



Reach
SOLAR ENERGY

APPENDIX E

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT (BDAR)

(SLR Report)

Ref: 610.17428-R03 -v3.0
August 2018

SLR



YARRABEE SOLAR PROJECT

Environmental Impact Statement - Appendix E Biodiversity Development Assessment Report

Prepared for:

Reach Solar énergy
Level 16, 461 Bourke Street
MELBOURNE VIC 3000

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PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
2 Lincoln Street
Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
T: +61 2 9427 8100 F: +61 2 9427 8200
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Reach Solar énergy (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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EXECUTIVE SUMMARY

Reach Solar énergy (Reach Solar) is proposing the development of the 900 Megawatt (MW) Yarrabee Solar Project to be located approximately 23 kilometres (km) southwest of Narrandera in Western NSW. The solar park would occupy 2,600 ha within the 3,000 ha project site. The project has been deemed 'State Significant Development' and will be assessed under Part 4 (Division 4.1) of the NSW *Environmental Planning and Assessment Act 1979*.

This Biodiversity Development Assessment Report has been prepared in accordance with the NSW Biodiversity Assessment Method (BAM).

The assessment reveals that the project site contains the following features and biodiversity values:

- The project site is relatively flat and lies within an alluvial floodplain to the west of Washpen Creek.
- The project site contains three constructed dams, all of which lack aquatic and emergent vegetation.
- The soils within the project site are derived from quaternary alluviums which consist of grey, brown and red cracking clays.
- A total of 74 plant species were recorded on the project site. These comprised 41 native species and 33 exotic species.
- No threatened plant species listed under the NSW *Biodiversity Conservation Act 2016* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were recorded.
- Three native plant communities were identified:
 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion);
 - Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina and Murray Darling Depression Bioregions); and
 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone.
- The stands of White Cypress Pine open woodland are commensurate with the threatened community *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions*, which is listed as 'endangered' under the NSW *Biodiversity Conservation Act 2016*. A patch of this community occurs in the western parts of the site. The proposed solar panel layout avoids this patch and therefore the proposal will not require any removal of this threatened community.
- A total 68 fauna species were recorded on the project site, comprising 43 birds, 18 mammals, six reptiles and one amphibian.
- Two threatened fauna species listed under the BC Act were identified:
 - Brown Treecreeper (*Climacteris picumnus victoriae*) - Vulnerable
 - Inland Forest Bat (*Vespadelus baverstocki*) – Vulnerable

EXECUTIVE SUMMARY

The proposed layout of the solar project has been specifically designed to avoid areas of biodiversity value, which for the Project site, comprise generally isolated patches of relict (or regrowth) woodland and riparian vegetation along watercourses. Impacts of the proposed development on biodiversity values are minimal given that no native vegetation, threatened ecological communities or threatened species habitats will be removed or directly impacted. Avoidance measures and mitigation measures have been presented to reduce the potential for indirect impacts to biodiversity values that will be retained within the project site. These measures are relevant to the construction and operational phases of the project.

The proposed development footprint will be restricted to existing areas of agricultural land (being areas of grazing land, wheat crop and canola crop) that are devoid of native vegetation or habitat for threatened species. Accordingly, in accordance with the BAM, no biodiversity offsets are required for approval of the proposed development.

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Stage 1 – Biodiversity Assessment

1 Introduction

This section introduces the proposal and provides the context of the Biodiversity Development Assessment Report (BDAR). The proposal, landscape context, key features of the Project site and report objectives are detailed below.

1.1 The Project

Reach Solar énergy (Reach Solar) is proposing the development of the 900 Megawatt (MWac) Yarrabee Solar Project to be located approximately 23 kilometres (km) southwest of Narrandera in Western NSW. This BDAR identifies and assesses the potential for impacts to biodiversity associated with the construction and operation of a proposed 900 MW photovoltaic (PV) solar project that will connect to the 330 kilovolt (kV) Wagga to Darlington Point Transmission Line. This line has been identified as a priority renewable energy zone in the recent Independent Review into the Future Security of the National Electricity Market. The scale and location of the Yarrabee Solar Project allows it to offer a tariff which is competitive with black coal, provides ancillary services which will assist the grid, and provide a material contribution to meeting the Paris Accord.

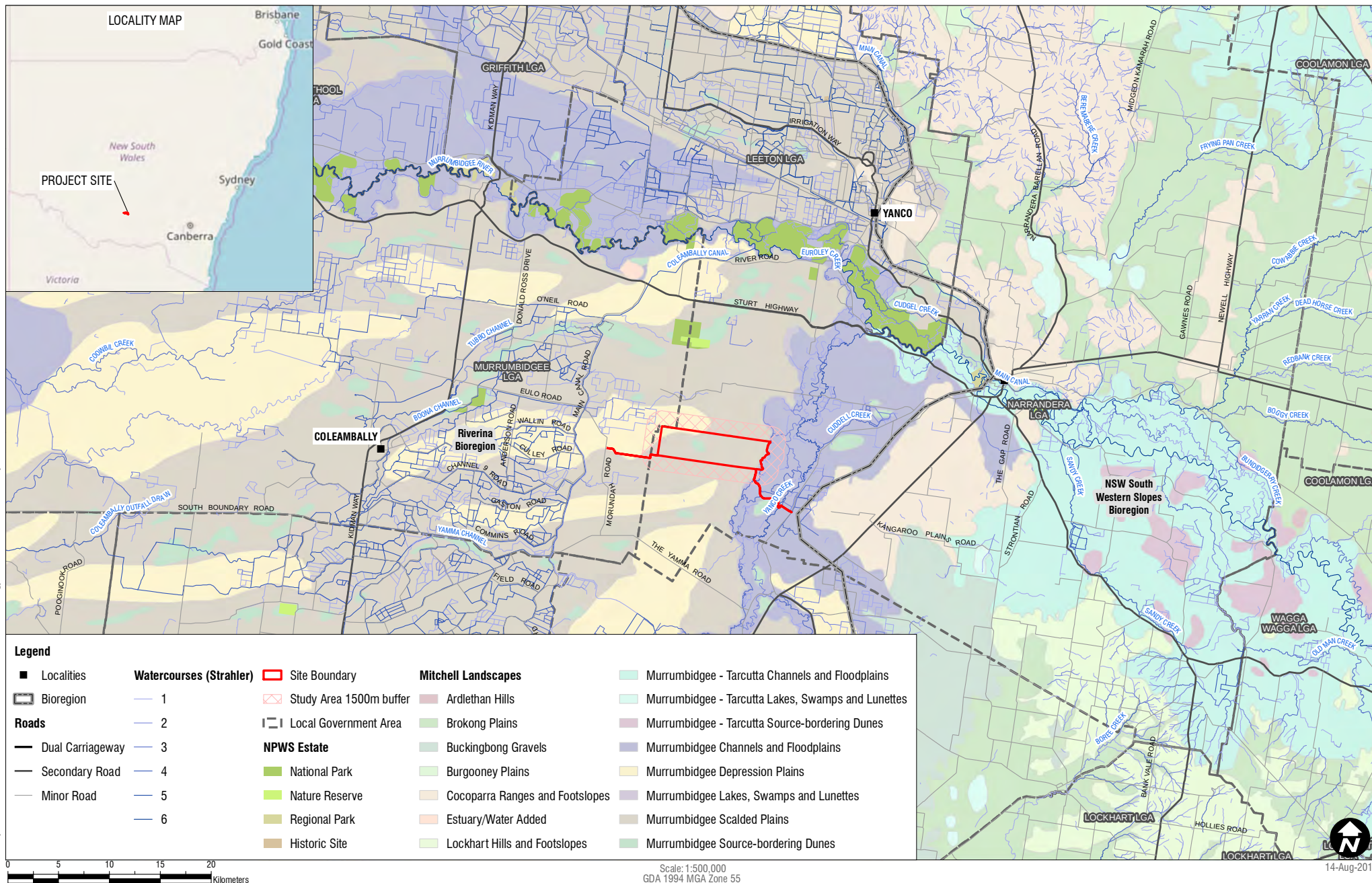
The solar project would occupy 2,600 ha within the 3,000 ha project site (hereafter referred to as ‘the Project site’). The Project is expected to include solar photovoltaic (PV) modules and single axis tracking system, inverter stations, a new substation, energy storage, grid connection, security perimeter fencing, designated buffer zones for confirmed environmentally and culturally sensitive areas, internal access tracks, underground cabling and ancillary services including a Project site office.

1.2 The Project Site

The Project site is located in the Narrandera local government area (LGA) in Western NSW, approximately 23 km southwest of Narrandera (**Figure 1**). The proposed development is sized to accommodate 900 MWac on 2,600 ha, including 100 ha for temporary construction laydown areas.

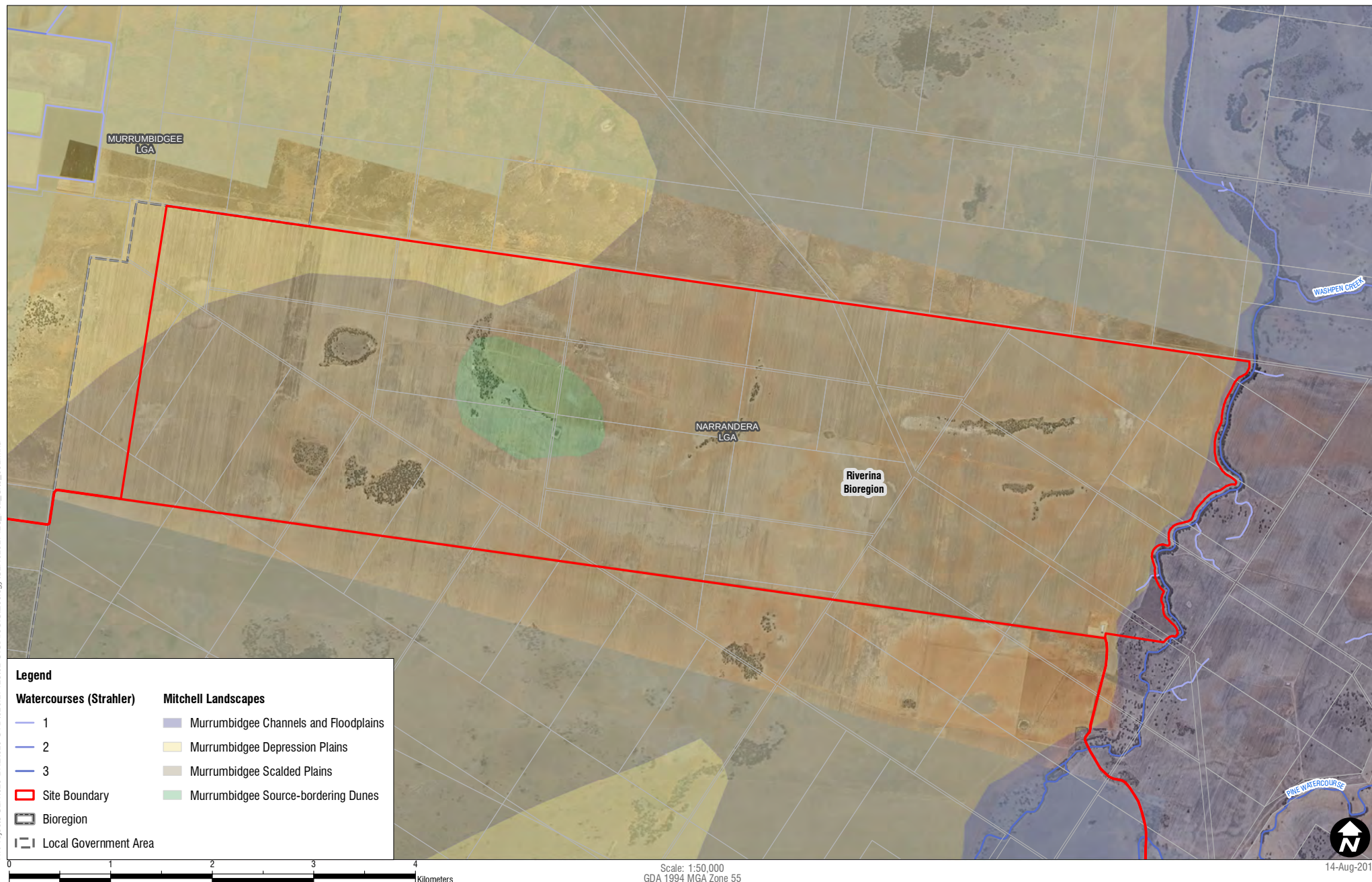
The Project site occupies all or part of the parcels of land titles identified in **Figure 2**. The Project site is zoned “RU1 - Primary Production” under the provisions of the *Narrandera Shire Council Local Environment Plan 2013* (Narrandera LEP). The long-standing and existing use of the Project site is traditional agricultural production.

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1.3 Project Description

The Project comprises the construction of a 900 MWac photovoltaic (PV) solar plant to be developed in stages. The number of stages to be constructed is dependent on factors including:

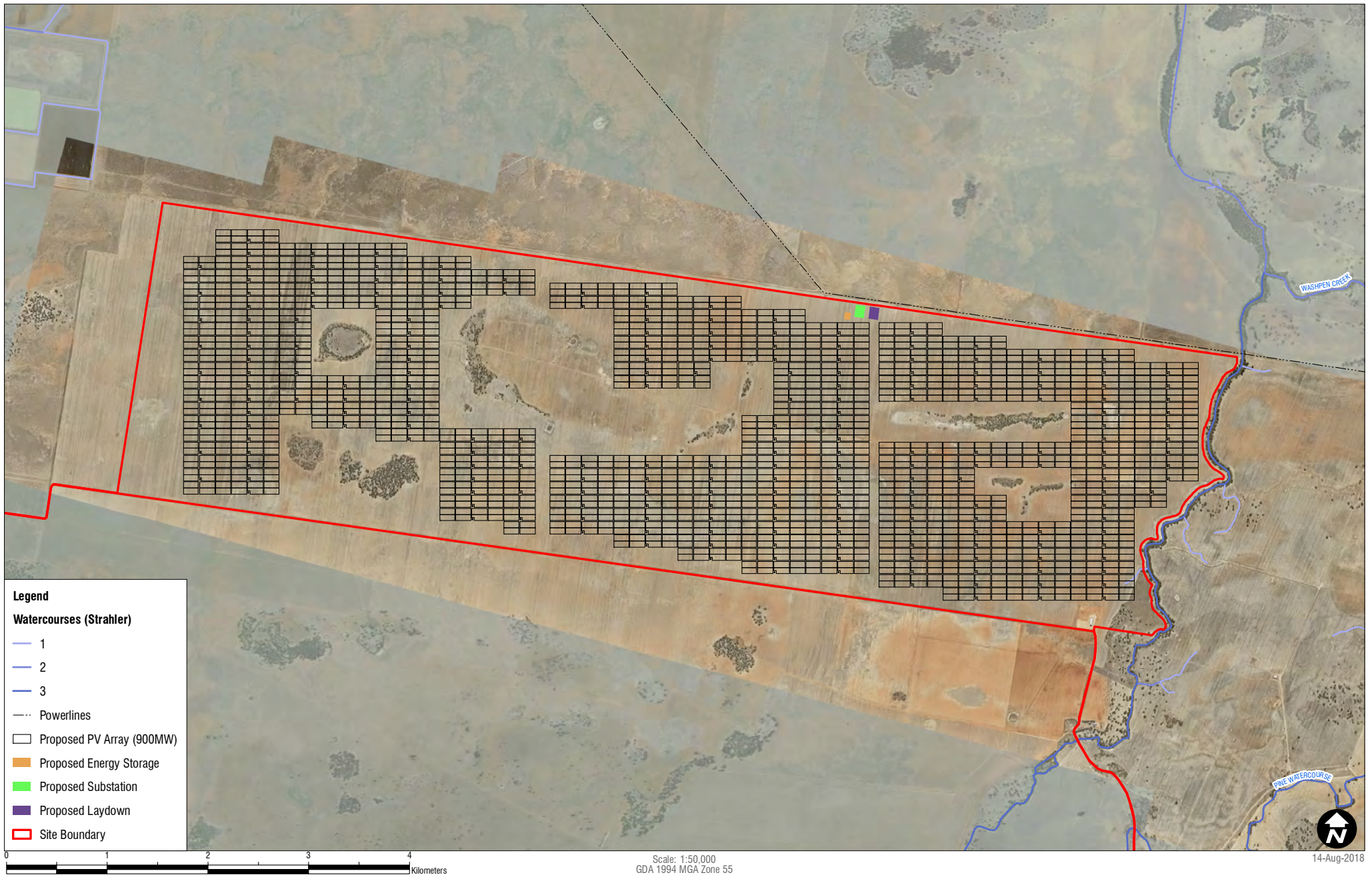
- The contractual obligations for the purchase of electricity by one or more third parties; and
- The capacity of the high voltage transmission network to which the Project will be connected for the export of generated electricity.

The Project is expected to include the following elements:

- PV modules using solar panels and single axis tracking system;
- inverter stations and low-voltage and medium voltage reticulation systems;
- ancillary services equipment to assist the grid operations;
- synchronous condensers may be installed if required by the System Network Provider;
- a permanent office and maintenance building;
- internal access tracks to enable site maintenance;
- access to Project site from Yamma Road, Back Morundah Road, Main Canal Road and Old Morundah Road;
- a substation to be constructed within close proximity to the existing 330 kV Wagga to Darlington Point transmission line;
- potential energy storage located adjacent to the substation that is likely to have a storage capacity of approximately 50MW / 100MWhrs.
- grid connection from the new substation to the existing 330 kV Wagga to Darlington Point transmission line;
- designated buffer zones to areas of confirmed native vegetation and Washpen Creek riparian vegetation;
- designated buffer zones to areas of confirmed cultural and heritage significance;
- security perimeter fencing; and
- temporary construction laydown areas and ancillary facilities.

An indicative layout for the 900 MWac Project is presented in **Figure 3**.

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1.4 Report Objectives

1.4.1 Biodiversity Assessment Method

This BDAR has been prepared in accordance the NSW *Biodiversity Assessment Method* (OEH 2017c) and aims to:

- Outline the methods used to identify the biodiversity values within the Project site;
- Describe the biodiversity values within the Project site, including:
 - The presence of native vegetation and its integrity;
 - The presence and extent of each Plant Community Type (PCT);
 - The presence of flora and fauna species, and the extent of their respective habitats;
 - The presence of threatened species, populations and ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act); and
 - The presence of matters of national environmental significance, particularly threatened ecological communities (TECs), threatened species and migratory species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- To assess potential impacts of the proposal on biodiversity values, including prescribed impacts and serious and irreversible impacts (SAIIs), in terms of biodiversity credits (i.e. ecosystem credits and species credits) as per the BAM (OEH 2017b);
- Recommend mitigation and environmental management measures to avoid and/or minimise adverse impacts on biodiversity values; and
- Determine whether a biodiversity offset is required for project approval, as per the requirements of the BAM.

1.4.2 Secretary's Environmental Assessment Requirements

A project scoping report and request for Secretary's Environmental Assessment Requirements (SEARs) relating to the content of the environmental impact statement (EIS) required to accompany the project application for the Project was submitted to the NSW Department of Planning and Environment in March 2018. The SEARs were subsequently issued by DP&E on 20 April 2018.

A project scoping report and request for Secretary's Environmental Assessment Requirements (SEARs) relating to the content of the environmental impact statement (EIS) required to accompany the project application for the Project was submitted to the NSW Department of Planning and Environment in March 2018. The SEARs were subsequently issued by DP&E on 20 April 2018.

In relation to biodiversity, the SEARs state that the EIS is required to contain '*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).*'

1.4.3 NSW Office of Environment and Heritage Assessment Requirements

In response to a request for input to the SEARS the NSW Office of Environment and Heritage (OEH) requested the following in relation to the BDAR:

- *'The list of predicted threatened species should be generated through a BioNet search by IBRA sub-region (Riverina – Murrumbidgee);*
- *Diuris pedunculata (small snake orchid) is not included in BioNet as recorded in central southern NSW and should be removed from the predicted species list;*
- *Southern Bell Frog (Litoria raniformis) has been recorded within six kilometres of the proposal site and remnant vegetation within and surrounding drainage depressions could provide habitat. The likelihood of occurrence for southern bell frog should be revisited.*
- *All native vegetation on the site that will be impacted by the proposal must be identified and included in the assessment.*
- *Paddock trees occur across the site that may provide habitat for threatened species that have been recorded locally, including the Superb Parrot (Polytelis swainsonii). If paddock trees are to be impacted, the EIS should detail the value of paddock tree habitat to all threatened species known or likely to occur in the area and an assessment of the impacts of clearing those trees.*
- *The native vegetation present may also be a threatened ecological community or habitat for a threatened species listed on the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. The assessment should identify any relevant Matters of National Environmental Significance and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action.*
- *Habitat mapping for the threatened Plains-wanderer (Pedionomus torquatus) produced in 2001 (Roberts and Roberts) includes parts of the proposal site as secondary habitat. This habitat may no longer be available due to past land use practices. However, if the site is found to contain suitable habitat for Plains-wanderer then the importance of the site would need to be determined and impacts on Plains-wanderer assessed.*
- *Surveys for Plains-wanderer must be conducted in potential habitat on the site (Forb-rich Speargrass – Windmill Grass – White Top grassland of the Riverina Bioregion) when this grassland has suitable structure, i.e. has not been grazed for at least six months.*
- *While Plains-wanderer may be detected at any time of the year, surveys are best conducted in Spring when birds have paired for breeding.*
- *There may be additional survey requirements for this species under the Commonwealth's Environment Protection and Biodiversity Conservation Act 1999.'*

1.5 Key Acts and Policies

1.5.1 NSW Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (NSW EP&A Act) forms the legal and policy platform for proposal assessment and approval in NSW and aims to ‘*encourage the proper management, development and conservation of natural and artificial resources*’. All development in NSW is assessed in accordance with the provisions of the EP&A Act and EP&A Regulation 2000.

The project is deemed to be ‘State Significant Development’ by virtue of *State Environmental Planning Policy (State and Regional Development) 2011* and pursuant to Division 4.7 of the NSW EP&A Act.

1.5.2 NSW Biodiversity Conservation Act 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act), the NSW *Biodiversity Conservation Regulation 2017* (NSW BC Regulation) and amendments to the *Local Land Services Act 2013* (NSW LLS Act) commenced on 25 August 2017. The legislation aims to deliver “a strategic approach to conservation in NSW whilst supporting improved farm productivity and sustainable development” (OEH 2018b). The BC Act repeals several pre-existing Acts, most notably the *Threatened Species Conservation Act 1995* (NSW TSC Act), the *Nature Conservation Trust Act 2001* and the *Native Vegetation Act 2003*. Relevant provisions from each of the repealed Acts has been saved and incorporated into the new legislative framework. Transitional arrangements are in place to ensure a smooth transition from the repealed legislation to the BC Act.

In accordance with the BC Act, the BAM (OEH 2017c) and entry into the Biodiversity Offsets Scheme (BOS) is applicable to certain development activities based on specific criteria. Preparation of a Biodiversity Development Assessment Report (BDAR) is required for a development application that meets any of the following criteria:

- Part 4 development activities deemed to be ‘State Significant’ under the NSW *Environmental Planning and Assessment Act 1979* (NSW EP&A Act);
- Development activities that have the potential to impact Areas of Outstanding Biodiversity Value (AOBV) as listed under Part 3 of the BC Act;
- Development activities that have the potential to cause a significant impact on a threatened species, population or ecological community, listed under Schedules 1 and 2 of the BC Act, as determined by application of a five-part-test of significance in accordance with Section 7.3 of the BC Act;
- Development activities that have the potential to impact areas mapped as having ‘high biodiversity value’ as indicated by the NSW Biodiversity Values Map (BV Map); and
- Development activities that involve clearing of native vegetation that exceeds the Biodiversity Offset Scheme thresholds (BOS thresholds) as determined by the NSW BC regulation.

1.5.3 NSW Biodiversity Values Map

SLR reviewed the NSW Biodiversity Values Map (BC Map) on 16 May 2018 and found that no areas of high biodiversity value are mapped within the Project site.

1.5.4 NSW Biosecurity Act 2015

The NSW *Biosecurity Act 2015* provides a streamlined statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds. The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Priority weeds recorded within the Project site are addressed in **Section 3.2** of this report.

1.5.5 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* aims to conserve nature, objects, places or features (including biological diversity) of cultural value within the landscape. The Act also aims to foster public appreciation, understanding and enjoyment of nature and cultural heritage, and provides for the preservation and management of national parks, historic sites and certain other areas identified under the Act. The Act is administered by the NSW Office of Environment and Heritage (OEH).

No areas of National Park estate occur within or adjacent to the Project site. An assessment of the proposal in relation to impacts on native flora and fauna; with an emphasis on threatened species and habitat, is undertaken in **Section 4**.

1.5.6 NSW Water Management Act

Controlled activities carried out in, on or under waterfront land are regulated by the NSW *Water Management Act 2000* (WM Act). The NSW Department of Primary Industries – Water administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 m of the highest bank of the river, lake or estuary. This means that a controlled activity approval must be obtained from the Department of Primary Industries – Water before commencing the controlled activity.

The development footprint lies to the east of Washpen Creek, which is a third order stream; however, the development does not occur within 40 m of this waterway, or any other waterway. Therefore, the proposal is not a controlled activity and approval is not required under the WM Act. An assessment of indirect impacts of the proposal, such as the effects of sedimentation during construction activities, is undertaken in **Section 4**. Mitigation measures to reduce these effects are presented in **Section 5**.

1.5.7 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on 'matters of national environmental significance' undergo an assessment and approval process. Under the EPBC Act, an action includes a proposal, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Minister for the Environment.

The EPBC Act identifies matters of NES as:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar Wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

As part of the current investigation, matters of national environmental significance (and their habitats) that are predicted to occur within the locality (applying a 10 km buffer) were obtained from the on-line Protected Matters Search Tool (DEE 2018). These records are discussed in **Section 2.4**. The EPBC Act has been further addressed in this assessment through:

- Targeted field surveys for EPBC listed threatened biota and migratory species;
- Assessment of potential impacts on EPBC listed threatened species and migratory biota;
- Identification of suitable impact mitigation and environmental management measures for EPBC listed threatened species and migratory biota; and
- Identification of the need for an EPBC referral based on the EPBC Act *Significant Impact Guidelines 1.1* (DEWHA 2013).

1.5.8 State Environmental Planning Policy No. 44- Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims to encourage the ‘proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus*) to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline’. A new version of SEPP 44 is currently being amended by the NSW Department of Planning and Environment and consultation has now closed on the draft. Key changes to the amended SEPP 44 relate to the following:

- Definitions of koala habitat;
- List of Koala feed tree species;
- List of councils to which the SEPP applies; and
- Various changes to the development assessment process.

SEPP 44 does not apply to State Significant Projects. Notwithstanding this, a brief discussion of the main requirements of the policy has been included here to describe the Koala habitat (if present) on the site and the relevance of the site to the occurrence of the Koala.

Narrandera LGA is identified in Schedule 1 of SEPP 44 as being an area to which the SEPP applies. Preferred Koala feed tree species include those identified in Schedule 2 of the SEPP. This list was reviewed to determine if any Koala feed trees were present within the Project site prior to the biodiversity assessment. Following the biodiversity assessment, *Eucalyptus camaldulensis* (River Redgum) was identified as a listed Koala feed tree species that is abundant within some woodland patches within the Project site. Accordingly, the patches of vegetation within the site where River Red Gum makes up more than 15 % of the tree canopy (including the riparian zone of Washpen Creek) would qualify as 'potential Koala habitat' in accordance with Clause 7 of SEPP 44. However, due to a lack of recent Koala sightings, low numbers of Koala records within the locality and the fragmented nature of potential Koala habitat within and surrounding the site, the Project site does not constitute 'core Koala habitat', as defined under Clause 8 of the policy.

1.5.9 Local Environmental Planning Instruments

The Project site is located within the Narrandera Shire Local Government Area (LGA). The *Narrandera Shire Local Environmental Plan 2013* (LEP 2014) controls development within the Project site through zoning and development controls.

2 Stage 1 Biodiversity Assessment Methodology

This chapter described the methods undertaken to identify biodiversity values within the Project site in accordance with Stage 1 of the BAM.

2.1 Personnel

The roles and qualifications of all staff responsible for preparation of this BDAR are listed in **Table 1**.

Table 1 Staff Roles and Qualifications

Staff Name	Project Role	Qualifications
Jeremy Pepper Principal Ecologist	Report review and Project Management	Bachelor of Science (Hons Class 1) University of NSW 1996 Certificate II Bushland Regeneration, TAFE NSW BAM accredited assessor (BAAS17104)
Dr. Gilbert Whyte Associate Botanist	Project Management Field work and Report drafting	Doctor of Philosophy (PhD), Murdoch University, Perth Western Australia. Bachelor of Biological Sciences, 1st Class Honours, La Trobe University, Melbourne, Victoria. BAM accredited assessor (BAAS18041)
Daniel O'Brien Senior Ecologist	Field work and Report drafting	Bachelor of Environmental Science and Management (Hons Class 1), University of Newcastle Doctorate of Philosophy candidate, University of Wollongong
Matthew Doherty Project Ecologist	Data Analysis	Bachelor of Environmental Science and Management, University of Newcastle 2016
Peter McGown CAD/GIS Manager	GIS Analysis and Mapping	Associate Degree of Geographic Information Systems, University of Southern Queensland 2002

2.2 Information Sources

Existing information on the flora and fauna of the Project site and the locality, including relevant threatened biota was also obtained from:

- Regional vegetation mapping: *Vegetation of Central and Southern NSW* (OEH 2017d);
- The NSW Office of Environment and Heritage (2018a) *BioNet Atlas of NSW* for previous records of threatened species, populations and ecological communities (as listed under the BC Act) within the Riverina - Murrumbidgee IBRA Subregion (date searched 23/05/2018);
- The Department of the Environment and Energy (2018a) *Protected Matters Search Tool*, which involved a search for matters of national environmental significance within a 10-kilometre radius centred on the centre of the site (date searched 24/01/2018);
- Department of the Environment and Energy (2018b). *Species Profile and Threats Database* (SPRAT);
- The NSW Office of Environment and Heritage (2018c) *Threatened Species Profiles*; and
- Relevant published literature on threatened biota (see References – **Section 6**).

The results of the database searches were used to compile and list of threatened species, populations and communities (i.e. listed under the BC Act and EPBC Act) that could potentially occur within the Project site. A likelihood of occurrence of these species is presented in **Attachment A**. The results of the EPBC protected matters search is presented in **Attachment B**.

2.3 Field Assessment

The field assessment was undertaken by SLR Associate Ecologist, Gilbert Whyte, and SLR Senior Ecologist, Daniel O'Brien. Vegetation assessment and threatened flora surveys were conducted on the 19/02/2018 and 23/02/2018. Fauna surveys and habitat assessments were conducted between the 19/02/2018 and the 19/04/2018. Methods utilised during the field surveys are described in the following sections. The assessment was undertaken in accordance with the BAM (OEH 2017c) and with reference to the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (DEC 2004). Limitations of the surveys are discussed in **Section 2.6**.

2.3.1 Vegetation Mapping

Native vegetation types were identified based on dominant flora species present within each structural layer (i.e. canopy, shrub and ground layers). Exotic or highly modified native vegetation was defined based on structure and species composition. Boundaries of vegetation types and communities were marked with a hand-held GPS and mapped using geographical information system (GIS) software.

Vegetation types within the Project site were assessed against identification criteria for State and Commonwealth listed threatened ecological communities (DoEE 2018b and OEH 2018c). Vegetation and habitats were compared with descriptions provided in the Bionet Vegetation Information System (OEH 2018b) to identify Plant Community Types (PCTs).

The vegetation condition of each PCT was defined as either good, moderate or high based on the definitions presented in **Table 2**. Vegetation condition was then used to delineate vegetation zones as required by the BAM (OEH 2017c).

Table 2 Vegetation Condition Definitions

Vegetation Condition	Definition
Good	Vegetation retaining the species complement and structural characteristics of the pre-European equivalent. Such vegetation has usually changed very little over time and displays resilience to weed invasion due to intact groundcover, shrub and canopy layers.
Moderate	Vegetation retaining a native canopy and has a native understorey of greater than 50% cover. This condition class can include derived native grasslands and can have minor weed incursions with some patches being subject to grazing.
Low	Vegetation within which the understorey is generally dominated by exotic species being greater than 50% exotic cover. The shrub layer is generally absent and weed invasion is generally significant.

2.3.2 Vegetation Survey Plots (BAM Plots)

Following delineation of the PCT vegetation zones within the Project site, 400 m² floristic plot/transects (BAM Plots) were sampled. Plot/ transects were positioned to sample areas that were most representative of the floristic characteristics of each PCT vegetation zone. The number of plot/transects sampled in each vegetation zone was based on the requirements of the BAM (OEH 2017c), which are presented in **Table 3**.

Table 3 Minimum number of plots and transects required per vegetation zone area

Vegetation Zone Area (ha)	Minimum number of plots/transects
< 2	1 plot/transect
> 2-5	2 plot/transect
> 5-20	3 plot/transect
> 20-50	4 plot/transect
> 50-100	5 plot/transect
> 100-250	6 plot/transect
> 250-1000	7 plot/transect
> 1000	8 plot/transect

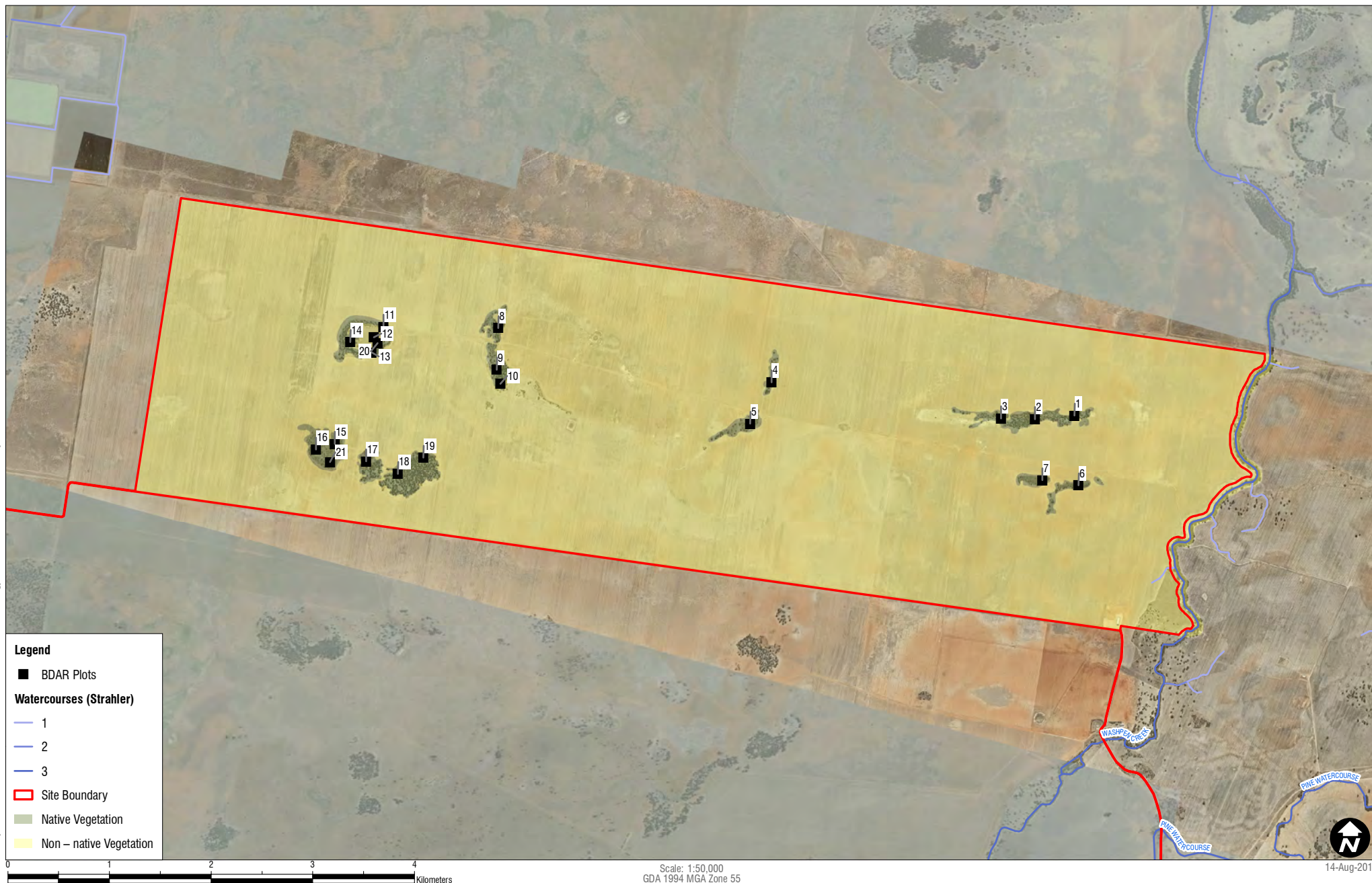
Vegetation integrity was determined using data collected from vegetation survey plot/ transects (BAM Plots) by examining the vegetation composition, structure and function attributes as follows:

- The assessment of vegetation composition was based on the number of native plant species (richness) observed within the 400 m² plot/transect (standard 20 m x 20 m BAM Plot);
- The assessment of vegetation structure was based on the % of foliage cover for each plant growth form group within the 400 m² plot (standard 20 m x 20 m BAM plot); and
- The assessment of vegetation function was based on an assessment of the following attributes within the 1,000 m² plot (20 m x 50 m BAM Plot):
 - Number of large trees
 - Tree regeneration
 - Tree stem size class
 - Total length of fallen logs
 - Litter cover (i.e. assessed using five 1 m² quadrats along the 50 m transect)
 - High threat exotic vegetation cover
 - Hollow bearing trees

For a more detailed description of how vegetation integrity is calculated, refer to the BAM (OEH 2017c).

The vegetation survey is summarised in **Figure 4**.

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2.3.3 Threatened Flora Surveys

Targeted threatened flora surveys were conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH 2016) for species identified during the desktop review. Threatened flora surveys consisted of a random meander followed by parallel field traverses (i.e. 10 m apart) in suitable habitats. This methodology is consistent with the survey effort required to adequately detect threatened herb, shrubs and trees in woodland habitat. Threatened flora species identified as requiring targeted surveys were determined based on previous records and habitat suitability. A likelihood of occurrence assessment for these species is presented in **Attachment A**.

A summary of the target threatened flora species and their corresponding seasonal detectability is presented in **Table 4**. Note that the survey effort did not coincide with the detectability for all threatened flora with a moderate likelihood of occurrence within the Project site. These limitations are further discussed in **Section 2.6**.

Table 4 Target Threatened Flora Species and Seasonal Detectability

Threatened Flora Species	Seasonal Detectability
Bindweed <i>Convolvulus tedmoorei</i>	Detectable when in flower: late winter (August) and early spring (September)
Chariot Wheels <i>Maireana cheelii</i>	Detectable when in flower: mostly spring to summer. Bears fruits mostly from September to November.
Claypan Daisy <i>Brachyscome muelleroides</i>	Detectable when in flower: September to November
Hoary Sunray <i>Leucochrysum albicans</i> var. <i>tricolor</i>	Detectable when in flower: mainly summer
Lanky Buttons <i>Leptorhynchus orientalis</i>	Detectable when in flower: late winter (August) and spring (October).
Menindee Nightshade <i>Solanum karsense</i>	Detectable when in flower: chiefly in spring.
Oaklands Diuris <i>Diuris</i> sp. (Oaklands, D.L. Jones 5380)	Detectable when in flower: chiefly in spring.
Red Darling Pea <i>Swainsona plagiotropis</i>	Detectable when in flower: August to November, with fruit maturing in November
Sand-hill Spider Orchid <i>Caladenia arenaria</i>	Detectable when in flower: September and November
Silky Swainson-pea <i>Swainsona sericea</i>	Detectable when in flower: chiefly in spring.
Slender Darling Pea <i>Swainsona murrayana</i>	Detectable when in flower: spring to early summer and then die back after flowering
Small Scurf-pea <i>Cullen parvum</i>	Detectable when in flower: chiefly in spring
Winged Peppergrass <i>Lepidium monoplocoides</i>	Detectable when in flower: late winter to spring, or August to October

2.3.4 Plant Identification and Nomenclature

Plant identification and nomenclature was based on species descriptions presented within *The Flora of New South Wales* Volumes 1 to 4 (Harden, 1992 - 2002) and the taxonomic updates in PlantNET - The Plant Information Network System of Botanic Gardens Trust, Sydney, Australia (NSW Botanic Gardens, 2016).

2.3.5 Fauna Surveys

Fauna surveys and habitat assessments were undertaken during February and March 2018 to assess and map the presence of fauna species and their corresponding habitats within the Project site. Fauna surveys also include remote survey methodologies including cameras and song recorders. Surveys and habitat assessments also included relevant threatened fauna species, particularly the Plains-wanderer and Southern Bell Frog.

In identifying fauna survey requirements, the following key guidelines were considered:

- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, for threatened species (excluding frogs) listed under the BC Act (DEC 2004).
- Amphibians - Threatened species survey and assessment guidelines: field survey methods for fauna - Amphibians (DoE 2009)
- Threatened bats - Survey Guidelines for Australia's Threatened Bats, Commonwealth of Australia (DEWHA 2010a)
- Threatened birds - Survey Guidelines for Australia's Threatened Birds, Commonwealth of Australia (DEWHA 2010b)
- Threatened reptiles - Survey Guidelines for Australia's Threatened Reptiles, Commonwealth of Australia (DEWHA 2011b)
- Threatened frogs - Survey Guidelines for Australia's Threatened Frogs, Commonwealth of Australia (DEWHA 2010)
- Threatened mammals - Survey Guidelines for Australia's Threatened Mammals, Commonwealth of Australia (DEWHA 2011a).

Fauna Habitat Assessment

Fauna habitat assessments were undertaken by two SLR ecologists between 19/02/2018 and 23/02/2018. The locations of any important habitat features, such as microbat roosting habitat, hollow-bearing trees and nests/burrows were captured with a handheld GPS unit and photographed where appropriate.

Searches for potential habitat for threatened fauna species included but were not limited to:

- Koala feed trees;
- Foraging trees for threatened arboreal fauna;
- Hollow-bearing trees;
- Potential roosts for microchiropteran bats;
- Vegetated waterbodies, riparian vegetation and drainage lines for frogs and waterbirds; and
- Terrestrial refugia such as woody debris and logs.

For threatened species with specific or complex microhabitat requirements, targeted habitat assessments were employed at selected sites, using a strategic combination of indicators that measure habitat suitability and viability. Targeted habitat assessments were conducted for Plains-wanderer (*Pedionomus torquatus*) and the Southern Bell Frog (*Litoria raniformis*) that are known to occur in the locality and present complex habitat requirements. Targeted habitat assessments provide the ability to direct survey effort to areas of high to moderate suitability.

Habitat for the Plains-wanderer was assessed according to their specific habitat requirements, including:

- Percentage of grass/herb cover – prefers 40%,
- Percentage of bare ground – prefers 50%,
- Percentage of litter cover – prefers 10%,
- Percentage of rock cover – no preference,
- Mean grass/herb height – prefers < 5cm,
- Maximum grass/herb height – prefers < 30cm,
- Ratio of native: exotic grasses/herbs – prefers native grassland,
- Soil type – prefers red-brown loams, and
- Evidence of grazing – prefers optimal level to maintain ground cover and height.

Habitat for the Southern Bell Frog was assessed according to the potential for waterbodies to provide breeding habitat. Targeted habitat assessments were conducted at all waterbodies present on site according to the specific habitat requirements of the species in New South Wales, including:

- Waterbody permanence – prefers both permanent and ephemeral,
- Waterbody type – prefers swamps, marshes, billabongs and irrigation channels,
- Size (diameter) – preference varies,
- Bank angle – prefers gentle or gradual banks,
- Emergent vegetation – requires emergent and aquatic vegetation for breeding,
- Emergent vegetation species - prefers cumbungi or Common Reeds,
- Adjacent vegetation/refuge cover – prefers fallen timber, bark, rocks, grass clumps,
- Presence of predatory fish or insects – carp, goldfish, *Gambusia* pose threats, and
- Turbidity or pollution – high runoff, disturbance and pollution pose threats.

Diurnal Opportunistic Fauna Surveys

Diurnal opportunistic and incidental observations of fauna species were recorded at all times during field surveys from the 19/02/2018 to 23/02/2018. These included opportunistic observation of fauna activity such as scats, tracks, burrows or other traces. Fauna species that were observed were recorded and identified to species level. Specifically, threatened bird species that inhabit a wide range of habitats (potentially occurring within the Project site) and are active during all daylight hours were recorded opportunistically:

- Spotted Harrier (*Circus assimilis*);
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri*);

- Black Falcon (*Falco subniger*);
- Little Eagle (*Hieraaetus morphnoides*);
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*); and
- Black-breasted Buzzard (*Hamirostra melanosternon*).

Dawn Bird Surveys

Dawn bird surveys were completed on foot using a telephoto zoom lens during a 60-minute random meander through native vegetation patches. Systematic two hectare bird surveys were not undertaken given the irregular geographic nature of each vegetation patch within the Project site. Bird surveys were conducted between 19/02/2018 to 23/02/2018 during the hours of 0530-0830. Bird species that were detected were recorded and identified to species level visually or audibly.

The following threatened bird species were identified as having a moderate likelihood of occurrence within the Project site and were targeted during the dawn bird surveys:

- Dusky Woodswallow (*Artamus cyanopterus*);
- Diamond Firetail (*Stagonopleura guttata*);
- Varied Sittella (*Daphoenositta chrysoptera*);
- Bush Stone-curlew (*Burhinus grallarius*);
- Turquoise Parrot (*Neophema pulchella*);
- Superb Parrot (*Polytelis swainsonii*);
- Brown Treecreeper (*Climacteris picumnus victoriae*);
- Regent Honeyeater (*Anthochaera Phrygia*);
- Painted Honeyeater (*Grantiella picta*);
- Black-chinned Honeyeater - Eastern Subspecies (*Melithreptus gularis gularis*);
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*); and
- Scarlet Robin (*Petroica boodang*).

A likelihood of occurrence for these species and other threatened species previously recorded within the locality is presented in **Attachment A**.

Amphibian Surveys

According to the NSW Bionet Atlas (OEH 2018a), two threatened amphibian species are predicted or known to occur within the locality:

- Sloane's Froglet (*Crinia sloanei*); and
- Southern Bell Frog (*Litoria raniformis*).

Marginal habitat was identified within woodland patches for Sloane's Froglet during periods of flood. Permanent waterbodies (dams) did not contain riparian or aquatic vegetation preferred by either species and lacked connections to refuge sites. Surveys within woodland patches during flood events within the known breeding season of Sloane's Froglet (June-August) were not conducted. These survey limitations are further discussed in **Section 2.6**. Suitable habitat for the Southern Bell Frog was not identified within the Project site. All amphibians detected during nocturnal and diurnal surveys were identified.

Reptile Surveys

Reptiles were detected during 30-minute diurnal herpetofauna surveys within each woodland patch, although habitat was not identified within the Project site for any threatened reptile species previously recorded within the locality (**Attachment A**). All types of refuge cover were systematically searched for reptiles including woody debris, exfoliating bark, rocks and ground vegetation.

Nocturnal Spotlighting

Spotlighting was conducted over two separate nights between 19/02/2018 to 22/02/2018 at each native vegetation patch following the targeted nocturnal search transects. Surveys commenced 30 minutes after dusk following stag watching (see section 2.3.5.7). Each nocturnal survey was undertaken by two ecologists on foot using high-powered (1000 lumens) headlamps for one hour (two-person hours) between 2030 and 2300. Spotlighting was used to targeted arboreal, flying and ground dwelling mammals, nocturnal birds, reptiles and amphibians and the following threatened species:

- Barking Owl (*Ninox connivens*);
- Plains-wanderer (*Pedionomus torquatus*);
- Koala (*Phascolarctos cinereus*); and
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

Dusk Stag watching

Due to the abundance of hollow-bearing trees within the Project site, select trees were observed at dusk to detect arboreal fauna emerging from associated hollows. Hollow-bearing trees selected for stag-watching were those that showed evidence of usage (or likely usage) by arboreal fauna. Hollow-bearing trees were observed by the recorder for a period of approximately 30 minutes before dusk and for 30 minutes after dusk prior to spotlighting within each vegetation patch (19/02/2018 to 22/02/2018).

Remote Survey Methodologies

Remote camera trapping was conducted within each vegetation patch from 19/02/2018 to 19/04/2018 to detect terrestrial fauna including introduced species. Surveys specifically targeted exotic species (such as rabbits, foxes and cats) that are likely to impact native fauna present within each vegetation patch. A minimum of one remote camera was installed within each vegetation patch, directed towards a PVC bait station that contained a mixture of peanut butter, rolled oats and honey; or fish. The cameras were left in place for two months. Cameras are triggered to take photos when movement is detected using an infrared sensor. Photos were later analysed in house to identify fauna species.

Despite poor suitability of habitats to support Plains-wanderer, song metres were installed at two locations for two nights to target Plains-wanderer (21/02/2018 & 22/02/2018). Song metres were programmed to turn on and off at 30 minute intervals during the hours 1930-0630 during each night deployed. Audio recordings were later analysed in house to identify fauna species based on unique species calls.

The locations of the remote camera and song metres are presented in **Figure 5**.

Fauna Call Playback

Fauna call playback was used to survey for the following threatened fauna species:

- Barking Owl (*Ninox connivens*);
- Koala (*Phascolarctos cinereus*).

Fauna call playback was conducted using the methods of Debus (1995) and Debus & Rose (1994). Recorded calls of each threatened species were played through a megaphone after dusk on four separate nights from the 19/02/2018 to 22/02/2018 and involved an initial listening period of 15 minutes, followed by a spotlighting search for a two-hour period.

Microbat Surveys

Anabat Express detectors (Titley Scientific) were deployed for two consecutive nights between 19/02/2018 to 22/02/2018 at each vegetation patch within the Project site to collect microbat call data (**Figure 5**).

Analysis of all bat calls was completed. Calls were identified using zero-crossing analysis and AnalookW software by visually comparing the time-frequency graph and call characteristics (e.g. characteristic frequency and call shape) with reference calls and/or species call descriptions from published guidelines.

The guide *Bat calls of NSW: Region based guide to the echolocation calls of microchiropteran bats* (Pennay *et al.* 2004) was used to assist call analysis. Call identification was also assisted by consulting distribution information for possible species (Pennay *et al.* 2011; Churchill 2008; Duffy 2000) and records from the Bionet Atlas (OEH 2018a). No reference calls were collected during the survey.

A call (pass) was defined as a sequence of three or more consecutive pulses of similar frequency and shape. Calls with less than three defined consecutive pulses of similar frequency and shape were not identified to species level, but were used as part of the activity count for the survey area. Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (see Mills *et al.* 1996 and Duffy *et al.* 2000) as summarised in **Table 5**. Due to the high level of variability within a bat call and overlap in call characteristics between some species, a conservative approach was taken when analysing calls.

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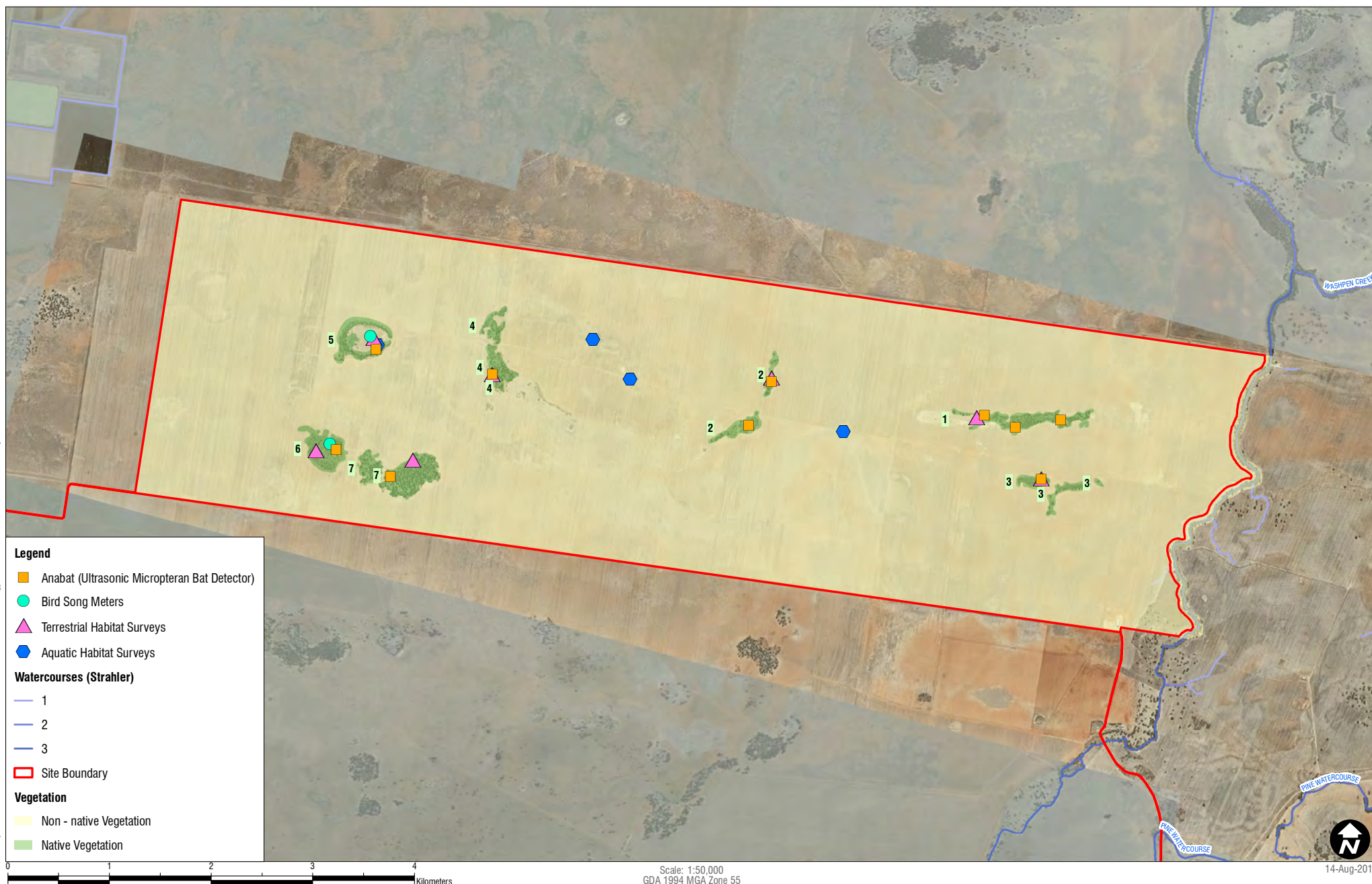


Table 5 Confidence rating applied to Anabat calls

Identification	Description
D – Definite	Species identification not in doubt.
PR – Probable	Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call type or call lacks sufficient detail.
SG – Species Group	Call made by one of two or more species, making it difficult to distinguish between species. For example the calls of <i>Chalinolobus gouldii</i> and <i>Ozimops</i> species and various <i>Nyctophilus</i> species can be easily confused during the analysis process and are therefore grouped.

Weather Conditions¹

A summary of the weather conditions during the survey period are presented in **Table 6**. These weather conditions were considered to be conducive to fauna activity within the Project site including target threatened fauna species.

Table 6 Weather Conditions during the Survey Period

Date	Conditions
19/02/2018	Clear and sunny day. Temperature between 35 and 24 degrees. Moderate to strong winds throughout the afternoon and early evening due to brief storm. Wind speeds around 43 km/h. 1-5 mm rainfall received.
20/02/2018	Clear and sunny day. Light winds: 26km/h. Temperatures ranging from 32 to 20 degrees. Clear night.
21/02/2018	Clear and sunny day. Calm: 9km/h. Temperatures ranging from 31 to 16 degrees. Clear night.
22/02/2018	Clear and sunny day. Light winds: 19km/h. Temperatures ranging from 34 to 19 degrees. Clear night.
23/02/2018	Clear and sunny day. Light winds: 12km/h. Temperatures ranging from 34 to 19 degrees.

Fauna Survey Effort Summary

A summary of the fauna survey effort is presented in **Table 7**.

• ¹ Weather conditions sourced from Bureau of Meteorology Weatherzone application (Weather Station: Narrandera Airport: 074148)

Table 7 Flora and Fauna Survey Effort Summary

Field Survey Technique	Target Species	Survey Effort	No. sites/units	Dates	Time
Threatened Flora Surveys	All flora including the following threatened plant species: • Bindweed (<i>Convolvulus tedmoorei</i>); • Chariot Wheels (<i>Maireana cheelii</i>); • Claypan Daisy (<i>Brachyscome muelleroides</i>); • Hoary Sunray (<i>Leucochrysum albicans</i> var. <i>tricolor</i>); • Lanky Buttons (<i>Leptorhynchos orientalis</i>); • Menindee Nightshade (<i>Solanum karsense</i>); • Oaklands Diuris (<i>Diuris</i> sp. - Oaklands, D.L. Jones 5380); • Red Darling Pea (<i>Swainsona plagiotropis</i>); • Sand-hill Spider Orchid (<i>Caladenia arenaria</i>); • Silky Swainson-pea (<i>Swainsona sericea</i>); • Slender Darling Pea (<i>Swainsona murrayana</i>); • Small Scurf-pea (<i>Cullen parvum</i>); and • Winged Peppergrass (<i>Lepidium monoplocoides</i>).	5 days	-	19/02/2018- 23/02/2018	9am-5pm
Flora Survey Plot/Transects	As above	5 days	22 Plots	19/02/2018- 23/02/2018	9am-5pm
Fauna Habitat Assessment	General fauna and targeted assessments for: • Southern Bell Frog (<i>Litoria raniformis</i>) • Plains-wanderer (<i>Pedionomus torquatus</i>)	5 days	7 Sites	19/02/2018- 23/02/2018	9am-5pm
Opportunistic Fauna Surveys	All fauna including diurnal threatened birds: • Spotted Harrier (<i>Circus assimilis</i>);	5 days	-	19/02/2018- 23/02/2018	5am-11pm

Field Survey Technique	Target Species	Survey Effort	No. sites/units	Dates	Time
	• 2 • Major Mitchell's Cockatoo (<i>Lophochroa leadbeateri</i>); • Black Falcon (<i>Falco subniger</i>); • Little Eagle (<i>Hieraaetus morphnoides</i>); • White-bellied Sea-Eagle (<i>Haliaeetus leucogaster</i>); • Black-breasted Buzzard (<i>Hamirostra melanosternon</i>);				
Dawn Bird Surveys	All birds including the following threatened bird species: • Dusky Woodswallow (<i>Artamus cyanopterus</i>); • Diamond Firetail (<i>Stagonopleura guttata</i>); • Varied Sittella (<i>Daphoenositta chrysoptera</i>); • Bush Stone-curlew (<i>Burhinus grallarius</i>); • Turquoise Parrot (<i>Neophema pulchella</i>); • Superb Parrot (<i>Polytelis swainsonii</i>); • Brown Treecreeper (<i>Climacteris picumnus victoriae</i>); • Regent Honeyeater (<i>Anthochaera Phrygia</i>) • Painted Honeyeater (<i>Grantiella picta</i>) • Black-chinned Honeyeater - eastern subspecies (<i>Melithreptus gularis gularis</i>) • Grey-crowned Babbler (<i>Pomatostomus temporalis temporalis</i>) • Scarlet Robin (<i>Petroica boodang</i>)	5 mornings	7 Sites	19/02/2018- 23/02/2018	5:30am-8:30am
Amphibian Waterbody Assessment	All amphibian species including the following threatened species: • Southern Bell Frog (<i>Litoria raniformis</i>); • Sloane's Froglet (<i>Crinia sloanei</i>)	5 days	5 Sites	19/02/2018- 23/02/2018	9am-5pm

Field Survey Technique	Target Species	Survey Effort	No. sites/units	Dates	Time
Reptile Survey	All reptile species	5 days	7 Sites	19/02/2018- 23/02/2018	9am-5pm
Nocturnal Spotlighting	Nocturnal fauna species and the following threatened species: - Barking Owl (<i>Ninox connivens</i>); - Koala (<i>Phascolarctos cinereus</i>); - Plains-wanderer (<i>Pedionomus torquatus</i>) - Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)	4 nights	7 Sites	19/02/2018- 22/02/2018	8.30-11pm
Dusk Stag Watching	Targeting the Barking Owl (<i>Ninox connivens</i>);	4 nights	7 Sites	19/02/2018- 22/02/2018	7:30-8:30pm
Camera Surveillance	All fauna (including pest species)	2 months	7 Sites	19/02/2018 to 19/04/2018	Continuous
Call Playback	Call playback was conducted to target the following threatened species: - Barking Owl (<i>Ninox connivens</i>); - Koala (<i>Phascolarctos cinereus</i>);	4 nights	7 Sites	19/02/2018- 22/02/2018	8.30-11pm
Microbat Surveys	Microbat species and the following threatened species: - Little Pied Bat (<i>Chalinolobus picatus</i>) - Inland Forest Bat (<i>Vespadelus baverstocki</i>) - Southern Myotis (<i>Myotis macropus</i>) - Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>)	4 nights	10 Sites/ 10 Anabats	19/02/2018- 22/02/2018	6:00pm -6:00am

2.4 Likelihood of occurrence

Following collation of database records and species and community profiles, a 'likelihood of occurrence' assessment was prepared with reference to the broad habitats contained within the Project site. The likelihood of threatened and migratory biota occurring in the proposal site was assessed based on presence of records from the locality, species distribution and habitat preferences, and the quality of potential habitat present, as defined in **Table 8**.

Table 8 Key to Likelihood of Occurrence for Threatened Species

Likelihood	Criteria
Present	The species was observed in the proposal site during the current survey.
High	It is highly likely that a species inhabits the proposal site and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 km) and is known or likely to maintain resident populations in the proposal site. Also includes species known or likely to visit the proposal site during regular seasonal movements or migration.
Moderate	Potential habitat is present in the proposal site. Species unlikely to maintain sedentary populations; however, may seasonally use resources within the proposal site opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the proposal site or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the proposal site and has not been recorded recently in the locality (10 km). It may be an occasional visitor, but habitat similar to the proposal site is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the proposal site or the species are non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent.

2.5 Biodiversity Credit Calculations (BAM)

2.5.1 Biodiversity Credit Calculations

The BC Act, together with the BC Regulation, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme.

Biodiversity credits required to offset impacts of the proposal were calculated using the BAM Calculator, available at <https://www.lmbc.nsw.gov.au/bamcalc> in accordance with the Biodiversity Offsets Scheme. These calculations were performed by SLR Associate Ecologist - Gilbert Whyte (BAM Accredited Assessor - BAAS18041).

The calculator provides:

- A consistent method for the assessment of the impact on biodiversity on a proposed Project site, major project, or clearing site;
- A scientific and repeatable calculation of how the biodiversity impacts need to be the offset for biodiversity impacts (quantified as biodiversity credits) as required to achieve a standard of 'no net loss' of biodiversity; and
- A consistent method for the assessment of the biodiversity values of a stewardship site and how those values will change under conservation management (i.e. not applicable to this assessment).

2.5.2 Ecosystem Credit Species and Candidate Threatened Species

A discussion of 'ecosystem credit species' and 'candidate threatened species' as returned by the BAM (OEH 2017c) is presented in **Section 3.5**. The section states the recommended survey period for detecting each species, whether each species was detected during the field survey and whether the proposal is likely to impact each species (i.e. based on habitat suitability). Although surveys did not coincide with the detectability of all of these species, the BAM states *'that a candidate threatened will be considered unlikely to occur on the Project site if after carrying out a field assessment of the habitat constraints or microhabitats on the subject land, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land'*. It has been determined that targeted surveys for most of the listed candidate threatened species are not required for the current assessment due to a lack of habitat present within the Project site or due to a lack of foreseeable impacts due to avoidance and mitigation measures as detailed in **Section 5**.

Given that no areas of native vegetation are proposed to be removed by the project, the following BAM calculator reports could not be generated for the assessment:

- Biodiversity Credit Report (Variation Options);
- Biodiversity Credit Report;
- Credit Summary Report;
- Payment Report; and
- Vegetation Zones Report.

For a more detailed description of how biodiversity credits are calculated, refer to the BAM (OEH 2017c).

2.6 Survey Limitations and Assumptions

The current survey was designed to provide an overall assessment of the ecological values within the Project site and fulfil the requirements of the BAM (OEH 2017c). Given the duration and timing of the field survey, it is likely that some of the fauna species, particularly those that disperse or migrate seasonally or transiently, were not detected during the survey.

Surveys within woodland patches during flood events within the known breeding season of Sloane's Froglet (June-August) were not conducted. To account for this, targeted habitat assessments were performed to assess habitat suitability for this species. These were considered adequate for the purposes of the assessment given that these habitats will not be directly impacted by the proposal.

Habitat was identified within the Project site in woodland areas for a range of threatened flora species that would not have been detectable during the survey period when they are not in flower (see **Section 2.3.3**). Given that the proposal will not impact any of these habitats directly, the vegetation assessment and threatened flora surveys conducted are considered adequate to assess potential impacts of the proposal on threatened flora.

Site conditions (including the presence of threatened species of flora and/or fauna) may change after the date of this report. SLR does not accept responsibility arising from, or in connection with, any change to the site conditions. SLR is also not responsible for updating this report if the site conditions change.

3 Stage 1 Biodiversity Assessment Results

This chapter describes the biodiversity values of the site, in accordance with Stage 1 of the BAM.

3.1 Landscape Features

3.1.1 Site Location and Key Features

The long-standing and existing use of the Project site is traditional agricultural production. The project site comprises fields that have been consistently cropped and grazed for many years. The Project site is predominately surrounded by land use for agricultural purposed, consistent with the dominant land use in the region. Site specific landscape information relevant to this assessment is presented in **Table 9**.

Table 9 Site specific landscape Information

Landscape	Site Specific Information
Interim Biogeographic Regionalisation for Australia (IBRA)	Riverina
IBRA Sub Region	Murrumbidgee Channels and Floodplains
NSW Landscape	Murrumbidgee Scalded Plains, Murrumbidgee Depression Plains

3.1.2 Native Vegetation Extent

Vegetation clearing has occurred within the Project site for agriculture. The vegetation that remains within the Project site consists of patches of native woodland. The lack of large trees in some woodland areas also indicates that the Project site may have been selectively logged at some point in the past thirty to fifty years. A lack of mid-storey species in many of the woodland patches is likely to be due to grazing by herbivores including resident populations of Western Red Kangaroos and Eastern Grey Kangaroos.

The Project site contains approximately 91.75 ha of native vegetation and 2908.42 ha of non-native agricultural land. The extent of native vegetation is therefore approximately 3%.

3.1.3 Rivers and Streams

The Project site is relatively flat (i.e. 131-136 m elevation) and lies within a large alluvial floodplain on the western side of Washpen Creek (i.e. third order stream that flows north-south) within the Murrumbidgee Catchment (see **Figure 2**). The Project site contains three shallow, constructed dams, all of which lack any emergent vegetation. No natural wetlands or other water courses occur.

The soils within the Project site are derived from quaternary alluviums which consist of grey, brown and red cracking clays.

3.1.4 Connectivity Features

Due to agricultural development, the native vegetation within the Project site has low internal and external connectivity. Patches of vegetation mapped within the Project site range in size from 3 ha to 35 ha. Gaps between vegetation patches range from 100 m to 5,000 m. The nearest patch of native vegetation lies approximately 750 m to the south of the site boundary.

3.1.5 Other Notable Landscape Features

The Project site contains no other notable landscape features relevant to this assessment. These include those listed below:

- Wetlands (including important wetlands) – there are no wetlands within or adjacent to the site;
- Areas of geological significance and soil hazard features;
- Karst, caves, crevices, cliffs or areas of geological significance; and
- Areas of Outstanding Biodiversity Value (AOBV) as listed under the BC Act.

3.2 Native Vegetation

3.2.1 Native Plant Species

A total of 74 plant species were recorded on the Project site, comprising 41 native plant species and 33 exotic plant species. A complete list of all plant species is presented in **Attachment C**. All BAM Plot/Transect data is presented in **Attachment F**.

Native plant species comprised the following plant groups:

- 4 chenopod species;
- 2 epiphytic species;
- 15 forb species;
- 3 rush species;
- 2 sedge species;
- 2 shrub species;
- 5 tree species; and
- 8 tussock grass species.

The majority of these native plant species were identified in woodland habitat in areas of the Project site that have not been cleared for agriculture.

3.2.2 Weeds and High Threat Exotics

One of the exotic plant species is listed as a priority weed within the Narrandera LGA, *Lycium ferocissimum* (African Box Thorn), although very few individuals were observed during the assessment.

Additionally, the following High Threat Exotic species (OEH 2018f) were identified:

- *Cirsium vulgare* (Spear Thistle);
- *Echium plantagineum* (Paterson's Curse);
- *Tribulus terrestris* (Caltrop); and
- *Xanthium spinosum* (Bathurst Burr).

The majority of these exotic plant species were found in low abundance throughout the Project site (i.e. mainly single shrubs and trees and small patches of herbaceous weeds and grasses). Other common environmental weeds comprised the following species:

- *Chenopodium murale* (Nettle-leaf Goosefoot);
- *Conyza bonariensis* (Flax-leaved Fleabane);
- *Cucumis myriocarpus* subsp. *leptodermis* (Paddy Melon);
- *Dysphania pumilio* (Crumb Weed);
- *Heliotropium europaeum* (Potato Weed);
- *Hordeum leporinum* (Barley Grass);
- *Lactuca serriola* (Prickly Lettuce);
- *Malva parviflora* (Small-flowered Mallow); and
- *Marrubium vulgare* (White Horehound).

No threatened plant species, listed under the BC Act or the Commonwealth EPBC Act, were identified (see **Section 3.5.2**).

3.2.3 Plant Community Types

The regional vegetation mapping (OEH 2017d) indicates that the following vegetation communities occur within the Project site:

- Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina and Murray Darling Depression Bioregions);
- Native grassland complex;
- River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina and Murray Darling Depression Bioregions);
- River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion;
- Shallow Swamp;
- White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone;
- Yellow Box - River Red Gum tall grassy riverine woodland of NSW South West Slopes and Riverina Bioregions; and
- Yellow Box - White Cypress Pine grassy woodland on deep sandy-loam alluvial soils of the eastern Riverina and western NSW South Western Slopes Bioregion.

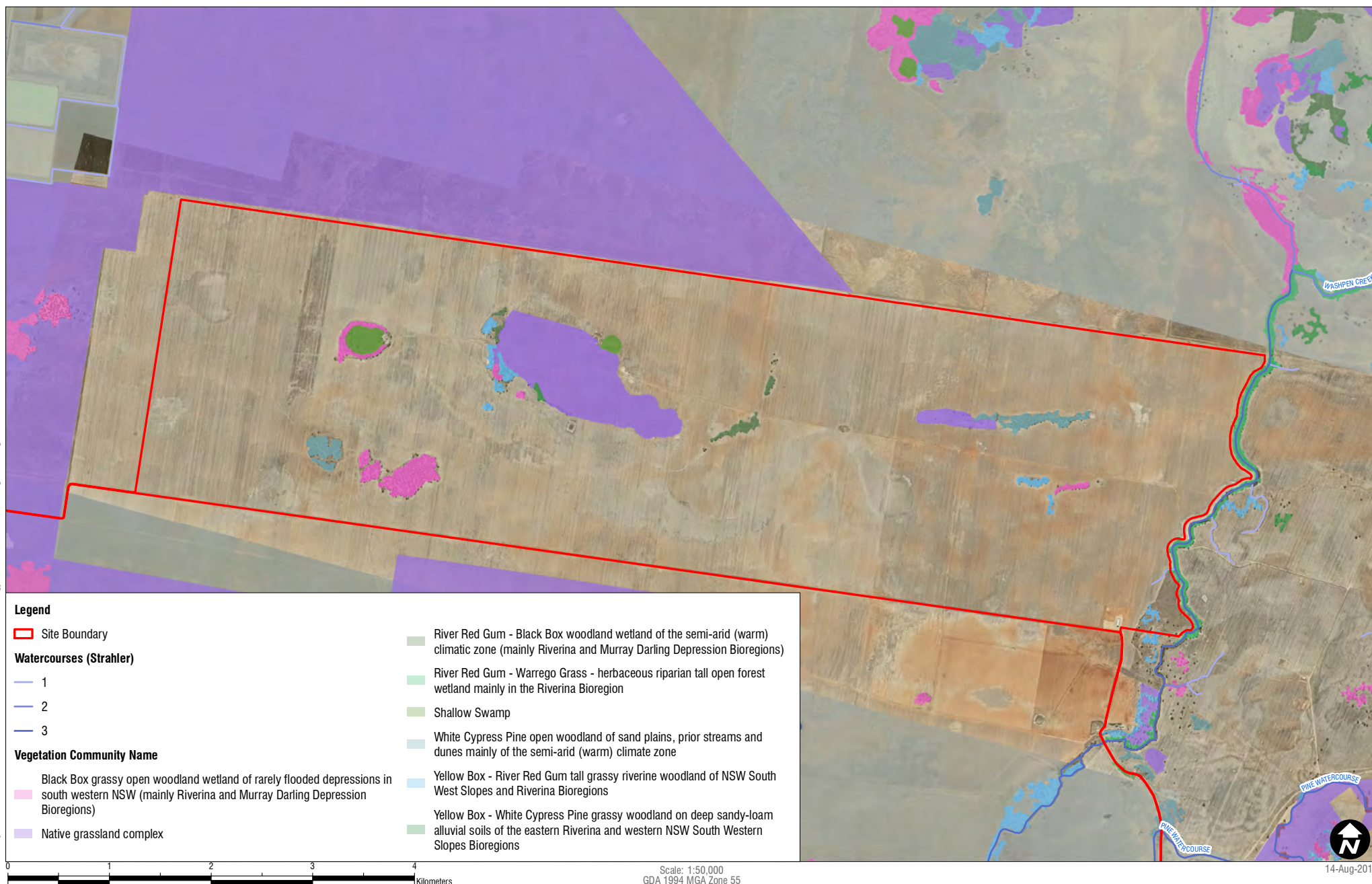
The extent of these vegetation communities as indicated by the regional mapping is shown in **Figure 6**. The field assessment determined that the regional vegetation mapping was relatively inaccurate in terms of vegetation community identification and extent. Following the site assessment, it was determined that native grasslands were not as extensive as indicated by the mapping and only three plant community types (PCTs) were confirmed to be present. A revised vegetation map, based on site data collected by SLR as part of the vegetation survey (as described in **Section 2.3.1**), is presented **Figure 7**.

Detailed information pertaining to each PCT is presented in **Table 10**, **Table 11** and **Table 12**.

Table 10 River Red Gum - Black Box woodland wetland (PCT 10)

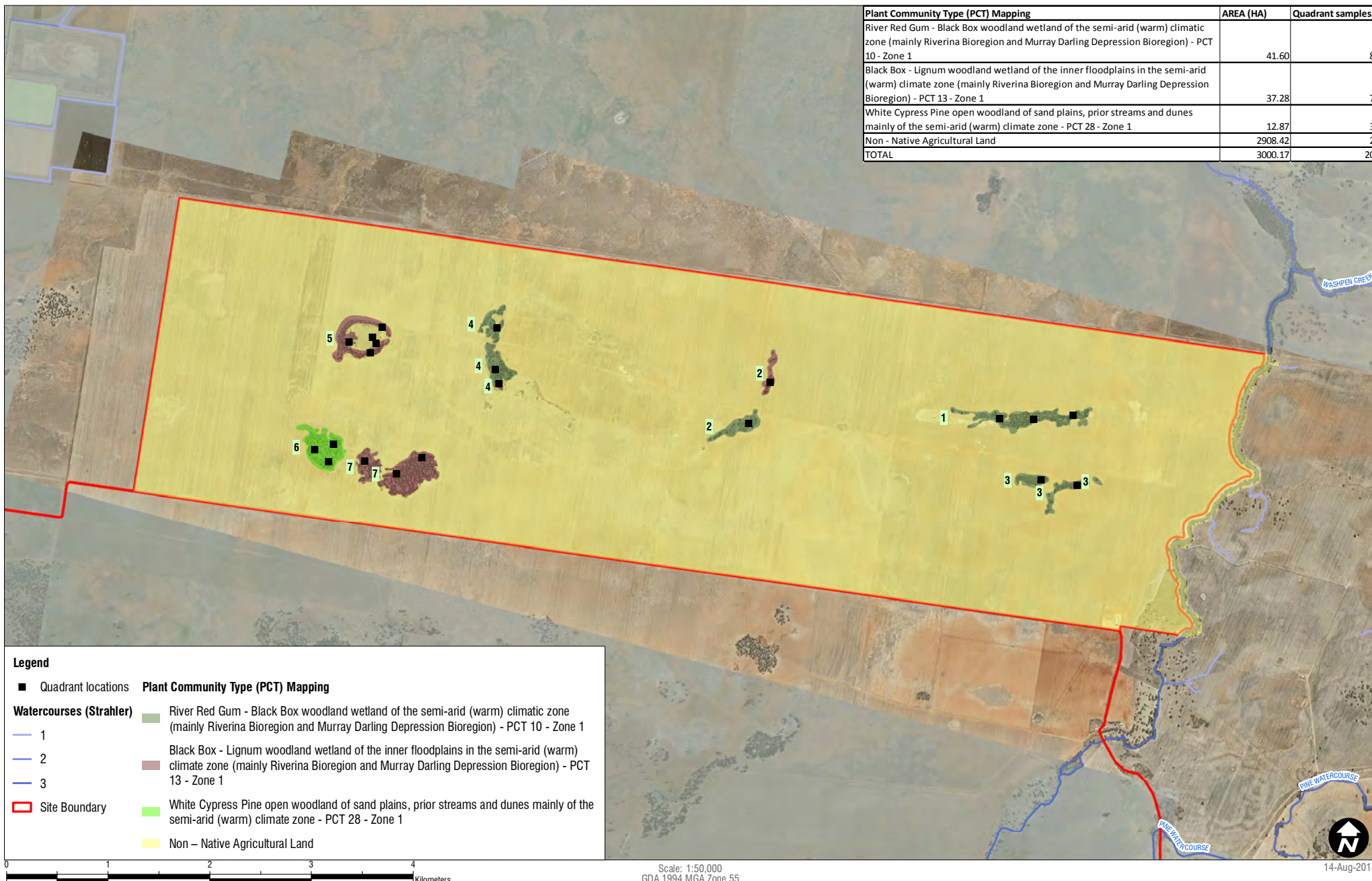
Vegetation Community	Floristic Structure and Composition
Vegetation Formation	KF-CH9 - Forested Wetland
Vegetation Class	Inland Riverine Forests
PCT Equivalent (PCT Code) (OEH 2018b)	River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 10)
PCT Scientific Name (OEH 2018b)	<i>Eucalyptus camaldulensis</i> subsp. <i>camaldulensis</i> , <i>Eucalyptus largiflorens</i> / <i>Muehlenbeckia florulenta</i> / <i>Cyperus exaltatus</i> , <i>Paspalidium jubiflorum</i> , <i>Oxalis perennans</i>
Conservation Status (BC Act and EPBC Act)	Not listed
Cleared Status (OEH 2018b)	43%
Occurrence within the Project site and Approximate Area (ha)	A total of 41.61 ha of the community occurs within the Project site (i.e. remnant patches)
General Vegetation Structure	The community has a low open woodland structure with a sparse shrub layer and groundcover dominated by native herbs and grasses
Floristic Composition	The dominant canopy species was <i>Eucalyptus camaldulensis</i> (River Red Gum). The dominant shrub species was <i>Duma florulenta</i> (Lignum). Other shrubs that occurred to a lesser extent included <i>Einadia nutans</i> (Ruby Saltbush), <i>Salsola australis</i>, <i>Sclerolaena muricata</i> (Black Roly-poly) and <i>Sclerolaena diacantha</i> (Grey Copperburr). The groundcover was dominated by grasses and herbs. The dominant grass species in most areas was <i>Hordeum leporinum</i> (Barley Grass). Other grass species that occurred to a lesser extent included <i>Austrostipa aristiglumis</i>, <i>Austrostipa scabra</i>, <i>Chloris truncata</i> and <i>Chloris ventricosa</i>. The dominant herbs included <i>Alternanthera nodiflora</i>, <i>Boerhavia dominii</i> (Tarvine), <i>Oxalis perennans</i>, <i>Sida cordifolia</i>, <i>Sida corrugate</i>, <i>Sida trichopoda</i>, <i>Solanum esuriale</i> (Quena) and <i>Vittadinia cuneata</i> var. <i>cuneata</i> (Fuzzweed).
Soil Type and Geology	Alluvial Clay Loam
Evidence of Disturbance	Selective logging and grazing by Kangaroos. The dominant introduced herbs included <i>Marrubium vulgare</i> (White Horehound) and <i>Dysphania pumilio</i> (Crumb Weed).
Plots/transects Sampled	1, 2, 3, 5, 6, 7, 8 and 9.

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Table 11 Black Box - Lignum woodland wetland (PCT 13)

Vegetation Community	Floristic Structure and Composition
Vegetation Formation	KF-CH11A Semi-arid Woodlands (Grassy sub-formation)
Vegetation Class	Inland Floodplain Woodlands
PCT Equivalent (PCT Code) (OEH 2018b)	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 13)
PCT Scientific Name (OEH 2018b)	<i>Eucalyptus largiflorens</i> / <i>Muehlenbeckia florulenta</i> , <i>Chenopodium nitrariaceum</i> / <i>Einadia nutans</i> subsp. <i>nutans</i> , <i>Paspalidium jubiflorum</i> , <i>Sclerolaena muricata</i> var. <i>muricata</i> , <i>Austrodanthonia caespitosa</i>
Conservation Status (BC Act and EPBC Act)	Not listed
Cleared Status (OEH 2018b)	57%
Occurrence within the Project site and Approximate Area (ha)	A total of 37.28 ha of the community occurs within the Project site (i.e. remnant patches)
General Vegetation Structure	The community has a low open woodland structure with a sparse shrub layer and groundcover dominated by native herbs and grasses
Floristic Composition	The dominant canopy species was <i>Eucalyptus largiflorens</i> (Black Box). The dominant shrub species was <i>Duma florulenta</i> (Lignum). Other shrubs that occurred to a lesser extent included <i>Einadia nutans</i> (Ruby Saltbush), <i>Salsola australis</i>, <i>Sclerolaena muricata</i> (Black Roly-poly) and <i>Sclerolaena diacantha</i> (Grey Copperburr). The groundcover was dominated by grasses and herbs. The dominant grass species in most areas was <i>Hordeum leporinum</i> (Barley Grass). Other grass species that occurred to a lesser extent included <i>Austrostipa aristiglumis</i>, <i>Austrostipa scabra</i>, <i>Chloris truncata</i> and <i>Chloris ventricosa</i>. The dominant herbs included <i>Alternanthera nodiflora</i>, <i>Boerhavia dominii</i> (Tartvine), <i>Oxalis perennans</i>, <i>Sida cordifolia</i>, <i>Sida corrugate</i>, <i>Sida trichopoda</i>, <i>Solanum esuriale</i> (Quena) and <i>Vittadinia cuneata</i> var. <i>cuneata</i> (Fuzzweed).
Soil Type and Geology	Alluvial Clay Loam
Evidence of Disturbance	Selective logging and grazing by Kangaroos. The dominant introduced herbs included <i>Marrubium vulgare</i> (White Horehound) and <i>Dysphania pumilio</i> (Crumb Weed).
Plots/transects Sampled	4, 10, 11, 12, 13, 14, 17, 18, 19 and 20

Table 12 White Cypress Pine open woodland (PCT 28)

Vegetation Community	Floristic Structure and Composition
Vegetation Formation	KF-CH11B Semi-arid Woodlands (Shrubby sub-formation)
Vegetation Class	Riverine Sandhill Woodlands
PCT Equivalent (PCT Code) (OEH 2018b)	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone (PCT 28)
PCT Scientific Name (OEH 2018b)	<i>Callitris glaucophylla</i> / <i>Hakea leucoptera</i> subsp. <i>leucoptera</i> , <i>Pittosporum angustifolium</i> , <i>Maireana pyramidata</i> , <i>Maireana enchylaenoides</i> / <i>Enchylaena tomentosa</i> , <i>Dissocarpus paradoxus</i> , <i>Austrostipa scabra</i> subsp. <i>scabra</i> , <i>Tribulus terrestris</i>
Conservation Status (BC Act and EPBC Act)	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions, an 'endangered ecological community' listed under the BC Act.
Cleared Status (OEH 2018b)	73%
Occurrence within the Project site and Approximate Area (ha)	A total of 12.87 ha of the community occurs within the Project site in a single patch in the western portion.
General Vegetation Structure	The community has a tall open woodland structure. The shrub layer is largely absent and the groundcover is dominated by native herbs and grasses
Floristic Composition	The dominant canopy species was <i>Callitris glaucophylla</i> (White Cypress). Low-lying shrubs included <i>Einadia nutans</i> (Ruby Saltbush), <i>Salsola australis</i>, <i>Sclerolaena muricata</i> (Black Roly-poly) and <i>Sclerolaena diacantha</i> (Grey Copperburr). The groundcover was dominated by grasses and herbs. The dominant grass species in most areas was <i>Hordeum leporinum</i> (Barley Grass). Other grass species that occurred to a lesser extent included <i>Austrostipa aristiglumis</i>, <i>Austrostipa scabra</i>, <i>Chloris truncata</i> and <i>Chloris ventricosa</i>. The dominant herbs included <i>Alternanthera nodiflora</i>, <i>Boerhavia dominii</i> (Tarvine), <i>Oxalis perennans</i>, <i>Sida cordifolia</i>, <i>Sida corrugate</i>, <i>Sida trichopoda</i>, <i>Solanum esuriale</i> (Quena) and <i>Vittadinia cuneata</i> var. <i>cuneata</i> (Fuzzweed).
Soil Type and Geology	Alluvial Clay Loam
Evidence of Disturbance	Selective logging and grazing by Kangaroos and Rabbits. The dominant introduced herbs included <i>Marrubium vulgare</i> (White Horehound) and <i>Dysphania pumilio</i> (Crumb Weed).
Plots/transects Sampled	15, 16 and 21.

3.2.4 Plant Community Type Justifications

Justification for each of the PCT identifications is provided below:

River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 10)

- The vegetation is a native vegetation community within the Riverina Bioregion;
- The vegetation is commensurate with a Forested Wetland as indicated by its position on an alluvial plain;
- The canopy of the community contains indicator species including *Eucalyptus camaldulensis*;
- The shrub layers of the community contains the indicator shrub species *Duma florulenta* (Lignum); and
- The groundcover of the community is comprised of native grasses and herbs.

Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina and Murray Darling Depression Bioregions) (PCT 13)

- The vegetation is a native vegetation community within the Riverina Bioregion;
- The vegetation is commensurate with an Inland Floodplain Woodland, as indicated by its woodland structure and position on an alluvial plain;
- The canopy of the community contains indicator species including *Eucalyptus largiflorens* (Black Box);
- The shrub layers of the community contains the indicator shrub species *Duma florulenta* (Lignum); and
- The groundcover of the community is comprised of native grasses and herbs.

White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone (PCT 28)

- The vegetation is a native vegetation community within the Riverina Bioregion in the semi-arid climatic zone of NSW;
- The vegetation is commensurate with Riverine Sandhill Woodlands, as indicated by its position on an elevated sand hill area Project site;
- The obvious presence of sandy soils in the upper strata;
- The canopy of the community is comprised almost entirely of the indicator tree species: *Callitris glaucophylla* (White Cypress); and
- The groundcover of the community is comprised of native grasses and herbs.

3.2.5 Vegetation Integrity Assessment

Native Vegetation Extent

The area of the Project site is approximately 3,000 ha. The total area of native vegetation within the Project site is 95.75 ha. Therefore, the extent of native vegetation within the site is approximately 3%.

Mapping Vegetation Zones

The approximate area (ha) of each vegetation zone and the number of BAM plot/ transects required to sample the vegetation in accordance with Section 5 of the BAM is presented in **Table 13**.

Table 13 BAM Plots Completed per Vegetation Zone

PCT	Veg Zone Name	Area (ha)	Min. Plots Required (BAM)	Plots Completed
10	10_Zone 1	41.61	4	8
13	13_Zone 1	37.28	4	10
28	28_Zone 1	12.87	3	3

Patch Size

In accordance with the BAM, patch size area was assigned to each vegetation zone as a class, being < 5ha, 5–24 ha, 25–100 ha or ≥ 100 ha as presented in **Table 14**.

Table 14 Vegetation Patch Size

PCT	Veg Zone Name	Patch No.	Area (ha)	Patch Size Class (ha)
10	10_Zone 1	Patch 1	35.54	25 – 100
		Patch 2	6.07	5 – 4
13	13_Zone 1	Patch 1	3.08	< 5
		Patch 2	34.20	25 – 100
28	28_Zone 1	Patch 1	12.87	5 – 24

Vegetation Integrity Scores

The vegetation integrity assessment was conducted in accordance with the BAM for each of the vegetation zones as presented in **Table 15**.

Table 15 Vegetation Integrity Calculations

PCT	Veg Zone Name	Area (A)	Composition Condition Score	Structure Condition Score	Function Condition Score	Vegetation Integrity Score
10	10_Zone 1	41.61	30.3	95.1	53	53.5
13	13_Zone 1	37.28	9.6	40.1	41.4	25.2
28	28_Zone 1	12.87	17.8	6.4	39.5	16.5

3.3 Fauna Species and Habitat

A total 68 fauna species were recorded during the field survey, comprising 43 birds, 18 mammals, six reptiles and one amphibian. Each of these groups is discussed below in relation to the habitats present within the Project site. A complete list of all fauna species recorded is presented in **Attachment D**. Photographs of a subset of fauna species are presented in **Attachment E**. Two threatened fauna species listed under the BC Act were detected during field surveys (see **Section 0**).

3.3.1 Avifauna

Dawn bird surveys detected a moderate to high diversity of birds within the Project site, comprised mostly of Psittacines (parrot species) and Passerines (perching species). Most of these species were identified in woodland habitat where eucalypts provide feeding opportunities for parrots, cockatoos and honeyeaters, all of which predominately feed on nectar. Most of the species detected are common within the Murrumbidgee region, with large numbers of Australian Magpie (*Cracticus tibicen*), Australian Raven (*Corvus coronoides*), Cockatiel (*Nymphicus hollandicus*), Common Starling (*Sturnus vulgaris*), Eastern Rosella (*Platycercus eximius*), Galah (*Eolophus roseicapillus*) and Kookaburra (*Dacelo novaeguineae*) present during the survey period. Large family groups of Emu (*Dromaius novaehollandiae*) were also regularly observed.

One bird species; Brown Treecreeper (*Climacteris picumnus victoriae*), which is listed as 'vulnerable' under the BC Act, was identified near the eastern boundary of the Project site. This species was observed foraging in riparian woodland associated with Washpen Creek.

3.3.2 Nocturnal Fauna

A total of seven mammal species were detected during the nocturnal surveys. These species comprised one native arboreal mammal: Brushtail Possum (*Trichosurus vulpecula*), and four introduced terrestrial mammals: House Mouse (*Mus musculus*), Introduced Cat (*Felis catus*), Introduced Fox (*Vulpes vulpes*) and Introduced Rabbit (*Oryctolagus cuniculus*). Large family groups of Eastern Grey Kangaroos (*Macropus giganteus*) and Western Red Kangaroos (*Macropus rufus*) were common throughout the Project site.

During nocturnal surveys, large numbers of the Eastern Barn Owl (*Tyto javanica*) were observed. Individuals were observed entering and exiting hollows associated with River Redgum and Black Box trees within the woodland areas. The Barn Owl population within the Project site is likely to be sustained by the abundance of tree hollows for nesting and large numbers of House Mice present in the surrounding agricultural lands.

One amphibian species was recorded: Giant Banjo Frog (*Limnodynastes interioris*). Several individuals were observed in woodland areas following light rain during the nocturnal survey which prompted foraging activity. This species is widespread in western NSW.

3.3.3 Microchiropteran Bats

A total of 10 microchiropteran bats ('microbats') were recorded on Anabat call recorders from most woodland patches within the Project site. All of these species are likely to forage within the Project site and many are likely to utilise tree hollows for roosting habitat (Pennay *et al.* 2011; Strahan 1983).

One species, Inland Forest Bat (*Vespadelus baverstocki*) is listed as Vulnerable in NSW under the BC Act. This species roosts in tree hollows and abandoned buildings and is known to roost in very small hollows in stunted trees only a few metres high (OEH 2018g). The habitat requirements of this species are poorly known but it has been recorded from a variety of woodland formations, including mallee, mulga and River Red Gum woodland. Most records of the species are from drier woodland habitats with riparian areas inhabited by the Little Forest Bat; however, other habitats may be used for foraging and/or drinking (OEH 2018g).

3.3.4 Reptiles

Additional opportunistic sightings of fauna included reptiles such as Bearded Dragon (*Pogona barbata*), Curl Snake (*Suta suta*), Eastern Brown Snake (*Pseudonaja textilis*), South-eastern Morethia Skink (*Morethia boulengeri*), Lace Monitor (*Varanus varius*) and Tessellated Gecko (*Diplodactylus tessellatus*). All of these species were utilising woodland habitat within the Project site.

3.3.5 Fauna Habitat

The field surveys confirmed that the following main fauna habitat types occur within or adjacent to the Project site:

- Woodland;
- Native Grassland;
- Dams (Aquatic Habitat);
- Riparian Vegetation (adjacent to the Project site); and
- Agricultural Areas.

Mapping of these habitat types is presented in **Figure 8**.

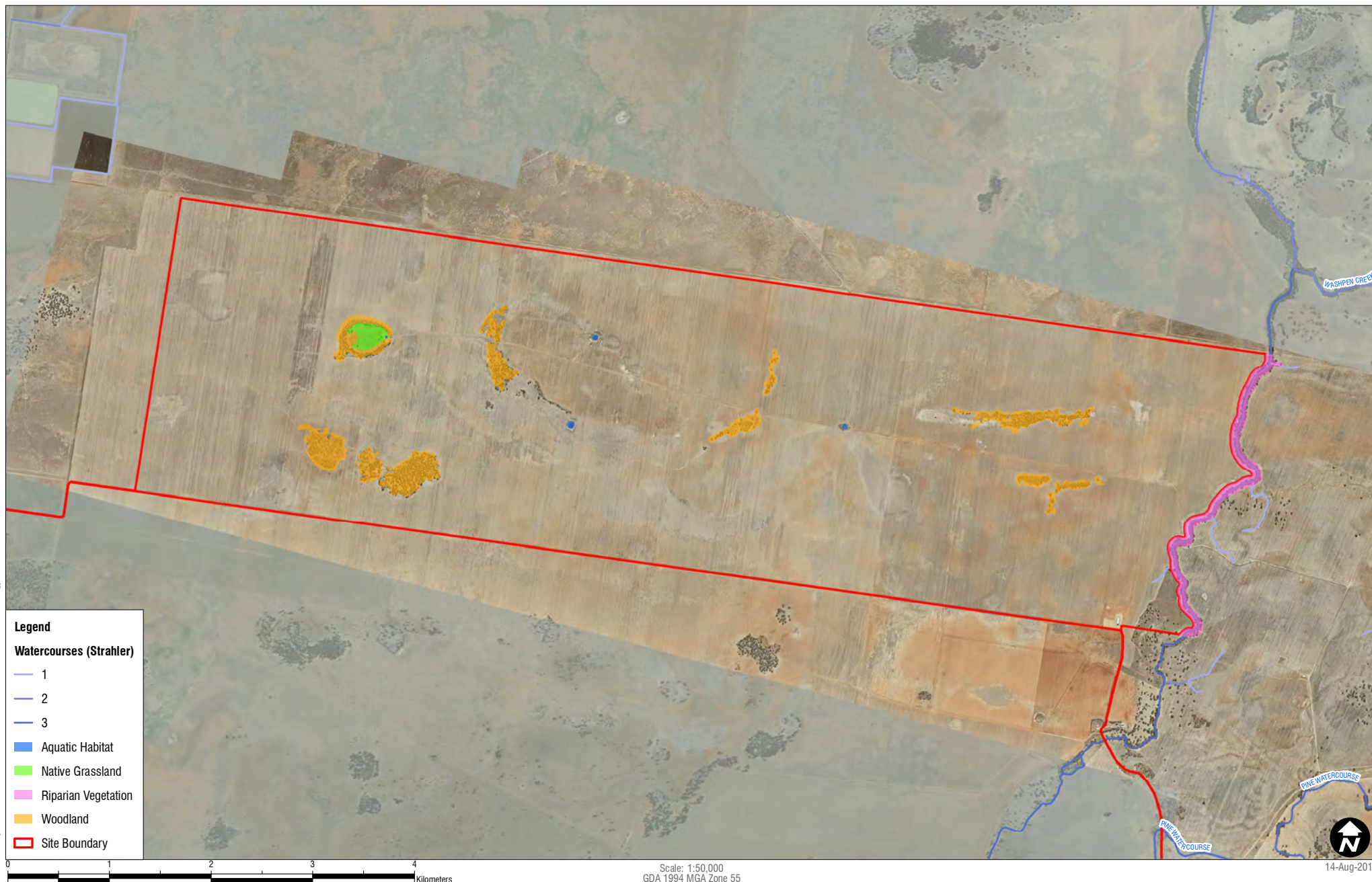
Photographs of fauna habitats are presented in **Attachment E**.

Descriptions of the habitats and the associated fauna species observed during the field surveys are presented in **Table 16, Table 17, Table 18, Table 19 and Table 20**.

Habitat within the Project site lacked native grassland and where present (see **Table 15**) was considerably dense and of approximately 50 cm in height. Expansive areas are used for agricultural purposes (i.e. cropping) with vegetation patches presenting mostly exotic grasses and/or herbs. Grassland structure and composition of native species is critically important to the Plains-wanderer, as such no suitable habitat was identified within the Project site.

Waterbodies identified within the study site comprised five constructed dams, one of which was dry. Dams lacked riparian and/or aquatic vegetation and were highly disturbed, evident by high water turbidity and evidence of trampling by hooved animals (i.e. grazing stock). Most dams were isolated within agricultural areas with limited adjacent vegetation or refuge cover. As such, waterbodies within the Project site did not contain suitable habitat for the Southern Bell Frog. However, waterbodies may be important to the survival of many fauna species within the area as these dams provide a reliable source of water. Several native birds and mammals were observed drinking from the dams throughout the survey period.

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Table 16 Woodland Habitat Description

Woodland	
Description	Woodland areas are restricted to remnant patches within the Project site (Figure 8). The structural diversity of the vegetation is generally low with a mature canopy of eucalypts up to 10 m tall over a sparse shrub and ground layer. Canopy tree species include <i>Eucalyptus camaldulensis</i> (River Redgum), <i>Eucalyptus largiflorens</i> (Black Box) and <i>Eucalyptus melliodora</i> (Yellow Box). These species are an important foraging resource for birds and arboreal mammals. Other important feed tree species were identified including <i>Allocasuarina luehmannii</i> (Bulloak) and <i>Callitris glaucophylla</i> (White Cypress). The seeds from the cones of these species are fed upon by several parrot and cockatoo species. Around 300 vertebrate species are known to utilise tree-hollows and shedding bark in Australia and the shelter provided by these habitat features is critical for the survival of many species (Gibbons and Lindenmayer, 2002). Large numbers of hollow-bearing trees were present within woodland areas. A range of hollow sizes and shapes were observed and these may be utilised by a variety of species including amphibians, reptiles, micro-bats and arboreal mammals such as possums and birds including owls and cockatoos. This habitat type contained a sparse shrubby understorey comprised mainly of <i>Duma florulenta</i> (Lignum), which would provide some sheltering habitat for terrestrial species such as amphibians, reptiles, terrestrial mammals and prey species for arboreal predators. Woody debris is also present. This is an important habitat resource for terrestrial fauna species.
Typical fauna species	Myrtaceous trees and other habitats contained within this habitat type provide suitable foraging and sheltering resources for a range of fauna species, particularly species such as large forest owls and several microbats, including the vulnerable Inland Forest Bat (<i>Vespadelus baverstocki</i>). Numerous common woodland bird species were observed within this habitat during surveys including; Australian Magpie (<i>Cracticus tibicen</i>), Australian Raven (<i>Corvus coronoides</i>), Common Starling (<i>Sturnus vulgaris</i>), Crested Pigeon (<i>Ocyphaps lophotes</i>) and Eastern Rosella (<i>Platycercus eximius</i>). The Giant Banjo Frog (<i>Limnodynastes interioris</i>) was also recorded in parts of this habitat. Few terrestrial fauna species were observed during the survey. This is likely to be due to disturbance from agriculture. However, native mammals that were observed include the Eastern Grey Kangaroo (<i>Wallabia gigantea</i>), Western Red Kangaroo (<i>Macropus rufus</i>) and Common Brush-tailed Possum (<i>Trichosurus vulpecula</i>).
Threatened fauna recorded	One threatened fauna species was recorded utilising the habitat: Inland Forest Bat (<i>Vespadelus baverstocki</i>), which likely to be utilising hollow-bearing trees as roosting habitat.

Table 17 Native Grassland Habitat Description

Native Grassland	
Description	Due to agricultural development, native grasslands were restricted to a small patch in the western portion of the Project site (Figure 8). This habitat type lacked woody debris, which limited availability of terrestrial habitat for amphibians, mammals and reptiles. This habitat provides marginal quality foraging and sheltering habitat for woodland birds, mammals, amphibians and reptiles.
Typical fauna species	Raptor species such as Black Kite (<i>Milvus migrans</i>), Brown Falcon (<i>Falco berigora</i>), Nankeen Kestrel (<i>Falco cenchroides</i>) and Black-shouldered Kite (<i>Elanus axillaris</i>), may utilise the grassland for hunting of prey species. Ground-dwelling species such as the Stubble Quail (<i>Coturnix pectoralis</i>) may also forage in this area.
Threatened fauna recorded	Although no threatened species were recorded in this habitat, it is considered to provide marginally suitable foraging habitat for threatened fauna species, such as large forest owls (i.e. Masked Owl) and microbat species. The habitat is considered to be unsuitable for the Plains-wanderer (<i>Pedionomus torquatus</i>) due to the computation of ground cover, density and average height of grasses.

Table 18 Dams (Aquatic Habitat) Habitat Description

Dams (Aquatic Habitat)	
Description	This habitat is restricted to five dams that occur within the Project site. The aquatic habitats contained within these dams are highly disturbed (by stock grazing), lack riparian vegetation and woody debris, which limits the availability of aquatic and terrestrial habitat for amphibians, mammals and reptiles. This habitat provides marginal quality foraging and sheltering habitat for woodland birds, mammals, amphibians and reptiles. Waterbodies are an important source of water for many native fauna residing within vegetation patches.
Typical fauna species	Wetland birds that were observed utilising the habitat included Australasian Grebe (<i>Tachybaptus novaehollandiae</i>), Australian Wood Duck (<i>Chenonetta jubata</i>), Grey Teal (<i>Anas gracilis</i>) and White-faced Heron (<i>Egretta novaehollandiae</i>).
Threatened fauna recorded	Due to the high disturbance of the waterbodies and lack of aquatic or emergent vegetation, this habitat is considered to be unsuitable for most amphibian species, including the Southern Bell Frog and Sloane's Froglet.

Table 19 Riparian Woodland Habitat Description

Riparian Woodland	
Description	Riparian woodland habitat is restricted to the margins of Washpen Creek adjacent to the eastern boundary of the Project site (Figure 8). The structural diversity of the vegetation is generally low with a mature canopy of eucalypts to 10 m tall over a sparse shrub and ground layer. Canopy species comprise <i>Eucalyptus camaldulensis</i> (River Redgum) and <i>Eucalyptus largiflorens</i> (Black Box). These species are an important foraging resource for birds and arboreal mammals. This habitat type contains a sparse shrubby understorey comprised mainly of <i>Duma florulenta</i> (Lignum), which would provide some sheltering habitat for terrestrial species such as amphibians, reptiles, terrestrial mammals and prey species for arboreal predators. Woody debris was also present. This is an important habitat resource for terrestrial fauna species.
Typical fauna species	Myrtaceous trees and other habitats contained within this habitat type provide suitable foraging and sheltering resources for a range of fauna species, particularly species such the vulnerable Brown Treecreeper (<i>Climacteris picumnus victorae</i>). Numerous common woodland bird species were observed within this habitat during surveys including; Australian Magpie (<i>Cracticus tibicen</i>), Australian Raven (<i>Corvus coronoides</i>), Common Starling (<i>Sturnus vulgaris</i>), Crested Pigeon (<i>Ocyphaps lophotes</i>) and Eastern Rosella (<i>Platycercus eximius</i>).
Threatened fauna recorded	One threatened fauna species was recorded utilising the habitat: Brown Treecreeper (<i>Climacteris picumnus victorae</i>), which was observed foraging in riparian woodland vegetation during the field survey.

Table 20 Agricultural Areas Habitat Description

Agricultural Areas	
Description	This habitat type is present throughout the majority of the Project site (Figure 8). This habitat type consists of introduced plant species (i.e. <i>Hordeum</i> sp., <i>Brassica</i> sp. and <i>Sorghum</i> sp.) and lacked woody vegetation, leaf litter and woody debris, which are generally important for most fauna species.
Typical fauna species	Raptor species such as Black Kite (<i>Milvus migrans</i>), Brown Falcon (<i>Falco berigora</i>), Nankeen Kestrel (<i>Falco cenchroides</i>) and Black-shouldered Kite (<i>Elanus axillaris</i>), were observed utilising the habitat for hunting of prey species such as the introduced House Mouse (<i>Mus musculus</i>). The Eastern Barn Owl (<i>Tyto javanica</i>) was also observed hunting in this habitat at night. The Stubble Quail (<i>Coturnix pectoralis</i>) was observed foraging in this habitat.
Threatened fauna recorded	No threatened species were recorded in this habitat. The habitat is considered to be unsuitable for the Plains-wanderer (<i>Pedionomus torquatus</i>) due to a lack of native grass species.

3.4 Threatened Ecological Communities

A search of the NSW Bionet Atlas detected four threatened ecological communities (TECs) within a 10 km radius from the centre of the Project site (**Attachment A**). Of these, one was identified within the Project site: *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions* ('Sandhill Pine Woodland'). In the Riverina bioregion and the far south-western portion of the NSW South Western Slopes bioregion, the community is typically associated with prior streams and aeolian source-bordering dunes, which are scattered within an extensive alluvial clay plain dominated by chenopod shrublands (OEH 2018h).

The occurrence of Sandhill Pine Woodland TEC within the Project site is restricted to a single 12.87 ha patch in the southwest portion. The vegetation integrity score for this community is 17.2 (see **Section 3.2.5**). This indicates that the condition of the community is low, as evidenced by the lack of native understory and shrub species identified during the field assessment. Justification for the identification of this TEC is provided below:

The vegetation is a native plant community within the Riverina Bioregion;

- The vegetation is commensurate with a Riverine Sandhill Woodlands as indicated by its position on an elevated sand hill area within the Project site;
- The canopy of the community contains indicator species including *Callitris glaucophylla* (White Cypress); and
- The groundcover of the community is comprised of native grasses and herbs.

The extent of the occurrence of this EEC within the Project site is presented in **Figure 9**.

3.5 Threatened Species

This section describes the threatened species predicted to occur within the Project site, based on the field survey results, the outputs of desktop assessment and the outputs of the BAM Credit Calculator, in accordance with Section 6 of the BAM.

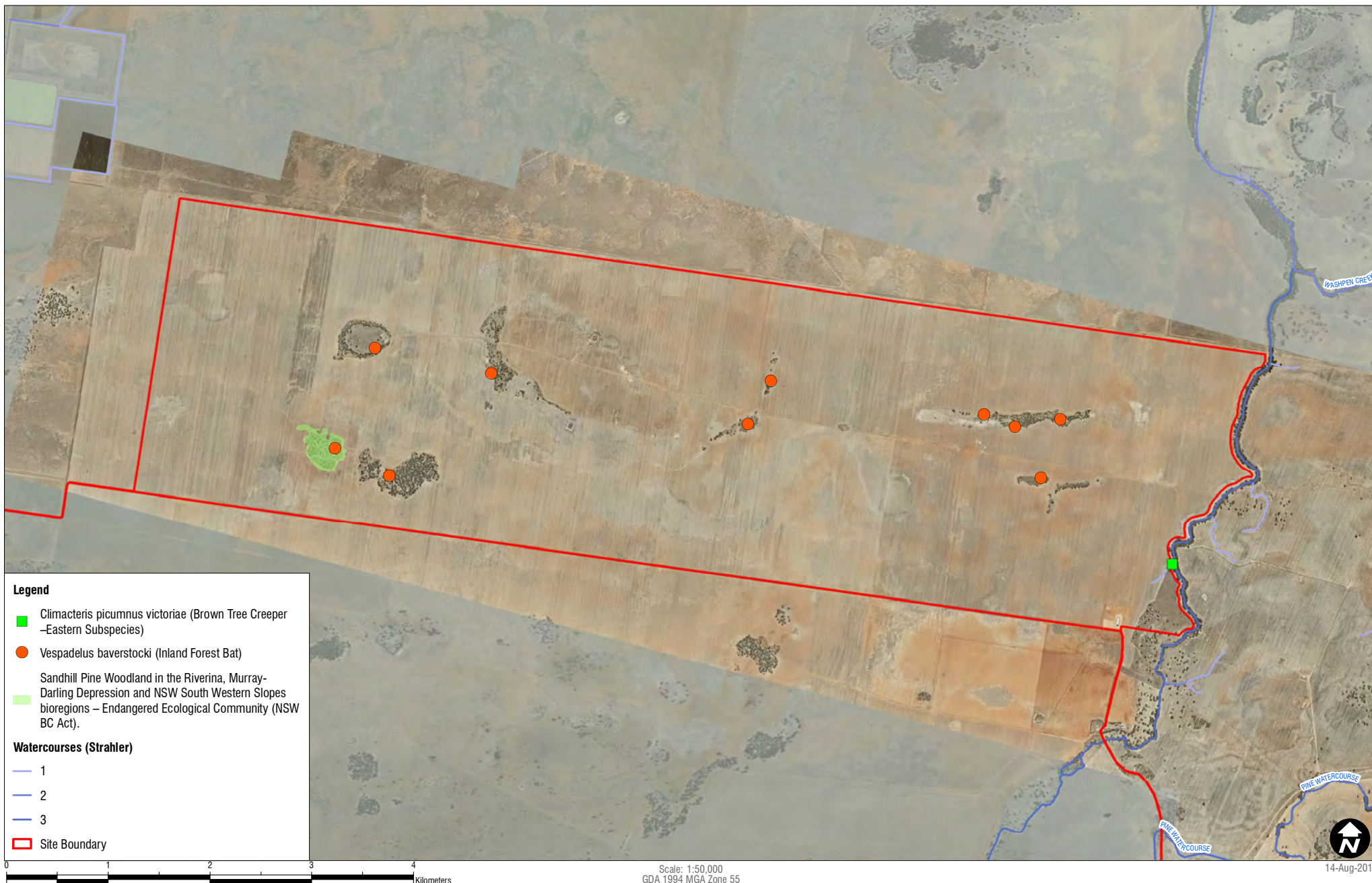
3.5.1 Overview

Several sources of information have been employed to create a list of candidate threatened species and populations relevant to the Project site. The BAM Credit Calculator outputs of ecosystem credit species and species credit species are used as the main basis of this BDAR, along with previous records of threatened species retrieved from the NSW Bionet Atlas database (10 km search area) (OEH 2018a). This search returned a total of 58 threatened fauna species 24 threatened flora species and 5 threatened ecological communities (**Attachment A**).

In addition, as noted in **Section 1.4.3**, OEH identified the following threatened biota as "requiring further consideration" in its input to the SEARs:

- Southern Bell Frog (*Litoria raniformis*);
- Superb Parrot (*Polytelis swainsonii*); and
- Plains-wanderer (*Pedionomus torquatus*).

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Combining Credit Calculator outputs for threatened species with search results from the NSW Bionet Atlas and Protected Matters Search Tool (PMST) results, an assemblage of threatened species that has been compiled and each entity has been assessed for its potential relevance to the Project site. The habitat requirements and ecology of the potential threatened species and relevant habitat attributes within the Project site are described in the likelihood of occurrence table presented in **Attachment A** of this report. The likelihood of occurrence rating is based on the results of field surveys, and particularly on the extent, nature and condition of habitat types and habitat features within the Project site.

3.5.2 Threatened Flora

A search of the NSW Bionet Atlas detected 24 threatened plant species within a 10 kilometre radius from the centre of the Project site (**Attachment A**). No threatened flora species were identified within the Project site, although the following species were identified as having a moderate 'likelihood of occurrence' based on habitat availability in woodland habitat:

- Bindweed (*Convolvulus tedmoorei*);
- Chariot Wheels (*Maireana cheelii*);
- Claypan Daisy (*Brachyscome muelleroides*);
- Hoary Sunray (*Leucochrysum albicans* var. *tricolor*);
- Lanky Buttons (*Leptorhynchos orientalis*);
- Menindee Nightshade (*Solanum karsense*);
- Oaklands Diuris (*Diuris* sp. - Oaklands, D.L. Jones 5380);
- Red Darling Pea (*Swainsona plagiotropis*);
- Sand-hill Spider Orchid (*Caladenia arenaria*);
- Silky Swainson-pea (*Swainsona sericea*);
- Slender Darling Pea (*Swainsona murrayana*);
- Small Scurf-pea (*Cullen parvum*); and
- Winged Peppercress (*Lepidium monolocoides*).

Although the flora surveys did not coincide with the detectability of all of these species, no habitat for these species is present within the development footprint.

3.5.3 Threatened Fauna

Of the threatened biota potentially relevant to the Project site, two species were recorded during the field surveys:

- Brown Treecreeper (*Climacteris picumnus victoriae*) (a 'species credit species') which was observed foraging in riparian woodland vegetation during the field survey; and
- Inland Forest Bat (*Vespadelus baverstocki*), (a 'species credit species') which is likely to be utilising hollow-bearing trees in woodland areas as roosting habitat.

Additionally, the following threatened fauna species were identified as having a moderate 'likelihood of occurrence' based on habitat availability in woodland habitat:

- Spotted Harrier (*Circus assimilis*);
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri*);
- Black Falcon (*Falco subniger*);
- Little Eagle (*Hieraaetus morphnoides*);
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*);
- Black-breasted Buzzard (*Hamirostra melanosternon*);
- Dusky Woodswallow (*Artamus cyanopterus*);
- Diamond Firetail (*Stagonopleura guttata*);
- Varied Sittella (*Daphoenositta chrysoptera*);
- Bush Stone-curlew (*Burhinus grallarius*);
- Turquoise Parrot (*Neophema pulchella*);
- Superb Parrot (*Polytelis swainsonii*);
- Regent Honeyeater (*Anthochaera Phrygia*);
- Painted Honeyeater (*Grantiella picta*);
- Black-chinned Honeyeater - Eastern Subspecies (*Melithreptus gularis gularis*);
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*);
- Scarlet Robin (*Petroica boodang*);
- Barking Owl (*Ninox connivens*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Little Pied Bat (*Chalinolobus picatus*);
- Southern Myotis (*Myotis macropus*); and
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*).

Although the fauna surveys did not coincide with the detectability of all of all of these species, no suitable habitat will be directly impacted by the project. Additionally, the majority of these species are likely to utilise habitats within the Project site as part of a wider network of habitat within the locality. Therefore, the habitat is not considered to be critical to the survival of these species.

Native grasslands were restricted to a very small area outside the development footprint (see **Figure 8**).

The habitat assessment (See **Section 3.3.5**) determined that the grasses in this area are too tall and dense to be considered suitable habitat for the Plains-wanderer (*Pedionomus torquatus*), which prefers sparser native groundcover (Parker and Oliver 2006). It was therefore determined that no suitable habitat occurs within the Project site for the Plains-wanderer (*Pedionomus torquatus*).

The aquatic habitats within the Project site consist of constructed dams with no aquatic or emergent vegetation and were highly disturbed (see **Section 3.3.5**). The aquatic habitat is therefore unsuitable for the Southern Bell Frog (*Litoria raniformis*), which prefers dense aquatic vegetation (OEH 2018j).

During periods of flooding, some woodland patches may support habitat for the Sloane's Froglet (*Crinia sloanei*); however, these areas will not be directly impacted by the proposal.

The locations of where each threatened fauna species was recorded within the Project site is present in **Figure 9**.

The following sections describe 'ecosystem credit species' and 'species credit species' separately, in accordance with Section 6 of the BAM.

3.5.4 Ecosystem Credit Species (BAM Credit Calculator)

A total of 16 threatened species have been predicted to occur within the Project site by the BAM Credit Calculator:

- Australasian Bittern (*Botaurus poiciloptilus*)
- Australian Painted Snipe (*Rostratula australis*)
- Brolga (*Grus rubicunda*)
- Diamond Firetail (*Stagonopleura guttata*)
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)
- Freckled Duck (*Stictonetta naevosa*)
- Grey Falcon (*Falco hypoleucos*)
- Grey-crowned Babbler – eastern subspecies (*Pomatostomus temporalis temporalis*)
- Hooded Robin - south-eastern form (*Melanodryas cucullata cucullata*)
- Inland Forest Bat (*Vespadelus Baverstocki*)
- Koala (*Phascolarctos cinereus*)
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri*)
- Regent Parrot (Eastern Subspecies) (*Polytelis anthopeplus monarchoides*)
- Superb Parrot (*Polytelis swainsonii*)
- Swift Parrot (*Lathamus discolor*)
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*)

The predicted occurrence of these threatened species is based on the PCTs that have been mapped within the Project site, the distributional range of the species, the condition of the vegetation, and patch size (as per Section 6 of the BAM). The predicted threatened species report from the BAM Credit Calculator is provided in **Attachment G**.

3.5.5 Species Credit Species

Flora Credit Species

A total of nine flora species credit species have been determined relevant to the Project site according to the BAM Credit Calculator:

- A Spear Grass (*Austrostipa wakoolica*);
- Austral Pillwort (*Pilularia novae-hollandiae*);
- Boland Yellow Gum (*Eucalyptus leucoxylon* subsp. *pruinosa*);
- Menindee Nightshade (*Solanum karsense*);
- Mossgiel Daisy (*Brachyscome papillosa*);
- Sand-hill Spider Orchid (*Caladenia arenaria*);
- Silky Swainson-pea (*Swainsona sericea*);
- Slender Darling Pea (*Swainsona murrayana*); and
- Winged Peppercress (*Lepidium monoplocoides*).

Although most of these species were not detectable during the survey period (i.e. not in flower), no habitat for these species was identified in any areas that would be impacted by the project. The 'Threatened species requiring survey' report from the BAM Credit Calculator, which lists species credit species and their survey timing requirements, is provided in **Attachment G**.

Fauna Credit Species

The following 'candidate threatened fauna species' were identified as requiring surveys in accordance with the BAM:

- Australian Bustard (*Ardeotis australis*);
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri*);
- Swift Parrot (*Lathamus discolor*);
- Southern Myotis (*Myotis macropus*);
- Koala (*Phascolarctos cinereus*);
- Regent Parrot (*Polytelis anthopeplus monarchoides*);
- Superb Parrot (*Polytelis swainsonii*); and
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*).

Although habitat was identified within the Project site for some of these species, no habitat for these species was identified within the development footprint. The 'Threatened species requiring survey' report from the BAM Credit Calculator, which lists species credit species and their survey timing requirements, is provided in **Attachment G**.

3.5.6 Prescribed Biodiversity Values

With reference to Section 6.7 of the BAM, the Project site does not contain any of the 'prescribed biodiversity values' identified in that section, as follows:

- Karst, caves, crevices and cliffs;
- Occurrences of rock;
- Human made structures (being that no structures are located within the development footprint);
- Watercourses or hydrological processes that interact with rivers and streams; and
- The proposed development is not for a wind farm.

3.6 EPBC Act Protected Matters

A search of the Protected Matters Search Tool reveals that a total of 19 threatened species and 10 migratory species (and/or their habitats), four threatened ecological communities and four Wetland of International Importance (RAMSAR) listed in the EPBC Act are predicted to occur within a 10 km radius of the site (**Attachment B**). No other EPBC Act matters are of relevance to the biodiversity of the site.

Stage 2 – Impact Assessment

4 Introduction

This chapter details the potential impacts of the proposed development on biodiversity values, in accordance with Stage 2 of the BAM.

4.1 Avoidance of impacts on native vegetation and habitat

Consideration has been given to avoiding and minimising impacts to biodiversity throughout each phase of the project to date. Site selection options have been assessed against key environmental, social and economic criteria, with several alignment and interchange options being eliminated due to their impact on environmental values; notably on native vegetation, EECs, and threatened species habitat. The option selection process has ensured the no direct impacts on these biodiversity values will result from the proposal.

4.2 Impacts on Native Vegetation and Habitat

Construction of the project will not require the removal of native vegetation or threatened species habitat within the Project site. Additionally, existing roads and tracks will be utilised to gain access to the Project site during the construction and operational phases. No removal of native vegetation or removal of habitat for native fauna will be required.

All woodland areas, as shown in **Figure 8**, will be retained within the Project site. The proposed layout of the solar panels and internal roads has been designed to create a buffer of at least 20 m between the solar panels and the edges of any woodland patches (see **Figure 3**).

No mature trees or hollow-bearing trees are located within the development footprint and therefore none will be removed to allow construction of the project.

Impacts on fauna habitat are therefore restricted to the removal of aquatic habitat at each of the dam sites and removal of agricultural land that provides low quality foraging habitat for a narrow selection of common fauna species (see **Section 3**). Given that resident fauna populations are likely to utilise these areas as part of a wider network of habitats, the proposal is likely to have minimal adverse impacts on these species.

4.3 Indirect Impacts on Native Vegetation and Habitat

Potential indirect impacts on threatened biota may occur during the construction and operational phase of the project. Such impacts may include the following:

- The construction of solar panels and security perimeter fencing within the Project site may obstruct the movement of fauna species through the landscape and may trap fauna within the Project site;
- Light spill from artificial lighting within the Project site may adversely affect the natural behaviour of nocturnal fauna species such as arboreal mammals, large forest owls and foraging microbats;
- Increased traffic within the Project site may facilitate the encroachment of plant weeds that could further degrade the retained areas of native woodland; and

- Increased visitation of the Project site may disturb resident fauna and disrupt their natural behaviour.

Mitigation measures are presented in **Section 5** to reduce the potential for these impacts.

4.4 Direct Impacts on Threatened Biota (BC Act)

One EEC was identified within the Project site: *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions*. Avoidance measures will ensure that no areas of this EEC will be directly impacted by the proposal. Additionally, no EECs were identified adjacent to or downstream of the Project site. It is therefore unlikely that any direct or indirect impacts to EECs will occur as a result of the proposal.

No woodland habitat or other habitats critical to the survival of threatened plant species will be removed by the proposal.

All of the threatened fauna species recorded within the Project site, including threatened species for which habitat was identified, are highly mobile species that are likely to utilise the habitat as part of a much larger network of habitats. No woodland habitat or other habitats critical to the survival of threatened fauna species will be removed by the proposal.

Mitigation measures to reduce the potential for indirect impacts to threatened biota are presented in **Section 5**.

4.5 Cumulative Impacts

Cumulative impacts arise from the interaction of individual elements within the proposal and the additive effects of other external projects. At the time of writing, no other projects have been identified close to the Project site. Given that the proposal will not result in the clearing of native vegetation, and large areas of native vegetation will remain undisturbed outside the Project site within the locality, cumulative impacts of the proposal are expected to be negligible.

4.6 Serious and Irreversible Impacts

According to the BC Regulation and in consideration of the *Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017c), TECs and candidate threatened species that are sensitive to serious and irreversible impacts (i.e. SAI entities) are determined by the following principles:

- Principle 1 – species or ecological communities currently in a rapid state of decline; and
- Principle 2 – species or ecological communities with a very small population size.

Given that no TECs or habitat for threatened candidate species will be removed within the Project site, it is unlikely that impacts of the proposal would constitute a serious and irreversible impact, as defined by the NSW BC Regulation.

4.7 Impacts on EPBC Act Protected Matters

No habitat for EPBC Act listed biota will be removed as a result of construction of the project. It is therefore unlikely that the proposal would directly impact any EPBC Act matters listed in **Attachment B**. The potential for indirect impacts to fauna species, including EPBC listed species is discussed previously in **Section 4.3**.

5 Mitigation and Management of Impacts on Biodiversity Values

This chapter recommends a selection of measures that are designed to reduce the risk or severity of potential indirect impacts on biodiversity values, in accordance with Section 9.3 of the BAM.

5.1 Mitigation Measures – Construction Phase

Construction activities within the Project site have the potential to impact on habitats outside the Project site (i.e. Washpen Creek) indirectly through sedimentation. The following prescribed mitigation measures are recommended to minimise such impacts.

5.1.1 Erosion Control

Mitigation measures to reduce soil erosion and pollutant run-off during construction activities should include:

- Installation of erosion and sediment control measures prior to any works;
- Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality;
- Management of excavated materials to prevent sediment transfer;
- Avoiding stockpiling of materials adjacent to native vegetation, but instead use areas that are already cleared/ disturbed; and
- Undertake maintenance of silt fences and other mitigation measures to isolate runoff.

5.1.2 Dust Control

Specific measures to minimise the generation of dust and associated impacts on adjacent natural environments should include:

- Setting maximum speed limits for all traffic within the Project site to limit dust generation;
- Use of a water tanker or similar to spray unpaved access tracks during the construction phase where required; and
- Application of dust suppressants or covers on soil stockpiles.

5.1.3 Chemical Spills

Specific measures to minimise the potential for chemical spills and associated impacts on adjacent natural environments should include the following:

- All chemicals must be kept in clearly marked bunded areas;
- Regularly inspect vehicles and mechanical plant for leakage of fuel or oil; and
- No re-fuelling of vehicles, washing of vehicles or maintenance of vehicles and plant to be undertaken within 20 m of natural drainage lines.

5.1.4 Weed Management

Priority weeds, environmental weeds and HTE species were identified within the Project site (see **Section 3.2**). Measures to prevent the spread of weeds should include the following weed hygiene procedures:

- All vehicles, equipment, footwear and clothing should be clean and free of weed propagules prior to entering the Project site; and
- Any weeds that are removed during the construction phase should be disposed of via an appropriate waste facility.

5.2 Mitigation Measures – Operational Phase

5.2.1 Security Perimeter Fencing

The fencing of large land parcels can have a negative impact on terrestrial fauna species within the locality such as Kangaroos and Emus. It is important to allow for natural movements of fauna throughout the landscape thus maintaining high connectivity. Degradation of habitat by high Kangaroo numbers in fenced sites has occurred on numerous Defence sites throughout NSW and the ACT and has caused widespread public concern after culls have been required to control animal numbers (Peachey *et al.* 2007). Additionally, high numbers of Kangaroos can cause severe degradation of grassland and woodland habitats (Leigh 1989; ESA 2016) if trapped within fenced areas.

Monitoring should be conducted annually for a three to five year period following project construction to assess the abundance and welfare of Kangaroos and Emus within the Project site. A quantitative survey approach should be employed by a suitably trained project ecologist. This method should involve walking transects to estimate Kangaroo and Emu numbers. Statistical analysis may involve using distance analysis to estimate population size and density (Thomas *et al.* 2010). Each monitoring event should also assess the impacts of grazing pressure on native vegetation via permanent monitoring plots. At least one monitoring plot should be placed in each vegetation type to assess grazing impacts. Vegetation integrity should be assessed using the Biodiversity Assessment Method (OEH 2017c).

5.2.2 Artificial Lighting

Artificial lighting has the potential to disrupt the natural behaviour of nocturnal fauna species such as arboreal mammals, large forest owls and microbats. To reduce impacts to these species, including the vulnerable Inland Forest Bat (*Vespadelus baverstocki*), artificial lighting should be reduced where possible within the Project site. Lights should be turned off at night and any essential lighting should be directed away from fauna habitats such as woodland areas.

5.3 Impacts Requiring an Offset

The BAM (OEH 2017c) establishes a framework to offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. Section 10.3.1 of the BAM sets out thresholds for impacts on native vegetation that require offsetting based on vegetation integrity scores. The proposed development footprint is to be located entirely within areas assessed and mapped as 'Non-native vegetation'. These areas are currently cropped lands (containing almost entire wheat and/or canola and weed species, as described in **Section 3.2.3**) and therefore are not identifiable as patches of native vegetation and are not assessed as native vegetation zones in this assessment. As noted in Section 10.4.1 of the BAM, the assessor is not required to assess areas of land on the Project site "without native vegetation", but must still assess these areas for threatened species.

Given that the proposal will not directly impact any areas native vegetation (i.e. Plant Community Types) or habitat for threatened species, no biodiversity offsets are required for the proposed development.

5.4 Impacts Not Requiring Further Assessment

The areas mapped as agricultural lands within the Project site do not contain native vegetation. The proposed development footprint has been located entirely within these areas of non-native vegetation, which do not require further assessment. Notwithstanding, these areas have been assessed for the potential occurrence of threatened species in accordance with Section 10.4 of the BAM, as discussed in **Section 3.5**.

5.5 Biodiversity Offsets

The proposed Yarrabee Solar Project will not require the removal of native vegetation or habitat for threatened species listed under the BC Act or the Commonwealth EPBC Act. Avoidance measures and mitigation measures have been presented to reduce the potential for indirect impacts on biodiversity values to be retained within the Project site during and after construction. No biodiversity offsets are required for the proposed development.

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7 Definitions

The following terms are defined for the purposes of the Biodiversity Assessment Method:

Accredited person: has the same meaning as in the BC Act, referred to in the Biodiversity Assessment Method as ‘assessor’.

Ancillary rules: has the same meaning as set out in clause 6.5 of the NSW *Biodiversity Conservation Regulation 2017*.

Annual probability of decline in vegetation and habitat condition: an estimate of the average probability of decline of each attribute through clearing, stochastic factors or ongoing degrading actions (firewood removal, weed invasion, livestock grazing).

Areas of geological significance: geological features such as karst, caves, crevices, cliffs.

Assessment area surrounding the subject land: the area of land in the 1500 m buffer zone around a Project site, or land to be biodiversity certified or a biodiversity stewardship site, that is determined in accordance with Subsection 4.3.2 of the Biodiversity Assessment Method.

Assessor: the person accredited under the NSW *Biodiversity Conservation Act 2016* referred to in Subsection 2.1.2 of the Biodiversity Assessment Method and who has been engaged by the proponent.

Averted loss: the gain in vegetation and habitat condition that arises from managing the proposed land as an offset compared to the probable future vegetation condition if the land was to be left unmanaged (see *Annual probability of decline*).

Avoid: measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity. Refer to the Biodiversity Assessment Method for operational guidance.

BAM: the Biodiversity Assessment Method.

BC Act: the NSW *Biodiversity Conservation Act 2016*.

BC Regulation: the NSW *Biodiversity Conservation Regulation 2017*.

Benchmark data: for a PCT, vegetation class or vegetation formation benchmark data is contained in the BioNet Vegetation Classification. A local reference site may also be used to establish benchmark data for a PCT that may be used in a BAM assessment.

Benchmarks: the quantitative measures that represent the ‘best-attainable’ condition, which acknowledges that native vegetation within the contemporary landscape has been subject to both natural and human-induced disturbance. Benchmarks are defined for specified variables for each PCT. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, is not subject to high frequency burning, and has evidence of recruitment of native species.

Biodiversity Assessment Method (BAM): is established under section 6.7 of the NSW *Biodiversity Conservation Act 2016* (BC Act) The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values, where required under the BC Act, *Local Land Services Act 2013* (LLS Act) or the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*).

Biodiversity certification: has the same meaning as in the NSW *Biodiversity Conservation Act 2016*.

Biodiversity Certification Assessment Report (BCAR): has the same meaning as in the NSW *Biodiversity Conservation Act 2016*.

Biodiversity credit report: the report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a Project site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.

Biodiversity Development Assessment Report (BDAR): has the same meaning as in the BC Act. Biodiversity offsets: management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development.

Biodiversity stewardship agreement: has the same meaning as in the NSW *Biodiversity Conservation Act 2016*.

Biodiversity stewardship site: has the same meaning as in the NSW *Biodiversity Conservation Act 2016*.

Biodiversity Stewardship Site Assessment Report (BSSAR): the report that must be prepared in accordance with the Biodiversity Assessment Method and submitted as part of an application for a biodiversity stewardship agreement.

Biodiversity values: has the same meaning as clause 1.5(2) of the NSW *Biodiversity Conservation Act 2016*.

Biodiversity values map: is established according to clause 7.3 of the NSW *Biodiversity Conservation Regulation 2017*. Development within an area identified on the map requires assessment using the BAM.

BioNet Atlas: the OEH database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the TSC Act) and some fish.

Bionet Vegetation Classification: the master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by OEH and available at www.environment.nsw.gov.au/research/Visclassification.htm.

Broad condition state: areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.

Certified more appropriate local data: has the same meaning as set out in Subsection 2.2.2 of the Biodiversity Assessment Method.

Change in vegetation integrity score for a biodiversity stewardship site: the difference (gain) between the estimated vegetation integrity score without management at a biodiversity stewardship site and the predicted future vegetation integrity score with management at a biodiversity stewardship site.

Class of biodiversity credit: as defined in Section 11.3 of the Biodiversity Assessment Method.

Clearing site: the site proposed to be cleared of native vegetation where approval is sought under Part 5A of the *Local Land Services Act 2013* or the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*.

Clonal species: flora species that propagate asexually at a site or have a limited degree of sexual reproduction, either within or between sites. Modes of asexual reproduction will include vegetative reproduction such as by rhizomes, root suckers or bulb replication.

Connectivity: the measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.

Credit Calculator: the computer program that provides decision support to assessors and proponents by applying the BAM, in particular by using the data required to be entered and the equations in Appendix 6 and Appendix 9 of the Biodiversity Assessment Method to calculate the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.

Critically endangered ecological community (CEEC): an ecological community specified as critically endangered in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Crown cover: the vertical projection of the periphery of tree crowns within a designated area.

Derived vegetation: PCTs that have changed to an alternative stable state as a consequence of land management practices since European settlement. Derived communities can have one or more structural components of the vegetation entirely removed or severely reduced (e.g. over-storey of grassy woodland), or have developed new structural components where they were previously absent (e.g. shrubby mid-storey in an open woodland system).

Project site: an area of land that is subject to a proposed development application, application for approval, or activity within the meaning of Part 5 of the EP&A Act. The term development is also taken to include clearing, except where the reference is to a small area development or a major project development.

Development footprint: the area of land that is directly impacted on by a proposed development, including access roads and areas used to store construction materials. The term development footprint is also taken to include clearing footprint except where the reference is to a small area development or a major project development.

Project site: an area of land that is subject to a proposed development that is under the EP&A Act. The term Project site is also taken to include clearing site except where the reference is to a small area development or a major project development.

Ecosystem credits: a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a Project site and the gain in biodiversity values at a biodiversity stewardship site.

Endangered ecological community (EEC): an ecological community specified as endangered in Schedule 2 of the BC Act, or listed under the EPBC Act.

Environment Agency Head: has the same meaning as in the BC Act.

EP&A Act: the NSW Environmental Planning and Assessment Act 1979.

EPBC Act: the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Ephemeral flora species: flora species where the abundance of the species above ground fluctuates in response to the plant life history in combination with environmental conditions and/or disturbance regimes. Fluctuations in abundance may be short-term (seasonal) or long-term (yearly to decadal). Many ephemeral species persist underground through unfavourable conditions via soil seed banks or dormant vegetative organs (bulbs, tubers, rootstocks).

Estuarine area: a semi-enclosed body of water having an open or intermittently open connection with the ocean, in which water levels do not vary with the ocean tide (when closed to the sea) or vary in a predictable, periodic way in response to the ocean tide at the entrance (when open to the sea).

Expert: a person who has the relevant experience and/or qualifications to provide expert opinion in relation to the biodiversity values to which an expert report relates.

Foliage cover: the percentage of a plot area that would be covered by a vertical projection of the foliage and branches and trunk of a plant, or plants or a growth form group. Foliage cover can also be referred to as percent foliage cover.

Gain: the gain in biodiversity values at a biodiversity stewardship site, over time from undertaking management actions at a biodiversity stewardship site. Gain in biodiversity values is the basis for creating biodiversity credits at the biodiversity stewardship site.

Grassland: native vegetation classified in the vegetation formation 'Grasslands' in Keith (2004)². Grasslands are generally dominated by large perennial tussock grasses, lack of woody plants, the presence of broad-leaved herbs in inter-tussock spaces, and their ecological association with fertile, heavy clay soils on flat topography in regions with low to moderate rainfall.

Growth form: the form that is characteristic of a particular flora species at maturity. Growth forms are set out in Appendix 4.

Habitat: an area or areas occupied, or periodically or occasionally occupied, by a species or ecological community, including any biotic or abiotic component.

Habitat component: the component of habitat that is used by a threatened species for either breeding, foraging or shelter.

Habitat surrogates: measures of habitat that predict the occurrence of threatened species and communities: IBRA subregion, PCT, percent vegetation cover and vegetation condition.

Herbfield: native vegetation which predominantly does not contain an over-storey or midstorey and where the ground cover is dominated by non-grass species.

High threat exotic plant cover: plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species. Also referred to as high threat weeds.

Hollow bearing tree: a living or dead tree that has at least one hollow. A tree is considered to contain a hollow if:

- (a) the entrance can be seen;
- (b) the entrance width is at least 5cm;
- (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance);
- (d) the hollow is at least 1m above the ground. Trees must be examined from all angles.

IBRA region: a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system³, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.

IBRA subregion: a subregion of a bioregion identified under the IBRA system.

Impact assessment: an assessment of the impact or likely impact of a development on biodiversity values which is prepared in accordance with the BAM.

Impacts on biodiversity values: loss in biodiversity values from direct or indirect impacts of development in accordance with Chapters 8, 1 and 10.

Important wetland means: a wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) from time to time, and the actual location on the ground that corresponds to a SEPP 14 Coastal wetland.

Individual: in relation to organisms, a single, mature organism that is a threatened species, or any additional threatened species listed under Part 13 of the EPBC Act.

Intact vegetation: vegetation where all tree, shrub, grass and/or forb structural growth form groups expected for a plant community type are present.

Intrinsic rate of increase (ir): an estimate of the rate of gain for an attribute at a biodiversity stewardship site from actions undertaken as part of the management plan. The intrinsic rate of increase is specified for an attribute according to the formation of the PCT being assessed (see Appendix 8).

Landscape attributes: in relation to a Project site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site.

Large tree benchmark: is the largest stem size class for a PCT as determined by the benchmark for the PCT.

Life cycle: the series of stages of reproduction, growth, development, aging and death of an organism.

Life form: the form that is characteristic of a particular species at maturity. In the BAM, life form has the same meaning as growth form for flora species.

Linear shaped development: development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length.

Litter cover: the percentage ground cover of all plant material that has detached from a living plant, including leaves, seeds, twigs, branchlets and branches (<10cm in diameter).

Local population: the population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.

Local wetland: any wetland that is not identified as an important wetland (refer to definition of Important wetland).

Loss of biodiversity: the loss of biodiversity values from a Project site, native vegetation clearing site or land where biodiversity certification is conferred.

Major project: State Significant Development and State Significant Infrastructure.

Minimise: a process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of development on biodiversity values.

Mitchell landscape: landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Multiple fragmentation impact development: developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines.

Native ground cover: all native vegetation below 1m in height, including all such species native to NSW (i.e. not confined to species indigenous to the area).

Native ground cover (grasses): native ground cover composed specifically of native grasses.

Native ground cover (other): native ground cover composed specifically of non-woody native vegetation (vascular plants only) <1m in height that is not grass (e.g. herbs, ferns).

Native ground cover (shrubs): native ground cover composed specifically of native woody vegetation <1m in height.

Native mid-storey cover: all vegetation between the over-storey stratum and a height of 1m (typically tall shrubs, under-storey trees and tree regeneration) and including all species native to NSW (i.e. native species not local to the area can contribute to mid-storey structure).

Native over-storey cover: the tallest woody stratum present (including emergent) above 1m and including all species native to NSW (i.e. native species not local to the area can contribute to over-storey structure). In a woodland community, the over-storey stratum is the tree layer, and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum.

Native plant species richness: the number of different native vascular plant species that are characteristic of a PCT.

Native vegetation: has the same meaning as in section 1.6 of the BC Act.

Native vegetation cover: the percentage of native vegetation cover on the subject land and the surrounding buffer area. Cover estimates are based on the cover of native woody and non-woody vegetation relative to the approximate benchmarks for the PCT, taking into account vegetation condition and extent. Native over-storey vegetation is used to determine the percent cover in woody vegetation types, and native ground cover is used to assess cover in non-woody vegetation types.

Number of trees with hollows: a count of the number of living and dead trees that are hollow bearing.

Offset rules: are those established by the BC Regulation.

Onsite measures: measures and strategies that are taken, or are proposed to be taken at a Project site to avoid and minimise the direct and indirect impacts of the development on biodiversity values.

Operational Manual: the Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM.

Patch size: an area of intact native vegetation that:

- a) occurs on the Project site or biodiversity stewardship site, and
- b) includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the Project site or biodiversity stewardship site.

PCT classification system: the system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification.

Percent cleared value: the percentage of a PCT that has been cleared as a proportion of its pre-1750 extent, as identified in the BioNet Vegetation Classification.

Plant community type (PCT): a NSW plant community type identified using the PCT classification system.

Plot: an area within a vegetation zone in which site attributes are assessed.

Population: a group of organisms, all of the same species, occupying a particular area.

Probability of reaching benchmark: the probability of a specific attribute or growth form group reaching benchmark conditions in the vegetation zone at the end of the management timeframe.

Proponent: a person who intends to apply for consent or approval to carry out development, clearing, biodiversity certification or for approval for infrastructure.

Reference sites: the relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.

Regeneration: the proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height < 5 cm within a vegetation zone.

Residual impact: an impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.

Retirement of credits: the retirement of biodiversity credits from a biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.

Riparian buffer: an area of land determined according to Appendix 3.

Risk of extinction: the likelihood that the local population or CEEC or EEC will become extinct either in the short term or in the long term as a result of direct or indirect impacts on the viability of that population or CEEC or EEC.

SAIL Entity: candidate species and communities that are sensitive to serious and irreversible impacts.

SEPP 14 Coastal wetland: a wetland to which State Environmental Planning Policy No 14 – Coastal Wetlands applies or an area that is identified as a coastal wetland within the meaning of the term coastal wetlands and littoral rainforests area for the purposes of Coastal Management Act 2016.

Site attributes: the matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.

Site-based development: a development other than a linear shaped development, or a multiple fragmentation impact development.

Site context: the value given to landscape attributes of a Project site or biodiversity stewardship site after an assessment undertaken in accordance with Section 4.3.

Species credit species: are threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.

Species credits: the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.

State Significant Development: has the meaning given by Division 4.1 of Part 4 of the EP&A Act.

State Significant Infrastructure: has the meaning given by Part 5.1 of the EP&A Act.

Stream order: has the same meaning as in Appendix 3.

Subject land: is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a Project site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.

Threat status class: the extent to which a species or ecological community is threatened with extinction, or the extent to which a PCT is estimated to have been cleared (see Percent cleared value).

Threatened Biodiversity Data Collection: part of the BioNet database, published by OEH and accessible from the BioNet website at www.bionet.nsw.gov.au.

Threatened ecological community (TEC): means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act.

Threatened species: critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.

Threatened species survey: a targeted survey for threatened species undertaken in accordance with Section 6.5.

Threatened species survey guidelines: survey methods or guidelines published by OEH from time to time at www.environment.nsw.gov.au/topics/animals-and-plants/threatenedspecies/about-threatened-species/surveys-and-assessments.

Total length of fallen logs: the total length of logs present in a vegetation zone that are at least 10cm in diameter and at least 0.5m long.

Transect: a line or narrow belt along which environmental data is collected.

Upland Swamp Policy: the document entitled Addendum to NSW Biodiversity Offsets Policy for Major Projects: Upland swamps impacted by longwall mining subsidence as in force on the day when the BAM is published until such time as the Environment Agency Head publishes any further document for the purpose of it being adopted by the BAM as the Upland Swamp Policy.

Vegetation Benchmarks Database: a database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification. It is available at www.environment.nsw.gov.au/research/Visclassification.htm.

Vegetation class: a level of classification of vegetation communities defined in Keith (2004)⁴. There are 99 vegetation classes in NSW.

Vegetation formation: a broad level of vegetation classification as defined in Keith (2004)⁴. There are 16 vegetation formations and sub-formations in NSW.

Vegetation integrity: the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.

Vegetation integrity score: the quantitative measure of vegetation condition calculated in accordance with Equation 15 or Equation 16.

Vegetation zone: a relatively homogenous area of native vegetation on a Project site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.

Viability: the capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.

Vulnerable ecological community (VEC): an ecological community specified as vulnerable in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.

Wetland: an area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water (see also *Important wetland* and *Local wetland*).

Woody native vegetation: native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

Bionet Atlas Data

KEY	
Status	The “ <i>threatened species</i> ” or “ <i>endangered ecological community</i> ” listing in the <i>Biodiversity Conservation Act 2016</i>
V	Species listed as “ <i>Vulnerable</i> ”
E1	Species listed as “ <i>Endangered</i> ”
E4A	Species listed as “ <i>Critically Endangered</i> ”
E2	An “ <i>endangered population</i> ”
E	An EEC listed as “ <i>endangered</i> ”
CE	An EEC listed as “ <i>critically endangered</i> ”
	The “ <i>threatened species</i> ” or “ <i>endangered ecological community</i> ” listing in the <i>Environment Protection and Biodiversity Conservation Act 1999</i>
V	Species listed as “ <i>Vulnerable</i> ”
E	Species listed as “ <i>Endangered</i> ”
CE	Species listed as “ <i>Critically Endangered</i> ”
M	Species listed as “ <i>Migratory</i> ”
MR	Species listed as “ <i>Marine</i> ”
LoO	Likelihood or Occurrence - the probability of a threatened species occurring on the site
P	Present or recorded on the Project site
H	High likelihood of occurrence
M	Moderate likelihood of occurrence
L	Low likelihood of occurrence
N	No potential relevance
Source	Data Source

KEY

PMST Sourced from Protected Matters Search Tool

BioNet Sourced from OEH Bionet Atlas

SLR Sourced from SLR field data and reports

Notes

Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^^ rounded to 0.01°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria: Licensed Report of all Valid Records of Threatened (listed on BC Act) Entities in Riverina - Murrumbidgee IBRA Subregion returned a total of 7,394 records of 116 species. Report generated on 23/05/2018 9:18 AM.

Species Name	BC Act	Habitat Requirements	LoO	Source
Threatened Plants				
A burr-daisy <i>Calotis moorei</i>	E	Erect perennial herb to 45 cm with yellow petals on the flower heads. The species is confined to NSW and is known to grow in sandy soil and appears to be associated with Acacia woodlands and chenopod shrublands. The species has been recorded flowering in September.	L	BioNet
A spear-grass <i>Austrostipa wakoolica</i>	E	Densely tufted perennial growing to 1 m that is often found growing on grey, silty clay or sandy loam soils. The species is confined to the floodplains of the Murray River tributaries of central-western and south-western NSW. The leaves of the species are flattened or rolled and densely hairy. The ideal survey time is October to December.	L	BioNet PMST
Austral Pillwort <i>Pilularia novae-hollandiae</i>	E	Semi-aquatic fern with thread like fronds growing to 8 cm. The populations at Lake Cowal and Oolambeyan NP are the only known extant populations in NSW, although the species is obscure and has possibly been overlooked elsewhere. The species grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous.	L	BioNet
Bindweed <i>Convolvulus tedmoorei</i>	E	Perennial herb with trailing stems recorded from northern inland areas of South Australia, south-western Queensland and western NSW. Few known records from NSW. Grows in self-mulching grey clay soils on the floodplains of the Darling and Murrumbidgee Rivers. Flowers August to September.	M	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
Chariot Wheels <i>Maireana cheelii</i>	V	Perennial forb to about 20 cm high, with slender striped woolly stems and a fleshy swollen taproot. Restricted to the southern Riverina region of NSW, mainly in the area between Deniliquin and Hay. Usually found on heavier, grey clay soils tending to grow in shallow depressions, often on eroded or scalded surfaces.	M	BioNet
Claypan Daisy <i>Brachyscome muelleroides</i>	V	Annual herb that grows to 14 cm tall occurring in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Grows in damp areas on the margins of claypans in moist grassland.	M	
Floating Swamp Wallaby-grass <i>Amphibromus fluitans</i>	V	Perennial grass to 0.8 m tall with sprawling stems apart from the flowering section, which is erect to 35 mm. The species requires wetlands which are at least moderately fertile with bare ground which is periodically flooded. The ideal survey period for the species is November to March. Often the flower heads are the only part of the plant above water as the species is virtually aquatic.	L	BioNet
Hoary Sunray <i>Leucochrysum albicans</i> var. <i>tricolor</i>	P	A perennial everlasting daisy. Stems are 10–15 cm tall. In NSW it currently occurs on the Southern Tablelands adjacent areas in an area roughly bounded by Albury, Bega and Goulburn. Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils.	M	BioNet
Holly-leaf Grevillea <i>Grevillea ilicifolia</i> subsp. <i>ilicifolia</i>	E	Small to medium spreading to erect shrub. In New South Wales, the Holly-leaf grevillea occurs, or has occurred, at highly disjunct localities in the central west and central south of the State. Recorded from shrubby mallee communities. Flowers from September to November.	L	BioNet
Lanky Buttons <i>Leptorhynchos orientalis</i>	E	Erect annual forb to 30 cm high the species has been recorded from several Hay Plain and southern Riverina localities. Grows in woodland or grassland, sometimes on the margins of swamps. The species flowers from August to October.	M	BioNet
Menindee Nightshade <i>Solanum karsense</i>	V	Grey-green downy forb to 0.3 m high. The species is endemic to NSW, restricted to the far south-western plains, extending up the Darling River to the Menindee and Wilcannia districts. Grows in occasionally flooded depressions with heavy soil, including level river floodplains of grey clay with Black Box and Old Man Saltbush, and open treeless plains with solonized brown soils.	M	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
Mossgiel Daisy <i>Brachyscome papillosa</i>	V	Multi-stemmed perennial herb to 40 cm tall that is endemic to NSW. Chiefly occurs within the Riverina Bioregion, from Mossgiel in the north, Murrumbidgee Valley (Yanga) National Park in the south west to Urana in the south east. Recorded primarily in clay soils on Bladder Saltbush (<i>Atriplex vesicaria</i>) and Leafless Bluebush (<i>Maireana aphylla</i>) plains, but also in grassland and in Inland Grey Box (<i>Eucalyptus microcarpa</i>) - Cypress Pine (<i>Callitris spp.</i>) woodland. Known to inhabit Black Box Lignum woodland, Black Box grassy open woodland. Ideal survey time is when the mauve flower heads appear between June and December.	L	PMST
Oaklands Diuris <i>Diuris sp.</i>	E	'Donkey Orchid' growing to 50 cm tall currently known only from the Oaklands-Urana region of southern NSW Grows in White Cypress Pine (<i>Callitris glaucophylla</i>) Woodland, either among dense grasses in flat areas with associated eucalypts, or amongst sparse grasses and forbs on low sandhills.	M	BioNet
Pine Donkey Orchid <i>Diuris tricolor</i>	V	Tuberous, deciduous terrestrial orchid species sporadically distributed on the western slopes of NSW extending of Narrandera to the north of NSW growing on sandy soils either on flats or small rises. The species is commonly recorded in disturbed habitats. Flower stalk of the species is between 20 and 40 cm and has 2-6 flowers. Ideal; survey time is between early September to late October when the species produces pleasant, sweet smelling bright yellow to orange flowers.	L	BioNet
<i>Ptilotus extenuatus</i>	E	Erect perennial with a woody rootstock, stems to 30 cm high, the species is now presumed to be extinct. The habitat of <i>Ptilotus extenuatus</i> is unknown; however one specimen label records the soil as 'grey silty clay' while another says 'light sandy soil'.	L	BioNet
Red Darling Pea <i>Swainsona plagiotropis</i>	V	Small prostrate forb to about 15 cm high occurring in the upper Murray River valley in the south-western plains of NSW and into Victoria. Grows on flat grassland and in heavy red soil, often on roadsides and especially in table drains. Flowering occurs from August to November.	M	BioNet
Sand-hill Spider Orchid <i>Caladenia arenaria</i>	E	Typical spider orchid characterised by five long, spreading petals and sepals around a broad down-curved labellum. The species is currently only known to occur in the Riverina between Urana and Narrandera and occurs in woodland with sandy soil, especially that dominated by White Cypress Pine (<i>Callitris glaucophylla</i>). Ideal survey time is typically when the species is in flower for a few weeks from late August to early October.	M	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
Silky Swainson-pea <i>Swainsona sericea</i>	V	Low prostrate herb occurring in Box-Gum Woodland in the Southern Tablelands and South West Slopes. It can sometimes found in association with cypress-pine <i>Callitris</i> spp. Ideal survey time is spring to autumn where it can be identified by its foliage as well as the purple flowers that appear from spring to summer.	M	BioNet
Slender Darling Pea <i>Swainsona murrayana</i>	V	Sparsely downy forb distinguished by the strongly twisted hypanthium and keel with retracted tip The species requires some disturbance and is known to occur moderately grazed paddocks. The ideal survey time is spring to early summer.	M	PMST
Small Scurf-pea <i>Cullen parvum</i>	E	Small perennial pea that may either trail or stand erect. Large populations have been recorded in grassy gaps in the Red Gum Woodlands of Barmah State Park, just across the border in Victoria. Extensive suitable habitat probably occurs across the border in NSW.	M	BioNet
Turnip Copperburr <i>Sclerolaena napiformis</i>	E	Low subshrub growing to 30 cm with slender branches that are sparsely covered in short, curled hairs. The species is confined to grassland habitats on clay-loam soils sometimes in areas of intermittent grazing. The ideal survey time is between November to May when the species produces hard, 2 mm long fruits with 5-6 widely spreading, stout spines.	L	PMST
Velvet Thread-petal <i>Stenopetalum velutinum</i>	E	Annual woody herb that is currently distributed in Queensland, Western Australia, South Australia, and the Northern Territory. The species is strongly associated with buffel grass cover and sandy soils. It is presumed extinct in NSW.	L	BioNet
Winged Peppergrass <i>Lepidium monoplocoides</i>	E	Erect annual herb or perennial forb, 15-20 cm high the species is widespread in the semi-arid western plains regions of NSW. Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm. Predominant vegetation is usually an open woodland. The species flowers from August to October.	M	BioNet
Yellow Gum <i>Eucalyptus leucoxylon</i> subsp. <i>pruinosa</i>	V	Small to medium-sized tree growing to about 20 m high the species is restricted to several small areas between Barham and Euston. Occurs at the bases of sandy rises and on loamy clay flats on the floodplains of the Murray River and its tributaries in the Riverina Bioregion.	L	BioNet
Threatened Amphibians				

Species Name	BC Act	Habitat Requirements	LoO	Source
Southern Bell Frog <i>Litoria raniformis</i>	E1	Large olive to bright green patterned frog with a turquoise blue under-thigh and a growling call in breeding season. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps along floodplains and river valleys. Will use non-native vegetation such as rice fields. Ideal survey time during breeding which occurs from November to March summer following flooding or significant rainfall events. During breeding season they are found amongst aquatic vegetation in still or slow flowing waterbodies, outside breeding season they move away from the water and are found amongst timber, rocks, soil and vegetation. Ideal survey period from September to May.	L	BioNet PMST
Sloane's Froglet <i>Crinia sloanei</i>	V	Small, ground-dwelling easily distinguished by its call and the mustard yellow or greyish back with large patches of darker pigment over the body. The species has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin. It is typically associated with areas in woodland, grassland or disturbed habitats that are periodically inundated with water. Ideal survey period March to November after rain. Calling appears from to be from mid-winter to early spring.	L	BioNet
Threatened Birds				
Australasian Bittern <i>Botaurus poiciloptilus</i>	E	Stocky bird with a long, thick neck and a straight, brownish-yellow bill. The species upper surface is mottled brown and its under-surface is buff with dark brown stripes. It has yellow eyes and a pale eyebrow. The species is widespread but uncommon over south-eastern Australia favouring permanent freshwater wetlands with tall, dense vegetation. Breeding occurs in summer from October to January with nests built in secluded places such as densely vegetated wetlands on a reed platform.	L	PMST
Australian Bustard <i>Ardeotis australis</i>	E	Very large, heavy-bodied, ground-dwelling bird up to one m tall. Mainly occurs in inland Australia and is now scarce or absent from southern and south-eastern Australia. In NSW, they are mainly found in the north-west corner and less often recorded in the lower western and central west plains regions. Inhabits tussock and hummock grasslands.	L	Bionet
Australian Painted Snipe <i>Rostratula australis</i>	E1	Small wader with brown-grey patterned plumage, white band around the eye and white underside. Inhabits the edges of swamps, marshes and dams with a cover of grass, shrubs or timber. Forages at night in shallow water or on mudflats. Distributed throughout Australia, more commonly found in the south than north particularly the Murray-Darling region. Breeding is often in response to local conditions generally occurring between September and December with the species nesting on the ground among tall vegetation.	N	BioNet PMST

Species Name	BC Act	Habitat Requirements	LoO	Source
Barking Owl <i>Ninox connivens</i>	V	Wide but sparse distribution in NSW, Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. Nests in mature eucalypts with hollows. Known to inhabit Black Box Lignum woodland, Black Box grassy open woodland. Floodplain Transition Woodlands. Nesting occurs during mid-winter and spring but is variable between pairs and among years. Generally laying occurs during August and fledging in November.	M	BioNet
Black Falcon <i>Falco subniger</i>	V	Uniformly dark brown to sooty black with pale throat, eye rings and feet as well as indistinct black streak below each eye. The species is widely spread but sparsely distributed mostly occurring in inland regions.	M	BioNet
Black-chinned Honeyeater (eastern subspecies) <i>Melithreptus gularis gularis</i>	V	Largest of the honeyeater genus the species has a black cap, a distinctive white crescent around the nape and 'chin' patch beneath the bill extending down to a white throat. There is a small blue crescent of blue skin above the eye as well as dull olive-green wings and back. The species is widespread in NSW occupying the upper levels of drier open forests or woodlands that are dominated by box and ironbark <i>Eucalypts</i> . Breeding period from June to December.	M	BioNet
Black-tailed Godwit <i>Limosa limosa</i>	V	Large, migratory sandpiper with a distinctive long, straight, pink bill with a black tip. The upper wing is dark with a white wing bar and there is a sharp demarcation between the white rump and the black tail. The species legs a greenish-black. Primarily a coastal species that is usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats.	N	BioNet
Blue-billed Duck <i>Oxyura australis</i>	V	One of only two Australian species of stiff-tailed ducks the species is endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation.	N	BioNet
Brolga <i>Grus rubicunda</i>	V	Abundant in the northern tropics, but very sparse across the southern part of its range. Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged. Black Box Lignum woodland, Black Box grassy open woodland. The species lays two eggs from winter to autumn.	L	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
Brown Treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i>	V	Small grey-brown bird with black streaking on the lower breast/belly and black bars on the undertail. Inhabits Box-Gum woodlands and dry open forest of inland slopes and plains. Preferred woodlands dominant by stringybarks or other rough-barked eucalypts. Forages in trees and on the ground. Endemic to eastern Australia, occurring from the coast to inland plains and western slopes of the great dividing range. Nests in tree or stump hollows greater than 6cm.	P	BioNet
Bush Stone-curlew <i>Burhinus grallarius</i>	E1	White and brown streaked bird with large yellow eyes and long thin legs. Occurs in woodlands and open forests with a grassy layer and fallen timber. Eggs are laid between spring and early summer in nests that are built on bare patches on the ground.	M	BioNet
Curlew Sandpiper <i>Calidris ferruginea</i>	E	Small, highly gregarious migratory shorebird with a medium length, down-curved bill and longish black legs. The species is usually identified by its non-breeding plumage while in Australia, which is mottled grey above and paler below. Occurs along most of the Australian coastline and sometimes in freshwater estuaries in the Murray-Darling Basin. Inland records are likely to be birds passing during migration.	N	PMST
Diamond Firetail <i>Stagonopleura guttata</i>	V	Widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum <i>Eucalyptus pauciflora</i> Woodlands. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Known to inhabit Black Box Lignum woodland, Black Box grassy open woodland. Groups separate into small colonies to breed between August and January.	M	BioNet
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	Medium sized bird with dark grey-brown feathering merging to black on the longish tail. The species has a blueish bill with a black tip. The upper-wings are blue-grey with a white leading edge. Widespread in the eastern, southern and south-western Australia, occurring throughout most of NSW. Primarily inhabit dry, open <i>eucalypt</i> forests and woodlands with and open or sparse understorey. Most of the species breeding activity occurs on the western slopes of the Great Dividing Range.	M	BioNet
Eastern Osprey <i>Pandion cristatus</i>	V	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	L	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
Eastern Curlew <i>Numenius madagascariensis</i>	N/A	Large wader with a very long, down-curved black bill which is pink at the base. The feathering is a streaky dark brown buff above. The chin and throat of the species is whitish with a prominent white eye-ring. Primarily a coastal species they are found Australia wide. In NSW the species is mainly found in estuaries, inlets, bays and coastal lakes.	N	PMST
Flame Robin <i>Petroica phoenicea</i>	V	Small red, black and white (male) or brown and white (female) robin. Endemic to south eastern Australia, ranging from northern NSW to south east South Australia and Tasmania. In NSW, it breeds in upland areas, inhabiting tall open eucalypt forest, and in winter, many birds move to the inland slopes and plains. Breeding occurs in late spring to summer, nests are built in sheltered sites such as tree cavities, close to the ground.	L	BioNet
Freckled Duck <i>Stictonetta naevosa</i>	V	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Nesting usually occurs between October and December but can take place at other times when conditions are favourable	L	BioNet
Gilbert's Whistler <i>Pachycephala inornata</i>	V	Distributed over much of the arid and semi-arid zone of inland southern Australia, from the western slopes of NSW to the Western Australian wheat belt. Often recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests with a dense shrub layer. Forages on or near the ground in shrub thickets and in tops of small trees. Breeding takes place between August and November with the species laying 2-4 eggs.	L	BioNet
Glossy Black-Cockatoo Riverina population <i>Calyptorhynchus lathami</i>	E2	Occurs on hills and ridges containing stands of Drooping Sheoak (<i>A. verticillata</i>). Feeds almost exclusively on Drooping Sheoak. This population is found in the Narrandera Range and to the north-west in the Brobenah Hills, McPhersons Range, Cocoparra Range, Lachlan Range and Jimberoo State Forests, and the Naradhan Range. Nests in large Eucalypt hollows often along drainage lines.	L	BioNet,
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	Small brown-black with a massive, bulbous bill and a short crest. Males have a distinctive red tail panel while the female's tail panel is yellow to orange. The female commonly has irregular pale-yellow markings on the head and neck. The species is widespread in suitable woodland and forest and forest habitat however the species is uncommon. The species is dependent on large hollow-bearing <i>Eucalypts</i> for breeding. An egg is laid between March and May.	L	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
Grey Falcon <i>Falco hypoleucos</i>	E	Medium-sized, compact, pale falcon with a heavy, thick-set, deep-chested appearance. The species is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	L	BioNet
Grey-crowned Babbler <i>Pomatostomus temporalis temporalis</i>	V	Fairly large brown babbler with distinctive white/grey crown and brow. Live in family groups of up to 15 birds. Inhabits Box-Gum woodlands on slopes, and Box-Cypress pine and Open-Box woodlands when on Alluvial plains. Distribution along most of the eastern side of Australia, particularly the western slopes of the Great Dividing Range. Breeding occurs between July and February. Several conspicuous dome-shaped nests are built and maintained in shrubs, sapling eucalypts or lower branches of larger eucalypts. Territories are usually around 10ha, but can be up to 50ha.	M	BioNet
Hooded Robin <i>Melanodryas cucullata cucullata</i>	V	Widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. The south-eastern form (subspecies <i>cucullata</i>) is found from Brisbane to Adelaide and throughout much of inland NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Known to inhabit Black Box grassy open woodland, Black Box Lignum woodland. Breeding occurs anytime between July and November.	L	BioNet
Little Eagle <i>Hieraaetus morphnoides</i>	V	Medium-sized bird of prey with dark or pale brown colouring and distinctive underwing patterns. Occupies open eucalypt forest and woodland, also utilising riparian, sheoak or <i>Acacia</i> woodlands of interior NSW. Wide distribution through Australia excluding densely vegetated areas of the Great Divide. Large stick nests built in winter with eggs laid during spring.	M	BioNet
Magpie Goose <i>Anseranas semipalmata</i>	V	Large, distinctively black and white water bird with a prominent knob on its head and orange legs. It has black plumage on the head, neck, upper chest and tail and a white body and wings. The species is mainly found in shallow wetlands with a dense growth of sedges or rushes. Breeding is unlikely to occur in south-east as the species prefers to breed in monsoonal areas.	L	BioNet
Major Mitchell's Cockatoo <i>Lophochroa leadbeateri</i>	V	Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres. Distributed throughout interior Australia, found across the arid and semi-arid inland. Known to inhabit Black Box Lignum woodland, Black Box grassy open woodland.	M	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
Malleefowl <i>Leipoa ocellata</i>	V	Distinctive ground-dwelling bird identifiable by its robust, powerful legs, short bill and flattish head while the wings are short, broad and rounded at the tip. The head and neck are greyish above topped with black. The species has a distinctive central black stripe down the throat and chest. Predominately inhabit mallee communities preferring tall, dense and floristically rich habitats preferring areas of light sandy to sandy loam soils. Breed year round laying up to 34 eggs in a year.	L	PMST
Masked Owl <i>Tyto novaehollandiae</i>	V	Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt woodlands from sea level to 1100 m. Roosts and breeds in large (>40cm) hollows and sometime caves in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. Prey mostly terrestrial mammals but arboreal species may also be taken.	M	BioNet
Painted Honeyeater <i>Grantiella picta</i>	V	Nomadic. Greatest concentrations and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. Feeds on the fruits of mistletoes growing on woodland eucalypts and acacias. Nests from spring to autumn in outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches. Known to inhabit Black Box Lignum woodland, Black Box grassy open woodland.	M	BioNet PMST
Pied Honeyeater <i>Certhionyx variegatus</i>	V	Distinctive small, black and white honeyeater with white wing-bar, rump and tail-panels the species is widespread throughout acacia, mallee and spinifex scrubs of arid and semi-arid Australia. Inhabits wattle shrub, primarily Mulga (<i>Acacia aneura</i>), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering. The species is highly nomadic, following the flowering shrubs.	M	BioNet
Plains-wanderer <i>Pedionomus torquatus</i>	E1	A small quail-like bird with fawn plumage, straw yellow legs and bill. Best detected using spotlighting. Inhabits semi-arid, lowland native grasslands typically on hard red-brown soils with high plant diversity. Primarily found within the western riverina region. Breed throughout the year, requiring sparse native grassland with bare ground, grass, herb and forb and a small amount of leaf litter.	M	BioNet
Redthroat <i>Pyrholaemus brunneus</i>	V	Small, generally nondescript bird of inland shrublands the species is endemic to southern mainland Australia in all States and the NT. In NSW, the species is confined to the far west of the state mainly inhabiting chenopod shrublands.	M	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
Regent Honeyeater <i>Anthochaera phrygia</i>	E4A	Occurs in dry open forest and woodland, including Box-Ironbark woodland and riparian River Sheoak forests. Woodlands favoured have high species richness of birds, high number of mature trees and abundance of mistletoes. Forages on a wide range of eucalypts and mistletoes as well as insects. Range occurs between north-east Victoria and south-east Queensland. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak.	M	BioNet
Regent Parrot (eastern subspecies) <i>Polytelis anthopeplus monarchoides</i>	E1	Slim medium-sized parrot (37 to 42 cm) with a long narrow tail and pointed backswept wings, the eastern subspecies is restricted to areas around the Murray River in South Australia, Victoria and NSW. The species nests within River Red Gum forests along the Murray, Wakool and lower Murrumbidgee Rivers. Principal foraging habitat is mallee woodlands, though foraging also occurs in riverine forests and woodlands.	L	BioNet
Scarlet Robin <i>Petroica boodang</i>	V	Small Australian robin with a black head and upperparts with a distinctive white forehead patch, white wings stripes and white tail edges. The male has a bright scarlet-red chest and white belly. In NSW the species occurs from the coast to inland slopes inhabiting mature and regrowth <i>eucalypt</i> woodlands and forests with open grassy understory. Habitat usually has abundant logs and fallen timber. Ideal survey time may be in autumn and winter when the Scarlet Robin moves in open woodlands and grasslands or grazed paddocks with scattered trees. Breeding generally occurs between the months of July and January	M	BioNet
Speckled Warbler <i>Chthonicola sagittata</i>	V	Small, well camouflaged and heavily streaked ground-dwelling species. The back, wings and tail are grey-brown with soft, dark streaks and the crown is distinctively black streaked with a buff. The species is patchily distributed throughout the eastern half of NSW inhabiting a wide range of <i>Eucalyptus</i> dominated communities that have a grassy understory. Large, relatively undisturbed areas are required for the species to persist. The species lays a clutch of 3-4 eggs between August and January.	L	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
Spotted Harrier <i>Circus assimilis</i>	V	Occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Known to inhabit Black Box Lignum woodland, Black Box grassy open woodland. The species habitat is characterised by large open water and breeding habitat of mature tall open forest. A stick nest is built in a tree in spring (sometimes autumn) with egg-laying occurring in the same month.	M	BioNet
Square-tailed Kite <i>Lophoictinia isura</i>	V	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Breeding is from July to February.	M	BioNet
Superb Parrot <i>Polytelis swainsonii</i>	V	Distinctive large, bright green parrot with red and yellow facial features and a long narrow tail. Occurs in Box-Gum, Box-Cypress pine and Boree Woodland and River Red Gum Forest. Forages in trees, shrubs and on the ground. Distribution is throughout eastern inland NSW. Breeding occurs from September to January. In the Riverina, nests in hollows of large trees in riparian River Red Gum forest or woodland. The Riverina region is considered to hold important breeding sites.	M	BioNet PMST
Swift Parrot <i>Lathamus discolor</i>	E	Migratory, travelling to the mainland from March to October. Breeds in Tasmania from September to January. On the mainland, it mostly occurs in the southeast foraging on winter flowering eucalypts and lerps, with records of the species between Adelaide and Brisbane. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. <i>Eucalyptus robusta</i> , <i>Corymbia maculata</i> and <i>C. gummifera</i> dominated coastal forests are also important habitat.	L	BioNet
Turquoise Parrot <i>Neophema pulchella</i>	V	Inhabits fringes of eucalypt woodlands, often adjacent to clearings, ridges and farmland creeks. Typically forages on the ground under trees. Distributed from southern Queensland to northern Victoria, extending from the coast to the western slopes of the Great Dividing Range. Nesting occurs from December to August in tree hollows.	M	BioNet
Varied Sitella <i>Daphoenositta chrysoptera</i>	V	Inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Known to inhabit Black Box Lignum woodland, Black Box grassy open woodland. Floodplain Transition Woodlands	M	BioNet

Species Name	BC Act	Habitat Requirements	LoO	Source
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	V	Large eagle with long, broad wings and a short, wedge-shaped tail. The feathering on the legs, head, breast and belly is white while back and the upper surfaces of the wings are grey. The tail has a distinctive white tip. Ideal survey time during the eggs laying period between June and September.	M	BioNet
White-fronted Chat <i>Epthianura albifrons</i>	V	Endemic passerine bird with a short, slender bill, long spindly legs, a square short-tipped tail and rounded wings. Easily distinguished from similar species by its black and white colouration. The species is found mostly in temperate to arid climates and occupies foothills and lowlands up to 1000 m above sea level. In NSW the species is known to occur in damp open habitats along the coast or near waterways. The species is known to breed from late July to early March.	L	BioNet
Threatened Mammals				
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	Around the size of a domestic cat however the species has noticeably shorter legs and a pointed face. It has rich-rust to dark-brown fur above with irregular white spots on the back and a pale belly. The species spotted tail distinguishes it from all other mammals. Recorded in a variety of habitats using hollow-bearing trees, fallen logs, small caves, rocky outcrops and rocky cliff faces as den sites. The species presence in an area can be indicated by the use of communal latrine sites, often on flat rocks among boulder fields, on cliff faces or along rocky stream beds. Mostly nocturnal species, ideal survey period after dusk. Breeds year round.	L	BioNet
Koala <i>Phascolarctos cinereus</i>	V	Arboreal marsupial with white-brown above and white below. It has distinctive large, furry ears, a prominent black nose and no tail. The species is known to inhabit eucalypt forests as woodlands spending most of its time in trees. Koala browse on most eucalypt species however in localised areas they have been known to select preferred browsing species. Ideal survey time after dusk as the species is generally inactive during the day, feeding and moving mostly at night.	L	BioNet PMST
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	Australia's largest bat species, it has dark grey fur on the body, lighter grey fur on the head and russet collar encircling the neck. It can be distinguished from other flying-foxes by the leg fur which extends to the ankle. The species is usually found within 200 km of the eastern coast in sub-tropical and temperate rainforests, tall sclerophyll forests and woodlands, heathland swamps as well as urban areas. The species roosts in camps that are commonly located within 20 km of a food source. The caps are usually located in gullies close to water in vegetation with a thick canopy. Annual mating commences from January with conception usually in April or May.	L	BioNet PMST

Species Name	BC Act	Habitat Requirements	LoO	Source
Bilby <i>Macrotis lagotis</i>	Presumed Extinct	Distinctive large, rabbit-like ears with blue-grey fur with patches of tan. The species tail is black and white with a noticeable crest. One widespread in arid and semi-arid environments the species is considered extinct in NSW and occurs only in scattered populations in NT, QLD and WA. Nocturnal omnivores the ideal survey time for the species would occur after dusk.	N	BioNet
Little Pied Bat <i>Chalinolobus picatus</i>	V	The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimil box woodlands. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. Can tolerate high temperatures and dryness but need access to nearby open water. Known to occur in Black Box Lignum woodland, Black Box grassy open woodland.	M	BioNet
Inland Forest Bat <i>Vespadelus baverstocki</i>	V	Distribution and habitat requirements poorly known but has been recorded from a variety of woodland formations, including Mallee, Mulga and River Red Gum. Most records are from drier woodland habitats with riparian areas. Roosts in tree hollows and abandoned buildings. Known to roost in very small hollows in stunted trees only a few metres high. Females congregate in November and December until young are independent in late January.	P	BioNet
Southern Myotis <i>Myotis macropus</i>	V	The species is easily identified by is disproportionately large feet with widely spaced, distinctly hairy toes. It has dark-grey to reddish brown fur above and pale fur below. Rarely found inland, except along major waterways, the species is known to occupy the coastal band from north west Australia, across the top end and south to western Victoria. Generally roost in groups in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Give birth to one young each year usually in November or December.	M	BioNet
Yellow-bellied Sheathtail-bat <i>Saccolaimus flaviventris</i>	V	Wide ranging, occupies a large variety of habitats throughout NSW. Forages in most habitats across its wide range, with and without trees. Roosts in hollow-bearing trees, buildings and mammal burrows in treeless areas. Breeding has been recorded from December to mid-March. Seasonal movements are unknown.	M	BioNet

Threatened Fish

Species Name	BC Act	Habitat Requirements	LoO	Source
Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow <i>Galaxias rostratus</i>	CE	Small native fish that are known from the southern part of the Murray Darling Basin. They have not been recorded and are considered locally extinct in the lower Murray, Murrumbidgee, Macquarie and Lachlan Rivers. The species is now only known from the upper Murray River near Tintaldra and wetland areas near Howlong.	N	PMST
Murray Cod <i>Maccullochella peelii</i>	N/A	The largest freshwater fish found in Australia. It occurs in the waterways of the Murray–Darling Basin in warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are considered too cold to contain suitable habitat.	N	PMST
Macquarie Perch <i>Macquaria australasica</i>	E	Moderate-sized freshwater fish that occurs in waters with lots of cover such as aquatic vegetation, snags, boulders and overhanging banks. They can tolerate relatively cold water temperatures but require a temperature rise in spring to at least 16°C for spawning to occur. Spawning occurs above riffles (shallow running water),	N	PMST
Endangered Ecological Communities				
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	E	Woodland in which the most characteristic tree species, Inland Grey Box <i>Eucalyptus microcarpa</i> , is often found in association with Bimble Box <i>E. populnea</i> , White Cypress Pine <i>Callitris glaucophylla</i> , Kurrajong <i>Brachychiton populneus</i> , Bullock <i>Allocasuarina luehmannii</i> or Yellow Box <i>E. melliodora</i> and sometimes with White Box <i>E. albens</i> . Shrubs are typically sparse or absent and a variable ground layer of grass and herbaceous species is present at most sites. Occurs on fertile soils of the western slopes and plains.	N	PMST
Weeping Myall Woodland	E	Occurs on red-brown earths and heavy textured grey and brown alluvial soils. The tree layer grows up to a height of about 10 metres and invariably includes <i>Acacia pendula</i> (Weeping Myall or Boree) as one of the dominant species or the only tree species present. The understorey includes an open layer of chenopod shrubs and other woody plant species and an open to continuous groundcover of grasses and herbs.	N	PMST
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	E	Dominated by Buloke (<i>Allocasuarina luehmannii</i>), sometimes with co-occurring tree species, that typically occupies patches of red-brown loamy sands with alkaline sub-soils on the alluvial plain of the Murray River and its tributaries in south-western NSW. Typically comprises an open tree canopy with a sparse and highly variable ground layer dominated by grasses and herbs, sometimes with scattered shrubs and/or small trees.	N	PMST

Species Name	BC Act	Habitat Requirements	LoO	Source
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	Can occur either as woodland or derived native grassland. It is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and a dominance or prior dominance of White Box (<i>Eucalyptus albens</i>) and/or Yellow Box (<i>E. melliodora</i>) and/or Blakely's Red Gum (<i>E. blakelyi</i>) trees.	N	PMST

PMST Search Report



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: 24/01/18 15:01:16

[Summary](#)

[Details](#)

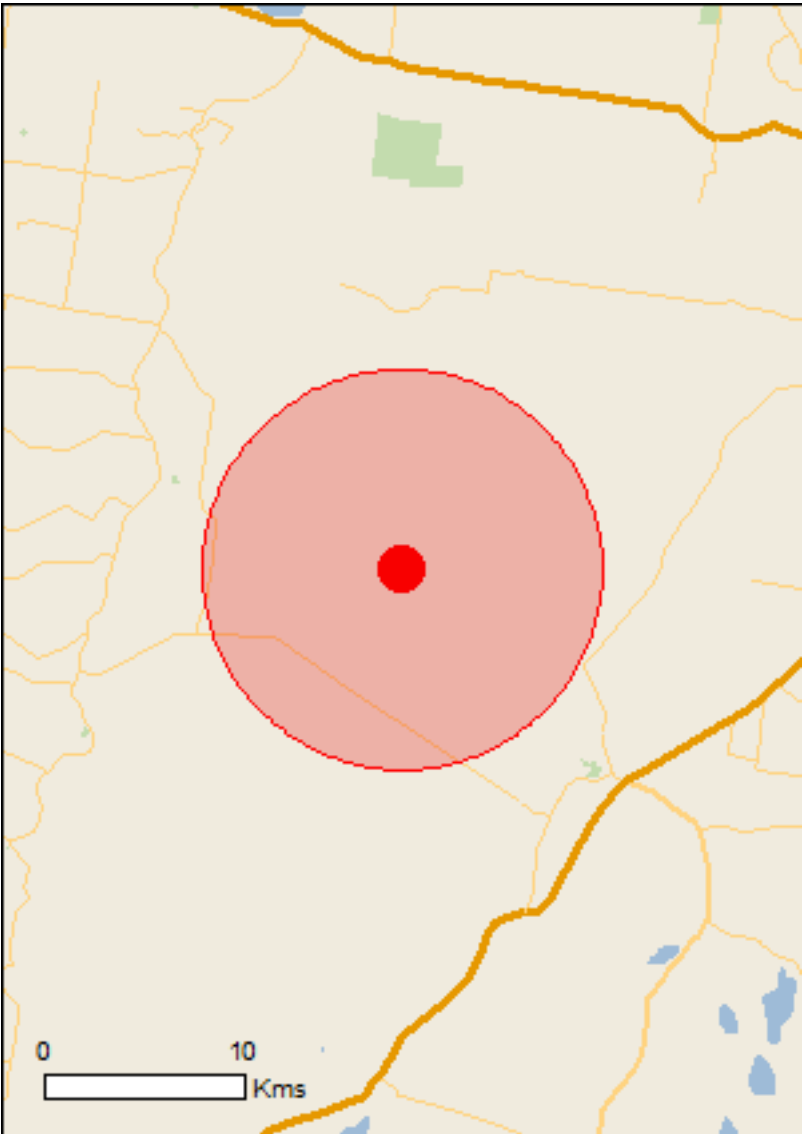
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

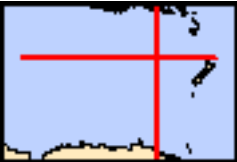
[Acknowledgements](#)



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:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	19
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	15
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:	None
Regional Forest Agreements:	None
Invasive Species:	20
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	500 - 600km upstream	
Hattah-kulkyne lakes	300 - 400km upstream	
Riverland	400 - 500km upstream	
The coorong, and lakes alexandrina and albert wetland	500 - 600km 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
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species	[Resource Information]
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Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely 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 likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	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
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat known to occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species

Name	Status	Type of Presence
habitat may occur within area		
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 raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may 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 likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Austrostipa wakoolica [66623]	Endangered	Species or species habitat may occur within area
Brachyscome papillosa Mossgiel Daisy [6625]	Vulnerable	Species or species habitat likely to occur within area
Sclerolaena napiformis Turnip Copperburr [11742]	Endangered	Species or species habitat may occur within area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]	Critically Endangered	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]		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]	Critically Endangered	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]		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 likely to occur within area

Name	Threatened	Type of Presence
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species

[[Resource Information](#)]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer montanus Eurasian Tree Sparrow [406]		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
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
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
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		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

-34.85879 146.20806

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](#)
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- [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](#)
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- [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.

Flora Data

Table C.1 Key and Notes

Notes	
The SLR 2017 floristic data was collected by one SLR Associate Botanist on 19/02/2018-23/02/2018. Unknown specimens were sampled and identified using the online PlantNET database (Botanic Gardens Trust 2017), and relevant field books.	
Nomenclature (i.e. species names and common names) used in this Appendix is sourced from PlantNET database (Botanic Gardens Trust 2018)	
Key	
Symbol	Description
C	Cover
A	Abundance
HTE	High Threat Exotic species (OEH 2018d)
X	Priority Weed in the Narrandera LGA (DPI 2018)

Table C.2 Flora Data

Growth Form,	Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11	
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
HTE	<i>Echium plantagineum</i>	1	20	2	100	5	200					0.5	5	5	1000								
HTE, X	<i>Lycium ferrocissimum</i>																						
HTE	<i>Tribulus terrestris</i>					1	10	0.1	2														
HTE	<i>Xanthium spinosum</i>	1	10	1	5													0.1	1				
HTE	<i>Cirsium vulgare</i>	5	50	5	100	1	20					0.1	10			1	20	0.1	1				
Exotic	<i>Amsinkia intermedia</i>																						
Exotic	<i>Atriplex semibaccata</i>							0.1	10	0.1	10							0.1	1			2	100
Exotic	<i>Avena barbata</i>					1	50					0.1	50	2	500								
Exotic	<i>Brassica</i> sp.													0.1	100			0.1	1	0.1	5		
Exotic	<i>Bromus catharticus</i>	1	5	0.2	10																		
Exotic	<i>Chenopodium murale</i>																						
Exotic	<i>Conyza bonariensis</i>	15	200	5	100	2	50					30	100					0.1	10				
Exotic	<i>Cucumis myriocarpus</i>	1	1	1	50	1	10			2	20	0.1	4	2	100								
Exotic	<i>Dysphania pumilio</i>	2	50	2	100	0.1	10	0.1	20	2	10					0.5	20	1	100	1	100		
Exotic	<i>Eragrostis cilianensis</i>											0.1	50										
Exotic	<i>Heliotropium europaeum</i>	1	10	2	50	1	20	0.5	10	2	50												
Exotic	<i>Hordeum leporinum</i>	2	200	2	100	10	1000	50	1000			20	1000	20	1000			0.1	1				
Exotic	<i>Lactuca serriola</i>	1	10	1	10	2	100					0.5	50	1	100	1	100	1	100	0.1	5		
Exotic	<i>Lolium rigidum</i>																						
Exotic	<i>Malva parviflora</i>					1	100	0.1	5			0.1	20	2	50			0.1	1				
Exotic	<i>Marrubium vulgare</i>	5	50	10	500	10	1000	1	20			2	100	5	100					0.1	5	0.1	5
Exotic	<i>Marsilea drummondii</i>																						

Growth Form,	Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11	
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
Exotic	Megathyrsus maximus															2	1000						
Exotic	Panicum miliaceum	1	20	1	50			0.1	10	1	50	0.1	20	0.1	10	10	1000	0.5	50	2	200	0.5	20
Exotic	Polygonum aviculare	0.1	1			1	20	0.5	10	5	20												
Exotic	Ptilotus sp.									0.1	1												
Exotic	Rumex pulcher																						
Exotic	Rumex tenax							0.1	1									0.1	1				
Exotic	Solanum nigrum	1	30	1	50									0.1	10	40	1000	1	50	5	100		
Exotic	Solanum physalifolium var. nitidibaccatum			0.2	10							0.1	10										
Exotic	Sonchus oleraceus											0.1	10										
Exotic	Sonchus aspera											0.1	10	1	100								
Exotic	Medicago sp.									2	1												
Chenopod	Einadia nutans																	0.1	1		2	50	
Chenopod	Salsola australis																	0.1	1		5	500	
Chenopod	Sclerolaena muricata																						
Chenopod	Sclerolaena diacantha									2	20							0.1	1		0.5	20	
Epiphyte	Lysiana exocarpi subp. tenuis																						
Epiphyte	Santalum acuminatum																						
Forb	Alternanthera nodiflora	1	50	1	20			0.1	5	2	20												
Forb	Boerhavia dominii			1	20	1	50	0.1	10														
Forb	Centipeda cunninghamii																						
Forb	Crassula colorata var. acuminata																						
Forb	Euphorbia drummondii							0.1	5														
Forb	Haloragis heterophylla									0.1	50												
Forb	Haloragis sp.																						
Forb	Oxalis perennans			1	50																		
Forb	Senecio quadridentatus							0.1	5														
Forb	Sida cordifolia																				0.1	5	
Forb	Sida corrugata																						
Forb	Sida trichopoda																				0.1	2	
Forb	Solanum esuriale			1	10	1	50	20	1000														
Forb	Solanum sp.																				0.5	10	
Forb	Vittadinia cuneata var. cuneata																						
Rush	Juncus ingens																						
Rush	Juncus subsecundis																						
Rush	Juncus usitatus																						
Sedge	Carex incomitata							0.1	10														

Growth Form,	Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11	
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
Sedge	<i>Isolepis</i> sp.									0.1	1												
Shrub	<i>Duma florulenta</i>							0.1	1	1	50			0.1	50			0.1	1	1	2		
Shrub	<i>Enchylaena tomentosa</i>																						
Tree	<i>Allocasuarina luehmannii</i>																						
Tree	<i>Callitris glaucophylla</i>																						
Tree	<i>Eucalyptus camaldulensis</i>	15	3	20	7	30	5			20	2	30	10	30	8	30	6	40	10				
Tree	<i>Eucalyptus largiflorens</i>							30	4											20	2	15	3
Tree	<i>Eucalyptus melliodora</i>	5	1																				
Tussock Grass	<i>Austrostipa aristiglumis</i>			0.1	2									0.1	50			1	5				
Tussock Grass	<i>Austrostipa scabra</i>																						
Tussock Grass	<i>Chloris truncata</i>	1	1									0.1	2	0.1	10								
Tussock Grass	<i>Chloris ventricosa</i>			1	10									5	1000	1	50						
Tussock Grass	<i>Cynodon dactylon</i>					2	1000					0.1	10										
Tussock Grass	<i>Elymus scaber</i>			2	100	40	1000	2	100	0.1	2	0.1	50	50	1000								
Tussock Grass	<i>Lachnagrostis filiformis</i>							0.1	10	1	50												
Tussock Grass	<i>Rytidosperma caespitosum</i>					30	1000	2	100	1	200	0.1	5			0.5	50				0.2	10	

Growth Form,	Scientific Name	Q12		Q13		Q14		Q15		Q16		Q17		Q18		Q19		Q20		Q21	
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
HTE	<i>Cirsium vulgare</i>											0.1	1								
HTE, X	<i>Echium plantagineum</i>																			0.1	2
HTE	<i>Lycium ferrocissimum</i>															0.1	1				
HTE	<i>Tribulus terrestris</i>																			0.1	5
HTE	<i>Xanthium spinosum</i>																	0.1	2		
Exotic	<i>Amsinkia intermedia</i>																			0.5	20
Exotic	<i>Atriplex semibaccata</i>											0.5	20	2	100	20	1000				
Exotic	<i>Avena barbata</i>																			0.1	10
Exotic	<i>Brassica</i> sp.																				
Exotic	<i>Bromus catharticus</i>																				
Exotic	<i>Chenopodium murale</i>																	0.5	5	0.1	4
Exotic	<i>Conyza bonariensis</i>	0.1	2			0.1	1														
Exotic	<i>Cucumis myriocarpus</i>							0.5	20												
Exotic	<i>Dysphania pumilio</i>			0.5	50					2	100	1	50					0.1	20	2	50
Exotic	<i>Eragrostis cilianensis</i>	2	500									0.1	1								
Exotic	<i>Heliotropium europaeum</i>	0.1	5									0.1	1					0.1	2	1	50
Exotic	<i>Hordeum leporinum</i>			1	500			40	1000	40	1000							40	1000	80	1000

Growth Form,	Scientific Name	Q12		Q13		Q14		Q15		Q16		Q17		Q18		Q19		Q20		Q21	
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
Exotic	<i>Lactuca serriola</i>	0.1	5	0.1	1							0.1	5					0.1	2		
Exotic	<i>Lolium rigidum</i>	2	500			2	100														
Exotic	<i>Malva parviflora</i>			0.5	50	0.1	50														
Exotic	<i>Marrubium vulgare</i>			0.1	1							0.5	10	0.1	1						
Exotic	<i>Marsilea drummondii</i>	0.5	1000			1	1000					0.5	100					0.5	1000		
Exotic	<i>Megathyrsus maximus</i>																				
Exotic	<i>Panicum miliaceum</i>			1	100	1	20	0.1	5	0.1	10			0.1	2	0.1	10	1	500	0.1	10
Exotic	<i>Polygonum aviculare</i>	0.1	50	0.1	5	0.1	20	1	200												
Exotic	<i>Ptilotus</i> sp.																				
Exotic	<i>Rumex pulcher</i>																			0.1	1
Exotic	<i>Rumex tenax</i>																				
Exotic	<i>Solanum nigrum</i>																				
Exotic	<i>Solanum physalifolium</i> var. <i>nitidibaccatum</i>																	0.5	50	0.1	1
Exotic	<i>Sonchus oleraceus</i>																				
Exotic	<i>Sonchus aspera</i>																				
Exotic	<i>Medicago</i> sp.																				
Chenopod	<i>Einadia nutans</i>											1	20	2	50	1	50			0.1	1
Chenopod	<i>Salsola australis</i>			0.1	2							0.5	20	5	500	2	50				
Chenopod	<i>Sclerolaena muricata</i>																	0.1	10		
Chenopod	<i>Sclerolaena diacantha</i>			1	20	0.1	2					1	20	0.5	20					0.1	2
Epiphyte	<i>Lysiana exocarpi</i> subsp. <i>tenuis</i>									0.1	1										
Epiphyte	<i>Santalum acuminatum</i>																			1	1
Forb	<i>Alternanthera nodiflora</i>	0.1	10									0.1	1								
Forb	<i>Boerhavia dominii</i>											0.1	5								
Forb	<i>Centipeda cunninghamii</i>											0.1	1								
Forb	<i>Crassula colorata</i> var. <i>acuminata</i>							0.5	50												
Forb	<i>Euphorbia drummondii</i>																				
Forb	<i>Haloragis heterophylla</i>																				
Forb	<i>Haloragis</i> sp.																				
Forb	<i>Oxalis perennans</i>											0.1	5					0.1	1		
Forb	<i>Senecio quadridentatus</i>																			0.1	10
Forb	<i>Sida cordifolia</i>													0.1	5						
Forb	<i>Sida corrugata</i>																			0.1	1
Forb	<i>Sida trichopoda</i>			0.5	50							0.1	1	0.5	10	1	20			0.1	2
Forb	<i>Solanum esuriale</i>			0.5	50									0.1	5						
Forb	<i>Solanum</i> sp.																				

Growth Form,	Scientific Name	Q12		Q13		Q14		Q15		Q16		Q17		Q18		Q19		Q20		Q21	
		C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
Forb	<i>Vittadinia cuneata</i> var. <i>cuneata</i>			0.1	1							0.2	2			0.1	2				
Rush	<i>Juncus ingens</i>	0.1	10																		
Rush	<i>Juncus subsecundis</i>					0.1	20											0.2	10		
Rush	<i>Juncus usitatus</i>	0.1	10																		
Sedge	<i>Carex incomitata</i>																				
Sedge	<i>Isolepis</i> sp.																				
Shrub	<i>Duma florulenta</i>	1	5			0.1	1					0.1	1					0.1	1		
Shrub	<i>Enchylaena tomentosa</i>	1	20																		
Tree	<i>Allocasuarina luehmannii</i>							5	1											2	1
Tree	<i>Callitris glaucophylla</i>							20	3	10	4									10	3
Tree	<i>Eucalyptus camaldulensis</i>																				
Tree	<i>Eucalyptus largiflorens</i>			30	7							10	7	15	3	20	5				
Tree	<i>Eucalyptus melliodora</i>																				
Tussock Grass	<i>Austrostipa aristiglumis</i>	20	1000									2	30					10	100		
Tussock Grass	<i>Austrostipa scabra</i>					2	500														
Tussock Grass	<i>Chloris truncata</i>							0.1	2	0.1	10					0.1	1			0.1	1
Tussock Grass	<i>Chloris ventricosa</i>																				
Tussock Grass	<i>Cynodon dactylon</i>																				
Tussock Grass	<i>Elymus scaber</i>																				
Tussock Grass	<i>Lachnagrostis filiformis</i>																				
Tussock Grass	<i>Rytidosperma caespitosum</i>	20	1000	40	1000	30	1000					2	50	0.5	20	1	100	40	1000		

Fauna Data

Table D1 Key and Notes

Notes	
The SLR 2018 fauna data was collected by one SLR Senior Ecologist on 19/02/2018-23/02/2018.	
Key	
Symbol	Description
A	Anabat
C	Camera/ Bait Station
O	Observed
P	Protected (BC Act)
H	Heard
V	Vulnerable (BC Act)

Table D2 Fauna Data

Common Name	Scientific Name	Detection Method	F1	F2	F3	F4	F5	F6	F7	Opp	Conservation Status (BC Act)
Birds											
Apostlebird	<i>Struthidea cinerea</i>	O, H								x	P
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	O								x	P
Australian Magpie	<i>Cracticus tibicen</i>	O, H	x	x	x	x	x	x	x		P
Australian Pipit	<i>Anthus novaeseelandiae</i>	O, H								x	P
Australian Raven	<i>Corvus coronoides</i>	O, H	x	x	x	x			x		P

Common Name	Scientific Name	Detection Method	F1	F2	F3	F4	F5	F6	F7	Opp	Conservation Status (BC Act)
Australian Wood Duck	<i>Chenonetta jubata</i>	O					x				P
Black Kite	<i>Milvus migrans</i>	O								x	P
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	O, H	x								P
Black-shouldered Kite	<i>Elanus axillaris</i>	H	x	x	x	x					P
Blue Bonnet	<i>Northiella haematogaster</i>	O, H					x	x	x		P
Brown Falcon	<i>Falco berigora</i>	H						x	x		P
Brown Songlark	<i>Cincloramphus cruralis</i>	O, H								x	P
Brown Treecreeper	<i>Climacteris picumnus victoriae</i>	O, H								x	V
Cockatiel	<i>Nymphicus hollandicus</i>	O, H		x				x	x		P
Common Starling	<i>Sturnus vulgaris</i>	O, H	x	x	x	x	x	x	x		
Crested Pigeon	<i>Ocyphaps lophotes</i>	O, H	x	x	x	x	x	x	x		P
Eastern Barn Owl	<i>Tyto javanica</i>	O, H	x	x	x	x	x	x	x		P
Eastern Rosella	<i>Platycercus eximius</i>	O, H	x	x	x	x	x	x	x		P
Emu	<i>Dromaius novaehollandiae</i>	O			x	x					P
Galah	<i>Eolophus roseicapillus</i>	O, H	x	x	x	x	x	x	x		P
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	O, H						x			P
Grey Teal	<i>Anas gracilis</i>	O					x				P
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	O, H	x						x		P
Little Friarbird	<i>Philemon citreogularis</i>	O, H			x						P
Magpie-lark	<i>Grallina cyanoleuca</i>	O, H	x		x		x	x	x		P
Nankeen Kestrel	<i>Falco cenchroides</i>	O	x	x	x			x			P

Common Name	Scientific Name	Detection Method	F1	F2	F3	F4	F5	F6	F7	Opp	Conservation Status (BC Act)
Noisy Miner	<i>Manorina melanocephala</i>	O, H	x	x	x	x	x	x	x		P
Pacific Black Duck	<i>Anas superciliosa</i>	O								x	P
Pallid Cuckoo	<i>Cacomantis pallidus</i>	O, H						x	x		P
Pied Butcherbird	<i>Cracticus nigrogularis</i>	O, H	x	x		x	x		x		P
Red-rumped Parrot	<i>Psephotus haematonotus</i>	O, H					x	x	x		P
Sacred Kingfisher	<i>Todiramphus sanctus</i>	O, H				x	x				P
Spotted Pardalote	<i>Pardalotus punctatus</i>	H	x	x	x	x	x	x	x		P
Stubble Quail	<i>Coturnix pectoralis</i>	O								x	P
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	O, H		x							P
Tawny Frogmouth	<i>Podargus strigoides</i>	O							x		P
Tree Martin	<i>Petrochelidon nigricans</i>	O							x		P
Wedge-tailed Eagle	<i>Aquila audax</i>	O			x			x			P
Welcome Swallow	<i>Hirundo neoxena</i>	O								x	P
White-faced Heron	<i>Egretta novaehollandiae</i>	O								x	P
White-winged Chough	<i>Corcorax melanorhamphos</i>	C, O								x	P
Willie Wagtail	<i>Rhipidura leucophrys</i>	O, H								x	P
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	H	x								P
Mammals											
Chocolate Wattled Bat	<i>Chalinolobus morio</i>	A	x	x	x	x	x	x	x		P
Common Brushtail Possum	<i>Trichosurus vulpecula</i>	O	x			x					P
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	O									

Common Name	Scientific Name	Detection Method	F1	F2	F3	F4	F5	F6	F7	Opp	Conservation Status (BC Act)
Free-tailed Bat	<i>Mormopterus "Species 4"</i>	A	x	x	x	x	x	x	x		P
Gould's Wattled Bat	<i>Chalinolobus gouldi</i>	A									P
House Mouse	<i>Mus musculus</i>	C, O		x	x	x	x	x	x		
Inland Broadnosed Bat	<i>Scotorepens balstoni</i>	A	x	x	x	x	x	x	x		P
Inland Forest Bat	<i>Vespadelus baverstocki</i>	A	x	x	x	x	x	x	x		V
Inland Free-tailed Bat	<i>Mormopterus petersi</i>	A	x	x	x	x	x	x	x		P
Introduced Cat	<i>Felis catus</i>	C, O					x		x		
Introduced Fox	<i>Vulpes vulpes</i>	C, O		x			x				
Introduced Rabbit	<i>Oryctolagus cuniculus</i>	C, O			x	x		x			
Little Broad-nosed Bat	<i>Scotorepens greyii</i>	A	x	x	x	x	x	x	x		P
Little Forest Bat	<i>Vespadelus vulturnus</i>	A	x	x	x	x	x	x	x		P
Southern Forest Bat	<i>Vespadelus regulus</i>	A	x	x	x	x	x	x	x		P
Unidentified Long-eared Bat	<i>Nyctophilus sp.</i>	A	x	x	x	x	x	x	x		P
Western Red Kangaroo	<i>Macropus rufus</i>	O									
White-striped Freetail Bat	<i>Austronomus australis</i>	A	x	x	x	x	x	x	x		P
Reptiles											
Bearded Dragon	<i>Pogona barbata</i>	C, O								x	P
Curl Snake	<i>Suta suta</i>										
Eastern Brown Snake	<i>Pseudonaja textilis</i>	O								x	P
South-eastern Morethia Skink	<i>Morethia boulengeri</i>	O	x	x	x	x	x	x	x		P
Lace Monitor	<i>Varanus varius</i>	C					x				

Common Name	Scientific Name	Detection Method	F1	F2	F3	F4	F5	F6	F7	Opp	Conservation Status (BC Act)
Tessellated Gecko	<i>Diplodactylus tessellatus</i>	O					x				P
Amphibians											
Giant Banjo Frog	<i>Limnodynastes interioris</i>	O	x								P

Site Photographs



Photo 1 River Red Gum – Black Box woodland wetland within the Project site



Photo 2 Black Box grassy open woodland wetland within the Project site



Photo 3 Sandhill Pine Woodland within the Project site



Photo 4 A Fox and Western Red Kangaroos within the Project site



Photo 5 Barn Owl within the Project site



Photo 6 Brown Treecreeper identified foraging in riparian vegetation along Washpen Creek

BAM Plot/ Transect Datasheets

BAM Site – Field Survey Form				Site Sheet no: 1 of 1	
		Survey Name	Zone ID	Recorders	
Date	19/2/18	YARRABEE	ZONE 1	GILBERT WHYTE	
Zone SS	Datum GDA 94	Plot ID	Q1 (48)	Plot dimensions 20m x 20m	Photo # 7550
Easting 074.805898	Northing 146.278528	IBRA region	RIVERINA	Midline bearing from 0 m 144°	Magnetic °
Vegetation Class		FORESTED WETLAND – INLAND RIVERINE FOREST			Confidence: (H) M L
Plant Community Type		RIVER RED GUM – BLACKBOX WOODLAND			Confidence: (H) M L
		EEC: NO			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WETLAND PCT 10

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	0
	Grasses etc.	1
	Forbs	1
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	20
	Shrubs	0
	Grasses etc.	1
	Forbs	1
	Ferns	0
	Other	0
High Threat Weed cover		7

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1	4
50 – 79 cm	1	1
30 – 49 cm	11	1
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)		

Counts apply when the **number of tree stems** within a size class is ≤ 10 . Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	60	80	90	40	50	40	20	10	60	50	0	0	0	0	0	0	0	0	0	
Average of the 5 subplots	64					30					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPLAIN CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE SPECIFIC EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			ALSO KANGAROOS
Storm damage			-
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	19 / 2 / 18	YARRAMERE	Q1 (48	GILBERT WYTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS MELLIODORA	N	5	1		
T	2	EUCALYPTUS CAMERARIENSIS	N	15	3		
-	3	CUNYZA BONARIENSIS	E	15	200		
-	4	MURRUMBIDIA VULGARIS	E	5	50		
F	5	ALTERNANTHERA NODIFLORA	N	1	50		
-	6	SOLANUM NIGRUM	E	1	20		
-	7	LACTUCA SCARIOLA	E	1	10		
-	8	CURCUMA VULGARIS	HTE	5	50		
-	9	XANTHUM SPINOSUM	HTE	1	10		
-	10	PANICUM CARICARIAE MILIACEUM	E	1	20		
-	11	ECCHINUM PLANTAGINEUM	HTE	1	20		
-	12	HELIOTROPISM EUROPAEUM	E	1	10		
-	13	DYSPHAMA PUMILIO	E	2	50		
G	14	CITRUS TRUNCATA	N	1	1		
-	15	BROMUS CATARTICUS	E	1	5		
-	16	HORDEUM LEPORINUS	E	2	200		
-	17	CUCUMIS MYRICARPUS	E	1	1		
-	18	POLYGONUM AVICULARE	E	0.1	1		
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form				Site Sheet no: 1 of	
Date		Survey Name	Zone ID	Recorders	
19/2/18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q2(50)	20m x 20m	7552	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic °	
-034.806311	146.270598	RIVERINA	17°		
Vegetation Class		INLAND RIVERINE FOREST			Confidence: (H) M L
Plant Community Type		RIVER REDGUM - BLACK BOX WOODLAND			Confidence: (H) M L
		EEC:	NO		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	0
Grasses etc.	3
Forbs	4
Ferns	0
Other	0
Sum of Cover of native vascular plants by growth form group	
Trees	20
Shrubs	0
Grasses etc.	3.1
Forbs	4
Ferns	0
Other	0
High Threat Weed cover	8

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1	1
50 – 79 cm	111	1
30 – 49 cm		
20 – 29 cm	111	11
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1111 1111	Tally space = 9m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	95 99 60 88 80	5 1 0 2 10	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	84.4	3.6	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLORIDIAN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIT CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (RANLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	15 / 2 / 18	YARRABIE	2 (50)	GILBERT WHITE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS CAMADULENSIS	N	20	7		
—	2	CIRSIIUM VULGARE	HTE	5	100		
—	3	MARRUBIUM VULGARE	R	10	500		
—	4	ECUM PLANTAGINUM	HTE	2	100		
—	5	HELIOPSYCHUM EUROPAEUM	R	2	50		
—	6	DYSPHANIA PUMICIO	R	2	100		
—	7	CONYZA BONARIENSIS	R	5	100		
—	8	SOLANUM NIGRUM	R	1	50		
G	9	CHENOPodium VENTRICOSA	N	1	10		
F	10	OXALIS PARREIANUS	N	1	50		
F	11	BOERHAVIA DOMINII	N	1	20		
—	12	CUCUMIS MYRLOCARPUS	R	1	50		
—	13	XANTHANUM SPINOSUM	HTE	1	5		
F	14	SOLANUM ELLEIPSEUM LEVURUM	N	1	10		
G	15	AUSTROSTYPA ARISTAEALUMIS	N	0.1	2		
—	16	SOLANUM NIGRUM PHYLLIFOLIUM	R	0.2	10		
—	17	PANICUM CAPILLARE MILLAREUM	R	1	50		
—	18	LACTUCA SCAROLA	R	1	10		
F	19	ALTERNANTHERA NOOIFLORA	N	1	20		
—	20	HORDIUM LEPORINUS	R	1	100		
G	21	ELYMUS SCABER	N	2	100		
—	22	BROMUS CATHARTICUS	R	0.2	10		
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form Site Sheet no: 1 of 1

Date		Survey Name	Zone ID	Recorders	
19/2/18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q3 (51)	20m x 20m	—	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic	
		RIVERINA			
Vegetation Class		INLAND RIVERINE FOREST			Confidence: (H) M L
Plant Community Type		RIVER RED GUM - BLACKBOX WOOD			Confidence: (H) M L
		EEC: NO			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WROOLAND WETLAND PCT 10

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	0
Grasses etc.	3
Forbs	2
Ferns	0
Other	0
Count of Native Richness	
Trees	30
Shrubs	0
Grasses etc.	72
Forbs	2
Ferns	0
Other	0
Sum of Cover of native vascular plants by growth form group	
Trees	30
Shrubs	0
Grasses etc.	72
Forbs	2
Ferns	0
Other	0
High Threat Weed cover	7

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	111	111
30 – 49 cm	111	111
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	11	Talk space 2m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 60 50 60 60	5 5 5 2 2	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	62	3.8	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIE CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	19/2/18	YARRABERRIE	G3 51	GILBERT WATTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
1	EUCALYPTUS	CANNOLIENSIS	N	30	5		
2	MURRUMBIDIA	VULGARE	E	10	1000		
3	BOERHAAVIA	DOMINII	N	1	50		
4	CYNODON	DACTILON	N	2	1000		
5	ADUSTRODANTHUS	RYTIDOSPERMA	N	30	1000		
6	ELYNUR	SCABER	N	40	1000		
7	HORDEUM	LEPORINUS	E	10	1000		
8	SOLANUM	ESURIALE	N	1	50		
9	MARVA	PARVIFLORA	E	1	100		
10	ECHINUM	PLANTAGINUM	HTE	5	200		
11	CUCUMIS	MIRINDICARPUS	E	1	10		
12	TRIBULUS	TERRESTRIUS	HTE	1	10		
13	CIRSIIUM	VULGARE	HTE	1	20		
14	CONYZA	BONARIENSIS	E	2	50		
15	LACTUCA	SERRIOLA	E	2	100		
16	DYSPHANIA	PUMILLO	E	0.1	10		
17	HELIOTROPANUM	EUROPANUM	E	1	20		
18	POLYGONUM	AVICULARE.	E	1	20		
19	ARENA	BARBATA	E	1	50		
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form					Site Sheet no: 1 of	
Date		Survey Name	Zone ID	Recorders		
19 / 2 / 18		YARRABEE	ZONE 1	GILBERT WHYTE		
Zone	Datum	Plot ID	Plot dimensions	Photo #		
SS	GDA 94	Q4 (53)	20m x 20m	7554		
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic °		
032.802865	146.245932	RIVERINA	299°			
Vegetation Class		Inland Flood Plain Woodland			Confidence: (H) M L	
Plant Community Type		Black Box - Lignum Woodland			Confidence: (H) M L	
		EEC: N°				

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	1
	Grasses etc.	3
	Forbs	5
	Ferns	0
	Other	1
Sum of Cover of native vascular plants by growth form group	Trees	30
	Shrubs	0.1
	Grasses etc.	4.1
	Forbs	20.4
	Ferns	0
	Other	0.1
High Threat Weed cover		0.1

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	111	1111
30 – 49 cm	1	1
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)		Tally space - 13m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	40	90	100	50	80	30	10	0	50	20	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	72					22					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	Floodplain	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIE CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	19/2/18	YARRAMERE	Q4 (53)	GILBERT WATTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS LARGIFLORENS	N	30	4		
-	2	HORDEUM LEPOCINUS	E	50	1000+		
-	3	MAIVA PARVIFLORA	E	0.1	5		
F	4	SOLANUM ESURIALE	N	20	1000		
	5	PANICUM MILIACEUM	E	0.1	10		
	6	DYSIPHANIA PUMILO	E	0.1	20		
S	7	DUMA FLORULENTA	N	0.1	1		
-	8	ARTIFLEX SEMIBACCATA	E	0.1	10		
G	9	RYTIDOSPHERMA SP.	N	2	100		
G	10	ELYNUS SCABER	N	2	100		
+	11	BOERHAVIA DOMINII	N	0.1	10		
	12	LAENHAGROSTIS FILIFORMIS	E	0.1	10		
	13	MARRUBIUM VULGARE	E	1	20		
-	14	TRIBULUS TERRESTRIS	E	0.1	2		
-	15	HELIOXROPEUM EURAPRUM	E	0.5	10		
F	16	ALTERNANTHERA MODIFLORA	N	0.1	5		
-	17	MAIVA PARVIFLORA	E	0.1	5		
-	18	CHAMEROPHYTES DRUMMONDII	E	0.1	5		
F	19	SENECIO QUADRIDENTATUS	N	0.1	5		
	20	POLYGONUM ANGULARE	E	0.5	10		
V	21	CAREX INCOMITATA	N	0.1	1		
-	22	RUMEX TENAX	E	0.1	1		
	23						
	24						
	25	GENUS EPHORHIA					
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Date		Survey Name	Zone ID	Recorders	
19/2/18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q5(SS)	20m x 20m	7556	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic ?	
634.806431	146.243703	RIVERINA	320°		
Vegetation Class			Confidence:		
INLAND RIVERINE FOREST			H M L		
Plant Community Type			EEC:	Confidence:	
RIVER RED GUM - BLACK BOX				H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WOODLAND WETLAND PK 10

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	1
Grasses etc.	3
Forbs	2
Ferns	0
Other	2
Sum of Cover of native vascular plants by growth form group	
Trees	20
Shrubs	1
Grasses etc.	2.1
Forbs	2.1
Ferns	0
Other	2.1
High Threat Weed cover	0

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	11	1X1
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1X1 1X1 11	Tally space = 12m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	5 80 60 50 50	95 20 40 50 50	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	49	51	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	Landform Element	Landform Pattern	Microrelief
FLOODPLAIN	—	—	—
Lithology	Soil Surface Texture	Soil Colour	Soil Depth
ALLUVIAL	HARD-SETTING	BROWN CLAY	SHALLOW < 20cm
Slope	Aspect	Site Drainage	Distance to nearest water and type
FLAT (1°-2°)	—	WEST	WASHPIE CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BIRLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	19 / 2 / 18	YARRABERE	Q5 (55)	GILBERT WATTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS CAMERULENSIS	N	20	2		
I	2	CUCURBIT MYRIOCARA	E	2	20		
I	3	POLYGONUM AVICULARE	E	5	20		
F	4	ALTERNANTHERA NODIFLORA	N	2	20		
I	5	DYSIPHAMA PUMILO	E	2	10		
V	6	ISOLEPIS SP.	N	0.1	1		
F	7	AMARANTHUS (PSILOTHUS SP.)	N	0.1	1		
I	8	MEDICAGO SP.	E	2	1		
G	9	ELYMUS SCABER	N	0.1	2		
I	10	ARIPLEX SEMIBACCATA	E	0.1	10		
F	11	HALAGORIS (HETEROPHYLLUS)	N	0.1	50		
S	12	DUMA FLORULENTA	N	1	1		
I	13	LACHNAGROSTIS FILIFORMIS	E	1	50		
I	14	PANICUM MILIACEUM	E	1	50		
C	15	SCLEROLAENA DICANTHA	N	2	20		
S	16	RYTHOSPHERMA SP. CAESITUM.	N	1	200		
I	17	HELLOPORUM FLORENTIN ENO	E	2	50		
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form				Site Sheet no: 1 of _____	
Date		Survey Name	Zone ID	Recorders	
20/2/18		YARRABEE	ZONE 1	GILBERT WHITE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q6 (66)	20m x 20m	7571	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic?	
034.812085	146.279135	RIVERINA	275°		
Vegetation Class		INLAND RIVERINE FOREST		Confidence: (H) M L	
Plant Community Type		RIVER REDGUM - BLACK BOX		Confidence: (H) M L	
		EEC: NO			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WOODLAND WETLAND

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	0
	Grasses etc.	4
	Forbs	0
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	30
	Shrubs	0
	Grasses etc.	0.4
	Forbs	0
	Ferns	0
	Other	0
High Threat Weed cover		0.6

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	1	
30 – 49 cm	1X IIII	IIII
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)		1X III Tally space = 8m.

PCT 10

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 70 80 60 50	5 10 2 5 10	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	68	4.6	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	Landform Element	Landform Pattern	Microrelief
FLOODPLAIN	—	—	—
Lithology	ALLUVIAL	HARD-SETTING	BROWN CLAY
Slope	FLAT (1°-2°)	—	WEST
	Aspect	Site Drainage	Distance to nearest water and type
			WASHPIER CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/slock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	20 / 2 / 18	YARRAMERE	G26 (64)	GILBERT WATTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS CAMADULENSIS	N	30	10		
-	2	CONYZA BONARIENSIS	E	30	100		
-	3	LACTUCA SERRIOLA	E	0.5	50		
-	4	MARRUBIUM VULGARE	E	2	100		
-	5	ERAPROSTIS CYLIANENSIS	E	0.1	50		
G	6	PELVMUS SCARER	N	20	1000		
-	7	AVENA BARBATA	E	0.1	50		
-	8	SCANUM PHYSALICUM	E	0.1	10		
-	9	SONCHUS OLIVACEUS	E	0.1	10		
-	10	CIRSIVM VULGARE	E	0.1	10		
-	11	FECHVM PLANTAGINEUM	HTE	0.5	5		
-	12	HORDEUM LEPODINUM	E	20	1000		
-	13	SONCHUS ASPERA	E	0.1	10		
-	14	CUCUMUS MYRIOCARPUS	E	0.1	4		
G	15	CHLORIS TRUNCATA	N	0.1	2		
G	16	RYTIDOLPERMA SP. CASPITUM	N	0.1	5		
G	17	CYNODON DACTYLON	N	0.1	10		
-	18	MALVA PARVIFLORA	E	0.1	20		
-	19	PANICUM MILLACRUM	E	0.1	20		
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form Site Sheet no: 1 of 1

Date		Survey Name	Zone ID	Recorders	
20 / 2 / 18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q7 (65)	20m x 20m	7573	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic ?	
34.822218	146.164516	RIVERINA	332°		
Vegetation Class		INLAND RIVERINE FOREST			Confidence: (H) M L
Plant Community Type		RIVER REDGUM - BLACK BOX WOODLAND			Confidence: (H) M L
		EEC: NO			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	1
Grasses etc.	4
Forbs	0
Ferns	0
Other	0
Sum of Cover of native vascular plants by growth form group	
Trees	30
Shrubs	0.1
Grasses etc.	55.2
Forbs	0
Ferns	0
Other	0
High Threat Weed cover	5

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1	
50 – 79 cm	1111	1111
30 – 49 cm	1111	
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1111	Tall space 4m

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	50 40 60 50 50	2 1 1 5 1	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	50	2	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLUDDPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPEN CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	20 / 2 / 18	YARRABERE	Q7 (65)	GILBERT WHITE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory. All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS CAMERULENSIS	N	30	8		
I	2	LACTUCA SERRIOLA	E	1	100		
I	3	MARRUBIUM VULGARE	E	5	500		
G	4	CHLORIS TRUNCATA	N	0.1	10		
I	5	SONCHUS ASPERA	E	1	100		
I	6	PANICUM MILLACEUM	E	0.1	10		
G	7	ELYMUS SCABER	N	50	1000		
G	8	CHLORIS VENTRICOSA	N	5	1000		
S	9	DUMA FLORULENTA	N	0.1	50		
I	10	SOLANUM NIGRUM	E	0.1	10		
I	11	CANOLA? → BRASSICA SP.	E	0.1	100		
I	12	HORDEUM LEPORINUS	E	20	1000		
I	13	MAIVA PARVIFLORA	E	2	50		
G	14	AUSTROSTIPA ARISTIGLUMIS	N	0.1	50		
I	15	ECIUM PLANTAGINEUM	HTE	5	1000		
I	16	AVENA BARBATA	E	2	500		
I	17	CUCUMIS MYRIOCARPUS	E	2	100		
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Date		Survey Name	Zone ID	Recorders	
20 / 2 / 18		VARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q8(66)	20m x 20m	7577	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic °	
-034.797845	146.216369	RIVERINA	102°		
Vegetation Class		INLAND RIVERINE FOREST			Confidence: H M L
Plant Community Type		RIVER DEW - BLACKBOX WOODLAND			Confidence: H M L
		EEC: NO			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WETLAND PCT 10

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	0
Grasses etc.	2
Forbs	0
Ferns	0
Other	0
Sum of Cover of native vascular plants by growth form group	
Trees	30
Shrubs	0
Grasses etc.	1.5
Forbs	0
Ferns	0
Other	0
High Threat Weed cover	1

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	1111	1111
30 – 49 cm	11	—
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1111 1111 1111	Tally space - 14m

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	60 40 20 10 80	2 20 20 0 0	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	40	12	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLUDDPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHUP CR.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BUDLEY / CANVIA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date <u>20 / 2 / 18</u>	<u>YARRABERE</u>	<u>Q8 (66)</u>	<u>GILBERT WATTE</u>

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
<u>T</u>	1 <u>EUCALYPTUS CAMALALENSIS</u>	<u>N</u>	<u>30</u>	<u>6</u>		
<u>-</u>	2 <u>SOLANUM NIGRUM</u>	<u>R</u>	<u>40</u>	<u>1000</u>		
<u>-</u>	3 <u>PANICUM MALLACEUM</u>	<u>R</u>	<u>10</u>	<u>1000</u>		
<u>-</u>	4 <u>MELATHYRSUS MAXIMA</u>	<u>R</u>	<u>2</u>	<u>1000</u>		
<u>G</u>	5 <u>CHORIS VENTRICOSA</u>	<u>N</u>	<u>1</u>	<u>50</u>		
<u>-</u>	6 <u>LACTUCA SERRIOLA</u>	<u>R</u>	<u>1</u>	<u>100</u>		
<u>-</u>	7 <u>DYSPHANIA PUMILIO</u>	<u>R</u>	<u>0.5</u>	<u>20</u>		
<u>G</u>	8 <u>RYTIDOSPERMA SP</u>	<u>N</u>	<u>0.5</u>	<u>50</u>		
<u>-</u>	9 <u>CIRSium VULGARE</u>	<u>HTE</u>	<u>1</u>	<u>20</u>		
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	20 / 2 / 18	YARRABIE	G9 (67)	GILBERT WHITE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS CAMEROLIENSIS	N	40	10		
S	2	DUMA FLORULENTA	N	0.1	1		
	3	DRYPHILA PUMILO	E	1	100		
	4	LACTUCA SERRIOLA	E	1	100		
	5	PANICUM MILLACEUM	E	0.5	50		
	6	SOLANUM NIGRUM	E	1	50		
	7	CAROLA - BRASSICA SP.	E	0.1	1		
	8	CONYZA BONARIENSIS	E	0.1	10		
C	9	SARSILA AUSTRALIS	N	0.1	1		
C	10	LEINDIA NUTANS	N	0.1	1		
	11	CIRSIMUM VULGARE	HTE	0.1	1		
	12	XANTHIUM SPINOSA	HTE	0.1	1		
G	13	AVICARIA ARISTIGLUMIS	N	1	5		
	14	HORDEUM LEPODINUS	E	0.1	1		
	15	ARIPLEX SEMIRACATA	E	0.1	1		
C	16	SCLEROLAENA DIACANTHA	N	0.1	1		
	17	MALVA PARVIFLORA	E	0.1	1		
	18	RUMEX TENAX	E	0.1	1		
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Date		Survey Name	Zone ID	Recorders	
20 / 2 / 18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q10 (68)	20m x 20m	7581	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic ?	
34.801699	146.216401	RIVERINA	95°		
Vegetation Class		INLAND FLOODPLAIN WOODLANDS			Confidence: H M L
Plant Community Type		BLACK BOX - LIGNUM WOODLAND			Confidence: H M L
		EEC:			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WETLAND. PCT 13

BAM Attribute (400 m² plot)	Sum values
Trees	1
Shrubs	1
Grasses etc.	0
Forbs	0
Ferns	0
Other	0
Count of Native Richness	
Trees	20
Shrubs	1
Grasses etc.	0
Forbs	0
Ferns	0
Other	0
Sum of Cover of native vascular plants by growth form group	
Trees	20
Shrubs	1
Grasses etc.	0
Forbs	0
Ferns	0
Other	0
High Threat Weed cover	0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1	
50 – 79 cm	1	1x1 1x1 1x1 1
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1x1 1x1 1x1 1x1	Tally space - 20m

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	60 80 60 80 60	40 20 40 20 40	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	68	32	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIE CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (RILEY / CANADA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	20 / 2 / 18	YARRAMERE	G 10 (68)	GILBERT WYTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS LARGIFLORENS	N	20	2		
S	2	DUMA FLORULENTA	N	1	2		
—	3	SOLANUM NIGRUM	E	5	100		
—	4	PANICUM MILLACEUM	E	2	200		
—	5	DYSPHANIA PUMILIO	E	1	100		
—	6	MARUBIUM VULGARE	E	0.1	5		
—	7	BRASSICA sp. (INTRODUCED)	E	0.1	5		
—	8	LACTUCA SERRIOLA	E	0.1	5		
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
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	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Date		Survey Name	Zone ID	Recorders		
21 / 2 / 18		YARRABEE	ZONE 1	GILBERT WHYTE		
Zone	Datum	Plot ID	Plot dimensions	Photo #		
SS	GDA 94	Q 11 (69)	20m x 20m	7596		
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic °		
34.761769	146.540026	RIVERINA	29°			
Vegetation Class		INLAND FLOODPLAIN WOODLAND			Confidence: (H) M L	
Plant Community Type		BLACKBOX - LIGNUM WOODLAND			Confidence: (H) M L	
		EEC: NO				

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WETLAND PCK 13.

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	0
Grasses etc.	1
Forbs	3
Ferns	0
Other	3
Sum of Cover of native vascular plants by growth form group	
Trees	15
Shrubs	0
Grasses etc.	0.2
Forbs	0.7
Ferns	0
Other	7.5
High Threat Weed cover	0

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		IIII
30 – 49 cm	III	
20 – 29 cm	II	
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space = 12m.	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 70 80 60 70	20 30 20 30 20	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	72	24	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIT CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BIRCH / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	21 / 2 / 18	YARRABEE	Q11 (69)	GILBERT WATTE

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS LARGIFLORUS	N	15	3		
C	2	SALICARIA ARGENTAE	N	5	500		
J	3	ARTROSTYLIS SEMIBACCATA	E	2	100		
C	4	ELNADIA MUTANS	N	2	50		
G	5	RYTIDOSPHERA CASPIATUM	N	0.2	10		
C	6	SCLEROLAENA DIACANTHA	N	0.5	20		
J	7	PANICUM MILLACEUM	E	0.5	20		
F	8	SIDA TRICHOPODA	N	0.1	2		
F	9	SOLANUM ESURIALE	N	0.5	10		
F	10	SIDA CORDIFOLIA	N	0.1	5		
J	11	MARRUBIUM VULGARE	E	0.1	5		
	12						
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	14						
	15						
	16						
	17						
	18						
	19						
	20						
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	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Date		Survey Name	Zone ID	Recorders		
21 / 2 / 18		YARRABEE	ZONE 1	GILBERT WHYTE		
Zone	Datum	Plot ID	Plot dimensions	Photo #		
SS	GDA 94	Q12 (70)	20m x 20m	7598		
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic?		
034.798586	146.202903	RIVERINA	291°			
Vegetation Class		INLAND FLOODPLAIN WOODLAND			Confidence: (H) M L	
Plant Community Type		BLUE BOX - LIGNUM (DERIVED GRASS)			Confidence: (H) M L	
		EEC: No				

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

PCT 13

BAM Attribute (400 m ² plot)	Sum values
Trees	0
Shrubs	2
Grasses etc.	2
Forbs	1
Ferns	0
Other	2
Count of Native Richness	
Trees	0
Shrubs	2
Grasses etc.	40
Forbs	0.1
Ferns	0
Other	0.2
Sum of Cover of native vascular plants by growth form group	
Trees	0
Shrubs	2
Grasses etc.	40
Forbs	0.1
Ferns	0
Other	0.2
High Threat Weed cover	0

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	—	—
50 – 79 cm	—	—
30 – 49 cm	—	—
20 – 29 cm	—	—
10 – 19 cm	—	—
5 – 9 cm	—	—
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	—	Tally space 0 m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	70	60	50	50	70	30	40	50	50	70	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	60					40					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	Landform Element	Landform Pattern	Microrelief
FLOODPLAIN	—	—	—
Lithology	Soil Surface Texture	Soil Colour	Soil Depth
ALLUVIAL	HARD-SETTING	BROWN CLAY	SHALLOW < 20cm
Slope	Aspect	Site Drainage	Distance to nearest water and type
FLAT (1°-2°)	—	WEST	WASHPIT CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			— CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARKLEY / CANVIA)
Soil erosion			RUN OFF - POTENTIAL SOIL EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet <u> </u> of <u> </u>		Survey Name	Plot Identifier	Recorders
Date	<u>21 / 2 / 18</u>	<u>YARRABERE</u>	<u>G12 (70)</u>	<u>GILBERT WATTE</u>

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
S	1	DUMA FLORULENTA	N	1	5		
E	2	MARSILEA DRUMONDII	N	0.5	1000		
I	3	POLYGONUM ANGULARE	E	0.1	50		
R	4	JUNCUS USITATUS	N	0.1	10		
R	5	JUNCUS INGENS	N	0.1	10		
I	6	CONYZA BUNARIENSIS	E	0.1	2		
G	7	RYTHOSPHERMA CRESPIENS	N	20	1000		
G	8	ANSTRODANTHONA ARISTIGLUMIS	N	20	1000		
I	9	LOLIUM RIGIDUM	E	2	500		
I	10	ERAGRUS CILIARIENSIS	R	2	500		
I	11	LACTUCA SERRULA	E	0.1	5		
I	12	HELOTROPEUM EUROPAEUM	E	0.1	5		
C	13	ENCYCLANERIS TORENTOSA	N	1	20		
F	14	ALTERNANTHERA NODIFLORA	N	0.1	10		
	15	POLYGONUM		0.1	1		
	16						
	17						
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	39						
	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form				Site Sheet no: 1 of	
Date		Survey Name	Zone ID	Recorders	
21 / 2 / 18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q13 (71)	20m x 20m	7600	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic ?	
84.819767	146.194383	RIVERINA	005°		
Vegetation Class		INLAND FLOODPLAIN WOODLAND			Confidence: (H) M L
Plant Community Type		BLACK BOX – LIGNUM WOODLAND			Confidence: (H) M L
		WETLAND			PCT 13

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	0
Grasses etc.	1
Forbs	3
Ferns	0
Other	2
Sum of Cover of native vascular plants by growth form group	
Trees	30
Shrubs	0
Grasses etc.	40
Forbs	1.1
Ferns	0
Other	1.1
High Threat Weed cover	0

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	11	2
20 – 29 cm	11	
10 – 19 cm	111	
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	11x 11x 11 Tally space = 12m.	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	80	90	80	90	80	5	10	5	10	5	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	84					7					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIT CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (RILEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	21 / 2 / 18	YARRABEE	Q13 (70)	GILBERT WATTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS LARHIFLORENS	N	30	7		
—	2	HORDEUM LEPODINUS	R	1	500		
F	3	SIDA TRICHOPODA	N	0.5	50		
F	4	SOLANUM ESURIALE	N	0.5	50		
G	5	RYTIDOSPERMA CAESPITOSUM	N	40	1000		
C	6	SALSOLA AUSTRALIS	N	0.1	2		
—	7	POLYGONUM AVICULARE	R	0.1	5		
C	8	SCLEROLAENA DIACANTHA	N	1	20		
—	9	MARRUBIUM VULGARE	R	0.1	1		
—	10	LAENCA SERRIOLA	R	0.1	1		
—	11	PANICUM WILLARUM	R	1	100		
F	12	VITADINIA CUNEATA	N	0.1	1		
—	13	DYSPHANIA PUMILIO	R	0.5	20		
—	14	SIDA MALVA PARVIFLORA	E	0.5	50		
	15						
	16						
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	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Date		Survey Name	Zone ID	Recorders	
21 / 2 / 18		VARRADJEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q14(72)	20m x 20m	7602	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic ?	
034.839611	146.188919	RIVERINA	257°		
Vegetation Class		INLAND FLOODPLAIN WOODLAND			Confidence: (H) M L
Plant Community Type		BLACK BOX - LIGNUM WOODLAND			Confidence: (H) M L
		EEC: No			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

- DERIVED GRASSLAND PCT 13

BAM Attribute (400 m ² plot)	Sum values
Trees	0
Shrubs	1
Grasses etc.	2
Forbs	0
Ferns	0
Other	2
Sum of Cover of native vascular plants by growth form group	
Trees	0
Shrubs	0.1
Grasses etc.	32
Forbs	0
Ferns	0
Other	0.2
High Threat Weed cover	0

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)		Tally space
		0m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 90 80 90 20	10 5 5 5 80	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	72	21	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPEN CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (RANGEY / CANVIA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	21 / 2 / 18	YARRABREE	Q14 (72)	GILBERT WATTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
E	1	MARSILEA DRUMMONDII	N	1	1000		
—	2	POLYGONUM AVICULARE	E	0.1	20		
R	3	JUNCUS SUBSECUNDUS	N	0.1	20		
—	4	CUNYZA BONARIENSIS	E	0.1	1		
G	5	RYTHOSPERMA CAESPITOSUM	N	30	1000		
—	6	LOLUM RIGIDUM	E	2	100		
—	7	MAVIA PARVIFLORA	E	0.1	50		
C	8	SCLEROLAENA DIACANTHA	N	0.1	2		
S	9	DUNA FLORULENTA	N	0.1	1		
—	10	PANICUM MILLACEUM	E	1	20		
G	11	AUSTROSTIPA SCABRA	N	2	500		
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
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	39						
	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name		Zone ID	Recorders	
Date	21 / 2 / 18	YARRABEE	ZONE 1	GILBERT WHYTE
Zone	SS	Datum	Plot ID	Plot dimensions
	GDA 94		Q15 (73)	20m x 20m
Easting	Northing	IBRA region	Midline bearing from 0 m	Photo #
-34.845112	146.160123	RIVERINA	358°	7604
Vegetation Class		RIVERINE SANDHILL WOODLANDS		Confidence: (H) M L
Plant Community Type		WHITE CYPRESS PINE OPEN WOODLAND		Confidence: (H) M L
		EEC: YES		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

PCT 28

BAM Attribute (400 m ² plot)	Sum values
Trees	2
Shrubs	0
Grasses etc.	1
Forbs	1
Ferns	6
Other	0
Sum of Cover of native vascular plants by growth form group	
Trees	25
Shrubs	0
Grasses etc.	0.1
Forbs	0.5
Ferns	0
Other	0
High Threat Weed cover	0

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	111	-
20 – 29 cm	1	-
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1	Tally space 1m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	10 5 10 10 20	80 90 90 90 60	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	14	82	0	6

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPEN CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	21 / 2 / 18	YARRABERE	Q15 (73)	GILBERT WHITE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	ALLOCAURNA LEUHMANNI	N	5	1		
T	2	CALAMIS GLAUCOPHYLLA	N	20	3		
—	3	ACORUM LEPORINUS	E	40	100		
—	4	CUCUMIS MYRIOCARPA	E	0.5	20		
G	5	CHLORIS TRUNCATA	N	0.1	2		
—	6	POLYGONUM AVICULARE	E	1	200		
—	7	PANICUM MILLACEUM	E	0.1	5		
F	8	CRACKLA COLORATA VAR. ACUMINATA	N	0.5	50		
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form				Site Sheet no: 1 of	
Date		Survey Name	Zone ID	Recorders	
21/2/18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	916 (74)	20m x 20m	7606	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic	
34.845112	146.160123	RIVERINA	253°		
Vegetation Class		RIVERINE SANDAL PINE WOODLAND			Confidence: (H) M L
Plant Community Type		WHITE CYPRESS PINE WOODLAND			Confidence: (H) M L
		EEC: YES			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

PCC 28

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	0
Grasses etc.	1
Forbs	0
Ferns	0
Other	1
Sum of Cover of native vascular plants by growth form group	
Trees	10
Shrubs	0
Grasses etc.	0.1
Forbs	0
Ferns	0
Other	0.1
High Threat Weed cover	0

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	11	0
20 – 29 cm	11	0
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space 1m.	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	20 60 30 20 30	60 30 60 80 70	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	32	90	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLUDDPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIT CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	21 / 2 / 18	YARRABERE	G 16 (74)	GILBERT WHITE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	CALAMIS GLAUCOPHYLLA	N	10	4		
—	2	HORDALEM LEPORINUS	E	40	1000		
G	3	CHLORIS TRUNCATA	N	0.1	10		
—	4	PANICUM MILLACEUM	E	0.1	10		
—	5	DYSPHANIA PUMILLO	E	2	100		
K	6	LYCIANA EXOCARPI SUBSP. TENUIS	N	0.1	1		
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	8						
	9						
	10						
	11						
	12						
	13						
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	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of 1

Survey Name		Zone ID	Recorders	
Date	22/2/18	YARRABEE	ZONE 1	GILBERT WHYTE
Zone	SS	Datum	GDA 94	Plot ID
Easting	34.815729	Northing	146.188827	Plot dimensions
IBRA region		RIVERINA	Midline bearing from 0 m	46°
Vegetation Class		INLAND FLOODPLAIN WOODLANDS		Confidence: (H) M L
Plant Community Type		BLACK BOX - LIGNUM WOODLAND		Confidence: (H) M L
EEC: NO				

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WETLAND

PCT 13

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	1
Grasses etc.	2
Forbs	6
Ferns	0
Other	3
Sum of Cover of native vascular plants by growth form group	
Trees	10
Shrubs	0.1
Grasses etc.	4
Forbs	0.7
Ferns	0
Other	2.5
High Threat Weed cover	0.1

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1	1
50 – 79 cm	1	
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm	11	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	11	Tally space 7m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	90 95 70 60 80	0 0 5 15 10	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	79	6	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIE CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	22/2/18	YARRABIE	G 17 (83)	GILBERT WYTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS LARGIFLORENS	N	10	7		
G	2	AUSTROSTIPA ARISTGLUMIS	N	2	30		
G	3	RYTIDOSPERMA SP.	N	2	50		
C	4	EINADIA NUTANS	N	1	20		
C	5	SCLEROLAENA DIACANTHA	N	1	20		
—	6	MARKYDUM VULGARE	E	0.5	10		
F	7	GRAMI PERRENANS	N	0.1	5		
—	8	LACINIA SERRIOLA	E	0.1	5		
—	9	DYSPHANIA PUMILLO	E	1	50		
—	10	ATRIPLER SEMIBACCATA	E	0.5	20		
E	11	MARSILEA DRUMMONDII	N	0.5	100		
C	12	SALSOLA AUSTRALI	N	0.5	20		
—	13	HELLOPROPIUM EUROPAEUM	E	0.1	1		
S	14	DUMA FLORULENTA	N	0.1	1		
—	15	CIRSIVM VULGARE	HTE	0.1	1		
F	16	BOERHAVIA DOMINII	N	0.1	5		
—	17	ERAGROSTIS CILLIANENSIS	E	0.1	1		
F	18	BRACHYCOMA CONEIPOLIA	N	0.2	2		
F	19	SIDA TROCHOCARPA	N	0.1	1		
F	20	ALTERNANTHERA NODIFLORA	N	0.1	1		
F	21	CENTPEDEA CUNNINGHAMII	N	0.1	1		
F	22	VITADINIA CUNEATA	N	0.2	2		
	23						
	24						
	25						
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	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Date		Survey Name	Zone ID	Recorders	
22 / 2 / 18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
SS	GDA 94	Q18 (84)	20m x 20m	7621	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic ?	
-84.815729	146.188827	RIVERINA	296°		
Vegetation Class		INLAND FLOODPLAIN WOODLAND			Confidence: (H) M L
Plant Community Type		BLACK BOX - LIGNUM WOODLAND			Confidence: (H) M L
		EEC: NO			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WETLAND. PCT 13

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	0
Grasses etc.	1
Forbs	3
Ferns	0
Other	3
Sum of Cover of native vascular plants by growth form group	
Trees	15
Shrubs	0
Grasses etc.	0.5
Forbs	0.7
Ferns	0
Other	7.5
High Threat Weed cover	0

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	111	4
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1	Tally space 1m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	60	70	60	60	10	10	10	20	10	20	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	38					14					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIE CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BIRLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	22 / 2 / 18	YARRABEE	Q18 (84)	GILBERT MAYTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	EUCALYPTUS LARGIFLORENS	N	15	3		
C	2	SALSOLA AUSTRALIS	N	5	500		
—	3	ATRIPLER SEMIBACCATA	IE	2	100		
C	4	FEINARIA NUTANS	N	2	50		
G	5	RYTIDOSPHERA CAESPITOSUM	N	0.5	20		
C	6	SCLERLAENA DICANTHA	N	0.5	20		
—	7	PANICUM HILLACEUM	IE	0.1	2		
F	8	SIDA TRICHOPODA	N	0.5	10		
F	9	SOLANUM ESURIALE	N	0.1	5		
F	10	SIDA CORPIFOLIA	N	0.1	5		
—	11	MARRUBIUM VULGARE	E	0.1	1		
	12						
	13						
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Date		Survey Name	Zone ID	Recorders	
22 / 2 / 18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
55	GDA 94	Q19 (86)	20m x 20m	7624	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic ?	
034.815129	146.188827	RIVERINA	280°		
Vegetation Class		INLAND RIVERINE WOODLANDS			Confidence: (H) M L
Plant Community Type		BLACK BOX - LIGNUM WOODLAND			Confidence: (H) M L
		EEC: NO			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

WETLAND

PCT 13

BAM Attribute (400 m ² plot)	Sum values
Trees	1
Shrubs	0
Grasses etc.	2
Forbs	3
Ferns	0
Other	2
Sum of Cover of native vascular plants by growth form group	
Trees	20
Shrubs	0
Grasses etc.	1.1
Forbs	2.1
Ferns	0
Other	22
High Threat Weed cover	0.1

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	1	
30 – 49 cm	111	11
20 – 29 cm	1	1
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	11	Tally space 2m.

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	80	90	60	50	40	10	5	20	30	60	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	64					25					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPEN CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	22 / 2 / 18	YARRABERE	Q 19 (86)	GILBERT WATTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
1	1	EUCALYPTUS LARGIFLORENS	N	20	5		
C	2	SALSOLA AUSTRALIS	N	2	50		
—	3	LYCIUM FERROSISIMUM	E	0.1	1		
C	4	MYRTLEX SEMIBACCATA	N	20	1000		
F	5	SIDA TROCHOPODA (HAIRY SIDA)	N	1	20		
F	6	VITTADINIA CUNEATA VAR. CUNEATA	N	0.1	2		
F	7	EINADIA NUTANS	N	1	50		
G	8	AUSTRODANTHOMA	N	1	100		
—	9	PANICUM MILIACEUM	E	0.1	10		
G	10	CHLORIS TRUNCATA	N	0.1	1		
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name		Zone ID	Recorders	
Date	23 / 2 / 18	YARRABEE	ZONE 1	GILBERT WHYTE
Zone	SS	Datum	Plot ID	Q20 (96)
Easting	34.798374	Northing	Plot dimensions	20m x 20m
	146.200516	IBRA region	Midline bearing from 0 m	340°
Vegetation Class		INLAND FLOODPLAIN WOODLANDS		Confidence: (H) M L
Plant Community Type		BLACK BOX - LIGNUM - DERIVED GRASS		Confidence: (H) M L
		ECC	NO	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

PCK 13

BAM Attribute (400 m ² plot)	Sum values
Trees	0
Shrubs	1
Grasses etc.	2
Forbs	1
Ferns	0
Other	2
Sum of Cover of native vascular plants by growth form group	
Trees	0
Shrubs	0.1
Grasses etc.	50
Forbs	0.1
Ferns	0
Other	0.3
High Threat Weed cover	0.1

BAM Attribute (1000 m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	0	0
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)		Tally space 0m

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	100 100 100 100 100	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	100	0	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	FLOODPLAIN	Landform Element	—	Landform Pattern	—	Microrelief	—
Lithology	ALLUVIAL	Soil Surface Texture	HARD-SETTING	Soil Colour	BROWN CLAY	Soil Depth	SHALLOW < 20cm
Slope	FLAT (1°-2°)	Aspect	—	Site Drainage	WEST	Distance to nearest water and type	WASHPIE CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BUDLEY / CANVUA)
Soil erosion			RUN OFF - POTENTIAL SITE EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			—
Storm damage			—
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	23 / 2 / 18	YARRABEE	Q 20 (46)	GILBERT WATTE.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
G	1 AUSTROSTIPA ARISTIGLUMIS	N	10	100		
S	2 DUMA FLORULENTA	N	0.1	1		
—	3 HELIOTROPEUM EUROPAEUM	E	0.1	2		
—	4 CHENOPODIUM MURALE	E	0.5	5		
—	5 DYSPHANIA PUMILIO	E	0.1	20		
E	6 MARSILEA DRUMONDII	N	0.5	1000+		
—	7 LACTUCA SERRIOLA	E	0.1	2		
—	8 SOLANUM PHYSALIFOLIUM	E	0.5	50		
—	9 PANICUM MLIACEUM	E	1	500		
—	10 XANTHOSA SPINOSA	HTE	0.1	2		
C	11 SCLEROLAENA MURICATA	N	0.1	10		
R	12 JUNCUS SUBSECUNDUS	N	0.2	10		
G	13 AUSTRODANTHOMA RHYNDO CAEPITEUM	N	40	1000+		
F	14 OXALIS PERRENANS	N	0.1	1		
—	15 HORDEUM LEPOREUM	E	40	1000		
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF – circle code if 'top 3'.

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

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Date		Survey Name	Zone ID	Recorders	
23 / 2 / 18		YARRABEE	ZONE 1	GILBERT WHYTE	
Zone	Datum	Plot ID	Plot dimensions	Photo #	
55	GDA 94	Q21 (97)	20m x 20m	7631	
Easting	Northing	IBRA region	Midline bearing from 0 m	Magnetic °	
34.798370	146.200475	RIVERINA	313°		
Vegetation Class		RIVERINE SANDHILL WOODLAND			Confidence: (H) M L
Plant Community Type		WHITE CYPRESS PINE OPEN WOOD			Confidence: (H) M L
		EEC: 4E1			

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

PCK 28

BAM Attribute (400 m² plot)	Sum values
Trees	2
Shrubs	1
Grasses etc.	1
Forbs	4
Ferns	0
Other	2
Sum of Cover of native vascular plants by growth form group	
Trees	12
Shrubs	1
Grasses etc.	0.1
Forbs	0.4
Ferns	0
Other	0.2
High Threat Weed cover	0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	III	0
20 – 29 cm	I	
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space 0m	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	90 100 60 50 40	10 0 20 30 30	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	68	18.	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type	Landform Element	Landform Pattern	Microrelief
FLOODPLAIN			
Lithology	Soil Surface Texture	Soil Colour	Soil Depth
ALLUVIAL	HARD-SETTING	BROWN CLAY	SHALLOW < 20cm
Slope	Aspect	Site Drainage	Distance to nearest water and type
FLAT (1°-2°)		WEST	WASHPIT CK.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			- CLEARING INDIVIDUAL TREES / SELECTIVE
Cultivation (inc. pasture)			MATRIX OF AGRICULTURAL LAND (BARLEY / CANOLA)
Soil erosion			RUN OFF - POTENTIAL JITTER EROSION
Firewood / CWD removal			
Grazing (identify native/stock)			EVIDENCE OF HISTORICAL GRAZING - CATTLE
Fire damage			-
Storm damage			-
Weediness			LARGE NUMBER OF EXOTIC GRASSES / HERBS
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m ² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders			
Date	23 / 2 / 18	YARRAMBEI	Q 21 (97)	GILBERT WHITE.			
GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
I	1	CALLIRIS GLAUCOPHYLLA	N	10	3		
—	2	HORDEUM LEPORINUM	E	80	1000+		
I	3	ALLOCASURINA LEUWMANNII	N	2	1		
—	4	DYSIPHANIA PUMILIO	E	2	50		
—	5	HELIOTROPUM EUROPAEUM	E	1	50		
—	6	ECIUM PLATAGINACEAE	HTE	0.1	2		
—	7	RYENA BARBATA	E	0.1	10		
—	8	PANICUM MILIACEUM	E	0.1	10		
F	9	RENADIA NUTANS	N	0.1	1		
C	10	SCLEROLAENA DIACANTHA	E	0.1	2		
F	11	SIDA TROCHOPODA	N	0.1	2		
G	12	CHLORIS TRUNCATA	N	0.1	1		
F	13	SIDA CORRUGATA	N	0.1	1		
C	14	CHENOPodium MURALE	E	0.1	4		
—	15	SOLANUM PHYSALIFOLIUM —	E	0.1	1		
	16	VAR. NITIDIBACCATUM					
S	17	SANTALUM ACUMINATUM	N	1	1		
—	18	TRIBULUS TERRESTRIS	HTE	0.1	5		
F	19	SENECIO QUADRIDENTATUS	N	0.1	10		
—	20	AMSIKIA INTERMEDIA	E	0.5	20		
—	21	RUMEX PULCHER	E	0.1	1		
	22						
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GF Code: see Growth Form definitions in Appendix 1

N: native, E: exotic, HTE: high threat exotic

GF — circle code if 'top 3'.

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

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

BAM Calculator Reports

BAM Candidate Species Report

Proposal Details

Assessment Id 00011177/BAAS18041/18/00011178	Proposal Name Yarrabee Solar Project_Assessment 2	BAM data last updated * 24/02/2018
Assessor Name Gilbert Whyte	Report Created 11/06/2018	BAM Data version * 3
Assessor Number BAAS18041	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	

List of Species Requiring Survey

Name	Presence	Survey Months
<i>Ardeotis australis</i> Australian Bustard	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Austrostipa wakoolica</i> A spear-grass	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Brachyscome papillosa</i> Mossgiel Daisy	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Lophochroa leadbeateri</i> Major Mitchell's Cockatoo	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Caladenia arenaria</i> Sand-hill Spider Orchid	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Lathamus discolor</i> Swift Parrot	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Lepidium monophlocoides</i> Winged Peppergrass	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

BAM Candidate Species Report

<i>Litoria raniformis</i> Southern Bell Frog	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Eucalyptus leucoxylon subsp. pruinosa</i> Boland Yellow Gum	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Myotis macropus</i> Southern Myotis	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Phascolarctos cinereus</i> Koala	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Pilularia novae-hollandiae</i> Austral Pillwort	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Polytelis anthopeplus monarchoides</i> Regent Parrot (eastern subspecies)	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Polytelis swainsonii</i> Superb Parrot	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Solanum karsense</i> Menindee Nightshade	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Swainsona murrayana</i> Slender Darling Pea	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Swainsona sericea</i> Silky Swainson-pea	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00011177/BAAS18041/18/00011178	Yarrabee Solar Project_Assessment 2	24/02/2018
Assessor Name	Report Created	BAM Data version *
Gilbert Whyte	11/06/2018	3
Assessor Number	* 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.	
BAAS18041		

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

Common Name	Scientific Name	Vegetation Types(s)
Australasian Bittern	Botaurus poiciloptilus	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Australian Painted Snipe	Rostratula australis	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Brolga	Grus rubicunda	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Diamond Firetail	Stagonopleura guttata	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

BAM Predicted Species Report

Diamond Firetail	Stagonopleura guttata	28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
Dusky Woodswallow	Artamus cyanopterus cyanopterus	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
Freckled Duck	Stictonetta naevosa	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Grey Falcon	Falco hypoleucos	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

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Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
Inland Forest Bat	Vespadelus baverstocki	13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
Koala	Phascolarctos cinereus	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Major Mitchell's Cockatoo	Lophochroa leadbeateri	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
Regent Parrot (eastern subspecies)	Polytelis anthopeplus monarchoides	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Superb Parrot	Polytelis swainsonii	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

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Superb Parrot	<i>Polytelis swainsonii</i>	28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
Swift Parrot	<i>Lathamus discolor</i>	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
		28-White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone

ASIA PACIFIC OFFICES

BRISBANE

Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

MELBOURNE

Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

SYDNEY

2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

AUCKLAND

68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

CANBERRA

GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

NEWCASTLE

10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

TAMWORTH

PO Box 11034
Tamworth NSW 2340
Australia
M: +61 408 474 248
F: +61 2 9427 8200

NELSON

5 Duncan Street
Port Nelson 7010
New Zealand
T: +64 274 898 628

DARWIN

5 Foelsche Street
Darwin NT 0800
Australia
T: +61 8 8998 0100
F: +61 2 9427 8200

PERTH

589 Hay Street
Jolimont WA 6014
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

TOWNSVILLE

Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

NEW PLYMOUTH

Level 2, 10 Devon Street East
New Plymouth 4310
New Zealand
T: +64 0800 757 695

MACKAY

21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

ROCKHAMPTON

rockhampton@slrconsulting.com
M: +61 407 810 417