 4-4). On inspection the culvert is highly unlikely to be utilised for microbats due to its exposure onsite. The culvert will not be impacted directly but may be impacted indirectly, especially if there is an increase in the volume of traffic onsite and size of vehicles using the road.

No substantive impacts for habitat of threatened species or ecological communities associated with human made structures or non-native vegetation are anticipated.

6.2.4 Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities

Spring Flat Creek is a fourth order watercourse, which runs through the centre of the Wollar study area and development site. The creek itself, although a forth order stream, has no distinguishable bed and banks, primarily due to the large size of Wollar Valley being a broad expansive flat where energy dissipation of water is very low. The creek itself is spread over a wide flat plain and any water does not concentrate into a channel. No ponded water was observed at the time of inspection in May 2018. Much of its water resources, especially during drier times would be contained within the alluvial sands underground. Based on observation during May 2018, it is assumed that Spring Flat Creek and its associated tributaries are dry most of the time and would only flow during heavy rainfall events. A network of dams exist on Spring Flat Creek providing more permanent water resources to stock.

Due to the ephemeral nature of Spring Flat Creek, the placement of infrastructure within riparian buffers is considered feasible. The designated 40 metre buffer zone either side of the centreline of this creek is devoid of trees and shrubs and is highly degraded. It is not optimal habitat for birds of prey due to the lack of permanent water onsite. The establishment of solar panels is not expected to generate many indirect impacts. There will be minimal ground disturbance when installing the infrastructure. The most impacting activity would be constructing new roads and hardstand areas with the highest impact occurring during construction. Due to the local topography being largely flat and mildly sloping, the momentum of runoff during heavy rainfall events is not expected to cause flash flooding or impact on any watercourses onsite.

6.2.5 Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

The proposal would not directly increase impacts of vehicle strikes on threatened species. Threatened species would not be funnelled into transport corridors as a result of the development proposed. However, an increase in vehicle traffic is likely to indirectly increase (albeit marginally) the risk of vehicle strikes on common species such as Kangaroos and Wombats as well as common and threatened avifauna such as the

Regent Honeyeater. Site management to enforce and reduce site speed limits would minimise impacts of vehicle strikes.

7 IMPACTS UNABLE TO BE AVOIDED

7.1 DIRECT IMPACTS

The construction and operational phases of the proposal has the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts such as habitat clearance and installation and existence of infrastructure.

Table 7-1 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	Consequence
Direct impacts				
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks)	461 ha (assuming total impact over development footprint)	Regular	Construction	<ul style="list-style-type: none"> • Direct loss of native flora and fauna habitat • Potential impacts of additional clearing outside the proposed development footprint • Injury and mortality of fauna during clearing of fauna habitat and habitat trees • Disturbance to stags, fallen timber, and bush rock
Displacement of resident fauna	Unknown	Regular	Construction, operation	<ul style="list-style-type: none"> • Direct loss of native fauna • Decline in local fauna populations
Injury or death of fauna	Unknown	Regular	Construction	<ul style="list-style-type: none"> • Direct loss of native fauna • Decline in local fauna populations
Removal of habitat features e.g. HBTs	9 HBTs 0.56 ha waterbodies	Regular	Construction	<ul style="list-style-type: none"> • Direct loss of native fauna habitat • Injury and mortality of fauna during clearing of habitat features
Shading by solar infrastructure	250.5 ha	Regular	Operational Phase: Long-term	<ul style="list-style-type: none"> • Indirect impacts of altered light (i.e. shading) on derived native grasslands of TECs which could lead to altered species composition and cover abundance.

Nature of impact	Extent	Frequency	Duration and timing	Consequence
				<ul style="list-style-type: none"> Modification of native fauna habitat. Potential loss of ground cover resulting in unstable ground surfaces and sedimentation of adjacent waterways.
Existence of permanent infrastructure (Fencing)	Approximately 15.6km	Regular	Operational Phase: long-term	<ul style="list-style-type: none"> Reduced fauna movements across landscape due to fencing. Collision risks to birds and microbats due to fencing.

7.1.1 Changes in vegetation integrity scores

The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone in Table 7-2 below. For the purpose of this preliminary BDAR, it is assumed that there will be total removal/modification of all vegetation zones, leading to future scores of zero.

Table 7-2 Table of current and future vegetation integrity scores for each vegetation zone within the development footprint.

Zone ID	PCT	NSW and/or threatened species habitat?	EEC	Area (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
1	1303_BoxGumWL	Yes		16.45	47.2	0
2	1303_Derived Native GL	Yes		102.30	9.4	0
3	1303_Cultivated_Low	Yes		110.80	11.4	0
4	1303_Exotic (Paddock tree)	No		12.83	NA	NA
5	281_BoxGumWL	Yes		12.61	68.7	0
6	281_Derived Native GL	Yes		101.51	11.9	0
7	281_Exotic (Paddock tree)	No		31.64	NA	NA
9	1610_Degraded	No		26.86	2.3	0

7.1.2 Loss of species credit species habitat or individuals

The proposal would not result in the loss of species credit species habitat or individuals. Although the Large-eared Pied Bat, Eastern Bentwing Bat and Eastern Cave bat were detected during surveys, optimal breeding, roosting or foraging habitat would not be impacted.

7.1.3 Loss of hollow-bearing trees

Nine Hollow bearing trees (HBTs) were recorded inside the development footprint (see Table 7-3 and Figure 7-1 below).

Table 7-3 Hollow bearing trees that would be removed and associated vegetation zone.

ZONE	HBTs within zone
1) 1303_BoxGumWL	2
2) 1303_DerivedNativeGL	3
3) 1303_Cultivated_Low	0
4) 1303_Exotic (paddock tree)	0
5) 281_BoxGumWL	1
6) 281_DerivedNativeGL	3
7) 281_Exotic (paddock trees)	0
9) 1610_Disturbed	0
TOTAL	9

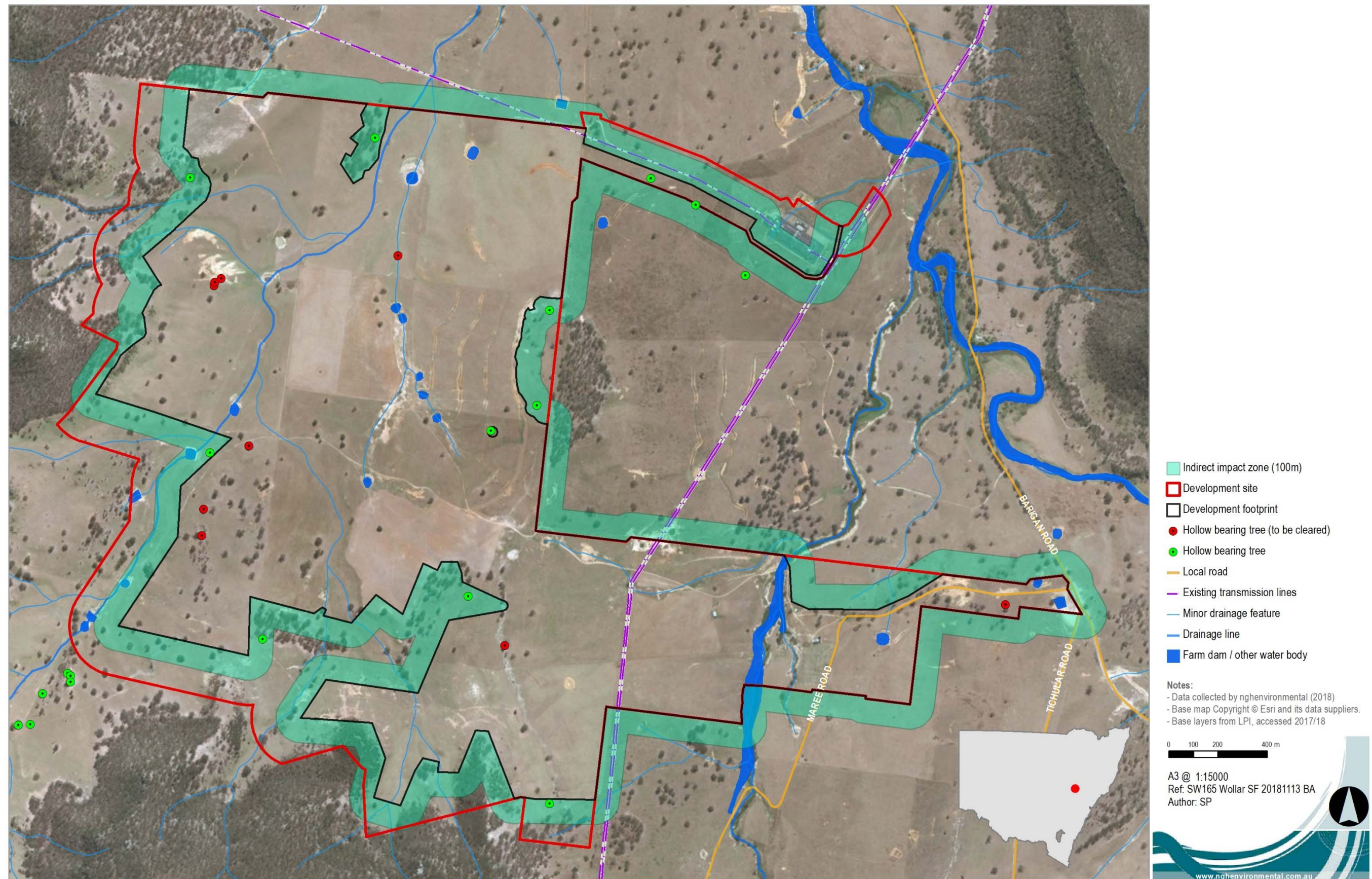


Figure 7-1 Hollow bearing trees (HBTs) within and within 150m of the development site.

7.2 INDIRECT IMPACTS

Indirect impacts of the proposal include soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light or noise and inadvertent disturbances to retained hollow bearing trees. Table 7-1 below details the type, frequency, intensity, duration and consequence of the direct and indirect impacts of the proposal. The zone of indirect impact is mapped on Figure 7-1 above and separately on Figure 7-2.

Table 7-4 Potential indirect impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)					
Inadvertent impacts on adjacent habitat or vegetation	Unknown	Rare	Construction Phase: Short-term	<ul style="list-style-type: none"> White Box – Yellow Box – Blakely's Red Gum Woodland EEC (NSW) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland (EPBC) 	<ul style="list-style-type: none"> Direct loss of native flora and fauna habitat Injury and mortality of fauna during clearing of fauna habitat and habitat trees Disturbance to stags, fallen timber, and bush rock Increased edge effects
Reduced viability of adjacent habitat due to edge effects	Unknown	Constant	Operational Phase: Long-term	<ul style="list-style-type: none"> White Box – Yellow Box – Blakely's Red Gum Woodland EEC (NSW) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland (EPBC) 	<ul style="list-style-type: none"> Further degradation of TECs. Loss of native flora and fauna habitat
Reduced viability of adjacent habitat due to noise, dust or light spill	Unknown	Rare	Operational Phase: Short-term	<ul style="list-style-type: none"> White Box – Yellow Box – Blakely's Red Gum Woodland EEC (NSW) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland (EPBC) 	<ul style="list-style-type: none"> May alter fauna activities and/or movements Loss of foraging or breeding habitat Inhibit the function of plant species, soils and dams
Transport of weeds and pathogens from the site to adjacent vegetation	Unknown	Irregular	Construction & Operational Phase: Long-term	<ul style="list-style-type: none"> White Box – Yellow Box – Blakely's Red Gum Woodland EEC (NSW) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland (EPBC) 	<ul style="list-style-type: none"> Degradation of TEC onsite through future weed invasion
Increased risk of starvation, exposure and loss of shade or shelter	Unknown	Rare	Construction & Operational Phase: Long-term	<ul style="list-style-type: none"> White Box – Yellow Box – Blakely's Red Gum Woodland EEC (NSW) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland (EPBC) 	<ul style="list-style-type: none"> Loss of foraging habitat

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Loss of breeding habitats	12 HBTS adjacent to impact areas	Constant	Construction Phase: Long-term	<ul style="list-style-type: none"> White Box – Yellow Box – Blakely's Red Gum Woodland EEC (NSW) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland (EPBC) 	<ul style="list-style-type: none"> Loss of potential breeding habitat
Increase in pest animal populations	Devt footprint	Regular	Long term	<ul style="list-style-type: none"> White Box – Yellow Box – Blakely's Red Gum Woodland EEC (NSW) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland (EPBC) 	<ul style="list-style-type: none"> Solar arrays may provide potential habitat for pest species like rabbits and foxes to take refuge under panels.
Bush rock removal and disturbance	TBA	One off	Long term	<ul style="list-style-type: none"> White Box – Yellow Box – Blakely's Red Gum Woodland EEC (NSW) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland (EPBC) 	<ul style="list-style-type: none"> Loss of potential breeding habitat

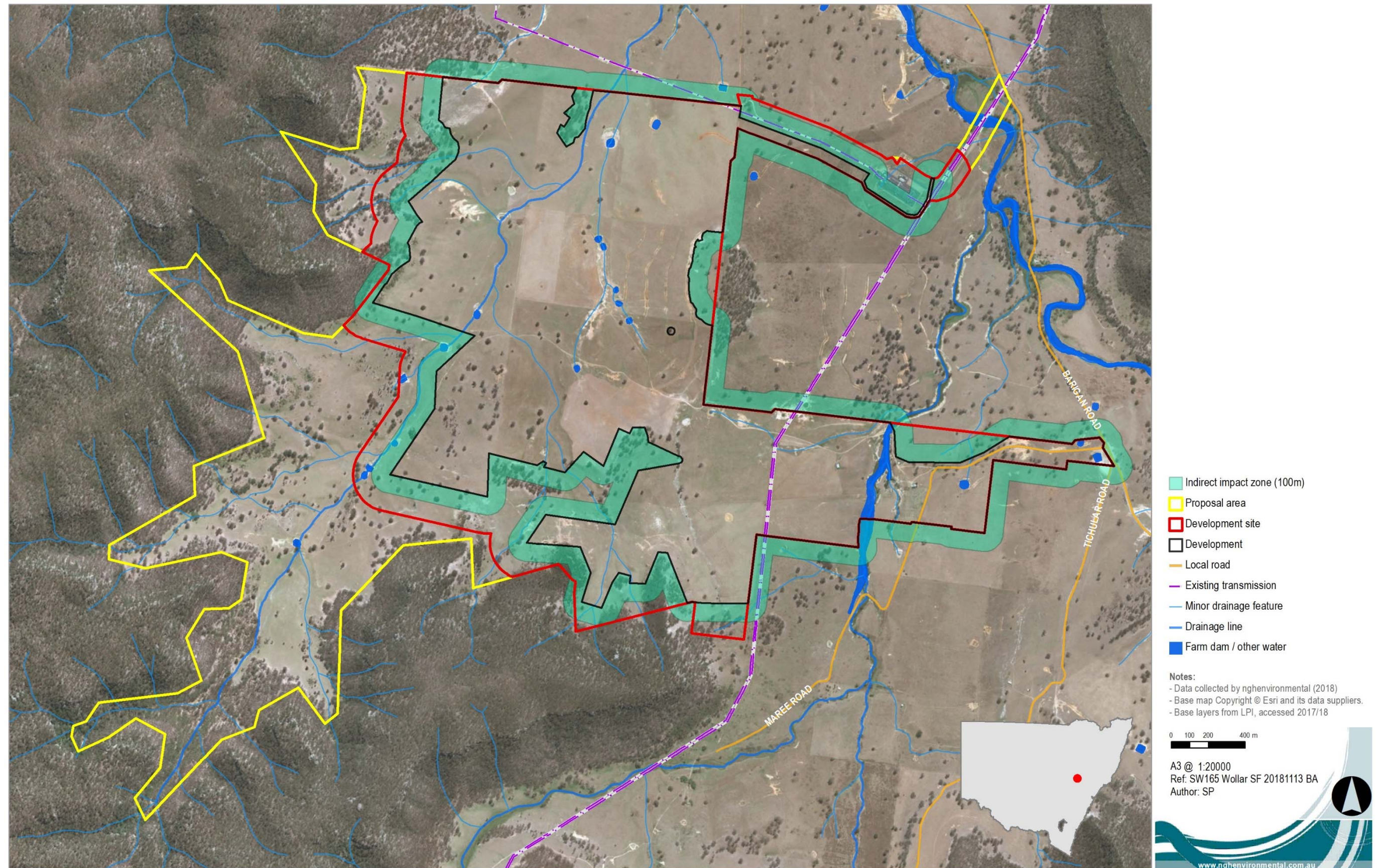


Figure 7-2 Zone of indirect impact for the proposal.

The following prescribed biodiversity impacts are relevant to the proposal:

- Impacts to karst, caves, crevices, cliffs, rocks and other features of geological significance
- Impacts of the development on the connectivity of different areas of habitat of threatened species that facilitates the movement of these species across their range
- Impacts of the development on movement of threatened species that maintains their life cycle
- Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities
- Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

These are discussed in detail below and the necessary information required by Section 9.2 of the BAM provided.

7.2.1 Impacts of development on the habitat of threatened species or ecological communities associated with rocks

There are several distinct bands of Narrabeen Sandstone outcropping along the 70-80m contour line south and west of the development site as can be seen in Figure 4-2 .

Fringing foraging habitat for the Large-eared Pied Bat, Eastern Bentwing-bat and Eastern Cave Bat occurs within the development site however would not be directly impacted by the proposal. Vegetated ridgelines surrounding the development contains significant sandstone caves, crevices and overhangs caves which is suitable roosting sites for Large-eared Pied Bats in the study area. The Large-eared Pied Bat, Eastern Bentwing-bat and Eastern Cave Bat were all detected via ultrasonic detection during surveys in the sandstone ridgeline. Areas containing suitable roosting habitats will not be impacted. Surveys did not detect these species within the development site however it is considered that this species may utilise fringing vegetation within the lower slopes surrounding the development site. No suitable foraging habitat or roosting habitat occurs within the development footprint or will be impacted. Linear rocky outcrops that are within the development site largely contain embedded rock with shallow crevices unlikely to be utilised regularly. No observations or evidence of their use was observed during the field surveys in these areas. The proposed development will be avoiding some, but not all rocky scarps. Some of these areas were unable to be avoided due to their proximity inside the development site. As such, there will be some direct impacts to this habitat. There is unlikely to be any indirect impacts if solar panels are located close to rocky outcrops. The solar panels will be directed towards the sky to capture sunlight and impacts from glare and reflection are unlikely to affect species utilising adjacent rocky habitat. All outcrops within Wollar Valley development site are exposed to sunny weather elements. Solar panel glare is unlikely to impact rocky habitat providing dark caves or crevices.

Suitable and potential foraging and breeding habitat for the Pink-tailed worm-lizard occurs within the development site and would be removed by the proposal. Surveys did not detect this species and so the development site is not considered known habitat.

There is approximately 0.9 ha of suitable habitat within the development site, of which 0.1 ha of partially embedded and loose rock surrounded native grass species including *Themada triandra* may be impacted. Additionally, there approximately 4.9 ha of rocky outcrop through the development site considered potential habitat of which 3.2 ha may be impacted during construction. The quality of potential habitat for

this species is low, being largely embedded rock and subject to persistent grazing and dominated by predominately exotic grasses. With the implementation of the recommended mitigation measures, the proposal would not lead to a long-term decrease in the size of an important population of this species.

7.2.2 impacts of development on the habitat of threatened species or ecological communities associated with human made structures

There is one large agricultural building within the development footprint used to store farm machinery and one small tin shed within some stockyards located within the centre of the property. The shed may have potential to provide suitable roosting habitat for the Eastern Bentwing-bat. No evidence of use was observed during the surveys within the shed.

There is also one culvert installed over Wollar Creek on the substation access track near the intersection of Barigan Road (See Figure 4-5). This structure will not be impacted directly. This structure is not likely to provide roosting habitat for the Eastern Bent-wing Bat because the culvert structure does not provide good protection from the outdoor elements and would be unable to provide thermal benefits or offer high humidity which are required for suitable roosting habitat (Bionet). Therefore it is unlikely to be considered habitat for any microbats addressed in this report.

7.2.3 impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation

Large portions of the development footprint contain areas of non-native vegetation which did not require assessment under the BAM. Most areas consisted of ploughed paddocks being sown with Lucerne and oats. These areas (excluding the paddock trees) are not expected to provide any unique habitat opportunities for any of the candidate species assessed.

7.2.4 impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

Box-gum woodland is currently highly fragmented through the central portions of the development site due to historical land use with only small clumps and isolated paddock trees remaining. More connected and better condition box- gum woodland occurs on the boundary of the development site and lower slopes outside of the development site. Connectivity of the woodland would still be maintained through these areas. The loss of a number of paddock trees and smaller patches within the development footprint would result in minor loss of connectivity for more transient, agile and disturbance tolerant species, however as these areas occur as canopy species only, and lack the more complex vegetative structure of the lower slopes and larger patches of vegetation within and outside of the development site that would not be impacted, ensuring that species that rely of box-gum woodland as well as genetic variation would be maintained and not considered to significantly increase fragmentation of the box-gum woodland.

The remnant treed Box Gum Woodland habitat provides connectivity for threatened woodland birds such as Regent Honeyeater, Speckled Warbler, Brown Treecreeper, Varied Sittella, Little Lorikeet, Swift Parrot, Hooded Robin, Black-chinned Honeyeater, Turquoise Parrot, Scarlet Robin, Flame Robin, Grey-crowned Babbler and Diamond Firetail. Where hollow-bearing trees are present there are key breeding habitat opportunities for Gang-gang Cockatoo, Barking Owl, Powerful Owl, Masked Owl, Squirrel Glider and Brush-tailed Phascogale. These patches of woodland have been subjected to a history of clearing and farming and are fragmented. This has resulted in these patches becoming isolated and less viable, especially for

terrestrial fauna such as Koalas and the Spotted-tail Quoll. The degree of impact on these already fragmented patches is not seen to pose a substantial impact on any threatened species.

The derived native grasslands and paddock trees and woodland habitat provide habitat for threatened birds of prey like the Spotted Harrier, White-bellied Sea Eagle, Little Eagle and Square-tailed Kite, especially around areas containing large dams found on Spring Flat Creek.

The proposal is therefore not likely to disrupt the movement of these species and would not have a substantive impact on their bioregional persistence.

7.2.5 impacts of the development on movement of threatened species that maintains their life cycle

In term of key habitat for threatened species onsite, they include;

- Box Gum Woodlands (where trees are less than 50m apart)
- Isolated hollow bearing trees
- Rocky scarps
- Areas of thick native groundcover
- Watercourses, especially where areas contain large eucalypts.

The development footprint chosen will not remove large quantities of key habitat such that the life-cycles of any Candidate species (assessed within the BDAR) will be significantly affected. Fringing foraging habitat for the Large-eared Pied Bat, Eastern Bentwing-bat and Eastern Cave Bat occurs within the development site however would not be directly impacted by the proposal. Vegetated ridgelines surrounding the development contains significant sandstone caves, crevices and overhangs caves which is suitable roosting sites for Large-eared Pied Bats in the study area. The Large-eared Pied Bat, Eastern Bentwing-bat and Eastern Cave Bat were all detected via ultrasonic detection during surveys approximately 400m south of the development site in the sandstone ridgeline. Areas containing suitable roosting habitats will not be impacted.

No suitable foraging habitat or roosting habitat occurs within the development footprint or will be impacted. These microchiropteran bats are sub canopy foragers preferring to forage along the edges of vegetation and sandstone escarpments and are not known to utilise open grasslands or small area vegetated areas for foraging. Eastern Cave Bats may forage away from sub canopy and fringing shrubby vegetation and forage up to 500m over grassland areas on occasion, however the proposal would not impact upon the ability of this species to forage within these areas. Although detected within the study area, no species credits have been generated for these species from the proposal as optimal breeding, roosting or foraging habitat would not be impacted.

7.2.6 Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development)

In terms of TECs onsite, the proposed solar farm will not alter water quality or influence hydrological processes onsite or cause any new impacts on Box Gum Woodlands beyond what is impacted by installing solar panels. The development footprint is located within the riparian zone where panels will be

constructed either side of the watercourse. The watercourse (although 4th order) does not contain a definable bed and banks where most of its water flows under the ground. The designated 40 metre buffer zone either side of the bank is devoid of trees and shrubs and is highly degraded.

The establishment of solar panels is not expected to generate many indirect impacts on threatened species. There will be minimal ground disturbance when installing the infrastructure. The most impacting activity would be constructing new roads and hardstand areas with the highest impact occurring during construction. Due to the local topography being largely flat and mildly sloping, the momentum of runoff during heavy rainfall events is not expected to generate indirect impacts from stormwater runoff.

Two of the candidate species rely on aquatic habitat for food and shelter. These are the White-bellied Sea Eagle and Square-tail Kite. Neither species were observed during any of the field assessment inspections including targeted survey and it is therefore assumed that they do not utilise habitat onsite. No stick nest trees were observed inside the development footprint or site. Based on these inspections, it is concluded that the area is not optimal breeding or foraging habitat for birds of prey, primarily because of the lack of permanent water onsite.

7.2.7 Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

An increase in vehicle traffic during construction and required maintenance may slightly increase the risk of vehicle strike on threatened species occurring in or near the development site.

Fencing may act as a barriers to movement and may funnel species into transport corridors.

Mitigation measures will be implemented to enforce a site speed. With the recommended mitigation measures, it is therefore not likely that vehicles associated with the proposal will have a substantive impact on any species.

7.3 IMPACTS TO BIODIVERSITY VALUES THAT ARE UNCERTAIN

The majority of the development footprint (55%) will consist of solar panels. The impacts of shading and diversion of rainfall runoff from the panels themselves is largely unknown. This aspect is discussed in more detail under section 7.5 below in relation to potential impacts on the composition and cover abundance of groundcover.

For the purpose of this BDAR report, the entire development footprint is assumed to be removed however, as the indicative layout shows, substantial peripheral areas are likely to be unimpacted and it is likely that a number of perennial native species will persist underneath the solar arrays. Certainly, only a minor proportion of the seed bank will be impacted, given the limited excavation proposed.

In this assessment an assumption has been made that all vegetation within the development footprint would be removed. This is a 'worst case' conservative approach. There is currently limited ability to vary this assumption without specific scientific data to justify a lesser impact; such as the results of ground cover monitoring beneath the solar array. Therefore the costs associated with purchasing and retiring ecosystem and species credits or the need for offset areas is currently an 'over estimated result' of the impacts of this solar farm undertaken to address current uncertainty.

7.4 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

To address the Supplementary SEARs regarding MNES:

- Additional field survey was undertaken in October 2018 to better characterise CEEC vegetation and undertake targeted surveys for other species listed under the EPBC.
- Evaluation of floristics was undertaken.
- A condition threshold evaluation was undertaken against the Commonwealth criteria
- Assessments of Significance were undertaken.

The results are summarised below.

7.4.1 Threatened Ecological Communities

One EPBC listed community – ‘White Box -Yellow Box – Blakely’s Red Gum Grassy Woodlands and Derived Native Grassland’ (PCT 281 & 1303) was present within the development site.

537 ha of Box Gum Woodland (BGW) and Derived Native Grasslands (DNG) occurs within the development site of which 232 ha will be directly impacted. 29 ha of this is considered high diversity structural woodland and the residual areas (87%) of derived native grassland are relatively degraded. Development footprint revisions were undertaken to exclude as much of the high diversity CEEC as possible.

It is interesting to note that while much of the site is very weedy and degraded, the native species persisting are perennial and therefore the proportion of native biomass (ignoring exotic annuals) is often over 50%. While occurring at low density and in low numbers, the total number of native grass and forb species was often relatively high. This may be due to the effects of recent fire, stimulating the soil seed bank and also the use of cattle grazing in preference to sheep grazing. Excluding the high diversity areas mapped for the site, the residual areas are considered to have relatively low conservation value despite meeting the CEEC criteria. Table 7-5 below illustrates the analysis of floristics and cover abundance undertaken of the BAM plots to assess the status of vegetation and its classification of box gum woodland and derived native grassland requiring assessment under Matters of National Significance (MNES).

An EPBC Assessment of significance was completed for Box Gum Woodland EEC (Appendix E) and concluded the proposal will result in the loss of 232 ha of box-gum woodland, approximately 43% of the know extent of BGW/DNG within the development site. Although additional areas of box-gum woodland occur within the Wollar Valley, many of areas are fragmented and subjected to degradation of invasion of exotic flora and other land use practices. As all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria are considered critical to the survival of this ecological community, as well as degraded woodland areas not considered part of the listed ecological community being considered essential to the long-term conservation of Box-Gum Grassy Woodland, due to landscape setting or habitat features, the assessment has concluded that although unlikely, there is a potential for a significant impact and referral to the Commonwealth Department of Environment is recommended for legal certainty.

Table 7-5 Analysis of floristics and cover abundance of BAM plots for classifying box gum woodland and derived native grassland requiring assessment under EPBC Act criteria.

Zone ID and PCT	Area	Plot ID	Field BAM Plot ID (refer to Figure 3-2)	Trees present	No of grass species	No of forb/fern /Other species	% proportion of native biomass over plot (ignoring exotic annuals)	EPBC Act criteria met	Presence of one important species for this CEEC.	VI score BAM C
Zone 1 1303_BGW	16.45 ha	1	W1	No trees but present <75m away	9	6	>50%	No	<i>Calotis lappulacea</i>	47.2
		2	W7	Yes trees	8	26	>50%	Yes	<i>Calotis lappulacea</i>	
		3	W6	Yes trees	11	18	>50%	Yes	<i>Calotis lappulacea</i>	
		4	W8	No trees	13	16	>50%	Yes	<i>Calotis lappulacea</i>	
Zone 2 1303_DNG	102.3 ha	1	W9	No trees	13	5	<50%	No	<i>Calotis lappulacea</i>	9.4
		2	W10	No trees	8	11	>50%	No	<i>Calotis lappulacea</i>	
		3	W29	No trees	2	10	>50%	No	<i>Vittadinia cuneata</i>	
		4	W12	No trees	8	11	>50%	No	<i>Calotis lappulacea</i>	
		5	W11	No trees	6	13	>50%	Yes	<i>Calotis lappulacea</i>	
		6	W4	No trees	15	15	>50%	Yes	<i>Vittadinia muelleri</i>	
Zone 3 1303_Cultivated_Low	110.8 ha	1	W3	No trees	6	2	>50%	No	<i>Calotis lappulacea</i>	11.4
		2	W13	No trees	7	5	>50%	No	<i>Calotis lappulacea</i>	
		3	W16	No trees	10	7	>50%	No	<i>none</i>	
		4	W14	No trees	7	9	>50%	No	<i>Calotis lappulaceae</i>	
		5	W17	No trees	5	11	>50%	No	<i>Vittadinia muelleri</i>	
		6	W15	No trees	3	4	<50% (rye grass)	No	<i>Goodenia pinnatifolia</i>	
Zone 4 1303_Paddock tree	12.8 ha	1	W18	No trees	1	2	<50% (Lucerne)	No	<i>none</i>	-
Zone 5 281_BGW	12.61 ha	1	W2	Yes trees/16 forbs	20	16	>50%	Yes	<i>Glycine clandestina</i>	68.7
		2	W20	Yes trees/10 forbs	4	12	>50%	Yes	<i>Glycine clandestina</i>	
		3	W19	Yes trees/22 forbs	5	26	>50%	Yes	<i>Glycine clandestina</i>	
Zone 6 281_DNG	101.5 ha	1	W5	No trees	11	15	>50%	Yes	<i>Calotis lappulaceae</i>	11.9
		2	W21	No trees	5	14	>50%	Yes	<i>Calotis lappulaceae</i>	
		3	W28	No trees	7	15	>50%	Yes	<i>Calotis lappulaceae</i>	

Zone ID and PCT	Area	Plot ID	Field BAM Plot ID (refer to Figure 3-2)	Trees present	No of grass species	No of forb/fern /Other species	% proportion of native biomass over plot (ignoring exotic annuals)	EPBC Act criteria met	Presence of one important species for this CEEC.	VI score BAM C
		4	W22	No trees	6	13	>50%	Yes	<i>Calotis lappulaceae</i>	
		5	W30	No trees	8	9	>50%	No	<i>Calotis lappulaceae</i>	
		6	W23	No trees	7	10	>50%	No	<i>Calotis lappulaceae</i>	

7.4.2 Threatened species

One EPBC-listed species was recorded during the surveys; the Large-eared Pied Bat.

A habitat evaluation (Appendix D) assessing the presence of habitat and likelihood for potential EPBC listed species including species identified within supplementary SEARS being impacted was undertaken, after the October 2018 targeted field surveys. The habitat evaluation determined EPBC Assessments of significance were completed for Regent Honeyeater, Pink-tailed worm-lizard and Large-eared Pied Bat; these were the only species required to be considered as the other species were evaluated as having no to very low likelihood to occur onsite and be impacted.

While considered to have low potential to occur, a Koala habitat assessment was undertaken using the Commonwealth tool to characterise the potential for impact to this species.

Large-eared Pied Bat, Regent Honeyeater, Pink-tailed worm-lizard

The Large-eared Pied Bat was recorded via ultrasonic detection. Optimal breeding and roosting habitat for this species is primarily limited to sandstone crevices and overhangs within the surrounding ridgelines outside of the development site. Additionally, foraging habitat consisting of complex forest or woodland structure which is not considered to occur within the development footprint. As this is a sub canopy forager and species would unlikely utilise grasslands for foraging, therefore only utilising areas within the development footprint for transient purposes, impacts to this species are not considered to occur as a result of the proposal.

The Assessments of significance (provided in full Appendix E) concluded that a significant impact was unlikely for Regent Honeyeater, Pink-tailed worm-lizard and Large-eared Pied Bat, on the basis that the proposal would not:

- Lead to a reduction of the size or area of occupancy of a population, or fragment or disrupt the breeding cycle of a population
- Affect habitat critical to the survival of these species
- Affect habitat or introduce disease such that these species would decline
- Introduce invasive species harmful to the species
- Interfere with the recovery of these species

Koalas

No Koalas were found during targeted SAT surveys onsite in May 2018. Habitat for this species within the development site is isolated and highly degraded. It is considered unlikely that the Koala would utilise the habitats available.

The EPBC Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is provided as Table 7-6 below as it applies to the proposal. Impact areas that score five or more using the habitat assessment tool contain habitat critical to the survival of the Koala. The assessment in Table 7-6 resulted in a score of 3 and as such, habitat within the study area is not considered to be critical to the survival of the Koala. An assessment of significant impact according to the EPBC Act significant impact criteria is not required.

Table 7-6 Koala habitat assessment tool for inland areas (DoE 2014)

Attribute	Score	Inland	Applicable to the proposal?
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	No evidence of Koalas recorded during the surveys
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	
	0 (low)	None of the above.	✓ (0)
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	✓ (2) White Box & Yellow Box are listed food tree species and both are present in the upper strata
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	
	0 (low)	None of the above.	
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	
	+1 (medium)	Area is part of a contiguous landscape < 1000 ha, but ≥ 500 ha.	
	0 (low)	None of the above.	✓ (0)
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, OR Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	✓ (1) No Koala mortality observed during the survey
	0	Evidence of frequent or regular koala mortality from vehicle strike or dog attack	

Attribute	Score	Inland	Applicable to the proposal?
	(low)	in the study area at present, OR Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	✓(0) Study area is not considered a habitat refuge nor does it provide important connectivity to large areas surrounding a habitat refuge
Total	3	Decision: Habitat is NOT critical to the survival of the Koala—assessment of significance NOT required	

7.5 LIMITATIONS TO DATA, ASSUMPTIONS AND PREDICTIONS

7.5.1 Assumptions about impact extent

For the purpose of this BDAR report, the entire development footprint is assumed to be removed however, as the indicative layout shows, substantial peripheral areas are likely to be unimpacted and it is likely that a number of perennial native species will persist underneath the solar arrays. Certainly, only a minor proportion of the seed bank will be impacted, given the limited excavation proposed.

In this assessment an assumption has been made that all vegetation within the development footprint would be removed. This is a 'worst case' and highly conservative approach. There is currently limited ability to vary this assumption without specific scientific data to justify a lesser impact; such as the results of ground cover monitoring beneath the solar array. Therefore the costs associated with purchasing and retiring ecosystem and species credits or the need for offset areas is currently an 'over estimated result' of the impacts of this solar farm.

7.5.2 Survey timing and efficacy

The seasonal conditions at the time of targeted survey for threatened plants, especially *Monotaxis macrophylla* were not ideal. A declared drought during the optimal time for survey (August) means there are limited resources available for this plant to grow and set seed. The optimal habitat zone would also be frequented by hungry stock causing a further decline in groundcover from overgrazing and trampling onsite.

The calculation of hollow-bearing trees, in particular the size and number of hollows, was made from ground level. It is possible that some hollows are present that were not visible from ground level, which may result in underestimates of the number of hollows (Gibbons and Lindenmayer, 2000). However, it was noted where it was considered likely that hollows were present but not visible from ground level.

It is possible that some species were not recorded during the survey due to the timing of the survey outside their recommended survey period. Where survey effort or timing is not consistent with the BAM or relevant guidelines, this is stated explicitly in the assessment and measures identified to address the limitation; i.e. assumption of occurrence for species whose survey window could not be met.

8 MITIGATING AND MANAGING IMPACTS

8.1 MITIGATION MEASURES

A general summary of the key measures required to mitigate the impacts of the proposal are provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure and an analysis of the consequences of any residual impacts are provided in Table 8-1.

8.1.1 *Impacts from the clearing of vegetation and habitats*

1. Time works to avoid critical life cycle events on threatened species
2. Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler
3. Relocate habitat features (fallen timber, hollow logs) from within the development site

8.1.2 *Indirect impacts*

1. Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed
2. Adaptive dust monitoring programs to control air quality
3. Temporary fencing to protect significant environmental features such as riparian zones
4. Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas
5. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented

8.1.3 *Prescribed impacts*

1. Appropriate landscape plantings of local indigenous species to replace loss of planted vegetation
Adaptive dust monitoring programs to control air quality
2. Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment
Temporary fencing to protect significant environmental features such as riparian zones
3. Enforce site speed limits to reduce impacts of vehicle strikes on threatened fauna.

Table 8-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Displacement of resident fauna through vegetation clearing and habitat removal						
Time works to avoid critical life cycle events	<ul style="list-style-type: none"> Hollow-bearing trees would not be removed during breeding season (spring to summer) for threatened hollow dependant fauna. If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure no impacts to fauna would occur 	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler	<ul style="list-style-type: none"> A tree clearing procedure would be implemented to minimise harm to resident fauna. 	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
Relocate habitat features (fallen timber, hollow logs) from within the development site	<ul style="list-style-type: none"> Procedure for relocation of habitat features to adjacent area for habitat enhancement would be implemented. 	Construction	Regular	Contractor	Low	None
Indirect impacts on native vegetation and habitat						
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is	<ul style="list-style-type: none"> Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing. No stockpiling or storage within dripline of any mature trees. 	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
preferable in situations where partial clearing is proposed	<ul style="list-style-type: none"> Access and laydown in areas of Box-Gum Woodland TEC will be minimised to reduce impacts. Exclusion fencing and signage or similar would be installed around habitat to be retained. 					
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	<ul style="list-style-type: none"> Construction Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible. 	Construction	Regular	Contractor	Low	None
Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	<ul style="list-style-type: none"> Avoid Night Works where possible Direct lights away from vegetation 	Construction/ Operation	Regular	Contractor	Low	None
Adaptive dust monitoring programs to control air quality	<ul style="list-style-type: none"> Daily monitoring of dust generated by construction activities Construction would cease if dust observed being blown from site until control measures were implemented All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the development site 	Construction	Regularly	Contractor	Moderate	Sedimentation in ephemeral waterways and dams.
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	<ul style="list-style-type: none"> A Weed Management procedure would be developed for the proposal to prevent and minimise 	Construction, Operation	Regular	Contractor	Moderate	Weed encroachment

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	<p>the spread of weeds. This would include:</p> <ul style="list-style-type: none"> ○ Management protocol for declared priority weeds under the Biosecurity Act 2015 during and after construction ○ Weed hygiene protocol in relation to plant, machinery, and fill • Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported. • The weed management procedure would be incorporated into the Biodiversity Management Plan. 					
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	<ul style="list-style-type: none"> • Site induction and toolbox talks for ecologically sensitive areas would be undertaken. 	Construction	Regular	Contractor	Moderate	Impacts to native vegetation or threatened species for Staff training not being followed
Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed development	<ul style="list-style-type: none"> • Preparation of a Biodiversity management plan that would include protocols for: <ul style="list-style-type: none"> ○ Protection of native vegetation to be retained ○ Best practice removal and disposal of vegetation ○ Staged removal of hollow-bearing trees and other habitat features such as fallen 	Construction	One-off	Contractor	Moderate	Impacts to native vegetation or threatened species for Biodiversity Management Plan not being followed.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	<ul style="list-style-type: none"> logs with attendance by an ecologist ○ Weed management ○ Unexpected threatened species finds ○ Exclusion of vehicles through sensitive areas. ○ Rehabilitation of disturbed areas 					
Preparation of a vegetation management plan to monitor ground cover beneath the solar array modules.	<ul style="list-style-type: none"> • A Ground cover management plan would be developed to: <ul style="list-style-type: none"> ○ Ensure that ground cover is retained beneath panels, to resist erosion and weeds ○ Preserve the native composition as much as possible 	Operation	Regula	Contractor	Moderate	Weed cover and erosion may increase. Native species composition may decline.
Erosion and sediment controls	<ul style="list-style-type: none"> • An erosion and sediment control plan would be prepared in conjunction with the final design and implemented 	Construction	Regular	Contractor	Moderate	Impacts may occur if erosion and sedimentation control plan not implemented.
Prescribed biodiversity impacts						
Sediment barriers and spill management procedures to control the quality of water runoff released from the site into the receiving environment	<ul style="list-style-type: none"> • An erosion and sediment control plan would be prepared in conjunction with the final design and implemented • Spill management procedures would be implemented. 	Construction	Regular	Contractor	Moderate	Impacts may occur to waterway if erosion and sedimentation control plan not implemented.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Appropriate landscape plantings of local indigenous species (where possible) within the development site	<ul style="list-style-type: none"> Landscape plantings will be comprised of local indigenous species. 	Operation	Regular	Client	Moderate	Plants not surviving
Staff training and site briefing to communicate impacts of traffic strikes on native fauna.	<ul style="list-style-type: none"> Awareness training during site inductions regarding enforcing site speed limits. Site speed limits to be enforced to minimise fauna strike. 	Construction and Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles

8.2 ADAPTIVE MANAGEMENT STRATEGY

The largest impact expected from this solar farm is the impact of solar panels and shading on White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived native grassland onsite. The assumption that solar panel arrays will result in 100% impact on groundcover is used because there is a lack of scientific data proving otherwise. It is recommended that monitoring of groundcover under the solar panels is undertaken:

1. Primarily to ensure that ground cover is retained to resist erosion and potential weed ingress managed,
2. But also to provide information to the scientific community regarding the impact of shading on native grasslands in this location.

It may be that the conservative assumptions of this assessment (regarding 100% impact on vegetation) are an unnecessarily high impost on projects that assist the transition to reduced greenhouse gas emissions and that thereby have many broader environmental benefits.

9 SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

9.1 POTENTIAL SERIOUS AND IRREVERSIBLE IMPACT ENTITIES

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- 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, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

9.1.1 Threatened ecological communities

One threatened ecological community will be impacted on by the proposal that is listed as a potential SAI entity in the *Guidance to assist a decision-maker to determine a serious and irreversible impact*. This is the;

- White Box-Yellow Box- Blakely's Red Gum Woodland (Box-gum Woodland).

9.1.2 Threatened species

The following are SAI candidate species that have been identified for assessment within the Wollar development site.

- Regent Honeyeater (important habitat mapping)

9.1.3 Additional potential entities

No further species were considered to be potential SAI entities.

9.2 ASSESSMENT OF SERIOUS AND IRREVERSIBLE IMPACTS

9.2.1 White Box – Yellow Box – Blakely's Red Gum Woodland (Box-gum Woodland)

An assessment of the impacts to the NSW EEC Box-gum woodland was undertaken. Figure 6-1 shows the location of the Box-gum woodland EEC in context to the development footprint.

- a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAI**

343 ha of vegetation that meets the NSW criteria for Endangered Ecological Communities, most (92%) in degraded condition that does not generate offsets.

Around fifty percent of the Wollar development site contains vegetation matching White Box – Yellow Box – Blakely's Red Gum Woodland (Box Gum Woodland). This makes the option to fully avoid this TEC impossible if the solar farm is to proceed. Most of the higher quality woodlands with trees are found

towards the southern parts of the development footprint, where larger patches of intact wooded TEC have been avoided.

- b) the area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone**

Table 9-1 Vegetation Zones defined as BGW/DNG inside the development site. The development proposal is not expected to indirectly impact any vegetation zones.

Zone ID and PCT	Vegetation Integrity Score	Area of direct impact	Area of indirect impact	Condition
Veg zone 1 1303_BoxGumWL	47.2	16.45	0	Good
Veg zone 2 1303_DerivedNativeGL	9.4	102.3	0	Moderate
Veg zone 3 1303_Low cultiv	11.4	110.8	0	Low
Veg Zone 5 281 BoxGumWL	68.7	12.6	0	Good
Veg Zone 6 281 DerivedNativeGL	11.9	101.5	0	Moderate

- c) a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact**

No threshold have yet been defined by OEH for the extent of Box-gum Woodland to be removed that constitutes a serious and irreversible impact.

- d) the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint**

The development footprint is 461 ha in area and 343 ha consists of vegetation defined as Box-gum Woodland /Derived native grassland TEC . Using Google Earth to view aerial imagery, it is estimated that approximately the same percentage (51%) of the surrounding landscape also contains Box Gum Woodland. Confirmation of groundcover outside of the Wollar study locality site however, cannot be verified by field survey.

- e) an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration**

It was not possible to accurately assess the percentage of Box Gum Woodlands and Derived Native Grasslands inside the Kerribee IBRA Subregion. This was because of the lack of vegetation mapping covering Wollar and surrounds. The use of GIS programs to estimate the percentage of mapped Box Gum Woodlands TEC could not be undertaken.

To try and overcome this constraint, a general review of Google Earth aerial photography was viewed in conjunction with Kerribee Subregion mapping. Areas of Box Gum Woodlands are most likely be confined to broad valleys within Kerribee Subregion which generally relate to cleared farming land. It is estimated that around 30% of Kerribee Subregion consists of farming country with potential for Box Gum Woodlands. Of this 30%, it is estimated that the Wollar solar farm would constitute about 1% of this area.

f) an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion

In NSW Box-gum grassy Woodland is known to occur within at least 42 reserve systems. 8,000 ha of Box-gum woodland is estimated to occur in national parks and nature reserves within the NSW South Western Slopes IBRA Region (Benson 2008).

g) the development proposal's impact on:

i. abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns

It is predicted that the proposal could have impacts on,

- surface water flows across the ground, this would be limited as minimal excavation is proposed and panels would be mounted above the ground,
- change in light levels reaching the ground due to shading of panels, mitigated by spacing between panels,
- modification to ground moisture levels where solar panels may block or concentrate rain over certain areas.

The proposal could potentially benefit the BGW/DNG by;

- Removing disturbances caused by farming activities such as application of fertilisers and overgrazing by stock.

There is little scientific information on the effects of solar farms on these factors. Until sufficient monitoring of Solar farms is carried out, it is largely unknown whether solar farms are likely to have a detrimental impact on abiotic factors. A 'worst case' assumption would be that alterations to sunlight reaching the ground and changes to surface water flows due to the large surface area of solar panels over the ground, could modify abiotic factors necessary for survival of the TEC.

A review of the National Recovery Plan for BGW/DNG, indicates that;

- Altered hydrological regimes may lead to impacts,
- Prolonged shading may lead to impacts and
- Mowing and slashing associated with managing grasslands may lead to impacts

To address the uncertainty, it is therefore assumed that this proposal may lead to modification and destruction of important abiotic factors for preserving the integrity of this TEC onsite.

ii. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants

The proposal would impact on the character and function of Box Gum Woodland in the following ways;

- Removing 29 ha of box gum woodland containing mature trees but not containing understorey vegetation
- Removing nine hollow bearing trees (with small, medium and large hollows) within this TEC
- Removing 29 ha of moderate to good condition vegetation of sufficient quality to generate offsets, and
- Removing 314.6 ha of degraded condition vegetation that does not generate offsets.

The groundcover within particular areas of the subject site is modified due to weed invasion, trampling by stock, past cultivation and past application of fertilisers which have all impacted on groundcover diversity. This reduces the severity of impacts that may result from any further changes to species composition.

No introduced fire or flooding regimes would occur and no increase of natural occurrences of these events is anticipated from the development. The harvesting of plants will not occur within the remaining Box-gum woodland.

iii. the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts

29ha (8 %) is relatively intact Box Gum Woodland with trees and 314 ha (92%) is degraded native grasslands of varying condition (but requiring assessment and offsetting under BOS). The proposed development is not expected to indirectly impact on any additional areas of this TEC. It may be that remaining land is used as an offset and if this is the case then management action would be expected to improve any remaining patches of TEC not directly impacted.

h) direct or indirect fragmentation and isolation of an important area of the potential TEC

Upper assumed extent

The proposal occurs within a much larger patch of BGW/DNG within the Wollar Valley. At present, this patch is bordered to the north (extending 11km from the subject site), to the south west and west (extending approximately 500m from the subject site) and to the east (extending approximately 2km), by vegetated mountains not defined or likely to constitute BGW/DNG.

The location of the area of direct impact will isolate a portion of BGW/DNG directly south-west of the subject site. This patch is estimated to be 210 ha in area which would become separated from the existing patch of BGW/DNG. It is estimated that the proposal would isolate around 4% of the current patch of BGW/DNG (not including the 4% to be removed for solar panels).

Smallest extent

The proposal forms the majority of the patch of BGW/DNG which extends off the property to the south west. The proposal will not result in fragmentation of this patch however it will substantially reduce its extent as outlined in a).

i) the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.

The 29 ha of Box-gum woodland generating offsets will be offset in accordance with the Biodiversity Conservation Act 2016 to ensure protection in perpetuity for similar habitat in the IBRA region.

There is good potential to offset the south western portion of the property (all remaining areas of Box Gum Woodland and other non Box Gum Woodland vegetation) to preserve and enhance TEC habitat onsite. These areas are in better condition and have better connectivity values due to the more mature/hollow bearing trees. There is scope to improve connectivity values within this area. Key abiotic factors inside these areas (like rocky scarp habitat) can also be protected for targeted candidate species.

9.2.2 Threatened species assumed present

No species are assumed present. The development footprint has been modified to avoid impacting any important mapped habitat for the Regent Honeyeater.

10 REQUIREMENT TO OFFSET

10.1 IMPACTS REQUIRING AN OFFSET

The total offset requirement for the project is 821 ecosystem credits. This section shows which zones generate the offset requirement.

10.1.1 Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

- a) a vegetation zone that has a vegetation integrity score ≥ 15 where the PCT is representative of an endangered or critically endangered ecological community, or
- b) a vegetation zone that has a vegetation integrity score of ≥ 17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or
- c) a vegetation zone that has a vegetation integrity score ≥ 20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset and the ecosystem credits required are documented and mapped within Table 10-1 below.

Table 10-1 Zones that require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation Integrity Score	Vegetation integrity loss	Ecosystem credits required
1_BoxGumWL	1303	White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion	16.45	47.2	47.2	388
5_BoxGumWL	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	12.6	68.7	68.7	433

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix G.

10.1.2 Paddock tree credits

Offsets are required for the clearing of Class 2 & 3 paddock trees.

There are five class 3 paddock trees inside the development site. Four of the paddock trees form part of PCT 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion. The remaining paddock tree forms part of PCT 1303 White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion. The combined PCT ecosystem credits required are documented in Table 10-2.

Table 10-2 Paddock trees that require offsets

Class of Paddock Tree being cleared	Hollows Present	Number of Paddock Trees to be cleared	Number of Credits Required	Ecosystem credits required
Class 3 >50cm DBH	No	5	5	5

10.1.3 Species credits

No offsets are required for species credit threatened species as none are considered to have habitat within the development footprint.

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix G.

10.1.4 Commonwealth offset strategy

Current legislative context

Prior to the introduction of the NSW *Biodiversity Conservation Act 2016*, the NSW Framework for Biodiversity Assessment was the Commonwealth endorsed NSW offset scheme for Major Projects such as the Wollar Solar Farm proposal. Assessment and offset requirements were able to be determined through the NSW scheme, with final approval then provided by the Commonwealth Department of Environment (DoE).

The updated NSW BOS is currently seeking the same endorsement. As it is not yet endorsed by the Commonwealth, offset quantification and options are considered using Commonwealth tools below.

Quantification of the offset requirement

For MNES, offsets are required only where significant impacts may result. For this project, that is limited to White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived native grassland – Critically Endangered Ecological Community.

Appendix F sets out the offset requirement using the EPBC offset tool. The minimum direct offset requirement (90% direct offset required for Commonwealth physical offsets) equates to 413 ha in total comprised of:

- 205 ha for treed BGW.
- 208 ha for derived native grassland BGW.

Offset options under consideration

Within the development site, in areas that would not be impacted by the development, 217 ha of CEEC is available for protection under an offset agreement. Based on available mapping, though not subject to detailed survey, it is estimated that an additional 258 ha remains within study area, that would not be

impacted by the development and may provide suitable direct offsets. If suitable, this exceeds the required amount by 62 ha.

It is noted that an estimated 5,497ha of similar vegetation occurs in the local area and outside the project area. This figure has been assumed from aerial photography, knowledge of the landscape, and observation of vegetation within the landscape during field surveys.

In advance of the NSW BOS being endorsed by the Commonwealth (as of 15 February 2019 it is on public exhibition), the Wollar Solar Farm offset strategy retains flexibility. This strategy demonstrates that:

- Securing in perpetuity physical offsets within the study area are likely to be feasible.
- Similar vegetation occurs in the locality and could also be considered, if required, for physical offsets.

Payment options may also be considered, such as making payments into the NSW Biodiversity Conservation Fund using the offset payments calculator, or funding a biodiversity action.

Pending project approval, consultation would be undertaken with NSW OEH and Commonwealth DoE to provide a detailed offset strategy that meets legislative requirements that are currently in flux.

10.2 IMPACTS NOT REQUIRING AN OFFSET

Table 10-3 Zones that do not require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation Integrity Score
2	1303_Derived Native GL	White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion	102.30	9.4
3	1303_Cultivated_Low	White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion	110.80	11.4
6	281_Derived Native GL	White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion	101.51	11.9
9	1610_Degraded	name White Box - Black Cypress Pine shrubby woodland of the Western Slopes	26.86	2.3

The BAM assessment tools adequately address all the impacts associated with this solar farm. No other impacts which don't require offsets are anticipated.

10.3 AREAS NOT REQUIRING ASSESSMENT

The areas that do not require assessment in accordance with BAM and are not defined as native vegetation are mapped below. These areas are cultivated and non native.



Figure 10-1 Areas requiring offsets, areas not requiring offsets and non native areas not requiring assessment under the BAM.

11 CONCLUSIONS

11.1 NSW BAM ASSESSMENT

NGH Environmental has prepared this BDAR for the proposed Wollar Solar Farm, located within the Mid-Western Regional Local Government Area (LGA), NSW. The purpose of this BDAR was to address the requirements of the BAM and to address the biodiversity matters raised in the SEARs and supplementary SEARs.

In this BDAR, biodiversity impacts have been assessed through comprehensive mapping and assessment completed in accordance with the BAM.

Regarding onsite surveys, three targeted survey programs were undertaken to address all candidate species. Three were confirmed onsite: the Large-eared Pied Bat (*Chalinolobus dwyeri*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) and Eastern Cave Bat (*Vespadelus troughtoni*). These were detected on Anabat recordings. Although detected onsite, it was concluded after extensive inspection of rocky scarp habitat that no specialised breeding/roosting/refuge habitat was present inside the development footprint.

Five paddock trees occur within areas that are primarily exotic. These were assessed using the paddock tree calculator. The paddock tree assessment generated 5 ecosystem credits that will need to be retired to remove these trees. In addition to the paddock trees, 29 ha of native vegetation was of sufficient quality to generate an offset requirement, totalling 826 credits. This is comprised of White Box Yellow Box Blakely's Red Gum Woodland listed under the BC Act.

The credit requirement has therefore been defined as:

- 826 ecosystem credits (5 of these credits generated by paddock tree removal)
- 0 species credits

Mitigation measures which have been outlined to reduce the impacts to biodiversity.

The retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets scheme, and will be achieved by either;

- (a) Retiring credits under the Biodiversity Offsets Scheme, or
- (b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or
- (c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

11.2 COMMONWEALTH ASSESSMENT

Following data collected during initial site surveys in May 2018, a referral to the Commonwealth Department of Environment and Energy commenced in July 2018. On 3 October 2018, the proposed Wollar Solar Farm was determined to be a controlled action for impacts on MNES protected under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Supplementary SEARs were issued for the project (provided in Appendix B: EPBC requirements). As such the project is subject to a 'streamlined assessment', to capture MNES as well as NSW matters.

- Additional field survey was undertaken in October 2018 to better characterise White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived native grassland vegetation and undertake targeted surveys for other species listed under the EPBC.
- A condition threshold evaluation was undertaken against the Commonwealth criteria
- Assessments of Significance were undertaken.

Regarding MNES, potential impacts on White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived native grassland – Critically Endangered Ecological Community are considered likely to be significant and warrant offsets. 232 ha of vegetation that meets the Commonwealth criteria for Critically Endangered Ecological Communities, most (87%) in degraded condition, would be impacted.

In advance of the NSW BOS being endorsed by the Commonwealth (as of 15 February 2019 it is on public exhibition), the Wollar Solar Farm offset strategy retains flexibility. The strategy demonstrates that:

- Securing in perpetuity physical offsets within the study area are likely to be feasible.
- Similar vegetation occurs in the locality and could also be considered, if required, for physical offsets.

Payment options may also be considered, such as making payments into the NSW Biodiversity Conservation Fund using the offset payments calculator, or funding a biodiversity action.

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APPENDIX A VEGETATION INTEGRITY PLOT DATA

A.1 REPRESENTATIVE VEGETATION INTEGRITY PLOT PHOTOS

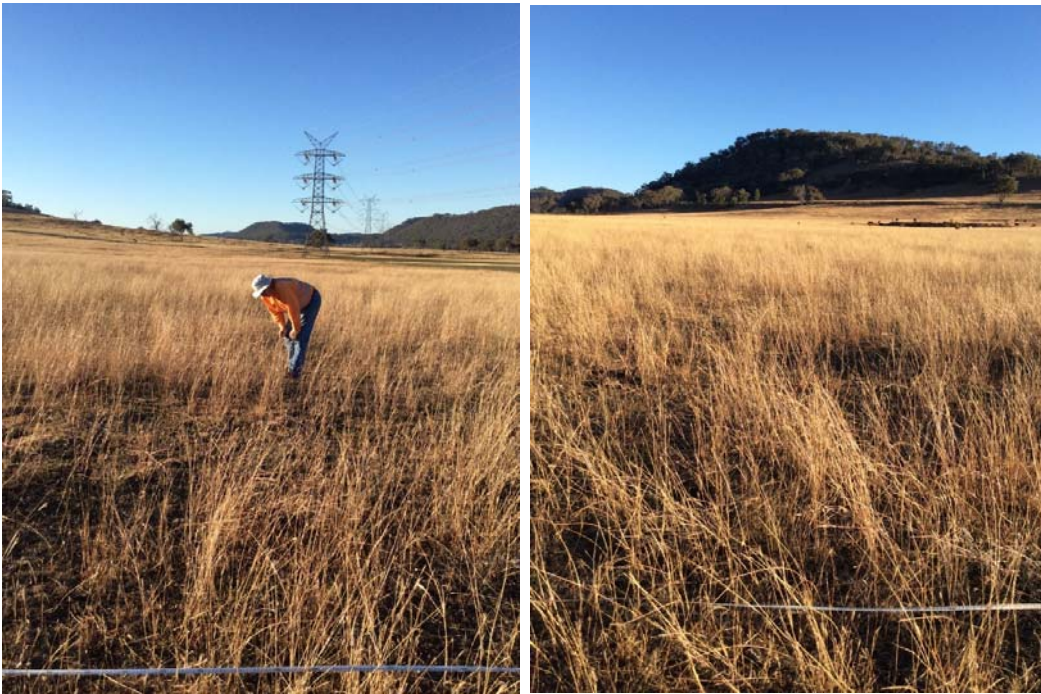
BAM VI Plot 1



BAM VI Plot 2



VI Plot 3



VI Plot 4



VI Plot 5



VI Plot 6



A.1.1 *BAM Electronic Field Data Sheets*

BAM Site Field Survey								
Project:	18-012 Wollar Solarfarm	Plot Identifier	Plot 1/W1	Pic 20x20	GIS pro	Pic 20x50	GIS pro	
Survey date:	23/05/2018		Compass Orientation (head of 20x20 plot)				Northwest	
Recorders	Gyoung		PCT:	1303				
GPS Easting	777164	GPS Northing	6410444		Datum	UTM	Zone	55
Landform			Soils			Drainage & Slope		
Morphology	simple slope		Soil Texture		sandy clay	Slope	5 degrees	
Land Element	Lower slope		Soil Colour		red/brown	Aspect	north west	
Landform	bottom		Soil Depth		>1m	Drainage	well drained	
Microrelief	vegetation		Geology		sandstone	Watercourses	None	
Plot Disturbance								
	Severity	Age	Observational Evidence					
Clearing	0							
Cultivation	0							
Soil erosion	0							
Firewood	0							
Grazing	1	R	Cow pats					
Fire Damage	0							
Storm Damage	0							
Weediness	1	R	Light weed cover					
Other								
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)								
Additional information								
Current land use								
Grazing land								
Age class, condition, disturbance (dbh, hollows, fire, grazing, ferals, clearing, logging, soil degradation, pollution)								
Cattle, thick groundcover								
High Threat Weeds								
Carthamnus lanatus								
Significant and threatened species and communities								
Dominant Species outside Plot		E. albens 50m to south						

Plot 1/W1

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	6
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	6
BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.6
	Grass/Sedge (GG)	56.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	56.9
	TOTAL 'HT'	0.2

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	N/A
<5	0	0	N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	47%	6308
	15m	60%		6309
	25m	40%		6310
	35m	70%		6311
	45m	35%		6312
Bare	5m	5%	1%	6308
	15m	0%		6309
	25m	2%		6310
	35m	0%		6311
	45m	0%		6312
Cryptogam cover	5m	0%	0%	6308
	15m	0%		6309
	25m	0%		6310
	35m	0%		6311
	45m	0%		6312
Rock Cover	5m	0%	0%	6308
	15m	0%		6309
	25m	0%		6310
	35m	0%		6311
	45m	0%		6312

Species recorded for Plot 1/W1									
N:Native	E:Exotic	HT: High Threat Exotic							
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	N, E or 'HT'	Exotic	BCA Status	EPBC Status
TREE (TG)									
	#N/A	#N/A	#N/A				#N/A	#N/A	#N/A
SHRUB (SG)	Scientific Name	Common Name	Family	Cover%	Abundance	N, E or 'HT'	Exotic	TSC Status	EPBC Status
	#N/A	#N/A	#N/A				#N/A	#N/A	#N/A
FORB (FG)	Scientific Name	Common Name	Family	Cover%	Abundance	N, E or 'HT'	Exotic	TSC Status	EPBC Status
Verb bona	<i>Verbena bonariensis</i>	Purpletop	Verbenaceae	0.5	15	E	*		
Calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.1	4	N			
Glyc taba	<i>Glycine tabacina</i>	Variable Glycine	Fabaceae (Faboidea	0.1	5	N			
Cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	0.2	20	HT	*		
Datu stra	<i>Datura stramonium</i>	Common Thornapple	Solanaceae	0.2	15	E	*		
schk pinn abro	<i>Schkuhria pinnata</i> var. <i>abrotanoides</i>	Dwarf Marigold	Asteraceae	3	500	E	*		
Rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	2	N			
Eina poly	<i>Einadia polygonoides</i>	Knotweed Goosefoot	Chenopodiaceae	0.1	3	N			
Port oler	<i>Portulaca oleracea</i>	Pigweed	Portulacaceae	0.1	1	N			
Modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.1	4	E	*		
Lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	0.1	1	E	*		
Alte pung	<i>Alternanthera pungens</i>	Khaki Weed	Amaranthaceae	0.1		E	*		
Sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.1	10	N			
Malv	<i>Malva</i> spp.	Mallow	Malvaceae	0.1	1	E	*		
	#N/A	#N/A	#N/A				#N/A	#N/A	#N/A
GRASS/SEDGE (G)	Scientific Name	Common Name	Family	Cover%	Abundance	N, E or 'HT'	Exotic	TSC Status	EPBC Status
Both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	15	200	N			
Aust vert	<i>Austrostipa verticillata</i>	Slender Bamboo Grass	Poaceae	3	40	N			
Pasp dist	<i>Paspalidium distans</i>		Poaceae	30	500	N			
Erag alve	<i>Eragrostis alveiformis</i>		Poaceae	2	50	N			
Ryti fulv	<i>Rytidosperma fulvum</i>	Wallaby Grass	Poaceae	0.1	10	N			
Phal Aqua	<i>Phalaris aquatica</i>	Phalaris	Poaceae	0.2	6	E	*		
Ryti	<i>Rytidosperma</i> spp.		Poaceae	0.5	50	N			
Spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	0.4	20	N			
Echi crus	<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	0.1	3	E	*		

Erio pseu	<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass	Poaceae	0.2	50	N			
Pasp dila	<i>Paspalum dilatatum</i>	Paspalum	Poaceae	0.1	4	E	*		
Aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	5	80	N			
Plan lanc	<i>Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae	0.1	1	N	*		
	#N/A	#N/A	#N/A				#N/A	#N/A	#N/A
FERN (EG)	<i>Scientific Name</i>	<i>Common Name</i>	<i>Family</i>	<i>Cover%</i>	<i>Abundance</i>	<i>N, E or 'HT'</i>	<i>Exotic</i>	<i>TSC Status</i>	<i>EPBC Status</i>
	#N/A	#N/A	#N/A				#N/A	#N/A	#N/A
Other (OG)	<i>Scientific Name</i>	<i>Common Name</i>	<i>Family</i>	<i>Cover%</i>	<i>Abundance</i>	<i>N, E or 'HT'</i>	<i>Exotic</i>	<i>TSC Status</i>	<i>EPBC Status</i>
	#N/A	#N/A	#N/A				#N/A	#N/A	#N/A

BAM Site Field Survey							
Project:	18-012 Wollar Solarfarm	Plot Identifier	Plot 6, W6	Pic 20x20	GIS pro	Pic 20x50	GIS pro
Survey date:	24/05/2018	Compass Orientation (head of 20x20 plot)					
Recorders	G Young	PCT:					
GPS Easting	774969	GPS Northing	6410290	Datum	UTS	Zone	55
Landform			Soils		Drainage & Slope		
Morphology	Lower slope	Soil Texture	Sandy		Slope	4 degrees	
Land Element	Lower slope	Soil Colour	Cream Orange		Aspect	East	
Landform	Bottom	Soil Depth	>1m		Drainage	Well drained	
Microrelief	None	Geology	Sandstone		Watercourses	40m north	
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing	2	O					
Cultivation	0						
Soil erosion	0						
Firewood	1	O					
Grazing	3	O					
Fire Damage	2		Charred tree trunk				
Storm Damage	0						
Weediness	2		Urtica				
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Grazing by cattle							
Age class, condition, disturbance (inc. dbh, hollows, fire, grazing, ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Mixed aged trees young and old, some hollow observed outside plot, heavily grazed and very dry sandy soil							
High Threat Weeds							
Significant and threatened species and communities (if present, note pop. size/area, structure, repro status, habit, habitat, threats, photos)							

Dominant Species outside Plot							
Plot 6, W6			BAM Attributes (1 x 1m Plots)				
BAM Attribute (20x20m plot)			Litter Cover	Tape length	% cover	Average %	Photos
Count of Native Richness	Stratum	Sum		5m	5%	19%	6336
	Tree (TG)	2		15m	40%		6337
	Shrub (SG)	0		25m	10%		6338
	Forb (FG)	18		35m	15%		6339
	Grass/Sedge (GG)	11		45m	25%		6340
	Fern (EG)	0		Bare ground	5m	90%	32%
	Other (OG)	0	15m		3%	6337	
	TOTAL	31	25m		30%	6338	
BAM Attribute (20x20m plot)			35m	15%	6339		
Count of cover abundance (native vascular plants)	Stratum	Sum	45m	20%	6340		
	Tree (TG)	25.1	Cryptogam cover	5m	0%	0%	6336
	Shrub (SG)	0		15m	0%		6337
	Forb (FG)	7.2		25m	0%		6338
	Grass/Sedge (GG)	15.8		35m	0%		6339
	Fern (EG)	0		45m	0%		6340
	Other (OG)	0	Rock Cover	5m	0%	0%	6336
	TOTAL Native	48.1		15m	0%		6337
	TOTAL 'HT'	3		25m	0%		6338
				35m	0%		6339
			45m	0%	6340		
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80	0	1	0				
50-79	0	0	0				
30-49	1	0	0				
20-29	1	0	0				
10-19	0	0	0				
5-9	2	0	N/A				
<5	22	0	N/A				
Length of logs (m)		0					

Species recorded for		Plot 6, W6							
N:Native	E:Exotic	HT: High Threat Exotic							
Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Status
TREE (TG)									
Ango flor	<i>Angophora floribunda</i>	Rough-barked Apple	Myrtaceae		25	1	N		
Brac popu	<i>Brachychiton populneus</i>	Kurrajong	Malvaceae		0.1	1	N		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
SHRUB (SG)	<i>Scientific Name</i>	<i>Common Name</i>	<i>Family</i>	<i>Exotic</i>	<i>Cover%</i>	<i>Abundance</i>	<i>N, E or 'HT'</i>	<i>EPBC Stat</i>	<i>TSC Status</i>
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
FORB (FG)	<i>Scientific Name</i>	<i>Common Name</i>	<i>Family</i>	<i>Exotic</i>	<i>Cover%</i>	<i>Abundance</i>	<i>N, E or 'HT'</i>	<i>EPBC Stat</i>	<i>TSC Status</i>
Dysp pumi	<i>Dysphania pumilio</i>	Small Crumbweed	Chenopodiaceae		5	1000	N		
Gera	<i>Geranium spp.</i>		Geraniaceae	*	0.1	5	E		
Glyc taba	<i>Glycine tabacina</i>	Variable Glycine	Fabaceae (Fa		0.2	100	N		
Poly tetr	<i>Polycarpon tetraphyllum</i>	Four-leaved Allseed	Caryophyllac	*	0.1	10	E		
Eina hast	<i>Einadia hastata</i>	Berry Saltbush	Chenopodiaceae		0.2	25	N		
Cirs vulg	<i>Cirsium vulgare</i>	Spear Thistle	Asteraceae	*	0.1	2	E		
Cony bona	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Asteraceae	*	0.1	3	E		
Modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	*	0.3	100	E		
Dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae		0.1	20	N		
Cotu aust	<i>Cotula australis</i>	Common Cotula	Asteraceae		0.1	1	N		
Paro bras	<i>Paronychia brasiliana</i>	Chilean Whitlow Wort	Caryophyllac	*	0.1	10	E		
Sola nigr	<i>Solanum nigrum</i>	Black-berry Nightshade	Solanaceae	*	0.1	3	E		
Cymb laws	<i>Cymbonotus lawsonianus</i>	Bear's Ear	Asteraceae		0.1	2	N		
Xant spin	<i>Xanthium spinosum</i>	Bathurst Burr	Asteraceae	*	0.2	10	E		
Sonc oler	<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	*	0.1	20	HT		
Plan hisp	<i>Plantago hispida</i>		Plantaginaceae		0.1	1	N		
Hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	*	0.2	30	E		
Cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	*	0.1	10	HT		
Arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	*	0.1	5	E		
Conv angu	<i>Convolvulus angustissimus</i>		Convolvulaceae		0.1	20	N		
Erod crin	<i>Erodium crinitum</i>	Blue Crowfoot	Geraniaceae		0.1	2	N		
Chon junc	<i>Chondrilla juncea</i>	Skeleton Weed	Asteraceae	*	0.2	30	E		
Sola cine	<i>Solanum cinereum</i>	Narrawa Burr	Solanaceae		0.1	1	N		

Desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fa		0.1	10	N		
Calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae		0.1	10	N		
Wahl grac	<i>Wahlenbergia gracilent</i>	Annual Bluebell	Campanulace		0.1	6	N		
Sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae		0.1	15	N		
Sige	<i>Sigesbeckia spp.</i>		Asteraceae		0.1	1	N		
Erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae *		0.2	50	E		
Hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae *		0.1	5	HT		
Lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae *		0.1	1	E		
Tara offi	<i>Taraxacum officinale</i>	Dandelion	Asteraceae *		0.1	10	E		
Urti inci	<i>Urtica incisa</i>	Stinging Nettle	Urticaceae		0.4	12	N		
Verb virg	<i>Verbascum virgatum</i>	Twiggy Mullein	Scrophularia *		0.1	1	E		
Oxal thom	<i>Oxalis thompsoniae</i>		Oxalidaceae *		0.1	2	E		
Dich sp.	<i>Dichondra sp. A</i>	Kidney Weed	Convolvulace		0.1	5	N		
Malv parv	<i>Malva parviflora</i>	Small-flowered Mallo	Malvaceae *		0.1	1	N		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
GRASS/SEDGE (G	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT	EPBC Stat	TSC Status
Aust vert	<i>Austrostipa verticillata</i>	Slender Bamboo Gras	Poaceae		0.2	30	N		
Spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Gras	Poaceae		0.1	2	N		
Micr stip	<i>Microlaena stipoides</i>	Weeping Grass	Poaceae		5	150	N		
Aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae		3	200	N		
Erag lept	<i>Eragrostis leptostycha</i>	Paddock Lovegrass	Poaceae		0.1	10	N		
Ryti caes	<i>Rytidosperma caespitosu</i>	Ringed Wallaby Grass	Poaceae		0.1	10	N		
Both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae		5	300	N		
Erag lacu	<i>Eragrostis lacunaria</i>	Purple Lovegrass	Poaceae		2	350	N		
Digi	<i>Digitaria spp.</i>	A Finger Grass	Poaceae *		0.1	1	E		
Pani simi	<i>Panicum simile</i>	Two-colour Panic	Poaceae		0.1	2	N		
Chlo vent	<i>Chloris ventricosa</i>	Tall Chloris	Poaceae		0.1	1	N		
Chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae		0.1	1	N		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
FERN (EG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
Other (OG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W7	Pic 20x20		Pic 20x50	
Survey date:	23/10/2018	Compass Orientation (head of 20x20 plot)					
Recorders	MP BT	PCT:	1303 good				
GPS Easting	775684	GPS Northing	6408603	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W7							
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)						
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos		
	Tree (TG)	2		5m	20%				
	Shrub (SG)	3		15m	12%				
	Forb (FG)	21		25m	18%				
	Grass & grasslike (GG)	8		35m	37%				
	Fern (EG)	1		45m	5%				
	Other (OG)	4	Bare ground cover	5m	3%	49%			
	TOTAL	39		15m	45%				
BAM Attribute (20x20m plot)			25m	40%	Cryptogam cover			0%	
Count of cover abundance (native vascular plants)	Stratum	Sum	35m	60%					
	Tree (TG)	30.1	45m	95%					
	Shrub (SG)	2.1	5m	0%					
	Forb (FG)	33.8	15m	0%					
	Grass & grasslike (GG)	7.7	25m	0%					
	Fern (EG)	0.1	35m	0%					
	Other (OG)	0.4	45m	0%					
	TOTAL Native	74.2	Rock Cover	5m	35%	7%			
TOTAL 'HTE'	0	15m		2%					
			25m	0%					
			35m	0%					
			45m	0%					

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	3	0	3
30-49	0	0	0
20-29	3	0	0
10-19	4	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		52	

COMPOSITION & STRUCTURE

Species recorded for W7										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca albe	<i>Eucalyptus albens</i>	White Box	Myrtaceae	30			Tree (TG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	10			Forb (FG)	No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	5			Forb (FG)	No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	5			Forb (FG)	No		
eina poly	<i>Einadia polygonoides</i>	Knotweed Goosefoot	Chenopodiaceae	5			Forb (FG)	No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	5			Forb (FG)	No		
gono tetr	<i>Gonocarpus tetragynus</i>	Poverty Raspwort	Haloragaceae	0.1	1		Forb (FG)	No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.1	5	*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.2	10	*		No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	1			Grass & grasslike (GG)	No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	5			Grass & grasslike (GG)	No		
vitt muel	<i>Vittadinia muelleri</i>	A Fuzzweed	Asteraceae	0.5	20		Forb (FG)	No		
eina hast	<i>Einadia hastata</i>	Berry Saltbush	Chenopodiaceae	0.5	5		Forb (FG)	No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	1			Grass & grasslike (GG)	No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal)	0.1	5		Other (OG)	No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	0.1	2		Grass & grasslike (GG)	No		
tric elat	<i>Tricoryne elatior</i>	Yellow Autumn-lily	Anthericaceae	0.1	1		Forb (FG)	No		
glyc clan	<i>Glycine clandestina</i>	Twining glycine	Fabaceae (Fal)	0.1	1		Other (OG)	No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.1	2		Forb (FG)	No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1	10		Forb (FG)	No		
euca blak	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	Myrtaceae	0.1	1		Tree (TG)	No		
micr stip	<i>Microlaena stipoides</i>	Weeping Grass	Poaceae	0.2	10		Grass & grasslike (GG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	0.5	100		Forb (FG)	No		
eina nuta	<i>Einadia nutans</i>	Climbing Saltbush	Chenopodiaceae	0.1	1		Forb (FG)	No		
swai gale	<i>Swainsona galegifolia</i>	Smooth Darling Pea	Fabaceae (Fal)	1			Forb (FG)	No		
conv erub	<i>Convolvulus erubescens</i>	Pink Bindweed	Convolvulaceae	0.1	2		Other (OG)	No		
hydr laxi	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	Apiaceae	0.1	10		Forb (FG)	No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	0.2	5		Grass & grasslike (GG)	No		
sola cine	<i>Solanum cinereum</i>	Narrawa Burr	Solanaceae	1			Shrub (SG)	No		
acac impl	<i>Acacia implexa</i>	Hickory Wattle	Fabaceae (Mi)	1			Shrub (SG)	No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.2	20	*		No		
gera sola	<i>Geranium solanderi</i>	Native Geranium	Geraniaceae	0.2	20		Forb (FG)	No		
pand pand	<i>Pandorea pandorana</i>	Wonga Wonga Vine	Bignoniaceae	0.1	1		Other (OG)	No		
chei	<i>Cheilanthes spp.</i>	Cloak Fern, Mulga Fern	Pteridaceae	0.1	2		Fern (EG)	No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
conv	<i>Convolvulus spp.</i>	A Bindweed	Convolvulaceae	0.1	1	*		No		
wahl grac	<i>Wahlenbergia gracilentia</i>	Annual Bluebell	Campanulaceae	0.1	1		Forb (FG)	No		
sonc oler	<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	0.1	1	*		No		
cotu aust	<i>Cotula australis</i>	Common Cotula	Asteraceae	0.1	1		Forb (FG)	No		

tolp barb	<i>Tolpis barbata</i>	Yellow Hawkweed	Asteraceae	0.1	10	*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	0.5	50	*		No		
petr nant	<i>Petrorhagia nanteuillii</i>	Proliferous Pink	Caryophyllaceae	0.1	10	*		No		
sola nigr	<i>Solanum nigrum</i>	Black-berry Nightshade	Solanaceae	0.2	1	*		No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
lepi afri	<i>Lepidium africanum</i>	Common Peppergrass	Brassicaceae	0.1	1	*		No		
euch spha	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	0.1	10	*		No		
aris pers	<i>Aristida personata</i>		Poaceae	0.1	2		Grass & grasslike (GG)	No		
arth minu	<i>Arthropodium minus</i>	Small Vanilla Lily	Anthericaceae	0.1	1		Forb (FG)	No		
acac deco	<i>Acacia decora</i>	Western Silver Wattle	Fabaceae (Mi	0.1	1		Shrub (SG)	No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W8	Pic 20x20		Pic 20x50	
Survey date:	25/10/2018		Compass Orientation (head of 20x20 plot)			270	
Recorders	MP BT		PCT:	803 DNG good			
GPS Easting	776697	GPS Northing	6409790		Datum	94	Zone 55
Landform			Soils		Drainage & Slope		
Morphology			Soil Texture			Slope	
LandF Element			Soil Colour			Aspect	
LandF Pattern			Soil Depth			Drainage	
Microrelief			Geology			Watercourses	
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W8					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	3%	4.20%	
	Shrub (SG)	1		15m	5%		
	Forb (FG)	14		25m	5%		
	Grass & grasslike (GG)	13		35m	3%		
	Fern (EG)	1		45m	5%		
	Other (OG)	1	Bare ground cover	5m	25%	20%	
	TOTAL	30		15m	10%		
BAM Attribute (20x20m plot)		25m		25%			
Count of cover abundance (native vascular plants)	Stratum	Sum		35m	20%		
	Tree (TG)	0	45m	20%			
	Shrub (SG)	10	Cryptogam cover	5m	0%	0%	
	Forb (FG)	10		15m	0%		
	Grass & grasslike (GG)	53.8		25m	0%		
	Fern (EG)	1		35m	0%		
	Other (OG)	0.1		45m	0%		
	TOTAL Native	74.9	Rock Cover	5m	20%	14%	
TOTAL 'HTE'	5.1	15m		3%			
		25m		25%			
		35m		20%			
		45m	1%				
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W8										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	20			Grass & grasslike (GG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	5			Forb (FG)	No		
chei sieb	<i>Cheilanthes sieberi</i>	Rock Fern	Pteridaceae	1			Fern (EG)	No		
vitt muel	<i>Vittadinia muelleri</i>	A Fuzzweed	Asteraceae	0.5	1		Forb (FG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	10			Grass & grasslike (GG)	No		
dysp pumi	<i>Dysphania pumilio</i>	Small Crumbweed	Chenopodiaceae	0.1	1			No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	0.5	10		Grass & grasslike (GG)	No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.1	5	*		No		
eina hast	<i>Einadia hastata</i>	Berry Saltbush	Chenopodiaceae	2			Forb (FG)	No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.1	2	*		No		
cony	<i>Conyza spp.</i>	A Fleabane	Asteraceae	0.1	1	*		No		
sola cine	<i>Solanum cinereum</i>	Narrawa Burr	Solanaceae	10			Shrub (SG)	No		
eina nuta	<i>Einadia nutans</i>	Climbing Saltbush	Chenopodiaceae	0.2	5		Forb (FG)	No		
petr nant	<i>Petrorhagia nanteuilii</i>	Proliferous Pink	Caryophyllaceae	0.1	5	*		No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1	5		Forb (FG)	No		
aris vaga	<i>Aristida vagans</i>	Threeawn Speargrass	Poaceae	0.5	10		Grass & grasslike (GG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	1		*		No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	10			Grass & grasslike (GG)	No		
lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	1		*		No		
aust vert	<i>Austrostipa verticillata</i>	Slender Bamboo Grass	Poaceae	1			Grass & grasslike (GG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	5		*		HTE		
gera sola	<i>Geranium solanderi</i>	Native Geranium	Geraniaceae	0.1	2		Forb (FG)	No		
them tria	<i>Themeda triandra</i>		Poaceae	5			Grass & grasslike (GG)	No		
cymb laws	<i>Cymbonotus lawsonianus</i>	Bear's Ear	Asteraceae	0.1	1		Forb (FG)	No		
calo cune	<i>Calotis cuneata</i>	Mountain Burr-Daisy	Asteraceae	0.1	1		Forb (FG)	No		
cotu aust	<i>Cotula australis</i>	Common Cotula	Asteraceae	0.1	1		Forb (FG)	No		
alte pung	<i>Alternanthera pungens</i>	Khaki Weed	Amaranthaceae	0.1	1	*		HTE		
erag brow	<i>Eragrostis brownii</i>	Brown's Lovegrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
erag alve	<i>Eragrostis alveiformis</i>		Poaceae	0.2	5			No		
erag lept	<i>Eragrostis leptocarpa</i>	Drooping Lovegrass	Poaceae	0.5	10		Grass & grasslike (GG)	No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	1			Forb (FG)	No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	1		*		No		
pani simi	<i>Panicum simile</i>	Two-colour Panic	Poaceae	0.5	5		Grass & grasslike (GG)	No		
digi brow	<i>Digitaria brownii</i>	Cotton Panic Grass	Poaceae	0.5	10		Grass & grasslike (GG)	No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	0.2	5		Grass & grasslike (GG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
verb bona	<i>Verbena bonariensis</i>	Purpletop	Verbenaceae	0.1	1	*		No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	0.1	2		Other (OG)	No		

erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	0.1	10	*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.5	2	*		No		
vero pleb	<i>Veronica plebeia</i>	Trailing Speedwell	Plantaginaceae	0.5	10		Forb (FG)	No		
paro bras	<i>Paronychia brasiliiana</i>	Chilean Whitlow Wor	Caryophyllaceae	0.2	10	*		No		
cras colo	<i>Crassula colorata</i>	Dense Stonecrop	Crassulaceae	0.1	5		Forb (FG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.1	2		Forb (FG)	No		

BAM Site Field Survey								
Project:	18-012 Wollar solarfarm	Plot Identifier	Plot 4 / W4	Pic 20x20	GIS pro	Pic 20x50	GIS pro	
Survey date:	24/05/2018		Compass Orientation (head of 20x20 plot)					
Recorders	G Young		PCT:					
GPS Easting	775649	GPS Northing	6408917		Datum	UTM	Zone	55
Landform			Soils			Drainage & Slope		
Morphology	Lower slope		Soil Texture		Clay	Slope	4 degrees	
Land Element	Lower slope		Soil Colour		Orange brown	Aspect	NN E	
Landform	footslope		Soil Depth		>1m	Drainage	Well drained	
Microrelief	None		Geology		Alluvial sandstone	Watercourses	56m SW	
Plot Disturbance								
	Severity	Age	Observational Evidence					
Clearing	3	O						
Cultivation	0							
Soil erosion	1	NR						
Firewood	0							
Grazing	2	R	Cattle					
Fire Damage	2	R	Fire Feb 2017					
Storm Damage	0							
Weediness	2	R						
Other								
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)								
Additional information								
Current land use								
Grazing for cattle								
Age class, condition, disturbance (inc. dbh, hollows, fire, grazing, ferals, clearing, logging, soil degradation, pollution, weeds, dieback)								
Rabbit scats observed								
High Threat Weeds								
Carthamnus lanatus								
Significant and threatened species and communities (if present, note pop. size/area, structure, repro status, habit, habitat, threats, photos)								

Dominant Species outside Plot			E. albens directly east of plot				
Plot 4 / W4							
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter	Tape length	% cover	Average %	Photos
	Tree (TG)	1		5m	5%	9%	
	Shrub (SG)	0		15m	7%		
	Forb (FG)	15		25m	15%		
	Grass/Sedge (GG)	15		35m	17%		
	Fern (EG)	0		45m	3%		
	Other (OG)	0	Bare	5m	40%	35%	
	TOTAL	31		15m	50%		
Count of cover abundance (native vascular plants)	Stratum	Sum		25m	35%		
	Tree (TG)	12		35m	40%		
	Shrub (SG)	0	45m	10%			
	Forb (FG)	1.7	Cryptogam cover	5m	0%	0%	
	Grass/Sedge (GG)	15.5		15m	0%		
	Fern (EG)	0		25m	0%		
	Other (OG)	0		35m	0%		
	TOTAL Native	29.2	45m	0%			
TOTAL 'HT'	0.1	Rock Cover	5m	0%	0%		
BAM Attribute (20 x 50m plot) Tree Stem Counts	DBH (cm)		Euc	Non Euc		Hollows	
	>80		0	0		0	
	50-79		0	0		0	
	30-49	0	0	0			
	20-29	0	0	0			
	10-19	0	0	0			
	5-9	0	0	N/A			
	<5	0	0	N/A			
Length of logs (m)		0					

Species recorded for Plot 4 / W4									
N:Native	E:Exotic	HT: High Threat Exotic							
Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Status
TREE (TG)									
euca albe	<i>Eucalyptus albens</i>	White Box	Myrtaceae		12	1	N		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
SHRUB (SG)	<i>Scientific Name</i>	<i>Common Name</i>	<i>Family</i>	<i>Exotic</i>	<i>Cover%</i>	<i>Abundance</i>	<i>N, E or 'HT'</i>	<i>EPBC Stat</i>	<i>TSC Status</i>
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
FORB (FG)	<i>Scientific Name</i>	<i>Common Name</i>	<i>Family</i>	<i>Exotic</i>	<i>Cover%</i>	<i>Abundance</i>	<i>N, E or 'HT'</i>	<i>EPBC Stat</i>	<i>TSC Status</i>
Cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae		0.1	8	N		
Erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	*	0.3	100	E		
Arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	*	0.2	40	E		
Dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae		0.2	25	N		
Modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	*	0.1	20	E		
Calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae		0.1	20	N		
Plan lanc	<i>Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae	*	0.2	200	E		
Vitt muel	<i>Vittadinia muelleri</i>	A Fuzzweed	Asteraceae		0.1	10	N		
Erod crin	<i>Erodium crinitum</i>	Blue Crowfoot	Geraniaceae		0.1	1	N		
Mair ench	<i>Maireana enchylaenoides</i>	Wingless Fissure-weed	Chenopodiaceae		0.1	6	N		
Eina hast	<i>Einadia hastata</i>	Berry Saltbush	Chenopodiaceae		0.1	5	N		
Alte pung	<i>Alternanthera pungens</i>	Khaki Weed	Amaranthaceae	*	0.1	1	E		
Malv parv	<i>Malva parviflora</i>	Small-flowered Mallow	Malvaceae	*	0.1	10	E		
Cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	*	0.1	20	HT		
Lepi afri	<i>Lepidium africanum</i>	Common Peppergrass	Brassicaceae	*	0.1	3	E		
Glyc taba	<i>Glycine tabacina</i>	Variable Glycine	Fabaceae (Faba)		0.1	1	N		
Eleu tris	<i>Eleusine tristachya</i>	Goose Grass	Poaceae	*	0.1	2	E		
Eina poly	<i>Einadia polygonoides</i>	Knotweed Goosefoot	Chenopodiaceae		0.1	1	N		
Cirs vulg	<i>Cirsium vulgare</i>	Spear Thistle	Asteraceae	*	0.1	1	E		
plan hisp	<i>Plantago hispida</i>		Plantaginaceae		0.1	3	N		
Medi	<i>Medicago spp.</i>	A Medic	Fabaceae (Faba)	*	0.1	2	E		
Vitt	<i>Vittadinia spp.</i>	Fuzzweed	Asteraceae		0.1	1	N		
Paro bras	<i>Paronychia brasiliana</i>	Chilean Whitlow Wort	Caryophyllaceae	*	0.1	1	E		

Good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae		0.2	100	N		
Good hede	<i>Goodenia hederacea</i>	Ivy Goodenia	Goodeniaceae		0.1	20	N		
Wahl grac	<i>Wahlenbergia gracilentia</i>	Annual Bluebell	Campanulaceae		0.1	6	N		
Trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fa	*	0.1	20	E		
Cymb laws	<i>Cymbonotus lawsonianus</i>	Bear's Ear	Asteraceae		0.1	2	N		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
GRASS/SEDGE (G)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
Chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae		3	300	N		
Chlo vent	<i>Chloris ventricosa</i>	Tall Chloris	Poaceae		1	200	N		
Both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae		5	500	N		
Ryti bipa	<i>Rytidosperma bipartitum</i>	Wallaby Grass	Poaceae		5	500	N		
Erio pseu	<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass	Poaceae		0.1	10	N		
Cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae		0.1	5	N		
Pani simi	<i>Panicum simile</i>	Two-colour Panic	Poaceae		0.1	10	N		
Ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae		0.5	100	N		
Aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae		0.1	5	N		
Spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae		0.1	2	N		
Dich seri	<i>Dichanthium sericeum</i>	Queensland Bluegrass	Poaceae		0.1	10	N		
Cony bona	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Asteraceae	*	0.1	2	E		
Ryti caes	<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass	Poaceae		0.1	6	N		
Erag lept	<i>Eragrostis leptostachya</i>	Paddock Lovegrass	Poaceae		0.1	3	N		
Cype grac	<i>Cyperus gracilis</i>	Slender Flat-sedge	Cyperaceae		0.1	1	N		
Care inve	<i>Carex inversa</i>	Knob Sedge	Cyperaceae		0.1	2	N		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
FERN (EG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
Other (OG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W9	Pic 20x20		Pic 20x50	
Survey date:	25/10/2018	Compass Orientation (head of 20x20 plot)				180	
Recorders	MP BT	PCT:	1303 DGL				
GPS Easting	776523	GPS Northing	6409645	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W9					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	3%	2.40%	
	Shrub (SG)	1		15m	3%		
	Forb (FG)	4		25m	3%		
	Grass & grasslike (GG)	13		35m	2%		
	Fern (EG)	0		45m	1%		
	Other (OG)	1					
	TOTAL	19					
BAM Attribute (20x20m plot)			Bare ground cover	5m	5%	4%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	5%		
	Tree (TG)	0		25m	5%		
	Shrub (SG)	1		35m	3%		
	Forb (FG)	1.2	45m	1%			
	Grass & grasslike (GG)	33.4	Cryptogam cover	5m	0%	0%	
	Fern (EG)	0		15m	0%		
	Other (OG)	0.1		25m	0%		
	TOTAL Native	35.7		35m	0%		
	TOTAL 'HTE'	10	45m	0%			
			Rock Cover	5m	1%	0%	
				15m	0%		
				25m	0%		
				35m	0%		
				45m	0%		
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W9										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	5			Grass & grasslike (GG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	10		*		HTE		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	30		*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	5		*		No		
cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae	0.5	20		Grass & grasslike (GG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	0.2	20	*		No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	1		*		No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	5			Grass & grasslike (GG)	No		
aust vert	<i>Austrostipa verticillata</i>	Slender Bamboo Grass	Poaceae	0.5	5		Grass & grasslike (GG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convulvulaceae	0.1	50		Forb (FG)	No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	10			Grass & grasslike (GG)	No		
sola cine	<i>Solanum cinereum</i>	Narrawa Burr	Solanaceae	1			Shrub (SG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.5	20		Forb (FG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	1		*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	0.5	20	*		No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	0.1	5		Other (OG)	No		
sonc oler	<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	0.1	1	*		No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	1			Grass & grasslike (GG)	No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.5	20	*		No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.5	20	*		No		
ryti fulv	<i>Rytidosperma fulvum</i>	Wallaby Grass	Poaceae	5			Grass & grasslike (GG)	No		
erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	1		*		No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.5	10		Forb (FG)	No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	1		*		No		
erag lept	<i>Eragrostis leptocarpa</i>	Drooping Lovegrass	Poaceae	0.5	10		Grass & grasslike (GG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	2		Forb (FG)	No		
ente acic	<i>Enteropogon acicularis</i>	Curly Windmill Grass	Poaceae	0.2	2		Grass & grasslike (GG)	No		
medi sati	<i>Medicago sativa</i>	Lucerne	Fabaceae (Fal	0.1	1	*		No		
poly avic	<i>Polygonum aviculare</i>	Wireweed	Polygonaceae	0.1	5	*		No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	0.1	5	*		No		
pani simi	<i>Panicum simile</i>	Two-colour Panic	Poaceae	0.1	5		Grass & grasslike (GG)	No		
ryti dutt	<i>Rytidosperma duttonianum</i>	Brown-back Wallaby	Poaceae	0.1	1		Grass & grasslike (GG)	No		
dich seri	<i>Dichanthium sericeum</i>	Queensland Bluegrass	Poaceae	0.5	20		Grass & grasslike (GG)	No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W10	Pic 20x20		Pic 20x50	
Survey date:	23/10/2018		Compass Orientation (head of 20x20 plot)			170	
Recorders	MP and BT		PCT:	1303 DGL			
GPS Easting	776157	GPS Northing	6409279		Datum	GDA 94	Zone 55
Landform			Soils		Drainage & Slope		
Morphology			Soil Texture			Slope	
LandF Element			Soil Colour			Aspect	
LandF Pattern			Soil Depth			Drainage	
Microrelief			Geology			Watercourses	
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W10					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	2%	1.60%	
	Shrub (SG)	1		15m	2%		
	Forb (FG)	10		25m	2%		
	Grass & grasslike (GG)	8		35m	1%		
	Fern (EG)	0		45m	1%		
	Other (OG)	1	Bare ground cover	5m	35%	32%	
	TOTAL	20		15m	40%		
BAM Attribute (20x20m plot)		25m		32%			
Count of cover abundance (native vascular plants)	Stratum	Sum		35m	28%		
	Tree (TG)	0	Cryptogam cover	45m	23%	0%	
	Shrub (SG)	0.1		5m	0%		
	Forb (FG)	4.3		15m	0%		
	Grass & grasslike (GG)	36.2		25m	0%		
	Fern (EG)	0	35m	0%			
	Other (OG)	0.1	45m	0%			
	TOTAL Native	40.7	Rock Cover	5m	0%	0%	
	TOTAL 'HTE'	20.3		15m	0%		
BAM Attribute (20 x 50m plot) Tree Stem Counts		25m		0%			
DBH (cm)	Euc	Non Euc		35m	0%		
>80			45m				
50-79							
30-49							
20-29							
10-19							
5-9							
<5						N/A	
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W10										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	1			Forb (FG)	No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.2	5		Forb (FG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	1			Forb (FG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	15			Grass & grasslike (GG)	No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	1			Forb (FG)	No		
calo cune	<i>Calotis cuneata</i>	Mountain Burr-Daisy	Asteraceae	0.1	2		Forb (FG)	No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	5			Grass & grasslike (GG)	No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	0.1	5		Other (OG)	No		
aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	0.5	20		Grass & grasslike (GG)	No		
echi crus	<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	2		*		No		
cart lana	<i>Carthamus lanata</i>	Saffron Thistle	Asteraceae	20		*		HTE		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.5	20	*		No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	10		*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.5	20	*		No		
wahl grac	<i>Wahlenbergia gracilent</i>	Annual Bluebell	Campanulaceae	0.1	2		Forb (FG)	No		
hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae	0.1	3	*		HTE		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1	2		Forb (FG)	No		
trif repe	<i>Trifolium repens</i>	White Clover	Fabaceae (Fal	0.2	10	*		No		
linu	<i>Linum spp.</i>		Linaceae	0.1	1	*		No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	10			Grass & grasslike (GG)	No		
pasp dila	<i>Paspalum dilatatum</i>	Paspalum	Poaceae	0.2	2	*		HTE		
phyl hirt	<i>Phyllanthus hirtellus</i>	Thyme Spurge	Phyllanthaceae	0.1	1		Shrub (SG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.5	10		Forb (FG)	No		
cent meli	<i>Centaurea melitensis</i>	Maltese Cockspur	Asteraceae	0.2	10	*		No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	1		*		No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	0.2	50		Forb (FG)	No		
erag alve	<i>Eragrostis alveiformis</i>		Poaceae	0.5	10		Grass & grasslike (GG)	No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	5		*		No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	5			Grass & grasslike (GG)	No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.5	10	*		No		
erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	0.2	10	*		No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	0.5	10	*		No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	0.1	5	*		No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	0.1	2		Grass & grasslike (GG)	No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.1	1		Forb (FG)	No		
arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	0.1	1	*		No		
chon junc	<i>Chondrilla juncea</i>	Skeleton Weed	Asteraceae	0.1	1	*		No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	0.5	50	*		No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W11	Pic 20x20		Pic 20x50	
Survey date:	23/10/2013	Compass Orientation (head of 20x20 plot)					
Recorders	MP BT	PCT:	1303 GL				
GPS Easting	775105	GPS Northing	6408789	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W11					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	1%	1.20%	
	Shrub (SG)	0		15m	2%		
	Forb (FG)	11		25m	1%		
	Grass & grasslike (GG)	6		35m	1%		
	Fern (EG)	0		45m	1%		
	Other (OG)	2	Bare ground cover	5m	75%	62%	
	TOTAL	19		15m	72%		
BAM Attribute (20x20m plot)			25m	50%			
Count of cover abundance (native vascular plants)	Stratum	Sum	35m	75%			
	Tree (TG)	0	Cryptogam cover	45m	37%	0%	
	Shrub (SG)	0		5m	0%		
	Forb (FG)	8.7		15m	0%		
	Grass & grasslike (GG)	17.5		25m	0%		
	Fern (EG)	0	35m	0%			
	Other (OG)	1.1	45m	0%			
	TOTAL Native	27.3	Rock Cover	5m	0%	0%	
	TOTAL 'HTE'	20		15m	0%		
			25m	0%			
			35m	0%			
			45m	0%			

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for W11										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	5		*		No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	1			Other (OG)	No		
wahl comm	<i>Wahlenbergia communis</i>	Tufted Bluebell	Campanulaceae	1			Forb (FG)	No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	5			Forb (FG)	No		
poly avic	<i>Polygonum aviculare</i>	Wireweed	Polygonaceae	0.5	20	*		No		
aspe conf	<i>Asperula conferta</i>	Common Woodruff	Rubiaceae	1			Forb (FG)	No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	5	10		Grass & grasslike (GG)	No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.1	5		Forb (FG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	20		*		HTE		
ryti	<i>Rytidosperma spp.</i>		Poaceae	1			Grass & grasslike (GG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	1		*		No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.5	1		Forb (FG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.1	0.5		Forb (FG)	No		
brun aust	<i>Brunonia australis</i>	Blue Pincushion	Goodeniaceae	0.1	1		Forb (FG)	No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	0.1	2		Forb (FG)	No		
aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	1	5		Grass & grasslike (GG)	No		
loma fili	<i>Lomandra filiformis</i>	Wattle Matt-rush	Lomandraceae	0.5	5		Grass & grasslike (GG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	0.2	10	*		No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.5	1		Forb (FG)	No		
wahl grac	<i>Wahlenbergia gracilentia</i>	Annual Bluebell	Campanulaceae	0.2	20		Forb (FG)	No		
linu	<i>Linum spp.</i>		Linaceae	0.2	5	*		No		
arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	0.5	10	*		No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.5	10	*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.5	2	*		No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.5	10	*		No		
cirs vulg	<i>Cirsium vulgare</i>	Spear Thistle	Asteraceae	1		*		No		
cymb laws	<i>Cymbonotus lawsonianus</i>	Bear's Ear	Asteraceae	0.1	1		Forb (FG)	No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.5	20	*		No		
conv erub	<i>Convolvulus erubescens</i>	Pink Bindweed	Convolvulaceae	0.1	1		Other (OG)	No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	1		*		No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	5			Grass & grasslike (GG)	No		
petr nant	<i>Petrorhagia nanteuilii</i>	Proliferous Pink	Caryophyllaceae	0.5	50	*		No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W12	Pic 20x20		Pic 20x50	
Survey date:	23/10/2018	Compass Orientation (head of 20x20 plot)				260	
Recorders	MP BT	PCT:	1303				
GPS Easting	776220	GPS Northing	6408504	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W12					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	1%	1.60%	
	Shrub (SG)	0		15m	2%		
	Forb (FG)	9		25m	1%		
	Grass & grasslike (GG)	8		35m	3%		
	Fern (EG)	1		45m	1%		
	Other (OG)	1	Bare ground cover	5m	40%	37%	
	TOTAL	19		15m	21%		
Count of cover abundance (native vascular plants)	Stratum	Sum		25m	35%		
	Tree (TG)	0		35m	27%		
	Shrub (SG)	0	45m	60%			
	Forb (FG)	4	Cryptogam cover	5m	0%	0%	
	Grass & grasslike (GG)	17.8		15m	0%		
	Fern (EG)	0.1		25m	0%		
	Other (OG)	1		35m	0%		
	TOTAL Native	22.9	45m	0%			
	TOTAL 'HTE'	40	Rock Cover	5m	1%	0%	
		15m		0%			
		25m		0%			
		35m		0%			
			45m	0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W12										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	5			Grass & grasslike (GG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	10			Grass & grasslike (GG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	40		*		HTE		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	1			Forb (FG)	No		
boer domi	<i>Boerhavia dominii</i>	Tarvine	Nyctaginaceae	0.1	10		Forb (FG)	No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	1			Forb (FG)	No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	5		*		No		
them tria	<i>Themeda triandra</i>		Poaceae	0.1	10		Grass & grasslike (GG)	No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	1	100		Grass & grasslike (GG)	No		
erag alve	<i>Eragrostis alveiformis</i>		Poaceae	0.5	50			No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	0.5	50		Grass & grasslike (GG)	No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Gra	Poaceae	0.1	20		Grass & grasslike (GG)	No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	1				No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	1			Forb (FG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	0.5	100		Forb (FG)	No		
loma fili	<i>Lomandra filiformis</i>	Wattle Matt-rush	Lomandraceae	1			Grass & grasslike (GG)	No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	1			Other (OG)	No		
brom	<i>Bromus spp.</i>	A Brome	Poaceae	0.1	5		Grass & grasslike (GG)	No		
arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	0.1	5	*		No		
chei sieb	<i>Cheilanthes sieberi</i>	Rock Fern	Pteridaceae	0.1	5		Fern (EG)	No		
tara offi	<i>Taraxacum officinale</i>	Dandelion	Asteraceae	0.1	2	*		No		
ryti fulv	<i>Rytidosperma fulvum</i>	Wallaby Grass	Poaceae	0.2	10			No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.1	20		Forb (FG)	No		
petr nant	<i>Petrorhagia nanteuilii</i>	Proliferous Pink	Caryophyllaceae	0.1	5	*		No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.5	50	*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.1	10		Forb (FG)	No		
sile	<i>Silene spp.</i>		Caryophyllaceae	0.1	20	*		No		
malv parv	<i>Malva parviflora</i>	Small-flowered Mallow	Malvaceae	0.1	1	*		No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	0.1	5	*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	1		*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	1		*		No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1	1		Forb (FG)	No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.1	2		Forb (FG)	No		
linu usit	<i>Linum usitatissimum</i>	Flax	Linaceae	0.1	1	*		No		
Schk pinn abro	<i>Schkuhria pinnata</i> var. <i>a</i>	Dwarf Marigold	Asteraceae	0.1	2	*		No		
tolp barb	<i>Tolpis barbata</i>	Yellow Hawkweed	Asteraceae	0.1	1	*		No		
conv	<i>Convolvulus spp.</i>	A Bindweed	Convolvulaceae	0.1	2	*		No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W29	Pic 20x20		Pic 20x50	
Survey date:	22/10/2018	Compass Orientation (head of 20x20 plot)				50	
Recorders	MP BT	PCT:	1610 Low				
GPS Easting	776672	GPS Northing	6408233	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W29					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	3%	9.40%	
	Shrub (SG)	0		15m	5%		
	Forb (FG)	10		25m	5%		
	Grass & grasslike (GG)	2		35m	4%		
	Fern (EG)	0		45m	30%		
	Other (OG)	0	Bare ground cover	5m	12%	13%	
	TOTAL	12		15m	15%		
BAM Attribute (20x20m plot)			25m	20%			
Count of cover abundance (native vascular plants)	Stratum	Sum	35m	11%			
	Tree (TG)	0	45m	7%	0%		
	Shrub (SG)	0	5m	0%			
	Forb (FG)	4.4	15m	0%			
	Grass & grasslike (GG)	5.1	25m	0%			
	Fern (EG)	0	35m	0%			
	Other (OG)	0	45m	0%			
	TOTAL Native	9.5	Rock Cover	5m	3%	1%	
	TOTAL 'HTE'	22.2		15m	3%		
			25m	0%			
			35m	0%			
			45m	0%			

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for W29										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	30		*		No		
Trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	10		*		No		
Trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	5		*		No		
Both Macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulace	2			Forb (FG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	20		*		HTE		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	1			Forb (FG)	No		
hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae	2		*		HTE		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	0.2	20		Forb (FG)	No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	1		*		No		
schk pinn abro	<i>Schkuhria pinnata</i> var. <i>a</i>	Dwarf Marigold	Asteraceae	1		*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.2	20		Forb (FG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulace	0.1	10		Forb (FG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
wahl grac	<i>Wahlenbergia gracilent</i>	Annual Bluebell	Campanulace	0.1	10		Forb (FG)	No		
petr nant	<i>Petrorhagia nanteuilii</i>	Proliferous Pink	Caryophyllace	0.1	5	*		No		
vulp	<i>Vulpia spp.</i>	Rat's-tail Fescue	Poaceae	0.5	50	*		No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.1	50		Forb (FG)	No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	1		*		No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	0.2	50	*		No		
cycl lept	<i>Cyclospermum leptophyl</i>	Slender Celery	Apiaceae	0.1	1	*		No		
loma fili	<i>Lomandra filiformis</i>	Wattle Matt-rush	Lomandraceae	0.1	1		Grass & grasslike (GG)	No		
rosa rubi	<i>Rosa rubiginosa</i>	Sweet Briar	Rosaceae	0.2	1	*		HTE		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.1	5		Forb (FG)	No		
malv parv	<i>Malva parviflora</i>	Small-flowered Mallo	Malvaceae	0.1	1	*		No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.5	50		Forb (FG)	No		

BAM Site Field Survey								
Project:	18-012 Wollar	Plot Identifier	Plot 3	Pic 20x20	GIS pro	Pic 20x50	Not done	
Survey date:	23/05/2018		Compass Orientation (head of 20x20 plot)					
Recorders	G Young		PCT:					
GPS Easting	776872	GPS Northing	6408534		Datum	UTM	Zone	55
Landform			Soils			Drainage & Slope		
Morphology	Lower slope		Soil Texture		Sandy Clay	Slope	2 degrees	
Land Element	Lower slope		Soil Colour		Cream Orange	Aspect	eastly	
Landform	Bottom		Soil Depth		<1m?	Drainage	Well drained	
Microrelief	Vegetation		Geology		Sandstone	Watercourses	None	
Plot Disturbance								
	Severity	Age	Observational Evidence					
Clearing	3	O	Historically cultivated (signs of ploughing)					
Cultivation	1	O	As above					
Soil erosion	0							
Firewood	0							
Grazing	2	R	Cattle/horses					
Fire Damage	0							
Storm Damage	0							
Weediness	3		Carthamnus lanatus					
Other								
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)								
Additional information								
Current land use								
Grazing for horses								
Age class, condition, disturbance (inc. dbh, hollows, fire, grazing, ferals, clearing, logging, soil degradation, pollution, weeds, dieback)								
Good cover of plants over ground								
High Threat Weeds								
Carthamnus lanatus								
Significant and threatened species and communities (if present, note pop. size/area, structure, repro status, habit, habitat, threats, photos)								
NOTE - Not enough time to complete 20 x 50 so 5 random photos taken inside 20 x 20 to estimate litter cover. No trees within 50m								

Dominant Species outside Plot		None observed		
Plot 3		BAM Attributes (1 x 1m Plots)		
BAM Attribute (20x20m plot)		Tape length	% cover	Average %
Count of Native Richness	Stratum	Sum		
	Tree (TG)	0		
	Shrub (SG)	0		
	Forb (FG)	2		
	Grass/Sedge (GG)	6		
	Fern (EG)	0		
	Other (OG)	0		
	TOTAL	8		
BAM Attribute (20x20m plot)				
Count of cover abundance (native vascular plants)	Stratum	Sum		
	Tree (TG)	0		
	Shrub (SG)	0		
	Forb (FG)	0.2		
	Grass/Sedge (GG)	47.8		
	Fern (EG)	0		
	Other (OG)	0		
	TOTAL Native	48		
	TOTAL 'HT'	15.5		
BAM Attribute (20 x 50m plot) Tree Stem Counts				
DBH (cm)	Euc	Non Euc	Hollows	
>80	0	0	0	
50-79	0	0	0	
30-49	0	0	0	
20-29	0	0	0	
10-19	0	0	0	
5-9	0	0	N/A	
<5	0	0	N/A	
Length of logs (m)		0		
Litter Cover	5m	70%	42%	6319
	15m	50%		6320
	25m	35%		6321
	35m	15%		6322
	45m	40%		6323
Bare	5m	0%	0%	6319
	15m	0%		6320
	25m	1%		6321
	35m	0%		6322
	45m	0%		6323
Cryptogam cover	5m	0%	0%	6319
	15m	0%		6320
	25m	0%		6321
	35m	0%		6322
	45m	0%		6323
Rock Cover	5m	0%	0%	6319
	15m	0%		6320
	25m	0%		6321
	35m	0%		6322
	45m	0%		6323

Species recorded for Plot 3									
N:Native	E:Exotic	HT: High Threat Exotic							
Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Status
TREE (TG)									
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
SHRUB (SG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
FORB (FG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
Cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	*	15	2000	HT		
Trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fa	*	10	1000	E		
Medi sati	<i>Medicago sativa</i>	Lucerne	Fabaceae (Fa	*	0.2	20	E		
Calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae		0.1	3	N		
Hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae	*	0.5	50	HT		
Chei sieb	<i>Cheilanthes sieberi</i>	Rock Fern	Pteridaceae		0.1	1	N		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
GRASS/SEDGE (G)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
Both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae		40	2000	N		
Aris pers	<i>Aristida personata</i>		Poaceae		5	30	N		
Erag alve	<i>Eragrostis alveiformis</i>		Poaceae		0.2	40	N		
Spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae		0.5	100	N		
Cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae		2	50	N		
Ryti	<i>Rytidosperma spp.</i>		Poaceae		0.1	1	N		
Eleu tris	<i>Eleusine tristachya</i>	Goose Grass	Poaceae	*	1	100	E		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
FERN (EG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
Other (OG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W13	Pic 20x20		Pic 20x50	
Survey date:	25/10/2018	Compass Orientation (head of 20x20 plot)				180	
Recorders	MP BT	PCT:	Cultivated				
GPS Easting	776634	GPS Northing	6410281	Datum	UTM	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W13					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	2%	1.80%	
	Shrub (SG)	0		15m	1%		
	Forb (FG)	5		25m	1%		
	Grass & grasslike (GG)	7		35m	3%		
	Fern (EG)	1		45m	2%		
	Other (OG)	0	Bare ground cover	5m	3%	3%	
	TOTAL	13		15m	2%		
BAM Attribute (20x20m plot)			25m	3%			
Count of cover abundance (native vascular plants)	Stratum	Sum	35m	3%			
	Tree (TG)	0	Cryptogam cover	45m	2%	0%	
	Shrub (SG)	0		5m	0%		
	Forb (FG)	0.5		15m	0%		
	Grass & grasslike (GG)	13.5		25m	0%		
	Fern (EG)	0.1		35m	0%		
	Other (OG)	0	45m	0%			
	TOTAL Native	14.1	Rock Cover	5m	0%	0%	
	TOTAL 'HTE'	30		15m	0%		
			25m	0%			
			35m	0%			
			45m	0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W13										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Euch spha	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.1	2		Forb (FG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	30		*		HTE		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	10			Grass & grasslike (GG)	No		
trif camp	<i>Trifolium campestre</i>	Hop Clover	Fabaceae (Fal	2		*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	10		*		No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	10		*		No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	5		*		No		
tolp barb	<i>Tolpis barbata</i>	Yellow Hawkweed	Asteraceae	0.1	10	*		No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	10		*		No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	0.2	10		Grass & grasslike (GG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.1	5		Forb (FG)	No		
ryti race	<i>Rytidosperma racemosu</i>	Wallaby Grass	Poaceae	0.1	2		Grass & grasslike (GG)	No		
sonc oler	<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	0.1	10	*		No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	1		*		No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Gra	Poaceae	1			Grass & grasslike (GG)	No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	1		*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clove	Fabaceae (Fal	0.5	50	*		No		
junc fili	<i>Juncus filicaulis</i>		Juncaceae	0.1	1		Grass & grasslike (GG)	No		
cycl lept	<i>Cyclospermum leptophyl</i>	Slender Celery	Apiaceae	0.1	5	*		No		
trif repe	<i>Trifolium repens</i>	White Clover	Fabaceae (Fal	0.1	5	*		No		
erag lept	<i>Eragrostis leptocarpa</i>	Drooping Lovegrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae	2			Grass & grasslike (GG)	No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	0.1	10	*		No		
erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	0.1	10	*		No		
sile	<i>Silene spp.</i>		Caryophyllace	0.1	5	*		No		
cotu aust	<i>Cotula australis</i>	Common Cotula	Asteraceae	0.1	1		Forb (FG)	No		
chon junc	<i>Chondrilla juncea</i>	Skeleton Weed	Asteraceae	0.1	2	*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.1	5		Forb (FG)	No		
chei sieb	<i>Cheilanthes sieberi</i>	Rock Fern	Pteridaceae	0.1	5		Fern (EG)	No		
sonc aspe	<i>Sonchus asper</i>	Prickly Sowthistle	Asteraceae	0.1	1	*		No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		

BAM Site Field Survey									
Project:	Wollar SF	Plot Identifier	W14	Pic 20x20		Pic 20x50			
Survey date:	23/10/2018	Compass Orientation (head of 20x20 plot)					110		
Recorders		PCT:	Cultivated						
GPS Easting	775692	GPS Northing	6409247		Datum	GD 94	Zone	55	
Landform			Soils			Drainage & Slope			
Morphology			Soil Texture			Slope			
LandF Element			Soil Colour			Aspect			
LandF Pattern			Soil Depth			Drainage			
Microrelief			Geology			Watercourses			
Plot Disturbance									
	Severity	Age	Observational Evidence						
Clearing									
Cultivation									
Soil erosion									
Firewood									
Grazing									
Fire Damage									
Storm Damage									
Weediness									
Other									
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)									
Additional information									
Current land use									
Age class of trees (DBH range) , Condition of Vegetation, Hollows									
10 - 100cm DBH									
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)									
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)									
Dominant Species outside Plot									

FUNCTION

Function attributes for		W14					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	1%	2.40%	
	Shrub (SG)	0		15m	1%		
	Forb (FG)	9		25m	3%		
	Grass & grasslike (GG)	7		35m	5%		
	Fern (EG)	0		45m	2%		
	Other (OG)	0	Bare ground cover	5m	20%	13%	
	TOTAL	16		15m	11%		
BAM Attribute (20x20m plot)			25m	13%			
Count of cover abundance (native vascular plants)	Stratum	Sum	35m	8%			
	Tree (TG)	0	Cryptogam cover	45m	13%	0%	
	Shrub (SG)	0		5m	0%		
	Forb (FG)	1.8		15m	0%		
	Grass & grasslike (GG)	12.3		25m	0%		
	Fern (EG)	0	35m	0%			
	Other (OG)	0	45m	0%			
	TOTAL Native	14.1	Rock Cover	5m	0%	0%	
	TOTAL 'HTE'	5		15m	0%		
			25m	0%			
			35m	0%			
			45m	0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W14										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	10		*		No		
sile	<i>Silene spp.</i>		Caryophyllaceae	0.2		*		No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	10		*		No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1			Forb (FG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	2		*		No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	20		*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	5		*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	2		*		No		
plan lanc	<i>Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae	1		*		No		
trif repe	<i>Trifolium repens</i>	White Clover	Fabaceae (Fal	0.5		*		No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	1		*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	2		*		No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	1			Grass & grasslike (GG)	No		
cycl lept	<i>Cyclospermum leptophyllum</i>	Slender Celery	Apiaceae	0.1		*		No		
petr nant	<i>Petrorhagia nanteuilii</i>	Proliferous Pink	Caryophyllaceae	0.2		*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.5			Forb (FG)	No		
cotu aust	<i>Cotula australis</i>	Common Cotula	Asteraceae	0.1			Forb (FG)	No		
cirs vulg	<i>Cirsium vulgare</i>	Spear Thistle	Asteraceae	1		*		No		
gera sola	<i>Geranium solanderi</i>	Native Geranium	Geraniaceae	0.1			Forb (FG)	No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1			Forb (FG)	No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	5		*		No		
wahl grac	<i>Wahlenbergia gracilentia</i>	Annual Bluebell	Campanulaceae	0.1			Forb (FG)	No		
linu	<i>Linum spp.</i>		Linaceae	0.1		*		No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	0.2			Forb (FG)	No		
erag alve	<i>Eragrostis alveiformis</i>		Poaceae	0.1			Grass & grasslike (GG)	No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	5			Grass & grasslike (GG)	No		
euch spha	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.1			Forb (FG)	No		
gomp frut	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton	Apocynaceae	0.1		*		No		
junc fili	<i>Juncus filicaulis</i>		Juncaceae	0.1			Grass & grasslike (GG)	No		
care inve	<i>Carex inversa</i>	Knob Sedge	Cyperaceae	0.1			Grass & grasslike (GG)	No		
Eleu tris	<i>Eleusine tristachya</i>	Goose Grass	Poaceae	0.1		*		No		
sonc oler	<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	0.1		*		No		
lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	0.1		*		No		
Echi crus	<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	1		*		No		
verb bona	<i>Verbena bonariensis</i>	Purpletop	Verbenaceae	0.1		*		No		
erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	0.1		*		No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.5		*		No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae	1			Grass & grasslike (GG)	No		

calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.5			Forb (FG)	No		
echi plan	<i>Echium plantagineum</i>	Patterson's Curse	Boraginaceae	0.1		*		No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	5		*		HTE		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W15	Pic 20x20		Pic 20x50	
Survey date:	24/10/2018	Compass Orientation (head of 20x20 plot)				186	
Recorders	MP BT	PCT:	Cultivated				
GPS Easting	776738	GPS Northing	6408708	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W15					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	6%	5.20%	
	Shrub (SG)	0		15m	7%		
	Forb (FG)	4		25m	3%		
	Grass & grasslike (GG)	3		35m	4%		
	Fern (EG)	0		45m	6%		
	Other (OG)	0					
	TOTAL	7					
BAM Attribute (20x20m plot)			Bare ground cover	5m	6%	3%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	4%		
	Tree (TG)	0		25m	1%		
	Shrub (SG)	0		35m	2%		
	Forb (FG)	1.3	45m	1%			
	Grass & grasslike (GG)	1.7	Cryptogam cover	5m	0%	0%	
	Fern (EG)	0		15m	0%		
	Other (OG)	0		25m	0%		
	TOTAL Native	3		35m	0%		
	TOTAL 'HTE'	35	Rock Cover	45m	0%	0%	
				5m	0%		
				15m	0%		
				25m	0%		
			35m	0%			
			45m	0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W15										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
medi sati	<i>Medicago sativa</i>	Lucerne	Fabaceae (Fal	0.1	2	*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	5		*		No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	30		*		HTE		
junc fili	<i>Juncus filicaulis</i>		Juncaceae	0.5	10		Grass & grasslike (GG)	No		
trif camp	<i>Trifolium campestre</i>	Hop Clover	Fabaceae (Fal	0.5	20	*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	5		*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	10		*		No		
hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae	5		*		HTE		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	10		*		No		
sile	<i>Silene spp.</i>		Caryophyllace	5		*		No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	25		*		No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	1			Grass & grasslike (GG)	No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	0.2	5		Grass & grasslike (GG)	No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	5		*		No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	1			Forb (FG)	No		
tara offi	<i>Taraxacum officinale</i>	Dandelion	Asteraceae	0.5	10	*		No		
euch spha	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	5		*		No		
petr nant	<i>Petrorhagia nanteuilii</i>	Proliferous Pink	Caryophyllace	0.1	5	*		No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	0.2	10	*		No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.1	1		Forb (FG)	No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	0.1	1			No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulace	0.1	1		Forb (FG)	No		
sonc oler	<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	0.1	1	*		No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W16	Pic 20x20		Pic 20x50	
Survey date:	25/10/2018	Compass Orientation (head of 20x20 plot)				85	
Recorders	MP BT	PCT:	Cultivated				
GPS Easting	776501	GPS Northing	6409093	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W16					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	3%		
	Shrub (SG)	0		15m	2%		
	Forb (FG)	7		25m	1%		
	Grass & grasslike (GG)	10		35m	2%		
	Fern (EG)	0		45m	2%		
	Other (OG)	0					
	TOTAL	17					
BAM Attribute (20x20m plot)			Bare ground cover	5m	40%	26%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	10%		
	Tree (TG)	0		25m	40%		
	Shrub (SG)	0		35m	10%		
	Forb (FG)	1.4	45m	30%			
	Grass & grasslike (GG)	3.7	Cryptogam cover	5m	0%	0%	
	Fern (EG)	0		15m	0%		
	Other (OG)	0		25m	0%		
	TOTAL Native	5.1		35m	0%		
TOTAL 'HTE'	25	Rock Cover	45m	0%	9%		
			15m	0%			
			25m	30%			
			35m	7%			
			45m	10%			

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for W16										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
echi crus	<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	0.2	10	*		No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	1			Grass & grasslike (GG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	25		*		HTE		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	2		*		No		
tolp barb	<i>Tolpis barbata</i>	Yellow Hawkweed	Asteraceae	0.1	2	*		No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	15		*		No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.5	10		Forb (FG)	No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	10		*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.2	50		Forb (FG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.2	10		Forb (FG)	No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1	5		Forb (FG)	No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.2	10	*		No		
erag brow	<i>Eragrostis brownii</i>	Brown's Lovegrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
erag lept	<i>Eragrostis leptocarpa</i>	Drooping Lovegrass	Poaceae	0.5	10		Grass & grasslike (GG)	No		
lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	20		*		No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	5		*		No		
paro bras	<i>Paronychia brasiliensis</i>	Chilean Whitlow Wort	Caryophyllaceae	0.2	10	*		No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	2		*		No		
pani simi	<i>Panicum simile</i>	Two-colour Panic	Poaceae	0.1	1		Grass & grasslike (GG)	No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	1			Grass & grasslike (GG)	No		
sile	<i>Silene spp.</i>		Caryophyllaceae	0.5	20	*		No		
ryti fulv	<i>Rytidosperma fulvum</i>	Wallaby Grass	Poaceae	2				No		
medi sati	<i>Medicago sativa</i>	Lucerne	Fabaceae (Fal	2		*		No		
aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	0.2	5		Grass & grasslike (GG)	No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	1		*		No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	2				No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.2	10		Forb (FG)	No		
cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae	0.5	5		Grass & grasslike (GG)	No		
erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	0.2	20	*		No		
dysp pumi	<i>Dysphania pumilio</i>	Small Crumbweed	Chenopodiaceae	0.1	1		Forb (FG)	No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.5	50	*		No		
poly avic	<i>Polygonum aviculare</i>	Wireweed	Polygonaceae	0.2	10	*		No		
junc fili	<i>Juncus filicaulis</i>		Juncaceae	0.1	1		Grass & grasslike (GG)	No		
sonc oler	<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	0.1	1	*		No		
cras colo	<i>Crassula colorata</i>	Dense Stonecrop	Crassulaceae	0.1	10		Forb (FG)	No		
caps burs	<i>Capsella bursa-pastoris</i>	Shepherd's Purse	Brassicaceae	0.1	10	*		No		
arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	0.5	50	*		No		
cype	<i>Cyperus spp.</i>		Cyperaceae	0.1	1		Grass & grasslike (GG)	No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W17	Pic 20x20		Pic 20x50	
Survey date:	23/10/2018	Compass Orientation (head of 20x20 plot)				270	
Recorders	MP BT	PCT:	Cultivated				
GPS Easting	776121	GPS Northing	6408961	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W17					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	4%	2.00%	
	Shrub (SG)	0		15m	2%		
	Forb (FG)	11		25m	2%		
	Grass & grasslike (GG)	5		35m	1%		
	Fern (EG)	0		45m	1%		
	Other (OG)	0					
	TOTAL	16					
BAM Attribute (20x20m plot)			Bare ground cover	5m	35%	15%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	15%		
	Tree (TG)	0		25m	10%		
	Shrub (SG)	0		35m	15%		
	Forb (FG)	2.9	45m	2%			
	Grass & grasslike (GG)	6.2	Cryptogam cover	5m	0%	0%	
	Fern (EG)	0		15m	0%		
	Other (OG)	0		25m	0%		
	TOTAL Native	9.1		35m	0%		
	TOTAL 'HTE'	40	Rock Cover	45m	0%	0%	
				5m	0%		
				15m	0%		
				25m	0%		
				35m	0%		
			45m	0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W17										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	5		*		No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	40		*		HTE		
trif repe	<i>Trifolium repens</i>	White Clover	Fabaceae (Fa	1		*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fa	2		*		No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Gra	Poaceae	0.5			Grass & grasslike (GG)	No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.2		*		No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	0.5			Grass & grasslike (GG)	No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	1			Forb (FG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.5			Forb (FG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.1		*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.5		*		No		
calo cune	<i>Calotis cuneata</i>	Mountain Burr-Daisy	Asteraceae	0.1			Forb (FG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fa	0.2		*		No		
vitt muel	<i>Vittadinia muelleri</i>	A Fuzzweed	Asteraceae	0.2			Forb (FG)	No		
arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	0.1		*		No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fa	0.5		*		No		
sile	<i>Silene spp.</i>		Caryophyllaceae	0.5		*		No		
tolp barb	<i>Tolpis barbata</i>	Yellow Hawkweed	Asteraceae	0.1		*		No		
cirs vulg	<i>Cirsium vulgare</i>	Spear Thistle	Asteraceae	0.5		*		No		
cycl lept	<i>Cyclospermum leptophyllum</i>	Slender Celery	Apiaceae	0.1		*		No		
euch spha	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.1			Forb (FG)	No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fa	5		*		No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	5		*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.1			Forb (FG)	No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.1			Forb (FG)	No		
tara offi	<i>Taraxacum officinale</i>	Dandelion	Asteraceae	0.1		*		No		
malv parv	<i>Malva parviflora</i>	Small-flowered Mallow	Malvaceae	0.2		*		No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.2		*		No		
plan hisp	<i>Plantago hispida</i>		Plantaginaceae	0.1			Forb (FG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	0.5			Forb (FG)	No		
echi crus	<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	0.5		*		No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1			Forb (FG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1			Forb (FG)	No		
erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	0.2		*		No		
plan lanc	<i>Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae	0.1		*		No		
erag lept	<i>Eragrostis leptocarpa</i>	Drooping Lovegrass	Poaceae	0.1			Grass & grasslike (GG)	No		
cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae	0.1			Grass & grasslike (GG)	No		
sonc oler	<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	0.1		*		No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W18	Pic 20x20		Pic 20x50	
Survey date:	24/10/2018	Compass Orientation (head of 20x20 plot)					
Recorders	MP BT	PCT:	Cultivated				
GPS Easting	776641	GPS Northing	6410164	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W18					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	1%	0.80%	
	Shrub (SG)	1		15m	1%		
	Forb (FG)	2		25m	0%		
				35m	2%		
	Grass & grasslike (GG)	1		45m	0%		
	Fern (EG)	0					
	Other (OG)	0					
TOTAL	4						
BAM Attribute (20x20m plot)			Bare ground cover	5m	65%	57%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	60%		
	Tree (TG)	0		25m	60%		
	Shrub (SG)	0.5		35m	50%		
	Forb (FG)	0.2	45m	50%			
			Cryptogam cover	5m	0%	0%	
	Grass & grasslike (GG)	2		15m	0%		
	Fern (EG)	0		25m	0%		
	Other (OG)	0		35m	0%		
TOTAL Native	2.7	45m	0%				
TOTAL 'HTE'	1	Rock Cover	5m	0%	0%		
			15m	0%			
			25m	0%			
			35m	0%			
			45m	0%			

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for W18										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
bras	<i>Brassica spp.</i>	Brassica	Brassicaceae	5		*		No		
medi sati	<i>Medicago sativa</i>	Lucerne	Fabaceae (Fa)	50		*		No		
sile	<i>Silene spp.</i>		Caryophyllace	0.1	5	*		No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	10		*		No		
cotu aust	<i>Cotula australis</i>	Common Cotula	Asteraceae	0.1	2		Forb (FG)	No		
erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	0.1	10	*		No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	1		*		HTE		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	1		*		No		
phal aqua	<i>Phalaris aquatica</i>	Phalaris	Poaceae	5		*		No		
lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	0.1	10	*		No		
cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae	2			Grass & grasslike (GG)	No		
sola cine	<i>Solanum cinereum</i>	Narrawa Burr	Solanaceae	0.5	3		Shrub (SG)	No		
malv parv	<i>Malva parviflora</i>	Small-flowered Mallo	Malvaceae	0.1	1	*		No		
chon junc	<i>Chondrilla juncea</i>	Skeleton Weed	Asteraceae	0.1	1	*		No		
poly avic	<i>Polygonum aviculare</i>	Wireweed	Polygonaceae	20		*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.1	1		Forb (FG)	No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.1	1	*		No		

BAM Site Field Survey								
Project:	18-012	Plot Identifier	Plot 2	Pic 20x20	GIS pro	Pic 20x50	GIS pro	
Survey date:	23/05/2018		Compass Orientation (head of 20x20 plot)				223	
Recorders	G Young		PCT:					
GPS Easting	776262	GPS Northing	6408847		Datum	UTM	Zone	55
Landform			Soils			Drainage & Slope		
Morphology	Simple slope		Soil Texture		Sandy clay	Slope		
Land Element	Mid slope		Soil Colour		Light Brown	Aspect	300 degrees west	
Landform	Valley footslope		Soil Depth		>1m	Drainage	Well drained	
Microrelief	Vegetation		Geology		Sandstone	Watercourses	None	
Plot Disturbance								
	Severity	Age	Observational Evidence					
Clearing	0							
Cultivation	0							
Soil erosion	0							
Firewood	3	R	Mostly cleaned up - occasional fallen timber					
Grazing	2	R	Cattle					
Fire Damage	2	R	Fire in Feb 2017 (according to land owner)					
Storm Damage	0							
Weediness								
Other								
Additional information								
Current land use								
Grazing country								
Age class, condition, disturbance (inc. dbh, hollows, fire, grazing, ferals, clearing, logging, soil degradation, pollution, weeds, dieback)								
Senescent with regeneration occurring, fire Feb 2017, cattle grazing and fire wood collection. Some mistletoe in surrounding Eucs								
High Threat Weeds								
None								
Significant and threatened species and communities (if present, note pop. size/area, structure, repro status, habit, habitat, threats, photos)								
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)								
Dominant Species outside Plot		E. blakelyi						

Plot 2

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	2
	Shrub (SG)	0
	Forb (FG)	16
	Grass/Sedge (GG)	20
	Fern (EG)	0
	Other (OG)	0
	TOTAL	38
BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	12.1
	Shrub (SG)	0
	Forb (FG)	1.8
	Grass/Sedge (GG)	31
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	44.9
	TOTAL 'HT'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	1	0	0
30-49	0	0	0
20-29	3	0	0
10-19	0	0	0
5-9	1	0	N/A
<5	37	0	N/A
Length of logs (m)		26	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	40%	18%	6313
	15m	30%		6314
	25m	10%		6315
	35m	5%		6316
	45m	7%		6317
Bare	5m	20%	36%	6313
	15m	40%		6314
	25m	25%		6315
	35m	5%		6316
	45m	90%		6317
Cryptogam cover	5m	0%	0%	6313
	15m	0%		6314
	25m	0%		6315
	35m	0%		6316
	45m	0%		6317
Rock Cover	5m	0%	0%	6313
	15m	0%		6314
	25m	0%		6315
	35m	0%		6316
	45m	0%		6317

Species recorded for Plot 2									
N:Native	E:Exotic	HT: High Threat Exotic							
Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Status
TREE (TG)									
Euca blak	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	Myrtaceae		12	35	N		
Euca	<i>Eucalyptus spp.</i>		Myrtaceae		0.1	1	N		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
SHRUB (SG)									
	<i>Scientific Name</i>	<i>Common Name</i>	<i>Family</i>	<i>Exotic</i>	<i>Cover%</i>	<i>Abundance</i>	<i>N, E or 'HT'</i>	<i>EPBC Stat</i>	<i>TSC Status</i>
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
FORB (FG)									
	<i>Scientific Name</i>	<i>Common Name</i>	<i>Family</i>	<i>Exotic</i>	<i>Cover%</i>	<i>Abundance</i>	<i>N, E or 'HT'</i>	<i>EPBC Stat</i>	<i>TSC Status</i>
Alte sp.	<i>Alternanthera sp. A</i>		Amaranthaceae		0.1	20	N		
Calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae		0.1	10	N		
calo cune	<i>Calotis cuneata</i>	Mountain Burr-Daisy	Asteraceae		0.2	20	N		
Good hede	<i>Goodenia hederacea</i>	Ivy Goodenia	Goodeniaceae		0.1	15	N		
Glyc clan	<i>Glycine clandestina</i>	Twining glycine	Fabaceae (Fa		0.1	1	N		
Glyc sten	<i>Glycine stenophita</i>		Fabaceae (Fa		0.1	10	N		
Eina nuta	<i>Einadia nutans</i>	Climbing Saltbush	Chenopodiaceae		0.1	15	N		
Tric elat	<i>Tricoryne elatior</i>	Yellow Autumn-lily	Anthericaceae		0.1	4	N		
Dysp pumi	<i>Dysphania pumilio</i>	Small Crumbweed	Chenopodiaceae		0.2	40	N		
Eina hast	<i>Einadia hastata</i>	Berry Saltbush	Chenopodiaceae		0.1	6	N		
Port oler	<i>Portulaca oleracea</i>	Pigweed	Portulacaceae		0.1	2	N		
Paro bras	<i>Paronychia brasiliensis</i>	Chilean Whitlow Wort	Caryophyllaceae	*	0.1	3	E		
Cony bona	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Asteraceae	*	0.1	1	E		
Modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	*	0.1	1	E		
Sper rubr	<i>Spergularia rubra</i>	Sandspurry	Caryophyllaceae	*	0.1	4	E		
Eleu tris	<i>Eleusine tristachya</i>	Goose Grass	Poaceae	*	0.1	4	E		
Mair ench	<i>Maireana enchylaenoides</i>	Wingless Fissure-weed	Chenopodiaceae		0.1	1	N		
Lepi afri	<i>Lepidium africanum</i>	Common Peppergrass	Brassicaceae	*	0.1	4	E		
Sola nigr	<i>Solanum nigrum</i>	Black-berry Nightshade	Solanaceae	*	0.1	1	E		
Wahl	<i>Wahlenbergia spp.</i>	Bluebell	Campanulaceae		0.1	3	N		
Sole domi	<i>Solenogyne dominii</i>		Asteraceae		0.1	1	N		
Gono tetr	<i>Gonocarpus tetragynus</i>	Poverty Raspwort	Haloragaceae		0.1	1	N		
Hype gram	<i>Hypericum gramineum</i>	Small St John's Wort	Clusiaceae		0.1	1	N		

	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
GRASS/SEDGE (G)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
Ente acic	<i>Enteropogon acicularis</i>	Curly Windmill Grass	Poaceae		10	500	N		
Aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae		0.2	45	N		
Chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae		15	800	N		
Pani simi	<i>Panicum simile</i>	Two-colour Panic	Poaceae		0.1	10	N		
Ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae		0.2	50	N		
Aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae		3	200	N		
Eula aure	<i>Eulalia aurea</i>	Silky Browntop	Poaceae		0.5	100	N		
Spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae		0.4	100	N		
Chlo vent	<i>Chloris ventricosa</i>	Tall Chloris	Poaceae		0.1	20	N		
Erag cili	<i>Eragrostis cilianensis</i>	Stinkgrass	Poaceae	*	0.1	1	E		
Cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae		0.2	5	N		
Erag parv	<i>Eragrostis parviflora</i>	Weeping Lovegrass	Poaceae		0.1	20	N		
Micr stip	<i>Microlaena stipoides</i>	Weeping Grass	Poaceae		0.2	50	N		
Erag lacu	<i>Eragrostis lacunaria</i>	Purple Lovegrass	Poaceae		0.1	10	N		
Aust seta	<i>Austrostipa setacea</i>	Corkscrew Grass	Poaceae		0.1	1	N		
Ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae		0.2	50	N		
Ryti caes	<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass	Poaceae		0.1	20	N		
Ryti bipa	<i>Rytidosperma bipartitum</i>	Wallaby Grass	Poaceae		0.1	20	N		
Digi brow	<i>Digitaria brownii</i>	Cotton Panic Grass	Poaceae		0.1	5	N		
Junc fili	<i>Juncus filicaulis</i>		Juncaceae		0.1	20	N		
Loma mult mult	<i>Lomandra multiflora subsp</i>	Many-flowered Mat-r	Lomandraceae		0.2	5	N		
FERN (EG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
Other (OG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W19	Pic 20x20		Pic 20x50	
Survey date:	24/10/2018	Compass Orientation (head of 20x20 plot)				0	
Recorders	MP BT	PCT:	281 Good				
GPS Easting	775209	GPS Northing	6410425	Datum	94	Zone	55
Landform			Soils		Drainage & Slope		
Morphology			Soil Texture		Slope		
LandF Element			Soil Colour		Aspect		
LandF Pattern			Soil Depth		Drainage		
Microrelief			Geology		Watercourses		
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W19					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	1		5m	8%	25.40%	
	Shrub (SG)	2		15m	50%		
	Forb (FG)	22		25m	40%		
				35m	9%		
	Grass & grasslike (GG)	5		45m	20%		
	Fern (EG)	0					
	Other (OG)	4					
TOTAL		34					
BAM Attribute (20x20m plot)			Bare ground cover	5m	40%	26%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	2%		
	Tree (TG)	25		25m	10%		
	Shrub (SG)	0.3		35m	70%		
	Forb (FG)	16.4	45m	7%			
			Cryptogam cover	5m	0%	0%	
	Grass & grasslike (GG)	15.2		15m	0%		
	Fern (EG)	0		25m	0%		
	Other (OG)	1.9		35m	0%		
	TOTAL Native		58.8	45m	0%		
TOTAL 'HTE'		10	Rock Cover	5m	0%	0%	
		15m		0%			
		25m		0%			
		35m		1%			
		45m		1%			

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49	1		
20-29	4		
10-19	7		
5-9	2		
<5	3		N/A
Length of logs (m)		4	

COMPOSITION & STRUCTURE

Species recorded for W19										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
gera sola	<i>Geranium solanderi</i>	Native Geranium	Geraniaceae	0.2	50		Forb (FG)	No		
euca blak	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	Myrtaceae	25			Tree (TG)	No		
pime lini	<i>Pimelea linifolia</i>	Slender Rice Flower	Thymelaeaceae	0.2	5		Shrub (SG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.2	50		Forb (FG)	No		
petr nant	<i>Petrorhagia nanteuillii</i>	Proliferous Pink	Caryophyllaceae	1		*		No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal)	0.5	20		Other (OG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal)	5		*		No		
care inve	<i>Carex inversa</i>	Knob Sedge	Cyperaceae	5			Grass & grasslike (GG)	No		
good hede	<i>Goodenia hederacea</i>	Ivy Goodenia	Goodeniaceae	0.5			Forb (FG)	No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	1		*		No		
glyc clan	<i>Glycine clandestina</i>	Twining glycine	Fabaceae (Fal)	0.2	5		Other (OG)	No		
cype grac	<i>Cyperus gracilis</i>	Slender Flat-sedge	Cyperaceae	0.1	1		Grass & grasslike (GG)	No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	1			Forb (FG)	No		
calo cune	<i>Calotis cuneata</i>	Mountain Burr-Daisy	Asteraceae	0.2	10		Forb (FG)	No		
clem aris	<i>Clematis aristata</i>	Old Man's Beard	Ranunculaceae	1			Other (OG)	No		
cymb laws	<i>Cymbonotus lawsonianus</i>	Bear's Ear	Asteraceae	0.5	5		Forb (FG)	No		
micr parv	<i>Microtis parviflora</i>	Slender Onion Orchid	Orchidaceae	0.1	5		Forb (FG)	No		P
loma fili	<i>Lomandra filiformis</i>	Wattle Matt-rush	Lomandraceae	0.1	5		Grass & grasslike (GG)	No		
elym scab	<i>Elymus scaber</i>	Common Wheatgrass	Poaceae	5			Grass & grasslike (GG)	No		
arth mill	<i>Arthropodium milleflorum</i>	Pale Vanilla-lily	Anthericaceae	0.5	20		Forb (FG)	No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	1		*		No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	1			Forb (FG)	No		
eina hast	<i>Einadia hastata</i>	Berry Saltbush	Chenopodiaceae	0.5	5		Forb (FG)	No		
conv erub	<i>Convolvulus erubescens</i>	Pink Bindweed	Convolvulaceae	0.2	10		Other (OG)	No		
acae ovin	<i>Acaena ovina</i>	Acaena	Rosaceae	5			Forb (FG)	No		
micr stip	<i>Microlaena stipoides</i>	Weeping Grass	Poaceae	5			Grass & grasslike (GG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	10		*		HTE		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	5			Forb (FG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal)	0.5	10	*		No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.2	5		Forb (FG)	No		
euch spha	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		
linu	<i>Linum spp.</i>		Linaceae	0.1	1	*		No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.2	5		Forb (FG)	No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.5	20	*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal)	1		*		No		
plan hisp	<i>Plantago hispida</i>		Plantaginaceae	0.1	1		Forb (FG)	No		
cotu aust	<i>Cotula australis</i>	Common Cotula	Asteraceae	0.2	5		Forb (FG)	No		
hydr laxi	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	Apiaceae	0.1	1		Forb (FG)	No		
phyl hirt	<i>Phyllanthus hirtellus</i>	Thyme Spurge	Phyllanthaceae	0.1	1		Shrub (SG)	No		

cyno echi	<i>Cynosurus echinatus</i>	Rough Dog's Tail	Poaceae	0.1	5	*		No		
sole	<i>Solenogyne spp.</i>		Asteraceae	0.1	1		Forb (FG)	No		
chei sieb	<i>Cheilanthes sieberi</i>	Rock Fern	Pteridaceae	0.1	5			No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	0.1	5	*		No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.5	2		Forb (FG)	No		
pter muti	<i>Pterostylis mutica</i>	Midget Greenhood	Orchidaceae	0.1	1		Forb (FG)	No		P
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1	1		Forb (FG)	No		
rost pumi	<i>Rostraria pumila</i>	Roughtail	Poaceae	0.5	20	*		No		
dysp pumi	<i>Dysphania pumilio</i>	Small Crumbweed	Chenopodiaceae	0.1	1			No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W20	Pic 20x20		Pic 20x50	
Survey date:	23/10/2018	Compass Orientation (head of 20x20 plot)				185	
Recorders	MP BT	PCT:	281 good				
GPS Easting	774824	GPS Northing	6409137	Datum	94	Zone	55
Landform			Soils		Drainage & Slope		
Morphology			Soil Texture			Slope	
LandF Element			Soil Colour			Aspect	
LandF Pattern			Soil Depth			Drainage	
Microrelief			Geology			Watercourses	
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W20					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	1		5m	2%	20.00%	
	Shrub (SG)	1		15m	3%		
	Forb (FG)	10		25m	80%		
				35m	10%		
				45m	5%		
	Grass & grasslike (GG)	4	Bare ground cover	5m	90%	60%	
	Fern (EG)	0		15m	93%		
Other (OG)	2	25m		20%			
TOTAL	18	35m		20%			
			45m	75%			
Count of cover abundance (native vascular plants)	Stratum	Sum	Cryptogam cover	5m	0%	0%	
	Tree (TG)	20		15m	0%		
	Shrub (SG)	0.2		25m	0%		
	Forb (FG)	5.3		35m	0%		
	Grass & grasslike (GG)	10.3	45m	0%			
	Fern (EG)	0	Rock Cover	5m	0%	0%	
	Other (OG)	2.1		15m	0%		
	TOTAL Native	37.9		25m	0%		
	TOTAL 'HTE'	0		35m	0%		
		45m		0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79	4		1				
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)		7					

COMPOSITION & STRUCTURE

Species recorded for W20										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fa)	2			Other (OG)	No		
malv parv	<i>Malva parviflora</i>	Small-flowered Mallow	Malvaceae	5		*		No		
calo cune	<i>Calotis cuneata</i>	Mountain Burr-Daisy	Asteraceae	0.2	10		Forb (FG)	No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	10			Grass & grasslike (GG)	No		
eina poly	<i>Einadia polygonoides</i>	Knotweed Goosefoot	Chenopodiaceae	2			Forb (FG)	No		
eina hast	<i>Einadia hastata</i>	Berry Saltbush	Chenopodiaceae	1			Forb (FG)	No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.5	20		Forb (FG)	No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.5			Forb (FG)	No		
lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	5		*		No		
wahl grac	<i>Wahlenbergia gracilent</i>	Annual Bluebell	Campanulaceae	0.1	2		Forb (FG)	No		
euca albe	<i>Eucalyptus albens</i>	White Box	Myrtaceae	20			Tree (TG)	No		
loma fili	<i>Lomandra filiformis</i>	Wattle Matt-rush	Lomandraceae	0.1	1		Grass & grasslike (GG)	No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	5		*		No		
urti inci	<i>Urtica incisa</i>	Stinging Nettle	Urticaceae	0.5	5		Forb (FG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	0.2	50		Forb (FG)	No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.1	2		Forb (FG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.2	10		Forb (FG)	No		
sola cine	<i>Solanum cinereum</i>	Narrawa Burr	Solanaceae	0.2	1		Shrub (SG)	No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	2		*		No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	0.2	50	*		No		
erag parv	<i>Eragrostis parviflora</i>	Weeping Lovegrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
glyc clan	<i>Glycine clandestina</i>	Twining glycine	Fabaceae (Fa)	0.1	2		Other (OG)	No		

BAM Site Field Survey							
Project:	18-012 Wollar Solarfarm	Plot Identifier	Plot 5	Pic 20x20	GIS pro	Pic 20x50	GIS pro
Survey date:	24/05/2018		Compass Orientation (head of 20x20 plot)				185
Recorders	G Young		PCT:				
GPS Easting	775463	GPS Northing	6409932		Datum	UTS	Zone 55
Landform			Soils			Drainage & Slope	
Morphology	Flat		Soil Texture		Sand	Slope	1-2 degrees
Land Element	Lower slope		Soil Colour		Light Grey	Aspect	Flat
Landform	Bottom		Soil Depth		>1m	Drainage	Moderate
Microrelief	None		Geology		Sandstone	Watercourses	120m east
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing	3	O					
Cultivation	2	O					
Soil erosion	0						
Firewood	0						
Grazing	2		Cattle observed				
Fire Damage	0						
Storm Damage	0						
Weediness	2		Carthamnus lanatus				
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Grazing by cattle							
Age class, condition, disturbance (inc. dbh, hollows, fire, grazing, ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Rabbit scats, burrows 100m away. History of cultivation/farming.							
High Threat Weeds							
Carthamnus lanatus							
Significant and threatened species and communities (if present, note pop. size/area, structure, repro status, habit, habitat, threats, photos)							

Dominant Species outside Plot		Nothing observed			
Plot 5		BAM Attributes (1 x 1m Plots)			
BAM Attribute (20x20m plot)		Tape length	% cover	Average %	Photos
Count of Native Richness	Stratum	5m	15%	22%	6331
	Tree (TG)	15m	20%		6332
	Shrub (SG)	25m	25%		6333
	Forb (FG)	35m	15%		6334
	Grass/Sedge (GG)	45m	35%		6335
	Fern (EG)	5m	1%	5%	6331
	Other (OG)	15m	5%		6332
	TOTAL	25m	7%		6333
		35m	5%		6334
BAM Attribute (20x20m plot)		45m	7%		6335
Count of cover abundance (native vascular plants)	Stratum	5m	0%	0%	6331
	Tree (TG)	15m	0%		6332
	Shrub (SG)	25m	0%		6333
	Forb (FG)	35m	0%		6334
	Grass/Sedge (GG)	45m	0%		6335
	Fern (EG)	5m	0%	0%	6331
	Other (OG)	15m	0%		6332
	TOTAL Native	25m	0%		6333
	TOTAL 'HT'	35m	0%		6334
BAM Attribute (20 x 50m plot) Tree Stem Counts		45m	0%		6335
DBH (cm)	Euc	Non Euc	Hollows		
>80	0	0	0		
50-79	0	0	0		
30-49	0	0	0		
20-29	0	0	0		
10-19	0	0	0		
5-9	0	0	N/A		
<5	0	0	N/A		
Length of logs (m)		0			

Species recorded for Plot 5									
N:Native	E:Exotic	HT: High Threat Exotic							
Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Status
TREE (TG)									
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
SHRUB (SG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
FORB (FG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
Chon junc	<i>Chondrilla juncea</i>	Skeleton Weed	Asteraceae	*	2	300	E		
Cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	*	5	1000	HT		
Hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	*	0.2	100	E		
Erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	*	0.3	500	E		
Dich sp.	<i>Dichondra sp. A</i>	Kidney Weed	Convolvulaceae		0.1	10	N		
Glyc taba	<i>Glycine tabacina</i>	Variable Glycine	Fabaceae (Fa		0.1	20	N		
Modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	*	0.1	10	E		
Trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fa	*	0.2	100	E		
Sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae		0.1	20	N		
Wahl comm	<i>Wahlenbergia communis</i>	Tufted Bluebell	Campanulaceae		0.1	10	N		
Gera sola	<i>Geranium solanderi</i>	Native Geranium	Geraniaceae		0.1	1	N		
Dysp pumi	<i>Dysphania pumilio</i>	Small Crumbweed	Chenopodiaceae		0.1	50	N		
Alte nana	<i>Alternanthera nana</i>	Hairy Joyweed	Amaranthaceae		0.1	2	N		
Hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae	*	0.2	50	E		
Cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae		0.1	1	N		
Calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae		0.1	1	N		
Cony bona	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Asteraceae	*	0.1	5	E		
Erod crin	<i>Erodium crinitum</i>	Blue Crowfoot	Geraniaceae		0.3	100	N		
Conv gram	<i>Convolvulus graminetinus</i>		Convolvulaceae		0.1	1	N		
Rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae		0.1	10	N		
Oxal pere	<i>Oxalis perennans</i>		Oxalidaceae		0.1	1	N		
Port oler	<i>Portulaca oleracea</i>	Pigweed	Portulacaceae		0.1	3	N		
Dysp pumi	<i>Dysphania pumilio</i>	Small Crumbweed	Chenopodiaceae		0.1	30	N		

GRASS/SEDGE (G)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
Ryti caes	<i>Rytidosperma caespitosu</i>	Ringed Wallaby Grass	Poaceae		0.2	50	N		
Erag lept	<i>Eragrostis leptostachya</i>	Paddock Lovegrass	Poaceae		0.1	20	N		
Erag cili	<i>Eragrostis cilianensis</i>	Stinkgrass	Poaceae	*	0.1	10	E		
Both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae		3	300	N		
Digi brow	<i>Digitaria brownii</i>	Cotton Panic Grass	Poaceae		2	200	N		
Pani simi	<i>Panicum simile</i>	Two-colour Panic	Poaceae		0.1	20	N		
Aris pers	<i>Aristida personata</i>		Poaceae		1	35	N		
Micr stip	<i>Microlaena stipoides</i>	Weeping Grass	Poaceae		10	1000	N		
Chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae		0.1	20	N		
Spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae		0.1	10	N		
Cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae		0.1	10	N		
Digi	<i>Digitaria spp.</i>	A Finger Grass	Poaceae	*	0.1	1	E		
Pasp crin	<i>Paspalidium criniforme</i>		Poaceae		0.1	1	N		
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
FERN (EG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
Other (OG)	Scientific Name	Common Name	Family	Exotic	Cover%	Abundance	N, E or 'HT'	EPBC Stat	TSC Status
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A
	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W21	Pic 20x20		Pic 20x50	
Survey date:	24/10/2018	Compass Orientation (head of 20x20 plot)				260	
Recorders	MP BT	PCT:	281 DGL				
GPS Easting	775798	GPS Northing	6410678	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W21					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	2%	1.20%	
	Shrub (SG)	0		15m	1%		
	Forb (FG)	12		25m	1%		
	Grass & grasslike (GG)	5		35m	1%		
	Fern (EG)	0		45m	1%		
	Other (OG)	2					
	TOTAL	19					
BAM Attribute (20x20m plot)			Bare ground cover	5m	5%	13%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	10%		
	Tree (TG)	0		25m	15%		
	Shrub (SG)	0		35m	25%		
	Forb (FG)	4.1	45m	10%			
	Grass & grasslike (GG)	2.5	Cryptogam cover	5m	0%	0%	
	Fern (EG)	0		15m	0%		
	Other (OG)	0.6		25m	0%		
	TOTAL Native	7.2		35m	0%		
	TOTAL 'HTE'	40	45m	0%			
			Rock Cover	5m	0%	0%	
		15m		0%			
		25m		0%			
		35m		1%			
		45m		0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W21										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	40		*		HTE		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	1			Forb (FG)	No		
gera sola	<i>Geranium solanderi</i>	Native Geranium	Geraniaceae	1			Forb (FG)	No		
elym scab	<i>Elymus scaber</i>	Common Wheatgrass	Poaceae	1			Grass & grasslike (GG)	No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	0.2	10		Grass & grasslike (GG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	1			Grass & grasslike (GG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.1	5		Forb (FG)	No		
euch spha	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.1	2		Forb (FG)	No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.2	20	*		No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	0.1	5		Forb (FG)	No		
echi crus	<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	1		*		No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	1		*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	10		*		No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	5		*		No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.1	5		Forb (FG)	No		
petr nant	<i>Petrorhagia nanteuillii</i>	Proliferous Pink	Caryophyllaceae	0.2	10	*		No		
tara offi	<i>Taraxacum officinale</i>	Dandelion	Asteraceae	0.1	1	*		No		
cymb laws	<i>Cymbonotus lawsonianus</i>	Bear's Ear	Asteraceae	0.1	1		Forb (FG)	No		
micr stip	<i>Microlaena stipoides</i>	Weeping Grass	Poaceae	0.2	20		Grass & grasslike (GG)	No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	0.2	10	*		No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	0.5	20		Other (OG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.2	4		Forb (FG)	No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
arth minu	<i>Arthropodium minus</i>	Small Vanilla Lily	Anthericaceae	0.2	20		Forb (FG)	No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.1	1		Forb (FG)	No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.1	1		Forb (FG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	1	100		Forb (FG)	No		
conv erub	<i>Convolvulus erubescens</i>	Pink Bindweed	Convolvulaceae	0.1	2		Other (OG)	No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	0.5	50	*		No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W22	Pic 20x20		Pic 20x50	
Survey date:	24/10/2018	Compass Orientation (head of 20x20 plot)				260	
Recorders	MP BT	PCT:	281 DGL				
GPS Easting	775954	GPS Northing	6410219	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W22					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	2%	1.40%	
	Shrub (SG)	0		15m	2%		
	Forb (FG)	13		25m	1%		
	Grass & grasslike (GG)	6		35m	1%		
	Fern (EG)	0		45m	1%		
	Other (OG)	0					
	TOTAL	19					
BAM Attribute (20x20m plot)			Bare ground cover	5m	30%	33%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	25%		
	Tree (TG)	0		25m	35%		
	Shrub (SG)	0		35m	25%		
	Forb (FG)	3.7	45m	50%			
	Grass & grasslike (GG)	12.2	Cryptogam cover	5m	0%	0%	
	Fern (EG)	0		15m	0%		
	Other (OG)	0		25m	0%		
	TOTAL Native	15.9		35m	0%		
	TOTAL 'HTE'	20.1	45m	0%			
			Rock Cover	5m	0%	0%	
		15m		0%			
		25m		0%			
		35m		0%			
		45m		0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W22										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	20		*		HTE		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	5		*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	1		*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.2	10		Forb (FG)	No		
xant spin	<i>Xanthium spinosum</i>	Bathurst Burr	Asteraceae	0.1	1	*		HTE		
cent sols	<i>Centaurea solstitialis</i>	St Barnabys Thistle	Asteraceae	0.1	2	*		No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	1			Grass & grasslike (GG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	1			Grass & grasslike (GG)	No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	1			Forb (FG)	No		
arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	5		*		No		
brom cath	<i>Bromus catharticus</i>	Prairie Grass	Poaceae	10		*		No		
plan lanc	<i>Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae	5		*		No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	5		*		No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	5			Grass & grasslike (GG)	No		
euch spha	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.5	20		Forb (FG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	1			Forb (FG)	No		
boer domi	<i>Boerhavia dominii</i>	Tarvine	Nyctaginaceae	0.1	3		Forb (FG)	No		
viit cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	0.1	5		Forb (FG)	No		
cycl lept	<i>Cyclospermum leptophyllum</i>	Slender Celery	Apiaceae	0.2	10	*		No		
lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	0.1	20	*		No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.1	5		Forb (FG)	No		
erod botr	<i>Erodium botrys</i>	Long Storksbill	Geraniaceae	2		*		No		
sonc oler	<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	0.1	1	*		No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.2	5		Forb (FG)	No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	5			Grass & grasslike (GG)	No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
eina poly	<i>Einadia polygonoides</i>	Knotweed Goosefoot	Chenopodiaceae	0.1	1		Forb (FG)	No		
plan debi	<i>Plantago debilis</i>	Shade Plantain	Plantaginaceae	0.1	1		Forb (FG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	1		*		No		
malv parv	<i>Malva parviflora</i>	Small-flowered Mallow	Malvaceae	0.1	5	*		No		
uroc pani	<i>Urochloa panicoides</i>	Urochloa Grass	Poaceae	0.1	1	*		No		
chon junc	<i>Chondrilla juncea</i>	Skeleton Weed	Asteraceae	0.1	1	*		No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1	1		Forb (FG)	No		
cotu aust	<i>Cotula australis</i>	Common Cotula	Asteraceae	0.1	1		Forb (FG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	0.5	1	*		No		
wahl grac	<i>Wahlenbergia gracilentia</i>	Annual Bluebell	Campanulaceae	0.1	1		Forb (FG)	No		
eleu tris	<i>Eleusine tristachya</i>	Goose Grass	Poaceae	0.1	10	*		No		
verb bona	<i>Verbena bonariensis</i>	Purpletop	Verbenaceae	0.1	1	*		No		
aris vaga	<i>Aristida vagans</i>	Threeawn Speargrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		

hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	10		*		No		
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BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W23	Pic 20x20		Pic 20x50	
Survey date:	25/10/2018	Compass Orientation (head of 20x20 plot)				20	
Recorders	MP BT	PCT:	281 DGL				
GPS Easting	777984	GPS Northing	6408353	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W23							
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)						
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos		
	Tree (TG)	0		5m	2%	2.40%			
	Shrub (SG)	0		15m	3%				
	Forb (FG)	9		25m	2%				
	Grass & grasslike (GG)	7		35m	2%				
	Fern (EG)	0		45m	3%				
	Other (OG)	1	Bare ground cover	5m	15%	18%			
	TOTAL	17		15m	20%				
BAM Attribute (20x20m plot)			25m	10%					
Count of cover abundance (native vascular plants)	Stratum	Sum	35m	20%					
	Tree (TG)	0	45m	23%	Cryptogam cover	5m	0%	0%	
	Shrub (SG)	0	Rock Cover	15m		0%			
	Forb (FG)	4.7		25m		0%			
	Grass & grasslike (GG)	31		35m		0%			
	Fern (EG)	0		45m		0%			
	Other (OG)	0.2	5m	0%	0%				
	TOTAL Native	35.9	15m	0%					
TOTAL 'HTE'	1	25m	0%						
		35m	0%						
			45m	0%					
BAM Attribute (20 x 50m plot) Tree Stem Counts									
DBH (cm)	Euc	Non Euc	Hollows						
>80									
50-79									
30-49									
20-29									
10-19									
5-9									
<5			N/A						
Length of logs (m)									

COMPOSITION & STRUCTURE

Species recorded for W23										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
brom cath	<i>Bromus catharticus</i>	Prairie Grass	Poaceae	0.5		*		No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	25		*		No		
paro bras	<i>Paronychia brasiliiana</i>	Chilean Whitlow Wort	Caryophyllaceae	0.5		*		No		
lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	2		*		No		
aust vert	<i>Austrostipa verticillata</i>	Slender Bamboo Grass	Poaceae	20			Grass & grasslike (GG)	No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	10			Grass & grasslike (GG)	No		
cycl lept	<i>Cyclospermum leptophyllum</i>	Slender Celery	Apiaceae	0.1		*		No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.5			Forb (FG)	No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal)	0.2			Other (OG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.5			Forb (FG)	No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.5		*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal)	10		*		No		
linu	<i>Linum spp.</i>		Linaceae	0.1		*		No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	1		*		No		
medi sati	<i>Medicago sativa</i>	Lucerne	Fabaceae (Fal)	0.1		*		No		
poly avic	<i>Polygonum aviculare</i>	Wireweed	Polygonaceae	0.2		*		No		
boer domi	<i>Boerhavia dominii</i>	Tarvine	Nyctaginaceae	0.1			Forb (FG)	No		
schk pinn abro	<i>Schkuhria pinnata</i> var. <i>a</i>	Dwarf Marigold	Asteraceae	0.1		*		No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal)	2		*		No		
eina nuta	<i>Einadia nutans</i>	Climbing Saltbush	Chenopodiaceae	0.2			Forb (FG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1			Forb (FG)	No		
chon junc	<i>Chondrilla juncea</i>	Skeleton Weed	Asteraceae	0.2		*		No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.1		*		No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	5		*		No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	0.5			Grass & grasslike (GG)	No		
wahl	<i>Wahlenbergia spp.</i>	Bluebell	Campanulaceae	2			Forb (FG)	No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	0.1			Grass & grasslike (GG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	1			Forb (FG)	No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1			Forb (FG)	No		
malv parv	<i>Malva parviflora</i>	Small-flowered Mallow	Malvaceae	0.2		*		No		
aris vaga	<i>Aristida vagans</i>	Threeawn Speargrass	Poaceae	0.2			Grass & grasslike (GG)	No		
erag lept	<i>Eragrostis leptocarpa</i>	Drooping Lovegrass	Poaceae	0.1			Grass & grasslike (GG)	No		
verb bona	<i>Verbena bonariensis</i>	Purpletop	Verbenaceae	0.2		*		No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	0.1			Grass & grasslike (GG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	0.2			Forb (FG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	1		*		HTE		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W28	Pic 20x20		Pic 20x50	
Survey date:	24/10/2018		Compass Orientation (head of 20x20 plot)			255	
Recorders	MP BT		PCT:	281 DGL			
GPS Easting	775475	GPS Northing	6410571		Datum	94	Zone 55
Landform			Soils		Drainage & Slope		
Morphology			Soil Texture			Slope	
LandF Element			Soil Colour			Aspect	
LandF Pattern			Soil Depth			Drainage	
Microrelief			Geology			Watercourses	
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W28					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	2%	1.60%	
	Shrub (SG)	0		15m	2%		
	Forb (FG)	13		25m	1%		
	Grass & grasslike (GG)	7		35m	1%		
	Fern (EG)	0		45m	2%		
	Other (OG)	2	Bare ground cover	5m	5%	17%	
	TOTAL	22		15m	35%		
BAM Attribute (20x20m plot)		25m		10%			
Count of cover abundance (native vascular plants)	Stratum	Sum		35m	30%		
	Tree (TG)	0	45m	5%			
	Shrub (SG)	0	Cryptogam cover	5m	0%	0%	
	Forb (FG)	15.6		15m	0%		
	Grass & grasslike (GG)	18.3		25m	0%		
	Fern (EG)	0		35m	0%		
	Other (OG)	1.1	45m	0%			
	TOTAL Native	35	Rock Cover	5m	0%	0%	
TOTAL 'HTE'	15	15m		0%			
		25m		0%			
		35m		0%			
		45m	0%				
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for	W28
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Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	15		*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	10		*		No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
cirs	<i>Cirsium spp.</i>		Asteraceae	5		*		No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1	10		Forb (FG)	No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	15		*		HTE		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	10			Grass & grasslike (GG)	No		
wahl grac	<i>Wahlenbergia gracilentata</i>	Annual Bluebell	Campanulaceae	0.1	5		Forb (FG)	No		
arth minu	<i>Arthropodium minus</i>	Small Vanilla Lily	Anthericaceae	0.2	10		Forb (FG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	2		Forb (FG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	5		*		No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	1			Grass & grasslike (GG)	No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.3	20	*		No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.1	2		Forb (FG)	No		
plan hisp	<i>Plantago hispida</i>		Plantaginaceae	2			Forb (FG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	10			Forb (FG)	No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	5		*		No		
gera sola	<i>Geranium solanderi</i>	Native Geranium	Geraniaceae	0.1	10		Forb (FG)	No		
swai	<i>Swainsona spp.</i>		Fabaceae (Fal	0.1	5		Forb (FG)	No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	1			Other (OG)	No		
trif camp	<i>Trifolium campestre</i>	Hop Clover	Fabaceae (Fal	1		*		No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	5		*		No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	0.2	5		Forb (FG)	No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.1	2	*		No		
micr stip	<i>Microlaena stipoides</i>	Weeping Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
Elym scab	<i>Elymus scaber</i>	Common Wheatgrass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.1	5	*		No		
petr nant	<i>Petrorhagia nanteuilii</i>	Proliferous Pink	Caryophyllaceae	0.5	10	*		No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	2			Grass & grasslike (GG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	2			Forb (FG)	No		
Glyc clan	<i>Glycine clandestina</i>	Twining glycine	Fabaceae (Fal	0.1	2		Other (OG)	No		
desm gunn	<i>Desmodium gunnii</i>	Slender Tick-trefoil	Fabaceae (Fal	0.1	1		Forb (FG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.5	10		Forb (FG)	No		

BAM Site Field Survey									
Project:	Wollar SF	Plot Identifier	W30	Pic 20x20		Pic 20x50			
Survey date:	23/10/2018	Compass Orientation (head of 20x20 plot)				300			
Recorders	MP and BT	PCT:	281 DGL						
GPS Easting	775122	GPS Northing	6409100		Datum	Gda 94	Zone	55	
Landform			Soils			Drainage & Slope			
Morphology			Soil Texture			Slope			
LandF Element			Soil Colour			Aspect			
LandF Pattern			Soil Depth			Drainage			
Microrelief			Geology			Watercourses			
Plot Disturbance									
	Severity	Age	Observational Evidence						
Clearing									
Cultivation									
Soil erosion									
Firewood									
Grazing									
Fire Damage									
Storm Damage									
Weediness									
Other									
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)									
Additional information									
Current land use									
Age class of trees (DBH range) , Condition of Vegetation, Hollows									
10 - 100cm DBH									
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)									
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)									
Dominant Species outside Plot									

FUNCTION

Function attributes for		W30					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	5%	10.00%	
	Shrub (SG)	0		15m	1%		
	Forb (FG)	8		25m	3%		
	Grass & grasslike (GG)	8		35m	1%		
	Fern (EG)	0		45m	40%		
	Other (OG)	1	Bare ground cover	5m	17%	23%	
	TOTAL	17		15m	14%		
Count of cover abundance (native vascular plants)	Stratum	Sum		25m	35%		
	Tree (TG)	0		35m	38%		
	Shrub (SG)	0	45m	11%			
	Forb (FG)	1.6	Cryptogam cover	5m	0%	0%	
	Grass & grasslike (GG)	12.9		15m	0%		
	Fern (EG)	0		25m	0%		
	Other (OG)	0.5		35m	0%		
	TOTAL Native	15	45m	0%			
	TOTAL 'HTE'	15.2	Rock Cover	5m	0%	0%	
				15m	0%		
		25m		0%			
		35m		0%			
		45m					
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W30										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
xant	<i>Xanthium spp.</i>		Asteraceae	0.1	1	*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	20		*		No		
plan lanc	<i>Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae	1		*		No		
sile	<i>Silene spp.</i>		Caryophyllaceae	0.1	10	*		No		
pani simi	<i>Panicum simile</i>	Two-colour Panic	Poaceae	0.1	5		Grass & grasslike (GG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	15		*		HTE		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	10			Grass & grasslike (GG)	No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	0.5	20		Other (OG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.5	50		Forb (FG)	No		
aust vert	<i>Austrostipa verticillata</i>	Slender Bamboo Grass	Poaceae	0.5	5		Grass & grasslike (GG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	1		*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	0.1	5	*		No		
care inve	<i>Carex inversa</i>	Knob Sedge	Cyperaceae	0.1	5		Grass & grasslike (GG)	No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	5		*		No		
petr nant	<i>Petrorhagia nanteuillii</i>	Proliferous Pink	Caryophyllaceae	0.1	20	*		No		
cycl lept	<i>Cyclospermum leptophyllum</i>	Slender Celery	Apiaceae	0.1	5	*		No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	1		*		No		
arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	1		*		No		
cirs vulg	<i>Cirsium vulgare</i>	Spear Thistle	Asteraceae	1		*		No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.5	20		Forb (FG)	No		
acet vulg	<i>Acetosella vulgaris</i>	Sheep Sorrel	Polygonaceae	0.1	5	*		HTE		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	0.1	1		Forb (FG)	No		
Echi crus	<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	0.5	10	*		No		
junc fili	<i>Juncus filicaulis</i>		Juncaceae	0.1	1		Grass & grasslike (GG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
tara offi	<i>Taraxacum officinale</i>	Dandelion	Asteraceae	0.1	1	*		No		
poly avic	<i>Polygonum aviculare</i>	Wireweed	Polygonaceae	0.1	2	*		No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.1	1		Forb (FG)	No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	0.2	10	*		No		
hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae	0.1	2	*		HTE		
aspe conf	<i>Asperula conferta</i>	Common Woodruff	Rubiaceae	0.1	10		Forb (FG)	No		
euch spha	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		
lepi afri	<i>Lepidium africanum</i>	Common Peppercrest	Brassicaceae	0.1	20	*		No		
ryti caes	<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	0.5	20	*		No		
aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	1	10		Grass & grasslike (GG)	No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	1	5		Grass & grasslike (GG)	No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.5	50	*		No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	0.5	50	*		No		

wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulace	0.1	2		Forb (FG)	No		
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BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W24	Pic 20x20		Pic 20x50	
Survey date:	24/10/2018	Compass Orientation (head of 20x20 plot)				120	
Recorders		PCT:	Exotic				
GPS Easting	775725	GPS Northing	6410100	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W24					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	10%	4.00%	
	Shrub (SG)	0		15m	3%		
	Forb (FG)	3		25m	2%		
	Grass & grasslike (GG)	1		35m	3%		
	Fern (EG)	0		45m	2%		
	Other (OG)	0		Bare ground cover	5m	5%	45%
	TOTAL	4	15m		55%		
BAM Attribute (20x20m plot)			25m	50%			
Count of cover abundance (native vascular plants)	Stratum	Sum	35m	55%			
	Tree (TG)	0	Cryptogam cover	45m	60%	0%	
	Shrub (SG)	0		5m	0%		
	Forb (FG)	0.3		15m	0%		
	Grass & grasslike (GG)	0.5		25m	0%		
	Fern (EG)	0	35m	0%			
	Other (OG)	0	45m	0%			
	TOTAL Native	0.8	Rock Cover	5m	0%	0%	
	TOTAL 'HTE'	0.1		15m	0%		
			25m	0%			
			35m	0%			
			45m	0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W24										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
aven fatu	<i>Avena fatua</i>	Wild Oats	Poaceae	50		*		No		
loli pere	<i>Lolium perenne</i>	Perennial Ryegrass	Poaceae	20		*		No		
cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae	0.5	10		Grass & grasslike (GG)	No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	1		*		No		
brom cath	<i>Bromus catharticus</i>	Prairie Grass	Poaceae	0.5	20	*		No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	10		*		No		
petr nant	<i>Petrorhagia nanteuilii</i>	Proliferous Pink	Caryophyllaceae	0.1	5	*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.5	10	*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.1	1		Forb (FG)	No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	0.1	5	*		No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.2	20	*		No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.1	5	*		No		
eina hast	<i>Einadia hastata</i>	Berry Saltbush	Chenopodiaceae	0.1	1		Forb (FG)	No		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	0.1	2		Forb (FG)	No		
onop	<i>Onopordum spp.</i>		Asteraceae	0.1	1	*		No		
uroc pani	<i>Urochloa panicoides</i>	Urochloa Grass	Poaceae	0.1	5	*		No		
bras	<i>Brassica spp.</i>	Brassica	Brassicaceae	0.1	5	*		No		
eleu tris	<i>Eleusine tristachya</i>	Goose Grass	Poaceae	0.1	5	*		No		
poa annu	<i>Poa annua</i>	Winter Grass	Poaceae	0.1	1	*		No		
plan lanc	<i>Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae	0.1	10	*		No		
xant spin	<i>Xanthium spinosum</i>	Bathurst Burr	Asteraceae	0.1	1	*		HTE		

BAM Site Field Survey									
Project:	Wollar SF	Plot Identifier	W25	Pic 20x20		Pic 20x50			
Survey date:	23/10/2018	Compass Orientation (head of 20x20 plot)				290			
Recorders	MP BT	PCT:	1610 low						
GPS Easting	775756	GPS Northing	6408327		Datum	94	Zone	55	
Landform			Soils			Drainage & Slope			
Morphology			Soil Texture			Slope			
LandF Element			Soil Colour			Aspect			
LandF Pattern			Soil Depth			Drainage			
Microrelief			Geology			Watercourses			
Plot Disturbance									
	Severity	Age	Observational Evidence						
Clearing									
Cultivation									
Soil erosion									
Firewood									
Grazing									
Fire Damage									
Storm Damage									
Weediness									
Other									
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)									
Additional information									
Current land use									
Age class of trees (DBH range) , Condition of Vegetation, Hollows									
10 - 100cm DBH									
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)									
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)									
Dominant Species outside Plot									

FUNCTION

Function attributes for		W25					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	1%	2.40%	
	Shrub (SG)	0		15m	5%		
	Forb (FG)	6		25m	1%		
	Grass & grasslike (GG)	3		35m	4%		
	Fern (EG)	1		45m	1%		
	Other (OG)	2	Bare ground cover	5m	13%	15%	
	TOTAL	12		15m	35%		
Count of cover abundance (native vascular plants)	Stratum	Sum		25m	12%		
	Tree (TG)	0		35m	9%		
	Shrub (SG)	0	45m	7%			
	Forb (FG)	2.6	Cryptogam cover	5m	2%	2%	
	Grass & grasslike (GG)	6.1		15m	2%		
	Fern (EG)	0.5		25m	2%		
	Other (OG)	0.3		35m	3%		
	TOTAL Native	9.5	45m	2%			
	TOTAL 'HTE'	20	Rock Cover	5m	1%	1%	
				15m	4%		
		25m		0%			
		35m		0%			
			45m	2%			

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for W25										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
pter muti	<i>Pterostylis mutica</i>	Midget Greenhood	Orchidaceae	0.5	20		Forb (FG)	No		P
hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae	10		*		HTE		
wahl comm	<i>Wahlenbergia communis</i>	Tufted Bluebell	Campanulaceae	0.2	10		Forb (FG)	No		
schk pinn abro	<i>Schkuhria pinnata</i> var. <i>a</i>	Dwarf Marigold	Asteraceae	0.5	50	*		No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.2	10		Forb (FG)	No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	1			Grass & grasslike (GG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	5		*		No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	1		*		No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	5		*		No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	10		*		HTE		
cham drum	<i>Chamaesyce drummondii</i>	Caustic Weed	Euphorbiaceae	1			Forb (FG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	5		*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	1		*		No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	0.2	10		Forb (FG)	No		
chei sieb	<i>Cheilanthes sieberi</i>	Rock Fern	Pteridaceae	0.5	30		Fern (EG)	No		
sile	<i>Silene spp.</i>		Caryophyllaceae	0.2	50	*		No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
poly avic	<i>Polygonum aviculare</i>	Wireweed	Polygonaceae	0.5	20	*		No		
glyc clan	<i>Glycine clandestina</i>	Twining glycine	Fabaceae (Fal	0.1	1		Other (OG)	No		
echi crus	<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	1		*		No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.5	20		Forb (FG)	No		
hord lepo	<i>Hordeum leporinum</i>	Barley Grass	Poaceae	1		*		No		
UNK forb	#N/A	#N/A	#N/A	0.1	1	#N/A		FALSE	#N/A	#N/A
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	0.2	10		Other (OG)	No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W27	Pic 20x20		Pic 20x50	
Survey date:	22/10/2018	Compass Orientation (head of 20x20 plot)				89	
Recorders	MP BT	PCT:	1610 Low				
GPS Easting	776121	GPS Northing	6408177	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W27					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	2%	3.20%	
	Shrub (SG)	0		15m	2%		
	Forb (FG)	6		25m	4%		
	Grass & grasslike (GG)	8		35m	3%		
	Fern (EG)	0		45m	5%		
	Other (OG)	0					
	TOTAL	14					
BAM Attribute (20x20m plot)			Bare ground cover	5m	3%	10%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	2%		
	Tree (TG)	0		25m	4%		
	Shrub (SG)	0		35m	25%		
	Forb (FG)	1.9	45m	17%			
	Grass & grasslike (GG)	12.6	Cryptogam cover	5m	0%	0%	
	Fern (EG)	0		15m	0%		
	Other (OG)	0		25m	0%		
	TOTAL Native	14.5		35m	0%		
	TOTAL 'HTE'	10.1	Rock Cover	45m	0%	1%	
				5m	1%		
				15m	3%		
				25m	3%		
			35m	0%			
			45m	0%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W27										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	10		*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	10		*		No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.5	20	*		No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	10			Grass & grasslike (GG)	No		
aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	2			Grass & grasslike (GG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	1			Forb (FG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	10		*		HTE		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	5		*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	1		*		No		
care inve	<i>Carex inversa</i>	Knob Sedge	Cyperaceae	0.1	10		Grass & grasslike (GG)	No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.1	1		Forb (FG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	0.5	50	*		No		
petr nant	<i>Petrorhagia nanteuillii</i>	Proliferous Pink	Caryophyllaceae	0.2	50	*		No		
cent meli	<i>Centaurea melitensis</i>	Maltese Cockspur	Asteraceae	0.1	10	*		No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.1	10		Forb (FG)	No		
salv verb	<i>Salvia verbenaca</i>	Vervain	Lamiaceae	1		*		No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.5	50		Forb (FG)	No		
malv parv	<i>Malva parviflora</i>	Small-flowered Mallow	Malvaceae	0.1	5	*		No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	0.1	5		Forb (FG)	No		
briz mino	<i>Briza minor</i>	Shivery Grass	Poaceae	0.1	1	*		No		
tara offi	<i>Taraxacum officinale</i>	Dandelion	Asteraceae	0.1	5	*		No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
arct cale	<i>Arctotheca calendula</i>	Capeweed	Asteraceae	0.1	2	*		No		
sile	<i>Silene spp.</i>		Caryophyllaceae	0.5	100	*		No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
ryti race	<i>Rytidosperma racemosum</i>	Wallaby Grass	Poaceae	0.1	20		Grass & grasslike (GG)	No		
erag alve	<i>Eragrostis alveiformis</i>		Poaceae	0.1	2		Grass & grasslike (GG)	No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	0.1	20	*		No		
cycl lept	<i>Cyclospermum leptophyllum</i>	Slender Celery	Apiaceae	0.1	5	*		No		
cyno dact	<i>Cynodon dactylon</i>	Common Couch	Poaceae	0.1	2		Grass & grasslike (GG)	No		
hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae	0.1	1	*		HTE		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W31	Pic 20x20		Pic 20x50	
Survey date:	22/10/2016	Compass Orientation (head of 20x20 plot)				ON	
Recorders	MP BT	PCT:	1610 Low				
GPS Easting	775979	GPS Northing	6408008	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W31					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	1%	2.00%	
	Shrub (SG)	0		15m	2%		
	Forb (FG)	11		25m	2%		
	Grass & grasslike (GG)	4		35m	3%		
	Fern (EG)	1		45m	2%		
	Other (OG)	0					
	TOTAL	16					
BAM Attribute (20x20m plot)			Bare ground cover	5m	2%	2%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	3%		
	Tree (TG)	0		25m	1%		
	Shrub (SG)	0		35m	4%		
	Forb (FG)	6.6	45m	2%			
	Grass & grasslike (GG)	5.4	Cryptogam cover	5m	0%	0%	
	Fern (EG)	0.1		15m	0%		
	Other (OG)	0		25m	0%		
	TOTAL Native	12.1		35m	0%		
TOTAL 'HTE'	5	Rock Cover	45m	0%	2%		
			5m	7%			
			15m	1%			
			25m	3%			
			35m	0%			
			45m	1%			
BAM Attribute (20 x 50m plot) Tree Stem Counts							
DBH (cm)	Euc	Non Euc	Hollows				
>80							
50-79							
30-49							
20-29							
10-19							
5-9							
<5			N/A				
Length of logs (m)							

COMPOSITION & STRUCTURE

Species recorded for W31										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	20		*		No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	10		*		No		
petr nant	<i>Petrorhagia nanteuilii</i>	Proliferous Pink	Caryophyllace	1		*		No		
briz mino	<i>Briza minor</i>	Shivery Grass	Poaceae	0.1	5	*		No		
paro bras	<i>Paronychia brasiliiana</i>	Chilean Whitlow Wor	Caryophyllace	0.2	20	*		No		
care inve	<i>Carex inversa</i>	Knob Sedge	Cyperaceae	0.2	20		Grass & grasslike (GG)	No		
salv verb	<i>Salvia verbenaca</i>	Vervain	Lamiaceae	0.2	20	*		No		
sile	<i>Silene spp.</i>		Caryophyllace	10		*		No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	5			Forb (FG)	No		
chon junc	<i>Chondrilla juncea</i>	Skeleton Weed	Asteraceae	0.1	2	*		No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.1	5		Forb (FG)	No		
rost pumi	<i>Rostraria pumila</i>	Roughtail	Poaceae	1	20	*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clove	Fabaceae (Fal	0.5	50	*		No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.5	10	*		No		
cirs	<i>Cirsium spp.</i>		Asteraceae	0.2	20	*		No		
acae ovin	<i>Acaena ovina</i>	Acaena	Rosaceae	0.1	5		Forb (FG)	No		
chei sieb	<i>Cheilanthes sieberi</i>	Rock Fern	Pteridaceae	0.1	2		Fern (EG)	No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
eina poly	<i>Einadia polygonoides</i>	Knotweed Goosefoot	Chenopodiace	0.2	5		Forb (FG)	No		
eina nuta	<i>Einadia nutans</i>	Climbing Saltbush	Chenopodiace	0.1	1		Forb (FG)	No		
dysp pumi	<i>Dysphania pumilio</i>	Small Crumbweed	Chenopodiace	0.5			Forb (FG)	No		
trif camp	<i>Trifolium campestre</i>	Hop Clover	Fabaceae (Fal	1		*		No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulace	0.1	10		Forb (FG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.1	1		Forb (FG)	No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	2		Forb (FG)	No		
trif subt	<i>Trifolium subterraneum</i>	Subterranean Clover	Fabaceae (Fal	5		*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	5		*		No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	5		*		HTE		
cotu aust	<i>Cotula australis</i>	Common Cotula	Asteraceae	0.1	2		Forb (FG)	No		
malv parv	<i>Malva parviflora</i>	Small-flowered Mallo	Malvaceae	0.1	2	*		No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	15		*		No		
tara offi	<i>Taraxacum officinale</i>	Dandelion	Asteraceae	0.1	5	*		No		
verb	<i>Verbascum spp.</i>		Scrophulariac	0.1	1	*		No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulace	0.2	100		Forb (FG)	No		
aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	0.1	2		Grass & grasslike (GG)	No		

BAM Site Field Survey							
Project:	Wollar SF	Plot Identifier	W32	Pic 20x20		Pic 20x50	
Survey date:	24/10/2018	Compass Orientation (head of 20x20 plot)				15	
Recorders	MP BT	PCT:	1610 low				
GPS Easting	776521	GPS Northing	6407941	Datum	94	Zone	55
Landform		Soils		Drainage & Slope			
Morphology		Soil Texture		Slope			
LandF Element		Soil Colour		Aspect			
LandF Pattern		Soil Depth		Drainage			
Microrelief		Geology		Watercourses			
Plot Disturbance							
	Severity	Age	Observational Evidence				
Clearing							
Cultivation							
Soil erosion							
Firewood							
Grazing							
Fire Damage							
Storm Damage							
Weediness							
Other							
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)							
Additional information							
Current land use							
Age class of trees (DBH range) , Condition of Vegetation, Hollows							
10 - 100cm DBH							
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)							
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)							
Dominant Species outside Plot							

FUNCTION

Function attributes for		W32					
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)				
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos
	Tree (TG)	0		5m	3%	8.40%	
	Shrub (SG)	0		15m	6%		
	Forb (FG)	11		25m	8%		
				35m	13%		
	Grass & grasslike (GG)	4		45m	12%		
	Fern (EG)	1					
	Other (OG)	1					
TOTAL	17						
BAM Attribute (20x20m plot)			Bare ground cover	5m	9%	10%	
Count of cover abundance (native vascular plants)	Stratum	Sum		15m	8%		
	Tree (TG)	0		25m	16%		
	Shrub (SG)	0		35m	9%		
	Forb (FG)	1.8	45m	7%			
			Cryptogam cover	5m	2%	1%	
	Grass & grasslike (GG)	0.9		15m	0%		
	Fern (EG)	0.1		25m	1%		
	Other (OG)	0.2		35m	1%		
TOTAL Native	3	45m	0%				
TOTAL 'HTE'	80	Rock Cover	5m	1%	1%		
			15m	0%			
			25m	2%			
			35m	1%			
			45m	3%			

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for W32										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	60		*		HTE		
hype perf	<i>Hypericum perforatum</i>	St. Johns Wort	Clusiaceae	20		*		HTE		
arth minu	<i>Arthropodium minus</i>	Small Vanilla Lily	Anthericaceae	0.1	2		Forb (FG)	No		
trif arve	<i>Trifolium arvense</i>	Haresfoot Clover	Fabaceae (Fal	5		*		No		
trif dubi	<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae (Fal	2		*		No		
swai gale	<i>Swainsona galegifolia</i>	Smooth Darling Pea	Fabaceae (Fal	0.2	5		Forb (FG)	No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.1	5		Forb (FG)	No		
ryti race	<i>Rytidosperma racemosu</i>	Wallaby Grass	Poaceae	0.2	5			No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.2	10		Forb (FG)	No		
euch spba	<i>Euchiton sphaericus</i>	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		
erod cicu	<i>Erodium cicutarium</i>	Common Crowfoot	Geraniaceae	0.1	5	*		No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	0.5	20	*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.5	50		Forb (FG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	0.1	5		Forb (FG)	No		
brom hord	<i>Bromus hordeaceus</i>	Soft Brome	Poaceae	1		*		No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.1	10	*		No		
salv verb	<i>Salvia verbenaca</i>	Vervain	Lamiaceae	0.1	20	*		No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	0.2	5		Other (OG)	No		
linu	<i>Linum spp.</i>		Linaceae	0.1	20	*		No		
hypo radi	<i>Hypochaeris radicata</i>	Catsear	Asteraceae	0.2	20	*		No		
sile	<i>Silene spp.</i>		Caryophyllaceae	0.1	1	*		No		
desm gunn	<i>Desmodium gunnii</i>	Slender Tick-trefoil	Fabaceae (Fal	0.1	5		Forb (FG)	No		
elym scab	<i>Elymus scaber</i>	Common Wheatgrass	Poaceae	0.1	2		Grass & grasslike (GG)	No		
cymb laws	<i>Cymbonotus lawsonianu</i>	Bear's Ear	Asteraceae	0.1	2		Forb (FG)	No		
loma mult mult	<i>Lomandra multiflora sub</i>	Many-flowered Mat-l	Lomandraceae	0.1	1		Grass & grasslike (GG)	No		
medi sati	<i>Medicago sativa</i>	Lucerne	Fabaceae (Fal	0.1	2	*		No		
rume brow	<i>Rumex brownii</i>	Swamp Dock	Polygonaceae	0.1	5		Forb (FG)	No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	0.2	20		Grass & grasslike (GG)	No		
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	0.2	5		Forb (FG)	No		
chei sieb	<i>Cheilanthes sieberi</i>	Rock Fern	Pteridaceae	0.1	5		Fern (EG)	No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Gra	Poaceae	0.5	50		Grass & grasslike (GG)	No		

BAM Site Field Survey									
Project:	Wollar SF	Plot Identifier	W26	Pic 20x20		Pic 20x50			
Survey date:	23/10/2016	Compass Orientation (head of 20x20 plot)					10		
Recorders	MP BT	PCT:	1610 good						
GPS Easting	775228	GPS Northing	6408435		Datum	94	Zone	55	
Landform			Soils			Drainage & Slope			
Morphology			Soil Texture			Slope			
LandF Element			Soil Colour			Aspect			
LandF Pattern			Soil Depth			Drainage			
Microrelief			Geology			Watercourses			
Plot Disturbance									
	Severity	Age	Observational Evidence						
Clearing									
Cultivation									
Soil erosion									
Firewood									
Grazing									
Fire Damage									
Storm Damage									
Weediness									
Other									
Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)									
Additional information									
Current land use									
Age class of trees (DBH range) , Condition of Vegetation, Hollows									
10 - 100cm DBH									
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)									
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)									
Dominant Species outside Plot									

FUNCTION

Function attributes for		W26							
BAM Attribute (20x20m plot)			BAM Attributes (1 x 1m Plots)						
Count of Native Richness	Stratum	Sum	Litter Cover	Tape length	% cover	Average %	Photos		
	Tree (TG)	0		5m	1%	1.20%			
	Shrub (SG)	3		15m	1%				
	Forb (FG)	13		25m	1%				
	Grass & grasslike (GG)	10		35m	1%				
	Fern (EG)	1		45m	2%				
	Other (OG)	3	Bare ground cover	5m	50%	42%			
	TOTAL	30		15m	30%				
BAM Attribute (20x20m plot)			25m	70%					
Count of cover abundance (native vascular plants)	Stratum	Sum	35m	40%					
	Tree (TG)	0	45m	20%	Cryptogam cover	5m	0%	0%	
	Shrub (SG)	15.6				15m	0%		
	Forb (FG)	22.9				25m	0%		
	Grass & grasslike (GG)	18.5				35m	0%		
	Fern (EG)	1				45m	0%		
	Other (OG)	1.3	Rock Cover	5m	1%	1%			
	TOTAL Native	59.3		15m	2%				
	TOTAL 'HTE'	10		25m	1%				
			35m	1%					
			45m	1%					
BAM Attribute (20 x 50m plot) Tree Stem Counts									
DBH (cm)	Euc	Non Euc	Hollows						
>80									
50-79									
30-49									
20-29									
10-19									
5-9		10							
<5		5	N/A						
Length of logs (m)									

COMPOSITION & STRUCTURE

Species recorded for W26										
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
sida corr	<i>Sida corrugata</i>	Corrugated Sida	Malvaceae	5			Forb (FG)	No		
zorn dyct dyct	<i>Zornia dyctiocarpa</i> var. <i>a</i>	Zornia	Fabaceae (Fal	1			Forb (FG)	No		
desm vari	<i>Desmodium varians</i>	Slender Tick-trefoil	Fabaceae (Fal	0.2	10		Other (OG)	No		
chlo trun	<i>Chloris truncata</i>	Windmill Grass	Poaceae	0.5	20		Grass & grasslike (GG)	No		
both macr	<i>Bothriochloa macra</i>	Red Grass	Poaceae	10			Grass & grasslike (GG)	No		
calo lapp	<i>Calotis lappulacea</i>	Yellow Burr-daisy	Asteraceae	5			Forb (FG)	No		
vitt cune	<i>Vittadinia cuneata</i>	A Fuzzweed	Asteraceae	10			Forb (FG)	No		
chei sieb	<i>Cheilanthes sieberi</i>	Rock Fern	Pteridaceae	1			Fern (EG)	No		
wahl stri	<i>Wahlenbergia stricta</i>	Tall Bluebell	Campanulaceae	0.5	20		Forb (FG)	No		
dich repe	<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	0.5	100		Forb (FG)	No		
acac ixio	<i>Acacia ixiophylla</i>		Fabaceae (Mi	15			Shrub (SG)	FALSE		
aris ramo	<i>Aristida ramosa</i>	Purple Wiregrass	Poaceae	1			Grass & grasslike (GG)	No		
aris pers	<i>Aristida personata</i>		Poaceae	0.1	2		Grass & grasslike (GG)	No		
gono tetr	<i>Gonocarpus tetragynus</i>	Poverty Raspwort	Haloragaceae	0.1	5		Forb (FG)	No		
ryti tenu	<i>Rytidosperma tenuius</i>	A Wallaby Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
loma fili	<i>Lomandra filiformis</i>	Wattle Matt-rush	Lomandraceae	0.2	10		Grass & grasslike (GG)	No		
trif glom	<i>Trifolium glomeratum</i>	Clustered Clover	Fabaceae (Fal	0.5	10	*		No		
lysi arve	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Myrsinaceae	1		*		No		
conv erub	<i>Convolvulus erubescens</i>	Pink Bindweed	Convolvulaceae	1	1		Other (OG)	No		
cart lana	<i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae	10		*		HTE		
ryti race	<i>Rytidosperma racemosu</i>	Wallaby Grass	Poaceae	0.5	20		Grass & grasslike (GG)	No		
glyc clan	<i>Glycine clandestina</i>	Twining glycine	Fabaceae (Fal	0.1	5		Other (OG)	No		
schk pinn abro	<i>Schkuhria pinnata</i> var. <i>a</i>	Dwarf Marigold	Asteraceae	0.5	50	*		No		
micr stip	<i>Microlaena stipoides</i>	Weeping Grass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
pter muti	<i>Pterostylis mutica</i>	Midget Greenhood	Orchidaceae	0.1	2		Forb (FG)	No		P
aspe conf	<i>Asperula conferta</i>	Common Woodruff	Rubiaceae	0.1	50		Forb (FG)	No		
burs spin	<i>Bursaria spinosa</i>	Native Blackthorn	Pittosporaceae	0.1	1		Shrub (SG)	No		
echi crus	<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	1		*		No		
sile	<i>Silene spp.</i>		Caryophyllaceae	0.2	50	*		No		
spor creb	<i>Sporobolus creber</i>	Slender Rat's Tail Gra	Poaceae	1			Grass & grasslike (GG)	No		
petr nant	<i>Petrorhagia nanteuillii</i>	Proliferous Pink	Caryophyllaceae	0.1	1	*		No		
oxal pere	<i>Oxalis perennans</i>		Oxalidaceae	0.1	5		Forb (FG)	No		
good pinn	<i>Goodenia pinnatifida</i>	Scrambles Eggs	Goodeniaceae	0.2	20		Forb (FG)	No		
eina poly	<i>Einadia polygonoides</i>	Knotweed Goosefoot	Chenopodiaceae	0.2	10		Forb (FG)	No		
aust scab	<i>Austrostipa scabra</i>	Speargrass	Poaceae	5			Grass & grasslike (GG)	No		
plan hisp	<i>Plantago hispida</i>		Plantaginaceae	0.1	1		Forb (FG)	No		
modi caro	<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	0.5	10	*		No		
davi geni	<i>Daviesia genistifolia</i>	Broom Bitter Pea	Fabaceae (Fal	0.5	2		Shrub (SG)	No		
UNK Forb	#N/A	#N/A	#N/A	0.5		#N/A		FALSE	#N/A	#N/A

poly avic	<i>Polygonum aviculare</i>	Wireweed	Polygonaceae	0.2	50	*		No		
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A.2 FAUNA SPECIES LIST

August Survey

Scientific name	Common name	BC Act	EPBC Act	Nocturnal Survey				Diurnal Survey			Opportunistic
				FS 1	FS 2	FS 3	FS 7	FS 4	FS 5	FS 6	
BIRDS											
<i>Acanthiza nana</i>	Yellow Thornbill					x					x
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill					x		x			x
<i>Aegotheles cristatus</i>	Owlet Nightjar				x						
<i>Anthus novaeseelandiae</i>	Australian Pipit					x					x
<i>Aquila audax</i>	Wedge-tailed Eagle					x				x	x
<i>Artamus cyanopterus</i>	Dusky Woodswallow	V						x		x	
<i>Cacatua sanguinea</i>	Corella					x		x	x		x
<i>Chenonetta jubata</i>	Australia Woodduck					x					x
<i>Cheramoeca leucosterna</i>	White-backed Swallow					x				x	x
<i>Climacteris picumnus</i>	Brown Treecreeper	V								x	
<i>Colluricincla harmonica</i>	Grey-shrike Thrush					x				x	x
<i>Corcorax melanorhamphos</i>	White-winged Chough					x			x		x
<i>Corvus coronoides</i>	Australian Raven					x					x
<i>Cracticus nigrogularis</i>	Pied Butcherbird					x					x
<i>Cracticus-tibicen</i>	Australian Magpie					x		x			x
<i>Dacelo novaeguineae</i>	Kookaburra					x					x

<i>Elanus axillaris</i>	Black-shouldered Kite					X					X
<i>Eolophus roseicapilla</i>	Galah							X			
<i>Eopsaltria australis</i>	Eastern Yellow Robin					X				X	X
<i>Falco cenchroides</i>	Australian Kestrel					X		X			X
<i>Grallina cyanoleuca</i>	Magpie Lark					X		X		X	X
<i>Hirundo neoxena</i>	Welcome Swallow					X		X			X
<i>Lichenostomus melanops</i>	Yellow-tufted Honeyeater									X	
<i>Malurus cyaneus</i>	Superb Fairy Wren					X		X	X	X	X
<i>Manorina melanocephala</i>	Noisy Miner					X			X		X
<i>Microeca fascians</i>	Jacky Winter					X		X	X	X	X
<i>Mirafra javanica</i>	Horsfields Bushlark					X					X
<i>Neochmia temporalis</i>	Red-browed Finch					X				X	X
<i>Nesoptilotis leucotis</i>	White-eared Honeyeater									X	
<i>Ocyphaps lophotes</i>	Crested Pigeon					X			X		X
<i>Pardalotus punctatus</i>	Spotted Pardalote					X		X	X	X	X
<i>Platycercus elegans</i>	Crimson Rosella					X			X		X
<i>Platycercus eximius</i>	Eastern Rosella							X	X		
<i>Podargus strigoides</i>	Tawny Frogmouth					X					X
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	V								X	
<i>Psephotus haematonotus</i>	Red-rumped Parrot					X		X	X		X
<i>Ptilotula fusca</i>	Fuscous Honeyeater					X					X
<i>Pyrrholaemus sagittatus</i>	Speckled Warbler	V								X	
<i>Rhipidura albiscapa</i>	Grey Fantail					X		X			X

<i>Rhipidura leucophrys</i>	Willie Wagtail					x				x	x
<i>Stagonopleura guttata</i>	Diamond Firetail	V							x	x	
<i>Strepera graculina</i>	Currawong					x			x		x
<i>Sturnus vulgaris</i>	Starling*					x					x
<i>Tyto alba</i>	Barn Owl					x					x
MACROPODS											
<i>Macropus giganteus</i>	Eastern Grey Kangaroo				x	x					
<i>Vombatus ursinus</i>	Common Wombat			x			x				
<i>Macropus robustus</i>	Wallaroo				x	x					
<i>Macropus refogriseus</i>	Red-necked Wallaby				x	x					

APPENDIX B EPBC REQUIREMENTS



Planning &
Environment

Planning Services
Resource & Energy Assessments
Contact: Anthony Ko
Phone: (02) 8217 2022
Email: anthony.ko@planning.nsw.gov.au

Rhyson Li
Wollar Solar Development Pty Ltd
52 Dalton Road
ST IVES NSW 2075

Dear Mr Li

**Wollar Solar (SSD 9254)
Supplement to Environmental Assessment Requirements**

I refer to the Secretary's Environmental Assessment Requirements (SEARs) issued for the Springdale Solar project on 3 October 2018.

As you are aware, the project was determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 1 May 2018, for likely impacts on listed threatened species and communities. Therefore, in accordance with Schedule 2, clause 3(5) of the *NSW Environmental Planning & Assessment Regulation 2000*, I have enclosed the Commonwealth's requirements for the assessment.

I can also confirm that the administrative procedures in relation to the accredited assessment process will apply to the assessment of this project under the EPBC Act, so that the Department can undertake an environmental impact assessment of the project to satisfy the requirements of both NSW and Commonwealth legislation.

You must ensure that the Environmental Impact Statement adequately addresses the SEARs issued on 3 October 2018, and the supplementary requirements attached to this letter.

If you have any enquiries about these requirements, please do not hesitate to contact Anthony Ko on the above contact details.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'C. Preshaw'.

1/11/18

Clay Preshaw
Director
Resource & Energy Assessments
as nominee of the Secretary

Department of Planning and Environment
320 Pitt Street Sydney NSW 2000 | GPO Box 39 Sydney NSW 2001 | planning.nsw.gov.au

Guidelines for preparing Assessment Documentation relevant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

Wollar Solar Farm (EPBC 2018/8258; SSD 9254)

1. On 3 October 2018, the proposed Wollar Solar Farm was determined to be a controlled action for impacts on the following matter of national environmental significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):
 - ☐ **threatened species and communities (sections 18 and 18A)**
2. The project will be assessed by NSW under an accredited assessment in accordance with section 87 of the EPBC Act. These requirements are a supplement to the NSW Secretary's Environmental Assessment Requirements (SEARs) issued on 4 May 2018 and should be addressed in conjunction with those requirements.
3. Assessment documentation prepared for the purposes of approval under the EPBC Act must address the statutory requirements outlined in Schedule 4 of the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) (EPBC Regulations). Proponents are advised to check these requirements have been appropriately addressed:
http://www.austlii.edu.au/au/legis/cth/consol_reg/epabcr2000697/.
4. The requirements are intended to ensure MNES are sufficiently addressed in the EIS such that the Commonwealth decision-maker can make a determination on whether or not to approve the action.
5. The EIS must include an assessment of **all** protected matters that may be impacted by the proposed action under the controlling provision identified in paragraph 1, noting that:
 - ☐ Protected matters that the Department considers are likely to be significantly impacted by the proposed action are listed at Attachment A.
 - ☐ This list is not exhaustive and it is the proponent's responsibility to ensure any relevant protected matters under this controlling provision are adequately assessed for the Commonwealth decision-maker's consideration.

Project Description

6. The title of the action, background to the development and current status.
7. The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on MNES.
8. How the action relates to any other actions that have been, or are being taken, in the region affected by the action.

Identification of threatened species and communities

9. The EIS must identify **each** EPBC Act-listed species and community likely to be significantly impacted by the proposed action and provide evidence as to why other EPBC Act-listed species and communities likely to be located in the project area or in the vicinity are unlikely to be impacted.
10. For **each** of the relevant EPBC Act-listed species and communities likely to be impacted, the EIS must provide:
 - ☐ A description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and

- details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Commonwealth guidelines and policy statements.

Note: the relevant guidelines and policy statements for each species and community are available from the Department of the Environment and Energy's Species Profiles and Threats Database.

<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Impacts

11. The EIS must include a comprehensive assessment of impacts on any relevant EPBC Act-listed species and communities. The assessment must address the nature, geographic extent, magnitude, timing and duration of any likely direct, indirect and consequential impacts. The description of impacts must have regard to the full national extent of the species or community's range (i.e. not just NSW).

Avoidance and mitigation

12. For each of the EPBC Act-listed species and communities that are likely to be impacted by the development, the EIS must provide information on proposed avoidance and mitigation measures to deal with the impacts of the action, and a description of the predicted effectiveness and outcomes that the avoidance and mitigation measures will achieve.

Offsets

13. Where a significant residual adverse impact to EPBC Act-listed species or communities is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy, how offsets will be secured, and timing of protection.

Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action i.e. 'like for like'.

14. For each EPBC Act-listed species and community likely to be significantly impacted by the action, the EIS must provide reference to, and consideration of, relevant approved conservation advice or recovery plan for the species or community.

Note: the relevant guidelines and policy statements for each species and community are available from the Department of the Environment Species Profiles and Threats Database.

<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Environmental Record of person proposing to take the action

15. Information in relation to the environmental record of a person proposing to take action must include details as prescribed in Schedule 4 Clause 6 of the EPBC Regulations 2000.

Information Sources

16. For information given in the EIS, the EIS must state the source of the information, how recent the information is, how the reliability of the information was tested; and what uncertainties (if any) are in the information.

The Department's Environment Reporting Tool (ERT) identifies threatened species and communities that may occur within 5 km of the proposed action. Based on the information in the referral documentation, the location of the action, species records and likely habitat present in the area, there are likely to be significant impacts to:

- White box- yellow box- Blakely's red gum grassy woodland and derived native grassland (Box Gum Woodland) – Critically endangered

In addition, there is some risk that there may be significant impacts on the following matters and levels of impact should be further investigated.

- *Tylophora linearis* – Endangered
- *Commersonia procumbens* – Vulnerable
- *Prostanthera discolor* – Vulnerable
- Mount Vincent Mintbrush - *Prostanthera stricta* – Vulnerable
- Bluegrass (*Dichanthium setosum*) - Vulnerable
- *Euphrasia arguta* – Critically endangered
- *Homoranthus darwinioides* – Vulnerable
- Hoary Sunray, Grassland Paper-daisy (*Leucochrysum albicans* var. *tricolor*) – Endangered
- *Ozothamnus tessellatus* – Vulnerable
- *Philothea ericifolia* – Vulnerable
- A Leek Orchid (*Prasophyllum* sp. *Wybong*) – Critically endangered
- Austral Toadflax (*Thesium australe*) – Vulnerable
- Small Purple-pea (*Swainsona recta*) – Endangered
- Regent Honeyeater (*Anthochaera Phrygia*) – Critically Endangered
- Painted Honeyeater (*Grantiella picta*) – Vulnerable
- Malleefowl (*Leipoa ocellata*) – Vulnerable
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable
- Striped Legless Lizard (*Delma impar*) – Vulnerable
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable
- Swift Parrot (*Lathamus discolor*) – Critically endangered
- Koala (*Phascolarctos cinereus*) – Vulnerable
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – Vulnerable
- Pink Tailed Worm Lizard (*Aprasia parapulchella*) - Vulnerable

Checklist of Supplementary SEARs, demonstrating where each matter has been addressed.

Requirement	Addressed:
<p>Assessment documentation prepared for the purposes of approval under the EPBC Act must address the statutory requirements outlined in Schedule 4 of the <i>Environment Protection and Biodiversity Conservation Regulations 2000</i> (Cth) (EPBC Regulations).</p>	<p>Consultation with DoEE occurred on 13 June 2018 regarding the requirement for lodgement of an EPBC referral.</p> <p>Specific matters required by Schedule 4 were included in the EPBC referral which was publicly exhibited: EPBC 2018/SSD 9254.</p> <p>On October 3, the project was deemed a controlled action.</p>
<p>The EIS must include an assessment of all protected matters that may be impacted by the proposed action under the controlling provision identified in paragraph 1, noting that:</p> <ul style="list-style-type: none"> Protected matters that the Department considers are likely to be significantly impacted by the proposed action are listed at Attachment A. This list is not exhaustive and it is the proponent's responsibility to ensure any relevant protected matters under this controlling provision are adequately assessed for the Commonwealth decision-maker's consideration. 	<p>Protected matters are addressed in the BDAR. Specifically:</p> <ul style="list-style-type: none"> Sections 5.1 to 5.4 set out relevant matters to be considered under the Act. Section 7.4 examines MNES impacts in detail, with reference to the additional surveys undertaken in October 2018 to address additional MNES requirements of the Supplementary SEARs. Section 7.4 is supported by Appendix D EPBC Habitat Assessment Evaluations. This evaluation considers all entities returned in the MNES search and included in the Supplementary SEARs. In consideration of entity habitat requirements, the surveys undertaken onsite, the habitat that is available onsite and the likelihood of occurrence, the potential for impact is determined in this table. Where entities are deemed to have less than a low risk of impact, an EPBC Assessment of Significant Impact is undertaken, Appendix E. The assessments also assist to target mitigation strategies as required. Only for those entities where significant impact is evaluated likely to occur, are Commonwealth offsets required. Appendix F sets out the quantification of offsets for relevant entities. Section 10.1.4 provides an offset strategy for relevant entities, as determined above.
<p>Project description</p> <ul style="list-style-type: none"> The title of the action, background to the development and current status. The precise location and description of all works to be undertaken 	<p>The project description is provided in detail in Section 4 of the EIS.</p>

Requirement	Addressed:
<p>(including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on MNES.</p> <ul style="list-style-type: none"> How the action relates to any other actions that have been, or are being taken, in the region affected by the action. 	
<p>Identification of threatened species and communities</p> <ul style="list-style-type: none"> The EIS must identify each EPBC Act-listed species and community likely to be significantly impacted by the proposed action and provide evidence as to why other EPBC Act-listed species and communities likely to be located in the project area or in the vicinity are unlikely to be impacted. For each of the relevant EPBC Act-listed species and communities likely to be impacted, the EIS must provide: <ul style="list-style-type: none"> A description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Commonwealth guidelines and policy statements. The EIS must include a comprehensive assessment of impacts on any relevant EPBC Act-listed species and communities. The 	<p>As above, threatened species and communities are addressed in Section 7.4 of this BDAR.</p> <p>Relevant species and communities considered likely to be impacted we determined to be:</p> <ul style="list-style-type: none"> White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (CEEC). Regent Honeyeater Large-eared pied bat Pink-tailed worm lizard <p>Appendix E contains the Assessments of significance for these entities, which set out habitat requirements and how these are met onsite, references relevant policies and plans, and concludes with a determination of the significance of the impacts proposed.</p> <p>Impacts on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (CEEC) were deemed likely to be significant.</p> <p>Survey methodology is included in Section 4.3.</p>

Requirement	Addressed:
<p>assessment must address the nature, geographic extent, magnitude, timing and duration of any likely direct, indirect and consequential impacts. The description of impacts must have regard to the full national extent of the species or community's range (i.e. not just NSW).</p>	
<p>Avoidance and mitigation</p> <ul style="list-style-type: none"> For each of the EPBC Act-listed species and communities that are likely to be impacted by the development, the EIS must provide information on proposed avoidance and mitigation measures to deal with the impacts of the action, and a description of the predicted effectiveness and outcomes that the avoidance and mitigation measures will achieve. 	<p>Proposed avoidance and mitigation measures to deal with the potential impacts of the proposal are addressed in Section 7.1 and the BDAR. Indirect impacts are included in Section 7.2.</p> <p>All impacts and measures are relevant to:</p> <ul style="list-style-type: none"> White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (CEEC). Regent Honeyeater Large-eared pied bat Pink-tailed worm lizard
<p>Offsets</p> <ul style="list-style-type: none"> Where a significant residual adverse impact to EPBC Act-listed species or communities is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy, how offsets will be secured, and timing of protection. For each EPBC Act-listed species and community likely to be significantly impacted by the action, the EIS must provide reference to, and consideration of, relevant approved conservation advice or recovery plan for the species or community. 	<p>An offset strategy for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (CEEC) is provided in Section 10.1.4.</p>
<p>Environmental Record of the person proposing to take action</p> <ul style="list-style-type: none"> Information in relation to the environmental record of a person proposing to take action must include details as prescribed in Schedule 4 Clause 6 of the EPBC Regulations 2000. 	<p>Information about the proponent is provided in Section 1.3 of the EIS and the EPBC referral which was publicly exhibited: EPBC 2018/SSD 9254.</p>

Requirement	Addressed:
<p>Information sources</p> <ul style="list-style-type: none"> • For information given in the EIS, the EIS must state the source of the information, how recent the information is, how the reliability of the information was tested; and what uncertainties (if any) are in the information. 	<p>Information sources are provided in the references list of the BDAR and Section 11 of this EIS. Reference citation makes clear published from non published (ie website) sources.</p> <p>Areas of uncertainty, specifically around the impacts of shading, are stated clearly and conservative assumptions made in place of reliable data.</p>

APPENDIX C EPBC PROTECTED MATTERS SEARCH



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: 25/01/18 10:00:50

[Summary](#)

[Details](#)

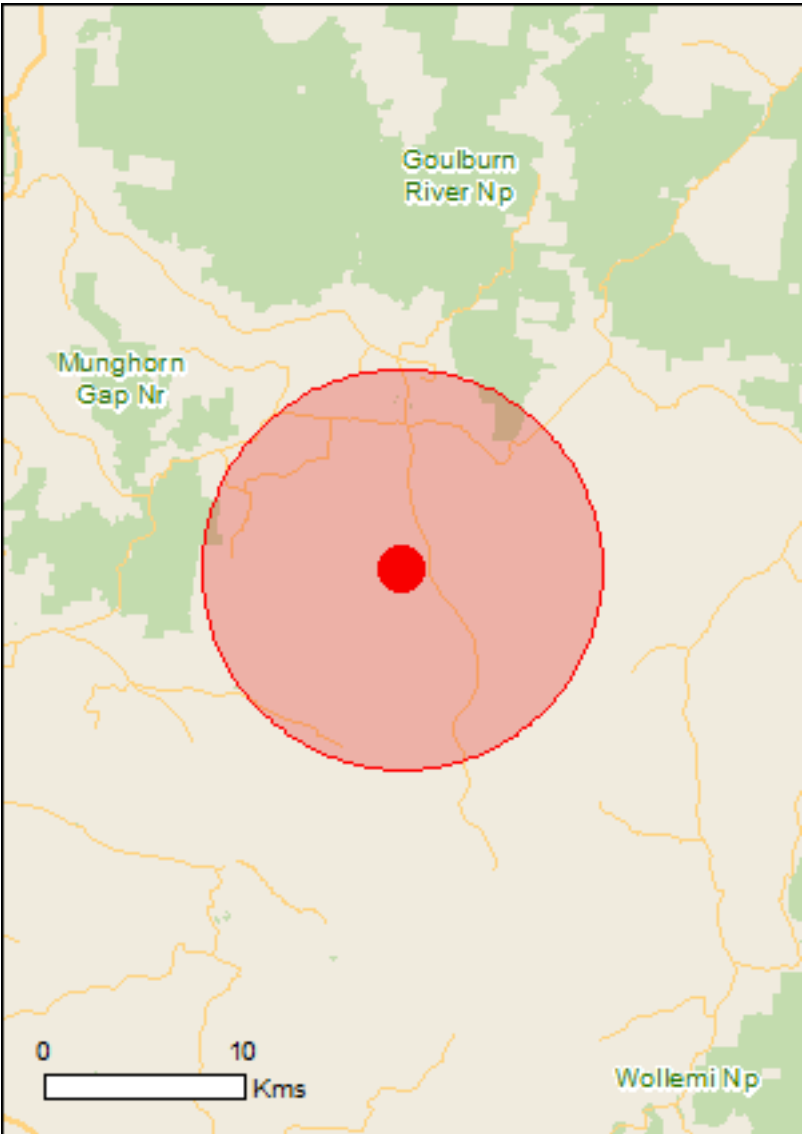
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

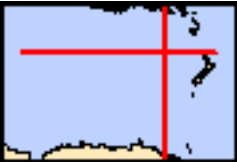
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	5
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	33
Listed Migratory Species:	12

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:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	30
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	900 - 1000km upstream	
Hunter estuary wetlands	150 - 200km upstream	
Riverland	800 - 900km upstream	
The coorong, and lakes alexandrina and albert wetland	1000 - 1100km	
The macquarie marshes	200 - 300km upstream	

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

Name	Status	Type of Presence
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species	[Resource Information]
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Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
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
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Fish		
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat 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
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	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		
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Homoranthus darwinioides [12974]	Vulnerable	Species or species habitat known to occur within area
Leucochrysum albicans var. tricolor Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Ozothamnus tessellatus [56203]	Vulnerable	Species or species habitat likely to occur within area
Pelargonium sp. Striatellum (G.W.Carr 10345) Omeo Stork's-bill [84065]	Endangered	Species or species habitat may occur within area
Philothea ericifolia [64942]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may 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
Delma impar Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may 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
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Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to 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 likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area

Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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

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
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]	Critically Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Goulburn River	NSW
Munghorn Gap	NSW

Invasive Species

[Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
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
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus 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

Name	Status	Type of Presence
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
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may 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
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

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

-32.41826 149.94788

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.

APPENDIX D EPBC HABITAT ASSESSMENT EVALUATION TABLE

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
FAUNA				
<i>Anthochaera phrygia</i> Regent Honeyeater	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Occurs in woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Present - Non optimal habitat occurs within the development site. More suitable vegetation occurs on <i>E.albens</i> dominated lower slopes outside of development site boundary.	Possible - Mapped important areas occur within the development site (OEH) however is considered not optimal. May occur on occasion in better condition vegetation outside of the development site with more complex structure. Not detected during surveys	YES – Assessment of Significance undertaken
Curlew Sandpiper <i>Calidris ferruginea</i>	Intertidal mudflats in both fresh and brackish waters in sheltered coastal areas, such as estuaries, bays, inlets, and lagoons. Also recorded inland, including around ephemeral and permanent lakes, dams, and waterholes, usually with bare edges of mud or sand	Absent - no intertidal mudflats	Unlikely	No – Unlikely to occur on site
Painted Honeyeater <i>Grantiella picta</i>	Boree/Weeping Myall, Brigalow, and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes.	Marginal - Scattered paddock trees of box-gum woodland. Minimal mistletoes present.	Unlikely – not detected during site surveys.	No – Unlikely to occur on site
Swift Parrot <i>Lathamus discolor</i>	On the coast and southwest slopes in areas with abundant flowering eucalypts or lerp. Feed	Present	Unlikely – outside mapped important areas	No – Unlikely to occur on site

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
	trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box and Lerp infested trees such as Grey Box and Black Butt.		(OEH). Not detected during surveys	
Mallee Fowl <i>Leipoa ocellata</i>	Semi-arid to arid shrublands and low woodlands, especially those dominated by Mallee and/or Acacia which are tall, dense, and floristically rich. A sandy to sandy-loam substrate and abundance of leaf litter are required for breeding.	Absent	Unlikely	No – Unlikely to occur on site
Eastern Curlew <i>Numenius madagascariensis</i>	Large intertidal mudflats often with seagrass beds along sheltered coasts including in estuaries, bays, harbours, inlets, lagoons, and among saltmarshes and mangroves.	Absent	Unlikely	No – Unlikely to occur on site
Superb Parrot <i>Polytelis swainsonii</i>	Box-Gum, Box-Cypress, and Boree Woodlands and River Red Gum Forests. They nest in hollows of large trees in tall open forest or woodland.	Marginal - Outside of normal habitat range.	Unlikely – No detected during surveys	No – Unlikely to occur on site
Australian Painted Snipe <i>Rostratula australis</i>	Shallow terrestrial freshwater or occasionally brackish wetlands, including temporary and permanent lakes, swamps, and claypans, as well as inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms, and bore drains. Fringes of swamps, dams, and nearby marshy areas with cover of grasses, lignum, low scrub, or open timber. Shallow wetlands with areas of bare wet mud.	Absent	Unlikely	No – Unlikely to occur on site
Booroolong Frog <i>Litoria booroolongensis</i>	Permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Requires cobble banks, riffles and other rock structures within stream margins.	Absent	Unlikely	No – Unlikely to occur on site
Large-eared Pied Bat	Caves (near their entrances), crevices in cliffs, old mine	Present – Large shallow	Present – No breeding habitat	YES – Assessment of

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
<i>Chalinolobus dwyeri</i>	workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features.	sandstone caves and crevices in ridges surrounding development site. Fairy martins recorded within southern end of development site	observed within development site however may be used for foraging with potential breeding habitat within 2km. Recorded via ultrasonic detection in ridgelines outside of development site.	Significance undertaken
Spotted-tail Quoll <i>Dasyurus maculatus</i>	Variety of vegetation types including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Present	Unlikely – May occur on a transient basis. No evidence of presence detected during survey	No – Unlikely to occur on site
Corben's Long-eared Bat <i>Nyctophilus corbei</i>	Variety of vegetation types, most commonly Mallee, Bulloke, and Box-dominated communities, but most common in vegetation with distinct canopy and dense understorey. Roost in tree hollows, crevices, and under loose bark.	Marginal	Unlikely	No – Unlikely to occur on site
Greater Glider <i>Petauroides volans</i>	Tall, montane, moist eucalypt forests with relatively old trees and abundant hollows and a high diversity of eucalypts	Absent	Unlikely	No – Unlikely to occur on site
Brush-tailed Rock-wallaby <i>Petrogale penicillata</i>	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north	Present – North facing sandstone rock outcrop on ridges at the southern end of development site	Unlikely – Unlikely to venture outside of optimal habitat in ridges to the south of the development site. No evidence off presence detected during site surveys	No – No direct or indirect impacts on optimal habitat

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
Koala <i>Phascolarctos cinereus</i>	Temperate, subtropical and tropical eucalypt woodlands and forests where suitable food trees grow, of which there are more than 70 eucalypt species and 30 non-eucalypt species that are particularly abundant on fertile clay soils.	Present	Unlikely – no evidence of presence detected during site surveys	No – Unlikely to occur on site
<i>Pseudomys novaehollandiae</i> New Holland Mouse,	Inhabits open heathlands, open woodlands with a heathland understorey and vegetated sand dunes.	Absent	Unlikely	No – Unlikely to occur on site
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines.	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
Pink-tailed Worm-lizard <i>Aprasia parapulchella</i>	Inhabits sloping open woodland areas with predominantly native grassy ground layers. Commonly found beneath small, partially-embedded rock.	Present - Majority of potential habitat within the development site considered no-optimal due to embedded rock and lack of native grass cover however one area of optimal habitat does occur.	Possible – Optimal habitat occurs with DNG to the north east of the development site with partially embedded/loose rock and good grass cover. No evidence of presence detected during site surveys	YES – Assessment of Significance undertaken
Striped legless lizard <i>Delma impar</i>	Inhabits grassland dominated by perennial, tussock-forming grasses such as Kangaroo Grass <i>Themeda australis</i> , spear-grasses <i>Austrostipa spp.</i> and poa tussocks <i>Poa spp.</i> , and occasionally wallaby grasses <i>Rhytidosperra spp</i> and exotic components.	Marginal - Groundcover dominated by exotic flora	Unlikely– development site outside known distribution	No – Unlikely to occur on site
FLORA				

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
<i>Commersonia procumbens</i>	Endemic to NSW, mainly confined to the Dubbo-Mendooran-Gilgandra region, but also in the Pilliga and Nymagee areas. Recorded in <i>Eucalyptus dealbata</i> and <i>Eucalyptus sideroxylon</i> communities, <i>Melaleuca uncinata</i> scrub, under mallee eucalypts with a <i>Calytrix tetragona</i> understorey, and in a recently burnt Ironbark and Callitris area. Also in <i>Eucalyptus fibrosa</i> subsp. <i>nubila</i> , <i>Eucalyptus dealbata</i> , <i>Eucalyptus albens</i> and <i>Callitris glaucophylla</i> woodlands north of Dubbo.	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Cryptostylis hunteriana</i>	Typically occurs in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>)	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Dichanthium setosum</i>	Associated with heavy basaltic black soils and red-brown loams with clay subsoils in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Euphrasia arguta</i>	Eucalypt forest with a mixed grass and shrub understorey in an open disturbed area and along the roadside.	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Homoranthus darwinioides</i>	Grows in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
	woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand.			
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	Variety of grassland, woodland and forest habitats, generally on relatively heavy soils	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Ozothamnus tessellatus</i>	Grows in eucalypt woodland.	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Pelargonium</i> sp. <i>Striatellum</i> (G.W.Carr 10345)	High-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Philotheca ericifolia</i>	Grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies. It has been collected from a variety of habitats including heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops.	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Prasophyllum petilum</i>	Open sites within Natural Temperate Grassland	Absent	Unlikely	No – Unlikely to occur on site
<i>Prasophyllum</i> sp. <i>Wybong</i> (C.Phelps ORG 5269)	Perennial orchid, appearing as a single leaf over winter and spring in open eucalypt woodland and grassland	Marginal - Groundcover dominated by exotic flora	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Prostanthera discolor</i>	Restricted to only a few localities from Bylong to the Baerami Valley within the Rylstone and Muswellbrook local government areas. Grows in dry sclerophyll forest in the side gullies of main creeklines, often on rocky or well-drained alluvial substrates.	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Prostanthera stricta</i>	Occurs from Mt Vincent to Genowlan Mountain in the Capertee Valley. <i>Prostanthera</i> aff. <i>stricta</i> is found at Dingo Creek and the Widden and Baerami Valleys in the Upper Hunter. Is often a locally dominant undershrub in heath or scrub communities along cliff	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
	edges, or as an understorey species within a range of open forest or tall open forest types, or in adjacent transitional communities. Associated vegetation includes <i>Eucalyptus blaxlandii</i> , <i>Eucalyptus cannonii</i> and <i>Eucalyptus viminalis</i> with <i>Acacia implexa</i> and <i>Goodenia ovata</i> . Other associated species recorded at sites include <i>Angophora floribunda</i> , <i>Eucalyptus punctata</i> , <i>Brachychiton populneus</i> , <i>Acacia parvipinnula</i> , <i>Beyeria viscosa</i> , <i>Microlaena stipoides</i> and <i>Cheilanthes species</i> .			
<i>Swainsona recta</i>	Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils.	Marginal - Groundcover dominated by exotic flora. Outside of known distribution.	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Tylophora linearis</i>	Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of <i>Eucalyptus fibrosa</i> , <i>Eucalyptus sideroxylon</i> , <i>Eucalyptus albens</i> , <i>Callitris endlicheri</i> , <i>Callitris glaucophylla</i> and <i>Allocasuarina luehmannii</i> .	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>Thesium australe</i>	Coastal headlands or grassland and grassy woodland away from the coast in association with Kangaroo Grass (<i>Themeda triandra</i>)	Marginal - Groundcover dominated by exotic flora	Unlikely – not detected during site surveys	No – Unlikely to occur on site
TEC				
<i>Central Hunter Valley eucalypt forest and woodland</i>	The Central Hunter Valley eucalypt forest and woodland ecological community is an open forest or woodland—typically with a tree canopy dominated by eucalypt species; an open to sparse mid-layer of shrubs; and a ground layer of native grasses, forbs and small shrubs. Typically	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
	occurs on lower hillslopes and low ridges, or valley floors in undulating country; on soils derived from finer grained sedimentary rocks. The woodland or forest canopy is dominated by one or more of the following four eucalypt species: – narrow-leaved ironbark (<i>Eucalyptus crebra</i>), spotted gum (<i>Corymbia maculata</i> (syn. <i>Eucalyptus maculata</i>), slaty gum (<i>Eucalyptus dawsonii</i>) and grey box (<i>Eucalyptus moluccana</i>).			
<i>Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion</i>	The Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion are generally tall open eucalypt forests found on igneous rock (predominately Tertiary basalt and microsyenite) in, or adjacent to, the Sydney Basin Bioregion. The ecological community occurs in areas of high rainfall, generally ranging from 950 to 1600 mm/year. Dominant canopy species are most often <i>Eucalyptus fastigata</i> (brown barrel), <i>E. viminalis</i> (ribbon gum) and <i>E. radiata</i> subsp. <i>radiata</i> (narrow-leaved peppermint). <i>Eucalyptus obliqua</i> (messmate stringybark), <i>E. elata</i> (river peppermint), <i>E. quadrangulata</i> (white-topped box) and <i>E. smithii</i> (ironbark peppermint) are also common components.	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site
<i>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</i>	White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: White Box <i>Eucalyptus albens</i> , Yellow Box <i>E. melliodora</i> and Blakely's Red Gum <i>E. blakelyi</i> . Intact sites contain a	Present	Present – Recorded onsite	YES – Assessment of Significance undertaken

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
	high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs.			

APPENDIX E EPBC ASSESSMENT OF SIGNIFICANT IMPACT

The EPBC specifies factors which are taken into account in deciding whether a development is likely to significantly affect Endangered Ecological Communities, threatened species and migratory species, listed at the Commonwealth level. The following is an assessment of the likely impacts associated with:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (CEEC).
- Regent Honeyeater
- Large-eared pied bat
- Pink-tailed worm lizard

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (Referred to as 'BGW') and Derived Native Grasslands (referred to as 'DNG') which is listed as a Critically Endangered Ecological Community (CEEC).

Significant impact criteria a) to g) as specified in the EPBC Significant Impact Guidelines (v1.1 2013) have been assessed below within Table 1. For the purposes of the assessment in within Table 1, the definition of 'extent' is provided below. Extent has been defined in terms of:

- An upper estimate of extent – that which could potentially occur within and outside the development site
- A lower estimate of extent – that which is known and likely to occur within and outside the development site

Upper estimate of extent

An upper extent of BGW and DNG outside of the development site can be viewed on Figure 5-1 and is assumed based on the following evidence;

- Observing vegetation along and immediately adjacent to Wollar Road, Barigan Rd and Maree road during field work in late May 2018. These roads traverse through the Wollar valley which is similar in landscape setting to that of the Wollar Solar Farm impact area.
- Aerial photo interpretation undertaken of surrounding properties using Google Earth imagery. This involved observing aerial photography of the Wollar Solar farm property and comparing this to adjoining grasslands and woodlands with similar topographic setting and landscape position.

This patch of BGW/DNG is approximately 5,947ha and comprises most of the Wollar Valley flats and foot slopes. The occurrence of BGW and DNG in the areas outside of the Wollar Solar Farm site has not been field validated through quantitative surveys.

Lower estimate of extent

For the purposes of this assessment a 'worst case scenario' of extent is given to assess the 'worst case' potential impact on BGW/DNG that could occur as a result of the Wollar Solar Farm development. For this

assessment, it is assumed all groundcover where trees are greater than 75m apart³ are not 'DNG' and do not form part of the patch for the purpose of this assessment.

An illustration of this patch (only containing BGW within the development site) is provided in Attachment B. DNG within the Wollar Solar Farm property are included within this patch due to confirmation with limited BAM survey during the site inspection in late May. The smaller estimate of the patch of BGW/DNG is 461ha.

Limitations

Without field verification, the assumed extent of BGW/DNG cannot be confirmed outside of the surveyed areas of the Wollar Solar Farm site.

Table 1 – Significant Impact Criteria to assess impacts on a CEEC

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:	
a) Will the action reduce the 'extent' of a community?	
The action will reduce the extent of the community by approximately 232 hectares (worst case scenario) when assuming that solar panels will destroy all components of BGW/DNG where solar panels are to be established.	
<i>Upper assumed extent</i>	
There is 29 ha of BGW and 203 ha of DNG directly impacted which adjoins onto a patch that is estimated to be around 5497ha in area (inclusive of powerlines and dirt roads running through Wollar valley). The area of CEEC directly impacted comprises around about 4% of the overall adjoining patch, (assuming that surrounding grasslands and woodlands contain similar vegetation). A reduction of 4% of this patch of BGW/DNG is a reduction in the extent, but is not likely to be a reduction that would affect the ongoing survival of the overall patch of BGW/DNG over the Wollar Valley considering the large areas (>5,500ha) that would remain. However, a loss of 203 ha of the patch is still substantial and could be deemed a significant loss of the CEEC.	
<i>Lower known extent</i>	
There is 29ha of BGW and 203 ha of DNG directly impacted which adjoins onto a patch that is estimated to be around 210 ha in area. The area of CEEC directly impacted is estimated to comprise 55% of the overall adjoining patch (when only assuming connection with wooded vegetation off the Wollar Solar Farm site). A reduction of 55% is a major reduction in the extent of this community and may affect the ongoing survival of this patch of BGW/DNG.	
b) Will the action fragment or increase fragmentation of the community, for example by clearing vegetation for roads or transmission lines?	
<i>Upper assumed extent</i>	
The proposal occurs within a much larger patch of BGW/DNG within the Wollar Valley. At present, this patch is bordered to the north (extending 11km from the subject site), to the south west and west (extending approximately 500m from the subject site) and to the east (extending approximately 2km), by vegetated mountains not defined or likely to constitute BGW/DNG.	
The location of the area of direct impact will isolate a portion of BGW/DNG directly south-west of the subject site. This patch is estimated to be 210 ha in area which would become separated from the existing patch of BGW/DNG. It is estimated that the proposal would isolate around 4% of the current patch of BGW/DNG (not including the 4% to be removed for solar panels).	
<i>Smallest extent</i>	

³ As defined in accordance with the White Box – Yellow Box – Blakley's Red Gum grassy woodlands and derived native grasslands EPBC Act Policy Statement and Appendix 2 of the National Recovery Plan (DEH 2012).

The development footprint contains the majority of the patch of BGW/DNG where the remaining extent (45%) extends off the property to the south west. The proposal will not result in fragmentation of this patch however it will substantially reduce its extent as outlined in a).

c) Will the action adversely affect habitat critical to the survival of an ecological community which consists of, or includes, fauna species?

The National Recovery Plan for the CEEC identifies habitat critical to the survival of Box-Gum Grassy Woodland as:

The moderate to highly fertile soils of the western slopes of NSW and Queensland, the northern slopes of Victoria, and the tablelands of the Great Dividing Range from southern Queensland through NSW and the ACT. Given the currently highly fragmented and degraded state of this ecological community, all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria... should be considered critical to the survival of this ecological community. In addition, degraded woodland areas not considered part of the listed ecological community may also be essential to the long-term conservation of Box-Gum Grassy Woodland, by virtue of their landscape setting (e.g. providing connectivity) or remaining flora/fauna habitat features (e.g. occurrence of rare or threatened species, tree hollows), and should also be considered as potential habitat critical to the survival of this ecological community.

Vegetation zones 1, 2, 5 & 6 within the development footprint meet the condition criteria for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands and would be considered critical habitat. As such the proposal will adversely affect habitat critical to the survival of the community.

d) Will the action modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?

It is predicted that the proposal could have impacts on,

- surface water flows across the ground, this would be limited as minimal excavation is proposed and panels would be mounted above the ground,
- change in light levels reaching the ground due to shading of panels, mitigated by spacing between panels,
- to ground moisture levels where solar panels may block or concentrate rain over certain areas.

The proposal could potentially benefit the BGW/DNG by;

- Removing disturbances caused by farming activities such as application of fertilisers and overgrazing by stock.

There is little scientific information on the effects of solar farms on these factors. Until sufficient monitoring of Solar farms is carried out, it is largely unknown whether solar farms are likely to have a detrimental impact on abiotic factors. A 'worst case' assumption would be that alterations to sunlight reaching the ground and changes to surface water flows due to the large surface area of solar panels over the ground, could modify abiotic factors necessary for survival of the CEEC.

A review of Table 4, proposed actions within the National Recovery Plan for BGW/DNG, indicates that;

- Altered hydrological regimes may lead to impacts,
- Prolonged shading may lead to impacts and
- Mowing and slashing associated with managing grasslands may lead to impacts

To address the uncertainty, it is therefore assumed that this proposal may lead to modification and destruction of important abiotic factors for preserving the integrity of this CEEC onsite.

e) Will the action cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?

The proposal may cause a change in species composition of DNG onsite, as solar panels will block sunlight to the ground. At present the DNG receives full sun so changing to full or partial shade is likely to influence what species may grow onsite. As stated above, scientific data in this regard is not available and a 'worst case' assumption would be that functionally important species could decline or be lost.

The majority of CEEC to be impacted consists of degraded DNG (ie 87% of the total area of CEEC impacted). The DNGs are subjected to annual weed invasion, trampling by stock, past cultivation and past application of fertilisers which have all impacted on groundcover structure and diversity. The current impacts encountered reduce the severity of impacts that will be caused by the solar farm. With active management of weeds it may be that DNGs may improve in floristics

and composition without grazing and pasture improvement but it is largely unknown. In relation to the box-gum woodland containing trees, these areas have also been subjected to ongoing disturbances similar to the derived native grasslands. Fire wood collection is an added impact within these areas where at the time of assessment during May the landholder was collecting firewood from fallen timber onsite. With existing impacts of agricultural practises onsite, the impacts of establishing a solar farm may reduce impacts to Box-gum woodland and derived native grassland but it largely unknown.

f) Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: - assisting invasive species, that are harmful to the listed ecological community, to become established; and - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?

There are existing impacts currently affecting the integrity of the BGW/DNG that include activities associated with farming. This has resulted in the introduction of Saffron Thistle, a high threat weed which has high cover abundance readings within some of the vegetation integrity plots conducted onsite. Farming activities have also removed a lot of BGW converting it into a DNG. The existing remnants of BGW which contain sparse fallen timber resources which are still being subjected to firewood collection as observed during survey in May. The use of fertilisers and herbicides is very likely to have occurred in the past as part of the farming practises onsite. All these farming practises contribute to a decline in species diversity.

Installing a solar farm may benefit the DNG by removing stock and stopping the future cultivation of the land, both of which are likely to contribute to the spread of existing weeds onsite. The solar farm is unlikely to require any fertilisers although managed application may be needed to maintain groundcovers within certain areas.

The proposal is unlikely to result in further assisting invasive flora species to become established with the implementation of appropriate weed management. Any herbicide applications would be conducted in accordance with recommended guidelines. Increases in invasive fauna species are unlikely given that these species are already present and the proposal would not introduce any factors that would increase the populations.

Considering the above, the proposal is unlikely to cause a substantial reduction in quality or integrity as a result of assisting invasive species, or causing regular mobilisation of fertilisers, herbicides, chemicals or pollutants.

g) Will the action interfere with the recovery of an ecological community?

The National Recovery Plan for the CEEC (DEH 2012) specifies the following criteria as indicators of CEEC recovery;

1. An increase in the area of listed CEEC,
2. An increase in areas meeting minimum condition criteria,
3. Maintenance of floristics, structure, ecological function across its distribution,
4. Improved landscape connectivity and
5. Improved overall condition in BGW/DNG

The proposal is inconsistent with the recovery criteria as it will:

- Decrease the area of CEEC.
- Potentially further degrade the CEEC which may lead to certain areas of this CEEC not fitting the 'minimum condition criteria',
- Modify the floristics (by removing trees), 'structure' (by removal of canopy cover) and 'ecological function' through modifying key habitat resources such as hollow bearing trees and fallen timber as a result of tree removal.
- Result in a decline in landscape connectivity in further distancing patches of BGW onsite and a general decline in overall condition of the BGW/DNG onsite.

The effects of a solar farm on the recovery of DNG is uncertain. Construction of the solar farm is unlikely to introduce negative impacts in addition to those that are currently associated with farming, for example, new invasive weeds that contribute to reduced condition of BGW/DNG onsite. Strict weed hygiene and control protocols would be implemented as part of the proposal managing this risk.

Table 4 (Current Best Practice Site Management Practices) of the National Recovery Plan stipulates that;

- Altered hydrological regimes (e.g. diversion of rainfall caused by solar panels)
- Prolonged shading (e.g. caused by solar panels) and
- Regular mowing and slashing (e.g. maintenance around solar panels)

are actions that should be avoided in managing CEECs sustainably. Shading may lead to a reduction in groundcover floristics and may also lead to some areas of CEEC DNG not meeting the minimum condition criteria. Altered hydrological regimes may result in some areas receiving more ground moisture and other areas becoming drier. This may affect groundcover composition and diversity.

Conclusion

The proposal is likely to impact on the existing extent of BGW/DNG within the Wollar Valley. Assuming all areas under infrastructure (including panel arrays) are permanently removed, the lower value of impact is estimated to be around 4% of the existing patch of BGW/DNG assuming that adjoining properties contain 'like for like' groundcover to that found on the Wollar Solar Farm site (See Figure 5-1). The upper-value impact scenario could lead to a 55% reduction in the patch of existing BGW/DNG within the Wollar Valley (See Figure 5-2).

All habitat to be impacted is considered to be or is potentially habitat critical to the survival of the EEC. The loss of 55% of the patch is likely to be significant. Similarly, even the loss of 4% could be determined to be a significant impact on the CEEC

Fragmentation of the existing patch, when assuming the upper extent, would result in the isolation of 210ha of BGW/DNG directly southwest of the Wollar Solar Farm property.

The removal of BGW/DNG from the site may reduce foraging habitat for many birds of prey and habitat for various reptiles, however these microhabitats are likely to be present in adjoining farmland within Wollar Valley which is around 6000ha.

There may be potential impacts to abiotic factors affecting DNG onsite. Impacts in relation to shading changes to ground moisture may lead to altered groundcover composition and floristics. Some areas are likely to receive more or less rainfall depending on the diversion of rainfall onsite. The potential effects of this are unknown.

This assessment has taken a conservative approach in assuming all native vegetation within the development footprint would be removed. On this basis, the assessment has concluded that there is a potential for a significant impact.

Regent Honeyeater

a) Will the action lead to a long-term decrease in the size of a population of a species?

Regent Honeyeater

Potential foraging habitat for Regent Honeyeater occurs within the development site. OEH mapping determines that mapped areas of critical habitat occur on the lower slopes within and surrounding the development site. The development footprint has been defined to avoid these areas.

Numerous diurnal avifauna surveys and call play back surveys were undertaken and did not detect these species. Following a habitat assessment of the broader study area, it was determined that areas surrounding the development site that contain a more complex vegetative structure on the lower slopes contains potential habitat that may be used on occasion by these nomadic species. These areas, although recovering from a major bushfire in the last 2 years, had a high abundance of woodland birds species present. However, vegetation within development footprint is considered non-optimal for the regent honeyeater due to low canopy cover, dominance of aggressive native fauna ie noisy miner and noisy friarbird as well as general poor health of the species present. This could be attributed to recover from the recent bushfire as well the trees subjected to more frequent indirect fertilisers use. Only one preferred forage species, *E. melliodora*, was observed in flowering over the many survey periods, at the most southern point of the study area, well outside of the development site and development footprint.

The proposal would involve the removal of around 25.66 ha of woody vegetation of which most of it is largely fragmented and isolated remnant vegetation. There would also be some disturbance associated with construction, including noise, vibration, light, and risk of introduction or spread of weeds, pests, and pathogens.

The quality of potential habitat impacted for these species is low, being largely cleared, with few mature or hollow-bearing trees, and highly disturbed by agriculture. Given the amount of non-optimal habitat to be removed, the amount of higher quality habitat on the lower slopes of the ridgelines surrounding the development site that would not be impacted and with the recommended mitigation measures, the likelihood of the proposal leading to a long-term decrease in the size of a population of this species is minimal.

b) Will the action reduce the area of occupancy of the species?

Regent Honeyeater

The proposal would involve the removal of around 29 ha of woody but non-optimal habitat. No critical habitat for the regent honeyeater mapped by the OEH would be affected.

The quality of potential habitat for this species is low within the development site. Large areas surrounding the development site on the lower slopes of the ridgelines contain better quality and more suitable habitat, that if present on occasion, would be utilised in preference to the poorer quality, sparse non-optimal habitat impacted.

c) Will the action fragment an existing population into two or more populations?

Regent Honeyeater

There would also be some disturbance associated with construction. The development site is not considered known habitat and the likelihood of occurrence of these species is low within the development site.

The proposal would not fragment an existing population of these species into two or more populations.

d) Will the action adversely affect habitat critical to the survival of a species?

Regent Honeyeater

The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for these species.

e) Will the action disrupt the breeding cycle of a population?

Regent Honeyeater

Regent Honeyeaters breed in specific breeding areas, with the development site being within the Mudgee-Wollar key breeding area. However, considering the non-optimal habitat impacted, and better quality habitat being avoided, the likelihood of the action disrupting the breeding cycle of a population of these species is minimal.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Regent Honeyeater

The proposal would not remove any important mapped habitat. There would also be some disturbance associated with construction, which could decrease the quality of some habitat temporarily.

The quality of habitat impacted is low, and the area of habitat to be removed is relatively small and would not disrupt habitat connectivity for canopy species. With the implementation of the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability or quality of habitat to the extent that these species would be likely to decline is minimal.

g) Will the action result in invasive species that are harmful to a critically endangered or endangered/vulnerable species becoming established in the endangered / critically endangered /vulnerable species habitat?

Regent Honeyeater

The proposal has the potential to contribute to the spread of invasive species in the study area through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site. Currently, field surveys and observations noted a high abundance of aggressive native avifauna such as noisy miner and noisy friarbird in the vegetation to be impacted, however these species became less abundant in the better quality vegetation outside of the development site were more complex vegetative structure and connected vegetation occurs, as noted by the higher abundance of other woodland avifauna including a number of state listed threatened species. The proposal is therefore unlikely to result in invasive species, native or exotic, that are harmful or restrictive to the Regent Honeyeater becoming established in future.

h) Will the action introduce disease that may cause the species to decline?

Regent Honeyeater

There is a risk that diseases could be introduced to the development site via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is therefore unlikely to result in the introduction of any disease that may cause these species to decline.

i) Will the action interfere with the recovery of the species?

Regent Honeyeater

The National Recovery Plan for the Regent Honeyeater lists the following objectives:

1. Reverse the long-term population trend of decline and increase the numbers of Regent Honeyeaters to a level where there is a viable, wild breeding population, even in poor breeding years.
2. Enhance the condition of habitat across the Regent Honeyeater range to maximise survival and reproductive success and provide refugia during periods of extreme environmental fluctuation.

The proposal would not interfere with any of these objectives.

Conclusion

The proposal will result in the loss of around 29 ha of woody but non-optimal Regent Honeyeater habitat. Areas impacted are isolated patches or paddock trees with low to moderate canopy cover, lacking complex vegetative structure, and subjected to regular occurrence of aggressive native species such as the noisy miner. Better quality vegetation occurs outside of the development site that would not be impacted. It is unlikely that the proposal would significantly impact on the existence of the Regent Honeyeater and therefore, referral to the Commonwealth Department of Environment is not required.

Large-eared pied bat/Pink-tailed worm lizard

a) Will the action lead to a long-term decrease in the size of an important population of a species?

Large-eared Pied Bat

Fringing foraging habitat for the Large-eared Pied Bat occurs within the development site however would not be directly impacted by the proposal. Vegetated ridgelines surrounding the development contains significant sandstone caves, crevices and overhangs caves which is suitable roosting sites for Large-eared Pied Bats in the study area.

The Large-eared Pied Bat was detected via ultrasonic detection during surveys approximately 400m south of the development site in the sandstone ridgeline. Areas containing suitable roosting habits will not be impacted. Surveys did not detect these species within the development site however it is considered that this species may utilise fringing vegetation within the lower slopes surrounding the development site. No suitable foraging habitat or roosting habitat occurs within the development footprint or will be impacted. Linear rocky outcrops that are within the development site largely contain embedded rock with shallow crevices. No observations or evidence of their use was observed during the field surveys in these areas.

The Large-eared Pied Bat is a sub canopy forager preferring to forage along the edges of vegetation and sandstone escarpments and are not known to utilise open grasslands or small area vegetated areas for foraging. The proposal is not located in a known important population of these species. In this context, the proposal would not lead to a long-term decrease in the size of an important population of these species.

Pink-tailed worm-lizard

Suitable and potential foraging and breeding habitat for the Pink-tailed worm-lizard occurs within the development site and would be removed by the proposal. Surveys did not detect this species and so the development site is not considered known habitat.

There is approximately 0.9 ha of suitable habitat within the development site, of which 0.1 ha of partially embedded and loose rock surrounded native grass species including *Themada triandra* may be impacted. Additionally, there approximately 4.9 ha of rocky outcrop through the development site considered potential habitat of which 3.2 ha may be impacted during construction. The quality of potential habitat for this species is low, being largely embedded rock and subject to persistent grazing and dominated by predominately exotic grasses. With the implementation of the recommended mitigation measures, the proposal would not lead to a long-term decrease in the size of an important population of this species.

b) Will the action reduce the area of occupancy of an important population of a species?

Large-eared Pied Bat

The proposal would not directly impact upon suitable roosting or foraging habit for this species. Indirect impacts such as noise, dust and light spill may occur during construction but would be short term and temporary. It is not considered that the proposal would reduce the area of occupancy for this species.

Pink-tailed worm-lizard

The proposal would involve the removal of around 0.1 ha of potential habitat. These areas were surveyed and the species was not detected. Areas of rocky outcrop were assessed and surveyed by two ecologists on the 24th and 25th October 2018 for approximately 30 minutes at each site within and surrounding the development site. This included traversing the rocky outcrop area and randomly turning and inspecting loose rocks and partially embedded rock that occurred before being placed back into their original position. Where practicable, between 100-150 rock were turned and inspected at each surveyed area.

If assumed to occur, there would be some disturbance associated with construction. The quality of potential habitat for this species is low, and the area of habitat to be removed is relatively small. In this context, while removal of this habitat could reduce the area of occupancy, it would not have a significant impact on an important population of this species.

c) Will the action fragment an existing important population into two or more populations?

Large-eared Pied Bat

The proposal would not impact upon suitable roosting or foraging habit for this species and therefore the proposal would not fragment an existing important population of these species into two or more populations.

Pink-tailed worm-lizard

The proposal would involve the removal of around 0.1 ha of potential habitat. There would also be some disturbance associated with construction. The quality of potential habitat is low, and the area of habitat to be removed is relatively small. The proposal would not fragment an existing important population of this species into two or more populations.

d) Will the action adversely affect habitat critical to the survival of a species?

Large-eared Pied Bat

The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for these species.

Pink-tailed worm-lizard

The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for this species.

e) Will the action disrupt the breeding cycle of an important population?

Large-eared Pied Bat

There is no suitable breeding habitat for these species in the development site. The proposal would not disrupt the breeding cycle of an important population of these species.

Pink-tailed worm-lizard

The proposal would involve the removal of around 0.1 ha of potential habitat. There would also be some disturbance associated with construction. The quality of potential habitat is low, and the area of habitat to be removed is relatively small. The proposal would not disrupt the breeding cycle of an important population of this species.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Large-eared Pied Bat

The proposal would not impact upon suitable roosting or foraging habit for this species. Suitable habitat does occur in the vegetated lower slopes and sandstone ridgelines but these areas would not be directly impacted. Indirect impacts such as noise, dust and light spill may occur during construction but would be short term and temporary.

With the implementation of the recommended mitigation measures, the proposal would not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that an important population of these species would be likely to decline.

Pink-tailed worm-lizard

The proposal would involve the removal of around 0.1 ha of suitable habitat, including some areas of grassland. There would also be some disturbance associated with construction. The quality of potential habitat is low, and the area of habitat to be removed is relatively small and would not disrupt habitat significantly. With the implementation of the recommended mitigation measures, the proposal would not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that an important population of these species would be likely to decline.

g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Large-eared Pied Bat and Pink-tailed worm-lizard

The proposal has the potential to contribute to the spread of invasive species in the study area through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site. The proposal is therefore unlikely to result in invasive species that are harmful to these vulnerable species becoming established in potential habitat.

h) Will the action introduce disease that may cause the species to decline?

Large-eared Pied Bat and Pink-tailed worm-lizard

There is a risk that diseases could be introduced to the development site via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is therefore unlikely to result in the introduction of any disease that may cause these species to decline.

i) Will the action interfere substantially with the recovery of the species?

Large-eared Pied Bat

The National Recovery Plan for the Large-eared Pied Bat lists the following specific objectives:

1. Identify priority roost and maternity sites for protection.
2. Implement conservation and management strategies for priority sites.
3. Educate the community and industry to understand and participate in the conservation of the Large-eared Pied Bat.
4. Research the Large-eared Pied Bat to augment biological and ecological data to enable conservation management.
5. Determine the meta-population dynamics throughout the distribution of the Large-eared Pied Bat.

The proposal would not interfere with any of these objectives.

Pink-tailed worm-lizard

There is no National Recovery Plan for Pink-tailed worm-lizard at this time, however conservation actions include

1. Identify priority sites for protection
2. Ensure appropriate grazing regimes
3. Educate the community and industry to understand and participate in the conservation of the Pink-tailed worm-lizard.
4. Information and research priorities.
5. Survey and monitoring priorities

Conclusion

Pink-tailed worm-lizard

The proposal will result in the loss of 0.1 ha of potential habitat for the Pink-tailed worm-lizard. Approximately 0.8 ha would remain and not be impacted. Areas of rocky outcrop were assessed and surveyed by two ecologists; between 100-150 rock were turned and inspected at each surveyed area. No individuals were observed during field surveys.

Large-eared Pied Bat

Although detected in close proximity to the development site in suitable sandstone ridgelines containing appropriate foraging habitat, only suboptimal roosting or foraging habitat for the Large-eared Pied Bat would be impacted.

It is highly unlikely that the proposal would significantly impact on the existence of the Large-eared Pied Bat or Pink-tailed worm-lizard.

APPENDIX F EPBC OFFSET CALCULATIONS

F.1 COMMONWEALTH OFFSETTING REQUIREMENTS

The EPBC Act Environmental Offsets Policy (EOP) outlines the Australian Government's approach to the use of environmental offsets ('offsets') under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This policy relates to all matters protected under the EPBC Act. Offsets are required where a significant impact is anticipated. For the proposed Wollar Solar Farm, this could include:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (henceforth, Box-Gum Woodland).

No other entities are considered likely to have a significant impact. Commonwealth offset requirement calculations are detailed below for this entity.

F.2 COMMONWEALTH OFFSET METHODOLOGY

The Offsets Assessment Guide (OAG) was run according to the information contained in the document titled 'How to use the Offsets Assessment Guide' (which is published on the DoEE's EPBC Act environmental offsets policy web page). In running the OAG, the user is required to enter a number of variables which require a quantitative assessment of the condition of the vegetation at the development and offset site and also factors such as the time until the ecological benefit of the offset is realised, the risk of the loss of the offset and the level of confidence in these results. The reasoning used in reaching these values is discussed individually for each below.

F.2.1 Box Gum Woodland

Conservation listing

The *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (aka Box Gum Woodland, BGW) is listed as Critically Endangered.

Area of impacted community

A total of 232 ha will be impacted, of this:

- 29 ha are considered to support high diversity vegetation and nine hollow-bearing trees.
- 203 ha are relatively degraded secondary grasslands, modified by agriculture.

It is noted that the impacts of the project in derived grasslands do not involve total removal of vegetation. The vast majority of impact will be from shading by panel modules which may not lead to substantive composition or structural changes. For the purpose of this assessment however, 100% removal is assumed.

Habitat quality

The overall habitat quality score (0-10) was determined by considering the following factors (as outlined in the 'How to use the Offsets Assessment Guide') individually:

- Site condition. Including vegetation condition, structure and species diversity;
- Site context. The biodiversity importance of the site in terms of its landscape position;
- Species stocking rate. The number of individual populations at the site.

The contribution of these factors was noted according to their level of importance. The results of this analysis are provided in the below table. As potential offset sites are within the project boundary or immediate area, the start quality of both areas was considered to be the same.

Table 1 Overall habitat quality score for Box Gum Woodland / Derived Native Grassland CEEC

Factor	Score	Importance Ranking	Reasoning
Site condition	6 (BGW treed) 1 (BGW grassland)	1	<p>Where BGW CEEC occurs with tree cover within the solar farm it was classified as being in moderate condition. A total of 29 ha are considered to support high diversity and nine hollow-bearing trees. A condition rating of 6 has been given to the grassland areas based on the floristics analysis presented in Table 7-5 against EPBC criteria .</p> <p>Where BGW occurs as a derived grassland it is primarily of low condition. A total of 203 ha is degraded. A condition rating of 1 has been given to the grassland areas based on the floristics analysis presented in Table 7-5 against EPBC criteria .</p>
Site context	6 (BGW treed) 2 (BGW grassland)	2	<p>Aerial imagery demonstrates the site itself varies between cleared and sparsely treed areas of vegetation. The site comprises mostly paddocks within flatter land or foot slopes, which have been cleared for agricultural purposes. There are no significant connectivity features within the development site itself.</p> <p>At a local scale the project area supports some small patches of treed BGW directly south of the site, but this only provides some minor connectivity value. The value of the treed BGW within the site is therefore important locally given the prior clearance and fragmented nature of the woodland within the project area. A score of 6 has been given to the treed BGW habitat as its importance value is assumed higher than the grassland areas.</p> <p>The Wollar Valley has a patchy distribution of both exotic and native pastures. The proposed solar farm is not expected to disrupt connectivity of native grasslands when consideration is given the large area of native grasslands surrounding the development site that exist within Wollar Valley (~8000ha).</p> <p>At a regional scale, the project area can be seen to be located within cleared agricultural land, with woodland outside the development zone to the west and south. As treed vegetation is primarily non-existent or patchy within the project area, it does not facilitate direct linkages to the woodland located outside the project area.</p> <p>A score of 1 has been given to the BGW grassland habitat as its importance value is lower than the treed BGW and it is more abundant in the landscape.</p>
Species stocking rate	N/A	N/A	N/A
Overall quality score	6 (BGW treed) 1 (BGW grassland)		

Quantum of impact

For treed BGW the quantum of impact (adjusted hectares), based on the habitat quality score of six is: 15.60 ha.

For BGW grassland the quantum of impact (adjusted hectares), based on the habitat quality score of one is: 20.30 ha.

Offset description

An offset site has not been identified at the time of writing, however, it is proposed to offset impacts within the local area under one offset site, protecting the better-quality residual areas within the project area. There is good potential to offset the south western portion of the project area where Box Gum Woodland (BGW) is not impacted to preserve and enhance CEEC habitat onsite. These areas are in better condition and have better connectivity values due to the more mature/hollow bearing trees. There is also scope to improve connectivity values within this area.

The Wollar Valley comprises largely of BGW and Derived Native Grassland (DNG) habitat on the valley flats and foot slopes. It is estimated around 5497ha of BGW/DNG in area (inclusive of powerlines and dirt roads running through Wollar valley) is present within the wider area (i.e. outside the project area). This figure has been assumed from aerial photography, knowledge of the landscape, and observation of vegetation within the landscape during field surveys. The occurrence of BGW/DNG however, has not been validated through quantitative field surveys.

Time horizon

The risk-related time horizon has been set at the maximum forecast term of 20 years as the offset site would be legally secured and managed in perpetuity under a NSW BC Act Stewardship agreement.

The time until ecological benefit was entered as 5 years, as the offset package would not expect to be finalised until after construction of the solar farm so that all impacts can be accurately accounted for.

Start area and quality

The start area required to achieve 90% offset for impact to 29 ha of treed BGW in moderate condition is 205 ha.

The start area required to achieve 90% offset for impact to 20.3 ha of BGW grassland in low condition is 208 ha.

It is assumed this total number of ha to offset the impact can be achieved in the local area if the assumption that approximately 5497 ha of BGW/DNG is present within the Wollar Valley, as described above.

Offset quality has been given the condition rank of 6 (from ten), as the surrounding vegetation within the landscape is considered to represent 'moderate' quality habitat.

Future area and quality without offset

RISK OF LOSS

An estimate of 45% risk of loss without offset has been applied to the treed BGW and 70% risk of loss without offset to the grassland BGW as the site is unprotected and subject to agricultural activities. The sites are currently utilised for agriculture and are situated in an area where this is the dominant land use. A wide spread fire is likely to have stimulated the seed bank and is reflected in current plot data composition however, the ground cover amount shows impacts of drought and grazing and is unlikely to

improve, in consideration of land use alone. The land is privately owned and not protected by any conservation agreements or reservation schemes. There are no known pending mining leases or development applications that apply to the candidate offset sites. As stated in the 'How to use the Offsets Assessment Guide', degradation to the quality of the site due to current management practices and use should not be incorporated into the risk of loss as these factors are incorporated in the quality score. However, it is considered reasonable that future land management practices be taken into account. These may include broad scale spraying and cropping.

QUALITY

The future quality of the treed BGW without offset has been entered as four, as degradation over time would be expected to reduce habitat and vegetation condition and quality.

The future quality of the BGW grassland without offset has been entered as two, as the land is already heavily degraded and further degradation above that already occurring is not expected.

Future area and quality with offset

RISK OF LOSS

The Stewardship agreement for the offset site would be a formal, legal protection mechanism for BGW/DNG. However, there may still be some natural attrition and the intentions of landowners are unknown. Therefore, the future risk of loss with offset has been set at 5%.

With 5% risk of loss, the offset calculator shows the adjusted hectares of an offset site as 194.8 ha for the treed BGW.

With 5% risk of loss, the offset calculator shows the adjusted hectares of an offset site as 197.6 ha for the BGW grassland.

QUALITY

Management of offset sites would include managing grazing for conservation, minimising clearing as well as weed and erosion control. With these measures in place, over time it is expected that the quality of the vegetation on site would improve to 'moderate-good'. A quality factor of eight has been entered for the treed BGW area and a quality factor of seven has been entered for the BGW grassland areas.

Gain from offset

RAW GAIN

For the treed BGW offsetting is expected to bring about a raw gain of 82 ha and a quality score increase of eight. This assumes active management.

For the BGW grassland offsetting is expected to bring about a raw gain of 135.20 ha and a quality score increase of five. This assumes active management such as planting overstorey species appropriate to the community.

CONFIDENCE IN RESULT

The estimated values for risk of loss are based on factors outside the control of the Wollar Solar Farm, but are considered reasonable, given the known land use history. An 80% confidence in these results has been applied.

ADJUSTED GAIN

Taking into account an 80% confidence, the potential adjusted gain from offsetting the impact is 65.6 ha for the treed BGW and 108.16 ha for the BGW grassland.

NET PRESENT VALUE

The net present value (adjusted hectares) is 14.08 ha for treed BGW.

The net present value (adjusted hectares) is 20.31 ha for BGW grassland.

Results

PERCENTAGE OF IMPACT OFFSET

The minimum direct offset requirement (90% direct offset required) equates to:

- 205 ha for treed BGW.
- 208 ha for BGW grassland.
- **413 ha in total.**

REQUIRED AREA OF LIKE-FOR-LIKE

It is noted that the Wollar Valley comprises largely of BGW and Derived Native Grassland (DNG) habitat on the valley flats and foot slopes. It is estimated around 5497ha of BGW/DNG in area (inclusive of powerlines and dirt roads running through Wollar valley) is present within the wider area (i.e. outside the project area). This figure has been assumed from aerial photography, knowledge of the landscape, and observation of vegetation within the landscape during field surveys. The occurrence of BGW/DNG however, has not been validated through quantitative field surveys.

Within the project boundaries, in areas that would not be impacted by the development, 217 ha of CEEC is available for protection under an offset agreement. Based on available mapping, though not subject to detailed survey, it is estimated that an additional 258 ha remains within the property boundary, that would not be impacted by the development and may provide suitable direct offsets. If suitable, this exceeds the required amount by 62 ha.

APPENDIX G BAM CALCULATOR CREDIT REPORT



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00011361/BAAS17086/19/00012396	Wollar Solar Farm BDAR_Major Project	04/01/2019
Assessor Name	Assessor Number	BAM Data version *
Mitch Palmer	17051	6
Proponent Names	Report Created	* 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.
	14/03/2019	

Candidate Serious and Irreversible Impacts

PCT	TEC
1303-White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion	White Box Yellow Box Blakely's Red Gum Woodland
281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	White Box Yellow Box Blakely's Red Gum Woodland

Species
Chalinolobus dwyeri / Large-eared Pied Bat
Chalinolobus dwyeri / Large-eared Pied Bat
Chalinolobus dwyeri / Large-eared Pied Bat
Chalinolobus dwyeri / Large-eared Pied Bat



BAM Biodiversity Credit Report (Like for like)

Miniopterus schreibersii oceanensis / Eastern Bentwing-bat

Miniopterus schreibersii oceanensis / Eastern Bentwing-bat

Miniopterus schreibersii oceanensis / Eastern Bentwing-bat

Miniopterus schreibersii oceanensis / Eastern Bentwing-bat

Vespadelus troughtoni / Eastern Cave Bat

Vespadelus troughtoni / Eastern Cave Bat

Vespadelus troughtoni / Eastern Cave Bat

Vespadelus troughtoni / Eastern Cave Bat

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

Ecosystem Credit Summary

PCT	TEC	Area	Credits
1303-White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	229.6	388.00

BAM Biodiversity Credit Report (Like for like)

281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	114.1	433.00
1610-White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Not a TEC	26.9	0.00

Credit classes for 281	Like-for-like options		
	Any PCT with the below TEC	Containing HBT	In the below IBRA subregions
	White Box Yellow Box Blakely's Red Gum Woodland (including PCT's 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698)	Yes	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Credit classes for 281				
Credit classes for 1303	Like-for-like options			
	Any PCT with the below TEC	Containing HBT	In the below IBRA subregions	
	White Box Yellow Box Blakely's Red Gum Woodland (including PCT's 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698)	Yes	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.	
Credit classes for 1610	Like-for-like options			
	Any PCT in the below Class	And in any of below trading groups	Containing HBT	In the below IBRA subregions

BAM Biodiversity Credit Report (Like for like)

	Western Slopes Dry Sclerophyll Forests (including PCT's 54, 110, 217, 255, 273, 287, 330, 333, 341, 343, 346, 348, 358, 403, 455, 456, 472, 577, 581, 592, 617, 673, 676, 713, 940, 956, 1277, 1279, 1313, 1316, 1381, 1610, 1661, 1668, 1709)	Western Slopes Dry Sclerophyll Forests - $\geq 50\%$ - $< 70\%$ cleared group (including Tier 6 or higher).	No	Kerrabee, Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Area	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	0.0	0.00
Miniopterus schreibersii oceanensis / Eastern Bentwing-bat	0.0	0.00
Vespadelus troughtoni / Eastern Cave Bat	0.0	0.00

Chalinolobus dwyeri / Large-eared Pied Bat	1303_BGW_Zone1	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Chalinolobus dwyeri / Large-eared Pied Bat	Any in NSW

BAM Biodiversity Credit Report (Like for like)

Chalinolobus dwyeri/ Large-eared Pied Bat	1303_DNG_Zone2	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Chalinolobus dwyeri/ Large-eared Pied Bat	Any in NSW
	281_BGW_Zone5	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Chalinolobus dwyeri/ Large-eared Pied Bat	Any in NSW
	281_DNG_Zone6	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Chalinolobus dwyeri/ Large-eared Pied Bat	Any in NSW
Miniopterus schreibersii oceanensis/ Eastern Bentwing-bat	1303_BGW_Zone1	Like-for-like options	
		Only the below Spp	In the below IBRA subregions

BAM Biodiversity Credit Report (Like for like)

		Miniopterus schreibersii oceanensis /Eastern Bentwing-bat	Any in NSW
	1303_DNG_Zone2	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Miniopterus schreibersii oceanensis /Eastern Bentwing-bat	Any in NSW
	281_BGW_Zone5	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Miniopterus schreibersii oceanensis /Eastern Bentwing-bat	Any in NSW
	281_DNG_Zone6	Like-for-like options	
		Only the below Spp	In the below IBRA subregions

BAM Biodiversity Credit Report (Like for like)

Vespadelus troughtoni / Eastern Cave Bat		Miniopterus schreibersii oceanensis /Eastern Bentwing-bat	Any in NSW
	1303_BGW_Zone1	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Vespadelus troughtoni /Eastern Cave Bat	Any in NSW
	1303_DNG_Zone2	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Vespadelus troughtoni /Eastern Cave Bat	Any in NSW
	281_BGW_Zone5	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Vespadelus troughtoni /Eastern Cave Bat	Any in NSW

BAM Biodiversity Credit Report (Like for like)

Vespadelus troughtoni/ Eastern Cave Bat	281_BGW_Zone5		
	281_DNG_Zone6	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Vespadelus troughtoni/Eastern Cave Bat	Any in NSW

APPENDIX H ASSESSMENT PERSONNEL

Name	Title	Qualifications	Roles
Brooke Marshall	Project Director	<ul style="list-style-type: none"> • Certified Environmental Practitioner (CEnvP) • BAM Accredited Assessor • B. Nat Res (First Class Honours) 	Review and approval of BDAR
Dave Maynard	Principal Ecologist	<ul style="list-style-type: none"> • BAM Accredited Assessor • B Science (Ecology, First Class Honours) 	<p>Direction in BAM assessment and BDAR.</p> <p>Preliminary review.</p>
Gillian Young	Senior Ecologist	<ul style="list-style-type: none"> • BAM Accredited Assessor • B. Nat Res (Second Class Honours) 	<p>Field work including PCT identification, vegetation mapping, vegetation plots and threatened flora surveys.</p> <p>Main author and assessor of the BDAR report.</p> <p>Author of BAM Calculator report.</p> <p>AOS assessment for EPBC listed CEECs onsite.</p>
Colin Bower	Field ecologist	<ul style="list-style-type: none"> • BAM Accredited Assessor • Bachelor of Science (Hons) and Ph.D. Entomology 	Field work including stratifying vegetation and collection of VI Plot data.
Zoe Quaas	Field ecologist	<ul style="list-style-type: none"> • B. Env. Sc. and Mgmt (First Class Honours) 	<p>Field work including threatened fauna surveys.</p> <p>Writing parts of the BDAR report.</p> <p>GIS Mapping</p>
Mitch Palmer	Field ecologist and co author	<ul style="list-style-type: none"> • BAM Accredited Assessor • B. Science 	<p>Field work including threatened flora/fauna surveys.</p> <p>AOS assessment of EPBC listed fauna species.</p>
Lauren Byrne	Field ecologist	<ul style="list-style-type: none"> • B. Science 	Assistant to field work including threatened flora/fauna surveys.