



Flora and Fauna assessment:

Yarrabilly Estate Retirement Village Stage 1 subdivision,
Cowra, NSW

FINAL REPORT

Prepared for Fraish Consulting

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Contents

Glossary.....	iv
Summary	v
1 Introduction	8
1.1 Project background	8
1.2 Scope of assessment	8
1.3 Location of the study area	8
2 Methods	11
2.1 Literature and database review.....	11
2.2 Site investigation	11
2.2.1 Flora assessment	11
2.2.2 Fauna assessment	12
2.2.3 Permits and licences.....	12
2.3 Limitations	12
2.4 Mapping	12
3 Legislative context	14
3.1 Commonwealth.....	14
3.1.1 Environmental Protection and Biodiversity Conservation Act 1999.....	14
3.2 State	14
3.2.1 Environmental Planning and Assessment Act 1979.....	14
3.2.2 Threatened Species Conservation Act 1995	15
3.2.3 Native Vegetation Act 2003.....	16
3.2.4 Noxious Weeds Act 1993.....	16
3.2.5 Water Management Act 2000.....	16
3.2.6 Fisheries Management Act 1994	17
3.2.7 Local Environment Plans (Part 3, Division 4)	17
4 Results	19
4.1 Landscape context.....	19
4.2 Flora and fauna	19
4.3 Vegetation communities and fauna habitat	20
4.4 Threatened biota	23
4.5 Noxious Weeds	23
5 Assessment against key biodiversity legislation	26
5.1 Commonwealth.....	26
5.1.1 Environmental Protection and Biodiversity Conservation Act 1999.....	26
5.2 State	26
5.2.1 Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995.....	26

5.2.2	Native Vegetation Act 1993	26
5.2.3	Noxious Weeds Act 1993	27
5.2.4	Water Management Act 2000	27
5.2.5	Fisheries Management Act 1994	27
5.2.6	Local Environment Plans (Part 3, Division 4)	27
6	Ecological impacts and recommendations	28
6.1	Ecological constraints analysis	30
6.2	Conservation class matrix	30
7	Conclusion	32
	References	33
	Appendices	34
Appendix 1	Flora	35
Appendix 2	Fauna	44

Tables

Table 1	Vegetation community within the study area	20
Table 2	Noxious weeds within the study area	23
Table 3	Ecological values, impacts and recommendations	29
Table 4	Conservation class matrix	30
Table A.1	Flora species recorded from the study area	35
Table A.2	Threatened flora species recorded / predicted to occur within ten kilometres of the study area	38
Table A.3	Threatened ecological communities recorded / predicted to occur within ten kilometres of the study area	40
Table A.4	Vertebrate fauna recorded from the study area (current assessment)	44
Table A.5	Threatened fauna species recorded, or predicted to occur, within ten kilometres of the study area	47
Table A.6	Migratory species (EPBC Act listed)	56
Table A.7	Migratory fauna species recorded or predicted to occur within ten kilometres of the study area	56

Figures

Figure 1	Location of the study area, NSW	10
Figure 2	Ecological values of the study area, NSW	22
Figure 3	Threatened flora species recorded within ten kilometres of the study area	24
Figure 4	Threatened fauna species recorded within ten kilometres of the study area	25
Figure 5	Ecological constraints within the study area	31

Glossary

AoS	Assessment of Significance
CBD	Central Business District
DA	Development Application
DEE	Department of the Environment and Energy
DP&E	NSW Department of Planning and Environment
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	<i>Fisheries Management Act 1994</i>
GPS	Global positioning system
KTP	Key Threatening Process
LEP	Local Environment Plan
LGA	Local Government Area
NES	Matters of National Environmental Significance
NSW	New South Wales
NV Act	<i>Native Vegetation Act 2003</i>
NW Act	<i>Noxious Weed Act 1993</i>
OEH	NSW Office of Environment and Heritage
PVP	Property Vegetation Plan
RoTAP	Rare or Threatened Australian Plants
SEPP	State Environmental Planning Policies
SIS	Species Impact Statement
SIX	Spatial Information Exchange
study area	The broader area of Lot 1 DP111554 (Stage 1) which the subject site is located
subject site	The area of impact for the proposed works
TSC Act	<i>Threatened Species Conservation Act 1995</i>
VIS	Vegetation Information System
VRZ	Vegetated Riparian Zone
WM Act	Water Management Act

Summary

Biosis Pty Ltd was commissioned by Fraish Consulting to undertake a flora and fauna assessment of an area of land (Lot 4 DP1092812), proposed for residential subdivision as part of the Stage 1 Yarrabilly Estate Retirement Village, Cowra, NSW (the study area). The subject site is located in farmland approximately 1.7 kilometres north-east of the centre of Cowra.

The study area, defined by the extent of proposed works, is likely to be directly affected by the proposed residential subdivision with adjacent land having the potential to experience indirect effects. Therefore, this assessment covers both the study area and, as a precautionary measure, includes land outside the study area situated within a ten metres buffer from the study area boundary. This will allow for comprehensive assessment of the study area as well as any additional areas in the immediate locality which are likely to be affected by the Proposal, either directly or indirectly. Identified constraints will guide Fraish Consulting through the detailed design phase, with an emphasis on avoiding impacts to ecological values where feasible.

The study area encompasses 9.36 hectares of exotic vegetation including approximately 0.24 hectares of rock outcropping within the south-east corner and a natural drainage line extending in a north-south direction to the south.

The vegetation and fauna habitat throughout the majority of the study area has been modified by past disturbances which have included vegetation clearance, livestock grazing, ploughing, dumping of construction materials and vegetation management regimes using herbicide and mowing.

Ecological value

The key ecological value identified within the 9.36 hectare study area, dominated by exotic pasture includes, 0.24 hectares of granite and pink rhyolite outcropping.

Recommendations

No native vegetation communities have been recorded within the study area, therefore the ecological value (rock outcropping) within the study area has been mapped as low constraint within this report with mapping provided to highlight this conclusion.

Based on the presence of exotic vegetation with minimal ecological value, no further assessment under federal (EPBC Act) or state (TSC Act, Part 5 of the EP & A Act, WM Act and FM Act) legislation is required, however under the NV Act, removal of the exotic pasture vegetation community for any reason other than routine agricultural maintenance activities or as a continuation of existing farming practices will require development consent.

Government legislation and policy

An assessment of the project against key biodiversity legislation and policy is provided and summarised below.

Legislation / Policy	Relevant ecological feature on site	Permit / approval required
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	No Matters of National Significance or their habitat listed under the EPBC Act	No further assessment under the EPBC Act is required.

Legislation / Policy	Relevant ecological feature on site	Permit / approval required
	is present within the study area.	
Threatened Species Conservation Act 1995	No threatened biota or their habitat listed under the TSC Act is present within the study area.	No further assessment under the TSC Act or Part 5 of the EP&A Act is required.
Environmental Planning & Assessment Act 1979	No threatened biota or their habitat listed under the TSC Act is present within the study area.	No further assessment under Part 5 of the EP&A Act is required.
State Environmental Planning Policy (Rural Lands) 2008	The study area is zoned R1 – General Residential and RE1 – Public Recreation under the Cowra LEP 2012. Therefore this SEPP does not apply to the current Proposal.	SEPP (Rural Lands) 2008 does not apply to the study area therefore the associated Rural Planning Principles are not applicable to the Proposal.
Native Vegetation Act 2003	No native vegetation communities exist within the study area which is dominated by exotic pasture containing 96% cover of exotic species and 4% cover of native species.	Removal of the exotic pasture vegetation community is permissible without a Property Vegetation Plan or Development Application if carried out as part of agricultural maintenance activities or a continuation of existing land management practices, however removal of this community will require development consent if conducted for the purpose of development or construction.
Noxious Weeds Act 1993	The following noxious weeds are present within the study area: <ul style="list-style-type: none"> • African Boxthorn • Giant Reed • Silverleaf Nightshade • St John's Wort • Sweet Briar 	Control requirements for these noxious listed weeds are outlined in Table 2 with management recommendations outlined in Section 6, Table 3.
Water Management Act 2000	An artificial drainage line and a natural drainage line occur within the southern section of the study area. Both drainage lines traverse the study area in a north-south direction and do not join with any waterways mapped by NSW DPI. Both drainage lines were observed to be dry, did not contain flora or fauna associated with periodic inundation and in the case of the natural drainage line, was shallow and did not exhibit formed banks. Therefore, it is concluded that these drainage lines do not form a riparian	No further assessment or permits under the WM Act is required.

Legislation / Policy	Relevant ecological feature on site	Permit / approval required
	corridor or waterway as described under the WM Act.	
<i>Fisheries Management Act 1994</i>	No habitat for threatened species listed under the FM Act for Cowra Shire Council LGA, Purple Spotted Gudgeon <i>Mogurnda adspersa</i> and Silver Perch <i>Bidyanus bidyanus</i> , is present within the study area. In addition, the artificial and natural drainage lines within the study area do not form a continuous corridor with Waugoola Creek, a tributary of the Lachlan River.	No further assessment or permits under the FM Act or assessment under Part 5 of the EP & A Act is required.
<i>Cowra Local Environment Plan (2012).</i>	The proposed 100 lot Yarrabilly Retirement Village (Stage 1) is to be undertaken on land zoned R1 – General Residential and RE1 – Public Recreation. The study area is mapped as an Urban Release Area in the Cowra LEP 2012.	The Proposal is in accordance with Cowra LEP 2012 land use objectives and requirements.

Note: Guidance provided in this report does not constitute legal advice.

1 Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Fraish Consulting to undertake an ecological assessment of the proposed subdivision of the western section of Lot 4 DP1092812 (Figure 1) which forms Stage 1 of the Yarrabilly Estate Retirement Village, Cowra, NSW (the study area). The study area comprises of approximately 9.36 hectares of pastoral land consisting of exotic pasture and widely scattered exotic paddock trees.

Fraish Consulting intend to lodge a Development Application (DA) on behalf of the landholder proposing the subdivision of the study area into 100 independent living seniors houses as part of the Yarrabilly Retirement Village (the Proposal). Future activities associated with the proposal may entail the removal of ecological values (rock outcropping) contained within the study area (Figure 2).

Therefore, this flora and fauna assessment has been prepared to provide Fraish Consulting with a detailed record of the ecological values of the study area and to outline the significance of these constraints, in support of the DA and associated Statement of Environmental Effects.

1.2 Scope of assessment

The objectives of this investigation are to:

- Describe the vascular flora (ferns, conifers, flowering plants), vertebrate fauna (birds, mammals, reptiles and frogs).
- Map native vegetation and other ecological values (threatened flora presence, large infestations of noxious weeds, hollow-bearing trees, rock outcrops, waterways etc.).
- Report on the presence or likely occurrence of threatened flora, fauna or ecological communities (biota) or suitable habitat for such based on the survey findings, as listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Threatened Species Conservation Act 1995* (TSC Act) or the *NSW Fisheries Management Act 1994* (FM Act).
- Review the implications of relevant biodiversity legislation and policy including an analysis of legislative implications of the proposed works.
- Identify potential implications of the Proposal and provide recommendations to assist with development design.
- Provide mitigation measures (if any) required for future works associated with the Proposal, to proceed in accordance with best practice and project requirements.

1.3 Location of the study area

The study area is located approximately 1.7 kilometres north-east of the town of Cowra and approximately 310 kilometres west of the Sydney CBD (Figure 1). It encompasses 9.36 hectares of privately owned land including adjacent road reserves. The study area is currently zoned R1- General Residential and RE1- Public Recreation under the Cowra LEP. The study area comprises of exotic pasture, former and current pastoral land which is currently stocked with cattle, consisting of a matrix of exotic pasture within which are widely distributed exotic canopy trees. The study area is predominantly flat to gently undulating throughout the

northern extent with the central section characterised by a low ridgeline which then forms a moderate south-east facing incline throughout the southern extent.

Regional soil landscape mapping indicates that soils within the study area occur on the Cowra soil landscape (Kovac et al., 1990), underlain by Cowra Granodiorite. The Cowra soil landscape is characterised by undulating to rolling hills studded with granite outcrops with local relief typically ranging between 100 metres and 160 metres. Soil types in this landscape are dominated by red podzolic soils and siliceous sands on crests and non-calcic brown soils or red-brown earths on upper slopes and gentle inclines. White Box *Eucalyptus albens* communities are dominant within this soil landscape with Western Grey Box *Eucalyptus macrocarpa* in valleys and Red Ironbark *Eucalyptus fibrosa* and Red Stringybark *Eucalyptus macrorhyncha* atop ridges (Kovac et al., 1990).

The study area is within the:

- NSW South Western Slopes Bioregion.
- Lachlan River Basin (Murrumbidgee catchment).
- Central Tablelands Local Land Services (Central Tablelands LLS).
- Cowra Shire Council Local Government Area (LGA).

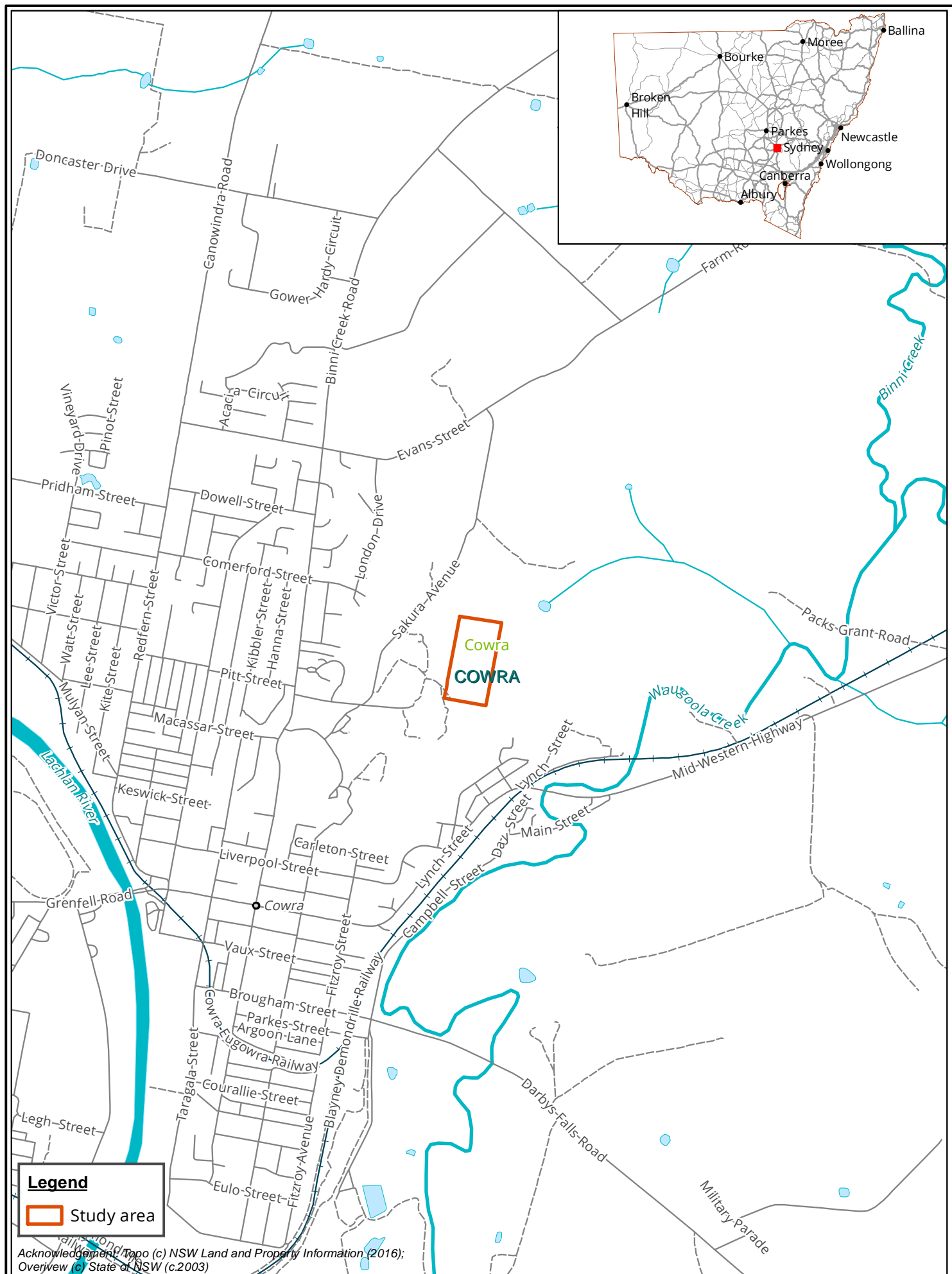
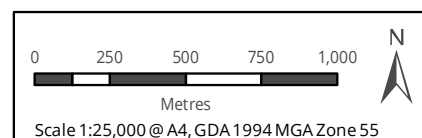


Figure 1: Location of the study area



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2 Methods

2.1 Literature and database review

In order to provide a context for the study area, information about flora and fauna from within ten kilometres (the 'locality') was obtained from relevant public databases. Records from the following databases were collated and reviewed:

- Department of the Environment and Energy (DEE) Protected Matters Search Tool for matters protected by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- NSW BioNet - *the database for the Atlas of NSW Wildlife*, Office of Environment and Heritage (OEH) (TSC Act).
- NSW Department of Primary Industries (DPI) *Freshwater threatened species distribution map*.
- PlantNET (The Royal Botanic Gardens and Domain Trust, 2016) for Rare or Threatened Australian Plants (RoTAP).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2013.

Other sources of biodiversity information:

- Relevant vegetation mapping, including:
 - OEH Vegetation Information System (VIS) Mapping through the Spatial Information eXchange (SIX) Vegetation Map Viewer.
 - *Predicted Vegetation Cover in the Central Lachlan Region* (Austin et al., 2000).
 - *Reconstructed and extant distribution of native vegetation in the Central West Catchment* (DEC 2006).
 - *2008 Updated land use and extant distribution of native vegetation in the Lachlan and Central West Catchments* (DECC 2008).

The following reports were also reviewed:

- NSW Scientific Committee final determinations for threatened biodiversity.

2.2 Site investigation

2.2.1 Flora assessment

The flora assessment was undertaken over two days, 14/12/2016 and 15/12/2016 (total survey effort of seven hours) using a combination of 20 x 20 metre quadrats, transects, spot locations and random meanders to determine the vegetation types present within the study area.

General classification of native vegetation in NSW used in this report is based on the classification system in Keith (2004) which uses three groupings of vegetation: vegetation formation, vegetation class and vegetation type, with vegetation type the finest grouping. The grouping referred to in this report is vegetation type.

A list of flora species was compiled for each vegetation type. Records of threatened flora species will be submitted to OEH for incorporation into the BioNet Wildlife Atlas.

The general condition of native vegetation was observed as well as the effects of current seasonal conditions. Notes were made on specific issues such as noxious weed infestations, evidence of management works, current grazing impacts and the regeneration capacity of the vegetation.

2.2.2 Fauna assessment

The study area was investigated over two days, 14/12/2016 and 15/12/2016 (total survey effort of seven hours) to determine values for fauna. These were determined primarily on the basis of the types and qualities of habitat(s) present. All species of fauna observed during the assessment were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for threatened biota and their habitats. Fauna species were recorded with a view to characterising the values of the site and the investigation is not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.

Fauna records will be submitted to OEH for incorporation into the NSW BioNet Wildlife Atlas.

2.2.3 Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by the Office of Environment and Heritage under the *National Parks and Wildlife Act 1974* (SL100758, expiry date 31 March 2017). Fauna survey was conducted under approval 11/355 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2017).

2.3 Limitations

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as species dormancy, seasonal conditions, ephemeral status of waterbodies and migration and breeding behaviours of some fauna. In many cases these factors do not present a significant limitation to assessing the overall ecological values of a site.

The current flora and fauna assessment was conducted in early summer, which is an optimal time for survey as the majority of flora species have either recently reproduced and are actively seeding or are making preparations for flowering and terrestrial fauna are active and not in torpor. The majority of the threatened flora and fauna species are conspicuous during the early summer season and would have been detected if present within the study area. Furthermore, the study area consists entirely of exotic pasture which has a history of regular grazing by livestock, with cattle observed within the study area over the duration of the field assessment. Based on the limited habitat availability, the conspicuous nature of the flora and fauna species and the timing of the field assessment, the survey effort of seven hours was considered sufficient to assess the ecological values of the study area.

Database searches, and associated conclusions on the likelihood of species to occur within the study area, are reliant upon external data sources and information managed by third parties.

2.4 Mapping

Aerial photography and study area boundaries are based on the Yarrabilly Estate Concept Master Plan November 2016, supplied by Fraish Consulting via email correspondence on 23 November 2016.

Mapping was conducted using Samsung Tablet Personal Computer units (GDA94) and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally \pm 7 metres) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files containing the relevant flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently precise for detailed design purposes.

3 Legislative context

This section provides an overview of key biodiversity legislation and government policy considered in this assessment. Where available, links to further information are provided. This section does not describe the legislation and policy in detail and guidance provided here does not constitute legal advice.

3.1 Commonwealth

3.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act.

Nine Matters of NES are identified under the EPBC Act:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (also known as 'Ramsar' wetlands).
- Nationally 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.

Under the EPBC Act, activities that have potential to result in significant impacts on Matters of NES must be referred to the Commonwealth Minister for the Environment for assessment.

Matters of NES relevant to the current project include nationally threatened species and ecological communities, migratory species and Ramsar wetlands. Threatened species and ecological communities protected by the EPBC Act are outlined in Section 4.4. An assessment of potential impacts to all Matters of NES under the provisions of the EPBC Act is provided in Section 5.1.1 and Section 6.

3.2 State

3.2.1 Environmental Planning and Assessment Act 1979

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

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

Assessment of Significance (Part 1, Section 5A)

Section 5A of the EP&A Act is an integral part of environmental impact assessment and requires proponents and consent authorities to consider if a development will have a significant effect on threatened species, populations or communities listed under the TSC Act and FM Act. The objective of the Assessment of Significance (AoS) (formally known as the “7-part test”) is to improve the standard of, and make transparent, the considerations given to threatened species, populations and ecological communities (biota), and their habitats, and Section 5A (and Section 94 of the TSC Act) outlines seven factors that must be taken into account. Typically, where any AoS determines that a development will result in a significant effect to threatened biota, a Species Impact Statement is required.

Threatened biota listed under the TSC Act are discussed in Section 4.4. An assessment of whether the project will result in a significant effect to these threatened species, populations and communities is summarised in Section 5.2.1 and Section 6.

State Environmental Planning Policies (Part 3, Division 2)

State Environmental Planning Policies (SEPPs) are environmental planning instruments under the EP&A Act that outline policy objectives relevant to State or regional environmental planning issues. There are over 65 SEPPs; however, only those relevant to the proposed development have been considered and are detailed below.

State Environmental Planning Policy (Rural Lands) 2008

SEPP (Rural Lands) 2008 aims to facilitate the economic use and development of rural lands for rural and related purposes in a way which is consistent with Rural Planning Principles and Rural Subdivision Principles, which avoids or reduces land use conflicts, which allows for ongoing viability of agricultural land and has regard for social, economic and environmental values.

Part 2, Clause 7 (e) of SEPP (Rural Lands) 2008 states the objectives of Rural Planning Principles in regards to biodiversity conservation:

“The identification and protection of natural resources, having regard to maintaining biodiversity, the protection of native vegetation, the importance of water resources and avoiding constrained land,”

Furthermore, in regards to designing and undertaking rural subdivision Part 3, Clause 8(d and e) stipulate that the following Rural Planning Principles be applied:

“(d) the consideration of the natural and physical constraints and opportunities of land”.

“(e) ensuring that planning for dwelling opportunities takes account of those constraints”.

Clause 9 (2) states that subdivision on rural land for the purposes of primary production should adhere to the following principles:

“(2) Land in a rural zone may, with consent, be subdivided for the purpose of primary production to create a lot of a size that is less than the minimum size otherwise permitted for that land.”

The study area is located within the Cowra Shire Council LGA, which is not listed in Part 1 Clause 4 as a Council to be excluded. However, the study area is zoned R1 – General Residential and RE1 – Public Recreation which does not allow for the implementation of the Rural Planning Principles outlined above, therefore SEPP (Rural Lands) 2008 is not relevant to the current assessment and will not be discussed further in this report.

3.2.2 Threatened Species Conservation Act 1995

The TSC Act is the key piece of legislation providing for the protection and conservation of biodiversity in NSW through the listing of threatened biota, key threatening processes and critical habitat for threatened biota. Impacts to threatened biota are assessed under Section 5A of the EP&A Act (see above).

The potential for threatened biota to occur within and be impacted by the proposed subdivision is assessed in Section 4.4. An assessment of whether the project will result in a significant effect to these threatened species, populations and communities is summarised in Section 5.2.1 and Section 6.

3.2.3 Native Vegetation Act 2003

The NV Act provides for, encourages and promotes the management of native vegetation on a regional basis and regulates the clearing of native vegetation on land in NSW. Under the NV Act no clearing of native vegetation is allowed except in accordance with prior development consent from the relevant Council or under a Property Vegetation Plan (PVP) approved by the relevant Catchment Management Authority.

The study area contains approximately 4% native vegetation cover in the form of understorey grasses and herbs with a sparse, patchy distribution, therefore the NV Act applied to this proposal. Consideration of the NV Act in relation to the Proposal is discussed further in Section 5.2.2.

3.2.4 Noxious Weeds Act 1993

The NW Act was enacted to provide for the identification, classification and control of noxious weeds. The NW Act aims to reduce the negative impact of weeds on the economy, community and environment of NSW by:

- *Establishing control mechanisms to prevent the establishment of significant new weeds in NSW.*
- *Preventing, eliminating or restricting the spread of particular significant weeds in NSW.*
- *Effectively managing widespread significant weeds in NSW.*

Plants declared as noxious weeds are currently listed under Noxious Weeds (Weed Control) Order 2014 published in the NSW Government Gazette No. 23. The NW Act is supported by a number of regulations and is administered by the DPI.

Noxious weeds are discussed further in Section 4.5 and Section 5.2.3 with recommendations for adhering to the NW Act provided in Section 6.

3.2.5 Water Management Act 2000

The WM Act provides for the sustainable and integrated management of the state's water for the benefit of both present and future generations based on the concept of ecologically sustainable development.

Under the WM Act an approval is required to undertake controlled activities on waterfront land, unless that activity is otherwise exempt (WM Act, section 91E).. In the WM Act, controlled activity means:

- *The erection of a building or the carrying out of works (within the meaning of the EP&A Act).*
- *The removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise.*
- *The deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise.*
- *The carrying out of any other activity that affects the quantity or flow of water in a water source.*

In relation to controlled activities, the WM Act states amongst other things that the carrying out of controlled activities must avoid or minimise land degradation, including soil erosion, compaction, decline of native vegetation and where possible land must be rehabilitated.

Activities associated with the Proposal are assessed against the WM Act in Section 5.2.4 with recommendations for adhering to the WM Act provided in Section 6.

3.2.6 Fisheries Management Act 1994

The FM Act provides for the protection and conservation of aquatic species and their habitat through NSW. Impacts to threatened biota listed under the FM Act must be assessed through the AoS process under Section 5A of the EP&A Act. Activities associated with the Project are assessed against the FM Act in Section 5.2.5 with recommendations for adhering to the FM Act provided in Section 6.

3.2.7 Local Environment Plans (Part 3, Division 4)

Local Environment Plans are created by Councils in consultation with their community and guide planning decisions for LGAs. They apply either to the whole or part of a LGA and make provision for the protection or utilisation of the environment through zoning of land and development controls.

The study area is subject to the Cowra LEP and is zoned R1 - General Residential and RE1 - Public Recreation. The objectives of R1 zoning are to:

- *To provide for the housing needs of the community".*
- *To enable other land uses that provide facilities or services to meet the day to day needs of the residents".*
- *To provide attractive, affordable, well located and market – responsive residential land".*
- *"To ensure that housing densities are broadly concentrated in locations accessible to public transport, employment, services and facilities.*

The objectives of RE1 zoning are to:

- *To enable land to be used for public open space or recreational purposes.*
- *To protect and enhance the natural environment for recreational purposes.*
- *To provide a range of recreational settings and activities and compatible land uses.*
- *To maximise public transport patronage and encourage walking and cycling.*

The south-eastern corner of the study area has been mapped as an area of high biodiversity importance (terrestrial biodiversity) within the Cowra LEP 2012. The objectives of terrestrial biodiversity zones are outlined in Part 7, Clause 7.3 with key objectives are to maintain terrestrial biodiversity by:

- *"Protecting native fauna and flora".*
- *"Protecting the ecological processes necessary for their continued existence".*
- *"Encouraging the conservation and recovery of native fauna and flora and their habitats".*

Additional considerations under Part 7, Clause 7.3(3) states that *"Before determining a development application for development on land to which this clause applies, the consent authority must consider:*

- *Whether this development is likely to have:*
 - *Any adverse impact on the condition, ecological value and significance of the fauna and flora on the land.*
 - *Any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna.*
 - *Any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land.*
 - *Any adverse impact on the habitat elements providing connectivity on the land.*

- *Any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development".*

Part 7, Clause 7.3(4) states that:

- *Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:*
 - *The development is designed, sited and will be managed to avoid any significant adverse environmental impact.*
 - *If that impact cannot be reasonably avoided by adopting feasible alternatives – the development is designed, sited and will be managed to minimise that impact.*
 - *If that impact cannot be minimised – the development will be managed to mitigate that impact.*

Lastly, the study area is mapped as an Urban Release Area in the Cowra LEP 2012.

The legislative implications of the Proposal in relation to the Cowra LEP 2012 are discussed further in Section 5.2.6.

4 Results

The ecological values of the study area are described below and mapped in Figure 2.

4.1 Landscape context

The study area is predominantly cleared of native vegetation with current land use consisting of agriculture in the form of pastoral farming. The study area was observed to be stocked with approximately 30 head of cattle during the field investigation. Land usage adjacent to the study area consists of public recreation, agriculture cropping and pastoral farming. The study area and adjacent cleared lands have undergone extensive historical native vegetation clearance and have been impacted by intensive livestock grazing as evidenced by the species composition of extant vegetation which is characterised by the dominance of grazing tolerant exotic species and absence of grazing intolerant native species. Approximately 0.24 hectares of granite and pink rhyolite outcropping occur in the south-east corner of the study area. An artificial drainage line extends in a north-south direction within the south-western extent of the study area with an additional shallow, natural drainage line traversing the south-east section of the study area, again in a north-south direction.

The subject site is not directly linked to bushland although it does form a stepping stone for generalist avifauna and macropods within the locality including those travelling between Conimbla National Park located approximately 20 kilometres to the west, Koorawatha Nature Reserve situated approximately 25 kilometres to the south-west and Grabine Lakeside State Park located approximately 32 kilometres to the south-east. The majority of the study area has been cleared and is dominated by exotic grasses and herbs with a small number of scattered paddock trees throughout the southern and eastern extent, providing limited foraging and dispersal linkages for fauna throughout the landscape.

4.2 Flora and fauna

Species recorded during the flora assessment are listed in Table A.1 of Appendix 1 (flora). Unless of particular note, these species are not discussed further. A list of threatened biota recorded or predicted to occur in the local area is also provided in those appendices, along with an assessment of the likelihood of the species occurring within the study area.

No RoTAPs were found during the survey effort, note of the three RoTAPs identified through desktop research (12 December 2016), only one, *Genoplesium systenum*, was considered likely to occur within the subject site, near the crest situated in the south-east corner.

Species recorded during the fauna assessment are listed in Appendix 2, Table A.4 (fauna). Unless of particular note, these species are not discussed further. A list of threatened biota recorded or predicted to occur in the local area is also provided in those appendices, along with an assessment of the likelihood of the species occurring within the project area.

The subject site is a frequently visited grazing area for a local population of Eastern Grey Kangaroo *Macropus giganteus* which habitually rest overnight amongst the area of rock outcropping situated in the south-east corner. Eastern grey kangaroo populations were observed to migrate from this area to adjoining properties located to the south, south-east and south-west of the study area over the duration of the field investigation.


4.3 Vegetation communities and fauna habitat

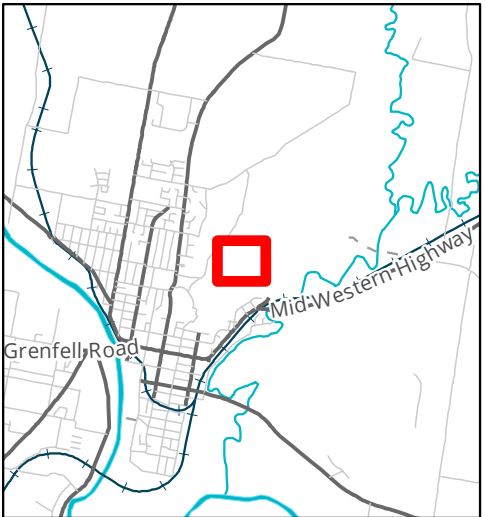
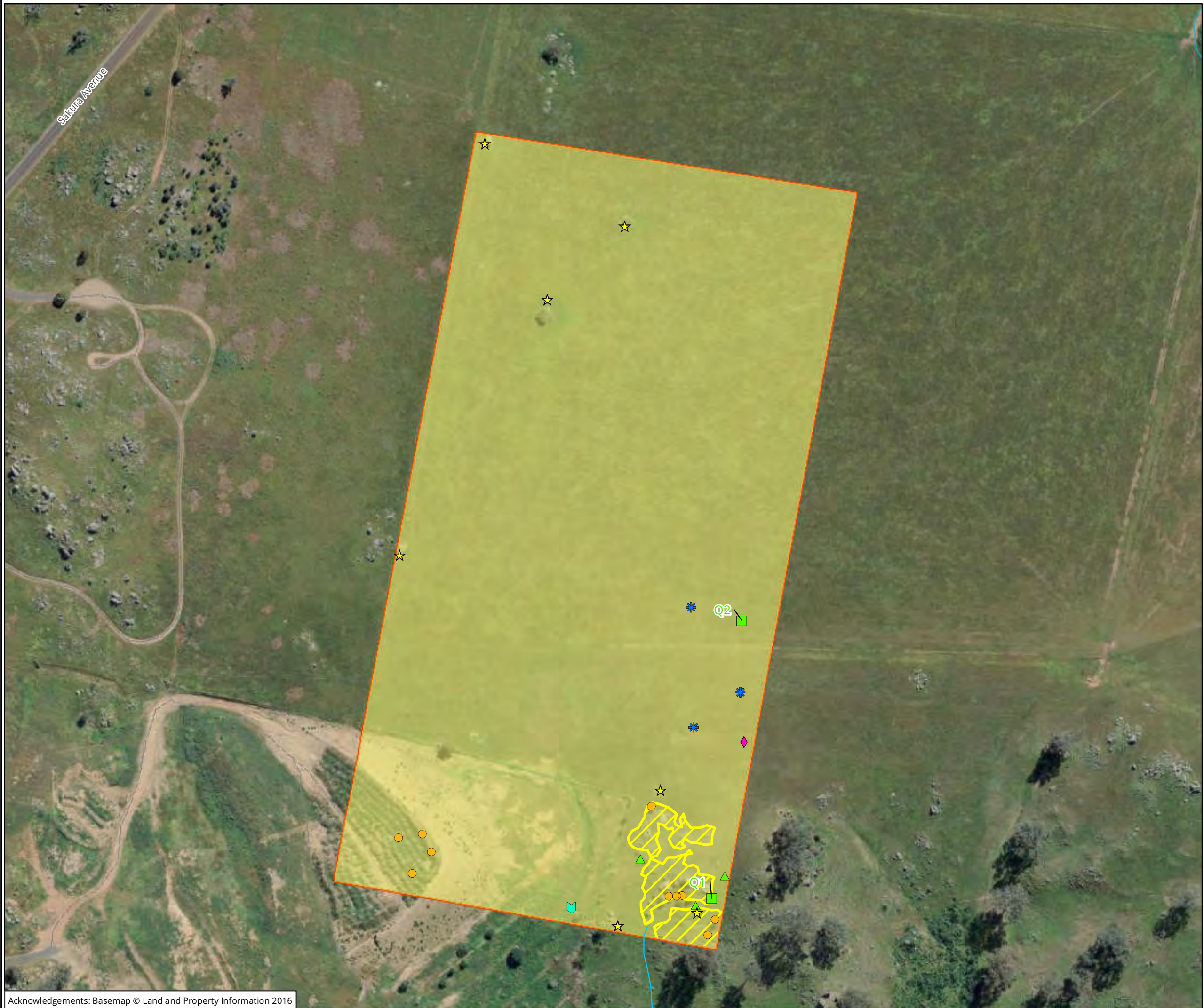
The vegetation and fauna habitat throughout the majority of the study area has been modified by past disturbances which have included vegetation clearance of all native canopy and mid-storey species and the majority of native understorey species. Further disturbances include, ploughing, livestock grazing including cattle and sheep, altered fire regime and altered hydrological regime, nutrient enrichment and weed ingress.

The study area supports a limited range of ecological values including areas of rock outcropping consisting of granite and pink rhyolite and a drainage line originating at the top of the rise in the south-west corner of the subject site and extending down hill to the southern boundary. The ecological values are outlined below, divided by the vegetation community they occur in (refer also to Figure 2).

Table 1 Vegetation community within the study area

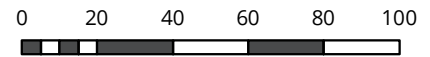
Exotic Pasture	
Extent within study area	Approximately 9.36 hectares of exotic pasture was recorded within the study area, covering the entire extent. Exotic species dominate this community with a cover value of 96%. A very low number of native species (approximately 4% cover) are sparsely interspersed throughout this community, usually in widely spaced clumps containing one or two individuals.
Description including fauna habitat	This community is found in agricultural lands which have undergone past vegetation clearance and have a long history of grazing by livestock. Soils are often highly disturbed and usually consist of silty loams or clays. The exotic pasture community is represented by three structural layers, a canopy of widely spaced exotic trees, a mid-storey of woody weeds in widely dispersed clumps and an understorey of exotic grasses and herbaceous annuals. The canopy layer includes approximately 6 trees in total consisting of Pepper Tree <i>Schinus molle</i> , European ash <i>Fraxinus excelsior</i> and Fig <i>Ficus carica</i> . Mid-storey species include; African Boxthorn <i>Lycium ferocissimum</i> and Sweet Briar <i>Rosa rubiginosa</i> . Exotic species present in the understorey include Wild Oats <i>Avena fatua</i> , Soft Brome <i>Bromus molliformis</i> , Rat's Tail Fescue <i>Vulpia myuros</i> , Saffron Thistle <i>Carthamus lanatus</i> , Catsear <i>Hypochaeris radicata</i> and Patterson's Curse <i>Echium plantagineum</i> . Few natives are present within the understorey, with the most represented species consisting of Tarvine <i>Boerhavia dominii</i> . The following native species have less than 1% cover throughout the subject site; Red Grass <i>Bothriochloa macra</i> , Weeping Grass <i>Microlaena stipoides</i> , Curly Windmill Grass <i>Enteropogon acicularis</i> , and Corrugated Sida <i>Sida corrugata</i>
Condition	The community is generally in poor condition with heavy recruitment of exotic species due to surrounding agricultural and pastoral land use and associated edge impacts. Native species are expected to continue to decline within the subject site due to heavy grazing.
Associated soils, rainfall and landscape position	Exotic pasture recorded within the study area occurs predominantly on the slopes, crests and flats of mildly undulating landscape in association with loose granite outcrops on soils of the Cowra soil landscape. The study area receives approximately 623 millimetres of rainfall per annum (BoM 2016a).
Threatened ecological community	Commonwealth EPBC Act: Not listed NSW TSC Act: Not listed
Threatened species habitat	The exotic pasture community is considered to provide marginal habitat for threatened flora including Silky Swainson-pea <i>Swainsona sericea</i> and Tarengo Leek Orchid <i>Prasophyllum petilum</i> / <i>Prasophyllum</i> sp. Wybong (C.Phelps ORG 5269) and RoTAP, <i>Genoplesium systemum</i> however targeted searches did not identify these species. Habitat within the exotic pasture community for threatened fauna is extremely limited,

Exotic Pasture	
	<p>consisting of marginal quality habitat for threatened raptors and migratory species listed in Appendix 2, Table A.5 and Table A.7. Marginal quality foraging habitat suitable for raptor species including Little Eagle <i>Hieraetus morphnoides</i>, Square-tailed Kite <i>Lophoictinia isura</i> and Barking Owl <i>Ninox connivens</i>. Additional threatened species such as Brown Treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i>, Swift Parrot <i>Lathamus discolor</i>, Superb Parrot <i>Polytelis swainsonii</i>, Diamond Firetail <i>Stagonopleura guttata</i> have been recorded between 200 metres and 700 metres from the study area, however habitat for these species has not been recorded within the study area.</p> <p>Migratory species may potentially visit the site to rest whilst travelling between breeding and overwintering grounds. Migratory species are transitory and habitat is marginal quality at best, therefore it is expected that these species would not linger for long within the subject site.</p>
<p>Picture: Exotic pasture in the study area</p>	



- Legend**
- Study area
 - Rock outcrop
 - Rock outcrop
 - Drainage line
 - Quadrats
 - Noxious weeds
 - African boxthorn
 - Giant reed
 - Silverleaf nightshade
 - St. John's wort
 - Sweet briar
 - Vegetation communities
 - Exotic pasture

Figure 2: Ecological values of the study area



Scale: 1:2,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Matter: 23875
Date: 23 December 2016,
Checked by: NRT, Drawn by: JMS, Last edited by: jshepherd
Location: P:\23800s\23875\Mapping\23875_F2_EcoFeatures

4.4 Threatened biota

Threatened biota includes all flora and fauna species, populations and ecological communities listed under the EPBC Act and TSC Act. Lists of threatened biota recorded or predicted to occur within ten kilometres of the study area are provided in Appendix 1 (flora) and Appendix 2 (fauna). Previous records of threatened biota within the locality are shown in Figure 3 (flora) and Figure 4 (fauna). An assessment of the likelihood of these species occurring in the study area, and an indication of where within the subject site (i.e. which habitats or features of relevance to the species), is included.

No areas of critical habitat for flora or fauna have been declared within the study area.

Known habitats for migratory species have been considered and are addressed in Appendix 2. No migratory species or suitable habitat was recorded within the study area, however, migratory species may use the study area on a transitory basis when travelling between breeding or overwintering habitat.

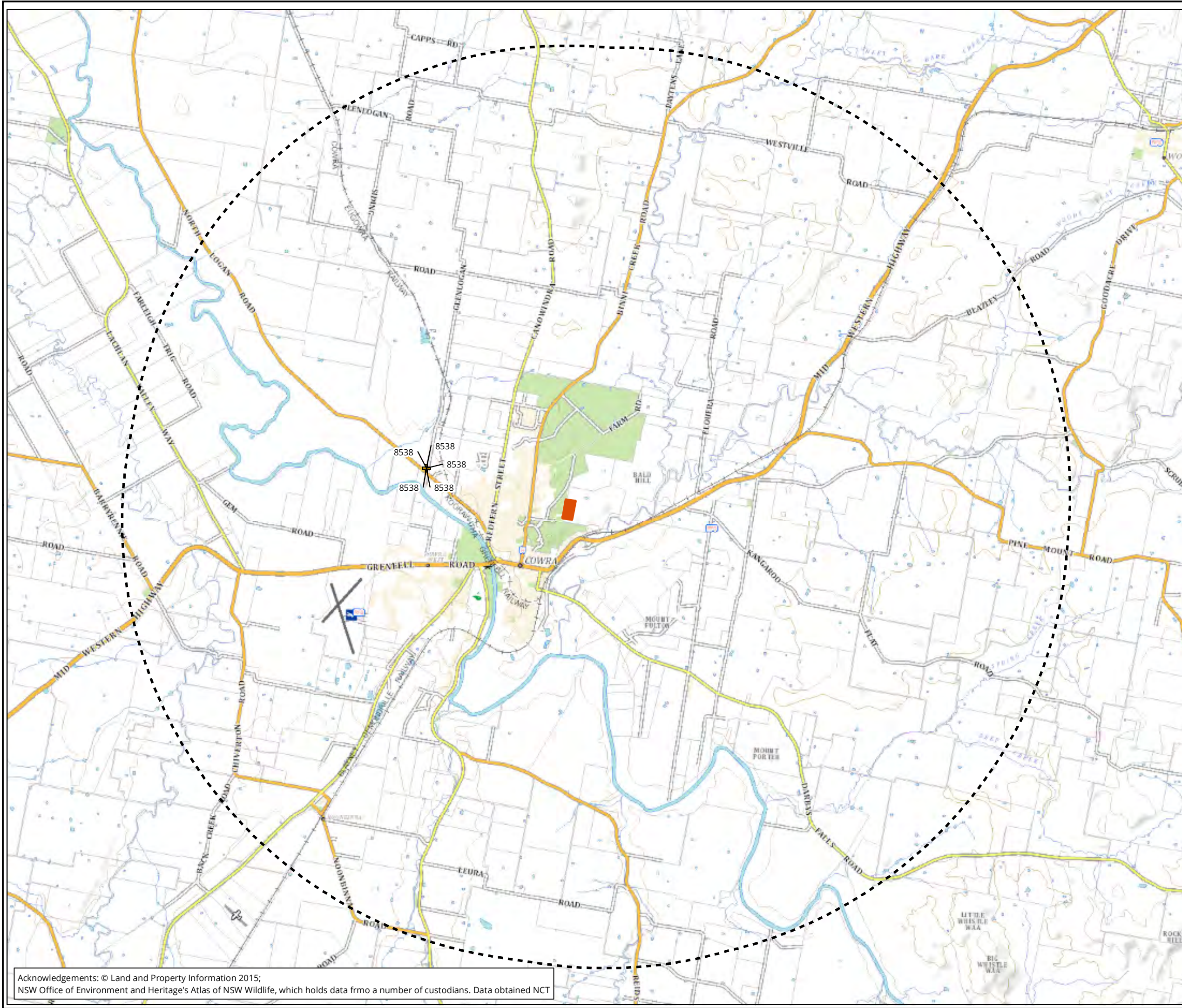
No flora or fauna species listed under the EPBC Act or TSC Act or habitat with a condition class higher than marginal was recorded within the study area during the field investigation. Based on these facts, it is concluded that there is no threatened biota which has a medium or higher likelihood of occurring in the study area.

4.5 Noxious Weeds

Five NSW DPI listed Class 4 noxious weeds for the Cowra Shire Council LGA recorded within the study area are listed in Table 2, including their legal class and management requirements. Recommendations for their management are listed below and in Section 6.

Table 2 Noxious weeds within the study area

Scientific name	Common name	Class	Legal requirements
<i>Arundo donax</i>	Giant Reed	N4	<i>The plant must not be sold, propagated or knowingly distributed</i>
<i>Hypericum perforatum</i>	St John's Wort	N4	<i>The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed</i>
<i>Lycium ferocissimum</i>	African Boxthorn	N4	<i>The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed</i>
<i>Solanum elaeagnifolium</i>	Silverleaf nightshade	N4	<i>The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed</i>
<i>Rosa rubiginosa</i>	Sweet Briar	N4	<i>The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread</i>



Legend

- Study area
- Search area
- Threatened Flora
- 8538 - *Swainsona sericea*

* Record is listed as sensitive under OEH's Sensitive Species Data Policy and cannot be shown at this scale

Figure 3: Threatened Flora within 10km of the Ecology study area

0 800 1,600 2,400 3,200 4,000

Metres

Scale: 1:80,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

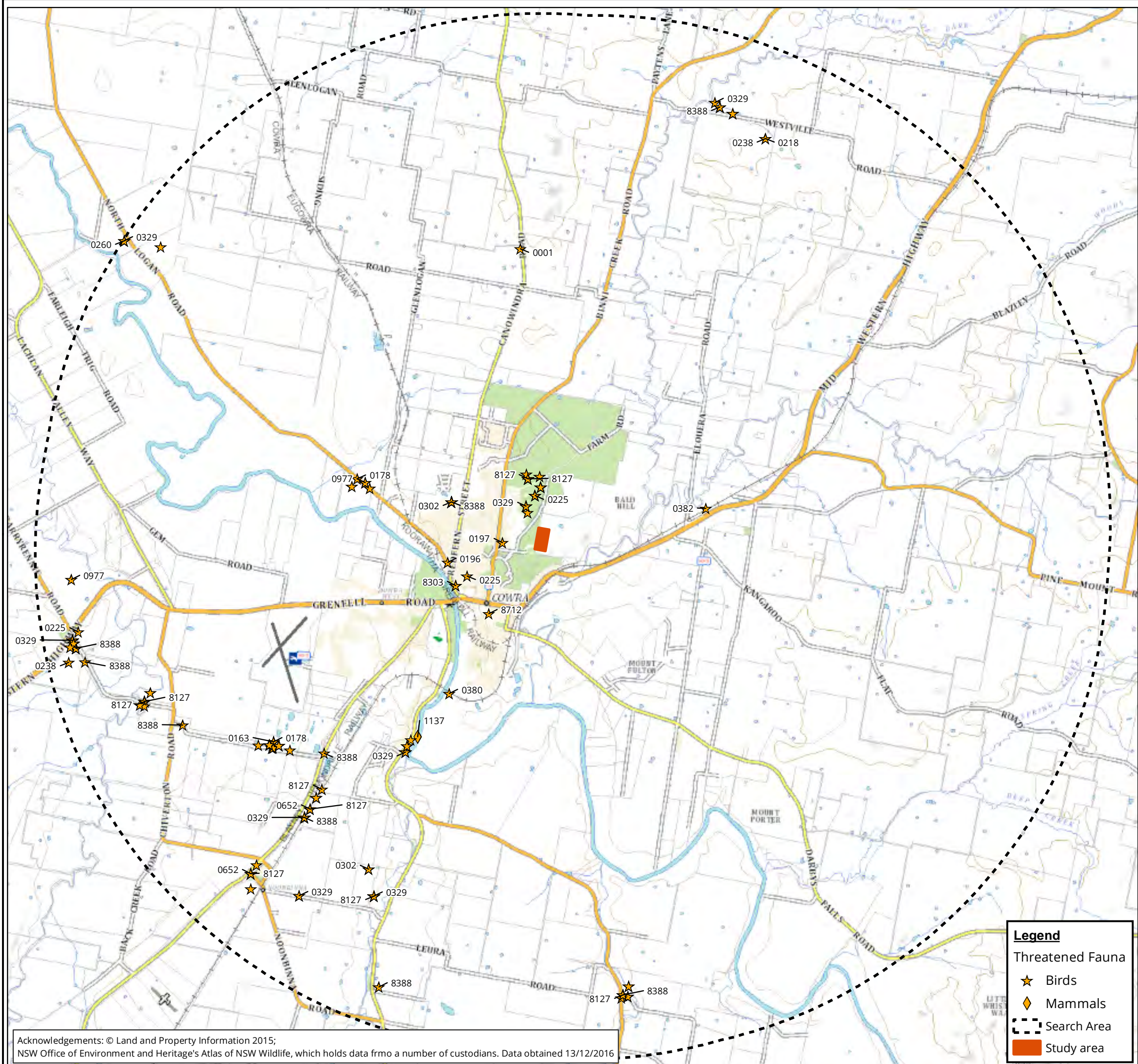
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Acknowledgements: © Land and Property Information 2015; NSW Office of Environment and Heritage's Atlas of NSW Wildlife, which holds data from a number of custodians. Data obtained NCT

Matter: Ecology
Date: 19 December 2016,
Checked by: NCT, Drawn by: JMS, Last edited by: jshepherd
Location: P:\23800s\23875\Mapping\23875_F3_ThrFlora



Species list

Birds

- 0196 - Black Bittern
- 0197 - Australasian Bittern
- 0214 - Freckled Duck
- 0218 - Spotted Harrier
- 0225 - Little Eagle
- 0230 - Square-tailed Kite*
- 0238 - Black Falcon
- 0246 - Barking Owl*
- 0260 - Little Lorikeet
- 0265 - Glossy Black-Cockatoo
- 0277 - Superb Parrot*
- 0302 - Turquoise Parrot
- 0309 - Swift Parrot*
- 0380 - Scarlet Robin
- 0382 - Flame Robin
- 0403 - Gilbert's Whistler
- 0448 - White-fronted Chat
- 0504 - Speckled Warbler
- 0549 - Varied Sittella
- 0652 - Diamond Firetail
- 8127 - Brown Treecreeper (eastern subspecies)
- 8303 - Black-chinned Honeyeater (eastern subspecies)
- 8388 - Grey-crowned Babbler (eastern subspecies)

Mammals

- 1137 - Squirrel Glider

* Record is listed as sensitive under OEH's Sensitive Species Data Policy and cannot be shown at this scale

Figure 4: Threatened Fauna within 10km of the Ecology study area

0 750 1,500 2,250 3,000 3,750
Metres

Scale: 1:75,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55



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Legend

- Threatened Fauna
- ★ Birds
- ◆ Mammals
- Search Area
- Study area

Acknowledgements: © Land and Property Information 2015; NSW Office of Environment and Heritage's Atlas of NSW Wildlife, which holds data from a number of custodians. Data obtained 13/12/2016

Matter: 15743
Date: 19 December 2016,
Checked by: 13/12/2016, Drawn by: SMV, Last edited by: jshepherd
Location: P:\23800s\23875\Mapping\23875_F4_ThrFauna

5 Assessment against key biodiversity legislation

5.1 Commonwealth

5.1.1 Environmental Protection and Biodiversity Conservation Act 1999

No threatened biota listed under the EPBC Act or threatened species habitat with a higher condition class than marginal was recorded within the study area during the recent field investigation. In addition, no previous records of threatened biota exist within the study area. The presence of cattle and other livestock have resulted in extensive disturbance which is likely to deter threatened biota from entering or utilising the study area. Based on these facts, it has been concluded that no threatened biota or threatened species habitat listed under the EPBC has a moderate or higher likelihood of occurrence and therefore no further assessment of the Proposal under the EPBC Act is required.

5.2 State

5.2.1 Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995

The recent field investigation did not record the presence of any TSC Act listed threatened biota or threatened species habitat with a higher condition class than marginal quality nor are there any previous records of threatened biota within the study area. Furthermore, the study area has a long history of grazing, being currently stocked with approximately 30 head of cattle, which has resulted in extensive disturbance. Therefore it is concluded that no further assessment under the TSC Act will be required based on the above facts.

5.2.2 Native Vegetation Act 1993

Under Part 2, Division 2 of the NV Act, any clearing (19) of non-protected regrowth is permitted without the requirement for development consent or a Property Vegetation Plan (PVP), approved by the Local Land Services.

In addition, Part 2 Division 2 clause 20 states that clearing of native groundcover species is permitted in accordance with the following criteria:

- (a) *The vegetation comprises less than 50% of indigenous species of vegetation*
- (b) *Not less than 10% of the area is covered with vegetation (whether dead or alive), and*
- (c) *Those percentages are calculated in accordance with the regulations*

Under Part 3, Division 3, Clause 22, clearing for routine agricultural management activities is permitted without the requirement for development consent or a PVP if activities are carried out in accordance with the following criteria:

- (1) *Clearing for routine agricultural management activities is permitted.*
- (2) *This section does not authorise any clearing of native vegetation:*
 - (a) *If it exceeds the minimum extent necessary for carrying out the activity, or*
 - (b) *If it is done for a work, building or structure before the grant of any statutory approval or other authority required for the work, building or structure.*

In addition, Part 3, Division 3, Clause 23 states that:

- (1) The continuation of existing cultivation, grazing or rotational farming practices is permitted if it does not involve the clearing of:
 - (a) Remnant native vegetation, and
 - (b) In the case of the Western Division – native vegetation comprising trees not less than 3 metres high of any of the following species: *Eucalyptus camaludensis* (River Red Gum), *Casuarina cristata* (Belah), *Casuarina pauper* (Belah) or *Callitris glaucophylla* (White Cypress Pine).

Therefore under the NV Act, clearing of native vegetation in areas of exotic pasture (Figure 2) within the study area is permitted without development consent or a PVP when conducted in accordance with routine agricultural maintenance activities or as a continuation of existing farming practices. However, clearing of exotic pasture for the purposes of development or construction will require approval under a DA.

5.2.3 Noxious Weeds Act 1993

Five Class 4 noxious weeds for the Cowra Shire Council, Giant Reed, African Boxthorn, Silverleaf Nightshade, St Johns Wort, and Sweet Briar were recorded within the study area during the field investigation. The Proponent must undertake the management actions outlined in Section 6 during construction of the project.

5.2.4 Water Management Act 2000

The study area contains no mapped waterways, however it does contain one artificial drainage line and one natural drainage line (Figure 2), which traverse the site in a north-south direction within the southern extent of the study area. The artificial drainage line was observed to be dry during the field assessment and did not harbour any flora species indicative of periods of prolonged inundation. The natural drainage line is exceptionally shallow and does not exhibit formed banks. Furthermore, the natural drainage line was observed to be dry during the field assessment and does not contain species indicative of periodic inundation for prolonged periods. Based on the results of the field assessment, the artificial drainage line and natural drainage line do not require further consideration under the WM Act 2000.

5.2.5 Fisheries Management Act 1994

Background research identified two threatened species, Purple Spotted Gudgeon *Mogurnda adspersa* and Silver Perch *Bidyanus bidyanus* listed under the FM Act within the Cowra Shire Council LGA which have been previously recorded within the nearby Lachlan River and its tributaries. Both the artificial and natural drainage lines are quite shallow and were observed to be dry at the time of survey and are not suitable for either of these threatened fish species, nor do either of the drainage lines provide a permanent corridor with the nearby Waugoola Creek resulting in the conclusion that no habitat for these threatened species is present within the study area. As a result, a licence to harm/pick/damage habitat of a threatened biota or damage critical habitat is not required although Biosis recommends that management measure outlined in Section 6 be implemented to prevent erosion and sedimentation of the artificial and natural drainage lines and ensure that actions associated with the Proposal do not result in indirect impacts to the nearby Waugoola Creek.

5.2.6 Local Environment Plans (Part 3, Division 4)

Assessment of the Proposal against the Cowra LEP 2012 has determined that the activities and impacts associated with the Proposal are consistent with the objectives of land use zones R1 General Residential and RE1 – Public Recreation.

6 Ecological impacts and recommendations

This section identifies the potential impacts of proposed development on the ecological values of the study area and includes recommendations to assist Fraish Consulting to design a development to avoid and/or minimise impacts on biodiversity (Table 3).

The principal means to reduce impacts on biodiversity values within the study area will be to minimise removal of native vegetation and habitat. Fraish Consulting acting on behalf of the landholder, intend to subdivide the study area into 100 independent living senior's houses as part of the Yarrabilly Retirement Village, the final design of which is detailed in the Yarrabilly Estate Concept Master Plan November 2016. Activities associated with the Proposal include potential vegetation clearance and modification associated with construction of residential dwellings and outbuildings, installation of infrastructure and services and disturbance associated with residential activities.

Potential impacts from activities associated with the Proposal comprise of the following:

- Removal or modification of 9.36 hectares of exotic pasture.
- The potential removal of 0.24 hectares of granite and pink rhyolite outcropping.

Native vegetation and rock outcropping within the study area is projected to be removed or modified in accordance with activities associated with the Proposal, triggering the Key Threatening Processes (KTP) under the NSW TSC Act, *Clearing of native vegetation* and *Bushrock removal*. There may be the potential to substantially decrease native vegetation clearance if feasible, however, the entire study area is of low ecological value or 'constraint' (Figure 5) with the only area comprising additional ecological value being the south-east corner of the study area which contains the rock outcropping and natural drainage line.

Table 3 Ecological values, impacts and recommendations

Category	Ecological feature	Avoidance measures	Management and mitigation measures
Low	Exotic vegetation / minimal native cover/poor habitat	<p>There is no requirement for avoiding vegetation clearance or landscape modification within the low constraint category.</p> <p>Vegetation designated as low constraint will require no further assessment under the EPBC Act or TSC Act.</p>	<ul style="list-style-type: none"> • Ensure installation of suitable sediment control measures around works areas and the artificial and natural drainage line to reduce mobilisation of sediments downslope. • Ensure machinery access is limited to the direct impact zone of the study area only. • Minimise entry and exit points with machinery and vehicles over the duration of the Proposal. • Ensure machinery and plant is clean and free of weed propagules to minimise transport into and out of the study area. • Ensure all noxious weeds within the direct impact zone of the study area are treated according to instructions within the NSW DPI recommendations in addition to the Noxious and environmental weed control handbook (DPI 2014) or removed from site and disposed of at the nearest registered green waste facility. • Ensure that all vehicles, earthmoving machinery and plant have been thoroughly cleaned and sanitised before entering the study area to prevent introduction of soil pathogens.

6.1 Ecological constraints analysis

This section defines the ecological constraints for consideration in future planning or design of the Proposal. Table 4 below determines ranked constraint classes from High to Low. High constraint areas have the highest conservation significance and are characterised by the presence of EPBC Act and TSC Act threatened biota or a high likelihood for their occurrence based on high quality of potential habitats and records of threatened species from the locality. Low constraints areas are non-native vegetation supporting no habitat for listed threatened species.

Ecological constraints are outlined in Figure 5 for a visual representation of how these highly constrained areas may affect the future design of the Proposal.

6.2 Conservation class matrix

Ecological constraints relating to the proposed subdivision of the study area into 100 independent living seniors houses as part of the Yarrabilly Retirement Village have been based on the following matrix (Table 4) and have been differentiated based on a number of factors likely to influence future planning or design of the Proposal. The ecological values of the study area constituting the low constraint class category only as displayed in Figure 5.

Table 4 Conservation class matrix

Ecological values	Constraint class		
	High	Medium	Low
EPBC Act and TSC Act listed Critically Endangered Ecological Community/Endangered Ecological Communities, threatened species, riparian vegetation communities within 20m of existing ephemeral or permanent waterways	X		
Non-threatened native vegetation community, potential threatened species habitat or landscape connectivity		X	
Non-native vegetation, no threatened species habitat or landscape connectivity			X



Legend



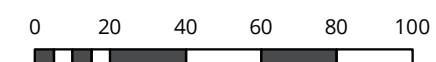
-  Study area
- Ecological constraints
-  Low constraint

Figure 5: Ecological constraints within the study area



Metres
Scale: 1:2,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55



Ballarat, Brisbane, Canberra, Melbourne,
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Matter: 23875
Date: 19 December 2016,
Checked by: NCT, Drawn by: JMS, Last edited by: jshepherd
Location: P:\23800s\23875\Mapping\23875_F5_Constraints

7 Conclusion

This report is an assessment of the potential impact of the Proposal on ecological values within the study area in accordance with the EP&A Act, the TSC Act and the EPBC Act.

No flora species, fauna species or endangered populations listed under the EPBC Act or TSC Act were recorded during the field investigation. In addition, no potential threatened species habitat and no native vegetation communities were mapped within the study area. Therefore, no further assessment under the EPBC Act, TSC Act or Part 5 of the EP & A Act is required.

The artificial and natural drainage lines within the southern extent of the study area not considered a riparian corridor (drainage lines are not mapped, are dry and do not contain native flora or fauna indicative of periodic or permanent inundation), therefore, the Proposal will not require a Controlled Activity Approval from the NSW Department of Primary Industries Water or a Section 91 to harm/pick/damage habitat of a threatened biota license under the TSC Act.

Exotic pasture has been recorded throughout the entire extent of the study area comprising of 96% exotic species and 4% native species cover. Removal of exotic vegetation under the NV Act is permissible without a PVP or DA when undertaken for the purpose of routine agricultural maintenance activities or as a continuation of existing farming practices. However, removal of the exotic pasture vegetation community for the purpose of development or construction will require development consent.

In the event of such consent, Biosis have devised a number of safeguards to avoid, minimise and mitigate the potential for any ecological impacts which is included in Section 6 of this report including Proposal design recommendations, exclusion fencing and recommendations regarding appropriate hygiene protocols for vegetation clearing and plant.

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Appendices

Appendix 1 Flora

A1.1 Flora species recorded from the study area

Notes to tables:

EPBC Act: CR – Critically Endangered EN – Endangered VU – Vulnerable Miscellaneous OSA – Outside study area	TSC Act: E1 – endangered species (Part 1, Schedule 1) E2 – endangered population (Part 2, Schedule 1) E4 – presumed extinct (Part 4, Schedule 1) E4A – critically endangered V1 – vulnerable (Part 1, Schedule 2) <i>Codes identify the Legal Status of threatened biota within NSW under the TSC Act and the OEH Sensitive Species Data Policy (SSDP).</i>
Non-indigenous species # – Native species outside natural range ** – noxious weed species declared under the Noxious Weeds Act	Noxious weed status: State prohibited species (Class 1) Regionally prohibited species (Class 2) Regionally controlled species (Class 3) Regionally restricted species (Class 4) Restricted plant (Class 5)

Table A.1 Flora species recorded from the study area

Status	Scientific name	Common name
Native species		
	<i>Boerhavia dominii</i>	Tarvine
	<i>Bothriochloa macra</i>	Red Grass
	<i>Chloris</i> sp	
	<i>Cynodon dactylon</i>	Common Couch
	<i>Echium</i> sp	Italian Bugloss
	<i>Eucalyptus polyanthemus</i>	Red Box
	<i>Hypericum gramineum</i>	Small St John's Wort
	<i>Microlaena stipoides</i>	Weeping Grass
	<i>Paspalidium</i> sp	
	<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed
	<i>Rumex brownii</i>	Swamp Dock
	<i>Sida</i> sp	Spinyhead Sida
Exotic species		
	<i>Acer negundo</i>	Box Elder

Status	Scientific name	Common name
	<i>Ailanthus altissima</i>	Tree of Heaven
	<i>Arctotheca calendula</i>	Capeweed
**4	<i>Arundo donax</i>	Giant Reed
	<i>Avena fatua</i>	Wild Oats
	<i>Bromus molliformis</i>	Soft Brome
	<i>Carthamus lanatus</i>	Saffron Thistle
	<i>Cirsium vulgare</i>	Spear Thistle
	<i>Conyza</i> sp	
OSA	<i>Eucalyptus polyanthemus</i>	Red Box
	<i>Fraxinus</i> sp	Claret Ash
	<i>Gamochaeta</i> sp	Cudweed
	<i>Hordeum leporinum</i>	Barley Grass
	<i>Hypochaeris radicata</i>	Catsear
	<i>Lactuca serriola</i>	Prickly Lettuce
	<i>Lepidium</i> sp	Common Peppergrass
	<i>Lolium perenne</i>	Perennial Ryegrass
**4	<i>Lycium ferocissimum</i>	African Boxthorn
	<i>Marrubium vulgare</i>	White Horehound
	<i>Modiola caroliniana</i>	Red-flowered Mallow
	<i>Orobancha minor</i>	Boomer species
	<i>Oxalis</i> sp	
	<i>Pennisetum clandestinum</i>	Kikuyu Grass
	<i>Plantago lanceolata</i>	Lamb's Tongues
	<i>Polycarpon tetraphyllum</i>	Four-leaved Allseed
	<i>Polygonum aviculare</i>	Wireweed
**4	<i>Rosa rubiginosa</i>	Sweet Briar
	<i>Schinus molle</i>	
	<i>Sonchus oleraceus</i>	Common Sowthistle
	<i>Solanum elaeagnifolium</i>	Silverleaf nightshade
	<i>Trifolium arvense</i>	Haresfoot Clover
	<i>Trifolium subterraneum</i>	Subterranean Clover
	<i>Verbascum thapsus</i>	Blanket Weed

A1.2 Threatened flora species and ecological communities

The following table includes a list of the threatened flora species and ecological communities that have potential to occur within the study area. The list of species is sourced from the NSW BioNet Wildlife Atlas and the Protected Matters Search Tool (DEE; accessed on 13/12/2016).

Examples of criteria for determining the likelihood of occurrence for threatened biota as a guide for writing the rationale for likelihood have been listed below.

Notes to table:

Likelihood of occurrence	Potential criteria
High	<ul style="list-style-type: none"> Species/ecological communities recorded in study area during current or previous assessments. Sufficient good quality habitat is present in study area in close proximity to the study area. Study area is within species natural distributional range. Species has been recorded within 10 kilometres of the study area.
Medium	<ul style="list-style-type: none"> Records of terrestrial biota within 10 kilometres of the study area . Habitat limited in its capacity to support the species due to extent, quality, or isolation.
Low	<ul style="list-style-type: none"> No records within 10 kilometres of the study area. Marginal habitat present (low quality & extent). Substantial loss of habitat since any previous records.
Negligible	<ul style="list-style-type: none"> Habitat not present in study area Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded.

Table A.2 Threatened flora species recorded / predicted to occur within ten kilometres of the study area

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC					
<i>Swainsona sericea</i>	Silky Swainson-pea		V	1913		Negligible	Absence of previous or recent records and lack of habitat within the study area.	Small prostrate or erect perennial herb with a distribution spanning from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains with an additional outlying population in the far north-west of NSW. Found growing in a variety of communities including Natural Temperate Grasslands, Snow Gum Eucalyptus pauciflora Woodlands on the Monaro, Box-Gum Woodland, New England Dry Sclerophyll Forests, North-west Slopes Dry Sclerophyll Woodlands, North-west Plain Shrublands, Western Slopes Grasslands, Floodplain Transition Woodlands and Subalpine Woodlands.
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	EN	E1	#		Negligible	Absence of previous or recent records and lack of habitat within the study area.	Terrestrial orchid restricted to five sites within NSW at Boorowa, Captains Flat, Ilford, a Travelling Stock Route at Delegate and 10 kilometres south-east of Muswellbrook. Found growing in open sites and patchy forest in Natural Temperate Grassland, Box-Gum Woodlands, Temperate Montane Grasslands, Southern Tableland Grassy Woodlands, Subalpine Woodlands, Tableland Clay Grassy Woodlands, Western Slopes Grassy Woodlands. This species is cryptic and most visible when flowering between October and December. Grows in fertile soils.
<i>Prasophyllum</i> sp. <i>Wybong</i> (C.Phelps ORG 5269)	A leek orchid	CE		#		Negligible	Absence of previous or recent records and lack of habitat within	The Tarengo Leek Orchid has been found at the Hall Cemetery in the ACT and at four site in New South Wales: Captains Flat Cemetery, Ilford Cemetery, Steves Travelling Stock Route at Delegate and the Tarengo Travelling Stock Route near Boorowa. This species has only been found in

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC					
							the study area.	areas of good condition grassy woodlands and remnants.

* - habitat descriptions have been adapted by qualified ecologists from the DEE Species Profile and Threats (SPRAT) Database, OEH Threatened Species online profiles and the NSW Scientific Committee final determinations for listed species, references within the above table are provided within the report reference list.

Table A.3 Threatened ecological communities recorded / predicted to occur within ten kilometres of the study area

Scientific name	Common name	Conservation status		Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Fuzzy Box Woodland	-	E3		Negligible	Lack of habitat present within the study area resulting from historical vegetation clearance combined with a history of intensive grazing combined with lack of previous and recent records.	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions occurs on alluvial or colluvial soils on plains or abandoned channels in the western slopes. The community is often found on sections of floodplain that are not frequently flooded. The community occurs as tall woodland or open forest. Key species include Fuzzy Box <i>Eucalyptus conica</i> , Grey Box <i>Eucalyptus microcarpa</i> , Yellow Box <i>Eucalyptus melliodora</i> , Kurrajong <i>Brachychiton populneus</i> and Buloke <i>Allocasuarina luehmannii</i> . The shrub layer is generally sparse, with the groundcover moderately dense.
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Grey Box Grassy Woodlands	EN	-		Negligible	Lack of habitat present within the study area resulting from historical vegetation clearance combined with a history of intensive	Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia predominantly occurs on the drier edge of the temperate grassy eucalypt woodland belt and ranges from central NSW through northern and central Victoria into South Australia. Patches that are disjunct from the main community belt occur to the south of the Great Dividing Range in Victoria, around Melton and Sunbury to the west of Melbourne, and also to the west of the Murray River coastal plain in South Australia, around the Flinders and Mount Lofty Ranges near

Scientific name	Common name	Conservation status		Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
						grazing combined with lack of previous and recent records.	Adelaide. The community generally occurs in landscapes of low-relief such as flat to undulating plains, low slopes and rises and drainage depressions and flats, and is associated with productive soils derived from alluvial or colluvial materials.
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions Bottom of Form	Inland Grey Box Woodland	EN	E3		Negligible	Lack of habitat present within the study area resulting from historical vegetation clearance combined with a history of intensive grazing combined with lack of previous and recent records.	This community is found predominantly in the Riverina and South West Slopes of NSW. It occurs on slopes and plain in fertile soils of Tertiary and Quaternary alluvial origin. The shrub and groundcover layers of the remnant communities are typically degraded due to agricultural pressures. Key species include Inland Grey Box <i>Eucalyptus microcarpa</i> , <i>E. populnea</i> subsp. <i>bimbil</i> , White Cypress Pine <i>Callitris glaucophylla</i> , Kurrajong <i>Brachychiton populneus</i> , Bullock <i>Allocasuarina luehmannii</i> and Yellow Box <i>E. melliodora</i> .
White Box Yellow Box Blakely's Red Gum Woodland Bottom of Form	Box-Gum Woodland	CE	E3		Negligible	Lack of habitat present within the study area resulting from historical vegetation	White Box Yellow Box Blakely's Red Gum Woodland is an open woodland community, dominated by White Box <i>Eucalyptus albens</i> , Yellow Box <i>E. melliodora</i> and Blakely's Red Gum <i>E. blakelyi</i> . Commonly co-occurring eucalypts include Apple Box <i>E. bridgesiana</i> , Red Box <i>E. polyanthemus</i> , Candlebark <i>E. rubida</i> , Snow Gum <i>E. pauciflora</i> , Argyle Apple

Scientific name	Common name	Conservation status		Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
						clearance combined with a history of intensive grazing combined with lack of previous and recent records.	<i>E. cinerea</i> , Brittle Gum <i>E. mannifera</i> , Red Stringybark <i>E. macrorhyncha</i> , Grey Box <i>E. microcarpa</i> , and Cabbage Gum <i>E. amplifolia</i> . The understorey in intact sites is characterised by native grasses and a high diversity of herbs; including Kangaroo Grass <i>Themeda australis</i> , Poa Tussock <i>Poa sieberiana</i> , wallaby grasses <i>Austrodanthonia</i> spp., spear-grasses <i>Austrostipa</i> spp., Common Everlasting <i>Chrysocephalum apiculatum</i> , Scrambled Eggs <i>Goodenia pinnatifida</i> , Small St John's Wort <i>Hypericum gramineum</i> , Narrow-leaved New Holland Daisy <i>Vittadinia muelleri</i> and blue-bells <i>Wahlenbergia</i> spp.. Remnants generally occur on fertile lower parts of the landscape where water and nutrients are abundant.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	White Box-Yellow Box-Blakely's Red Gum Woodland	CE	-		Negligible	Lack of habitat present within the study area resulting from historical vegetation clearance combined with a history of intensive grazing combined with lack of previous and	White Box Yellow Box Blakely's Red Gum Woodland is an open woodland community, dominated by White Box <i>Eucalyptus albens</i> , Yellow Box <i>E. melliodora</i> and Blakely's Red Gum <i>E. blakelyi</i> . Commonly co-occurring eucalypts include Apple Box <i>E. bridgesiana</i> , Red Box <i>E. polyanthemos</i> , Candlebark <i>E. rubida</i> , Snow Gum <i>E. pauciflora</i> , Argyle Apple <i>E. cinerea</i> , Brittle Gum <i>E. mannifera</i> , Red Stringybark <i>E. macrorhyncha</i> , Grey Box <i>E. microcarpa</i> , and Cabbage Gum <i>E. amplifolia</i> . The understorey in intact sites is characterised by native grasses and a high diversity of herbs; including Kangaroo Grass <i>Themeda australis</i> , Poa Tussock <i>Poa sieberiana</i> , wallaby grasses <i>Austrodanthonia</i> spp., spear-grasses <i>Austrostipa</i> spp., Common Everlasting <i>Chrysocephalum apiculatum</i> , Scrambled Eggs <i>Goodenia</i>

Scientific name	Common name	Conservation status		Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
						recent records.	<i>pinnatifida</i> , Small St John's Wort <i>Hypericum gramineum</i> , Narrow-leaved New Holland Daisy <i>Vittadinia muelleri</i> and blue-bells <i>Wahlenbergia</i> spp.. Remnants generally occur on fertile lower parts of the landscape where water and nutrients are abundant.

* - habitat descriptions have been adapted by qualified ecologists from the DEE Species Profile and Threats (SPRAT) Database, OEH Threatened Species online profiles and the NSW Scientific Committee final determinations for listed species, references within the above table are provided within the report reference list.

Appendix 2 Fauna

Fauna species in these tables are listed in alphabetical order within their taxonomic group.

A2.1 Fauna species recorded from the study area

Below is a list of fauna species recorded from the study area during the present assessment and a list of threatened fauna species recorded or predicted to occur within ten kilometres of the study area.

Notes to table:

EPBC Act:

EX - Extinct

CR - Critically Endangered

EN - Endangered

VU - Vulnerable

CD - Conservation dependent

TSC Act:

C1 – critically endangered

E1 – endangered species (Part 1, Schedule 1)

E2 – endangered population (Part 2, Schedule 1)

E4 – presumed extinct (Part 4, Schedule 1)

V1 – vulnerable (Part 1, Schedule 2)

FM Act:

C1 – critically endangered

E1 – endangered

E2 – endangered

E4 – presumed extinct

V1 – vulnerable

* - introduced species

Table A.4 Vertebrate fauna recorded from the study area (current assessment)

Status	Scientific name	Common name
Birds		
O	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill
O	<i>Anthochaera carunculata</i>	Red Wattlebird
O	<i>Corvus coronoides</i>	Australian Raven
O	<i>Cracticus tibicen</i>	Australian Magpie
O	<i>Eolophus roseicapillus</i>	Galah
O	<i>Grallina cyanoleuca</i>	Magpie-lark
O	<i>Malurus cyaneus</i>	Superb Fairy-wren
O	<i>Rhipidura leucophrys</i>	Willie Wagtail
O	<i>Sturnus vulgaris</i>	Common Starling
Mammals		
O	<i>Bos taurus</i>	European cattle
O	<i>Macropus giganteus</i>	Eastern Grey Kangaroo

Status	Scientific name	Common name
O	<i>Oryctolagus cuniculus</i>	European Rabbit
O	<i>Ovis aries</i>	Sheep
O	<i>Vicugna pacos</i>	Alpaca
O ##	<i>Vulpes vulpes</i>	Fox

established pest species subject to a Pest Control Order issued under the Local Land Services Act 2013.

A2.2 Threatened fauna species

The following table includes a list of the significant fauna species that have potential to occur within the study area. The list of species is sourced from the NSW BioNet Wildlife Atlas, BirdLife Australia data search and the Protected Matters Search Tool (DEE; accessed on 13/12/2016).

Notes to table:

#	species predicted to occur by the DEE database (not recorded on other databases)
##	species predicted to occur based on natural distributional range and suitable habitat despite lack of records in the databases searched
Year	recorded on databases listed above
2016	recorded during current survey

Likelihood of occurrence	Potential criteria
High	<ul style="list-style-type: none"> Species/ecological communities recorded in study area during current or previous assessments. Sufficient good quality habitat is present in study area in close proximity to the study area. Study area is within species natural distributional range. Species has been recorded within 10 kilometres of the study area.
Medium	<ul style="list-style-type: none"> Records of terrestrial biota within 10 kilometres of the study area . Habitat limited in its capacity to support the species due to extent, quality, or isolation.
Low	<ul style="list-style-type: none"> No records within 10 kilometres of the study area. Marginal habitat present (low quality & extent). Substantial loss of habitat since any previous records.
Negligible	<ul style="list-style-type: none"> Habitat not present in study area. Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded.
Transient/ Nomadic	<ul style="list-style-type: none"> Migratory or nomadic fauna species/individuals that may occur in the study area from time to time, but are not considered resident.

Table A.5 Threatened fauna species recorded, or predicted to occur, within ten kilometres of the study area

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
Mammals							
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	VU	V	#	Negligible	Habitat not present in study area.	Restricted to the Murray-Darling basin and western slopes. Found in a range of habitats including tall Eucalypt forests, mallee, open savanna and Black Box woodland, preferring habitats with a distinct canopy and cluttered, dense understorey. Roost in tree hollows and fissures and under exfoliating bark.
<i>Petaurus norfolcensis</i>	Squirrel Glider		V	2007	Negligible	Habitat not present in study area.	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.
<i>Phascolarctos cinereus</i>	Koala	VU	V	#	Negligible	Habitat not present in study area.	Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. They are solitary animals with varying home ranges.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	VU	V	#	Negligible	Habitat not present in study area.	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.
Birds							

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E4A	#	Negligible	Habitat not present in study area.	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nest in tall mature eucalypts and sheoaks.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	E1	1997#	Negligible	Habitat not present in study area.	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including <i>Typha</i> spp. and <i>Eleocharis</i> spp.. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day.
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE	E1	#	Negligible	Habitat not present in study area.	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo		V	2009	Negligible	Marginal habitat present (low quality & extent).	Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.
<i>Chthonicola sagittata</i>	Speckled Warbler		V	2009	Low	Marginal habitat present (low quality & extent).	<i>Chthonicola sagittata</i> occurs on the hills and tablelands of the Great Dividing Range. Found in eucalypt and cypress woodlands with a grassy understorey, often on ridges or gullies. The species nests on the ground in grass tussocks, dense litter

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
							and fallen branches. They forage on the ground for arthropods and seeds.
<i>Circus assimilis</i>	Spotted Harrier		V	2012	Low	Marginal habitat present (low quality & extent).	The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast. Preferred habitat consists of open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation. The Spotted Harrier is more common in drier inland areas, nomadic part migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)		V	2010	Low	Marginal habitat present (low quality & extent).	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present.
<i>Daphoenositta chrysoptera</i>	Varied Sittella		V	2008	Low	Marginal habitat present (low quality & extent).	The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
<i>Epthianura albifrons</i>	White-fronted Chat		V	2008	Low	Marginal habitat present (low quality & extent).	The White-fronted Chat occupies foothills and lowlands below 1000 m above sea level. In NSW it occurs mostly in the southern half of the state, occurring in damp open habitats along the coast, and near waterways in the western part of the state.
<i>Falco subniger</i>	Black Falcon		V	2012	Low	Marginal habitat present (low quality & extent).	Mainly occurs in woodlands and open country where can hunt. Often associated with swamps, rivers and wetlands. Nest in tall trees along watercourses.
<i>Glossopsitta pusilla</i>	Little Lorikeet		V	2010	Negligible	Habitat not present in study area.	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands.
<i>Grantiella picta</i>	Painted Honeyeater	VU	V	#	Negligible	Habitat not present in study area.	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.
<i>Hieraaetus morphnoides</i>	Little Eagle		V	2012	Low	Marginal habitat present (low quality & extent).	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.
<i>Ixobrychus flavicollis</i>	Black Bittern		V	1950	Negligible	Habitat not present in study area.	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
							recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation.
<i>Lathamus discolor</i>	Swift Parrot	CE	E1	2003#	Negligible	Habitat not present in study area.	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW.
<i>Leipoa ocellata</i>	Malleefowl	VU	E1	#	Negligible	Habitat not present in study area.	The malleefowl occurs in tall, dense mallee preferring areas with a light sandy to sandy loam soil, a dense but discontinuous canopy cover, dense and variable herb layer and open ground for easy of movement.
<i>Lophoictinia isura</i>	Square-tailed Kite		V	2010	Low	Marginal habitat present (low quality & extent).	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests.
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)		V	1990	Low	Marginal habitat present (low quality & extent).	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts. It is rarely recorded east of the Great Dividing Range.
<i>Neophema pulchella</i>	Turquoise Parrot		V	2010	Low	Marginal habitat present (low quality & extent).	Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs. Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies. Nest in hollow-bearing trees, either dead or

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
							alive; also in hollows in tree stumps.
<i>Ninox connivens</i>	Barking Owl		V	2010	Negligible	Habitat not present in study area.	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.
<i>Numenius madagascariensis</i>	Eastern Curlew	CE		#	Negligible	Habitat not present in study area.	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.
<i>Pachycephala inornata</i>	Gilbert's Whistler		V	2010	Low	Marginal habitat present (low quality & extent).	The Gilbert's Whistler is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia. The preferred habitat for this species is mallee often in association with spinifex. It has also been recorded in Belah, Riverine Black Box and Lignum vegetation communities with a mixture of dense shrubs.
<i>Petroica boodang</i>	Scarlet Robin		V	2015	Low	Marginal habitat present (low quality & extent).	The Scarlet Robin inhabits dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. During autumn and winter it moves to more open and cleared areas. The Scarlet Robin forages amongst logs and woody debris for insects. The nest is an open cup of plant fibres and cobwebs, sited in the fork of a tree.
<i>Petroica phoenicea</i>	Flame Robin		V	2010	Low	Marginal habitat present (low quality & extent).	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The preferred habitat in summer

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
							includes moist eucalyptus forests and open woodlands, in winter prefers open woodlands and farmlands. It is considered migratory.
<i>Polytelis swainsonii</i>	Superb Parrot	VU	V	2015#	Negligible	Habitat not present in study area.	Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Forages primarily in grassy box woodland, feeding in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants.
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)		V	2016	Low	Marginal habitat present (low quality & extent).	The eastern sub-species occurs on the western slopes of the Great Dividing Range, the western plains, woodlands in the Hunter Valley and locations on the north coast of NSW. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine, open Box Woodlands on alluvial plains and woodlands on fertile soils in coastal regions.
<i>Rostratula australis</i>	Australian Painted Snipe	EN	E1	#	Negligible	Habitat not present in study area.	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, but have been recorded in brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.
<i>Stagonopleura guttata</i>	Diamond Firetail		V	2010	Low	Marginal habitat present (low quality & extent).	The Diamond Firetail is widely distributed, found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs. Often occur in vegetation along watercourses. Feeds exclusively on

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
							the ground on ripe grass and herb seeds, green leaves and insects.
<i>Stictonetta naevosa</i>	Freckled Duck		V	1989	Negligible	Habitat not present in study area.	The Freckled Duck breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes, especially during drought. Often seen in groups on fallen trees and sand spits.
Reptiles							
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	VU	V	#	Low	Marginal habitat present (low quality & extent).	Fossorial species, which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae. Thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter. Key habitat features are a cover of native grasses, particularly Kangaroo Grass (<i>Themeda australis</i>), sparse or no tree cover, little or no leaf litter, and scattered small rock with shallow embedment in the soil surface.
<i>Delma impar</i>	Striped Legless Lizard	VU	V	#	Low	Marginal habitat present (low quality & extent).	Generally occurs in lowland native grasslands occurring on gently undulating plains having soils of basaltic origin. Grasses are dominated by perennial, tussock-forming grasses such as <i>Themeda triandra</i> , <i>Austrostipa</i> spp. and <i>Austrodanthonia</i> spp. Inhabits secondary grasslands only when they occur within 2km of primary grassland.
Fish							
<i>Maccullochella peelii</i>	Murray Cod	VU		#	Negligible	Habitat not present in study area.	The Murray Cods natural distribution extends throughout the Murray-Darling basin ranging west of the divide from south east Queensland, through

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	TSC				
							NSW into Victoria and South Australia. It is found in the waterways of the Murray–Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers, billabongs and large deep holes. Murray Cod is entirely a freshwater species and will not tolerate high salinity levels.
<i>Macquaria australasica</i>	Macquarie perch	EN		#	Negligible	Habitat not present in study area.	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries

* - habitat descriptions have been adapted by qualified ecologists from the DEE Species Profile and Threats (SPRAT) Database, OEH Threatened Species online profiles and the NSW Scientific Committee final determinations for listed species, references within the above table are provided within the report reference list.

Table A.6 Migratory species (EPBC Act listed)

Includes records from the following sources:

- NSW BioNet Wildlife Atlas (refer to Section 2.1)
- DEE database (accessed on 13/12/2016)
- BirdLife Australia data search
- Current survey

Bold denotes species recorded in the study area during the current assessment.

Table A.7 Migratory fauna species recorded or predicted to occur within ten kilometres of the study area

Scientific name	Common name	Most recent record
<i>Apus pacificus</i>	Fork-tailed Swift	2003
<i>Ardea ibis</i>	Cattle Egret	2009
<i>Ardea modesta</i>	Eastern Great Egret	2005
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	2014
<i>Calidris ferruginea</i>	Curlew Sandpiper	#
<i>Gallinago hardwickii</i>	Latham's Snipe	2014#
<i>Hirundapus caudacutus</i>	White-throated Needletail	2007#
<i>Leipoa ocellata</i>	Malleefowl	#
<i>Merops ornatus</i>	Rainbow Bee-eater	2009
<i>Motacilla flava</i>	Yellow Wagtail	#
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	2008#
<i>Numenius madagascariensis</i>	Eastern Curlew	#
<i>Plegadis falcinellus</i>	Glossy Ibis	2013
<i>Rhipidura rufifrons</i>	Rufous Fantail	#
<i>Tringa glareola</i>	Wood Sandpiper	2005
<i>Tringa stagnatilis</i>	Marsh Sandpiper	2005

* - habitat descriptions have been adapted by qualified ecologists from the DSEWPac Species Profile for listed migratory species, references within the above table are provided within the report reference list.