DEFENCE HOUSING AUSTRALIA

AUGUST 2022

LAWSON NORTH RESIDENTIAL DEVELOPMENT BELCONNEN NAVAL TRANSMITTING STATION

BIODIVERSITY IMPACT ASSESSMENT

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Lawson North Residential Development Belconnen Naval Transmitting Station Biodiversity Impact Assessment

Defence Housing Australia

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	NAME	DATE	SIGNATURE
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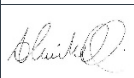
Approved by:	Alex Cockerill	09/08/2022	

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GLOSSARY

*	As asterix following a species name indicates that the species is an introduced species.
ACTmapi	ACTmapi is the ACT Government's interactive mapping service that provides a convenient and fast way to analyse ACT spatial data. It includes a wide range of ACT government data including significant species, vegetation communities and registered trees in the ACT region.
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: — Genetic diversity – the variety of genes (or units of heredity) in any population — Species diversity – the variety of species — Ecosystem diversity – the variety of communities or ecosystems.
Conservation area	The conservation area is the portion of the Site which is proposed to be retained for its biodiversity value for conservation purposes. The area will be subject to a Biodiversity Management Plan.
Critical habitat	Critical habitat is listed under the *Nature Conservation Act 2014* and/or the *Environment Protection and Biodiversity Conservation Act 1999*. Critical habitat is the whole or any part or parts of an area or areas of land comprising habitat critical to the survival of an endangered species, population or ecological community.
Development impact area	The development impact area is defined as the area directly affected by the proposed development. This area includes all locations of Project infrastructure elements as well as locations for construction elements such as construction compounds, access tracks and Site access points as well as Asset Protection Zones. It is noted that ground disturbance works, and complete vegetation clearing may not be required across the entirety of the referral area. For this project this encompasses the entirety of Block 2 Section 14 Lawson, corresponding to precinct A and B of the Development Control Plan (DCP) 09/12 dated 12 February 2013 (National Capital Authority, 2013), and a portion of Block 2 Section 6 Lawson, which relates to portions of precincts D and E in the DCP.
Direct impact	Where a primary action is a substantial cause of a secondary event or circumstance which has an impact on a protected matter (Commonwealth of Australia, 2012).
Ecological community	An assemblage of species occupying a particular area.
Habitat	An area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community, including any biotic or abiotic components.
Indirect impact	An indirect impact is not a direct result of the Project or action, often produced away from or as a result of a complex impact pathway.
Key Threatening Processes	A process that threatens, or could threaten, the survival, abundance or evolutionary development of native species, populations or ecological communities (Department of Environment and Conservation, 2004). Key Threatening Processes are listed under the *Nature Conservation Act 2014* and the *Environment Protection and Biodiversity Conservation Act 1999.* Capitalisation of the term 'Key Threatening Processes' in this report refers to those processes listed specifically under the relevant territory and Commonwealth legislation.
Likely	Taken to be a real chance or possibility (Department of Environment and Conservation, 2004).

Local population	The population that occurs within the Site, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated (Department of Environment and Climate Change, 2007a).
Locality	The area within 10 km of the Site.
Matters of National Environmental Significance (MNES)	Matters of national environmental significance are matters which are protected under the *Environment Protection and Biodiversity Conservation Act 1999* and include: world heritage properties; national heritage properties; wetlands of international importance; listed Threatened species and communities; migratory species; Commonwealth marine areas; nuclear actions and water resources in relation to coal seam gas or large coal mining developments.
Referral area	The Referral area is the location of the proposed action. The referral area includes a buffer on the development impact area (as defined above) to allow for minor changes in location of infrastructure and construction impacts that may occur during detailed design. The Referral area is the eastern portion of the Site and includes: — Block 2, Section 14 Lawson, zoned as RZ1: Suburban. This area of the Site was the former Defence village and landfill Site and was identified in the Development Control Plan (National Capital Authority, 2013) as suitable for residential or institutional development — portions of Block 2, Section 6 Lawson, zoned as PRZ1: Urban Open Space.
Region	A bioregion defined in a national system of bioregionalisation. For this study, this is the South Eastern Highlands as defined in the Interim Biogeographic Regionalisation for Australia (Thackway and Cresswell, 1995).
Significant impact	An impact which is important, notable, or of consequence, having regard to is context or intensity (as defined by (Department of the Environment, 2013a)).
the Project	Defence Housing Australia's (DHA) proposed residential development in Lawson North. Defence Housing Australia are undertaking this Project to provide housing for Defence families in the Canberra region.
the Site	The broader former Belconnen Naval Transmission Station Site, encompassing the entirety of Block 2 Section 6 Lawson and Block 1 Section 16. This includes the development impact area and residual land, some of which is planned to be retained in the conservation area.
Threatened biodiversity	Threatened species, populations or ecological communities, or their habitats as listed under the *Nature Conservation Act 2014* or the *Environment Protection and Biodiversity Conservation Act 1999*.
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as vulnerable, endangered or critically endangered (collectively referred to as Threatened) under the *Nature Conservation Act 2014* or the *Environment Protection and Biodiversity Conservation Act 1999*. Capitalisation of the terms 'Threatened', 'Vulnerable', 'Endangered' or 'Critically Endangered' in this report refers to listing under the relevant territory and/or Commonwealth legislation.
Vegetation Type	Vegetation Type is an association of plant species within a defined landscape position, which forms a relatively uniformed patch that is distinguishable from neighbouring patches of different vegetation types. The vegetation types in the ACT are defined by the ACT government (ACT Government, 2021c)

ABBREVIATIONS

ACT	Australian Capital Territory
APZ	Asset Protection Zone
BIA	Biodiversity Impact Assessment
CEMP	construction environmental management plan
DBH	Diameter at breast height
DHA	Defence Housing Australia
EPBC Act	(Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*
FVS	Floristic Value Score
Ha	hectares
IAPZ	Inner Asset Protection Zone
MNES	Matters of National Environmental Significance
NC Act	(ACT) *Nature Conservation Act 2014*
NCA	National Capital Authority
OAPZ	Outer Asset Protection Zone
TEC	Threatened ecological community/communities

EXECUTIVE SUMMARY

Defence Housing Australia is proposing a new residential development in Lawson North, at the former Belconnen Naval Transmission Station Site.

The purpose of this Biodiversity Impact Assessment is to assess the potential construction and operational impacts to biodiversity associated with the Project. This report has been prepared as part of the referral package to the Commonwealth Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report presents the desktop and ecological survey assessment methodology, results, and an assessment of the likely impacts of the Project on biodiversity values.

Although much of the development impact area has been highly modified, two Threatened ecological communities occur within the referral area:

- *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* – listed as a Critically Endangered Ecological Community under both the EPBC Act and *Nature Conservation 2014 Act* (NC Act).
- *Natural Temperate Grassland of the South Eastern Highlands* – listed as a Critically Endangered Ecological Community under both the EPBC Act and NC Act.

Two Threatened fauna species were recorded within the proposed development impact area during field surveys:

- Golden Sun Moth (*Synemon plana*) – listed as Vulnerable under the EPBC Act and Endangered under the NC Act.
- Striped Legless Lizard (*Delma impar*) – listed as Vulnerable under both the EPBC Act and NC Act.

In addition to the Golden Sun Moth and Striped Legless Lizard, six Threatened species listed under NC Act and/or the EPBC Act are considered to have a moderate or higher likelihood of occurrence in the referral area, based on availability of potential habitat, including:

- Perunga Grasshopper (*Perunga ochracea*)
- Little Eagle (*Hieraaetus morphnoides*)
- White-winged Triller (*Lalage tricolor*)
- Scarlet Robin (*Petroica boodang*)
- Superb Parrot (*Polytelis swainsonii*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

The action would require clearing of up to 42.25 ha of vegetation from within the Site. Of this 17.11 ha is considered to be remnant native vegetation consistent with threatened ecological communities listed under the EPBC Act. Impacts to *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland), Natural Temperate Grassland of the South Eastern Highlands* and Threatened species have been avoided and minimised, where possible, through early identification, preliminary design and consideration of alternative construction methodologies through:

- avoidance of impacts to the majority of the larger area of *Natural Temperate Grassland of the South Eastern Highlands* surrounding the referral area. Retention of this area would also retain:
  - high quality habitat and the core areas of Golden Sun Moth activity
  - majority of the available habitat for the Striped Legless Lizard including core habitat provided by Themeda dominated grassland
  - majority of the available habitat for Perunga Grasshopper
  - critical habitat for *Lepidium ginninderrense.*
- retention of majority of Box Gum Woodland
- minimising impacts to planted native trees including hollow bearing trees.

Significance assessments under the EPBC Act were completed for EPBC Act listed communities and species and concluded that the Project is likely to have a significant impact on three of these entities:

- *Natural Temperate Grassland of the South Eastern Highlands.*
- Golden Sun Moth.
- Striped Legless Lizard.

Detailed mitigation measures would be implemented under each phase of the Project to reduce impacts to biodiversity values as far as practicable. This includes considerations and mitigations for further design phases, mitigations for construction including a detailed Construction Environmental Management Plan, and mitigations for the on-going operation of the development. Additionally, a Biodiversity Management Plan prepared for the proposed conservation areas outlines management actions will include considerations for potential impacts as a result of on-going pressures to these areas as a result of the Project.

1 INTRODUCTION

1.1 PROJECT BACKGROUND

Defence Housing Australia (DHA) are proposing a new residential development (the Project) at Lawson within part of the Site formerly known as the Belconnen Naval Transmitting Station. Defence Housing Australia are undertaking this Project to provide housing for Defence families in the Canberra region.

Defence Housing Australia acquired the approximately 145 hectare Site (Territory Plan- Lawson: Block 2, Section 6) in February 2017 which is currently National Land falling under the control of the National Capital Authority (NCA) and is subject to the Development Control Plan (DCP) 09/12 dated 12 February 2013 (National Capital Authority, 2013).

Extensive ecological surveys of the Site have previously been undertaken including mapping of grassland and woodland vegetation types and condition, targeted surveys for Golden Sun Moth, Threatened reptiles and *Lepidium ginninderrense,* nocturnal and diurnal fauna surveys for birds, bats, arboreal mammals, and amphibians, and monitoring of kangaroo density (SMEC Australia, 2008, HLA Envirosciences, 2002, Richter and Osbourne, 2009, HLA Envirosciences, 2001, SMEC Australia, 2010, HLA-Envirosciences, 2004).

1.2 PURPOSE OF THIS REPORT

WSP was engaged to prepare a Biodiversity Impact Assessment (BIA) for the subdivision and residential development (referred to as *the Project*) of the Site. The purpose of the BIA is to form part of the referral package to to the Commonwealth Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report presents the desktop and ecological survey assessment methods and results; and assesses the potential construction and operational impacts to biodiversity associated with the Project and provides mitigation measures to minimise these impacts.

1.3 LEGISLATIVE CONTEXT

1.3.1 NATIONAL CAPITAL PLAN

The National Capital Plan (NCP) is administered by the NCA and is the overarching strategic plan for Canberra. The NCP primarily ensures that Canberra is planned and developed in accordance with its national significance. This is mostly achieved by identifying certain land as “Designated Areas” and outlining the planning principles and policies, and detailed conditions of planning, design and development (Purdon Associates, 2014).

The Site is not recognised as a ‘Designated Area’ within the NCP. However, as the land is National Land, the NCA is able to determine the planning objectives and requirements for the Site through the development of a DCP.

Development proposals on National Land, including subdivision and proposals to lease National Land are required to be referred to the NCA. The NCA will assess proposals to ensure that they are not inconsistent with the provisions of the Plan and the Lawson DCP (National Capital Authority, 2013).

1.3.2 LAWSON DEVELOPMENT CONTROL PLAN

A Development Control Plan reflects the requirements set out by the NCP and Territory Plan, and identifies requirements considered by the NCA to be in the best interests of Canberra. Development proposals on National Land, including subdivisions, are required to be referred to the NCA and must be consistent with the NCP and the subject DCP.

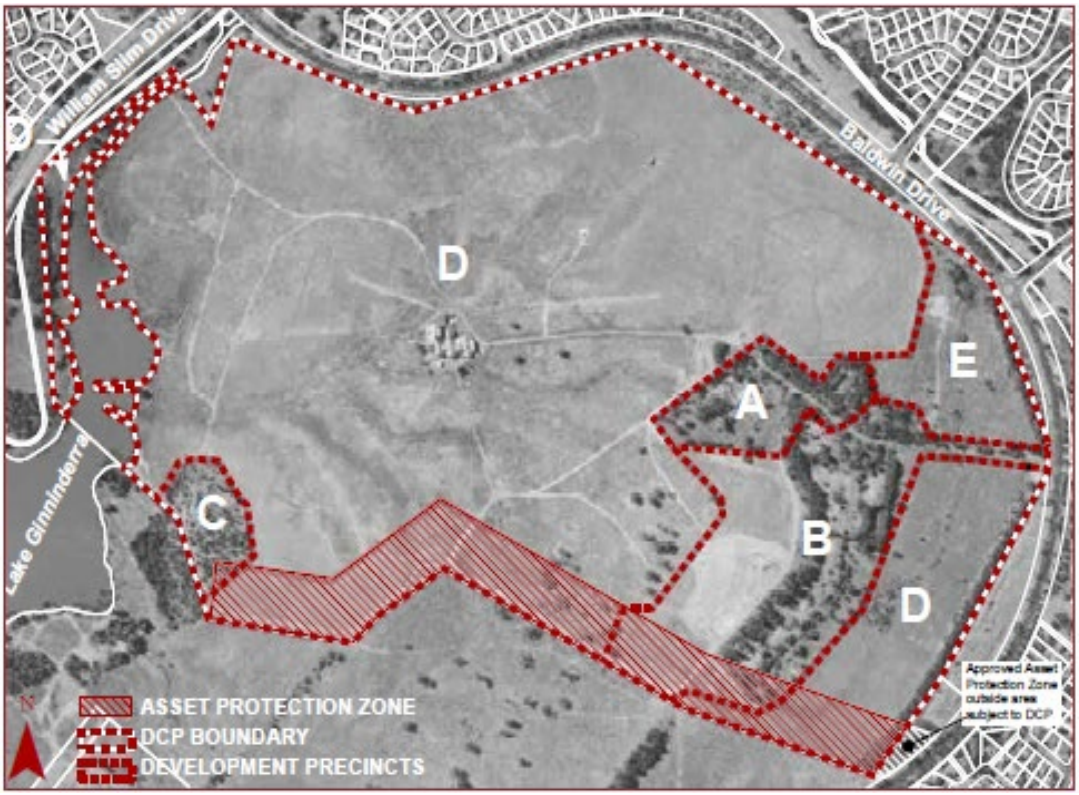
The Development Control Plan issued in 2013 by the NCA (National Capital Authority, 2013) provides indicative development precincts for the Site based on investigations of site remediation, environmental values, and heritage values. Indicative development precincts (refer to Figure 1.1) are based on these investigations, however further detailed planning is required prior to development of the Site.

The Lawson DCP identifies opportunities for residential development over part of the Site (precincts A and B, covering approximately 22 hectares of the Site).

The DCP contains objectives and desired outcomes, including the following items:

- the natural and cultural heritage values of the Site be maintained and integrated into future development of the Site
- protection and management of dry *Themeda* grassland as a remnant temperate grassland,
- protection and management of isolated *Austrostipa* grassland for its natural values as an open-space area for neighbouring urban development
- 24-hour cat containment measures for all blocks.

The DCP identifies that due to the environmental and heritage significance of the Site, future development at the Site must be subject to environment and heritage management plans.



Source: (National Capital Authority, 2013)

Figure 1.1 National Capital Authority, precincts assigned to the Belconnen Naval Transmission Station Site

The DCP key principles which determine desired planning and urban design outcomes are:

- allow for flexibility in design to ensure integration within the surrounding urban context, in particular the development of Lawson South adjacent to the Site
- maintain and integrate the existing natural and cultural heritage values of the Site with future development and allow for adaptive reuse of existing buildings on Site where possible (National Capital Authority, 2013).

1.3.3 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT

The *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places.

As a Commonwealth-owned property, the Site is subject to the EPBC Act. The objective of the EPBC Act is to provide for the protection of the environment, and particularly applies to Matters of National Environmental Significance (MNES).

Under Sections 26 and 28 of the EPBC Act, DHA is obliged to avoid, minimise, or manage potentially significant impacts on the environment.

The EPBC Act requires a proposed activity to be referred to the Commonwealth Minister for the Environment if it is:

- likely to have a significant impact on one or more matter of national environmental significance (MNES)
- an action on Commonwealth land which has, will have or is likely to have a significant impact on the environment.
- an action by the Commonwealth or a Commonwealth agency which has, will have or is likely to have a significant impact on the environment
- an action which has, will have or is likely to have a significant impact on the environment on Commonwealth land, no matter where it is to be carried out.

1.3.4 NATURE CONSERVATION ACT 2014

The *Nature Conservation Act 2014* (NC Act) is the chief legislation for the protection of native plants and animals in the Australian Capital Territory (ACT) and for the management of the conservation reserve network. The Act establishes a formal process for the identification and protection of threatened species and ecological communities within the ACT. The Act protects native plants and animals, and provides management authority for conservation lands. It provides the legal underpinning of nature conservation policy, management and action across the Territory.

While the Project would not require approval under the NC Act as the Site is located on Commonwealth land, consideration has been given to biodiversity listed under this Act as Defence operates under a 'good neighbour' policy which takes into account Territory legislation where it does not conflict with Commonwealth obligations. When approving any application for development on National Land the NCA will also consider ACT agency requirements.

1.4 THE SITE

The Site is located in the suburb of Lawson within the ACT. The Site is surrounded largely by existing development and infrastructure. The Lawson South residential development occurs to the south, Baldwin Drive to the east and north east with residential suburb of Kaleen and Giralang beyond. The western edge of the Site consists of open space between William Slim Drive and Ginninderra Creek.

The Site is currently unused, as the former Belconnen Naval Transmitting Station has been decommissioned and historic sheep grazing ceased. The Site is fenced and access by the public is not permitted. Existing infrastructure is present including the transmitter building, guard house and ceremonial ground, the formal naval base and mess hall, and security fencing and bitumen roads.

Ecological assessments were conducted across the entirety of the Site which includes both the area investigated for development and areas planned to be retained for conservation. While the whole of the Site is discussed within this report, the impact assessment relates only to the referral area and the development impact area.

The following definitions are used in this report:

- The Site – the broader former Belconnen Naval Transmission Station Site, encompassing the entirety of Block 2 Section 6 Lawson and Block 1 Section 16.
- The Referral area – the eastern portion of the Site which was considered for development:
  - Block 2, Section 14 Lawson, zoned under the Territory Plan as RZ1: Suburban. This area of the Site was the former Defence village and landfill site and was identified in the Development Control Plan (National Capital Authority, 2013) as suitable for residential or institutional development
  - portions of Block 2, Section 6 Lawson, zoned under the Territory Plan as PRZ1: Urban Open Space. Identification of preliminary biodiversity constraints minimised the impacts within this area
  - includes small areas outside the DHA site for infrastructure (water and traffic connections).
- The development impact area – the area directly affected by the proposed development. This area includes all Project infrastructure elements as well as locations for construction elements such as construction compounds, access tracks and Site access points. The proposed development impact area forms the basis for assessment of the potential biodiversity impacts for the Project. It is noted that ground disturbance works, and complete vegetation clearing may not be required across the entirety of the development impact area.
- The conservation area – over 100 ha of the Site which has been proposed for conservation for its biodiversity value. The area will be subject to a Biodiversity Management Plan.

The Site location and relevant areas are displayed in Figure 1.2.

Lawson North Residential Development Biodiversity Assessment

Figure 1.2
Project site

Legend

- Referral Area
- Development Impact Area - Permanent
- Development Impact Area - Temporary
- DHA Site
- Proposed Conservation Area

0 100 200 Metres

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:6,000 Date: 10/05/2022

Data sources: - ACTiMap, Geoscience Australia

2 METHODOLOGY

This section provides a detailed description of the methodologies used to undertake the ecological desktop assessment, and field surveys within the Site.

2.1 PERSONNEL

The contributors to the preparation of this report, their qualifications and roles are provided in Table 2.1.

Table 2.1 Contributors and their roles

NAME	QUALIFICATIONS	ROLE
Selga Harrington	Bachelor of Science (Hons) Twenty years' experience	Principal Ecologist – project management, field surveys, report preparation
Alex Cockerill	Bachelor of Science (Hons) Nineteen years' experience	Principal Ecologist – field surveys, technical review
Alicia Palmer	Bachelor of Science (Hons) Three years' experience	Ecologist – desktop review and research, report preparation
Lauren Smith	Bachelor of Science (Resource and Environmental Management) Two years' experience	Ecologist – desktop assessment, field surveys, report preparation
Julia Wyllie	Bachelor of Environment (Environmental Management and Biological Science) Certificate 3 Conservation and Land Management Eight years' experience	Ecologist – field surveys
Nicole Kelleway	Bachelor of Spatial Science Technology (GS) Diploma of Agriculture 10 years' experience	GIS consultant – data management, map preparation
Huw Chittleborough	Bachelor of Applied Geographical Information Systems (Hons) Four years' experience	GIS consultant – data management, map preparation
Isaac Augey	Bachelor of Environmental Science and Management One year experience	GIS consultant – data management, map preparation

2.2 DESKTOP ASSESSMENT

A desktop review of available databases and literature was undertaken to determine the likely vegetation and habitats within the Site and to identify the potential ecological values. Records of Threatened species and/or populations previously recorded or predicted to occur in the Site locality were obtained from the databases outlined below (Table 2.2).

Table 2.2 Database searches for Threatened species, populations, and communities

DATABASE	DATE OF SEARCH	SEARCH AREA	REFERENCE
EPBC Protected Matters Search tool	7 December 2021	10 km buffer of the Site	(Department of Agriculture Water and the Environment, 2021c)
ACTmapi – Significant Plants, Animals and Registered Trees	9 December 2021	10 km buffer of the Site	(ACT Government, 2021a)
ACT Threatened species list	9 December 2021	All of the ACT	(ACT Government, 2021b)
Atlas of Living Australia	9 December 2021	10 km buffer of the Site	(Atlas of Living Australia, 2021)
PlantNet	20 December 2021	10 km buffer of Lawson	(Royal Botanic Gardens and Domain Trust, 2021)

Extensive ecological surveys of the Site have previously been undertaken including mapping of grassland and woodland vegetation types and condition, targeted surveys for Golden Sun Moth, Threatened reptiles and *Lepidium ginninderrense,* nocturnal and diurnal fauna surveys for birds, bats, arboreal mammals, and amphibians, and monitoring of kangaroo density (SMEC Australia, 2008, HLA Envirosciences, 2002, Richter and Osbourne, 2009, HLA Envirosciences, 2001, SMEC Australia, 2010, HLA-Envirosciences, 2004).

Previous reports and management plans for the Site were also reviewed, including:

- Natural, Cultural and Heritage Assessment (Egloss et al., 2001).
- Review of Grassland Significance, Belconnen Naval Transmitter Station Lawson, ACT (HLA Envirosciences, 2001).
- Targeted surveys for Striped Legless Lizard (HLA Envirosciences, 2002).
- Further Investigation of Golden Sun Moth *Synemon plana* Habitat at Lawson, ACT (Rowell, 2003a).
- Lawson Residential Estate Study, Ecological Issues (Rowell, 2003b).
- *Synemon plana* Moth Habitat, Commonwealth Heritage Listing (Department of the Environment and Energy, 2018b)
- Conservation Advice for *Synemon plana* (Golden Sun Moth) (Department of Agriculture Water and the Environment, 2021a)
- Royal Australian Naval Transmitting Station, Commonwealth Heritage Listing (Department of the Environment and Energy, 2018b).
- Threatened species and kangaroo management at Belconnen Naval Transmitting Station (HLA-Envirosciences, 2004) (HLA-Envirosciences, 2004).
- Statement of Heritage Impact: Belconnen Naval Transmitting Station (Environmental Resources Management Australia, 2005).
- Lawson Development: Planning and Infrastructure Assessment Report (GHD, 2005).
- Environmental Management Plan: Belconnen Naval Transmitting Station (SMEC Australia, 2008).
- Due Diligence – Peer Review at Lawson North (Eco Logical Australia, 2014).
- Statutory planning report (Purdon Associates, 2014).

- Golden Sun Moth (*Synemon plana*) at the Belconnen Naval Transmitting Station: Larval abundance and floristic composition and structure at contaminated Sites in natural temperate grassland (Richter and Osbourne, 2009).
- Report on ACT Lowland Native Grassland Investigation (Cooper, 2009).
- Development Control Plan (National Capital Authority, 2013).
- Planning and design review (AECOM, 2018).
- A preliminary Arboricultural report for the "original windbreak planting" and part of the former Belconnen Naval Transmitting Station, Block 2, Section 6, DP 10748, Baldwin Drive, Lawson North, ACT (Canopy Tree Experts, 2018).
- Belconnen Naval Transmission Station Site – Heritage Management Plan – Draft Report (GML Heritage, 2019).
- Lawson North Preliminary Arboricultural Report (Tait Network, 2019).
- Bushfire Risk Assessment Report for Lawson North (Australian Bushfire Protection Planners Pty Ltd, 2019).
- Other relevant studies and conservation strategies for the region were also reviewed including:
  - Vegetation mapping of the local area (ACT Government, 2018, Baines et al., 2013, Armstrong et al., 2013, Benson, 1994) (Rehwinkel, 2009)
  - Box Gum Woodland in the ACT (Maguire and Mulvaney, 2011a)
  - Lowland native grasslands in the ACT and surrounding region: A review and research strategy for a recovery plan (Sharp, 1994)
  - ACT Native grassland conservation strategy and action plans (ACT Government, 2017a).
- Australian Heritage Database (Department of the Environment and Energy, 2018b).

2.3 LIKELIHOOD OF OCCURRENCE ASSESSMENT

The likelihood of Threatened species and/or populations and Migratory species occurring within the referral area was assessed against the criteria outlined in Table 2.3. Species subject to likelihood of occurrence assessments were those identified during the desktop investigations and/or the professional opinion of contributors to this assessment.

Table 2.3 Likelihood of occurrence assessment

LIKELIHOOD OF OCCURRENCE	CRITERIA
Low	— Have not been previously recorded in the surrounds and/or the Site is beyond the current known geographic range of the species. — Are dependent on specific habitat types or resources that are not present. — Are considered extinct in the locality.
Moderate	— Have been recorded previously on an infrequent basis (i.e. vagrant individuals). — Use habitat types or resources that are present, although generally in a poor or modified condition. — Are unlikely to maintain sedentary populations, however, may seasonally utilise resources opportunistically during variable seasons or migration.
High	— Are dependent on habitat types or resources that are present and are abundant and/or in good condition. — Are known or likely to maintain resident populations in the surrounds. — Are known or likely to visit during regular seasonal movements or migration.
Recorded	— Have been recorded in the site (either during current surveys or in published data/reports).

2.4 FIELD SURVEYS

Field surveys were undertaken, as described in Section 2.4 and mapped in Figure 2.2 between August 2018, June 2020 and May 2022.

2.4.1 VEGETATION SURVEYS

2.4.1.1 STRATIFICATION – DESKTOP ANALYSIS OF VEGETATION

Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation. Analysis of the aerial photographs was used to identify areas of disturbance (e.g. buildings, vehicle tracks, ground disturbance and weed distribution) and differences in vegetation structure and composition. This provided an initial definition of vegetation communities into simple structural and disturbance classifications for verification during field surveys.

2.4.1.2 RANDOM MEANDER

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by (Cropper, 1993), whereby the recorder walks in a random meander throughout the Site recording dominant and key plant species (e.g. Threatened species, noxious weeds), between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness. This survey technique was used to verify vegetation boundaries and stratification from the desktop analysis and classification of vegetation zones based on differences in species composition and condition. Vegetation zones were mapped based on relatively homogenous areas of the same vegetation type and similar condition.

2.4.1.3 PLOTS AND TRANSECTS

Detailed quantitative quadrat surveys were completed within different vegetation zones as identified in the desktop and random meander surveys. These quantitative surveys included both plot and transect surveys as outlined in the methodology contained within *ACT Environmental Offsets Policy* (ACT Government - Environment and Planning, 2015) Plots and transect surveys were undertaken at locations summarised in Table 2.4 and mapped in Figure 2.2. These surveys were undertaken following methods described below and illustrated in Figure 2.1.

Table 2.4 Quadrat locations

QUADRAT	DATE	EASTING[1]	NORTHING[1]
Q1	14/12/2018	690417.29	6099908.25
Q2	14/12/2018	690489	6099797.76
Q3	14/12/2018	691085.43	6100210.65
Q6	9/04/2019	690949.911	6100133.981
Q7	9/04/2019	690770.263	6099786.904
Q8	9/04/2019	690614.06	6099711.421
Q9	9/04/2019	690871.624	6100431.111
20-1	30/11/2018	690949.489	6100381.217
20-A1	30/11/2018	691050.494	6100122.483
20-2	30/11/2018	690650.992	6100037.19

QUADRAT	DATE	EASTING[1]	NORTHING[1]
20-3	30/11/2018	690466.681	6099880.788
20-8	27/03/2020	691071.257	6100065.24
20-9	27/03/2020	690875.419	6100356.787
20-10	27/03/2020	690668.234	6100392.583
20-13	27/03/2020	690736.66	6100637.21
20-14	27/03/2020	691076.621	6100080.74
20-15	27/03/2020	690854.714	6099722.304
18-1	18/04/2019	690296.025	6099910.698
18-2	18/04/2019	690468.428	6099964.56
18-3	18/04/2019	690764.588	6099674.252
18-4	18/04/2019	690886.035	6099764.375
18-5	18/04/2019	690950.481	6099877.43
18-6	18/04/2019	691018.921	6100015.592
19-7	30/11/2018	690361.794	6099858.608
19-8	30/11/2018	690473.618	6100101.47

(1) Zone 55

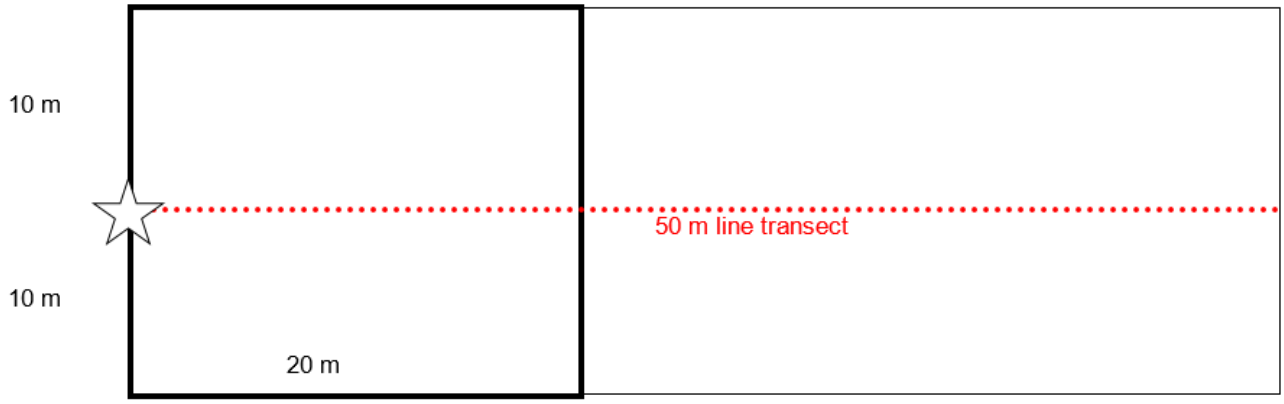


Figure 2.1 Schematic diagram illustrating the layout of the nested 20 x 50 m and 20 x 20 m quadrats used for the assessment of condition attributes at each Site

The following Site attributes were recorded at each Site:

- Location (easting – northing).
- Vegetation structure and dominant species and vegetation condition. Vegetation structure was recorded through estimates of percentage foliage cover, average height and height range for each vegetation layer.
- Native and exotic species richness (within a 400 m^2 quadrat): This consisted of recording all species by systematically walking through each 20 x 20 m quadrat. The cover abundance (percentage of area of quadrat covered) of each species was estimated.

- Native overstorey cover: This consisted of estimating the percentage foliage projective cover of the tallest woody stratum present (>1 m and including emergents) at 10 points along the 50 m transect and calculating the average. The woody stratum included species that were native to ACT including both indigenous and non-indigenous native species.
- Native mid-storey cover: This involved estimating the foliage projective cover of vegetation between the overstorey stratum and a height of 1 m (i.e. tall shrubs, under-storey trees and tree regeneration) at 10 points along the 50 m transect and calculating the average.
- Ground cover: This comprised estimating the foliage projective cover of plants below 1 m in height at 50 points along the 50 m transect and calculating the average. The following categories of plants were recorded:
  - **Native ground cover (grasses):** native grasses (Poaceae family native to ACT).
  - **Native ground cover (shrubs)**: all woody vegetation below 1 m in height and native to ACT.
  - **Native ground cover (other)**: non-woody vegetation (i.e. vascular plants – ferns and herbs) below 1 m in height and native to ACT.
  - **Exotic plant cover**: vascular plants not native to Australia.
- Number of large trees (1,000 m^2 quadrat): The count of the number of living and dead trees within a 50 x 20 m quadrat which have a circumference of 150 cm, 1 m above ground height or have a hollow greater than 5cm wide.
- Overstorey regeneration: This was estimated as the proportion of overstorey species present at the Site that was regenerating (i.e. saplings with a diameter at breast height ≤5 cm). The maximum value for this measure was 1.
- Total length of fallen logs (1,000 m^2 quadrat): This was the cumulative total of logs within each 50 x 20 m quadrat with a diameter of at least 10 cm and a length of at least 0.5 m.

2.4.1.4 FLORISTIC ANALYSIS

Plot and transect survey data were collected from the different vegetation zones to provide data vegetation quality analysis and calculation of offsets.

Floristic analysis of vegetation plot data was undertaken to determine the vegetation community, its condition and to compare the vegetation zones to condition thresholds for consistency with EPBC Act listed ecological communities. This included calculation of floristic value score (Rehwinkle, 2015) and comparison with:

- Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Threatened Species Scientific Committee, 2006)
- National Recovery Plan for White Box – Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Department of Environment Climate Change and Water NSW, 2010)
- Commonwealth Listing Advice on Natural Temperate Grassland of the South Eastern Highlands (Threatened Species Scientific Committee, 2016b).

2.4.2 THREATENED FLORA SURVEYS

Results of the Threatened species database searches identified Threatened plant species listed under the NC Act and/or the EPBC Act as known to occur or having potential to occur within the locality of the Site. Microhabitat assessment and habitat constraints assessments were undertaken for all species to determine the suitability of habitat. Targeted surveys were completed for the Threatened flora species identified as having moderate of higher likelihood of occurrence. The likelihood of occurrence assessment for each species is provided in Appendix D.

Several flora species have seasonal survey requirements due to difficulty of detection except at specific times of the year, during its flowering period. Surveys for Threatened flora were undertaken as outlined in Table 2.5.

Targeted Threatened flora surveys included:

- parallel line traverses where known or potential habitat for Threatened flora species occurred. This survey technique involved one or more ecologists walking parallel line traverses
- random meander surveys (section 2.4.1.2)
- plot- based searches (section 2.4.1.3).

Table 2.5 Targeted flora surveys

SCIENTIFIC NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	SURVEY TIMING	SURVEYS UNDERTAKEN
Leucochrysum albicans var. tricolor	Hoary Sunray	–	E	Flowers in spring and summer (Department of the Environment and Energy, 2019k). Survey timing September- April (Department of Planning Industry and Environment, 2021a, State of NSW and Office of Environment and Heritage, 2019).	Parallel transects, plots and random meander surveys 9, 12, 20, 30 November 2018; 9, 18 April 2019
Rutidosis leptorrhynchoides	Button Wrinklewort	E	E	Flowering in the ACT occurs between December and April (NSW Office of Environment and Heritage, 2012a). Survey all year (Department of Planning Industry and Environment, 2021a)	Parallel transects and random meander surveys 7 December 2018; 9 and 18 April 2019
Swainsona recta	Small Purple Pea	E	E	The species flowers in spring, peaking in a 2-3 week period during October (NSW Office of Environment and Heritage, 2012b). Surveys between September and November (State of NSW and Office of Environment and Heritage, 2019)	Parallel transects and random meander surveys 20, 28 September; 3, 10, 19, 26 October; 9, 12, 20 November 2018.

(1) V = Vulnerable, E = Endangered, under the NC Act.

(2) V = Vulnerable, CE = Critically Endangered, under the EPBC Act.

2.4.3 FAUNA

Fauna surveys included habitat assessments in conjunction with vegetation surveys as well as targeted seasonal surveys for species with a moderate or higher likelihood of occurrence. These surveys sought to identify fauna habitat characteristics present and detect Threatened species.

2.4.3.1 FAUNA HABITAT ASSESSMENT

Fauna habitat assessments were undertaken to assess the likelihood of Threatened fauna species (those species known or predicted to occur within the locality from the literature and database review) occurring. Fauna habitat characteristics assessed included:

- structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources
- presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, birds and reptiles

- presence of the ground cover vegetation, leaf litter, rock outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles and amphibians
- presence of waterways (ephemeral or permanent) and water bodies.

The criteria were used to evaluate the condition of habitat values are summarised in Table 2.6.

Table 2.6 Fauna habitat condition

HABITAT CONDITION	DESCRIPTION
Good	— A full range of fauna habitat components for that habitat type are usually present (for example, old-growth trees, fallen timber, rocky outcropping, spider burrows and soil cracks, feeding and roosting resources). — Habitat linkages to other remnant ecosystems in the landscape are intact.
Moderate	— Some fauna habitat components for that habitat type are missing or greatly reduced (for example, old-growth trees, rocky outcropping and fallen timber). — Although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
Poor	— Many fauna habitat elements for that habitat type in low quality remnants have been lost, including old growth trees (for example, due to past timber harvesting or land clearing, removal of rocks and fallen timber) and tree canopies are often highly fragmented. — Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive clearing in the past.

2.4.3.2 TARGETED SEASONAL SURVEYS

Surveys were undertaken to target Threatened species of animal listed under the EPBC Act and NC Act, which were identified as having potential habitat within the referral area (Appendix E). Surveys were also undertaken for the rare Canberra Raspy Cricket which had been previously recorded within the site. Surveys undertaken are summarised in Table 2.7 with methods described below.

Table 2.7 Targeted fauna surveys

SCIENTIFIC NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	SURVEY TIMING REQUIREMENTS	SURVEYS UNDERTAKEN
Synemon plana	Golden Sun Moth	E	V	Variable season year to year. Generally: — November – January (Department of the Environment and Energy, 2019m) — October-December (Department of Planning Industry and Environment, 2021a)	Habitat assessment Transect surveys November 2018

SCIENTIFIC NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	SURVEY TIMING REQUIREMENTS	SURVEYS UNDERTAKEN
Delma impar	Striped Legless Lizard	V	V	September – December for artificial shelter site surveys (Department of the Environment and Energy, 2019e, Conservation Research, 2016, Department of Planning Industry and Environment, 2021a)	Habitat assessment Artificial shelter site surveys November- December 2018
Polytelis swainsonii	Superb Parrot	V	V	September – November (ACT Government, 2016b, Department of Planning Industry and Environment, 2021a)	Habitat assessment Bird surveys (10, 19, 26 October; 9,12, 30 November 2018) Opportunistic observations Hollow-bearing tree survey
Perunga ochracea	Perunga Grasshopper	V	–	Spring/summer (Stephens, 1998 in (Stephens, 1998 in ACT Government, 2017d)	Habitat assessment Opportunistic diurnal searches including during Golden Sun Moth transect surveys, artificial shelter site surveys, and vegetation plots and transects November 2018
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	October – December (Department of Planning Industry and Environment, 2021a, State of NSW and Office of Environment and Heritage, 2019)	Habitat assessment Diurnal searches for camps 10, 19, 26 October; 9,12, 30 November 2018
Hieraaetus morphnoides	Little Eagle	V	–	September – December (ACT Government, 2016b); Breeding August- October (Department of Planning Industry and Environment, 2021a)	Habitat assessment Bird surveys (10, 19, 26 October; 9,12, 30 November 2018) Opportunistic observations
Lalage tricolor	White-winged Triller	V	–	September – February (ACT Government, 2016b)	Habitat assessment Bird surveys (10, 19, 26 October; 9,12, 30 November 2018) Opportunistic observations
Petroica boodang	Scarlet Robin	V	–	Occur at lower elevations during autumn and winter (ACT Government, 2016a) Highest records between April – August (Canberra Ornithologists Group, 2020)	Habitat assessment Bird surveys (10, 19, 26 October; 9,12, 30 November 2018; 9, 18 April 2019; 27 March, 19 June 2020) Opportunistic observations

SCIENTIFIC NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	SURVEY TIMING REQUIREMENTS	SURVEYS UNDERTAKEN
Cooraboorama canberrae	Canberra Raspy Cricket	–	–	Spring/ summer (Department of Planning Industry and Environment, 2021a)	Habitat assessment Opportunistic diurnal searches including during Golden Sun Moth transect surveys, artificial shelter site surveys, and vegetation plots and transects November- December 2018

(1) V = Vulnerable, E = Endangered, under the NC Act.

(2) V = Vulnerable, CE = Critically Endangered, under the EPBC Act.

GOLDEN SUN MOTH TRANSECTS

The EPBC Act survey guidelines recommend surveys for the Golden Sun Moth be conducted at any location containing habitat likely to support the species which includes all areas which have, or once had, native grasslands (including derived grasslands) or grassy woodlands that occur within the historical range of the species including sites dominated by the exotic weed Chilean Needlegrass.

Targeted surveys for Golden Sun Moth were undertaken in areas of open grassland and woodland in suitable weather conditions during the flying season of the moth. Surveys were undertaken following survey guidelines, namely surveys were undertaken:

- during the local flying season (generally late October–January)
- of reference sites (sites of known occurrence) to guide survey timing
- over at least four suitable days, suitable days are described as follows:
  - warm to hot day (above 20°C by 10 am)
  - clear or mostly cloudless sky
  - still or relatively still wind conditions
  - at least two days since rain.

Survey dates and conditions are summarised in Table 2.8.

All surveys were undertaken in conditions when Golden Sun Moths were recorded flying within the broader Site. The Site was used as a reference site to confirm that the conditions on the day of survey are suitable for the detecting the species if it is present within the referral area.

Survey effort was focussed on the Referral area and adjacent areas. Additional surveys were undertaken to inform the Biodiversity Management Plan for the conservation area.

Transects were initially walked throughout the Site approximately 50 metres apart and male moths observed within approximately 25 metres were recorded taking care not to count the same moth twice.

Areas of high activity were mapped and isolated records of Golden Sun Moth outside these were also recorded and mapped.

Counts were undertaken to provide an estimate of abundance in different areas of site and density of Golden Sun Moth was calculated as an average across these areas.

Table 2.8 Golden Sun Moth surveys

DATE	CONDITIONS	SURVEY EFFORT	FLYING AT REFERENCE SITE
9/11/2018	20–22 degrees, 20% cloud cover, light to moderate breeze	4 person hours	Yes
12/11/2018	29.5 degrees, light to moderate breeze	8 person hours	Yes
20/11/2018	22–28 degrees, sunny, light to moderate breeze	4 person hours	Yes
27/11/2018	21–24 degrees, sunny, light breeze	4 person hours	Yes

STRIPED LEGLESS LIZARD

A knowledge gap identified the need for additional Striped Legless Lizard surveys in order to gain a better understanding of the species distribution prior to any land use assessment being undertaken (Eco Logical Australia, 2014).

Targeted surveys for Striped Legless Lizard were undertaken in accordance with the ACT Government's *Survey Guidelines for Striped Legless Lizard* (Conservation Research, 2016). Targeted surveys involved the laying of artificial shelters (concrete roof tiles) as described in the survey guidelines.

Twelve survey locations (grids of 50 tiles per location) were located within the Site (Table 2.9, Figure 2.2) of which four were located within the Referral area.

Surveys were undertaken in peak seasonal activity periods (September – December), with survey conditions detailed in Table 2.10.

Table 2.9 Artificial shelter survey site locations

GRID	EASTING (m E)[1]	NORTHING (m S)[1]	LOCATION WITHIN BROADER SITE	HABITAT TYPE
A1	691003.70804	6099988.24196	Conservation area	Grassland
A2	690902.75664	6099809.24202	Conservation area	Grassland
B1	690688.42085	6100007.13631	Referral area	Grassland
B2	690533.44583	6099880.13874	Referral areaa	Grassland
C1	690397.89961	6100005.99656	Conservation area	Box Gum Woodland
D1	690680.29520	6100388.15255	Referral area	Grassland
D2	691045.30307	6100296.46976	Conservation area	Box Gum Woodland
D3	689918.29790	6100609.68245	Conservation area	Grassland
D4	689798.17026	6100467.58628	Conservation area	Grassland
D5	690159.07403	6100254.16590	Conservation area	Grassland
D6	690393.82348	6100724.02006	Conservation area	Grassland
D7	690874.25978	6100433.52785	Referral area	Grassland

(1) Centre of grid; Zone 55

Table 2.10 Weather conditions during artificial shelter surveys

DATE	TIME	CONDITIONS			
		Temperature (°C)	Cloud cover (%)	Wind	Rain
14/09/2018	10:30–13:00	17.0–20.0	5	Light breeze	None
20/09/2018	9:45–11:30	10.0–15.0	0	Light breeze	None
28/09/2018	10–12:30	18.0–21.0	10	Light breeze	None
03/10/2018	10:25–12:20	15–17.1	75–100	Light-moderate wind	Light drizzle
10/10/2018	10:35–12:15	11.0–11.3	50–100	Light-moderate wind	No rain, ground damp from previous rain events
19/10/2018	12:00–14:41	25.0–27.0	0	Still- light breeze	None
26/10/2018	10:26–12:53	17.9–22.0	0	Still- light breeze	None
02/11/2018	08:00–09:15	23.0–25.4	100	Light breeze	None
09/11/2018	15:00–17:15	19.8–23.2	20	Light to moderate breeze	None
16/11/2018	12:55–14:25	18.8–23.0	20–60	Still- light breeze	None
23/11/2018	10:13–11:01	11.0–11.1	60–70	Moderate wind	None
30/11/2018	09:13–09:49	17.0–18.0	5–20	Still- light breeze	None
07/12/2018	08:03–08:40	17.1–17.8	0	Still- light breeze	None
14/12/2018	08:23–09:11	17.6–18.7	100	Still- light breeze	None
20/12/2018	09:52–10:21	23.9–24.8	50–60	Still- light breeze	None

HOLLOW BEARING TREE SURVEY

A hollow-bearing tree survey was carried out within the referral area. Hollow-bearing tree assessments were used to inform habitat assessments. Characteristics recorded included:

- diameter at breast height (dbh)
- tree height
- presence, abundance, and size of hollows
- GPS location
- suitability for Superb Parrot nesting.

Trees containing hollows suitable for Superb Parrot nesting were identified, namely trees with:

- a trunk diameter at breast height of at least 75 cm.
- hollows:
  - at least 4 m above the ground that were in or proximal to the main trunk
  - with near round entrance hollows about 11 cm across and within the range of 8–18 cm (Rayner et al., 2016).

BURROW SEARCHES

Opportunistic burrow searches were carried out using a torch to visually inspect and identify use by terrestrial fauna.

BIRD SURVEYS

Diurnal bird searches were completed within wooded areas by actively walking through habitat over a period of at least 30 minutes. Generally, the length of survey was relative to size of the area and the level of bird activity. Birds were identified to the species level, either through direct observation or identification of call. Diurnal bird surveys were completed during different times of the day, but generally occurred during morning hours or evening when birds are most conspicuous.

Table 2.11 Diurnal bird surveys

DATE	AREA SURVEYED	PERSON HOURS
10 October 2018	Referral area (precincts A and B)	1.5
19 October 2018	Box Gum Woodland	1
26 October 2018	Box Gum Woodland	0.5
9 November 2018	Referral area (precincts A and B)	1
	Referral area (grassland in precinct D)	1
12 November 2018	Referral area (grassland in eastern portion of precinct D)	1
30 November 2018	Box Gum Woodland	0.75
5 March 2019	Referral area (precincts A and B)	1
5 March 2019	Box Gum woodland	0.75
9 April 2019	Referral area (precincts A and B)	1
	Referral area (grassland in precinct D)	0.5
18 April 2019	Box Gum Woodland	0.5
27 March 2020	Referral area (grassland in eastern portion of precinct D)	1
19 June 2020	Referral area (precincts A and B)	0.75
19 June 2020	Box Gum Woodland	0.75
Total		**13.5**

2.4.3.3 OPPORTUNISTIC RECORDING OF FAUNA

Opportunistic sightings of animals were recorded including diurnal birds, amphibians, mammals and reptiles. Frog calls were identified, including surveys following rainfall events (9 November 2018, 14 December 2018, 19 June 2020). Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows etc, were also noted. This provided indirect information on animal presence and activity.

2.4.4 WEATHER

Condition of both vegetation communities and fauna habitat are subject to changes over time in association with weather and climatic conditions and disturbance events. The survey period was prolonged and variations in both vegetation condition and fauna habitat suitability were observed over this period. At the beginning of the survey period conditions were drier than average and temperatures higher than average, which lead to an intensification of drought conditions across much of the country during 2018-2019 (Bureau of Meteorology, 2019). In January to May 2020 above average rainfall was experienced in much of southeastern Australia, which led to soil moisture recovery (Bureau of Meteorology, 2020). Observations in vegetation condition over the survey period reflect these changes in rainfall, with much of the Site showing recent improvements in condition.

Mean monthly rainfall and temperate (minimum and maximum) for the survey period are displayed below in Table 2.12.

Table 2.12 Monthly mean weather conditions during survey period

DATE	TEMPERATURE (°C)		RAIN (mm)
	Minimum	Maximum	
August 2018	0.8	13.9	25.0
September 2018	1.8	18.0	36.6
October 2018	7.3	22.8	4.0
November 2018	10.5	24.5	85.8
December 2018	13.7	29.3	94.2
January 2019	17.7	34.5	62.6
February 2019	12.9	29.1	47.2
March 2019	12.0	26.0	24.6
April 2019	7.5	22.6	54.2
May 2019	3.3	16.6	52.0
June 2019	-0.1	14.1	20.6
July 2019	0.7	13.7	9.2
August 2019	0.1	14.2	20.4
September 2019	2.1	18.8	32.4
October 2019	6.2	23.6	20.8
November 2019	9.5	26.8	15.0
December 2019	13.1	31.7	0.0
January 2020	15.2	31.7	28.1
February 2020	15.1	27.7	93.2
March 2020	10.8	23.4	108.2
April 2020	7.9	18.9	83.8
May 2020	2.8	15.0	29.2
June 2020	1.3	13.5	55.2

Source: Climate data obtained from Bureau of Meteorology (2019), rainfall data from AWS 70307, temperature data from AWS 070351.

2.5 IMPACT ASSESSMENT METHODOLOGY

Potential impacts to Threatened ecological communities and Threatened species and their habitat as a result of the Project are summarised in Section 5. An assessment of the potential for significant impact to Threatened entities was considered with reference to Project avoidance, minimisation and mitigation (Section 6).

For all EPBC Act listed species with a moderate or higher likelihood of occurrence, significance assessments have been completed following the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines (Department of the Environment, 2013b). These assessemnts were based on the field survey results, habitat assessments and information regarding potential impacts and mitigation

2.6 CONSULTATION

Consultation and stakeholder engagement were undertaken as part of the community consultation for the project in 2020 and 2021. This included but was not limited to:

- three community meetings
- four meetings with stakeholder groups (Conservation Council, Ginninderra Catchment Group and Friends of the Grasslands
- a Site walkover with representatives of the ACT Conservator of Flora and Fauna.

This consultation informed the discussion of the existing environment, recommendations and mitigation measures provided.

WILLIAM SLIM DRIVE

BALDWIN DRIVE

CANOPUS CRESCENT

CHUCULBA CRESCENT

WANDERLIGHT AVENUE

DIAMANTINA CRESCENT

20-11 20-13 20-17 20-16 20-12 20-6 20-7 20-5 20-4 20-10 20-9 20-1 20-A1 20-14 20-8 19-8 20-2 18-6 18-2 18-1 20-3 19-7 18-5 18-4 20-15 18-3

D6 Q5 D3 D4 D5 D1 D7 Q9 D2 Q3 Q6 C1 B1 A1 Q1 B2 Q7 A2 Q2 Q8

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Lawson North Residential Development Biodiversity Assessment

Figure 2.2
Survey Effort

Legend

- Vegetation Quadrat
- Invertebrate transects
- Referral Area
- Development Impact Area - Permanent
- Development Impact Area - Temporary
- DHA Site
- Striped Legless Lizard grids
- Conservation Area

0 100 200 Metres

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:6,000 Date: 10/05/2022

Data sources: - ACTiMap, Geoscience Australia

3 RESULTS

This section provides a summary of the results of the desktop assessment, field surveys, and the ecological characteristics of the referral area. Reference to the survey results from the broader Site is provided where appropriate for context.

The referral area consists of the old housing estate and adjacent areas. This area has been significantly modified as a result of previous development and consists predominantly of exotic flora species and a remnant road network.

3.1 VEGETATION

Much of the Referral area has been highly modified as a result of previous development and landuse and much of it now occurs as a mix of exotic and native plantings with an understorey of low native diversity consisting of exotic pasture and weed species as well as common disturbance tolerant native grasses.

The Site contains significant remnant patches of high conservation value remnant vegetation communities. While most these areas are proposed for retention and conservation, the proposed action would would impact on a portion of these high value communities including areas of Box Gum Grassy woodland and derived grassland and areas of Tablelands dry tussock grassland.

A total of 228 species of flora were recorded within the referral area. Of these, 121 (53%) were native species. The quadrat data is presented in Appendix A. No Threatened species of flora were recorded within the Site.

Vegetation communities recorded within the Site are summarised below in Table 3.1. Descriptions of the vegetation communities within the referral area are provided below.

Table 3.1 Vegetation communities recorded within the Site

PLANT COMMUNITY	TOTAL DEVELOPMENT IMPACT	RETAINED IN SITE (HA)
Tablelands Dry Tussock Grassland	21.88	84.65
Box-Gum Grassy Woodland and Derived Grassland	1.31	7.65
Native Amenity Planting	0.33	2.12
Miscellaneous Ecosystems	18.73	9.88
Total area	**42.25**	**104.30**

(1) The area investigated for development which was subject to a constraint's assessment. Not all of the vegetation within this area will be impacted for the proposed development.

3.1.1 TABLELANDS DRY TUSSOCK GRASSLAND

The Site contains areas of dry tussock natural temperate grassland. This community corresponds to Tablelands Dry Tussock Grassland (ACT01). Three sub-associations are present within the referral area:

- *Themeda* grassland
- *Rytidosperma* grassland
- *Austrostipa* grassland.

The sub-associations are described below.

3.1.1.1 *THEMEDA* GRASSLAND

This vegetation sub-association is dominated by *Themeda triandra*. Other species include *Austrostipa bigeniculata, Bothriochloa macra, Joycea pallida, Leptorhynchos squamatus, Convolvulus angustissimus, Calocephalus citreus, Oxalis perennans, Goodenia pinnatifida, Triptilodiscus pygmaeus, Rumex dumosus,* and *Chrysocephalum apiculatum.*

Photo 3.1 Themeda Grassland

Exotic species were generally uncommon but found in small localised patches particularly in proximity to the drainage line or where past human disturbance from vehicles, development and associated infrastructure was evident (7.8% exotic groundcover within referral area quadrats. An average Floristic Value Score (FVS)[1] of 10.15 was recorded within this vegetation community across the referral area. Exotic species included *Echium plantagineum*, *Nasella trichotoma, Trifolium* spp., *Hypericum perforatum, Paspalum dilatatum, Tragopogon porrifolius, Holcus lanatus, Phalaris aquatica, Bromus hordaceus, Taraxacum officinale, Plantago lanceolata, Conyza albida* and *Hypocaheris radicata.* Common garden plantings were also recorded such as *Prunus* sp., *Cotoneaster* sp. and *Rosa rubiginosa.*

Due to the high cover of *Themeda triandra*, this vegetation association is consistent with the Threatened natural temperate grassland community (see section 4.1.1).

This is equivalent to:

- *Themeda australis – Rytidosperma sp. – Poa sieberiana* moist tussock grassland of the South Eastern Highlands bioregion.

3.1.1.2 *RYTIDOSPERMA* GRASSLAND

This vegetation sub-association generally consisted of a low open tussock grassland with inter tussock spaces of bare earth and lichen. This vegetation was dominated by *Rytidosperma carphoides, Rytidosperma caespitosa, Austrostipa bigeniculata, Austrostipa scabra, Bothriochloa macra, Vittadinia muelleri, Chrysocephalum apiculatum, Goodenia pinnatifida.* Other common species included *Triptilodiscus pygmaeus* and *Rumex dumosus.* Weed cover was relatively low (average of 17.2% exotic groundcover within referral area quadrats) and *Rytidosperma* grassland exhibited the highest diversity of native plant species compared to the other sub-associations within the Site. Due to floristic value, this vegetation association is consistent with the Threatened natural temperate grassland community (see section 4.1.1).

Photo 3.2 Rytidosperma Grassland

[1] Floristic Value Score is a method of measuring the quality of a grassland site, based on Rehwinkel REHWINKLE, R. 2015. A Revised Floristic Value Scoring Method to assess grassland condition *In Grass half full or grass half empty? Valuing native grassy landscapes,* Proceedings of the Friends of Grasslands 20th anniversary forum. and is used in determining consistency of native grassland with the Threatened ecological community *Natural Temperate Grassland of the South Eastern Highlands* ACT SCIENTIFIC COMMITTEE 2020a. Conservation Advice Natural Temperate Grassland..

This association is equivalent to:

- North-western & Eastern Wallaby Grass - Red-grass Tussock Grassland (Rehwinkel, 2009)
- *Rytidosperma sp. – Austrostipa bigeniculata – Chrysocephalum apiculatum* tussock grassland of the South Eastern Highlands bioregion (Armstrong et al., 2013).

3.1.1.3 *AUSTROSTIPA* GRASSLAND

Austrostipa grassland is a tall open tussock grassland. This vegetation sub-association was dominated by *Austrostipa bigeniculata, Austrostipa scabra, Bothriochloa macra, Vittadinia muelleri, Panicum effusum.*

Species diversity was relatively low and weed species common in patches (average 36% exotic groundcover within referral area quadrats). Common weed species included *Avena spp*., *Nasella trichotoma, Hypericum perforatum, Echium plantagineum, Hypochaeris radicata, Avena sp, Vulpia myuros* and *Aira caryophylla.*

Photo 3.3 Austrostipa grassland

This association is equivalent to:

- *Rytidosperma sp. – Austrostipa bigeniculata – Chrysocephalum apiculatum tussock grassland of the South Eastern Highlands bioregion* (Armstrong et al., 2013).

3.1.2 BOX GUM GRASSY WOODLAND AND DERIVED NATIVE GRASSLAND

This community occurs in the southern section of the Site. This community corresponds to *Eucalyptus melliodora – E. blakelyi* Tableland Grassy Woodland (ACT 16) vegetation type.

This community occurs as a grassy open woodland dominated by *Eucalyptus melliodora* and *Eucalyptus blakelyi*. The ground layer is dominated by native grasses and forbs including *Austrostipa* spp., *Chrysocephalum apiculatum, C. semipapposum, Bothriochloa macra* and *Goodenia pinnatifida*. There is extensive regeneration of Eucalyptus saplings in this area.

Common weeds in this area include *Nasella trichotoma, Hypericum perforatum* and *Echium plantagineum*.

Photo 3.4 Box Gum Grassy Woodland in west

Photo 3.5 Box Gum Grassy Woodland regrowth in east

3.1.3 NATIVE AMENITY PLANTING

The eastern boundary of the Site contains native amenity plantings predominantly of *Eucalyptus cinerea*. The understory consisted of moderate leaf litter and a sparse understorey of native species consistent with adjacent vegetation including *Themeda triandra, Bothriochloa macra, Austrostipa bigeniculata, Rytidosperma* spp, *Chrysocephalum apiculatum* and *Vittadinia muelleri*. Despite the planting of non-local tree species, this community includes areas of understorey consistent with consistent with Natural Temperate Grassland or Box Gum Woodland threatened ecological communities.

Photo 3.6 Native amenity planting

3.1.4 MISCELLANEOUS ECOSYSTEMS

The majority of the referral area was previously a residential subdivision and has been significantly modified as a result. This area (predominantly in Precincts A and B) consisted of exotic vegetation dominated by native and exotic plantings associated with gardens, suburban landscaping and residential development with a predominantly exotic ground cover.

This area was dominated by exotic or non-local native plantings including *Pinus radiata, Eucalyptus bicostata, Cupressus sempervirens, Celtis australis, Quercus* and *Ulmus* species. Small numbers of locally native tree species were recorded, including *Eucalyptus mannifera* and *Casuarina cunninghamiana,* the majority of which were thought to have been planted due to their location in the landscape.

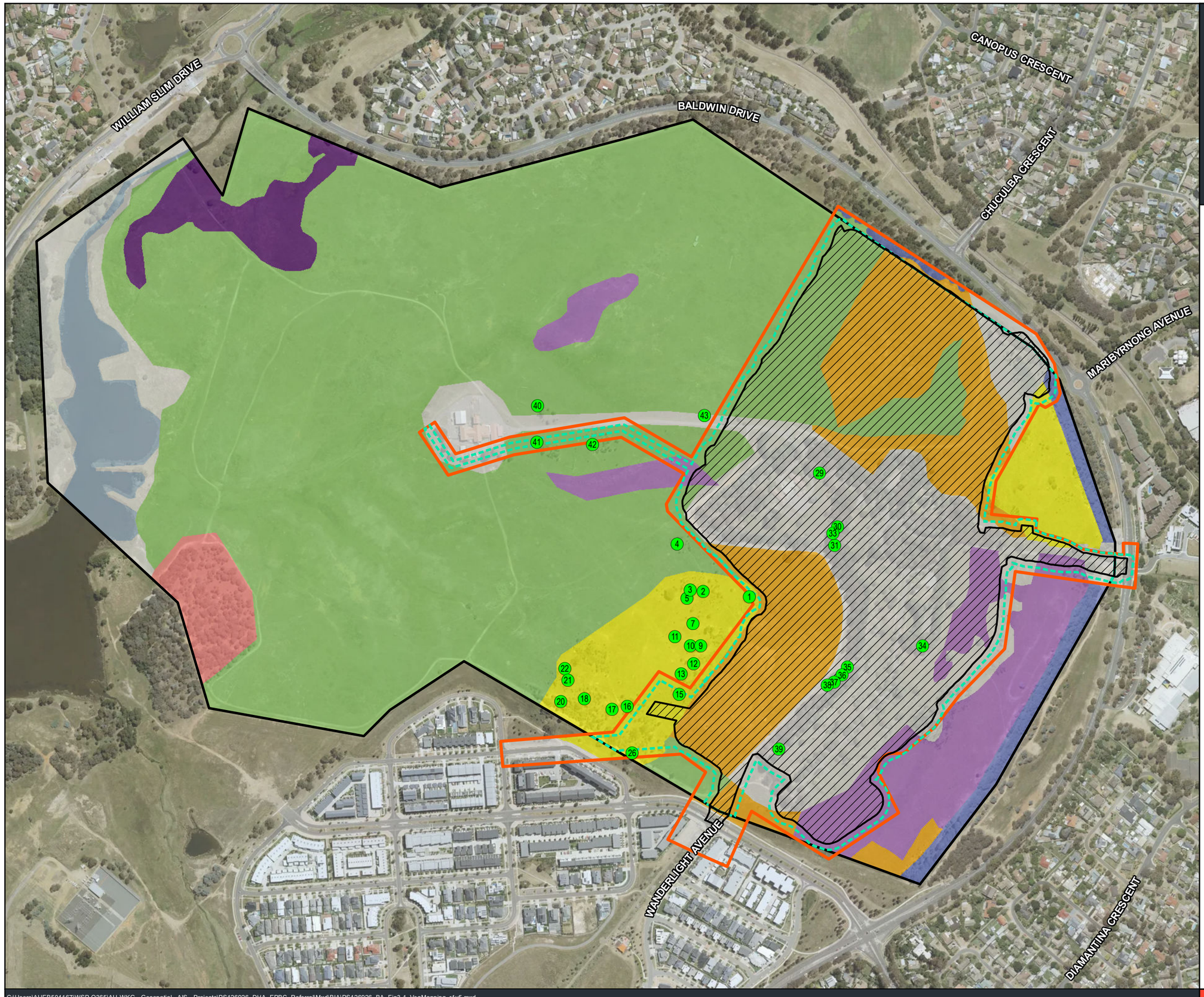
Shrubs or small trees included common urban plantings such as *Crataegus* sp, Cotoneaster *sp, Cotinus coggygria, Prunus sp, Rhododendron sp., Rosmarinus officinalis, Syringa vulgaris, Arbutus unedo, Nerium oleander,* and *Acacia baileyana.* The groundcover is predominantly exotic and includes *Vinca herbacea, Nasella trichotoma, Setaria sp., Paspalum dilatatum.*

Photo 3.7 Miscellaneous ecosystems, landscaping

Photo 3.8 Miscellaneous ecosystems, garden plantings

Patches of grassland dominated by exotic species occur within the referral area including a large area in the north east of the fenced area. This vegetation type is dominated by exotic species such as *Avena sp., Paspalum dilatatum, Tragopogon porrifolius, Holcus lanatus, Nasella trichotoma, Plantago lanceolata, Taraxacum officinale*, *Hypericum perforatum, Echium plantagineum, Trifolium* spp., *Hypericum perforatum, Phalaris aquatica, Bromus hordaceus., Conyza albida, Hypocaheris radicata* and *Carthamus lanatus.*

Photo 3.9 Exotic grassland in Precinct A



Lawson North Residential Development Biodiversity Assessment

Figure 3.1
Vegetation mapping

Legend

- Habitat Trees
- Referral Area
- Development Impact Area - Permanent
- Development Impact Area - Temporary
- DHA Site

Vegetation communities

- Austrostipa grassland
- Box Gum Woodland and derived native grassland
- Dry Themeda grassland
- Wet Themeda grassland
- Miscellaneous ecosystems
- Native Amenity Planting
- Planted Woodland
- Rytidosperma grassland
- Water

0 100 200 Metres

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:6,000 Date: 10/05/2022

Data sources: - ACTiMap, Geoscience Australia

3.2 FAUNA HABITATS

Fauna habitat within the referral area include native grassland, native woodland, and exotic vegetation.

A large portion of the referral area is dominated by a disturbed exotic groundlayer and planted vegetation which includes both native and exotic midstorey and canopy species. This type of habitat is highly modified and provides habitat for common native and exotic fauna species which utilise small areas of habitat and are tolerant of some disturbance. Areas of remnant native vegetation also occur within the referral area and adjacent area which include native grassland and native woodland (Box Gum Woodland).

Table 3.2 Fauna habitat within the referral area

HABITAT DESCRIPTION	CORRESPONDING VEGETATION COMMUNITY	DEVELOPMENT IMPACT AREA (HA)
Native grassland	Tablelands Dry Tussock Grassland	21.88
Native woodland	Box Gum Grassy Woodland and derived grassland Native Amenity Planting	1.64
Planted woodland	Miscellaneous ecosystems	18.73
Total		**42.25**

3.2.1 PLANTED WOODLAND

Much of the development area is within the old naval village. This area is dominated by a mix of native and exotic shrub and tree plantings with a disturbed ground layer consisting of exotic species and disturbance tolerant native grass species. This habitat does not correspond to any native vegetation community and has been subject to substantial human disturbance, such as clearing for previous development and associated infrastructure and landscaping maintenance. Consequently, this habitat is suited to those native and introduced fauna species that have adapted to open, modified environments.

Planting of canopy species has created a woodland habitat. Native canopy species and exotic fruit trees provided potential foraging resources for canopy nectarivorous fauna, such as birds and bats, during the various blossom cycles of those species planted. Further, planted trees with moderate canopy condition provided potentially suitable breeding opportunities for canopy nesting birds that are tolerant of disturbance and edge effects. In addition, 10 hollow-bearing trees were recorded in this area which may provide habitat for hollow-dependent species. Woody debris was limited, not occurring within much of the development area, and there were limited cover opportunities (such as mosaic shrub layer) for small animal species.

Photo 3.10 Exotic vegetation

Photo 3.11 Exotic vegetation

Photo 3.12 Exotic vegetation

3.2.2 GRASSLAND

The referral area contains grassland habitat. The majority of the grassland is dominated by native grasses. Areas adjacent to the historic development and subject to past discutrbance including landfill and drainage works contain a higher abundance of weed species compared to those areas within the conservation area.

Past disturbance of grassland habitats within the Referral area was evident including weed invasion, less diverse sward structure, and lack or of limited occurrence of habitat features such as surface rock, and arthropod burrows. Despite disturbance and modification, habitats within the Referral area provide habitat for a range of invertebrates, birds, amphibians, reptiles and mammals which are suited to open environments. This habitat type does not naturally support a high diversity of fauna species due to the limited variation in habitat structure within grassland communities, however it is important for specialist grassland fauna species which depend on native grasslands. Many specialist grassland species are threatened by extinction due to the extensive modification or removal of grasslands since European occupation increasing the importance of remaining native grassland habitats.

The dominant functional groups of fauna recorded were common open country medium sized birds (e.g. Cockatoos, Ravens, White-winged Chough, Magpies, Magpie-larks, Rosellas, Red-rumped Parrots and Galahs). In addition, fairly common highly mobile raptor species were observed over the investigation area, including, Black-shouldered Kite and Nankeen Kestrel. Lake Ginninderra in the west of the Site (outside of the development area) also provides wetland habitat for wetland birds and amphibians. In addition, the drainage line and surrounding vegetation on the eastern edge of the development boundary provides some habitat for amphibians.

The referral area contains suitable habitat for specialist grassland species including threatened Golden Sun Moth, Striped Legless Lizard, Perunga Grasshopper and the rare Canberra Raspy Cricket.

In addition, other native grassland fauna including birds, reptiles, amphibians, and invertebrates may utilise this habitat.

Introduced species recorded in this area included the European Hare, Fox, and European Rabbit.

3.2.3 NATIVE WOODLAND

Native woodland within the site includes two patches of native Box Gum Woodland and areas of native amenity planting on boundary of site. These areas generally have open woodland structure with native grasses and forbs in the groundcover. Localised areas of weeds occur particularly under the canopy of open Box Gum Woodland in the west of the Site.

Native woodland provide potential habitat for woodland species. These areas contain a mix of mature remnant trees as well as localised regeneration of canopy species. The density of hollows, fallen timber and woody debris and mistletoe was low. These characteristics reduce the usability of the area for fauna species that are dependent on higher quality woodland habitat, of larger size and structural complexity to provide a diversity of cover and foraging opportunities. The woodland provides habitat for common native species of urban Canberra including Common Brush-tail Possum, bats and birds adapted to open woodland habitat. Species recorded included Red-rumped Parrot, Grey Fantail, Galah and Crimson Rosella as well as introduced species such as Fox, Starlings and Common Myna. The diversity of small birds was relatively low and limited to common species such as Superb Fairy-wren and Yellow-rumped Thornbill.

Areas dominated by eucalypt plantings

Although not recorded, the woodland provides potential habitat for Threatened species including Superb Parrot, Grey-headed Flying-fox, White-winged Triller, Scarlet Robin, and Little Eagle. In addition, some marginal habitat within the patch exists for Golden Sun Moth (in patches where canopy cover is low or absent) and Perunga Grasshopper.

The combination of the above characteristics reduces the usability of woodland for fauna species that are dependent on higher quality habitats, which contain sufficient complexity to provide a diversity of cover and foraging opportunities. The limited woodland connectivity across the Site and surrounding areas hinders the ability of less mobile species to move across the landscape.

3.2.4 HOLLOW-BEARING TREES

Thirty-three trees/stags containing hollows or spouts which could be utilised by hollow-dwelling species were identified within the Site. Of these, 14 are located within the Referral area. Data collected from the hollow-bearing tree survey is presented in Appendix B and hollow-bearing tree locations shown on Figure 3.1. Common hollow nesting bird species Galah and Crimson Rosella were observed utilising hollows within the referral area. Starlings were observed to be abundant and Common Myna was also observed, particularly in the Box Gum Woodland in the west of the Site. Both are pest species which nest in hollows and may be utilising hollows within the Site.

While no records occur within the Site, a number of less common species of bird such as Gang-Gang Cockatoo, Yellow-tail Black-Cockatoo and the Threatened Superb Parrot may utilise suitable hollow bearing trees within the Site.

Superb Parrot is selective about hollows used for breeding. Hollow-bearing trees were assessed in accordance with the dimension preferences observed by the species in the ACT (Rayner et al., 2016), and eight eucalypts were identified as having hollows of suitable size and location on the tree for potential utilisation by the species. Of these, three are located within the Referral area. The locations of trees considered to have suitable hollows for Superb Parrots are presented in Figure 4.4. Within the Box Gum Woodland, hollow-bearing trees consisted of *Eucalyptus blakelyi* and *E. melliodora*. Within the former naval village, dominant eucalypts were *E. bicostata* and *E. mannifera.*

Photo 3.13 Hollow-bearing Eucalypt with the potential to provide nesting habitat for Superb Parrot in former naval village

Photo 3.14 Hollow-bearing Eucalypt with the potential to provide nesting habitat for Superb Parrot in Box Gum Woodland

3.3 FAUNA SURVEY RESULTS

Across the targeted and incidental fauna surveys completed for this assessment, 51 fauna species were recorded within the referral area (Table A.11), including five introduced species, Brown Hare, European Red Fox, European Rabbit, Common Starling, and Common Myna. Two Threatened species, Golden Sun Moth and Striped Legless Lizard were recorded within the referral area. In addition, one other Threatened species, Perunga Grasshopper, was recorded within the broader Site. The results of the targeted fauna surveys are detailed in the following sections.

3.3.1 GOLDEN SUN MOTH

Golden Sun Moth was detected in both exotic and native-dominated grassland areas. The results are provided in Appendix A and summarised in Table 3.3.

Areas of habitat were mapped based on areas dominated by high quality native vegetation including known food sources and appropriate inter-tussock space and records of males flying. Scattered individuals were also observed outside these areas as shown in Figure 4.5. In total, approximately 11.7 hectares of habitat was mapped in the impact area, with an average density of 11 male Golden Sun Moth per hectare.

The highest density of Golden Sun Moth within the referral area was observed within areas dominated by dense cover *Themeda triandra,* which is not commonly reported as habitat for the species. These areas did however, contain small localised areas of more open grassland which included preferred grasses including *Rytidosperma* spp.

Table 3.3 Golden Sun Moth habitat and density estimates

PATCH	HABITAT NOTES	DENSITY ESTIMATE (MALES PER HECTARE)	AREA OF HABITAT IMPACTED (HA)
G1	Good condition vegetation, dominated by preferred species such as *Rytidosperma* spp. and *Austrodanthonia*.	7	0.14
G2	Moderate condition, includes patches of preferred habitat.	9	0.48
G3	Dominated by dense *Themeda triandra*, known food source occurred in small localised patches on higher ground.	24	0.22
G4	Dominated by dense *Themeda triandra*, known food source occurred in small localised patches.	17	1.26
G5	Dominated by *Themeda triandra*, known food sources scattered throughout in low density.	21	1.64
G6	Sparse grassland dominated by *Austrostipa bigeniculata*, *Bothriochloa macra* and exotic pasture species. Good condition grassland including C3 grasses in the southern section.	1	5.78
G11	Good condition vegetation, dominated by preferred species such as *Rytidosperma* spp. and *Austrodanthonia*.	35	0.46
G12	Patch of sparse grassland with high cover of *Rytidosperma* spp. Past disturbance evident. Tall grassland with dense weeds in surrounding area.	22	1.66
Total			**11.6**

3.3.2 STRIPED LEGLESS LIZARD

Previous pitfall trapping undertaken within the Site (HLA Envirosciences, 2002) recorded the species in two trapping arrays within the Dry *Themeda* grassland in the east of the Site. Additional surveys in the planted woodland in the southwest of the Site, and in both patches of Box Gum Woodland and Derived Native Grassland failed to detect the species (SMEC Australia, 2008). A shed Striped Legless Lizard skin was previously identified within the fenced area in the western section of the Site (Ryan Walsh, pers. comm. in SMEC Australia, 2008).

In 2018, as part of this assessment, one individual was recorded in the development area (grid D1) during targeted surveys for the species. The species was also recorded within the broader Site, in areas proposed for conservation at grid A1, A2 and D6 (Figure 4.4). The species was recorded at low densities to the west of the referral area(one record at grid D6), and in higher densities to the east in dense *Themeda* Grassland (grid A1 and A2). Up to eight individuals were recorded at grid A2 during a single survey. Appendix B details survey results from artificial shelter site surveys across the Site.

While there was a low incident of records within the Referral area (one), there remains potential for the species to persist in other areas impacted by the development where suitable habitat exists. Potential habitat exists in areas of native grassland and open woodland; and additionally, in the exotic grassland. Exotic grassland within Precinct A of the DCP is considered unlikely to be potential habitat for the species due to the sparse cover and low height of tussock grasses and the history of soil disturbance.

Within the Site, the habitat quality has been assigned with consideration of the structure and density of grass tussocks, the number of records, past soil disturbance, and the presence of canopy cover. The following habitat quality categories have been assigned:

- High– Occupied habitat with dense grasses. This includes Dry Themeda Grassland where the species was recorded at relatively high density during current surveys and has a persistent population as indicated by historic records. Adjacent areas with high density of grass, lacking canopy cover are also included as high quality, despite high cover of exotic species.
- Moderate – Occupied habitat, at low density. Species recorded during current surveys at low density or in adjacent habitat, historic surveys also suggest low density with only one shed skin previously recorded. Moderate cover of grasses. This includes Rytidosperma Grassland, and Austrostipa Grassland and exotic grassland in the north of the Site.
- Low– Species not recorded during current or previous surveys in these areas and areas lack dense grass structure preferred by species. Some areas are shaded by canopy trees. This includes grassland in the south west of the Site and Box Gum Woodland and Derived Native Grassland. Species may utilise these areas at low density if habitat condition improves in these areas or as refuge site.

3.4 CRITICAL HABITAT

Critical habitat is listed under the NC Act and/or the EPBC Act. Critical habitat is the whole or any part or parts of an area or areas of land comprising habitat critical to the survival of an endangered species, population or ecological community.

Critical habitats are areas of land that are crucial to the survival of particular Threatened species, populations and ecological communities.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community.

No critical habitat listed under the EPBC Act exists within the development area. Listed critical habitat for *Lepidium ginninderrense* exists to the west of the proposed development within the conservation area (over 900 m to the west of the referral area.

Due to the disturbed and degraded nature of the habitat available for Threatened species within the development area, and the ongoing disturbance associated with the urban environment, it is not considered to contain critical habitat for Threatened species.

3.5 ACT REGISTERED TREES

Trees of exceptional value are protected and identified under the ACT *Tree Protection Act 2005* (TP Act) across leased and unleased urban land. The trees protected by the TP Act are provided for in the ACT Tree Register.

No trees protected under the TP Act are located within the Site. Arborist reports provide further information on the trees within the development area (Canopy Tree Experts, 2018, Tait Network, 2019).

3.6 WETLANDS

Wetlands of International Significance (RAMSAR wetlands) are listed as MNES under the EPBC Act. The EPBC protected matters search tool identified four wetlands of international significance (Department of the Environment and Energy, 2019i):

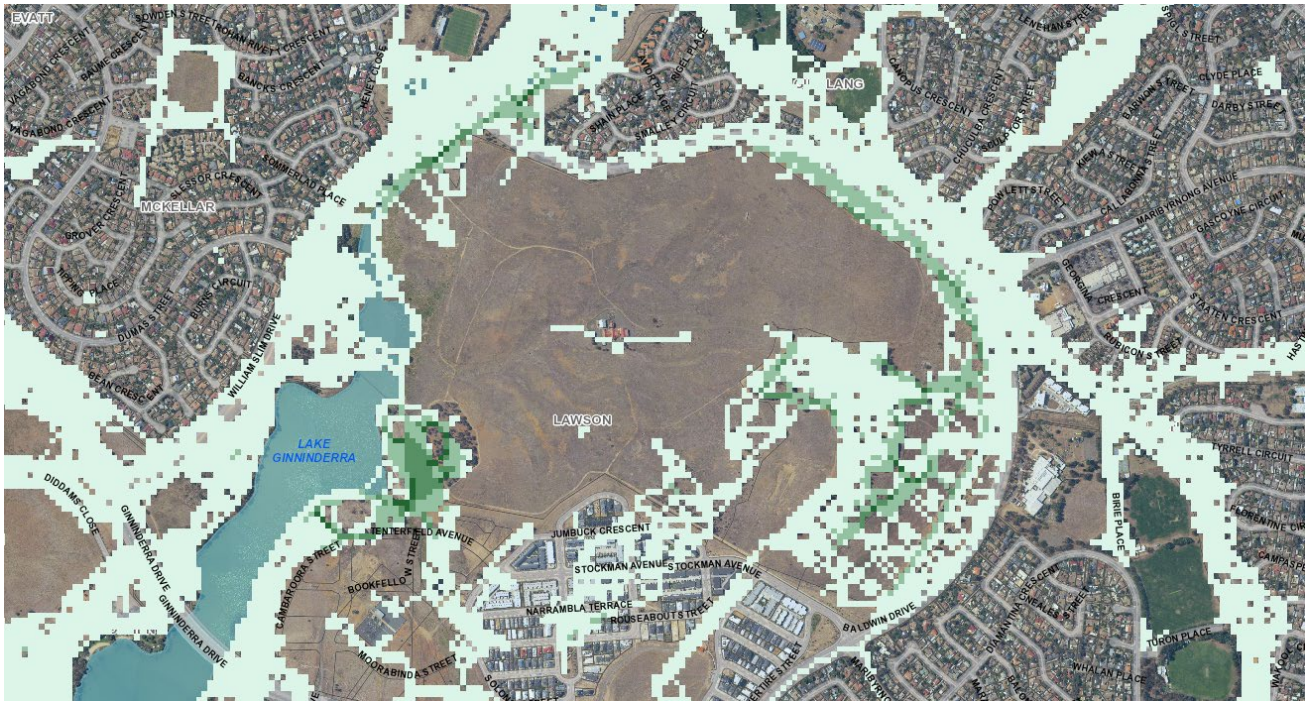
- Banrock station wetland complex.
- Hattah-kulkyne lakes.
- Riverland.
- The coorong, and lakes Alexandria and albert wetland.

These wetlands are located 500–900 km downstream from the Site. Given the distance of these wetlands and the lack of disturbance to waterways, the Project is unlikely to impact on Wetlands of International Significance.

3.7 HABITAT PATCHES AND CONNECTIVITY

Wildlife corridors can be defined as 'retained and/or restored systems of (linear) habitat which, at a minimum enhance connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation' (Wilson and Lindenmayer, 1995). Corridors can provide ecological functions at a variety of spatial and temporal scales, from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions.

Areas mapped as functional linkages between core habitat exist within the Site (Figure 3.2). Specifically, a majority of these areas overlay woodland habitat; both planted and remnant vegetation.



Source: (ACT Government, 2020)

Notes this map shows functional linkages between core habitat areas[2]. Value of linkages are classified as low, moderate, high and very high. Low value is shown in palest green, and high value shown in the darkest green.

Figure 3.2 Local (functional) links – functional canopy connection between core habitat

The Referral area consists of exotic dominated vegetation with stands of planted native and exotic canopy species, remnant Box Gum Woodland, and areas of native grassland.

The vegetation within the Site is connected to vegetation along Lake Ginninderra and Ginninderra Creek, a linkage to the north consisting of Urban Open Space between the suburbs of Giralang and Kaleen and vegetation within road reserves in surrounding developments. For the most part, the vegetation within the Site is relatively isolated from other areas of vegetation in the landscape with the exception of these few connections. Planted and remnant trees provide foraging habitat for highly mobile bird and bat species and provide linkages that may be used by species that would not otherwise move across the open landscape matrix. Additionally, areas of grassland are used by terrestrial species including kangaroos. Connectivity for terrestrial species is limited byexisting development including road network and high security fencing which occurs around the western portion of the site.

[2] Generalist 'paddock tree links' based on 105 m gap crossing threshold. High values indicate more paths were found linking higher quality habitat, i.e. important for local (stepping stone) connectivity between larger high value habitat patches. These links are considered functional.

The referral area, positioned within a larger area of vegetation remaining in an urban setting (the Site), plays a role in maintaining local connectivity between the remaining patches of habitat across the Site and landscape. Functional linkages will be retained along the northern and eastern boundaries of the Site. Additionally, linkages associated with Lake Ginninderra and Ginninderra Creek will not be impacted. In addition to amenity planting found within the old development (including heritage windbreak), additional tree planting and landscaping on site will maintain connectivity for birds.

3.8 OTHER SIGNIFICANT SPECIES

Canberra Raspy Cricket (*Cooraboorma canberrae*) is known to occur within the broader Site. This species is not listed under the NC Act or the EPBC Act, but is considered to be a rare species, endemic to the ACT and adjacent areas of NSW. Potential habitat for this species exists in native grassland within the Site. The species was recorded during surveys within *Rytidosperm*a grassland in the west of the Site; previous records also come from this general location within the Site (ACT Government, 2020).

Key's Matchstick Grasshopper (*Keyacris scurra*) is not listed under the NC Act or EPBC Act, however in 2019 the NSW Threatened Species Scientific Committee undertook a Conservation Assessment for the species and proposed for it to be listed as Endangered under the *NSW Biodiversity Conservation Act 2016* and the EPBC Act (NSW Threatened Species Scientific Committee, 2019*)*. This species is considered to be eligible for listing due to its inferred restricted geographical range, severe fragmentation, historical and inferred ongoing decline in abundance, habitat availability and quality, and ongoing threats including poor understanding of management requirements (NSW Threatened Species Scientific Committee, 2019). The species has been recorded approximately two kilometres to the northeast of the Site at the Gungahlin Cemetery (ACT Government, 2020) and has also been recorded in the ACT at Kambah, Tuggeranong Hill, and Mulligans Flat (NSW Threatened Species Scientific Committee, 2019). Based on current knowledge of species habitat, there is potential for the species to occur in native grassland habitat, the species has not previously been recorded within the Site, however this may reflect the fact that it is a cryptic species which is likely to be more active at night (NSW Threatened Species Scientific Committee, 2019).

The Gang-gang Cockatoo occurs from southern Victoria through to south and central-eastern NSW including the ACT where is occurs regularly (Department of Environment and Conservation, 2005a). The species is a common, breeding resident/ altitudinal migrant in the ACT and is commonly recorded in the gardens of Canberra's inner suburbs near bushland reserves (Canberra Ornithologists Group, 2020). While common in the ACT, the species is listed as Vulnerable in NSW under the *Biodiversity Conservation Act 2016*. The species is generally found in tall mountain forests and woodlands in the spring and summer, and preferences heavily timbered and mature wet sclerophyll forests (Department of Environment and Conservation, 2005a). In autumn and winter, the species often moves to drier more open eucalypt forests and woodlands at lower altitudes. The species nests in tree hollows that are 10 cm in diameter or larger and at least 9 m above the ground (Department of Environment and Conservation, 2005a). Gang-gang Cockatoo was not recorded during surveys, nor has it previously been identified on Site. However, records of this species are abundant in adjacent suburbs and surrounding Lake Ginninderra (Atlas of Living Australia, 2020). Suitable habitat within the referral area is present for this species, including the presence of hollow-bearing trees which could be used for breeding.

4 THREATENED BIODIVERSITY

4.1 THREATENED ECOLOGICAL COMMUNITIES

4.1.1 NATURAL TEMPERATE GRASSLAND OF THE SOUTH EASTERN HIGHLANDS

Natural Temperate Grassland of the South Eastern Highlands is listed as Critically Endangered under both the EPBC Act and NC Act. This community is mapped as occurring in part of the referral area and across the broader Site (ACTmapi).

4.1.1.1 EPBC ACT

Within the development area, Tablelands Dry Tussock Grassland broadly corresponds to the EPBC Act listed *Natural Temperate Grassland of the South Eastern Highlands* community (Table 4.1).

Table 4.1 Key diagnostic characteristics of EPBC Act listed *Natural Temperate Grassland of the South Eastern Highlands*

NATURAL TEMPERATE GRASSLAND OF THE SOUTH EASTERN HIGHLANDS	CONSISTENCY OF SITE WITH DIAGNOSTIC CHARACTERISTICS
Sites are generally confined to the South Eastern Highlands bioregion.	Yes
Sites typically occur at elevations between 350–1200 m above sea level, but may occur as low as 250 m, due to influences of local microclimate.	Yes
Native grasses usually are dominant and include one or more of the following, depending on the association present: – The major dominant or co-dominant grass species in NTG–SEH are: *Themeda triandra* syn. *T. australis* (Kangaroo grass), *Poa sieberiana* (Snowgrass), *Poa labillardierei* (River Tussock Grass), *Austrostipa bigeniculata* (Kneed Speargrass), *Austrostipa scabra* (Slender speargrass), *Bothriochloa macra* (Red Grass), various *Rytidosperma* species syn. *Austrodanthonia* species (Wallaby Grasses) and *Lachnagrostis* spp. (Blowngrasses). – Other grasses that commonly occur, and might form a dominant area within a patch, include *Aristida* spp. (Wiregrasses), *Austrostipa densiflora* (Fox-tail Speargrass), *Dichelachne* spp. (Plume Grasses), indigenous *Eragrostis* spp. (Lovegrasses) and *Poa meionectes* (Fine-leaf Tussock-grass, Short Snowgrass). – Other grasses that are frequently present, though seldom dominant, include *Anthosachne scaber* syn. *Elymus scaber* (Common Wheatgrass), *Panicum effusum* (Hairy Panic), *Chloris truncata* (Windmill Grass), and *Enneapogon nigricans* (Nine-awned Grass).	Yes
Native sedges may be dominant or co-dominant in some associations, typically *Carex appressa* (Tussock Sedge) or *C. bichenoviana* (Plains Sedge).	Yes, in wetter areas

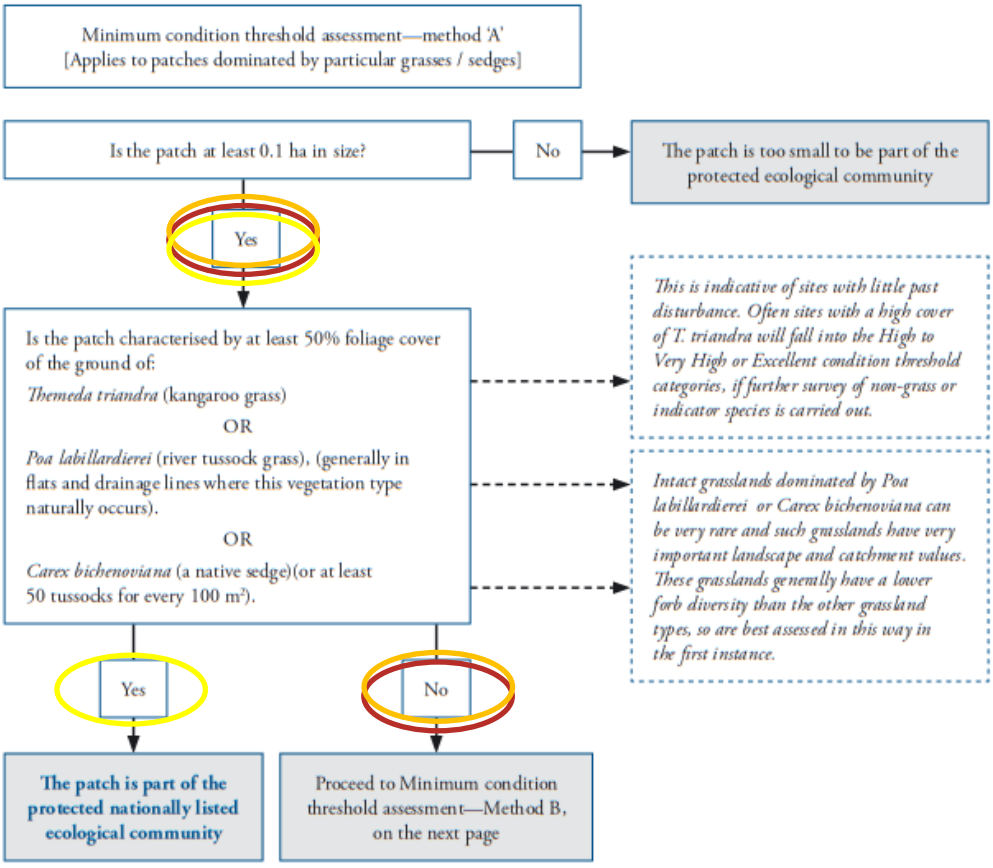
NATURAL TEMPERATE GRASSLAND OF THE SOUTH EASTERN HIGHLANDS	CONSISTENCY OF SITE WITH DIAGNOSTIC CHARACTERISTICS
Typically, a range of native forb species are present, or, in recently disturbed Sites, components of the indigenous native species (including both existing plants and reproductive propagules in the soil e.g. soil seed banks) are present that are sufficient to re-establish the characteristic native groundcover. Typical forb species for each of the defined associations are outlined in Armstrong et al. (2013). Species that are known to occur are also listed in Appendix A, Table A.1.	Yes
A tree, shrub or sub-shrub layer may be present, with up to 10% Projective foliage cover of each layer being present.	Yes, tree and shrub layer absent.
The area is not a derived or secondary grassland (i.e. a grassland derived from clearing of a woodland or forest community), as assessed by the following criteria: There is no evidence of trees formerly occurring on the Site in a density greater than that which would produce a 10% Projective foliage cover (e.g. there are no stumps, regularly spaced depressions in the ground that were once occupied by tree stumps and that may or may not retain pieces of dead timber, or significant amounts of fallen timber, and/or there are no trees of woodland or forest tree species in a woodland or forest formation adjacent to or near the Site, on similar topographical positions and geological substrates); if these signs are evident, then the Site is likely to be a derived or secondary grassland. As a derived grassland, it may be part of another Threatened ecological community that is listed nationally (EPBC Act) or under ACT, NSW or Victorian legislation. - Natural grasslands in some regions are restricted to frost hollows or on heavy soils, where trees will not usually persist. Sites that are difficult to determine as natural or derived grassland should be considered to be part of NTG–SEH, if they otherwise meet the Description and Key Diagnostic Characteristics.	The majority of the areas mapped as Tableland dry tussock grassland are likely to be natural grasslands as supported by historic photos. Box gum woodland is regenerating or expanding within the Site. Areas adjacent to the woodland have been included in dry tussock grassland community where there is no evidence of clearing and historic photographs show this area as grassland.
CONCLUSION: Tablelands dry tussock grassland broadly corresponds to the listed community	

As Tablelands Dry Tussock Grassland is broadly consistent with the key diagnostic characteristics outlined in Natural Temperate Grasslands in the Approved Conservation Advice (Threatened Species Scientific Committee, 2016), a condition threshold assessment was undertaken to determine if condition meets the listing criteria. Condition threshold assessments (Figure 4.1 and Figure 4.2) were undertaken on 21 quadrats following the patch definition outlined in the Approved Conservation Advice (Threatened Species Scientific Committee, 2016a). Appendix A summarises the condition threshold assessment findings:

- Areas of Tablelands Dry Tussock Grassland were consistent with *Natural Temperate Grassland of South Eastern Highlands* (Appendix A), namely: Dry Themeda Grassland – was characterised by at least 50% foliage cover of *Themeda trianda.*
- Rytidosperma Grassland – had floristic diversity to meet EPBC conditions.
- Three patches of Austrostipa grassland – had floristic diversity to meet EPBC conditions.

In total, approximately 16.07 ha of Tablelands Dry Tussock Grassland was commensurate with the *Natural Temperate Grassland of South Eastern Highlands* Threatened ecological community within the referral area. These are shown on Figure 4.4.

Figure 1: Flowchart to help identify which areas (patches) of the Natural Temperate Grassland of the South Eastern Highlands ecological community meet the minimum condition thresholds (A and B) for national protection

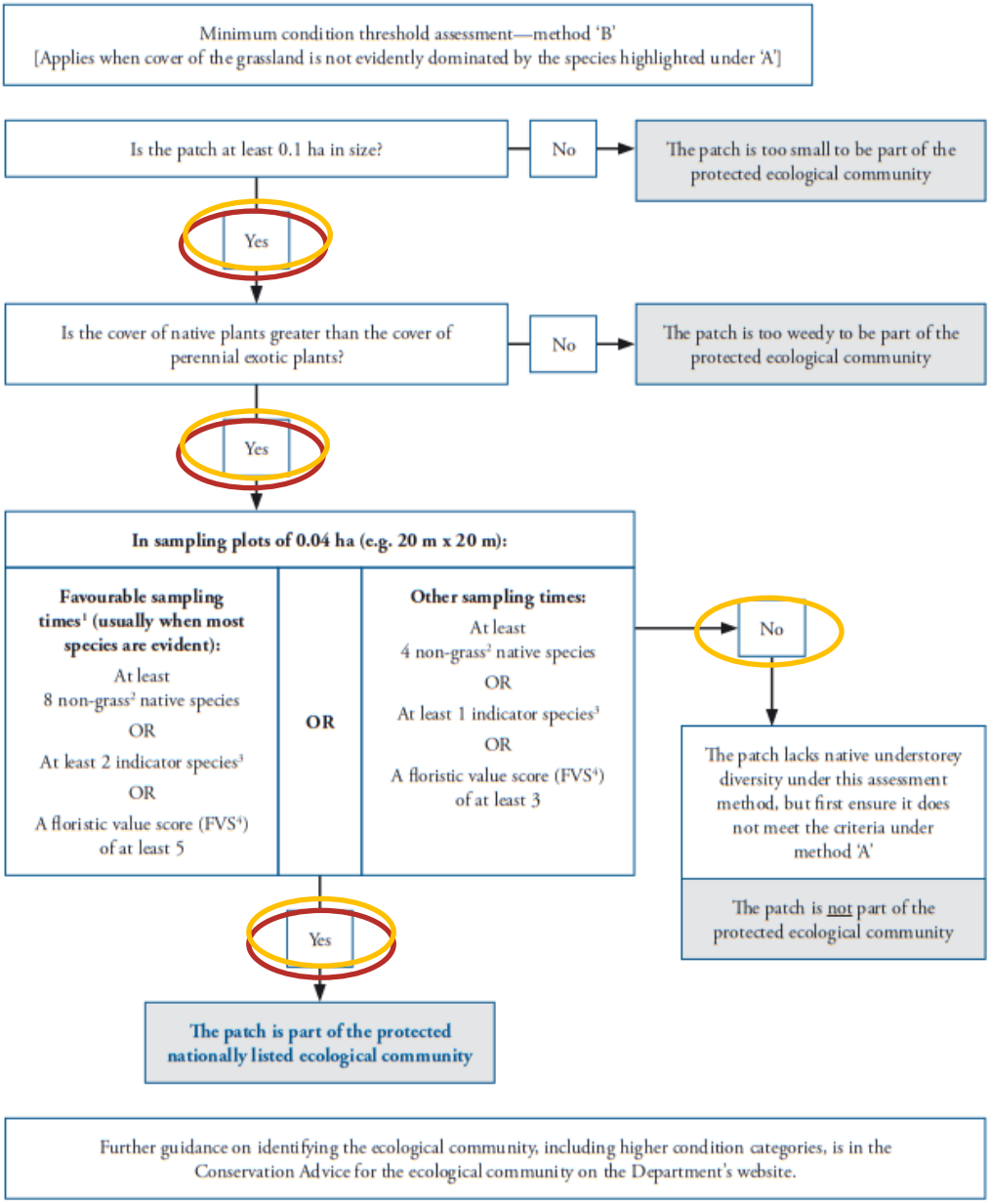


Please note:

- Assessments of a patch should initially be centred on the area of highest native floristic diversity.
- Consideration must be given to the timing of surveys and recent disturbance.
- The minimum patch size for consideration as part of the listed ecological community is 0.1 ha (e.g. 50 m x 20 m), but other condition thresholds must also be met.
- The surrounding context of a patch must also be taken into account when considering factors that add to the importance of a patch that meets the condition thresholds.
- The list of Indicator species referred to in the Condition Thresholds, can be found on the Species Profiles and Threats (SPRAT) database, on the Department's website[3].
- A relevant expert (e.g. ecological consultant, local NRM or environment agency) may be useful to help identify the ecological community and its condition.

Notes: Yellow represents *Themeda* grassland; red represents *Rytidosperma* grassland and orange represents *Austrostipa* grassland

Figure 4.1 Flowchart to identify *Natural Temperate Grassland of the South Eastern Highlands* ecological community meeting the minimum condition thresholds A for national protection



1. To be assessed in spring to early summer, and/or other time when native plant species are most evident (e.g. significant recent rainfall that has stimulated flowering of native plants). Or if these conditions not present, counts may be estimated from multiple surveys of the same site in different seasons or years.
2. Non-grass species include forbs/herbs (wildflowers), lilies, orchids, rushes and low shrubs. It does not include trees and, for the purposes of these thresholds, sedges.
3. Indicator species are native plant species that are useful surrogates for conservation value of a patch, and are typically disturbance sensitive species. The list is found on the ecological community profile on the Species Profiles and Threats Database (SPRAT), on the Department's website.
4. Floristic Value Score is a method of measuring the quality of a grassland site, based on Rehwinkel (2015) (see the Conservation Advice for the full reference).

Notes: Red represents *Rytidosperma* grassland and orange represents *Austrostipa* grassland

Figure 4.2 Flowchart to identify *Natural Temperate Grassland of the South Eastern Highlands* ecological community meeting the minimum condition thresholds B for national protection

4.1.1.2 NC ACT LISTED COMMUNITY

Natural Temperate Grassland is listed as Critically Endangered under the NC Act. This community is defined by the vegetation structure and dominance by native species of perennial tussock grasses and a diversity of native forbs. This community is dominated by moderately tall (25–50 cm) to tall (50 cm–1.0 m) dense to open native tussock grasses (*Themeda triandra*, *Rytidosperma* species, *Austrostipa* species, *Bothriochloa* macra, *Poa* species). There is also a diversity of native herbaceous plants (forbs), which may comprise up to 70% of species present. The community is naturally treeless or may contain up to 10% cover of trees or shrubs in its tallest stratum. In the ACT, it occurs up to 1200 m above sea level in locations where tree growth is limited by cold air drainage (ACT Scientific Committee, 2020a).

All native grassland areas within the referral area (21.93 ha) are consistent with *Natural Temperate Grassland* as listed under the NC Act.

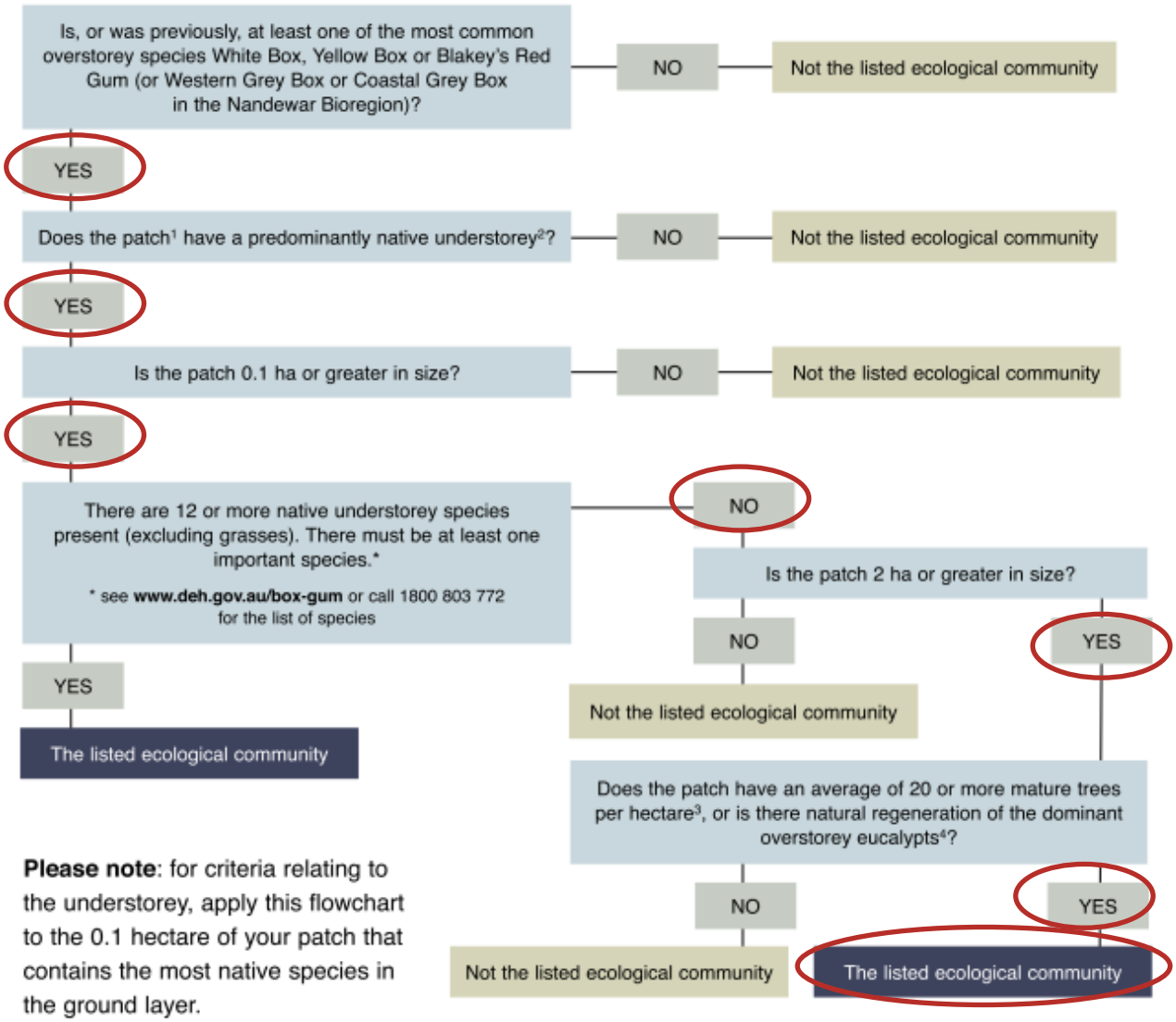
4.1.2 YELLOW BOX-BLAKELY'S RED GUM GRASSY WOODLAND

Box Gum Woodland is listed as Critically Endangered under the NC Act. Although White Box (*Eucalyptus albens*) does not occur within the ACT, this community, depending on condition, is consistent with the EPBC Act Critically Endangered ecological community White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Maguire and Mulvaney, 2011b). This community can occur as either open woodland or derived native grassland which has been created through the removal of all tree species. The canopy is dominated by Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyi*) with an understorey dominated by native tussock grasses, herbs and forbs.

4.1.2.1 EPBC ACT LISTED THREATENED COMMUNITY

The Box Gum Woodland vegetation within the Project footprint occurs as two patches within the Site. The patches varied in condition, with the floristic value score highly variable between quadrats within a patch. The patch of this community in the western section of the referral area showed high species diversity in the southern most portion.

Analysis of vegetation quadrats within Box Gum Woodland and areas of native grassland reveals that due to the patch size (> 2 ha) and the presence of natural regeneration of dominant overstorey eucalypts, both patches of this vegetation community are consistent with the EPBC Act listed community within the referral area.(Figure 4.4). Appendix A summarises the condition threshold assessment findings.



1 Patch – a patch is a continuous area containing the ecological community (areas of other ecological communities such as woodlands dominated by other species are not included in a patch). In determining patch size it is important to know what is, and is not, included within any individual patch. The patch is the larger of:

- an area that contains five or more trees in which no tree is greater than 75 m from another tree, or
- the area over which the understorey is predominantly native.

Patches must be assessed at a scale of 0.1 ha (1000m^2) or greater.

2 A predominantly native ground layer is one where at least 50 per cent of the perennial vegetation cover in the ground layer is made up of native species. The best time of the year to determine this is late autumn when the annual species have died back and have not yet started to regrow. (At other times of the year, you can determine whether something is perennial or not is if it is difficult to pull out of the soil. Annual species pull out very easily.)

3 Mature trees are trees with a circumference of at least 125 cm at 130 cm above the ground.

4 Natural regeneration of the dominant overstorey eucalypts when there are mature trees plus regenerating trees of at least 15 cm circumference at 130 cm above the ground.

Source: (Department of the Environment and Heritage, 2006)

Figure 4.3 Commonwealth criteria for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

4.1.2.2 NC ACT LISTED CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY

An assessment of the characteristics of the NC Act listed Yellow Box- Red Gum Grassy Woodland community against the two patched was undertaken (Table 4.2) (ACT Scientific Committee, 2020b).

Table 4.2 Characteristics of Yellow Box–Red Gum Grassy Woodland

CHARACTERISTICS OF YELLOW BOX–RED GUM GRASSY WOODLAND EEC	CHARACTERISTICS OF WESTERN PATCH	CHARACTERISTICS OF EASTERN PATCH
Discontinuous stratum of trees of medium height (10–35 m) with canopies that are separated and with 4–30% foliage cover. The community is dominated by Yellow Box *(Eucalyptus melliodora)* and/ or Blakely's Red Gum *(Eucalyptus blakelyi).*	The canopy is a discontinuous cover of medium height trees and of *E. blakelyi and E. melliodora*.	The canopy consists of isolated mature *E. blakelyi* and regenerating saplings
There is a species-rich understorey of native tussock grasses, herbs and scattered shrubs. Good condition remnants have a ground cover dominated (50% or more of the perennial species) by native grasses and forbs. The ground of remnants in lower condition may not be dominated by native species yet retain a canopy of mature trees (20 or more per hectare on average) and/or support natural regeneration.	The patch contains an understorey dominated by native perennial tussock grasses and herbs. The shrub layer is absent. Species richness varies throughout the patch, with the highest diversity recorded in the southern portion of the patch. Groundcover beneath mature canopy trees was dominated by exotic species.	The ground cover condition is variable, however, is dominated by native grasses and forbs and is generally in high condition to the east of the drainage line. Natural regeneration of canopy species is evident.
Derived (secondary) grasslands where the tree canopy cover is removed (or suffers dieback) but a relatively diverse understorey remains intact.	Portions of the patch have a very sparse or absent canopy cover. These areas have retained a relatively diverse understorey of native species.	The patch has a very sparse or absent canopy cover. The area has a relatively diverse understorey of native species.
CONCLUSION	This Box Gum patch contains an open canopy dominated by *E. melliodora* and *E. blakelyi.* The understorey is dominated by native perennial tussock grasses and herbs, with varying diversity recorded across the patch. **This vegetation is consistent with Yellow Box–Red Gum Grassy Woodland Critically Endangered Ecological Community listed under the NC Act.**	This patch contains regenerating canopy and the understorey is dominated by native perennial tussock grasses and forbs. **This vegetation is consistent with Yellow Box–Red Gum Grassy Woodland Critically Endangered Ecological Community listed under the NC Act.**

4.2 THREATENED SPECIES

4.2.1 THREATENED FLORA

Twenty-two Threatened flora species listed under the NC Act, and/or EPBC Act have been recorded or are predicted to occur within a 10 kilometre radius of the Site. No Threatened flora species are considered likely to occur within the referral area. The full likelihood of occurrence assessment for Threatened flora is available in Appendix D.

4.2.2 THREATENED FAUNA

Forty-four Threatened fauna species listed under the NC Act, EPBC Act and/or the ACT *Fisheries Act 2000* have been recorded or are predicted to occur within a 10 kilometre radius of the Site.

Of these species, two were recorded within the referral area during field survey (Golden Sun Moth and Striped Legless Lizard). Grey-headed Flying-fox was previously recorded flying over the Site and within the vicinity of the fruit crops within the old housing estate which provide foraging resources (SMEC Australia, 2008).

In addition, another five species of Threatened fauna are considered to have a moderate or higher likelihood of occurrence in the referral area, based on availability of potential habitat (Table 4.3). The remainder of species were considered to have a low likelihood of occurrence based on the availability of habitat and recent records of the species. Appendix E provides full details of habitat requirements and likelihood of occurrence assessment for each species.

Table 4.3 Threatened fauna with potential to occur within the Site

COMMON NAME (*SCIENTIFIC NAME*)	NC ACT[1]	EPBC ACT[2]	LIKELIHOOD OF OCCURRENCE
Golden Sun Moth (*Synemon plana*)	E	V	**Recorded** Low numbers of scattered individuals
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	V	**Previously recorded** Potential foraging habitat in the form of planted native and exotic canopy species. Potential foraging habitat within Box Gum Woodland and planted native canopy species.
Little Eagle (*Hieraaetus morphnoides*)	V	–	**Moderate** Potential foraging habitat across grassland and woodland areas.
Perunga Grasshopper (*Perunga ochracea*)	V	–	**High (recorded in conservation area)** Potential habitat within native grassland and Box Gum Woodland areas. The species has not previously been recorded in the *Themeda* grassland within the Site and may be absent as a result of former grazing (HLA Envirosciences, 2001).
Scarlet Robin (*Petroica boodang*)	V	–	**Low- Moderate** Potential seasonal foraging habitat during winter altitudinal migration in the form of planted native canopy.

COMMON NAME (*SCIENTIFIC NAME*)	NC ACT[1]	EPBC ACT[2]	LIKELIHOOD OF OCCURRENCE
Striped Legless Lizard (*Delma impar*)	V	V	**Recorded** Recorded within dry *Themeda* grassland in the east, and *Austrostipa* grassland habitat in the north. Grassland and open woodland areas provide potential habitat for this species.
Superb Parrot (*Polytelis swainsonii*)	V	V	**Moderate** No nest trees present within Box Gum Woodand within the referral area. Three nest trees with suitable hollow sizeoccur within the referral area however these trees are not preferred species and don't occur within breeding habitat (Box Gum Woodland).
White-winged Triller (*Lalage sueurii*)	V	–	**Low-Moderate** Not recorded within the site, however woodland areas provide potential habitat.

(1) V = Vulnerable, E = Endangered, under the NC Act.

(2) V = Vulnerable, CE = Critically Endangered, under the EPBC Act.

The grassland within the Site provides primary habitat for a range of rare and Threatened grassland fauna (Photo 4.1, Photo 4.2, Photo 4.3, Photo 4.4). The Site is also listed on the Register of the National Estate and Commonwealth Heritage Listing for the Golden Sun Moth noting the Gondwanan origins of the family of *Synemon* moths.

The ACT Government has prepared The ACT Native Grassland Conservation Strategy and Actions plans (2017) this includes updated action plans for Perunga Grasshopper, Golden Sun Moth and Striped Legless Lizard.

Photo 4.1 Striped Legless Lizard recorded under a tile within the conservation area

Photo 4.2 Golden Sun Moth was recorded within the referral area

Photo 4.3 Perunga Grasshopper was recorded to the west of the referral area

Photo 4.4 Canberra Raspy Cricket recorded to the west of the referral area

4.3 MIGRATORY AND MARINE SPECIES

Migratory species are protected under international agreements to which Australia are a signatory, including Japan-Australia Migratory Bird Agreement (JAMBA), China- Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (RoKAMBA) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory/marine species are considered MNES and are protected under the EPBC Act.

Based on EPBC Protected Matters area search and other desktop database searches, 14 migratory/marine bird species have been recorded or have the potential to occur in the Project locality. While some of these Migratory/marine species cannot discounted, the development area is not considered to be of sufficient extent or quality to be critical for these species. The development area would not be considered 'important habitat' for migratory birds as defined under the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines (Department of the Environment, 2013b), in that the development area does not contain:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
- habitat utilised by a migratory species which is at the limit of the species range
- habitat within an area where the species is declining.

As such, it is considered unlikely that the Project would significantly affect migratory/marine bird species and these species are not considered further.

4.4 OTHER COMMONWEALTH VALUES

A search of a 10 kilometre area surrounding the Site was undertaken using the Department of the Environment and Energy EPBC Act Protected Matters Search tool on the 27 August 2018 and again on 31 May 2019. The search identified a number of listed Threatened ecological communities and Threatened and Migratory/marine species and/or their habitat as potentially occurring (Appendix G). In addition, the following significant listings related to biodiversity for the Site have been identified:

- Commonwealth Heritage Place: *Synemon plana* Moth Habitat, located within the western portion of the Site.
- Critical Habitat: *Lepidium ginninderrense* (Ginninderra Peppercress) – Northwest corner Belconnen Naval Transmission Station, ACT, located in the conservation area of the Site.

4.4.1 COMMONWEALTH HERITAGE LISTING: SYNEMON PLANA MOTH HABITAT

Habitat for the Golden Sun Moth at the Belconnen Naval Station was listed on the Commonwealth Heritage List on 22 June 2004, with the Place ID 105535 (Department of the Environment and Energy, 2018b).

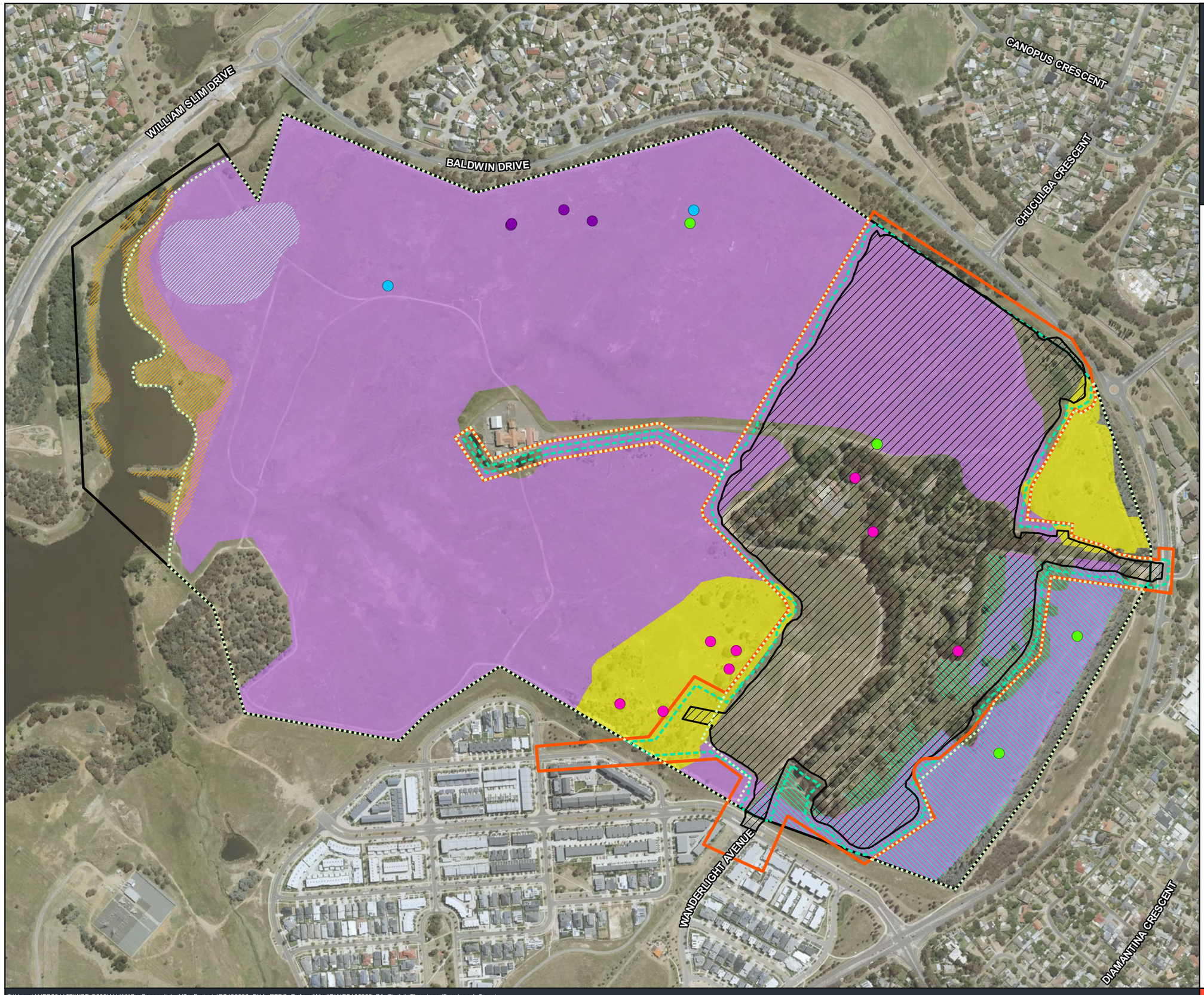
This listing was based on the high conservation value of the large remnanat of *Rytidosperma* grassland in good condition which provides essential habitat for the Golden Sun Moth. The Site is considered to be important for the long-term conservation of the Golden Sun Moth due to its size and condition, and the extant population at the Site. Additionally, the Site is an opportunity for further research into the Golden sun moth, other invertebrate species known to occur in the grasslands, and the endangered ecological community.

The heritage place occurs to the western portion of the Site, the eastern section of which occurs within the referral area. Approximately 14.06 ha of this Commonwealth Listed Place occurs within the Referral area (Figure 4.5).

4.4.2 CRITICAL HABITAT: LEPIDIUM GINNINDERRENSE

Critical habitat is listed under the EPBC Act. Critical habitat is the whole or any part or parts of an area or areas of land comprising habitat critical to the survival of an endangered species, population or ecological community.

Approximately 20 hectares of the Site is listed as critical habitat for the Threatened plant *Lepidium ginninderrense (Department of the Environment and Energy, 2018d).* This occurs within the western section of the Site within the proposed conservation area.



Lawson North Residential Development Biodiversity Assessment

Figure 4.4
Threatened Biodiversity

Legend

- Canberra Raspy Cricket
- Potential Superb Parrot habitat trees
- Perunga Grasshopper records
- Striped Legless Lizard records
- Conservation Area
- Referral Area
- Development Impact Area - Permanent
- Development Impact Area - Temporary
- DHA Site

Habitat Areas

- *Lepidium ginninderense* Habitat
- Latham's Snipe Habitat
- Striped Legless Lizard Core Habitat

EPBC Act Threatened Ecological Community

- Natural Temperate Grassland of the South Eastern Highlands
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

0 100 200 Metres

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:6,000 Date: 10/05/2022

Data sources: - ACTiMap, Geoscience Australia

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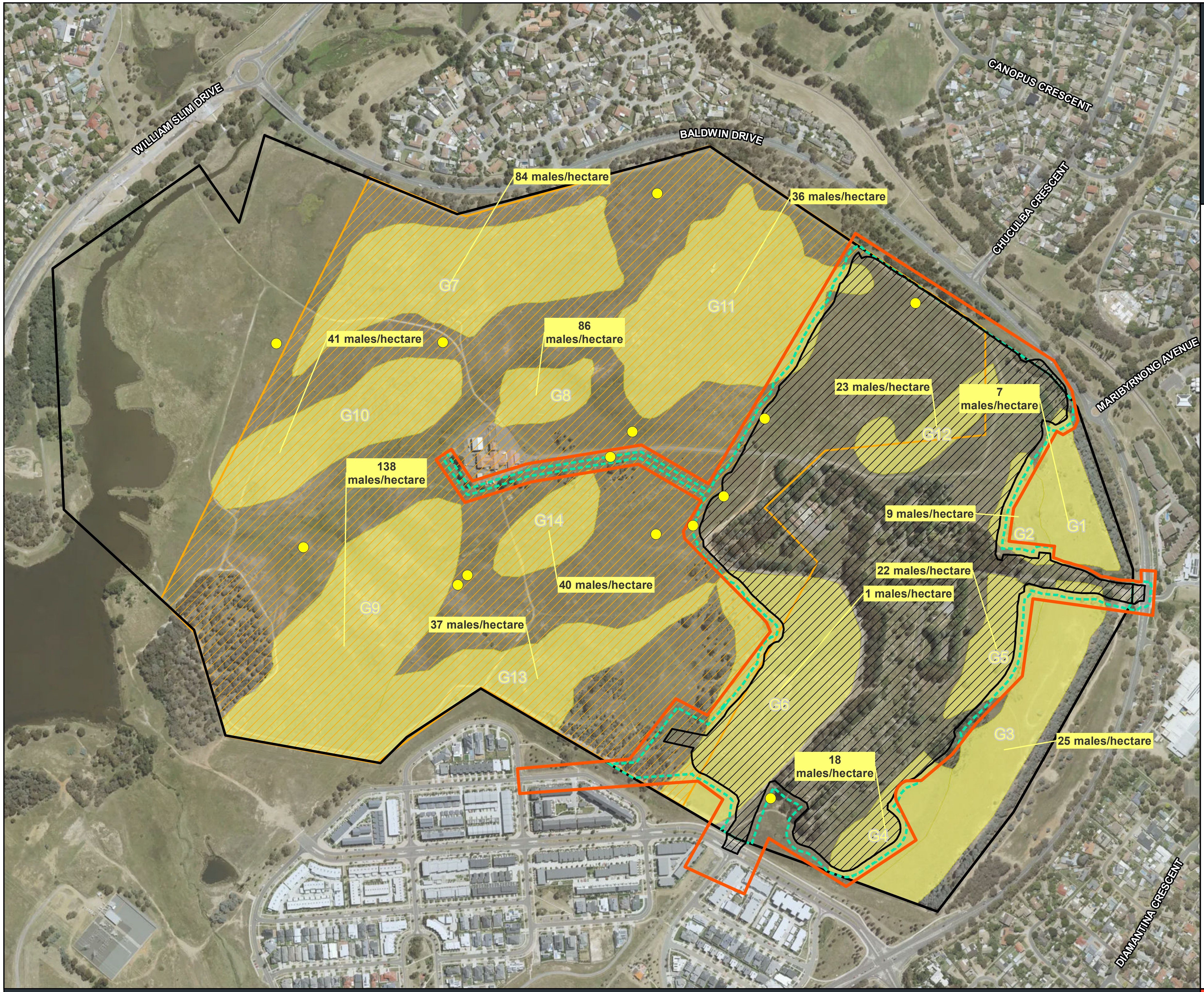

Lawson North Residential Development Biodiversity Assessment

Figure 4.5
Golden Sun Moth

Legend

- Isolated Golden Sun Moth Records
- Golden Sun Moth Core Activity Areas
- Referral Area
- Development Impact Area - Permanent
- Development Impact Area - Temporary
- DHA Site
- Synemon plana moth habitat Commonwealth heritage listing
- Golden Sun Moth Core Activity Areas

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:6,000 Date: 10/05/2022

Data sources: - ACTiMap, Geoscience Australia

5 POTENTIAL IMPACTS

The section contains a description of the potential impacts of the Project on biodiversity. The impacts are separated into direct, indirect and cumulative impact categories and include the following:

- Direct impacts:
  - removal of native vegetation and fauna habitat
  - removal of Threatened ecological communities
  - removal of Threatened species habitat
  - injury and mortality.
- Indirect impacts:
  - wildlife habitat fragmentation
  - edge effects; including weed invasion, noise, and light
  - invasion and spread of pests
  - invasion and spread of pathogens and disease.
- Cumulative impacts on biodiversity (resulting from this Project and surrounding developments within the locality).

Where applicable, impacts are also correlated with relevant key threatening processes.

5.1 DIRECT IMPACTS

5.1.1 REMOVAL OF NATIVE VEGETATION AND FAUNA HABITAT

The Project would require vegetation clearing prior to construction resulting in loss of native vegetation and fauna habitat. The main impact relating to Threatened species and communities would be the direct clearing of vegetation and habitat, of which the majority of the clearing would be permanent (Table 5.1).

Table 5.1 Vegetation communities and proposed clearing areas

VEGETATION COMMUNITY	TOTAL AREA IN SITE (HA)	REFERRAL AREA (HA)			RESIDUAL AREA (HA)[1]
		PERMANENT IMPACT AREA	TEMPORARY IMPACT	TOTAL IMPACT AREA	
Tablelands dry tussock grassland	106.53	19.79	2.09	21.88	84.65
Box Gum Woodland and Derived Native Grassland	8.96	0.43	0.88	1.31	7.65
Miscellaneous ecosystems (Mixed amenity plantings and exotic dominated grassland)	28.61	17.77	0.96	18.73	9.88
Native Amenity Planting (native ground cover)	2.44	0.28	0.04	0.33	2.12
Total	**146.54**	**38.27**	**3.97**	**42.25**	**104.30**

(1) Residual area is that not impacted directly by the development.

Key threatening processes associated with removal of vegetation and fauna habitat are shown in Table 5.2 below.

Table 5.2 Key threatening processes associated with removal of vegetation and fauna habitat

KEY THREATENING PROCESSES	LEGISLATION		IMPACT OF THE PROJECT
	NC Act	EPBC Act	
Land clearance	–	X	The Project would clear approximately 42.25 ha of vegetation of which 23.19 ha is remnant native vegetation.
Loss of Mature Native Trees	X	–	The Project would include the removal of up to 20.37 ha of woodland (1.31 ha remnant woodland and 19.06 ha of native and exotic amentity plantings) containing mature trees, including removal of 10 hollow-bearing trees.

5.1.1.1 CLEARING OF THREATENED ECOLOGICAL COMMUNITIES AND THREATENED SPECIES HABITAT

The Project would involve the loss of up to 42.25 ha of vegetation of which 23.19 ha is remnant native vegetation. This includes the following threatened ecological communities:

- 15.8 ha consistent with Threatened Natural Temperate Grassland of the Southern Tablelands ecological community listed as Critically Endangered under the EPBC Act
- 21.88 ha consistent with Natural Temperate Grassland listed as Critically Endangered under the NC Act
- 1.31 ha consistent with White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community listed as Critically Endangered under the EPBC Act and NC Act.

Table 5.3 below summarises the impacts to Threatened ecological communities. Full assessments for Commonwealth listed communities following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts, 2013) is presented in Appendix F.

Table 5.3 Potential impacts to EPBC listed Threatened ecological communities

COMMUNITY NAME	EPBC ACT[1]	TOTAL AREA WITHIN SITE	PERMANENT IMPACT (HA)	TEMPORAY IMPACT (HA)	TOTAL IMPACT (HA)	EPBC SIGNIFICANCE ASSESSMENT OUTCOME
Natural Temperate Grassland of the South Eastern Highlands	CE	100.41	13.97	1.84	15.8	Significant
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	8.96	0.43	0.88	1.31	Not significant
Total			**14.4**	**2.72**	**17.11**	

(1) CE = Critically Endangered under the NC Act and EPBC Act.

5.1.1.2 CLEARING OF THREATENED SPECIES HABITAT

The Project would involve the loss of up to 42.25 ha of vegetation of which 23.19 ha is remnant native vegetation (Tablelands dry tussock grassland and Box Gum Woodland) comprised of:

- 21.88 ha of native grassland
- 1.31 ha of native woodland.

Additional habitat types are comprised of:

- 0.33 ha of native grassland with planted native woodland canopy (amentity planting)
- 18.73 ha of exotic dominated grassland with mixed native/exotic amenity plantings (miscellaneous ecosystems).

Table 5.4 below summarises the impacts to Threatened species habitat respectively. Full assessments for Commonwealth listed species following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts, 2013) is presented in Appendix F.

Table 5.4 Potential impacts to EPBC and NC Act listed Threatened species habitat

SCIENTIFIC NAME	COMMON NAME	NC ACT[1]	EPBC ACT[1]	HABITAT CLEARING	RETAINED HABITAT[2]	EPBC SIGNIFICANCE ASSESSMENT OUTCOME
Synemon plana	Golden Sun Moth	E	V	11.6 ha of habitat. Average density of 11 males/hectare	45.55 ha of high-density core habitat. Average density of 56 males/hectare	Significant impact. Refer to EPBC Assessments of Significance (Appendix F).
Delma impar	Striped Legless Lizard	V	V	Up to 26.53 ha of known and potential habitat, including: — 4.72 ha of high quality — 14.13 ha of moderate quality 7.68 ha of low quality potential habitat.	Up to 97.84 ha of known and potential habitat, including: — 6.71 ha of high quality — 77.02 ha of moderate quality 14.11 ha of low quality.	Significant impact. Refer to EPBC Assessments of Significance (Appendix F).
Perunga ochracea	Perunga Grasshopper	V	–	23.19 ha of potential habitat (21.88 ha of native grassland and 1.31 ha of Box Gum Woodland and Derived Native Grassland).	92.3 ha (84.65 ha of native grassland and 7.65 ha of Box Gum Woodland and Derived Native Grassland).	N/A – species not listed under the EPBC Act.
Polytelis swainsonii	Superb Parrot	V	V	1.31 ha of preferred foraging habitat associated with Box Gum Woodland and Derived Native Grassland. * Impacts to an additional 18.73 ha of planted exotic and native shrub and canopy species (miscellaneous ecosystems) including three hollow-bearing eucalypts suitable for breeding and 0.33 ha of planted native woodland which could be used as supplementary foraging habitat.	7.65 ha of preferred foraging habitat associated with Box Gum Woodland and Derived Native Grassland vegetation and five hollow-bearing trees with hollows of suitable dimension for breeding: * An additional 9.88 ha of planted exotic and native shrub and canopy species (miscellaneous ecosystems) and 2.12 ha of planted native woodland which could be used as supplementary foraging habitat will be retained within the site.	Not a significant impact. This species was not recorded. The Referral area provides foraging habitat for the species, as well seven hollow bearing trees which could provide potential hollows for nesting. Refer to EPBC Assessments of Significance (Appendix F).
Hieraaetus morphnoides	Little Eagle	V	–	42.25 ha of potential foraging habitat	104.30 ha of potential foraging habitat	N/A – species not listed under the EPBC Act.

SCIENTIFIC NAME	COMMON NAME	NC ACT[1]	EPBC ACT[1]	HABITAT CLEARING	RETAINED HABITAT[2]	EPBC SIGNIFICANCE ASSESSMENT OUTCOME
Petroica boodang	Scarlet Robin	V	–	20.37 ha of potential foraging habitat: — 1.31 ha of Box Gum Woodland and Derived Native Grassland — 0.33 ha of planted native woodland — 18.73 ha of planted exotic and native shrub and canopy species (miscellaneous ecosystems) which may provide marginal supplementary foraging habitat.	19.65 ha of potential foraging habitat: — 7.65 ha of Box Gum Woodland and derived native Grassland — 2.12 ha of planted native woodland — 9.88 ha of planted exotic and native shrub and canopy species (miscellaneous ecosystems) which may provide marginal supplementary foraging habitat.	N/A – species not listed under the EPBC Act.
Lalage tricolor	White-winged Triller	V	–	1.31 ha of potential foraging habitat in Box Gum Woodland and Derived Native Grassland.	7.65 ha of potential foraging habitat in Box Gum Woodland and Derived Native Grassland.	N/A – species not listed under the EPBC Act.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	20.37 ha of potential foraging habitat: — 1.31 ha of Box Gum Woodland and Derived Native Grassland — 0.33 ha of planted native woodland — 18.73 ha of planted exotic and native shrub and canopy species (miscellaneous ecosystems) which may provide marginal supplementary foraging habitat.	19.65 ha of potential foraging habitat: — 7.65 ha of Box Gum Woodland and derived native Grassland — 2.12 ha of planted native woodland — 9.88 ha of planted exotic and native shrub and canopy species (miscellaneous ecosystems) which may provide marginal supplementary foraging habitat.	Not a significant impact. The Site did not contain any Grey-headed Flying-fox roost Sites. Potential foraging resources consisted of planted native and exotic canopy species, and remnant Box Gum Woodland vegetation. Whilst this species may utilise these resources during seasonal fruit/ blossom availability, the referral area is not likely to be a significant foraging resource and would not sustain individuals in isolation of other foraging grounds. Refer to EPBC Assessments of Significance (Appendix F).

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered

(2) Residual habitat is that not impacted directly by the development within the site.

5.1.2 INJURY AND MORTALITY

Injury and mortality of fauna could occur during construction activities when vegetation and habitats are being cleared. Fauna injury or mortality also has the potential to occur as a result of collisions during vehicle and machinery movement in both the construction and operational phases of the Project.

Landscaping associated with the Project may influence injury and mortality of animals during the operation phase due to the presence of feed sources or other artificial habitat adjacent to roads.

Table 5.5 Potential for injury and mortality of fauna as a result of the Project

ACTIVITY WITH POTENTIAL TO CAUSE MORTALITY	NATIVE ANIMALS WITH POTENTIAL TO BE AFFECTED	NATURE AND MAGNITUDE OF THE IMPACT OF THE PROJECT
Vegetation/habitat removal during construction		
Removal of trees, understorey, groundcover, topsoil and rocks	— Small woodland birds (species which nest in understorey vegetation and breed locally) — Hollow dependant species nesting in hollows — Canopy nesting birds — Reptiles (e.g. snakes, legless lizards, skinks) — Frogs — Invertebrates.	The level of mortality and injury of both non-threatened and Threatened species of birds and mammals is likely to be low due to their highly mobile nature and with the implementation of mitigation measures. Reptiles, frogs, and invertebrates are at a higher risk to direct injury and mortality from vegetation clearing. Mitigation measures including pre-clearing surveys and 'spotter-catchers' whilst vegetation clearance is undertaken will be implemented to minimise injury and mortality of fauna. This impact is short-term and irreversible.
Machinery/plant and vehicle movements during construction		
Direct hit with movement of vehicles and machinery between locations within the referral area	— Birds — Mammals — Reptiles (e.g. snakes, legless lizards, skinks) — Frogs — Invertebrates.	Occasional mortality of fauna may occur during movement of vehicles and machinery within the referral area. With the implementation of speed limits and briefing of staff as part of the induction process, the level of construction-phase mortality of native wildlife is likely to be negligible. This impact is short-term and irreversible.

ACTIVITY WITH POTENTIAL TO CAUSE MORTALITY	NATIVE ANIMALS WITH POTENTIAL TO BE AFFECTED	NATURE AND MAGNITUDE OF THE IMPACT OF THE PROJECT
Vehicle movements during operation		
Direct hit with vehicles during the operation of the residential development	— Birds — Mammals — Reptiles (e.g. snakes, legless lizards, skinks) — Frogs — Invertebrates.	Occasional mortality of fauna may occur during vehicle movements within the referral area once constructed. Following Project construction, fauna habitat will be limited within the development and formed roads will be operational. Additionally, speed limits will be suitable for a residential area and as such high speed roadways will not be present. The level of operational-phase mortality of native wildlife is likely to be negligible. This impact is long-term and irreversible.

5.2 INDIRECT IMPACTS

5.2.1 WILDLIFE HABITAT CONNECTIVITY AND FRAGMENTATION

The impacts of the Project on wildlife habitat connectivity are discussed in this section. Habitat fragmentation is the division of a single area of habitat into two or more smaller areas, with the occurrence of a new habitat type in the area between the fragments. This new dividing habitat type is often artificial and inhospitable to the species remaining within the fragments. Although the newly created habitat is generally used by some species, those species are usually generalists and are often considered aggressive (Grey et al., 1998), further decreasing population levels of the species remaining in the fragments. In addition to the loss of total habitat area, the process of fragmentation can impact on species within the newly created fragments in a number of ways, including barrier effects, genetic isolation, and edge effects. Habitat fragmentation can also create barriers to pollination (movement of pollinator vectors), such as restricting insect movements, thereby affecting the lifecycle of flora.

The following woodland linkages remain connected to the Site:

- Ginninderra Creek and the associate Lake Ginninderra.
- A corridor of Urban Open Space to the north of the Site between the suburbs of Giralang and Kaleen.
- Roadside plantings.

The Site itself is considered to be one of the largest remaining areas of Natural Temperate Grassland in high ecological condition within the ACT (ACT Government, 2017b), and is currently fragmented by existing infrastructure and disturbed exotic vegetation associated with the Sites former use.

Whilst vegetation in the referral area is not likely to be used solely in isolation of other habitat for most mobile guilds of animal, the referral area may be used as a stepping stone between habitat patches within the surrounding landscape. Comparably, small sedentary fauna such as reptiles, amphibians and invertebrates, are likely to be impacted by fragmentation from the Project through the further isolation of the eastern section of Dry *Themeda* Grassland (4.78 ha) from the larger area of native grassland in the west (> 80 ha), both proposed for conservation.

The potential impacts of the Project relating to habitat connectivity and fragmentation are presented below in Table 5.6.

Table 5.6 Potential impacts of the Project relating to habitat connectivity and fragmentation

IMPACT	POTENTIAL BIODIVERSITY AFFECTED	NATURE AND MAGNITUDE OF IMPACT	DURATION AND SIGNIFICANCE OF IMPACT
Genetic isolation due to fragmentation of habitat and barrier effects	Native plants	The habitat of native plants within the landscape is already fragmented and isolated by existing roadways, housing, and easements. While the Project will result in a slight increase in the distance between the habitat of populations and sub-populations of native plant species, it is not likely to significantly alter the current extent of genetic mixing or to result in significantly increased genetic isolation.	Permanent but unlikely to significantly increase genetic isolation.
	Birds	Birds are unlikely to be genetically isolated by the Project as they will be able to continue to be able to fly over the development.	Unlikely to impact birds.
	Terrestrial mammals, reptiles, and frogs	These groups are likely to continue to cross through the development within areas of retained vegetation. In the absence of fencing or other movement barriers, all these animal groups are likely to cross at ground level and hence to be at risk of roadkill mortality. However, moderate increases in genetic isolation of populations of these groups may occur as a result of the Project as rates of movement between habitat areas are likely to be reduced.	Permanent but unlikely to significantly increase genetic isolation.

IMPACT	POTENTIAL BIODIVERSITY AFFECTED	NATURE AND MAGNITUDE OF IMPACT	DURATION AND SIGNIFICANCE OF IMPACT
	Grassland specialists (including Golden Sun Moth, Striped Legless Lizard and Perunga Grasshopper)	Specialist grassland species occurring throughout the Site will be impacted by the Project as the proposed development will largely isolate the eastern portion of native grassland from the remainder of the Site in the west. Whilst some more mobile species which are tolerant to disturbance may move through the development, others such as the Golden Sun Moth, Striped Legless Lizard, and Perunga Grasshopper are unlikely to move across the development. It is likely that Striped Legless Lizard populations in the east and west of the Site are already genetically isolated by the presence of the existing development and associated infrastructure. Individuals of this species have been recorded moving at least 20 m a day and up to 50 m over several weeks indicating they are relatively wide-ranging (Department of Agriculture Water and the Environment, 2021b). Areas of exotic grassland and the former naval village provide a barrier to Golden Sun Moth occurring in the east and the west of the Site, however some connectivity is currently provided in the southern and northern portion of the site. Following development, connectivity in the north of the site would be lost. Golden Sun Moth are thought to fly no more than 100m from suitable habitat, and females even less so. They are known to persist in very small patches of habitat, with the medium habitat size of sites known to support the species in the ACT being only 2.8 ha (ACT Government, 2017c). As such, although there would be decrease in connectivity, it is likely that the species would persist in the retained areasThe proposed development is likely to further fragment these species. The Perunga Grasshopper is flightless and movement between habitat fragments is likely to be limited (ACT Government, 2017d). The species has been recorded in the west of the Site, but no records have come from the eastern area of the site. As a result, further fragmentation of grassland is not anticipated to impact on this species.	Permanent Populations in the east and west of the Site are either already isolated or genetic mixing between areas would be low. The Project is likely to further fragment these populations, however is unlikely to have a significant impact on Threatened grassland fauna.

5.2.2 EDGE EFFECTS

Habitat/vegetation fragmentation is likely to cause the following increased edge effects associated with the interface between the development and adjacent areas of habitat:

- altered soil moisture conditions
- altered light conditions (shading, reduced-shading, artificial lighting)
- noise and vibration (construction and operation)
- weed invasion (associated with soil disturbance and roadside littering).

These effects of fragmentation are likely to reduce the suitability of habitat adjacent to the development and are discussed in Table 5.7 below. Mitigation measures will be employed to reduce the impact of edge effects on the proposed conservation area. In addition, a Biodiversity Management Plan is currently being prepared for the proposed conservation area and will detail measures to further limit the impacts of the proposed development on remaining habitat.

Table 5.7 Potential impacts of the Project due to edge effects

EDGE EFFECTS	BIODIVERSITY WITH POTENTIAL TO BE AFFECTED	NATURE AND MAGNITUDE OF THE IMPACT OF THE PROJECT	DURATION AND SIGNIFICANCE OF IMPACTS
Soil moisture changes	Native flora and fauna	A change in soil moisture can result in changes in vegetation structure and composition. It can result in the loss of particular plant species and the proliferation of others, and in extreme cases, complete transformation of vegetation communities (e.g. from woodland to wetland or vice versa). This can, in turn, affect the suitability of vegetation as habitat for animals, including Threatened species. Additionally, species which burrow into the soil from shelter or other life-cycle processes can be impacted. There may be changes in soil moisture conditions associated with increased hard surfaces within the development and altered drainage. However, within the Referral area, infrastructure to manage and control runoff will be constructed. Changes in soil moisture in adjacent areas are likely to only occur over small areas adjacent to existing drainage channels and are unlikely to significantly affect biodiversity values.	Impacts to very small areas adjacent to drainage channels and these are unlikely to significantly affect biodiversity values. Impact will be permanent and localised.
Light, noise and vibration	All animal species	Biodiversity in urban and peri-urban environments are affected by developments associated with expanding urban areas (Newport et al., 2014). Artificial illumination and noise can impact on biodiversity in these settings. Understanding and mitigating the effects of noise light pollution on biodiversity is becoming increasingly important as our cities continue to grow. Limited research has been undertaken into the impacts of artificial light and noise on ecosystems, and species. Despite this, it is understood that noise and light pollution have effects on species physiology, behaviour and reproduction (Newport et al., 2014) Substantial variation has been shown in scientific studies in the responses of wildlife to human-generated noise and vibration, ranging from serious to non-existent in different species and situations. The risk of hearing damage in wildlife is probably greater from exposure to very loud noises at close proximity than from long-term exposure to lower noise levels. The presence or otherwise of direct physiological effects of noise on wildlife is poorly known (Larkin, 1996). The main impacts on wildlife associated with noise are behavioural. Vehicle noise has been shown, particularly in some species of birds and frogs, to interfere with communication essential for reproduction; however pedestrian activity may cause stronger behavioural reactions than people in vehicles. Noise may affect behaviour by causing animals to retreat from favourable habitat near	Increased noise, vibration and light impacts in an urban environment. These impacts will be permanent, but localised.

EDGE EFFECTS	BIODIVERSITY WITH POTENTIAL TO BE AFFECTED	NATURE AND MAGNITUDE OF THE IMPACT OF THE PROJECT	DURATION AND SIGNIFICANCE OF IMPACTS
		noise sources, reducing time spent feeding and resulting in energy depletion and lower likelihood of survival and reproduction (Larkin, 1996). Serious effects such as decreased reproductive success have been documented in some studies and documented to be lacking in other studies on other species (Larkin, 1996). Decreased responsiveness of wildlife after repeated noises is frequently observed and usually attributed to habituation (Larkin, 1996). The construction and ongoing operation phase of the Project will cause increased noise, vibration and light disturbance to animals. However, the impacts from noise, vibration and light emissions are likely to be localised close to the Project area, of which the majority is within exotic vegetation providing low quality habitat for fauna. Additionally, it is likely that most animal species within the Site are already habituated to periodic light and noise disturbance from human activity as it is bounded by existing urban development. These impacts are not likely to have a significant, long-term, impact on wildlife populations.	
Weed invasion	Native vegetation and fauna habitat	The weed density in the existing native vegetation that would be retained varies from very low to high. The most problematic weeds being various species of exotic perennial grasses in dry areas. At present, urban development appears to be one of the main causes of weed invasion, in conjunction with human activities in the area. The Project has the potential to further disperse weeds into adjacent areas of native vegetation. The greatest potential for weed dispersal and establishment associated with the construction phase of the Project would include earthworks, movement of soil and attachment of seed (and other propagules) to vehicles and machinery where these are utilised within or adjacent to retained vegetation. The operational phase of the Project would create potential for weed dispersal through the increase in vehicles and people utilising the area, the potential for garden plantings to move into adjacent areas, and the potential for runoff from the development to alter soil properties to favour exotic species. Mitigation measures will be employed to reduce the impact of edge effects on the conservation area and address weed management during construction. In addition, a Biodiversity Management Plan is currently being prepared for the conservation area and will detail measures to further limit the impacts of the Project on remaining habitat.	These impacts will vary in nature. Construction impacts will be short-term and mitigations measures implemented to manage the spread of weeds. Operational impacts will be on-going and have the potential to be permanent. Management of the conservation area will need to ensure that weeds are management, particularly at the interface of the development where increase risk of spread will be.

Key threatening processes associated with edge effects are shown in Table 5.8 below.

Table 5.8 Key threatening processes associated with edge effects

KEY THREATENING PROCESSES	LEGISLATION		IMPACT OF THE PROJECT
	NC Act	EPBC Act	
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.	–	X	The Project has the potential to increase the likelihood of escaped garden plants degrading adjacent areas of native vegetation which provide significant habitat for Threatened fauna and flora.

5.2.3 INVASION AND SPREAD OF PESTS

From a biodiversity conservation perspective, pest animals include all species that have a negative impact on the functioning of natural ecosystems and/or the conservation of Threatened biodiversity. Pests therefore include both exotic and native species. Exotic pests present or likely to occur in the development area include the Fox, Rabbit, Brown Hare, Cat, Common Myna, House Mouse, Black Rat and Common Starling.

These species have the potential to affect uncommon or Threatened indigenous biodiversity through predation (e.g. Black Rat, Cat, Fox), grazing (e.g. Rabbit, Brown Hare) and competition for breeding habitat (e.g. Common Myna, Common Starling).

The habitat that would be removed for the Project is already affected by pest species and as such the development is considered unlikely to introduce new pests to the Site. Lawson is a designated cat containment suburb. Mitigation measures for the development will include the provision of cat containment signage for the new development and the conservation area will be management in accordance with pest management identified in the Biodiversity Management Plan being prepared.

Many highly invasive and destructive pest species which are found overseas, or interstate have not yet become established or presently have restricted distributions in ACT. Several such species are the subject of Key Threatening Process listings (e.g. Red Imported Fire Ant, Yellow Crazy Ant, Large Earth Bumblebee, Cane Toad). The primary risk associated with these species is the importation of goods or materials from interstate or overseas locations where populations of these species are well established. Implementation of mitigation measures will minimise the risk of pests entering the Site with imported materials, and as such the risk would be considered low.

5.2.4 INVASION AND SPREAD OF PATHOGENS AND DISEASE

Plant and animal pathogens can affect Threatened biodiversity through direct mortality and modification to vegetation structure and composition. The following pathogens are considered to have potential to affect the biodiversity of the development area and are the subject of Key Threatening Process listings:

- Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*)
- Phytophthora Root Rot Fungus (*Phytophthora cinnamomi*).

The main way in which plant pathogens may be spread is through the movement of infected plant material and/or soil. The construction and operation of the Project may increase the risk of disturbing and spreading these pathogens. With the implementation of hygiene procedures for the use of vehicles and the importation of materials to the Project area, the risk of introducing these pathogens would, however, be low. Preferential use of plant materials sourced on-Site (e.g. mulch, seeds) used for vegetation restoration would also help to minimise this risk.

Amphibian Chytrid Fungus can be spread through the movement of infected animals or water (including mud or moist soil) from infected areas. With the implementation of hygiene procedures for the use of vehicles and the importation of materials to the Project area, the risk of introducing this pathogen to uninfected areas is low.

5.2.5 ASSET PROTECTION ZONES

The recommendation of the Bushfire Risk Assessment Report for the development (Australian Bushfire Protection Planners Pty Ltd, 2019) to comply with the Strategic Bushfire Management Plan for the ACT is a 40 meter wide Inner Asset Protection Zone (IAPZ) on western boundary and 10 m wise IAPZ on eastern boundary to be provided inside the Referral area (ACT Government, 2014b, Australian Bushfire Protection Planners Pty Ltd, 2019).

The ACT Bushfire Management Standards (ACT Government, 2014a) specifies the fuel management standards for IAPZs as presented below in Table 5.9.

Table 5.9 Fuel management standards – Inner Asset Protection Zones

ASSET PROTECTION ZONES	VEGETATION TYPE	FUEL MANAGEMENT STANDARDS
Inner Protection Zone		
Default standards to be applied across at least 80% of the zones as mapped. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone. Any significant variation on the default standards shall be approved by the ESA	Forest and woodland	Maintained at an overall fuel hazard ≤low 3–5 m canopy separation or fuel gap to crown, >3 m maintained
	Grass and open woodland	Grassland maintained at ≤200 mm height when grassland curing ≥70%.

Source: (ACT Government, 2014a)

The provision of the edge road to the south-eastern edge of the development impact area satisfies the provision of an IAPZ to the south-eastern edge.

The increased inner IAPZ to the western edge of the development, means that an Outer Asset Projection Zone (OAPZ) would not be required and this was the recommendation given the impact of management of a large OAPZ would have on Golden Sun Moth habitat to the west. The IAPZ would be intensively managed to reduce fuel which could have impacts to the suitability of habitat for Striped Legless Lizard and Golden Sun Moth if located within areas of habitat. Biomass management in the IAPZ should be managed with consideration to these species as outlined in Section 6 to avoid impacts which might otherwise be induced.

5.3 CUMULATIVE IMPACTS

The incremental effect of multiple sources of impact (past, present and future) are referred to as cumulative impacts (Contant and Wiggins, 1991, Council on Environmental Quality, 1978). Cumulative impact assessment considers a Project within the context of other past, present and likely future sources of impact. This is necessary to identify any impacts associated with the Project that may have an additive effect or interaction with impacts from other activities within the locality to the extent that the overall (cumulative) impact becomes significant when it would not otherwise have been significant.

The potential cumulative biodiversity impacts as a consequence of the construction and operation of the Project are discussed here within the context of the existing environment, present and likely future impacts.

Agricultural, residential and infrastructure development in the locality in historic and recent times has led to extensive vegetation clearing in the locality. Remaining native vegetation communities and fauna habitat has also been affected by a variety of disturbance mechanisms, including clearing of land, grazing by domestic animals, altered fire regimes, feral animals and weed invasion. This habitat loss and disturbance has resulted in the local extinction of a number of species which are less tolerant of habitat loss and disturbance (e.g. woodland birds and small mammals) and an increased risk of extinction to a number of vegetation communities.

Isolated remnant populations of disturbance-sensitive Threatened species in such a landscape may be susceptible to local extinction due to seemingly small reductions in habitat area or quality, if the habitat is near the lower limit in size or quality necessary to support a viable population and a critical threshold is reached.

In assessing the cumulative impact of a Project, it is important to consider whether the additive effects of multiple Projects may cause such a critical threshold to be reached for any Threatened biodiversity affected.

A number of assessments for development Projects have been undertaken in recent years which have or will impact on native grasslands, Box Gum Woodland, and associated Threatened species in the Project locality. This includes Strategic Assessments which have been undertaken for the Gungahlin, Molonglo Valley, West Belconnen, and the Eastern Broadacre regions. The Strategic Assessment process ensures that direct, indirect and cumulative impacts are well understood, and that avoidance, mitigation and offset strategies are addressed at a broader landscape scale to deliver a no net impact outcome.

A variety of other smaller scale developments are underway or planned in the locality, some of which would likely also impact Threatened biodiversity. These include infrastructure projects such as the Belconnen Trunk Sewer and the duplication of William Slim Drive to the west of the Site. The densification of residential development in the area will have an additive effect on processes that increase both direct and indirect impacts on Threatened biodiversity.

6 MITIGATION MEASURES

The general principle to minimise impacts to biodiversity, should in order of consideration, endeavour to:

- avoid impacts on biodiversity through the planning process
- minimise impacts on biodiversity through the planning process
- mitigate impacts on biodiversity though the use of a range of mitigation measures.

6.1 AVOIDING AND MINIMISING IMPACTS

The avoidance of impacts and minimisation of impacts, where feasible was undertaken through the early planning and design process. This was undertaken during the development of the DCP which was issue by the NCA in 2013 which was in part informed by investigations of ecological values of the Site. The DCP identified two precincts as suitable for residential use; and/or community facility or institutional use as these have low biodiversity value. This included areas which had ground disturbance as a result of past infrastructure and development including drainage works, septic systems, landfill and track construction as well as areas dominated or with high exotic vegetation cover as a result of landscaping and other disturbance. These Precincts have been incorporated into the proposed development.

Ecological surveys were undertaken across the broader Site to inform future conservation management of the Site as well as providing data to support the key principals of the DCP, namely to:

- allow for flexibility in design to ensure integration within the surrounding urban context, in particular the development of Lawson South adjacent to the Site
- maintain and integrate the existing natural and cultural heritage values of the Site with future development and allow for adaptive reuse of existing buildings on Site where possible (National Capital Authority, 2013).

Where possible, planning has aimed to reduce impacts to biodiversity. The following minimisation or avoidance of impact to the following have been achieved:

- minimising impacts to Natural Temperate Grassland of the South Eastern Highlands ecological community, through retention of approximately 83% of the total area of this community with the Site. This also includes:
  - avoidance of the area within Site that supports core habitat and the highest density of Golden Sun Moth
  - reduced impact to Dry *Themeda* Grassland (Natural Temperate Grassland) in the east of the Site where the highest density of Striped Legless Lizard occurs. This is consistent with previous recommendation of the Wildlife Research and Monitoring to retain this area to the east of the drainage line within the urban fabric, perhaps as open space (HLA Envirosciences, 2001).
- avoidance of *Lepidium ginninderrense* habitat in the western section of the Site
- retaining the majority of f Box Gum Woodland. Impacts to this community would be temporary for construction and could be revegetetated following completion of works
- avoidance of Lake Ginninderra, Ginninderra Creek and associated habitat for Migratory Species including Latham's Snipe.

Further mitigation measures will be employed throughout the design, construction and operational phases of the Project to mitigate impacts to biodiversity where possible. These mitigation measures are outlined in following sections.

6.2 DESIGN PHASE

A key aspect of mitigating the impacts of development is design of the urban interface with the grassland conservation area. The design measures provided below include measures that follow the principles outlined in *Land of Sweeping Plains* (2015) for the urban grasslands.

Mitigation measures for the design phase to limit indirect impacts from the development on the surrounding environment include:

- Ensuring all infrastructure and landscaping associated with the development including fencing, buffer plantings are located outside the conservation area.
- Designing fencing for the boundary of the grassland areas to exclude vehicles and trail bikes while:
  - maintaining vehicular access for management and research
  - allowing some pedestrian access to promote engagement with grassland and its conservation.
- Designing barrier kerb on all roads directly adjacent to the conservation area in order to prevent vehicle access and parking on road sides adjacent to the conservation area.
- Landscaping design for the project to only include non-invasive species.
- Providing appropriate landscape design at the boundary with grassland such as:
  - complementary plantings along the grassland boundary to provide a visual cue for public that the grassland conservation area is managed and cared for, and limit weed invasion at boundary. This could include mass plantings of grassland species. Consideration should also be given to potential planting low non-invasive shrub species to assist in reducing the loss of male Golden Sun moths from the conservation area as they appear to recognise suitable habitat and turn back after leaving it (Rowell, 2003b)
  - avoiding planting of trees at boundary which could shade grassland and provide roosts for predators of grassland reptiles. All tree planting on interface of grassland and development should be on the development side of the perimeter road
  - water sensitive urban design.
- Incorporating educational signage of grassland significance at high traffic areas at the grassland edge.
- Designing drainage to maintain pre-development hydrology and prevent nutrient run off into grassland area.
- Design lighting to minimise illumination surrounding habitats and reduce light spill into surrounding conservation areas to mitigate the impacts of artificial illumination on nocturnal and migratory species. This should include consideration of:
  - reducing the number of lights i.e. use only where required and consider use of timers; use of lowest intensity (wattage) lights appropriate
  - confining light spill by lowering the height of light fittings, including lights embedded in the ground rather than on poles; use light fittings that direct and confine the spread of light downwards, with full, cut-off shielded fixtures (that ensure no light is emitted horizontally or upward), that require less wattage, provide more light to the ground and reduce light waste.

6.3 CONSTRUCTION PHASE

As part of the overall Construction Environmental Management Plan (CEMP) for the Project, the following detailed mitigation measures would be incorporated to address potential biodiversity impacts:

- Workers to be inducted on environmental sensitivities, legislative requirements and penalties prior to commencement of Site work.
- 1.8 m high temporary fencing to be installed at the boundary of the development impact area to prevent access of unauthorised vehicles and construction workers into the conservation areas and avoid unintended impacts to these areas.
- Maintain kangaroo proof fencing in west of Site during construction to prevent movement of kangaroos onto roads or into construction areas.
- Fencing and clearing areas to be monitored to ensure impacts are no greater than approved.
- Provide clear Site maps identifying laydown areas, vegetation to be retained and undisturbed.
- The development of a Striped Legless Lizard Management Plan. This would include the following measures:
  - prior to commencing construction, erect frog/ reptile proof fencing at the boundary of the impact area and areas of habitat to prevent the lizards entering the construction area to minimise likelihood of injury and mortality
  - targeted pre-clearing surveys by an experienced ecologist and relocation of captured individuals to adjacent habitat outside the development area.
- Clearing of remnant and planted woodland vegetation to avoid spring and early summer when many birds breed (late August to January) or if being undertaken within this time period, an experienced fauna ecologist is to undertake a nest survey prior to tree removal (day of or day prior). Surveys should aim to identify nests and/or tree hollows being utilised by native bird species. Where practicable trees with active nests should remain in situ until nestlings have fledged. If clearing of the tree is to be undertaken immediately, a fauna ecologist is to supervise the removal of the nest tree.
- Where hollows are felled, these are to be recovered and reinstalled where possible. Re-use of hollows is preferred to the construction of artificial nest boxes as compensatory nesting offsets. Felled hollows that are not able to be mounted should be retained on ground in the area of retained Box Gum Woodland.
- Provide hollows or nest boxes for hollow-bearing trees to be removed at a minimum ratio of 1:1. These should be installed prior to clearing of hollow-bearing trees. Locate these on trees retained within the referral area or within planted vegetation with a maximum of one nest box on each tree.
- Stockpiling timber from tree removal to be utilised as course woody debris in the retained Box Gum Woodland and excess offered for use in nearby reserves. Consultation with the ACT Parks and Conservation Service should be undertaken to determine suitable locations for log reuse.
- A rehabilitation plan would be prepared which would include measures such as:
  - removing the topsoil in area of native vegetation to be stored and respread over areas of temporary ground disturbance during construction
  - revegetation would consist of locally native grasses and forbs consistent with the community impacted, namely:
    - Natural Temperate Grassland of the South Eastern Highlands ecological community
    - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland.

- Open trenches/pits would be backfilled as soon as possible following completion of works. If trenches/pits remain open overnight, they would be fully fenced (with shade cloth/reptile proof fencing or similar) to reduce terrestrial fauna access. Open pits/ trenches and excavations would be thoroughly checked each morning (prior to construction commencing) for any fauna that may have fallen in. A fauna handler or ecologist would be used to remove and relocate any trapped animals appropriately (as required).
- Measures to prevent the spread of invasive species and pathogens, including into areas within the conservation area would be implemented including., but not be limited to:
  - undertaking weed control in the development impact area prior to the clearing of vegetation and disturbance of soil
  - following the Australian Governments Arrive Clean, Leave Clean Guidelines (Department of the Environment, 2015a)
  - when undertaking vegetation clearing, working from non-weedy to weedy areas (i.e. from native vegetation to exotic vegetation)
  - undertaking vehicle check procedures, including wash/ brush down, to reduce the spread of weeds via vehicles and machinery
  - certifying any imported fill at the source location as pathogen and weed free
  - if importing materials from interstate or overseas, consider the potential for live pests to be carried in with goods
  - monitoring areas of potential new outbreaks for weed control including soil stockpiles, roadsides and any other disturbed areas
  - undertaking weed control when outbreaks are identified in and adjacent to the development area
  - controlling noxious and problematic weeds should they be found.
- Erosion and sediment controls, including stockpiling spoil in a manner to avoid the possibility of sediments entering waterways or migrating off-Site.
- Measures to prevent access of unauthorised vehicles into adjacent grassland, prior to, during, and post construction. Including, but not limited to:
  - temporary fences to prevent access by unauthorised vehicles during construction (no construction workers are permitted vehicle access into the adjacent grasslands)
  - replacement of temporary fences with permanent structures, such as bollards that will prevent access by unauthorised vehicles following construction.

6.4 OPERATIONAL PHASE

The following measures would be implemented to minimise potential ongoing impacts:

- Creation of information booklet and signage for local residents to foster an appreciation of the natural and cultural values of the Site and surrounds and to create a sense of stewardship. This should include information about the significance of the adjacent conservation areas and tips for how they can reduce their impacts. This may include information on:
  - appropriate garden plantings
  - minimising use of herbicides and fertilisers in gardens
  - cleaning shoes/clothing of weed material before entering the conservation areas.
- Provide signage indicating Lawson's designation as a cat containment suburb.
- Developing and implementing a weed management plan for the development area for a five year period following completion of construction focusing on highly invasive species and the boundaries of the conservation areas.

- Developing a management and monitoring plan to ensure appropriate management of vegetation within public areas, including but not limited to:
  - minimising use of herbicides in public areas as runoff could impact on native vegetation and Threatened species habitat in adjacent conservation areas
  - washdown procedures for slashing equipment used.
- Undertaking a five year monitoring program for the Striped Legless Lizard occurring in the eastern portion of Dry *Themeda* grassland to ensure objectives of the CEMP are achieved.
- Maintenance of permanent fencing around the conservation areas to manage public access including exclusion of vehicles and dirt bikes.

A Biodiversity Management Plan for the conservation area adjacent to the development outlines appropriate management actions, including adaptive management strategies for the maintenance and improvement of biodiversity values.

7 OFFSETS

7.1 OFFSETTING AIMS

The aim of offsetting is founded in the theory of 'avoid, minimise and mitigate' the impacts of projects. The accepted approach to environmental assessment requires that, in the first instance, environmental impacts are avoided or minimised as far as possible and subsequently reduced to acceptable levels through appropriate mitigation techniques. Where measures to avoid and mitigate impacts are not feasible or cost effective, then offset strategies can be used to compensate the residual impacts of the development on biodiversity.

Despite measures to avoid and mitigate impacts to threatened biodiversity including avoiding the areas of highest conservation significance, the project is likely to have significant impacts on MNES as such offsets are required at Commonwealth level. Offsetting is proposed through conservation and ongoing management of retained vegetation within the Site to the east and west of the proposed development.

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the relevant framework is the *EPBC Act Environmental Offsets Policy* (Department of Sustainability Environment Water population and Communities, 2012a) and related Offsets Assessment Guide (Department of Sustainability Environment Water Population and Communities, 2012b) The mechanism for determining offsets under the EPBC Act is via the Offsets Assessment Guide calculator.

7.2 PROPOSED OFFSET

The proposed offset is within the broader Site, to the east and west of the development (Figure 7.1 and Table 7.1). The MNES that would require offsets are found in this area, including:

- Natural Temperate Grassland.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community.
- Striped Legless Lizard population and associated habitat.
- Golden Sun Moth population and associated habitat.

In addition to threatened biodiversity that would be impacted by the proposed development, the offset site also contains habitat for other MNES near Lake Ginninderra, namely:

- habitat for Latham's Snipe – listed as migratory
- habitat for *Lepidium ginninderrense* (Ginninderra Peppercress) – species listed as Vulnerable and proposed offset area contains listed critical habitat.

The condition of the vegetation and habitats was a key constraint that defined the layout of the proposed development to focus development in areas with higher disturbance and lower ecological value while retaining the highest ecological value areas for conservation. As a result, the offset area supports a higher level of biodiversity and is in generally better condition than the corresponding vegetation and habitats within the proposed impact area.

Lawson North
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Figure 7.1
Proposed Conservation Area

Legend

- Proposed Conservation Area
- Development Impact Area - Permanent
- Development Impact Area - Temporary
- DHA Site
- Security Fence

0 100 200
Metres

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:6,000 Date: 22/12/2021

Data sources: - ACTiMap, Geoscience Australia

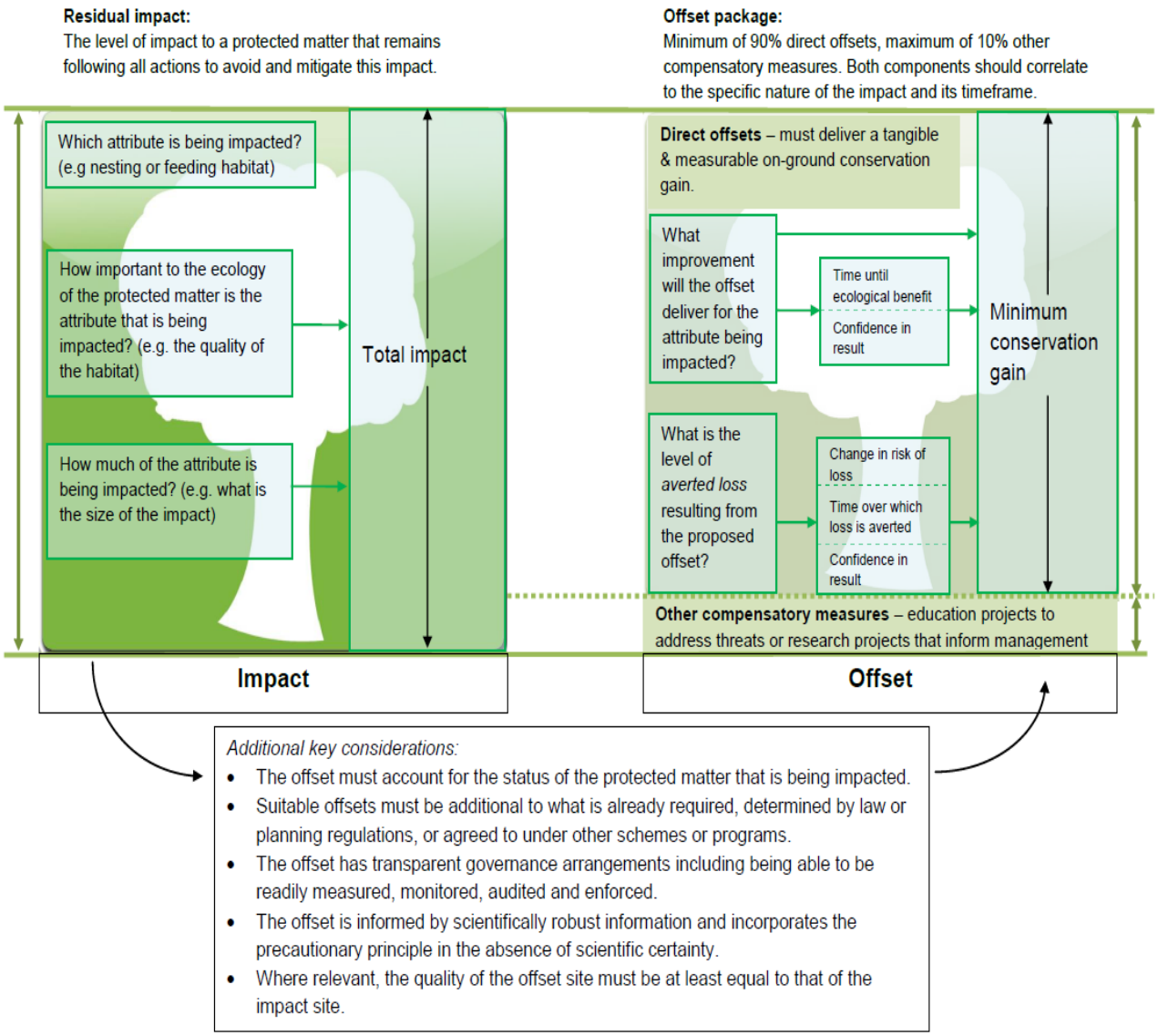
Table 7.1 MNES within proposed offset area

MNES	EPBC ACT[1]	AREA WITHIN PROPOSED DEVELOPMENT (HA)	AREA WITHIN PROPOSED OFFSET(HA)	OFFSET TO DEVELOPMENT RATIO
Natural Temperate Grassland of the South Eastern Highlands	CE	15.8	84.61	5.3:1
White Box-Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	1.31	7.65	2.5:1
Golden Sun Moth *Synemon plana*	V	11.6	61 (45.55 ha of high density core habitat)	5.3:1
Striped Legless Lizard *Delma impar*	V	26.53	97.84	3.7:1

1 CE= Critically Endangered, V= Vulnerable

7.3 COMPLIANCE OF OFFSET PACKAGE WITH THE EPBC OFFSETS POLICY PRINCIPLES

In assessing the suitability of an offset under the EPBC Act, the proposed offset package must be consistent with the EPBC offset principles (Figure 7.2). The proposed offset package has been assessed against these principles and is considered to be consistent (Table 7.2).



Source: (Department of Sustainability Environment Water population and Communities, 2012a)

Figure 7.2 Determining suitable offsets under the EPBC Act

Table 7.2 Assessment of offsets against principles in the EPBC Act Environment offset policy

PRINCIPLES OF EPBC OFFSETS	ASSESSMENT
Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action	While up to 15 ha of native vegetation and up to 32 ha of habitat would be cleared, the development has been located in areas that are more disturbed and of lower ecological value. The proposed onsite offset will protect approximately 85 hectares of land, comprising suitable habitat for the EPBC Act listed threatened ecological communities and species impacted by the proposed development namely: Natural Temperate Grassland; Golden Sun Moth and Striped Legless Lizard. The in perpetuity protection of the residual land as an offset and management of this area for conservation through the implementation of an adaptive biodiversity management plan will improve and maintain the viability of MNES within the site including those impacted by the proposed development.
Be built around direct offsets but may include other compensatory measures	The proposed offset is built around direct offset of MNES with a proposed on-site offset.
Be in proportion to the level of statutory protection that applies to the protected matter	Due to the higher risk involved with protected matters of greater conservation status, the offsets required for those protected matters with higher conservation status must be greater than those with a lower status. The proposed offset provides like for like offsets and the required offset area has been calculated using the offsets calculator which takes into consideration the statutory protection that applies.
Be of a size and scale proportionate to the residual impacts on the protected matter	In accordance with the EPBC Act Offset Assessment Guide, the proposed offset will exceed the offset requirements associated with the proposed removal of Golden Sun Moth, Striped Legless Lizard habitats, Box Gum Woodland and Natural Temperate Grassland as part of the development. Overall the proposed development covers 38 ha of which 15 ha consists of EPBC Act listed Natural Temperate Grassland and 33 ha of Striped Legless Lizard habitat. The offset would provide protection and improvement in condition of up to 80 hectares of Critically Endangered Ecological Community.
Effectively account for and manage the risks of the offset not succeeding	Appropriate management actions for the biodiversity within the offset site have been outlined in the biodiversity management plan and are designed to maintain and enhance current condition of vegetation and habitats within the proposed offset site. This is an adaptive management plan which includes monitoring and review of management measures to minimise the risk of the offset not succeeding.
Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs	The proposed offset is zoned as RZ1 – Suburban and PRZ1 – Urban Open Spaces. The proposed offset includes protection of the matters impacted by the proposal as well as habitat for the Ginninderra Peppercress and habitat for Latham's Snipe. The proposed offset site and its management for conservation is considered additional to what is currently required and includes protection and conservation.

PRINCIPLES OF EPBC OFFSETS	ASSESSMENT
Be efficient, effective, timely, transparent, scientifically robust and reasonable	The proposed offset provides protection and conservation management to an area of significant biodiversity within the broader site which supports the same MNES that are being impacted. In this way, the proposed offset provides an efficient and effective offset. As both the impact and offset area are owned by the same proponent, this provides a timely offset. The assessment of the impact and offset site follows standard methodology and as such is transparent and scientifically robust. For these reasons the offset is considered reasonable.
Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	The mechanism for long-term security of the offset is yet to be determined. Options for consideration include: — a conservation agreement under the EPBC Act. — inclusion in ACT offset reserves managed by ACT. — conservation trust.

8 RESIDUAL RISK ASSESSMENT

This section provides a risk assessment detailing the risks identified, the original risk rating without any mitigation and the residual risk assessment following consideration of management, mitigation and monitoring strategies applied to each risk identified. The residual risk rating describes the final risk with the mitigation measures in place. The risk rating level is determined by cross-referencing the likelihood of it occurring and the consequence of the action. A risk rating is determined from Table 8.1 below. The risk assessment is presented in Table 8.2.

Table 8.1 Qualitative risk assessment matrix – risk rating

LIKELIHOOD	CONSEQUENCE					
	Positive	**Minimal**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Remote	Beneficial	Negligible	Negligible	Very Low	Low	Medium
Unlikely	Beneficial	Negligible	Very Low	Low	Medium	High
Possible	Beneficial	Very Low	Low	Medium	High	Very High
Likely	Beneficial	Low	Medium	High	Very High	Significant
Almost Certain	Beneficial	Medium	High	Very High	Significant	Significant

Table 8.2 Residual risk assessment

IMPACT IDENTIFIED IN SECTION 5	ORIGINAL RISK RATING	ACTIONS CONDUCTED/ MITIGATIONS PROPOSED	RESIDUAL LIKELIHOOD	RESIDUAL CONSEQUENCE	RESIDUAL RISK RATING
Vegetation clearing					
Native vegetation clearing	Significant	— Initial Project design has minimised clearing of native vegetation by focusing on the eastern portion of the Site, and development impact area was further refined considering ecological constraints.	Almost certain	Moderate	Very High
Removal of Threatened ecological communities					
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Significant	— Retention of 7.65 ha of Box Gum Woodland which includes the area with high regeneration, good floristic diversity and scar tree. — Project design to retain hollow-bearing trees where possible. — Mitigation measures include including fencing and inductions to reduce over-clearing and minimise indirect impacts and disturbance.	Almost certain	Major	Significant
Natural Temperate Grassland of the South Eastern Highlands	Significant	— Project design has considered areas of Natural Temperate Grassland and aimed to retain large patches in good conditions which are of high conservation significance. — Retention of approximately 84.61 ha of this community.	Almost certain	Major	Significant

IMPACT IDENTIFIED IN SECTION 5	ORIGINAL RISK RATING	ACTIONS CONDUCTED/ MITIGATIONS PROPOSED	RESIDUAL LIKELIHOOD	RESIDUAL CONSEQUENCE	RESIDUAL RISK RATING
Removal of Threatened species habitat					
Impact on Threatened flora species	High	— Targeted surveys undertaken, and no Threatened flora species were identified within development area.	Remote	Major	Low
Impacts to hollow dependent species	High	— Hollow-bearing tree survey undertaken. — Surveys undertaken to identify presence of hollow dependent Threatened species and none recorded. — Design minimised clearing of hollow-bearing and mature trees as far as practicable. — Significance assessment undertaken for hollow-dependent Threatened species listed under the EPBC Act. — Ecologist on-Site during clearing of hollow-bearing trees. — Provision of nest boxes.	Possible	Minor	Low
Impact on Threatened woodland birds	Medium	— Surveys undertaken to identify presence of Threatened bird species and none recorded. — Design minimised clearing of hollow-bearing and mature trees as far as practicable. — Significance assessment undertaken for woodland bird species listed under the EPBC Act (Superb Parrot).	Possible	Minor	Low
Impact on Threatened Golden Sun Moth	Significant	— Targeted surveys undertaken. — Project design has avoided areas of high habitat quality and core area of activity. — Retention of 45.55 ha of high density core habitat for Golden Sun Moth. — Significance assessment undertaken for the species under the EPBC Act.	Almost certain	Major	Significant

IMPACT IDENTIFIED IN SECTION 5	ORIGINAL RISK RATING	ACTIONS CONDUCTED/ MITIGATIONS PROPOSED	RESIDUAL LIKELIHOOD	RESIDUAL CONSEQUENCE	RESIDUAL RISK RATING
Impact on Threatened Perunga Grasshopper	High	— Targeted surveys undertaken. — Project design has avoided areas of high habitat quality and known habitat. — 84.65 ha of native grassland will be retained as a part of the proposed offset.	Almost certain	Moderate	Very High

Impact on Threatened Striped Legless Lizard	Significant	— Targeted surveys undertaken.
		— Project design has minimised clearing of known and potential habitat.
		— Retention of up to 97.84 ha of known and potential habitat, including:
		  — 6.71 ha of high quality habitat
		  — 77.02 ha of moderate quality habitat
		  — 14.11 ha of low quality habitat.
		— Striped Legless Lizard management plan to be implemented.
		— Clearing of habitat to be undertaken during optimal survey conditions and following pre-clearing surveys.
		— Ecologist on Site for habitat clearing.
		— Significance assessment undertaken for the species under the EPBC Act.
			Almost certain	Major	Significant

Impact on Grey-headed Flying-fox	Medium	— Surveys undertaken to identify presence of camp sites and none recorded. — Significance assessment undertaken for the species under the EPBC Act.	Possible	Minor	Low

IMPACT IDENTIFIED IN SECTION 5	ORIGINAL RISK RATING	ACTIONS CONDUCTED/ MITIGATIONS PROPOSED	RESIDUAL LIKELIHOOD	RESIDUAL CONSEQUENCE	RESIDUAL RISK RATING
Injury and mortality					
Injury and mortality during vegetation clearing	Medium	— Implementation of CEMP including demarcating of vegetation clearing limits, pre-clearance surveys and on-Site ecologist during habitat clearing.	Unlikely	Moderate	Low
Fauna death or injury from vehicle strike	Medium	— Implementation of CEMP including Site inductions. — Availability of potential fauna habitat within the Project area to be low once operational.	Possible	Minor	Low
Indirect impacts					
Wildlife habitat fragmentation	High	— Design minimised clearing of hollow-bearing and mature trees as far as practicable. — Additional plantings will be made within the Project area.	Likely	Minor	Medium
Edge effects including weed invasion, noise and light	Very High	— Monitoring and weed control to be included in CEMP and in on-going operation for up to 5 years. — Minimising the use or herbicides and no use of fertilisers within public area of the development. — Implementing erosion and sediment controls, including stockpiling spoil in a manner to avoid the possibility of sediments entering waterways or migrating off-Site. — Considerations to reduce light spill during further Project design.	Possible	Major	High
Invasion and spread of pests	High	— Provide signage indicating Lawson's designation as a cat containment suburb.Monitoring for pests to be included in CEMP.	Unlikely	Major	Medium
Invasion and spread of pathogens and disease	High	— Imported fill to be certified at the source location as pathogen free. — Hygiene protocols to be included in CEMP.	Unlikely	Major	Medium

9 CONCLUSIONS

This biodiversity assessment was conducted to identify ecological values within the Site, minimise impacts through the design process and assess the impacts of the final design.

The vegetation within the referral area has been highly modified as a result of the previous development and operation of the former Belconnen Naval Transmission Station. In addition, the surrounding environment is dominated by residential developments. Although highly modified, some remnant native vegetation remains within the development area and will be impacted by the Project. This includes 17.31 ha which is consistent with critically endangered ecological communities, made up of:

- 1.31 ha of *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*
- 15.8 ha of *Natural Temperate Grassland of the South Eastern Highlands*.

Two Threatened fauna species were recorded within the Referral area during field survey:

- Golden Sun Moth – 11.6 ha of habitat. This species is listed as Endangered under the NC Act and Vulnerable under the EPBC Act.
- Striped Legless Lizard – 26.53 ha of known and potential habitat. This species is listed as Vulnerable under both the EPBC Act and NC Act.

In addition to this recorded species, another six Threatened fauna species are considered to have a moderate or higher likelihood of occurrence in the referral area, based on availability of potential habitat (Appendix D and Appendix E), including:

- four species of bird
- one species of invertebrate
- one species of mammal.

The Project would require clearing activities for construction resulting in loss of native vegetation, habitat, new edge effects, fragmentation and loss of connectivity. The Project would require clearing of up to 42.25 ha of vegetation of which 23.19 ha is remnant vegetation (Chapter 5). Impacts to Threatened ecological communities and habitat patches, where possible, have been minimised through early identification and preliminary design.

Significance assessments under the EPBC Act have been completed for EPBC Act listed communities and species and concluded that the Project is likely to have a significant impact on three of these entities (see Appendix F):

- *Natural Temperate Grassland of the South Eastern Highlands*
- Golden Sun Moth
- Striped Legless Lizard.

Impacts to species listed solely under the NC Act listed are considered unlikely to be significant based on survey results not detecting these species within the referral area, their mobility, availability of habitat within the broader landscape and the implementation of mitigation measures.

The avoidance of impacts and minimisation of impacts, where feasible, was undertaken through the planning process. This included:

- avoidance of impacts to the majority of the larger area of *Natural Temperate Grassland of the South Eastern Highlands* surrounding the referral area. Retention of this area would also retain:
  - high quality habitat and the core area of Golden Sun Moth activity
  - majority of the available habitat for the Striped Legless Lizard
  - majority of the available habitat for Perunga Grasshopper
  - habitat for Lepidium ginninderrense
  - habitat for Latham's Snipe
- minimising impacts to planted native trees and maintenance of connectivity at the perimeters of the Site.

Detailed mitigation measures would be implemented under each phase of the Project to reduce impacts to biodiversity values as far as practicable. This includes considerations and mitigations for further design phases, mitigations for construction including a details Construction Environmental Management Plan, and mitigations for the on-going operation of the development. A Biodiversity Management Plan for the proposed conservation area, outlines management actions will include considerations for potential impacts as a result of operational threats to these areas as a result of the proposed action.

The proposed offset for the project is within the broader Site, to the east and west of the development and covers over 100 ha. The MNES that would be impacted by the proposed action are found in this area, including:

- Natural Temperate Grassland
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community
- Striped Legless Lizard population and associated habitat
- Golden Sun Moth population and associated habitat.

In addition to threatened biodiversity that would be impacted by the proposed development, the offset site also contains habitat for other MNES, near Lake Ginninderra, namely:

- habitat for Latham's Snipe – listed as migratory
- habitat for *Lepidium ginninderrense* (Ginninderra Peppercress) – species listed as Vulnerable and proposed offset area contains listed critical habitat.

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11 LIMITATIONS

This Report is provided by WSP Australia Pty Limited (WSP) for Defence Housing Australia (Client) in response to specific instructions from the Client and in accordance with WSP's proposal dated 27 June 2018 and agreement with the Client dated 22 August 2018 (Agreement).

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WSP has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

11.3 ENVIRONMENTAL CONCLUSIONS

Detailed desktop assessment was undertaken prior to field surveys to identify the threatened biodiversity likely to occur in the locality and determine the field survey effort required for the scale of the Project and its ecological context. However, the precise range of habitats utilised by some species is not well understood. Furthermore, the discovery of hither to unknown populations of Threatened species, even well outside their known range, is always present. This applies particularly to cryptic species of plants and animals and plant species which can persist as soil seedbanks and easily go undetected despite intensive survey.

No sampling technique can eliminate the possibility that a species is present within the Project study area. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present within the study areas during surveys. Similarly, changing climatic conditions will see the distributions of some mobile species change over coming years. Condition of both vegetation communities and fauna habitat are also subject to changes over time in association with weather and climatic conditions and disturbance events, including seasonal changes. Changes in condition of vegetation and suitability of habitat can change reasonably quickly and may fluctuate between years. Changes in habitat condition may also result in changes to dispersal and as a result, the distribution of flora and fauna species. As such, the occurrence of some species in areas where they are currently thought unlikely to occur cannot be discounted.

The conclusions in this report are based upon data acquired for the Project study area and the known distribution and habitat preferences of species. The conclusions are, therefore, merely indicative of the likely biodiversity values of the Project Site, based on information available at the time of preparing the report, including the presence or otherwise of species. It should be recognised that, as more information becomes available, assessment of the likely presence of Threatened species can change with time.

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APPENDIX A

RECORDED SPECIES

A1 RECORDED FLORA

Table A.1 Flora recorded

EXOTIC	FAMILY	GENUS	SPECIES	COMMON NAME
*	Altingiaceae	*Liquidamber*	*stryaciflua*	Sweetgum
	Amaranthaceae	*Alternanthera*	sp.	
*	Amygdalaceae	*Prunus*	sp.	
*	Anacardiaceae	Cotinus	coggygria	Smoketree
	Anthericaceae	*Tricoryne*	*elatior*	Yellow Rush-lily
	Apiaceae	*Eryngium*	*ovinum*	
	Apiaceae	*Eryngium*	sp.	
	Apiaceae	Hydrocotyle	*laxiflora*	Stinking Pennywort
	Apiaceae	*Hydrocotyle*	*peduncularis*	
*	Apocynaceae	*Nerium*	*oleander*	
*	Asteraceae	*Arctotheca*	*calendula*	Capeweed
	Asteraceae	*Brachyscome*	sp.	
	Asteraceae	*Calocephalus*	*citreus*	Lemon Beauty-heads
	Asteraceae	*Calotis*	*lappulacea*	Yellow Burr-daisy
*	Asteraceae	*Carthamus*	*lanatus*	Saffron Thistle
*	Asteraceae	*Chondrilla*	*juncea*	Skelleton Weed
	Asteraceae	*Chrysocephalum*	*apiculatum*	Golden Everlasting
	Asteraceae	*Chrysocephalum*	*semipapposum*	Clustered Everlasting
	Asteraceae	*Chrysocephalum*	sp.	
*	Asteraceae	*Cirsium*	*vulgare*	Spear Thistle
*	Asteraceae	*Conyza*	*albida*	Fleabane
*	Asteraceae	*Conyza*	*bonariensis*	Fleabane
*	Asteraceae	*Conyza*	sp.	
	Asteraceae	*Euchiton*	*involucratus*	Shrubby Cudweed
	Asteraceae	*Euchiton*	sp.	
	Asteraceae	*Euchiton*	*sphaericus*	Round Cudweed
*	Asteraceae	*Gamochaeta*	*americana*	American Cudweed
*	Asteraceae	*Gamochaeta*	*purpurea*	
*	Asteraceae	*Hypochoeris*	*glabra*	Smooth Flatweed

EXOTIC	FAMILY	GENUS	SPECIES	COMMON NAME
*	Asteraceae	*Hypochoeris*	*radicata*	Flatweed
*	Asteraceae	*Lactuca*	*serriola*	Prickly Lettuce
	Asteraceae	*Leptorhynchos*	*squamatus*	Scaly Buttons
*	Asteraceae	*Onopordum*	*acanthium*	Scotch Thistle
	Asteraceae	*Pseudognaphalium*	*luteo-album*	Jersey Cudweed
	Asteraceae	*Senecio*	*quadridentatus*	Silver Fireweed
	Asteraceae	*Senecio*	*sp.*	
	Asteraceae	*Solenogyne*	*dominii*	Smooth Solenogyne
	Asteraceae	*Solenogyne*	*sp.*	
*	Asteraceae	*Sonchus*	*oleraceus*	Common Sow-thistle
	Asteraceae	*Stuartina*	*muelleri*	Spoon-leaved Cudweed
*	Asteraceae	*Taraxacum*	*officinale*	Dandelion
*	Asteraceae	*Tolpis*	*barbara*	
*	Asteraceae	*Tolpis*	*umbellata*	Tolpis
*	Asteraceae	*Tragopogon*	*porrifolius*	Purple
	Asteraceae	*Tragopogon*	sp.	
	Asteraceae	*Triptilodiscus*	*pygmaeus*	Austral Sunray
	Asteraceae	*Vittadinia*	*cuneata*	Bristly New Holland Daisy
	Asteraceae	*Vittadinia*	*gracilis*	Grey New Holland Daisy
	Asteraceae	*Vittadinia*	*muelleri*	Green New Holland Daisy
	Asteraceae	*Vittadinia*	sp.	
*	Asteraceae	*Xanthium*	*occidentale*	Nargoona Burr
*	Boraginaceae	*Echium*	*plantagineum*	Patersons Curse
*	Boraginaceae	*Echium*	*vulgare*	Viper Bugloss
*	Brassicaceae	*Lepidium*	*africanum*	African Bittercress
	Brassicaceae	*Lepidium*	*ginninderrense*	
*	Brassicaceae	*Rapistrum*	*rugosum*	
	Campanulaceae	*Wahlenbergia*	*communis*	Tufted Bluebell
	Campanulaceae	*Wahlenbergia*	*multicaulis*	Tadgell's Bluebell
	Campanulaceae	*Wahlenbergia*	sp.	
	Campanulaceae	*Wahlenbergia*	*stricta*	Tall Bluebell
*	Caryophyllaceae	*Moenchia*	*erecta*	Erect Chickweed

EXOTIC	FAMILY	GENUS	SPECIES	COMMON NAME
*	Caryophyllaceae	*Petrorhagia*	*nantueilii*	Pinks
*	Caryophyllaceae	*Stellaria*	*media*	Common Chickweed
	Casuarinaceae	*Allocasuarina*	*verticillata*	Weeping She-oak
	Casuarinaceae	*Casuarina*	*cunninghamiana*	River She-oak
	Chenopodiaceae	*Dysphania*	*pumilio*	Small Crumbweed
*	Clusiaceae	*Hypericum*	*perforatum*	St Johns Wort
	Convolvulaceae	*Convolvulus*	*angustissimus*	
	Convolvulaceae	*Dichondra*	*repens*	Kidney Weed
*	Cupressaceae	*Cupressus*	*arizonica*	Arizona Cypress
*	Cupressaceae	*Cupressus*	*glabra*	Smooth Arizona Cypress
*	Cupressaceae	*Cupressus*	*macrocarpa*	Monterey Pine
*	Cupressaceae	*Cupressus*	*sempervirens*	Mediterranean Cypress
	Cyperaceae	*Carex*	*appressa*	Tall Sedge
	Cyperaceae	*Carex*	*inversa*	Inverted Sedge
	Cyperaceae	*Schoenus*	*apogon*	Common Bog-rush
	Droseraceae	*Drosera*	*peltata*	Felty Sundew
*	Ericaceae	*Arbutus*	*unedo*	Irish Strawberry-tree
*	Ericaceae	*Rhododendron*	sp.	
	Euphorbiaceae	*Chamaesyce*	*drummondii*	Drummond's Spurge
	Euphorbiaceae	*Euphorbia*	*dallachyana* syn. E. *drummondii*	
	Fabaceae	*Desmodium*	*varians*	Variable Tick-trefoil
	Fabaceae	*Glycine*	*clandestina*	Twining Glycine
	Fabaceae	*Glycine*	*tabacina*	Vanilla Glycine
	Fabaceae	*Hovea*	*heterophylla*	
	Fabaceae	*Hovea*	*linearis*	Common Hovea
*	Fabaceae	*Trifolium*	*arvense*	Hare's-foot Clover
*	Fabaceae	*Trifolium*	sp.	
*	Fagaceae	*Quercus*	*palustris*	Pin Oak
*	Fagaceae	*Quercus*	*robur*	English Oak
*	Gentianaceae	*Centaurium*	*erythraea*	Pale Pink Century
	Gentianaceae	*Sebaea*	*ovata*	Yellow Sebaea

EXOTIC	FAMILY	GENUS	SPECIES	COMMON NAME
	Geraniaceae	*Erodium*	*crinitum*	Blue Heron's-bill
	Geraniaceae	*Pelargonium*	sp.	
	Goodeniaceae	*Goodenia*	*pinnatifida*	Scrambled Eggs
	Goodeniaceae	*Goodenia*	sp.	
	Haloragaceae	*Gonocarpus*	*tetragynus*	Common Raspwort
	Haloragaceae	*Haloragis*	*heterophylla*	Variable Raspwort
	Hypoxidaceae	*Hypoxis*	*hygrometrica*	Hairy Weather-glass
	Juncaceae	*Juncus*	*bufonius*	Toadrush
*	Juncaceae	*Juncus*	*capitatus*	Capitate Rush
	Juncaceae	*Juncus*	*filicaulis*	Fine Rush
	Juncaceae	*Juncus*	*homalocaulis*	Rush
	Juncaceae	*Juncus*	*subsecundus*	Common Rush
*	Lamiaceae	*Rosmarinus*	*officinalis*	Rosemary
*	Linaceae	*Linum*	*trigynum*	Yellow Flax
	Lomandraceae	*Lomandra*	*bracteata*	Mat-rush
	Lomandraceae	*Lomandra*	*filiformis*	Wattle Mat-rush
	Lomandraceae	*Lomandra*	*multiflora*	Many-flowered Mat-rush
	Lomandraceae	*Lomandra*	sp.	
	Lythraceae	*Lythrum*	*hyssopifolia*	Creeping Loosestrife
*	Malaceae	*Cotoneaster*	sp.	
*	Meliaceae	*Melia*	*azedarach*	White Cedar
	Mimosaceae	*Acacia*	*baileyana*	
	Mimosaceae	*Acacia*	*dealbata*	Silver Wattle
*	Mimosaceae	*Acacia*	sp.	Wattle
*	Moraceae	*Morus*	sp.	Mulberry
	Myrtaceae	*Callistemon*	*viminalis*	Weeping Bottlebrush
#	Myrtaceae	*Eucalyptus*	*bicostata*	Blue Gum
	Myrtaceae	*Eucalyptus*	*blakelyi*	Blakely's Red-gum
	Myrtaceae	*Eucalyptus*	*dalrympleana*	Mountain Gum
	Myrtaceae	*Eucalyptus*	*melliodora*	Yellow Box
	Myrtaceae	*Eucalyptus*	*polyanthemos*	Red Box
	Myrtaceae	*Eucalyptus*	sp.	

EXOTIC	FAMILY	GENUS	SPECIES	COMMON NAME
	Myrtaceae	*Melaleuca*	sp.	A Paperbark
*	Oleaceae	*Fraxinus*	sp.	Ash
*	Oleaceae	*Syringa*	*vulgaris*	
*	Orobanchaceae	*Parentucellia*	*latifolia*	Red Bartsia
	Oxalidaceae	*Oxalis*	*perennans*	Woodsorrel
*	Pinaceae	*Cedrus*	*atlantica*	Atla Cedar
*	Pinaceae	*Pinus*	*radiata*	Radiata Pine, Monterey Pine
	Plantaginaceae	*Plantago*	*gaudichaudii*	Narrow-leaved Plantain
*	Plantaginaceae	*Plantago*	*lanceolata*	Ribwort
	Plantaginaceae	*Plantago*	*varia*	Variable Plantain
*	Platanaeae	*Platanus*	*acerfolia*	London Plane
*	Poaceae	*Aira*	*caryophyllea*	Silvery Hair-grass
*	Poaceae	*Aira*	*elegantissima*	Elegant Hair-grass
*	Poaceae	*Aira*	sp.	
	Poaceae	*Anthosachne*	*scabra*	Common Wheatgrass
	Poaceae	*Aristida*	*ramosa*	Common Kerosine Grass
	Poaceae	*Austrostipa*	*bigeniculata*	Twice-bent Speargrass
	Poaceae	*Austrostipa*	*scabra*	Sickle Speargrass
	Poaceae	*Austrostipa*	*scabra subsp. falcata*	
*	Poaceae	*Avena*	*barbata*	Bearded Oat
*	Poaceae	*Avena*	*fatua*	Oat
*	Poaceae	*Avena*	sp.	
	Poaceae	*Bothriochloa*	*macra*	Red-leg Grass
*	Poaceae	*Briza*	*minor*	Small Quaking-grass
*	Poaceae	*Briza*	sp.	
*	Poaceae	*Briza*	spp.	
*	Poaceae	*Bromus*	*catharticus*	Prairie Brome
*	Poaceae	*Bromus*	*diandrus*	Great Brome
*	Poaceae	*Bromus*	*hordeaceus*	Soft Brome
*	Poaceae	*Bromus*	*molliformis*	Soft Brome
*	Poaceae	*Bromus*	sp.	
	Poaceae	*Chloris*	*truncata*	Windmill Grass

EXOTIC	FAMILY	GENUS	SPECIES	COMMON NAME
@	Poaceae	*Cynodon*	*dactylon*	Couch
	Poaceae	*Dichanthium*	*sericeum*	Silky Bluegrass
*	Poaceae	*Ehrharta*	*calycina*	Sand Veldt-grass
*	Poaceae	*Eleusine*	*tristachya*	Goose Grass
	Poaceae	*Elymus*	*scaber*	Common Wheat-grass
	Poaceae	*Enneapogon*	*nigricans*	Nine-awned Grass
	Poaceae	*Eragrostis*	*brownii*	Common Lovegrass
*	Poaceae	*Eragrostis*	*curvula*	
	Poaceae	*Eragrostis*	*leptostachya*	Paddock Lovegrass
*	Poaceae	*Eragrostis*	*pilosa*	
	Poaceae	*Eragrostis*	sp.	
*	Poaceae	*Holcus*	*lanatus*	Yorkshire Fog Grass
*	Poaceae	*Hordeum*	*marinum*	Sea Barley Grass
*	Poaceae	*Hordeum*	*marinum* ssp. *Leporinum*	
	Poaceae	*Joycea*	*pallida*	Red-anthered Snow-grass
	Poaceae	*Lachnagrostis*	*filiformis*	Green Blown-grass
*	Poaceae	*Lolium*	*perenne*	Perennial Ryegrass
	Poaceae	*Microlaena*	*stipoides*	Weeping Grass
*	Poaceae	*Nasella*	*neesiana*	Chilean Needle-grass
*	Poaceae	*Nassella*	*trichotoma*	Serrated Tussock
	Poaceae	*Panicum*	*effusum*	Hairy Panic
*	Poaceae	*Paspalum*	*dilatatum*	Paspalum
*	Poaceae	*Paspalum*	*distichum*	Water Couch
*	Poaceae	*Paspalum*	sp.	
*	Poaceae	*Phalaris*	*aquatica*	Toowoomba Canary-grass
	Poaceae	*Poa*	*meionectes*	Tussock-grass
	Poaceae	*Poa*	sp.	
	Poaceae	*Rytidosperma*	*bipartium*	
	Poaceae	*Rytidosperma*	*caespitosa*	Common Wallaby-grass
	Poaceae	*Rytidosperma*	*carphoides*	Short Wallaby-grass
	Poaceae	*Rytidosperma*	*eriantha*	Hill Wallaby-grass
	Poaceae	*Rytidosperma*	*pallidum*	

EXOTIC	FAMILY	GENUS	SPECIES	COMMON NAME
	Poaceae	*Rytidosperma*	sp.	
	Poaceae	*Sporobolus*	*creber*	Tall Sporobolus
	Poaceae	*Sporobolus*	sp.	
	Poaceae	*Themeda*	*triandra*	Kangaroo Grass
*	Poaceae	*Vulpia*	*myuros*	Squirrel-fescue
*	Poaceae	*Vulpia*	sp.	
*	Polygonaceae	*Acetosa*	*vesicaria*	
*	Polygonaceae	*Acetosella*	*vulgaris*	
*	Polygonaceae	*Rumex*	*crispus*	
	Polygonaceae	*Rumex*	*dumosus*	
*	Primulaceae	*Anagallis*	*arvensis*	
*	Ranunculaceae	*Ranunculus*	*nuricatus*	
	Rosaceae	*Acaena*	*novae-zelandiae*	
	Rosaceae	*Acaena*	*ovina*	
	Rosaceae	*Acaena*	sp.	
*	Rosaceae	*Aphanes*	*arvensis*	
*	Rosaceae	*Crataegus*	sp.	
*	Rosaceae	*Pyrus*	sp.	Pear
*	Rosaceae	*Pyrus*	*ussuriensis*	Manchurian Pear
*	Rosaceae	*Rosa*	*rubiginosa*	
	Rubiaceae	*Asperula*	*conferta*	
*	Rubiaceae	*Galium*	*aparine*	
*	Rubiaceae	*Galium*	*divarcatum*	
*	Salicaceae	*Populus*	*alba*	White Poplar
*	Salicaceae	*Populus*	*nigra*	Black Poplar
*	Scrophulariaceae	*Linaria*	*arvensis*	
*	Scrophulariaceae	*Verbascum*	*virgatum*	
	Sinopteridaceae	*Cheilanthes*	*austrotenuifolia*	Rock Fern
	Sinopteridaceae	*Cheilanthes*	*distans*	Bristly Rock Fern
	Sinopteridaceae	*Cheilanthes*	*sieberi*	Slender Rock Fern
	Sinopteridaceae	*Cheilanthes*	sp.	
*	Solanaceae	*Lycium*	*ferocissimum*	

EXOTIC	FAMILY	GENUS	SPECIES	COMMON NAME
*	Solanaceae	*Solanum*	*nigrum*	
*	Solanaceae	*Solanum*	*triflorum*	
	Stackhousiaceae	*Stackhousia*	*monogyna*	
	Thymelaeaceae	*Pimelea*	*curviflora*	
*	Ulmaceae	*Celtis*	*australis*	European Nettle tree
*	Ulmaceae	*Ulmus*	sp.	Elm
	Violaceae	*Hymenanthera*	*dentata*	
	Zygophyllaceae	*Tribulus*	*terrestris*	Tribulus

A2 PLOT AND TRANSECT DATA

Table A.2 Plot and transect summary values

QUADRAT	VEGETATION COMMUNITY	FLORISTIC VALUE SCORE (FVS)[1]	NUMBER OF INDICATOR SPECIES[2]	NUMBER OF NON-GRASS NATIVE SPECIES[3]	NUMBER OF EXOTIC SPECIES	NUMBER OF SIGNIFICANT WEED SPECIES	WEED VALUE SCORE[4]	NATIVE GROUND COVER (%)	EXOTIC PLANT COVER (%)
Q1	Box Gum Woodland and Derived Native Grassland	4.95	2	6	13	1	5.6	49	34
Q2	Rytidosperma Grassland	11.01	5	7	13	1	4.34	42	8
Q3	Box Gum Woodland and Derived Native Grassland	19.56	7	9	10	2	7.67	80	14
Q6	Dry Themeda Grassland	7.96	2	7	8	1	5.93	84	2
Q7	Dry Themeda Grassland	3.26	2	1	12	1	10.08	40	38
Q8	Austrostipa Grassland	6.46	2	4	9	1	4.98	66	28
Q9	Rytidosperma Grassland	2.72	1	4	6	0	3.30	56	18
18-4	Dry Themeda Grassland	15.19	6	9	12	1	4.28	92	4
18-5	Dry Themeda Grassland	10.35	6	8	7	2	3.19	86	4
18-6	Dry Themeda Grassland	11.72	5	10	5	0	1.43	86	2
19-7	Box Gum Woodland and Derived Native Grassland	12.90	5	11	6	1	2.40	50	24
19-8	Box Gum Woodland and Derived Native Grassland	2.88	1	5	11	1	4.54	42	12
20-1	Austrostipa Grassland	9.58	3	9	10	2	7.21	48	18
20-A1	Dry Themeda Grassland	10.64	5	6	2	0	0.5	94	4
20-2	Austrostipa Grassland	3.99	2	4	4	0	1.43	30	46
20-3	Austrostipa Grassland	0.93	0	1	9	1	3.46	38	52
20-8	Dry Themeda Grassland	10.23	5	6	1	0	0.40	96	2
20-9	Rytidosperma Grassland	4.82	3	5	7	1	4.56	68	16
20-10	Rytidosperma Grassland	2.49	0	5	7	0	3.63	80	12
20-13	Rytidosperma Grassland	3.06	1	6	5	0	1.5	66	32
20-14	Dry Themeda Grassland	8.2	5	6	3	0	0.77	96	2
20-15	Dry Themeda Grassland	8.74	5	8	7	1	3.31	82	14
18-1	Box Gum Woodland and Derived Native Grassland	4.86	3	6	10	1	3.41	62	4

QUADRAT	VEGETATION COMMUNITY	FLORISTIC VALUE SCORE (FVS)[1]	NUMBER OF INDICATOR SPECIES[2]	NUMBER OF NON-GRASS NATIVE SPECIES[3]	NUMBER OF EXOTIC SPECIES	NUMBER OF SIGNIFICANT WEED SPECIES	WEED VALUE SCORE[4]	NATIVE GROUND COVER (%)	EXOTIC PLANT COVER (%)
18-2	Box Gum Woodland and Derived Native Grassland	2.38	1	4	7	0	1.63	72	26
18-3	Dry Themeda Grassland	15.25	8	14	10	2	3.95	94	6
1B	Box Gum Woodland and Derived Native Grassland	16.12	5	5	7	1	2.94	92	2

(1) Floristic Value Score is a method of measuring the quality of a grassland site, based on Rehwinkel (2015) and is used in determining consistency of native grassland with the Threatened ecological community *Natural Temperate Grassland of the South Eastern Highlands* (ACT Scientific Committee, 2020a).

(2) Indicator species are native plant species that are useful surrogates for conservation value of a patch of native grassland and are typically disturbance sensitive species. Indicator species are used in determining consistency of native grassland with the Threatened ecological community *Natural Temperate Grassland of the South Eastern Highlands* (ACT Scientific Committee, 2020a).

(3) Non-grass species include forbs/herbs, lilies, orchids, rushes and shrubs. It does not include trees and, for the purposes of thresholds for community determination, sedges. Number of non-grass native species is used in determining consistency of native grassland with the Threatened ecological community *Natural Temperate Grassland of the South Eastern Highlands* (ACT Scientific Committee, 2020a).

(4) Weed value score obtained from the Floristiv Value Score Spreadsheet Tool for the South Eastern Highlands IBRA region (excluding the Monaro) (Wong, 2020).

Notes Plot and transect data for the remainder of the Site outside of the referral area is presented in the Biodiversity Management Plan.

Table A.3 Box Gum Woodland and Derived Native Grassland quadrat data (species cover/ abundance)

EXOTIC[1]	SPECIES NAME	COVER/ABUNDANCE[2]						
	Quadrat	19-8	18-2	18-1	19-7	Q1	Q3	1B
	Acaena novae-zelandiae					1		
	Acaena ovina			1				
*	*Acetosa vesicaria*					2		
*	*Acetosella vulgaris (Rumex acetosella)*		1	1				
	Alternanthera sp.					2		
*	*Anagallis arvensis*					1		
	Aristida ramosa				4			2
	Austrostipa bigeniculata	4	1	1	4			5
	Austrostipa scabra			1	4	5	2	
*	*Avena fatua*						2	
*	*Avena* sp.					2		
	Bothriochloa macra	4		1	4	3	4	4
*	*Briza maxima*							1
*	*Briza* sp.						3	
*	*Bromus hordeaceus*		1					
*	*Bromus molliformis*			1		2		
*	*Carthamus lanatus*	1		1		1		
	Centaurium erythraea						2	

EXOTIC[1]	SPECIES NAME	COVER/ABUNDANCE[2]						
	Quadrat	19-8	18-2	18-1	19-7	Q1	Q3	1B
	Cheilanthes distans				2			3
	Cheilanthes sieberi						2	
	Chloris truncata		1			3		
	Chrysocephalum apiculatum			1	3		3	3
*	*Cirsium vulgare*	1						
	Convolvulus angustissimus						1	
*	*Conyza bonariensis*	1						
	Dichondra repens		1					
	Dysphania pumilio	1						
*	*Echium plantagineum*	1	1					
*	*Echium vulgare*					1	1	1
	Einadia nutans				1			
*	*Eleusine tristachya*	1				1		
	Elymus scaber		1			2		
	Enneapogon nigricans		1					
	Eragrostis brownii						3	
*	*Eragrostis curvula*						2	
	Eragrostis leptostachya					4	3	

EXOTIC[1]	SPECIES NAME	COVER/ABUNDANCE[2]						
	Quadrat	19-8	18-2	18-1	19-7	Q1	Q3	1B
	Erodium crinitum	1						
	Eucalyptus blakelyi	4		3	1			
	Eucalyptus melliodora		1	5				
	Eucalyptus sp.					2		
*	*Galium aparine*				2			
*	*Gamochaeta americana*					1		
	Glycine clandestina			1				
	Glycine tabacina				2			
	Goodenia pinnatifida				2			
*	*Holcus lanatus*			1				
*	*Hordeum marinum*		1					
	Hovea heterophylla		1					
	Hypericum gramineum						1	
*	*Hypericum perforatum*				1		2	
*	*Hypochaeris radicata*					4	3	1
*	*Juncus capitatus*		1					
*	*Lepidium africanum*	1			1			
*	*Lolium perenne*			1				
	Lomandra bracteata			1				

EXOTIC[1]	SPECIES NAME	COVER/ABUNDANCE[2]						
	Quadrat	19-8	18-2	18-1	19-7	Q1	Q3	1B
	Lomandra multiflora							3
	Lomandra multiflora subsp. multiflora				1	2	4	
*	*Lycium ferocissimum*			1				
	Medicago sativa							1
	Melicytus dentatus		1					
	Microlaena stipoides	1				3	2	1
*	*Nassella neesiana*							
*	*Nassella trichotoma*	1		1	1	2	3	
*	*Onopodum acanthium*		1					
	Oxalis perennans	2		1	1	2	3	
	Panicum effusum	2		1	4	2	5	2
*	*Plantago lanceolata*	3	1	1	1	4	1	2
	Plantago varia	1						
*	*Rapistrum rugosum*	2						
*	*Rosa rubiginosa*					1	2	1
	Rumex dumosus							1
*	*Rumex* sp. (exotic species)					2		
	Rytidosperma carphoides				4		4	4

EXOTIC[1]	SPECIES NAME	COVER/ABUNDANCE[2]						
	Quadrat	19-8	18-2	18-1	19-7	Q1	Q3	1B
	Rytidosperma erianthum					1		
	Rytidosperma sp.						6	
*	*Solanum nigrum*	1						
*	*Sonchus oleraceus*			1				
	Stackhousia monogyna					1		
*	*Taraxacum officinale*	2		1	2	1		
	Themeda australis						4	4
	Tricoryne elatior						4	2
	Trifolium sp.			1				
	Triptilodiscus pygmaeus				2			
	Vittadinia cuneata				2			
	Vittadinia muelleri		1	1	3	1		
	Wahlenbergia communis				1		2	
	Wahlenbergia sp.	1						

(1) * indicated and exotic species.

(2) Cover/ abundance scores: 1 = <5 % cover and solitary (<4 individuals), 2 = < 5% cover and few (4-15 individuals), 3 = < 5% cover and numerous (> 15 individuals), 4 = 5% - < 25% cover, 5 = 25% - < 50% cover, 50% - < 75% cover, 7 = 75 or greater % cover.

Table A.4 Dry *Themeda* Grassland quadrat data (species cover/ abundance)

EXOTIC SPECIES[1]	SCIENTIFIC NAME	COVER/ABUNDANCE[2]									
	Quadrat	Q6	Q7	20-A1	20-8	20-14	20-15	18-3	18-4	18-5	18-6
	Acaena ovina	1						1	1		1
*	*Acetosella vulgaris*							1	1		
*	*Aira elegantissima*									1	1
	Asperula conferta			1		1	1	1	1		
	Austrostipa bigeniculata							2	1	1	1
	Austrostipa scabra										1
	Austrostipa sp.						1				
	Bothriochloa macra	4	6					2		4	
	Brachyscome sp.			1		1	1				
*	*Briza minor*						1				
*	*Briza* sp.							2	1		
*	*Bromus catharticus*							2			
*	*Bromus hordeaceus*							2	1		
	Calocephalus citreus			2		1	1			1	
	Carex appressa									1	
	Carthamus lanatus		3								
*	*Centaurium erythraea*			1		1	1				
	Cheilanthes distans				2						

EXOTIC SPECIES[1]	SCIENTIFIC NAME	COVER/ABUNDANCE[2]									
	Quadrat	Q6	Q7	20-A1	20-8	20-14	20-15	18-3	18-4	18-5	18-6
	Chrysocephalum apiculatum	3		3	2	1	1			1	
	Chrysocephalum semipapposum							4	4	1	1
	Chrysocephalum sp.										3
*	*Conyza bonariensis*		1								
*	*Cotoneaster* sp.		1								
	Dysphania pumilio		1								
*	*Echium plantagineum*		4					1	3		
*	*Ehrharta calycina*							1			
*	*Eragrostis curvula*							1			
	Eryngium sp.							1			
	Euchiton sp.						1				
	Glycine tabacina	2									
	Goodenia pinnatifida				1			1		1	1
	Goodenia sp.								1		
	Holcus lanatus						4				
*	*Hypericum perforatum*	3	3				1		1		
*	*Hypochaeris radicata*	3		2		1	1			1	1

EXOTIC SPECIES[1]	SCIENTIFIC NAME	COVER/ABUNDANCE[2]									
	Quadrat	Q6	Q7	20-A1	20-8	20-14	20-15	18-3	18-4	18-5	18-6
	Leptorhynchos squamatus	3						1			
	Lomandra bracteata							1	3		
	Lomandra filiformis								1		
	Lomandra multiflora			1							
	Lomandra sp.					1					
	Microlaena stipoides									1	
*	*Nassella neesiana*		4				1				
*	*Onopodum acanthium*								1		
	Oxalis perennans	1								1	
	Panicum effusum		4		3						
*	*Paspalum dilatatum*	1								1	
*	*Petrorhagia nanteuilii*								1		
*	*Phalaris aquatica*							1	1	1	
*	*Plantago lanceolata*	3	3		2	1	1		1	1	1
	Plantago varia							1	1	1	1
	Poa sp.							1			
*	*Rosa rubiginosa*		3								
*	*Rubus* sp.										

EXOTIC SPECIES[1]	SCIENTIFIC NAME	COVER/ABUNDANCE[2]									
	Quadrat	Q6	Q7	20-A1	20-8	20-14	20-15	18-3	18-4	18-5	18-6
	Rumex brownii			1		1	1				
*	*Rumex crispus*	2									
	Rytidosperma pallidum				3			1			
	Rytidosperma sp.	3		3		1	4			1	
	Senecio quadridentatus							1			
	Senecio sp.									1	
*	*Solanum nigrum*		2								
*	*Solanum triflorum*		1								
	Solenogyne dominii				1			1			1
*	*Sonchus oleraceus*								1	1	
	Sporobolus creber									1	
	Sporobolus sp.		2								
	Stackhousia monogyna							1			
	Stuartina muelleri							1			
*	*Taraxacum officinale*	3	3						1		1
	Themeda australis	7	3	7	7	7	6	4	4	4	5
*	*Tragopogon porrifolius*							1			1
	Tricoryne elatior				2		1		1		
	Trifolium arvense							1	1		

EXOTIC SPECIES[1]	SCIENTIFIC NAME	COVER/ABUNDANCE[2]									
	Quadrat	Q6	Q7	20-A1	20-8	20-14	20-15	18-3	18-4	18-5	18-6
	Trifolium sp.							1			1
	Vittadinia cuneata	2									1
	Vittadinia muelleri							1		1	1
	Vittadinia sp.								1	1	1
*	*Vulpia myuros*									1	
	Wahlenbergia communis						1				
	Wahlenbergia sp.				2			1	3		1
	Wahlenbergia stricta	2									
*	*Xanthium occidentale*		1								

(1) * denotes and exotic species

(2) Cover/abundance scores: 1 = <5 % cover and solitary (<4 individuals), 2 = < 5% cover and few (4-15 individuals), 3 = < 5% cover and numerous (> 15 individuals), 4 = 5% - < 25% cover, 5 = 25% - < 50% cover, 50% - < 75% cover, 7 = 75 or greater % cover.

Table A.5 *Austrostipa* Grassland quadrat data (species cover/abundance)

EXOTIC[1]	SCIENTIFIC NAME	COVER/ABUNDANCE[2]			
	Quadrat	Q8	20-1	20-2	20-3
	Acaena novae-zelandiae	2			
	Acaena sp.		1		
	Austrostipa bigeniculata	4	4	4	3
*	*Avena* sp.		3	3	3
	Bothriochloa macra	4	4	4	4
	Cheilanthes distans			2	
	Chloris truncata		2		
	Chrysocephalum apiculatum		2		
	Convolvulus angustissimus		1		
*	*Conyza albida*	2			
*	*Conyza bonariensis*		1		
*	*Cotoneaster* sp.	2			
	Daucus glochidiatus			1	
*	*Echium plantagineum*		2		2
*	*Eleusine tristachya*				1
	Elymus scaber			2	
	Euchiton involucratus			1	
	Glycine tabacina		2		
*	*Hypericum perforatum*	3			1
*	*Hypochaeris radicata*			2	2
*	*Lepidium africanum*				1
*	*Nassella trichotoma*		3		2
	Oxalis perennans		1		
	Panicum effusum	3		3	
*	*Paspalum dilatatum*	2	1		
*	*Malva* sp.			1	
*	*Plantago lanceolata*	3	2	2	2
*	*Prunus* sp.	1			
*	*Rosa rubiginosa*	2	1		

EXOTIC[1]	SCIENTIFIC NAME	COVER/ABUNDANCE[2]			
	Quadrat	Q8	20-1	20-2	20-3
*	*Rubus* sp.	1			
	Rumex dumosus		1		
	Rytidosperma sp.	3			
*	*Solanum nigrum*				1
*	*Taraxacum officinale*	3		1	
	Themeda australis	4			
*	*Tragopogon porrifolius*		1		
	Tricoryne elatior		4		
	Trifolium sp.		1	1	1
*	*Verbascum virgatum*		1		
	Vittadinia cuneata	3			
	Vittadinia muelleri	3	3		1
	Wahlenbergia communis		3		
	Wahlenbergia sp.			1	
	Wahlenbergia stricta	3			
Total number native species					
Total number exotic species					

(1) * denoted an exotic species

(2) Cover/abundance scores: 1 = <5 % cover and solitary (<4 individuals), 2 = < 5% cover and few (4-15 individuals), 3 = < 5% cover and numerous (> 15 individuals), 4 = 5% - < 25% cover, 5 = 25% - < 50% cover, 50% - < 75% cover, 7 = 75 or greater % cover.

Table A.6 *Rytidosperma* Grassland quadrat data (cover/abundance)

EXOTIC SPECIES[1]	SCIENTIFIC NAME	COVER/ABUNDANCE[2]				
	Quadrat	Q2	20-10	20-13	Q9	20-9
*	*Aira caryophyllea*	1				
	Asperula conferta		1		1	1
	Austrostipa bigeniculata		5	4	5	4
	Austrostipa scabra	5				
*	*Avena* sp.	2	4	3	4	4
	Bothriochloa macra	5	5	4	5	4
*	*Bromus diandrus*	2				
*	*Bromus hordeaceus*		4	3	4	4
*	*Bromus molliformis*	1				
*	*Centaurium erythraea*	1	3	1	3	3
	Cheilanthes sp.	2		1		
	Chrysocephalum apiculatum	1			2	
	Convolvulus angustissimus		1	1	1	
*	*Conzya* sp.	1				
	Elymus scaber			3		
	Euchiton sp.			1		
*	*Gamochaeta americana*	2				
	Goodenia pinnatifida					1
*	*Hypericum perforatum*	2	2	2	2	
*	*Hypochaeris radicata*	3	3	2	3	3
	Lomandra filiformis	2				
	Lomandra multiflora	4				1
	Microlaena stipoides	4				
*	*Nassella trichotoma*	2				2
	Oxalis perennans	3	2	2	2	2
	Panicum effusum	5				
*	*Plantago lanceolata*	2	3		3	3

EXOTIC SPECIES[1]	SCIENTIFIC NAME	COVER/ABUNDANCE[2]				
	Quadrat	**Q2**	**20-10**	**20-13**	**Q9**	**20-9**
	Rytidosperma carphoides	4				
	Rytidosperma sp.		3	3	3	3
	Solenogyne dominii		1	1		
*	*Tragopogon porrifolius*		1			1
	Tricoryne elatior	1				2
*	*Trifolium arvense*	1				
*	*Vulpia myuros*	2				
	Wahlenbergia communis	3	3			
	Wahlenbergia sp.			2		
Total number native species						
Total number exotic species						

(1) * denotes and exotic species

(2) Cover/abundance scores: 1 = <5 % cover and solitary (<4 individuals), 2 = < 5% cover and few (4-15 individuals), 3 = < 5% cover and numerous (> 15 individuals), 4 = 5% - < 25% cover, 5 = 25% - < 50% cover, 50% - < 75% cover, 7 = 75 or greater % cover.

A3 CONDITION THRESHOLD ASSESSMENTS (THREATENED ECOLOGICAL COMMUNITIES)

Table A.7 Native grassland patch condition threshold assessment against *Natural Temperate Grassland of the South Eastern Highlands* (table1)

VEGETATION COMMUNITY	AUSTROSTIPA GRASSLAND	RYTIDOSPERMA GRASSLAND	AUSTROSTIPA GRASSLAND	AUSTROSTIPA GRASSLAND	AUSTROSTIPA GRASSLAND	RYTIDOSPERMA GRASSLAND	RYTIDOSPERMA GRASSLAND	RYTIDOSPERMA GRASSLAND	DERIVED GRASSLAND	DERIVED GRASSLAND	AUSTROSTIPA GRASSLAND
Quadrat number	**20-10[1]**	**20-13[1]**	**20-2**	**20-3**	**Q8**	**Q2**	**Q9[2]**	**20-9**	**Q3**	**1B**	**20-1**
Non-grass native species	5	6	4	1	4	**7**	**4**	5	**9**	5	**9**
Indicator species	0	1	1	0	**2**	**5**	**1**	**3**	7	**5**	**3**
FVS	2.49	3.06	2.88	0.93	**6.46**	**11.01**	2.72	4.82	**19.86**	**16.12**	**9.58**
Minimum condition outcome	Not NTG	Not NTG[1]	Not NTG	Not NTG	**NTG**	**NTG**	**NTG[2]**	**NTG**	**NTG**	**NTG**	**NTG**
Justification	Patch lacks species diversity	Patch lacks species diversity	Patch lacks species diversity	Patch lacks species diversity	FVS and Indicator species meet criteria	Non-grass native species, indicator species and FVS meet criteria	Survey of this quadrat not undertaken in favourable sampling time. Non-grass native species and indicator species meet criteria for other sampling times.	Indicator species meets criteria	Non-grass native species, indicator species and FVS meet criteria	Indicator species and FVS meet criteria	Non-grass native species, indicator species and FVS meet criteria

(1) Quadrat was undertaken after significant recent rainfall which was observed to stimulate significant growth and flowering of native species across the Site, therefore sampling was considered to have been undertaken at a favourable sampling time.

(2) Meets condition for 'other sampling time'

Table A.8 Native grassland patch condition threshold assessment against *Natural Temperate Grassland of the South Eastern Highlands* (table 2)

VEGETATION COMMUNITY	THEMEDA GRASSLAND	THEMEDA GRASSLAND	THEMEDA GRASSLAND	THEMEDA GRASSLAND	THEMEDA GRASSLAND	THEMEDA GRASSLAND	THEMEDA GRASSLAND	THEMEDA GRASSLAND	THEMEDA GRASSLAND	THEMEDA GRASSLAND
Quadrat number	**18-4**	**18-5**	**18-6**	**Q6**	**Q7**	**20-A1**	**20-8**	**20-14**	**20-15**	**18-3**
Non-grass native species	**9**	**8**	**10**	7	1	6	6	6	**8**	**14**
Indicator species	**5**	**6**	**5**	**2**	**1**	**5**	**5**	**5**	**5**	**8**
FVS	**11.86**	**10.35**	**11.72**	**7.96**	4.15	**10.64**	**10.23**	**8.20**	**8.74**	**15.25**
Minimum condition outcome	**NTG**	**NTG**	**NTG**	**NTG**	**NTG**	**NTG**	**NTG**	**NTG**	**NTG**	**NTG**
Justification	Non-grass native species, indicator species and FVS meet criteria	Non-grass native species, indicator species and FVS meet criteria	Non-grass native species, indicator species and FVS meet criteria	Indicator species and FVS meet criteria, >50% Themeda	High Themeda cover	Indicator species and FVS meet criteria, >50% Themeda	Indicator species and FVS meet criteria, >50% Themeda	Indicator species and FVS meet criteria, >50% Themeda	Non-grass native species, indicator species and FVS meet criteria, >50% Themeda	Non-grass native species, indicator species and FVS meet criteria

(1) Quadrat was undertaken after significant recent rainfall which was observed to stimulate significant growth and flowering of native species across the Site, therefore sampling was considered to have been undertaken at a favourable sampling time.

(2) Meets condition for 'other sampling time'

Table A.9 EPBC Box Gum Woodland patch condition threshold assessment (table 1/2)

EPBC CONDITION CRITERIA	**ASSESSMENT**												
Quadrat number	**Q1**	**18-1**	**18-2**	**19-7**	**19-8**	**1b**	**Q3**	**20-13**	**Q9**	**20-9**	**Q2**	**20-10**	**20-1**
Vegetation community	Box Gum Woodland and Derived Native Grassland					Box Gum Woodland and Derived Native Grassland		*Rytidosperma* Grassland			*Rytidosperma* Grassland	*Austrostipa* Grassland	
Predominantly native understorey (exotic cover <50%)	Yes					Yes		Yes			Yes	Yes	
Patch greater than 0.1 ha	Yes					Yes		Yes			Yes	Yes	
Non-grass native species	6	6	4	11	5	5	9	6	4	5	7	5	9
Important species	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Natural regeneration of eucalypts	Yes					Yes		No			No	No	
Consistent with listed community	**Yes** **Patch greater than 2 ha and contains natural regeneration of dominant eucalypt species**					**Yes** **Patch greater than 2 ha and contains natural regeneration of dominant eucalypt species**		No Understorey lacks diversity and no canopy cover or regeneration of overstorey. Analysis of quadrats in this patch showed consistency with Natural Temperate Grassland community (see Table A.7)			No Understorey lacks diversity and no canopy cover or regeneration of overstorey. Analysis of quadrats in this patch showed consistency with Natural Temperate Grassland community (see Table A.7)	No Understorey lacks diversity and no canopy cover or regeneration of overstorey. Analysis of quadrats in this patch showed consistency with Natural Temperate Grassland community (see Table A.7)	

Table A.10 EPBC Box Gum Woodland patch condition threshold assessment (table 2/2)

EPBC CONDITION CRITERIA	ASSESSMENT												
Quadrat number	**Q6**	**20-A1**	**20-14**	**20-8**	**18-6**	**18-5**	**18-4**	**20-15**	**18-3**	**Q7**	**Q8**	**20-2**	**20-3**
Patch	*Themeda* Grassland											*Austrostipa* Grassland	
Predominantly native understorey (exotic cover <50%)	Yes											Yes	
Patch greater than 0.1 ha	Yes											Yes	
Non-grass native species	7	6	6	6	10	8	9	8	**14**	1	4	4	1
Important species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Natural regeneration of eucalypts	No											No	
Consistent with listed community	No No canopy cover or natural regeneration of overstorey. All except one quadrat lacked the species diversity for this community. Analysis of quadrats in this patch showed consistency with Natural Temperate Grassland community (see Table A.8)											No Understorey lacks diversity and no canopy cover or regeneration of overstorey	

A4 RECORDED FAUNA

Table A.11 Fauna recorded across the Site

FAUNA GROUP	FAMILY NAME	SCIENTIFIC NAME[1]	COMMON NAME	AREA SPECIES RECORDED		
				Development area	Conservation area	During previous surveys of the site[2]
Amphibians	Limnodynastidae	*Limnodynastes peronii*	Striped Marsh Frog	x		
	Limnodynastidae	*Limnodynastes tasmaniensis*	Spotted Marsh Frog	x		x
	Limnodynastidae	*Limodynastes dumerelii*	Eastern Banjo Frog	x		
	Myobatrachidae	*Crinia parinsignifera*	Plains Froglet	x	x	
	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	x		x
	Pelodryadidae	*Litoria verreauxii*	Whistling Tree Frog			x
Birds	Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	x	x	
	Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	x	x	x
	Acanthizidae	*Smicrornis brevirostris*	Weebill	x	x	
	Accipitridae	*Aquila audax*	Wedge-tailed Eagle	x	x	
	Accipitridae	*Elanus axillaris*	Black-shouldered Kite		x	
	Acrocephalidae	*Acrocephalus australia*	Australian Reed-warbler		x	
	Acrocephalidae	*Acrocephalus stentoreus*	Clamorous Reed Warbler			x
	Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	x	x	
	Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher			x

FAUNA GROUP	FAMILY NAME	SCIENTIFIC NAME[1]	COMMON NAME	AREA SPECIES RECORDED		
				Development area	Conservation area	During previous surveys of the site[2]
	Anatidae	*Anas superciliosa*	Pacific Black Duck		x	x
	Anatidae	*Chenonetta jubata*	Australian Wood Duck	x	x	x
	Anatidae	*Cygnus atratus*	Black Swan			x
	Anhingidae	*Anhinga novaehollandiae*	Australasian Darter		x	
	Ardeidae	*Egretta novaehollandiae*	White-faced Heron		x	x
	Ardeidae	*Nycticorax caledonicus*	Rufous Night Heron			x
	Artamidae	*Artamus cinereus*	Black-faced Woodswallow	x		
	Artamidae	*Artamus cyanopterus*	Dusky Woodswallow			x
	Artamidae	*Cracticus tibicen*	Australian Magpie	x	x	x
	Artamidae	*Strepera graculina*	Pied Currawong	x		
	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	x	x	x
	Cacatuidae	*Cacatua roseicapilla*	Galah	x	x	x
	Cacatuidae	*Calyptorhynchus banksii*	Red-tailed Black Cockatoo			x
	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black Cockatoo			x
	Campephagida	*Lalage suueurii*^	White-winged Triller			x
	Campephagidae	*Coracina novaehollandiae*	Black-faced cuckooshrike	x		
	Charadriidae	*Vanellus miles*	Masked Lapwing			x
	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	x	x	x

FAUNA GROUP	FAMILY NAME	SCIENTIFIC NAME[1]	COMMON NAME	AREA SPECIES RECORDED		
				Development area	Conservation area	During previous surveys of the site[2]
	Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	x	x	
	Corvidae	*Corvus coronoides*	Australian Raven	x	x	x
	Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo	x		
	Dicruridae	*Dicrurus bracteatus*	Spangled Drongo			x
	Estrildidae	*Neochmia temporalis*	Red-browed Firetail	x	x	x
	Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	x		
	Falconidae	*Falco cenchroides*	Nankeen Kestrel		x	x
	Falconidae	*Phile,on corniculatus*	Noisy Friarbird			x
	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	x		x
	Hirundinidae	*Petrochelidon nigricans*	Tree Martin		x	
	Locustellidae	*Cincloramphus mathewsi*	Rufous Songlark			x
	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	x	x	x
	Meliphagidae	*Anthochaera carnunculata*	Red Wattlebird	x		x
	Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater		x	
	Meliphagidae	*Manorina melanocephala*	Noisy Miner	x	x	
	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	x	x	x
	Motacillidae	*Anthus australis*	Richard's Pipit	x	x	
	Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush		x	x

FAUNA GROUP	FAMILY NAME	SCIENTIFIC NAME[1]	COMMON NAME	AREA SPECIES RECORDED		
				Development area	Conservation area	During previous surveys of the site[2]
	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	x	x	
	Pardalotidae	*Pardalotus punctatus*	Spotted pardalote	x		
	Pardalotidae	*Pardalotus striatus*	Striated Pardalote		x	
	Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican			x
	Petroicidae	*Microeca fascinans*	Jacky Winter			x
	Petroicidae	*Petroica goodenovii*	Red-capped Robin		x	
	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant			x
	Phalacrocoracidae	*Phalacrocorax melanoleucos*	Little Pied Cormorant			x
	Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant		x	x
	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant		x	
	Psittaculidae	*Alisterus scapularis*	King Parrot	x		
	Psittaculidae	*Platycercus elegans*	Crimson Rosella	x	x	x
	Psittaculidae	*Psephotus haematonotus*	Red-rumped Parrot	x	x	x
	Rallidae	*Fulica atra*	Eurasian Coot		x	x
	Rallidae	*Gallinula tenebrosa*	Dusky moorhen			x
	Rallidae	*Porphrio melanotus*	Australasian Swamphen		x	
	Rallidae	*Porphyrio porphyrio*	Purple Swamphen			
	Rhipiduridae	*Rhipidura fuliginosa*	Grey Fantail	x	x	

FAUNA GROUP	FAMILY NAME	SCIENTIFIC NAME[1]	COMMON NAME	AREA SPECIES RECORDED		
				Development area	Conservation area	During previous surveys of the site[2]
	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	x	x	x
	Scolopacidae	*Gallinago hardwickii*^	Lathams Snipe			x
	Sturnidae	*Acridotheres tristis**	Common Myna	x	x	x
	Sturnidae	*Sturnus vulgaris**	Common Starling	x	x	x
	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis		x	
	Turdidae	*Turdus merula*	Common Blackbird	x	x	
	Zosteropidae	*Zosterops lateralis*	Silvereye	x	x	
Invertebrates	Acrididae	*Perunga ochracea*^	Perunga Grasshopper		x	
	Castniidae	*Synemon plana*^	Golden Sun Moth	x	x	x
	Gryllacrididae	*Coorabooroma canberrae*	Canberra Raspy Cricket		x	
Mammals	Canidae	*Vulpes Vulpes**	European Red Fox	x	x	x
	Leporidae	*Lepus capensis**	Brown Hare	x	x	
	Leporidae	*Oryctolagus cuniculus**	European Rabbit	x	x	x
	Leporidae	*Pteropus poliocephalis*^	Grey-headed Flying-fox			x
	Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo	x	x	x
	Molossidae	*Mormopterus* Sp. 2	Eastern Freetail Bat			x
	Molossidae	*Tadarida australia*	White-striped Mastiff Bat			x
	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat			x

FAUNA GROUP	FAMILY NAME	SCIENTIFIC NAME[1]	COMMON NAME	AREA SPECIES RECORDED		
				Development area	Conservation area	During previous surveys of the site[2]
	Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat			x
	Vespertilionidae	*Vespadelus vulturnus*	Little Forest Bat			x
Reptiles	Elapidae	*Pseudonaja textilis*	Eastern Brown Snake	x	x	
	Pygopodidae	*Delma impar*^	Striped Legless Lizard	x	x	x
	Pygopodidae	*Delma inornata*	Olive Legless Lizard	x	x	x
	Scincidae	*Lampropholis delicata*	Delicate skink	x	x	x
	Scincidae	*Lampropholis guichenoti*	Common Garden Skink	x	x	
	Scincidae	*Lampropholis* sp.	Skink species	x	x	
	Scincidae	*Morethia boulengeri*	Boulenger's Skink			x

(1) * = introduced species, ^ = significant species (threatened species, listed under the EPBC Act and/ or NC Act, migratory species listed under the EPBC Act.

(2) Sources: (SMEC Australia, 2008, HLA Envirosciences, 2002)

APPENDIX B

HOLLOW-BEARING TREE SURVEY RESULTS

B1 HOLLOW-BEARING TREES

The results from the hollow-bearing tree survey which was undertaken within the development area are presented in Table B.1 below.

Table B.1 Hollow-bearing tree survey results

TREE ID	DBH (cm)	HEIGHT (m)	HOLLOW/ SPOUT SIZE (cm)				SPOUT/S	HOLLOW DISTANCE FROM GROUND (m)	HOLLOW/ SPOUT LOCATION	SUITABLE HOLLOW DIMENSIONS FOR SUPERB PARROT	COMMENTS	IMPACTED
			<5	6-15	16-25	>25						
1	66.8	16		2	1			5-8	Branch & Trunk	No		Yes
2	67.5	13	1	2			✓	2-11	Branch & Trunk	No		Yes
3	70.6	9	3		1	1	✓	4-6	Branch & Trunk	No		Yes
4	33.1	7	2				✓	2-4	Branch	No		Yes
5	69.4	11		1			✓	4	Branch & Trunk	No		Yes
7	54.1	11	1	1			✓	7-10	Branch	No		Yes
9	81.5	14		2				7-10	Branch & Trunk	Yes		Yes
10	82.8	13	1	2	2	1	✓	3-10	Branch & Trunk	No		Yes
11	104.4	16		2	2		✓	7-14	Branch & Trunk	Yes		Yes
12	125.7	16	4	1	3	1		4-15	Branch & Trunk	Yes		Yes
13	108.2	14	2				✓	6+	Branch	No		Yes
15	65.3	8	1	4			✓	4-8	Branch & Trunk	No	Stag	Yes
16	83.4	14			2	3		6-8	Branch & Trunk	Yes		Yes
17	58.3	9		2	1	1		5+	Branch & Trunk	No		No
18	87.9	12	1	2			✓	6-9	Branch & Trunk	Yes		No

TREE ID	DBH (cm)	HEIGHT (m)	HOLLOW/ SPOUT SIZE (cm)				SPOUT/S	HOLLOW DISTANCE FROM GROUND (m)	HOLLOW/ SPOUT LOCATION	SUITABLE HOLLOW DIMENSIONS FOR SUPERB PARROT	COMMENTS	IMPACTED
			<5	6-15	16-25	>25						
20	60.2	10		3	3	2	✓	6-8	Branch & Trunk	No		No
21	105.0	15	2		1		✓	5-12	Branch	No		No
22	81.5	14			2		✓	8-12	Branch	No		Yes
26	99.3	15		2		2		7-12	Branch	No		No
29	84.0	15		1				4	Trunk	Yes		No
30	75.4	11		2				4-10	Trunk and branches	Yes		Yes
31	66.8	14		1				3.5	Trunk	No		Yes
33	44.6	8					✓			No		Yes
34	99.3	14		1	1	1	✓	4	Trunk	Yes		Yes
35	90.1	12				1		5	Trunk	No		Yes
36	76.4	13			1			5	Trunk	No		Yes
37	68.1	12	1		1			1.5-3	Trunk	No		No
38	71.0	13				1		2	Trunk	No		No
39							✓			No	Stag	Yes
40	112	10				1	✓	3	Branch & Trunk	No		No
41	144	10			1			2-3	Branch	No	Noisy Miner using hollow	No
42	110	9				1		1.5	No	No		No
43	108	8				2	✓	2-3	No	No		No

APPENDIX C

STRIPED LEGLESS LIZARD SURVEY RESULTS

Table C.1 Artificial shelter site survey results

DATE	SURVEY RESULTS											
	A1	A2	B1	B2	C1	D1	D2	D3	D4	D5	D6	D7
14/09/2018		Striped Legless Lizard (1)									*No survey*	*No survey*
20/09/2018	Striped Legless Lizard (1)										*No survey*	*No survey*
28/09/2018	Striped Legless Lizard (2)	Striped Legless Lizard (1)				Striped Legless Lizard (1)					*No survey*	*No survey*
03/10/2018		Striped Legless Lizard (3)			Olive Legless Lizard (1)	Olive Legless Lizard (1) Unidentified Skink (3)	Unidentified Skink (1)	Unidentified Skink (9)	Unidentified Skink (5)		*No survey*	*No survey*
10/10/2018	*No survey*	Striped Legless Lizard (1)				*No survey*		Unidentified Skink (2)			*No survey*	*No survey*
19/10/2018	*No survey*	Striped Legless Lizard (1)		Unidentified Skink (8)		*No survey*	Olive Legless Lizard (1)	Unidentified Skink (3)	Unidentified Skink (1)	Unidentified Skink (1)	Unidentified Skink (1)	Unidentified Skink (2)
26/10/2018	*No survey*	Striped Legless Lizard (5) Unidentified Skink (4)	Unidentified Skink (3)	Unidentified Skink (7)	Unidentified Skink (3)	*No survey*	Olive Legless Lizard (1) Unidentified Skink (14)	Unidentified Skink (1)			Unidentified Skink (1)	

DATE	SURVEY RESULTS											
	A1	A2	B1	B2	C1	D1	D2	D3	D4	D5	D6	D7
02/11/2018	*No survey*	Striped Legless Lizard (6) Eastern Brown Snake (1)	Unidentified Skink (2)	Unidentified Skink (2)	Olive Legless Lizard (1) Unidentified Skink (1)	*No survey*	Unidentified Skink (5)	Unidentified Skink (7)		Unidentified Skink (1)	Unidentified Skink (5)	
09/11/2018	*No survey*	Striped Legless Lizard (8) Unidentified Skink (3)	Unidentified Skink (5)	Unidentified Skink (4)	Olive Legless Lizard (1) Unidentified Skink (3)	*No survey*	Unidentified Skink (6) Perunga Grasshopper (1)	Unidentified Skink (15)	Unidentified Skink (1)	Unidentified Skink (5)	Olive Legless Lizard (1) Unidentified Skink (4)	Unidentified Skink (6)
16/11/2018	*No survey*	Striped Legless Lizard (2)	Unidentified Skink (9)	Unidentified Skink (14)	Unidentified Skink (3)	*No survey*	Unidentified Skink (6)	Unidentified Skink (6)	Unidentified Skink (3)	Unidentified Skink (5)	Unidentified Skink (5)	Olive Legless Lizard (1) Unidentified Skink (1)
23/11/2019	*No survey*	Striped Legless Lizard (3) Eastern Brown Snake (1)	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	Unidentified Skink (2)	Unidentified Skink (4)
30/11/2019	*No survey*	Striped Legless Lizard (4) Unidentified Skink (2)	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	Striped Legless Lizard (1)	Olive Legless Lizard (1) Unidentified Skink (2)

DATE	SURVEY RESULTS											
	A1	A2	B1	B2	C1	D1	D2	D3	D4	D5	D6	D7
07/12/2019	*No survey*	Striped Legless Lizard (3) Unidentified Skink (2)	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	Unidentified Skink (2)	Olive Legless Lizard (1) Unidentified Skink (2)
14/12/2019	*No survey*	Striped Legless Lizard (1)	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*		
20/12/2019	*No survey*	Striped Legless Lizard (3)	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*	*No survey*		Unidentified Skink (1)

APPENDIX D

LIKELIHOOD OF OCCURRENCE OF THREATENED FLORA

Table D.1 Likelihood of occurrence of Threatened flora

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Ammobium craspedioides	Yass Daisy	–	V	PMST	The species is from the South Western Slopes near Wagga Wagga to Crookwell on the Southern Tablelands. The majority of the populations are located in the Yass region. The species is found in moist or dry forest communities, Box-Gum Woodland, and secondary grassland derived from the clearing of these communities. The species is known to grow in association with a range of eucalypt species, including: *Eucalyptus blakelyi, E. bridgesiana, E. dives, E. goniocalyx, E. macrorhyncha, E. mannifera, E. melliodora, E. polyanthemos, E. rubida* (Office of Environment & Heritage, 2018b).	Low Potential habitat occurs within the Box Gum Woodland area; however, the species has not been recorded within the Site or the broader ACT. The closest records coming from Yass in NSW (Atlas of Living Australia, 2019b).
Amphibromus fluitans	River Swamp Wallaby-grass, Floating Swamp, Wallaby Grass	–	V	PMST	The species occurs in southern NSW, Victoria, South Australia, and Tasmania. In NSW historic collections come from the Albury area, Along the Murray River, and along the Murrumbidgee River. It grows in moderately fertile soil, with some bare ground, and conditions that are caused by seasonally fluctuating water levels. This habitat includes: permanent swamps, billabongs, lagoons, dams, and in roadside ditches (Department of the Environment and Energy, 2018a).	Low No preferred habitat identified, and no records within the locality.
Bossiaea grayi	Murrumbidgee bossiaea	E	–	ACT Threatened species list	Species is found only with the ACT and known from ten locations along the Murrumbidgee, Paddy's and Cotter rivers. The species grows in sandy soil amongst boulders on river banks and adjacent slopes close to rivers (Environment and Planning Directorate - Environment, 2015).	Low No preferred habitat identified.

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Caladenia actensis	Canberra Spider Orchid	CE	CE	ACT Threatened species list PMST	The species is endemic to the ACT and is only known from two populations, from the Mount Ainslie and Mount Majura areas in the Canberra Nature Park. The species grows on shallow gravely brown clay loam soils of volcanic origin. The plants occur within a ground cover of grasses, forbs, low shrubs, and often rocks in the transition from woodland to forest at about 645-745 m above sea level (Department of Environment and Climate Change, 2018).	Low No preferred habitat identified.
Corunastylis ectopa	Brindabella Midge Orchid	CE	CE	ACT Threatened species list	The species is endemic to the ACT and is only known from a small area of the Brindabella Range within Namadgi National Park. It grows in an open part of the Namadgi eucalypt forest, on steep slope that faces north. It occurs amongst ground cover of low shrubs at 840 meters above sea level (Environment Planning and Sustainable Development Directorate, 2012).	Low No preferred habitat identified. As a part of a study undertaken in 2008, targeted searches were undertaken along random meanders in the immediate vicinity of quadrat locations within the Box Gum Woodland, Themeda Grassland and Austrostipa Grassland for approximately 30 minutes per Site (SMEC Australia, 2008). The species was not detected.

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Dodonaea procumbens	Trailing Hop-bush	–	V	PMST	The species is known from approximately 55 populations across south-eastern Australia in NSW, Victoria and South Australia. It grows in low-lying areas on sands and clays, usually occurs in winter-wet areas in grasslands, heathlands, woodlands, and low open forest (Office of the Environment and Energy, 2018). Nearest record was in Jerrabomberra east grasslands nature reserve in 1999 (Atlas of Living Australia, 2019a). Usually occurs on or near vertically-tilted shale outcrops, often on roadside batters. Does not persist in heavily grazed pastures of the Monaro (Office of Environment & Heritage, 2019b).	Low No preferred habitat identified and no records within the locality.
Eucalyptus aggregata	Black Gum	V	V	AoLA PMST ACT Threatened Species List	Black Gum has a moderately narrow distribution, occurring mainly in the wetter, cooler and higher parts of the tablelands, for example in the Blayney, Crookwell, Goulburn, Braidwood and Bungendore districts (Office of Environment & Heritage, 2019a). In the ACT, only 16 known mature trees occur in the wild. Historic records identified two plants previously adjacent to Kings Highway (Department of the Environment and Energy, 2019k). The species grows on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers in the lowest parts of the landscape (Office of Environment & Heritage, 2019a). The species often occurs with other cold-adapted eucalypts such as Snow Gum (*Eucalyptus pauciflora*), manna Gum (*E. viminalis*), Candlebark (*E. rubida*), Black Sallee (*E. stellulata*), and Swamp Gum (*E. ovata*). Often occurs in open woodland formation with a grass ground layer dominated by Kangaroo Grass (*Themeda triandra*) or River Tussock (*Poa labillardieri*) (Office of Environment & Heritage, 2019a).	Low No preferred habitat identified.

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Gentiana baeuerlenii	Baeuerlen's Gentian	E	E	ACT Threatened species list	The species is known from only one location in the Orroral Valley in Namadgi National Park (Environment Planning and Sustainable Development Directorate, 2017a). In Namadgi National Park the species grows as an inter-tussock herb in moist tussock grassland and sedgeland of *Poa labillardieri* and *Carex gaudichaudiana*. It is associated with ground water, possibly a spring fed-area. The species has not been observed within Namadgi National Park since in the 1990s (Office of Environment & Heritage, 2018a).	Low No preferred habitat identified, and no records within the locality. As a part of a study undertaken in 2008, targeted searches were undertaken along random meanders in the immediate vicinity of quadrat locations within the Box Gum Woodland, Themeda Grassland and Austrostipa Grassland for approximately 30 minutes per Site (SMEC Australia, 2008). The species was not detected.
Lepidium ginninderrense	Ginninderra Peppercress	E	V	ACTmapi ACT Threatened species list AoLA PMST	Species has been previously recorded in the western area of the broader Site on the flood plain of Ginninderra Creek. It grows in natural temperate grassland on the flood plain, especially in locations where grass tussocks and other plant growth are short and open, thus there is little competition for space and light. The soil type over most of the Site is a shallow red earth, with patches of colluvium on the footslopes and the population occurs at an altitude of c.580 metres. Flowers in late Spring. Record	Low No suitable habitat for the species has been identified. As a part of a study undertaken in 2008, targeted searches were undertaken along random meanders in the immediate vicinity of quadrat locations within the Box Gum Woodland, Themeda Grassland and Austrostipa Grassland for approximately 30 minutes per Site (SMEC Australia, 2008). The species was not detected.

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Lepidium hyssopifolium	Basalt Pepper-cress, Peppercress, Pepperweed	–	E	PMST	The species occurs or is predicted to occur throughout south-eastern NSW, ACT, Victoria, and eastern parts of Tasmania. There are no known populations within the ACT. The species is known to grow in open, bare ground within limited competition from other plants. It was previously recorded in grassy Eucalypt woodland, low open grassy Casuarina woodland, and tussock grassland. Recent records have come from heavy disturbed and modified areas, infested with weeds. Often on road or rail verges, fringes of developed agricultural land or within small reserves within agricultural land (Department of the Environment and Energy, 2018c).	Low Suitable habitat identified, however the species has not previously been recorded in the ACT or the Site despite previous vegetation and flora surveys.
Leucochrysum albicans var. tricolor	Hoary Sunray	–	E	ACTmapi PMST	The species occurs in a wide range of communities and habitats occurring within grasslands, grassy areas in woodlands and dry open forests and modified landscapes on a variety of soils types. This subspecies is restricted to the central and southern tablelands and the central western slopes (Royal Botanic Gardens, 2007).	Low Suitable habitat for the occurs grassy woodland and native grassland. Targeted surveys were undertaken and the species was not recorded.

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Muehlenbeckia tuggeranong	Tuggeranong Lignum	E	E	ACT Threatened species list	Known from a few Sites on flood terraces along the eastern bank of the Murrumbidgee River South of Canberra. Grows on terraces prone to occasional flooding and on adjacent gentle slopes at an altitude of 550 m growing on coarse-textured alluvium, mainly quarzitic sand and gravel (Department of the Environment, 2015b).	Low No preferred habitat identified, and no records within the locality. As a part of a study undertaken in 2008, targeted searches were undertaken along random meanders in the immediate vicinity of quadrat locations within the Box Gum Woodland, Themeda Grassland and Austrostipa Grassland for approximately 30 minutes per Site (SMEC Australia, 2008). The species was not detected.
Neoastelia spectabilis	Silver Sword Lily	-	V	PMST	Restricted to NSW and has only been recorded in New England National Park, on the eastern edge of the New England Tablelands. Grows in rock crevices near waterfalls and in seepage lines on rocky slopes in Antarctic Beech rainforest, between 900 - 1150 m altitude (Department of Planning Industry and Environment, 2020).	Low No preferred habitat identified and no records within the locality.
Pelargonium sp. striatellum	Omeo Stork's-bill	–	E	PMST	Known to occur in New South Wales and Victoria in habitat usually located just above the high water level of irregularly inundated or ephemeral lakes and in the transition zone between surrounding grasslands or pasture and the paludal and aquatic communities. During dry periods, the species is known to colonise exposed lake beds (NSW Scientifc Committee, 2010).	Low No preferred habitat identified and no records within the locality.

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Pomaderris cotoneaster	Cotoneaster Pomaderris	-	E	PMST	Known to occur in New South Wales in the Nungatta area, northern Kosciuszko National Park (near Tumut), the Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, Bungonia State Conservation Area, the Yerranderie area, Kanangra-Boyd National Park, the Canyonleigh area and Ettrema Gorge in Morton National Park. Also recorded from Victoria. Occurs in a range of habitats including forests with deep, friable soil, amongst rocks beside creeks, on rocky forested slopes and in steep gullies between sandstone cliffs (Department of Planning Industry and Environment, 2021b).	Low No records from locality – not known to occur within area.
Pomaderris pallida	Pale Pomaderris	V	V	ACT Threatened Species List PlantNet PMST	Has been recorded from near Kydra Trig, north-west of Nimmitabel, Tinderry Nature Reserve, and the Queanbeyan River. A record from Byadbo in Kosciuszko National Park has not been relocated. The main distribution is along the Murrumbidgee in the ACT. It was recorded recently in eastern Victoria. This species usually grows in shrub communities surrounded by Brittle Gum (*Eucalyptus mannifera*) and Red Stringybark (*E. macrorhyncha*) or *Callitris* spp. Woodland (Royal Botanic Gardens, 2009).	Low No preferred habitat identified.

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Pterostylis oreophila	Kiandra Greenhood	CE	CE	ACT Threatened Species List	A terrestrial orchid found in four distinct geographic locations being the Brindabella Ranges in the ACT, Kiandra and Bago areas of NSW, and northeast Victoria (Threatened Species Scientific Commitee, 2012). The species grows beside small montane and subalpine streams under tall dense thickets of *Leptospermum grandiflorum* (mountain tea tree), in black oozing mud or less commonly in peaty soils and sphagnum mounds (Threatened Species Scientific Commitee, 2012).	Low No preferred habitat identified.
Prasophyllum petilum	Tarengo Leek Orchid	E	E	ACT Threatened species list ALA PlantNet PMST	Known from two Sites in the NSW Southern Tablelands; at Boorowa and Captains Flat. Also at Hall in the Australian Capital Territory. Grows in open Sites within Natural Temperate Grassland at the Boorowa Site. Also grows in grassy woodland in association with *Poa labillardieri* (River Tussock), *Eucalyptus aggregata* (Black Gum) and *Leptospermum spp*. (tea-trees) at Captains Flat and within the grassy groundlayer of Box-Gum Woodland at Hall. Apparently highly susceptible to grazing, being retained only at a little-grazed travelling stock reserve (Boorowa) and in cemeteries (Captains Flat and Hall) (Department of Environment and Climate Change, 2008).	Low This species is considered unlikely to occur due to the history of heavy grazing across the site and lack of associated species recorded (i.e. *Poa labillardieri, Eucalyptus aggregata,* and *Leptospermum spp.*). Targeted searches undertaken in 2008 failed to detect this species (SMEC Australia, 2008). The species was not detected during the during transect surveys of the site undertaken on 9, 12, 20 November and 7 December 2018.

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Rutidosis leptorrhyn-choides	Button Wrinklewort	E	E	ACT Threatened species list ACTmapi AoLA PlantNet PMST	Occurs in Box-Gum Woodland, secondary grassland derived from Box-Gum Woodland or in Natural Temperate Grassland; and often in the ecotone between the two communities. Grows on soils that are usually shallow, stony red-brown clay loams; tends to occupy areas where there is relatively less competition from herbaceous species (either due to the shallow nature of the soils, or at some Sites due to the competitive effect of woodland trees). Exhibits an ability to colonise disturbed areas (eg. vehicle tracks, bulldozer scrapings and areas of soil erosion). Apparently susceptible to grazing, being retained in only a small number of populations on roadsides, rail reserves and other un-grazed or very lightly grazed Sites (Royal Botanic Gardens, 2014)	Low Suitable habitat for the occurs grassy woodland and native grassland. Targeted surveys were undertaken and the species was not recorded. As a part of a study undertaken in 2008, targeted searches were undertaken along random meanders in the immediate vicinity of quadrat locations within the Box Gum Woodland, Themeda Grassland and Austrostipa Grassland for approximately 30 minutes per site (SMEC Australia, 2008). The species was not detected.
Senecio macrocarpus	Large-fruit Fireweed	-	V	PMST	Occurs as one very large population and several small populations in South Australia. Also occurs in Victoria and one population has been discovered near Gundaroo in NSW In NSW, Large-fruit Fireweed occurs in partly cleared dry forests and box-gum woodlands which transition to Brittle Gum Forest with a relatively undisturbed understorey of native grasses, forbs and subshrubs (Department of Agriculture Water and the Environment, 2021d).	Low Not known to occur from area, no records within locality.

SPECIES NAME	COMMON NAME	NC ACT[1]	EPBC ACT[2]	DATA SOURCE[3]	HABITAT	LIKELIHOOD OF OCCURRENCE
Swainsona recta	Small Purple Pea	E	E	ACT Threatened species list ACTmapi AoLA PlantNet PMST	Found in grassland and open woodland, often on stony hillsides (Royal Botanic Gardens, 2004). Before European settlement it occurred in the grassy understorey of woodlands and open-forests dominated by *Eucalyptus blakelyi*, *E. melliodora*, *E. rubida* and *E. goniocalyx*. Grows in association with understorey dominants that include *Themeda triandra*, *Poa spp*. and *Austrostipa spp*. Plants die back in summer, surviving as a rootstocks until they shoot again in autumn (Department of Environment and Climate Change, 2008).	Low Suitable habitat for the occurs grassy woodland and native grassland. Targeted surveys were undertaken and the species was not recorded. As a part of a study undertaken in 2008, targeted searches were undertaken along random meanders in the immediate vicinity of quadrat locations within the Box Gum Woodland, Themeda Grassland and Austrostipa Grassland for approximately 30 minutes per Site (SMEC Australia, 2008). The species was not detected.
Thesium australe	Austral Toadflax	V	V	PMST	Grows in grassland or woodland often in damp Sites. It is a semi-parasitic herb and hosts are likely to be *Themeda australis* and *Poa* spp. (Harden, 1992, Department of Environment and Climate Change, 2008).	Low Preferred habitat not present.

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered under the *Nature Conservation Act 2014.*

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

(3) PMST = Department of the Environment and Energy's EPBC Protected Matters Search Tool, AoLA = Atlas of Living Australia, and ACTmapi = ACTmapi significant Species, Vegetation Communities and Registered Tress database, and PlantNet = Royal Botanic Gardens PlantNet Spatial Search.

APPENDIX E

LIKELIHOOD OF OCCURRENCE OF THREATENED FAUNA

Table E.1 Likelihood of occurrence of Threatened fauna

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Amphibians						
Litoria aurea	Green and Golden Bell Frog	V	V	The species was formerly distributed from the NSW north coast near Brunswick Heads, south along the NSW coast to Victoria. The distribution extended west to Bathurst. The majority of current populations (record from 1990 and more recent) are small, coastal or near coastal populations over the former range, although now more isolated and widely separated. There are larger populations located in the metropolitan areas of Shoalhaven, Sydney and the mid north coast. The Southern Tablelands of NSW only has one known population. The species inhabits marshes, dams and stream-sides, particularly those with *Typh*a spp. Or *Eleocharis* spp. (Office of Environment & Heritage, 2017c).	ACT Threatened Species List PMST AoLA	Low No preferred habitat identified. This species is believed to have disappeared almost entirely from its former range in the Southern Tablelands and is presumed locally extinct within the ACT.
Litoria booroolongensis	Booroolong Frog	E	–	Confined to mountain streams of the Great Dividing Range (Cogger, 2000). Usually found on or under boulders and debris in and beside the rocky beds of mountain streams; breeds in summer (Anstis, 2002).	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Litoria castanea	Yellow-spotted Tree Frog	E	CE	This species was rediscovered in 2011 in the Southern Highlands. It has two separate highland ranges, on the New England Tableland and on the southern highlands from Lake George to Bombala. There are unconfirmed reports from near Bathurst and Orange. It requires large permanent ponds or slow flowing streams with plenty of emergent vegetation such as bulrushes. Adults are active during spring and summer and bask on sunny days. Move and forage at night on grassy banks or float on the water's surface. Males call at night from the open water and breeding generally occurs during or following rain. Eggs are laid amongst aquatic vegetation. Shelter during autumn and winter under fallen timber, rocks, other debris or thick vegetation (Department of Environment and Conservation, 2007).	ACT Threatened Species List PMST AoLA	Low No preferred habitat identified. This species is believed to be locally extinct within the ACT.
Litoria raniformis	Southern Bell Frog	V	V	Although once more widely distributed within NSW, the species is now only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Unconfirmed records have also been made in the Murray Irrigation Area. The species is also found in South Australia, Victoria and Tasmania. The species inhabits permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/ Typha swamps and River Red Gum swamps. It is also found in billabongs along floodplains and river valleys, and irrigated rice crops (Office of Environment & Heritage, 2017e).	ACT Threatened Species List PMST	Low No preferred habitat identified. This species is believed to be locally extinct within the ACT.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Litoria verreauxii alpina	Alpine Tree Frog	V	V	The species is generally restricted to the NSW, ACT, and Victorian alpine and sub-alpine areas above 1100 m asl (Office of Environment and Heritage, 2017a). Found in a variety of habitats, including woodlands, grasslands, heath, and herbfields. The species uses a range of slow moving or still water bodies for breeding, including bogs, fens, stream pools, dams, drainage channels and artificial wetlands. Non-breeding habitat and overwintering refuge may include general ground debris such as logs, leaf litter and rocks (Office of Environment and Heritage, 2017a).	ACT Threatened Species List	Low No preferred habitat identified.
Pseudophryne pengilleyi	Northern Corroboree Frog	CE	CE	Three distinct populations are known. They occur in the Brindabella and Bimberi Ranges in the ACT, the lower northern parts of the Brindabella Ranges in NSW, and through the Bogong Mountains and Fiery Ranges in NSW. Habitat varies from summer to winter (Environment Planning and Sustainable Development Directorate, 2017b). In summer, breeding occurs in low lying pools in sphagnum, wet heath, wet herbfields and wet tussock grasslands. However, in winter, this species moves away from pools into surrounding leaf litter, logs and dense groundcover.	ACT Threatened Species List	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Birds						
Actitis hypoleucos	Common Sandpiper	M; m	–	The Common Sandpiper frequents a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. It is mostly encountered along muddy margins or rocky shores and rarely on mudflats. It has been recorded in estuaries and deltas of streams, banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. Roost Sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks (Department of the Environment and Energy, 2019a).	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Anthochaera phrygia	Regent Honeyeater	CE	CE	Occurs mostly in box-ironbark forests and woodland and prefers wet, fertile Sites such as along creek flats, broad river valleys and foothills. Riparian forests with *Casuarina cunninghamiana* and *Amyema cambagei* are important for feeding and breeding. Spotted Gum and Swamp Mahogany forests are also important feeding areas in coastal areas. Important food trees include *Eucalyptus sideroxylon* (Mugga Ironbark), *E. albens* (White Box), *E. melliodora* (Yellow Box) and *E. leucoxylon* (Yellow Gum) (Garnett and Crowley, 2000). The species prefers woodlands containing significantly large numbers of mature trees, high canopy cover and abundance of mistletoe, which support a significantly high abundance and species richness of bird species (Office of Environment & Heritage, 2019c). Within the ACT Regent Honeyeaters movements are complex and usually dependent on the occurrence of blossom resource of several eucalypt species. In the ACT region individuals have regularly been associated with the occurrence of Yellow Box – Red Gum Grassy Woodland along the lower slopes of Mounts Ainslie and Majura, extending through Mulligans Flat Nature Reserve to the Sutton and Lake George areas. The occurrence of large heavily flowering eucalypts on fertile soils are important habitats for individuals. Due to the species rapid decline there has been few records of individuals within the ACT, and majority of sightings have been single birds or occasional pairs. It is perceived that the ACT region acts as an area for rare breeding summer visitors. The most recent breeding records are of four pairs on the lowest western slopes of Mount Majura bordering Antill Street in Watson in early 1996 (ACT Government - Environment and Planning Directorate - Environment, 2015).	ACT Threatened Species List AoLA PMST	Low Marginal areas of potential habitat are present. However, the potential habitat would not fit the description for preferred habitat and is unlikely to provide important foraging resources for the species. However, rare occurrences of the species during seasonal movements cannot be discounted.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Apus pacificus	Fork-tailed Swift	M; m	–	Breeds in the northern hemisphere, wintering south to Australia. It is almost exclusively aerial, and occurs above any habitat, urban or rural. It mostly occurs over inland plains but sometimes above foothills or in coastal areas over cliffs, beaches, islands and well out to sea. It also occurs over towns and cities. It mostly occurs over dry and/or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh, grassland, spinifex sandplains, farmland and sand-dunes. It sometimes occurs above forests. It probably roosts aerially, but has occasionally been observed to land (Higgins, 1999). In the ACT it is a rare, non-breeding summer migrant, with 24 reports from 19 survey Sites (Canberra Ornithologists Group, 2019). It is most often recorded in late summer in stormy weather feeding on insect swarms, nearly always in flocks (average flock size of eight birds). Typically occur with White-throated needletails.	PMST	Low Species could occupy the air space above the area however the species is unlikely to utilise the terrestrial habitats.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Ardea alba	Great Egret	m	–	Eastern Great Egrets are widespread in Australia. They occur in all states/territories of mainland Australia and in Tasmania. In Australia, the largest breeding colonies, and greatest concentrations of breeding colonies, are located in near-coastal regions of the Top End of the Northern Territory. The Channel Country of south-western Queensland and north-eastern South Australia have at least 12 breeding colonies, and colonies are also known in the Darling Riverine Plains region of NSW and the Riverina region of NSW and Victoria. Minor breeding Sites are widely scattered across the species' distribution and include Sites in western Cape York Peninsula, the central coast of Queensland, north and north-eastern NSW, south-eastern South Australia, south-western Western Australia, the Kimberley region of Western Australia and the Barkly Tablelands in the Northern Territory. Non-breeding birds have been recorded across much of Australia, but avoid the driest regions of the western and central deserts. The Eastern Great Egret inhabits a wide range of wetland habitats which include swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs (Department of the Environment and Energy, 2019b).	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Ardea ibis	Cattle Egret	m	–	Widespread and common according to migration movements and breeding localities surveys. Breeds in colonies, either mono-specific or with other Egrets/Herons. In Australia the principal breeding Sites are the central east coast from about Newcastle to Bundaberg. It also breeds in major inland wetlands in north NSW (notably the Macquarie Marshes). Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures. It has been recorded on earthen dam walls and ploughed fields. It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer. The Cattle Egret is known to follow earth-moving machinery and has been located at rubbish tips. It uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora. They have sometimes been observed in swamps with tall emergent vegetation (Department of the Environment and Energy, 2015).	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Botaurus poiciloptilus	Australasian Bittern	E	E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds (Parsons Brinckerhoff, 2004).	ACT Threatened Species List	Low No preferred habitat identified.
Calidris acuminata	Sharp-tailed Sandpiper	M; m	–	Occurs in a variety of habitats: tidal mudflat, mangrove swamps, saltmarshes, shallow fresh, brackish, salt inland swamps and lakes; flooded and irrigated paddocks, sewage farms and commercial saltfields.	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Calidris ferruginea	Curlew Sandpiper	CE; M; m	–	Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. Occurs in inter-tidal mudflats of estuaries, lagoons, mangrove channels and also around lakes, dams, floodwaters and flooded saltbush surrounding inland lakes. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters (Morcombe, 2003, Department of the Environment and Energy, 2019l). In the ACT, the species is a non-breeding vagrant and has only been recorded within the Jerrabomberra Wetlands in the east of Canberra (Canberra Ornithologists Group, 2017a), with the exception of one other recorded in the Belconnen area from 1980 (Atlas of Living Australia, 2019b).	PSMT	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Calidris melanotos	Pectoral Sandpiper	M; m	–	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species frequents coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. It is usually found in coastal or near coastal habitat but occasionally further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. It has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands (Department of the Environment and Energy, 2019c). In the ACT, the species is a non-breeding vagrant (Canberra Ornithologists Group, 2017a) and has been recorded within the Jerrabomberra Wetlands in the east of Canberra. One record occurs within the Belconnen area from 1972 (Atlas of Living Australia, 2019b) and from the south of Canberra (Canberra Ornithologists Group, 2020).	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Calyptorhynchus lathami	Glossy Black-Cockatoo	E	V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. It inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Feeds almost exclusively on the seeds of several species of she-oak *(Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill. In the ACT, they feed almost exclusively on Dropping Sheoaks (*Allocasuarina verticillata*) in larger stands. Major known feeding and breeding areas in Canberra are on Mount Majura and Mount Ainslie although have been sighted through surrounding nature reserves in the ACT. Dependent on large hollow-bearing eucalypts for nest Sites (Office of Environment & Heritage, 2015, ACT Government - Environment and Planning Directorate - Environment, 2016).	ACT Threatened Species List AoLA	Low No preferred habitat identified. Additionally, habitat for this species is well known and the Site has not been identified in mapping of habitat for the species within the ACT (ACT Government, 2016b).

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Chrysococcyx osculans	Black-eared Cuckoo	m	–	Mainly open vegetation associations, especially open woodlands and open shrublands. Often in open woodlands dominated by Eucalyptus, particularly stunted mallee communities; Open woodlands of River Red Gum or Coolibah along rivers or round other wetlands in otherwise open grasslands; or open acacia woodlands, dominated by Mulga, Myall or Boree. Also often in saltbush or bluebush shrubland on sandhills or sandy flats; and in heathland, spinifex grassland or samphire shrubland (Higgins, 1999). The ACT is on the edge of the species range from the dry inland, this species is a rare, non-breeding visitor (Canberra Ornithologists Group, 2020).	PMST	**Moderate** The area provides some potential habitat.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	–	V	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains (Office of Environment & Heritage, 2017a). Sedentary, considered to be resident in many locations throughout its range. The species is present in all seasons or year-round at many Sites and is gregarious and usually observed in pairs of small groups or 8 to 12 birds. It is noisy and conspicuous while foraging on trunks, branches and amongst fallen timber (Office of Environment & Heritage, 2017a).	ACT Threatened Species List AoLA	Low While some preferred habitat in the form of Box Gum Woodland is present, there is a lack of fallen timber which is important for foraging and the species which is considered to be sedentary and noisy and conspicuous while foraging and was not recorded.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Daphoenositta chrysoptera	Varied Sittella	–	V	The Varied Sittella inhabits most of mainland Australia except the treeless deserts and open grasslands. It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Critical habitat features include large living or dead trees, and relatively well-treed habitats (Environment ACT, 2005b). The Varied Sittella feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years (Office of Environment & Heritage, 2016). In the ACT, it is recorded in Aranda bushland, O'Connor and Bruce Ridges, Black Mountain, the Pinnacle Stringybark forest, Mt Ainslie–Campbell Park, Mulligan's Flat, Bluett's Eucalypt forest, Naas and Orroral valleys, Shepherd's Lookout and the Murrumbidgee River Corridor. In this region, the species has a preference for areas with Red Stringybark (*Eucalyptus macrorhyncha*) (ACT Government - Environment and Planning Directorate - Environment, 2016).	ACT Threatened Species List AoLA	Low Box Gum Woodland is sparsely treed and is unlikely to provide preferred habitat for the species

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Gallinago hardwickii	Latham's Snipe	M; m	–	The species occurs in permanent and ephemeral wetlands up to 2000 m above sea level. They primarily inhabit open, freshwater wetlands with a form of shelter (commonly low, dense vegetation). Occasionally, they are also recorded in saline or brackish water habitats, in modified or artificial habitats, or close to human occupation. These habitats are primarily used during migration (Department of the Environment and Energy, 2019f). In Australia, the species most commonly inhabit flooded meadows, season or semi-permanent swamps, or open waters. They will utilise a range of other freshwater habitats, in which the structure and composition of vegetation does not appear to alter the suitability of these habitats. Therefore, suitable freshwater habitats may occur in tussock grasslands with reeds, rushed, and sedges, alpine or coastal heathland, lignum or tea-tree scrub, open forest, alpine herbfields, and button-grass plains (Department of the Environment and Energy, 2019f). Latham's Snipe is a fairly common visitor to the ACT. Canberra Ornithologists Group get regular recordings across the Territory (Canberra Ornithologists Group, 2017b), with higher number recorded at Jerrabomberra Wetlands, where a radio tracking program for the species started recently. Has been previously recorded at Lake Ginninderra.	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Grantiella picta	Painted Honeyeater	V	V	Lives in dry forests and woodlands. Primary food is the mistletoes in the genus *Amyema,* though it will take some nectar and insects. Its breeding distribution is dictated by presence of mistletoes which are largely restricted to older trees. Less likely to be found in in strips of remnant box-ironbark woodlands, such as occur along roadsides and in windbreaks, than in wider blocks (Garnett and Crowley, 2000). In the ACT region, the species has been recorded from a range of woodlands that contain mistletoe, including River Oak (*Casuarina cunninghamiana*) woodland associated with river systems, and Yellow Box–Red Gum Woodlands at locations such as Mulligans Flat and Campbell Park (ACT Government - Environment and Planning Directorate - Environment, 2015).	ACT Threatened Species List AoLA PMST	Low No mistletoe recorded during surveys. Rare occurrences of this species cannot be discounted.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Haliaeetus leucogaster	White-bellied Sea-Eagle	m	–	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at Sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion.	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Hieraaetus morphnoides	Little Eagle	–	V	The Little Eagle is distributed throughout the Australian mainland occupying habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest Sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. Prey includes birds, reptiles and mammals, with the occasional large insect and carrion. Most of its former native mammalian prey species in inland areas are extinct and rabbits now form a major part of the diet (Marchant and Higgins, 1993, Office of Environment and Heritage, 2017d). Within the ACT sightings have been recorded across majority of the territory, however, breeding range has been restricted to the lower parts of northern ACT around the Murrumbidgee and Molonglo river corridors (ACT Government - Environment and Planning Directorate - Environment, 2016).	ACT Threatened Species List AoLA	**Moderate** Potential foraging habitat, which occurs within the home range of local individuals.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Hirundapus caudacutus	White-throated Needletail	M; m	–	Widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. It is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. In coastal areas, they are sometimes seen flying over sandy beaches or mudflats and often around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes.	PMST	Low Species could occupy the air space above the Site however is unlikely to utilise the terrestrial habitats.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Lalage sueurii	White-Winged Triller	–	V	The species is found across Australia. It is resident near water in the north, but nomadic and seasonally migratory through central and southern Australia and vagrant in northern Tasmania. It is also found in Indonesia and New Guinea. In the ACT region, the species is an uncommon, breeding, summer migrant, and numbers vary from year to year. In the local area, the species is found in and around grassy woodland areas including Yellow Box–Red Gum, Apple Box, Candlebark, or less commonly, Snowgum woodlands. Important habitat includes large living and dead trees and areas of grass and fallen timber for foraging. In the ACT region, records of the species are widespread, but most records are from Hall, Mulligans Flat, Goorooyarroo, the Pinnacle, Campbell Park and the Gigerline–Tharwa area (ACT Government - Environment and Planning Directorate - Environment, 2016).	ACT Threatened Species List AoLA	Potential habitat in Box Gum Woodland

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Lathamus discolor	Swift Parrot	CE; m	CE	Breeding occurs in Tasmania, majority migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW, but also south-eastern Queensland as far north as Duaringa. Until recently it was believed that in New South Wales, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region, but new evidence indicates that the forests on the coastal plains from southern to northern NSW are also extremely important. In mainland Australia it is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for Sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for Sites with flowering *Acacia pycnantha*, is indicated. Sites used vary from year to year. In the ACT region, the Swift Parrot is associated with flowering and lerping eucalypts, particularly box-ironbark communities and Yellow Box – Red Gum Woodlands. It has the potential to occur anywhere below 700m and has also been recorded in suburban environments. Majority of records of the species have been from inner Canberra suburbs, Gungahlin and Hall (Garnett and Crowley, 2000, Swift Parrot Recovery Team, 2001, ACT Government - Environment and Planning Directorate - Environment, 2015).	ACT Threatened Species List AoLA PMST	Low No preferred habitat. Marginal foraging habitat may be present in the form of Box Gum Woodland however this area is small and would not provide a significant foraging resource when canopy eucalypts are flowering. Intermittent occurrences of this species cannot be discounted due to complex and varied spatial and temporal distribution of flowering resources.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Limosa lapponica	Bar-tailed Godwit	M	-	Recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria, including the offshore islands. Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, salt-lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas.	PMST	Low No preferred habitat available.
Melanodryas cucullate cucullate	Hooded Robin	–	V	Found in south-eastern Australia, generally east of the Great Dividing Range. Found in eucalypt woodland and mallee and acacia shrubland. This is one of a suite of species that has declined in woodland areas in south-eastern Australia (Traill and Duncan, 2000, Garnett and Crowley, 2000). The species occupies drier eucalypt forest, woodland and scrub, grasses and low shrubs, as well as cleared paddocks with regrowth or stumps. It avoids dense forests and urban areas. Requires structurally diverse habitats (Office of Environment & Heritage, 2017d). In the ACT, the species has been recorded at Mulligans Flat Nature Reserve, Goorooyarroo Woodlands, Newline Quarry, Majura Field Firing Range and Tharwa. Black Mountain, Campbell Park, Mt Ainslie and Tuggeranong Homestead may no longer support populations of the species (Department of Environment and Conservation, 2005b).	ACT Threatened Species List AoLA	Low No preferred habitat identified as the species is sensitive to disturbance and human presence, not often recorded in urban areas.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Merops ornatus	Rainbow Bee-eater	m	–	Usually occur in open or lightly timbered areas, often near water. Breed in open areas with friable, often sandy soil, good visibility, convenient perches and often near wetlands. Nests in embankments including creeks, rivers and sand dunes. Insectivorous, most foraging is aerial, in clearings.	PMST	Low No preferred habitat identified.
Monarcha melanopsis	Black-faced Monarch	M; m	–	Inhabits rainforests and wet eucalypt forest. Rare occurrences of the species during migration movement in Canberra suburbs. More commonly recorded migrating in coastal ranges to the east.	PMST	Low A rare visitor in Canberra suburbs while migrating.
Motacilla flava	Yellow Wagtail	M; m	–	This species occurs in a range of habitats including estuarine habitats such as sand dunes, mangrove forests and coastal saltmarshes. This species also occurs in open grassy areas including disturbed Sites such as sports grounds and has been recorded on the edges of wetlands, swamps, lakes and farm dams. This species migrates from Asia to Australia in spring-summer. It has been recorded in the estuarine areas of the Hunter River in Newcastle NSW and in QLD and the north of NT and WA (Higgins et al., 2006).	PMST	Low No records of the species within the locality. Rare occurrences of the species during seasonal movements cannot be discounted.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Myiagra cyanoleuca	Satin Flycatcher	M; m	–	Widespread in eastern Australia. In NSW and ACT, they are widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Satin Flycatchers mainly inhabit eucalypt forests, often near wetlands or watercourses. They generally occur in moister, taller forests, often occurring in gullies. They also occur in eucalypt woodlands with open understorey and grass ground cover, and are generally absent from rainforest. In south-eastern Australia, they occur at elevations of up to 1400 m above sea level, and in the ACT, they occur mainly between 800 m above sea level and the treeline (Department of the Environment and Energy, 2019l, Pizzey and Knight, 2007). In the ACT it is an uncommon, breeding summer migrant, usually recorded in the Brindabella Ranges, but occasionally on passage at lower altitudes (Canberra Ornithologists Group, 2020).	PMST	**Moderate** Marginal potential habitat for passage during migrations.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Numenius madagascarien-sis	Eastern Curlew	CE; M; m	–	Inhabits coastal estuaries, mangroves, mud flats and sand pits. It is a migratory shorebird which generally inhabits sea and lake shore mud flats, deltas and similar areas, where it forages for crabs and other crustaceans, clam worms and other annelids, molluscs, insects and other invertebrates. Its migration route ranges from its wintering grounds in Australia to its breeding grounds in northern China, Korea and Russia (Pizzey and Knight, 2007). Species has not been recorded within the locality since 1989 (Atlas of Living Australia, 2019b)	PMST	Low No preferred habitat identified.
Pandion haliaetus	Osprey	M; m	–	Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water (Office of Environment and Heritage, 2020).	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Petroica boodang	Scarlet Robin	–	V	The Scarlet Robin is found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. In cooler moths the species is often seen in lowland woodland, peri-urban woodland, grazed paddocks with scattered trees, gardens and parklands (ACT Government, 2019).	ACT Threatened Species List AoLA	**Moderate** Small patches of habitat present within the Box Gum Woodland, however limited important habitat components (logs and fallen timber) are present. Seasonal occurrences of the species cannot be discounted.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Polytelis swainsonii	Superb Parrot	V	V	The Superb Parrot occurs in south-eastern Australia where it occurs on inland slopes of the Great Divide and its adjacent plains. It mainly utilises eucalypt forests and woodland especially areas along river systems which consist of *Eucalyptus camaldulensis* (River Red Gum), *E. melliodora* (Yellow Box) and E. macrocarpa (Grey Box) (Department of the Environment and Energy, 2019h). The species is a summer breeding migrant to the ACT, and is gradually extending its range into the ACT from western woodlands (Canberra Ornithologists Group, 2017c). Within the region individuals inhabit Yellow Box-Red Gum Grassy Woodlands, with Blakey's Red Gum (*E. blakelyi*) being an important source for nesting hollows (ACT Government, 2005). The species has been recorded across the ACT, however breeding records appear to be concentrated in the north of the territory, around the Belconnen and Gungahlin regions (Canberra Ornithologists Group, 2017c). The species feeds both on the ground and in tress on seeds of a variety of grasses, Wattles, and Elms, as well as Eucalyptus flowers, nectar and fruits, Mistletoe, Dwarf Cherry (*Amyema miquelii*), Pums (*Prunus* spp.), and lerps (ACT Government, 2019). It forages primarily in grassy box woodland, but may also forage in artificial habits in urban areas of on private land.	ACT Threatened Species List AoLA PMST	**Moderate** Potential foraging and breeding habitat (five trees) in Box Gum Woodland and Derived Native Grassland.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Rhipidura rufifrons	Rufous Fantail	M; m	–	Occurs in a range of habitats including the undergrowth of rainforests/wetter eucalypt forests/gullies, monsoon forests paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks and gardens. When migrating they may also be recorded on farms, streets and buildings. Migrates to SE Australia in October-April to breed, mostly in or on the coastal side of the Great Dividing Range (Pizzey and Knight, 2007).	PMST	Low No preferred habitat identified. Rare occurrence during seasonal movements cannot be discounted.
*Rostratula benghalensis (*Syn. *Rostratula australis)*	Australian Painted-snipe, Painted Snipe	E; m	–	It has been recorded at wetlands in all states of Australia. It is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland, NSW, Victoria and south-eastern South Australia. Inhabits shallow, vegetated, temporary or infrequently filled wetlands, including where there are trees such as *Eucalyptus camaldulensis* (River Red Gum), *E. populnea* (Poplar Box) or shrubs such as *Muehlenbeckia florulenta* (Lignum) or *Sarcocornia quinqueflora* (Samphire). Feeds at the water's edge and on mudflats on seeds and invertebrates, including insects, worms, molluscs and crustaceans. Males incubate eggs in a shallow scrape nest (Garnett and Crowley, 2000). Breeding habitat requirements may be quite specific and include; shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are all, or nearly all, from or near small islands in freshwater wetlands (Department of the Environment and Energy, 2019l).	PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Fish						
Bidyanus bidyanus	Silver Perch	CE	E	The Silver Perch is found over a broad area of the Murray-Darling Basin and is often found in similar habitats to Murray Cod (*Maccullochella peelii*) and Golden Perch (*Macquaria ambigua*), i.e. lowland, turbid rivers. It prefers faster, open water, but the general scarcity of information on the habitat preferences of the species makes generalisation difficult. The species is not found in the cool, fast-flowing, upland rivers of the Murray-Darling Basin. In the Canberra region the species has been recorded from the Murrumbidgee River where numbers recorded in a fish trap at Casuarina Sands between 1980 and 1991 declined noticeably from the mid-1980s. In the last decade, there have been a small number of angler reports of Silver Perch from the Murrumbidgee River in the ACT. In the Canberra region the species is also known from four other locations being: a stocked population in Googong Reservoir on the Queanbeyan River, a stocked population in the Yass weir pool on the Yass River; a stocked population in Lake George; and a population of unknown size in Burrinjuck dam (ACT Government - Environment and Planning Directorate - Environment, 2016).	ACT Threatened Species List	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Euastacus armatus	Murray River Crayfish	–	V	The Murray River Crayfish inhabits large and small streams in a variety of habitats including cleared pasture and dry and wet sclerophyll forests at altitudes from close to sea level to over 700 m above sea level. The species prefers faster flowing cool water habitats of the main channels of rivers, in contrast to the Yabby, which prefers slow warm water and billabongs. In lowland rivers such as the Murray and lower Murrumbidgee, the species constructs burrows in the clay river banks for shelter. In the upland rivers with stony beds such as the Tumut, Goobarragandra and upper Murrumbidgee, the species tends to use the interstitial spaces between boulders and cobbles on the river bed for shelter. Within the ACT, it is mainly found in the Murrumbidgee River, but has also been recorded from the Cotter and Paddy's Rivers (ACT Government, 2015).	ACT Threatened Species List	Low No preferred habitat identified.
Gadopsis bispinosus	Two-spined Blackfish	–	V	The Two-spined Blackfish only occurs in inland drainages of south-eastern Australia, where it is restricted to cool, clear upland or montane streams with abundant instream cover, usually in the form of boulders and cobble. It is more often found in the medium to larger streams where there is greater water depth and lower stream velocity. It is not found in the smallest headwater streams but is generally found in forested catchments, where there is little sediment input to the stream from erosion or land management practices. In the ACT, the species is now found only in the Cotter River catchment upstream of the Cotter Dam (ACT Government, 1999b).	ACT Threatened Species List	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Maccullochella macquariensis	Trout Cod	E	E	Once widespread in the south-eastern region of the Murray-Darling Basin with records from the Murray, Murrumbidgee and Macquarie rivers in New South Wales/Australian Capital Territory and the Goulburn, Broken, Campaspe, Ovens, King, Buffalo and Mitta Mitta rivers in Victoria. The Murray River from Yarrawonga to Cobram is a large (60–100 m wide), slow flowing and deep (>3 m) river with a sand, silt and clay substrate, and contains abundant snags and woody debris. Seven Creeks (Victoria) is a relatively narrow (5–7 m wide) stream having a rock, gravel and sand substrate. The pools are generally less than 2 m deep and are interspersed by rapids and cascades. The physical characteristics of the Murrumbidgee River in the ACT are intermediate between Seven Creeks and the Murray River. In general, it appears that adults are essentially a pool dwelling, cover-seeking fish. In the ACT the species has been released in the Murrumbidgee River and associated tributaries (ACT Government, 1999a).	ACT Threatened Species List	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Maccullochella peelii	Murray Cod	V	–	The Murray Cod was historically distributed throughout the Murray-Darling Basin (the Basin), which extends from southern Queensland, through New South Wales (NSW), the Australian Capital Territory (ACT) and Victoria to South Australia, with the exception of the upper reaches of some tributaries. The species still occurs in most parts of this natural distribution, up to approximately 1000 m above sea level. It utilises a diverse range of habitats from clear rocky streams, such as those found in the upper western slopes of NSW (including the ACT), to slow-flowing, turbid lowland rivers and billabongs. Preferred microhabitat consists of complex structural features in streams such as large rocks, snags (pieces of large submerged woody debris), overhanging stream banks and vegetation, tree stumps, logs, branches and other woody structures. (Department of the Environment, 2016c)	ACTmapi PMST	Low No preferred habitat identified.
Macquaria australasica	Macquarie Perch	E	E	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/Nepean and Shoalhaven catchments. Macquarie Perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Spawning occurs just above riffles (shallow running water) (Department of the Environment and Energy, 2019g).	ACT Threatened Species List PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Invertebrates						
Perunga ochracea	Perunga Grasshopper	–	V	Important habitat for the species appears to be natural temperate grassland dominated by wallaby, kangaroo and spear grasses with forb food plants located in the inter-tussock spaces. Grass tussocks are used also to escape predators. It may also occur in open woodland areas with a grassy understorey, including the endangered Yellow Box–Red Gum Grassy Woodland community. Records of the species are from Wagga Wagga, Boorowa, Galong, the ACT and adjacent areas of NSW including Jeir, Murrumbateman and Queanbeyan. ACT locality records include Black Mountain, Gungahlin, Majura Valley, Canberra International Airport, Jerrabomberra Valley, Molonglo valley, the Campbell Park paddocks, Belconnen Naval Station, Hall, Kambah Pool, Mt Stromlo, Reid, Weetangera and Tuggeranong (Environment ACT, 2006).	ACTmapi ACT Threatened Species List	**High** Preferred habitat exists in areas of native grassland and may also utilise open woodland. Was recorded within the conservation area of the broader Site.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Synemon plana	Golden Sun Moth	CE	E	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species' historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses (Austrodanthonia spp). Grasslands dominated by wallaby grasses are typically low and open - the bare ground between the tussocks is thought to be an important microhabitat feature for the Golden Sun Moth, as it is typically these areas on which the females are observed displaying to attract males. Habitat may contain several wallaby grass species, which are typically associated with other grasses particularly spear-grasses Austrostipa spp. or Kangaroo Grass Themeda australis. The flight period is relatively short, typically lasting from six to eight weeks (during November and December in the ACT region, possibly earlier or later in other regions). Males fly only in bright sunshine during the warmest part of the day (1000 - 1400 hrs). Adults emerge continuously throughout the flying season (Office of Environment & Heritage, 2017b, Department of the Environment, 2016b).	ACTmapi ACT Threatened Species List AoLA PMST	**Recorded** Species was recorded within the area in relatively low densities. Species was recorded in high densities in the conservation area within the broader Site.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Mammals						
Bettongia gaimardi	Eastern Bettong	EX	RCD	The species occurs in dry eucalypt and casuarina forests with grassy or heathy understory. It builds a nest under fallen timber, or amongst small bushes and tussocks where it refuges during the daytime. The diet is primarily comprised of mycorrhizal fungi, and an individual can travel up to 1.5 km from its nest area to feeding areas. The species has been extinct from the wild on mainland Australia but persists in Tasmania. Two populations of the species have been introduced to the ACT. One in Mulligans Flat Woodland Sanctuary and the other at Tidbinbilla Nature Reserve. Both populations occur in predator proof fenced areas.	ACT Threatened Species List	Low Populations on the mainland are confined in fenced areas.
Chalinolobus dwyeri	Large-eared Pied Bat	V	–	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies (Schultz et al., 1999).	PMST	Low No breeding habitat identified, only marginal foraging habitat available, and no nearby records

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Dasyurus maculatus	Spotted-tailed Quoll	E	V	Occurs from the Bundaberg area in south-east Queensland, south through NSW to western Victoria and Tasmania. In NSW, it occurs on both sides of the Great Dividing Range and north-east NSW represents a national stronghold (NSW National Parks and Wildlife Service, 1999c). In the ACT region, occasional sightings with confirmed occurrences in three locations in Namadgi National Park. Most sightings have occurred in timbered ranges and large remnant reserves (Department of Environment, 2016). The preferred habitat occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large unfragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges. Nests in rock caves and hollow logs or trees. Feeds on a variety of prey including birds, terrestrial and arboreal mammals, small macropods, reptiles and arthropods (NSW National Parks and Wildlife Service, 1999b, NSW National Parks and Wildlife Service, 1999c).	ACTmapi ACT Threatened Species List AoLA PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Dasyurus viverrinus	Eastern Quoll	E	E	The Eastern Quoll was once widespread across Australia, but disappeared from the mainland in the 1960s, persisting only in Tasmania (Department of the Environment and Energy, 2019d). Several reintroductions of the species are preceding or proposed including to Booderee National Park on the NSW south coast, and to the fenced Mulligans Flat Woodland Sanctuary in the ACT (Miller, 2017). The species is highly flexible in habitat selection, occupying dry sclerophyll forest, scrub heathlands, pasture and cultivated land. Home ranges vary between sexes and depending on habitat quality, but range from a few hundred meters to over a kilometre a night (Office of Environment and Heritage, 2019).	ACT Threatened Species List	Low No wild populations of the species occur within the ACT.
Isoodon obesulus obesulus	Southern Brown Bandicoot (Eastern)	E	E	Inhabit a variety of habitats including heathland, shrubland, sedgeland, heathy open forest and woodland and are usually associated with infertile, sandy and well drained soils, but can be found in a range of soil types (Coates et al. 2008; Menkhorst and Seebeck 1990; NSW DEC 2006; Paull 1993). Within these vegetation communities they typically inhabit areas of dense ground cover. Species experts define suitable habitat for Southern Brown Bandicoots (eastern) to be any patches of native or exotic vegetation, within their distribution, which contains understorey vegetation structure with 50–80% average foliage density in the 0.2–1 m height range. In areas where native habitats have been degraded or diminished, exotic vegetation, such as Blackberry (Rubus spp.), can and often does, provide important habitat (DSEWPaC 2011g).	ACT Threatened Species List	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Mastacomys fuscus mordicus	Broad-toothed Rat	V	V	The Broad-toothed Rat has a fragmented distribution, having declined significantly since European settlement. Scattered records occur across the Great Diving Range from near Warburton (Victoria), to the Brindabella Range (ACT) and around Barrington Tops (NSW) (Threatened Species Scientific Commitee, 2016). The species occurs in a range of habitats but is typically highly selective in any region. Preferred habitats include alpine and subalpine heathlands, grassland adjacent to boulder outcrops, swamps, sedgelands, coastal grassy or shrubby dunes, and occasionally forests with grassy understorey (Threatened Species Scientific Commitee, 2016). The species occupies a complex of runways through dense vegetation of its wet grass, sedge or heath habitat or under snow in the winter (Office of Environment and Heritage, 2017b).	ACT Threatened Species List	Low No preferred habitat identified.
Petauroides volans	Greater Glider	V	V	The Greater Glider has a restricted distribution in eastern Australia, from the Windsor Tableland in north Queensland to central Victoria, with an elevated range from sea level to 1200m above sea level. The species is largely restricted to eucalypt forests and woodlands, feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. It is found in abundance in montane eucalypt forest with relatively old trees and an abundance of hollows. It also favours forests with a diversity of eucalypts to cater for seasonal variation in food abundance.	ACT Threatened Species List PMST	Low Marginal preferred habitat, however potential habitat is too small of a patch to support a population and is disconnected from better woodland habitats.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Petrogale penicillata	Brush-tailed Rock-wallaby	V	E	Occurs in inland and sub-coastal south eastern Australia where it inhabits rock slopes. It has a preference for rocks which receive sunlight for a considerable part of the day. Windblown caves, rock cracks or tumbled boulders are used for shelter. Occur in small groups or "colonies" each usually separated by hundreds of metres (NSW National Parks and Wildlife Service, 2003a). Within the ACT the species is presumed to be extinct, with the last confirmed sighting occurring at Wallaby Rocks in the TNR in 1959. However, the discovery of rock-wallaby skeletal material in NNP suggest a more recent occurrence of the species (Reside and Martin 1996). The nearest known extant colonies to the ACT are at Nattai National Park (156 km NNE of Canberra) and in Kangaroo Valley, NSW (187 km ENE of Canberra) (ACT Government - Environment and Planning Directorate - Environment, 2015).	ACT Threatened Species List PMST	Low No preferred habitat identified. The species is presumed to be extinct in the wild within the ACT.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Phascolarctos cinereus	Koala	V	V	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabits eucalypt woodlands and forests. Koalas Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. The preferred tree species vary widely on a regional and local basis. Some preferred species include Forest Red Gum (*Eucalyptus tereticornis),* Grey Gum (*E. punctata*) In coastal areas, Tallowwood (*E. microcorys*) and Swamp Mahogany (*E. robusta)* are important food species, while in inland areas White Box (*E. albens*), Bimble Box (*E. populnea*) and River Red Gum (*E. camaldulensis*) are favoured (NSW National Parks and Wildlife Service, 1999a, NSW National Parks and Wildlife Service, 2003b, Office of Environment and Heritage, 2017d). In the ACT region, Koalas are thought to be present through the Brindabella Ranges and in the Orroral Valley, Tidbinbilla reserve and Namadgi National Park (Department of the Environment and Energy, 2019l).	ACT Threatened Species List PMST	Low No preferred habitat identified.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Pseudomys fumeus	Smoky Mouse	E	E	The Smoky Mouse is currently limited to a small number of Sites in Victoria, south-east NSW and the ACT. Despite considerable survey effort having been conducted across the known NSW range for the species, there are 3 records from Kosciuszko National Park and 2 records adjacent to the park in Bondo and Ingbyra State Forests; the remainder are centred around Mt Poole, Nullica State Forest and the adjoining South East Forests National Park (Menkhorst and Seeback, 1981). The Smoky Mouse occurs in a variety of vegetation communities, ranging from coastal heath to dry ridgeline forest, sub-alpine heath and, occasionally, wetter gullies (Menkhorst and Seeback, 1981). Except for the wetter Sites, a consistent feature of Smoky Mouse habitats is the diversity of heath and bush-pea species present, combined with potential shelter Sites in the form of woody debris or rocks. Vegetation at capture Sites varies widely in age post-fire (Menkhorst and Broome, 2006).	ACT Threatened Species List	Low No preferred habitat identified.
Pseudomys novaehollandiae	New Holland Mouse	V	V	New Holland Mouse has a fragmented distribution across Queensland, NSW, Victoria and Tasmania. In the ACT the species has likely been locally extinct since the 1880s, however the species has been reintroduced to Mulligans Flat Woodland Sanctuary (Department of the Environment and Energy, 2019j). Mulligans Flat Woodland Sanctuary is a predator-proof fenced sanctuary which has reintroduced many native woodland species (Capital Woodlands and Wetlands Conservation Trust, 2015). Habitat for the species includes open heathland, woodlands and forests with a heathland understorey and vegetated sand dunes (Office of Environment and Heritage, 2017c).	ACT Threatened Species List	Low No wild populations of the species are known to occur within the ACT.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly. At a regional scale, broad trends in the distribution of plants with similar flowering and fruiting times support regular annual cycles of migration. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, elsewhere, during spring, Grey-headed Flying-foxes are uncommon south of Nowra and widespread in other areas of their range. The species is widespread throughout their range in summer, whilst in autumn it occupies coastal lowlands and is uncommon inland. In winter, the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW (associated with flowering Spotted Gum *Corymbia maculata*) and on the northwest slopes (generally associated with flowering White Box *Eucalyptus albens* or Mugga Ironbark *E. sideroxylon*). Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines (Office of Environment and Heritage, 2017d, Department of the Environment and Energy, 2019l).	PMST	**Moderate - High** The species has previously been recorded within the area where foraging habitat exists in the form of planted native species and exotic fruit trees. Limited potential foraging habitat for the species is present within the Box Gum Woodland.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Reptiles						
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	This lizard is known from four regions in eastern Australia: near Canberra in the ACT, Tarcutta and Bathurst in NSW, and near Bendigo in Vic. In general, lizards occur in open grassland habitats that have a substantial cover of small rocks (Osbourne and Jones, 1995). Lizards also show a preference for sunny aspects, avoiding south facing slopes. Has been recorded in grassland Sites that appear not to support any native grasses and several animals have been found on the edge of *Callitris endlicheri* woodland and Eucalyptus *macrorhyncha woodland* (Barrer, 1992). A burrowing species, it is usually found under rocks on well-drained soil and in ant nests, occasionally with several individuals found under the same rock (Swan et al., 2004).	ACT Threatened Species List PMST	Low No preferred habitat identified, previous pitfall trapping surveys failed to detect the species within the broader Site.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Delma impar	Striped Legless Lizard	V	V	The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes and possibly on the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma and Tumut areas. It also occurs in the ACT, Victoria and south-eastern South Australia. In the ACT region, four disjunct populations are recognised: Gungahlin, Yarramundi Reach, Majura Valley and Jerrabomberra Valley (Department of the Environment, 2016a). Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass *Themeda triandra,* spear-grasses *Austrostipa* spp. and *poa* tussocks *Poa* spp., and occasionally wallaby grasses *Austrodanthonia* spp. Sometimes present in modified grasslands with a significant content of exotic grasses. Also sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter (Environment ACT, 2005a, Office of Environment and Heritage, 2017d).	ACTmapi ACT Threatened Species List PMST AoLA	**Recorded** Habitat identified in the form of exotic and native grassland, and open box gum woodland. One individual was recorded during targeted surveys within the northwest of the development area. Targeted surveys across the broader Site, recorded individuals within the conservation area.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	NC ACT[2]	HABITAT	DATA SOURCE[3]	LIKELIHOOD OF OCCURRENCE
Tympanocryptis pinguicolla	Grassland Earless Dragon	E	E	Restricted to a small number of Natural Temperate Grassland Sites dominated by wallaby grasses (*Notodanthonia* spp.), spear grasses (*Austrostipa* spp.), Poa Tussock (*Poa sieberiana*), Red Grass (*Bothriochloa macra*), and occasionally Kangaroo Grass (*Themeda australis*). Introduced pasture grasses occur at many of the Sites supporting this species, which has also been captured in secondary grassland. Within its habitat, apparently prefers areas with a more open structure, characterised by small patches of bare ground between the grasses and herbs. In addition to tussocks, partially embedded surface rocks, and spider and insect holes are used for shelter. These are important micro-habitat elements within the grassland habitat. Rocks and arthropod holes provide important thermal refuges during temperature extremes. It feeds on small invertebrates, including ants and spiders. Tends to be inactive beneath rocks or in arthropod burrows during the winter months. Lays up to five eggs in shallow nests or burrows, (sometimes those dug by spiders or other arthropods), between late spring and late summer. Young hatch in late summer and autumn (Department of Environment and Climate Change, 2007b).	ACT Threatened Species List PMST	Low Some areas of suitable habitat identified, however, two targeted surveys previously undertaken, failed to detect species. Additionally, habitat for this species is well known and the site has not been identified in mapping of habitat for the species within the ACT (ACT Government, 2016b).

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered, m = Marine, M = Migratory under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered, RCD = Regionally Conservation Dependent under the *Nature Conservation Act 2014.*

(3) PMST = Department of the Environment and Energy's Protected Matters Search Tool, AoLA = Atlas of Living Australia, and ACTmapi = ACTmapi Significant Species, Vegetation Communities and Registered Trees database.

APPENDIX F

EPBC ASSESSMENTS OF SIGNIFICANCE

The direct impacts of the Project on entities listed as Threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are summarised Table F.1. An assessment of Project impacts against the Matters of National Environmental Significance (MNES), Significant impact guidelines 1.1 has been undertaken and is provided below.

Table F.1 Summary of impacts on Threatened species

SCIENTIFIC NAME	COMMON NAME	EPBC ACT STATUS	TOTAL IMPACT (HA)
Natural Temperate Grassland of the South Eastern Highlands		Critically Endangered	15.8
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		Critically Endangered	1.31
Synemon plana	Golden Sun Moth	Vulnerable	11.6
Delma impar	Striped Legless Lizard	Vulnerable	26.53
Polytelis swainsonii	Superb Parrot	Vulnerable	1.31
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	20.37

F1 NATURAL TEMPERATE GRASSLAND

F1.1 COMMUNITY PROFILE

F1.1.1 STATUS

The Natural Temperate Grassland of the South Eastern Highlands ecological community is listed as Critically Endangered under the EPBC Act and Endangered under the NC ACT.

DESCRIPTION

Natural Temperate Grasslands in the ACT are defined as (ACT Government, 2017a):

- occurring within the ACT's temperate zone, where tree growth is climatically limited
- treeless or contains up to 10% projective cover of trees, shrubs, or sedges
- dominated by native grasses and/ or native forbs (more than 50% total vegetative cover, excluding introduced annuals)
- a diversity of native forbs present, or if disturbed, having components of the indigenous native species sufficient to re-establish the characteristic native groundcover.

Natural Temperate Grassland in the ACT is distributed from low-lying plains of urbans areas to valleys up to the mountains of Namadgi National Park at 1200 m above sea level (ACT Government, 2017a). Since the 1800s this ecological community has faced loss and fragmentation across its range. The community now remains as primarily isolated remnants.

F1.1.2 THREATS

Key threats to native grassland communities include (Office of Environment & Heritage, 2018a; Envrionment ACT, 2006):

- loss of the community to competing land uses
- fragmentation and isolation of remnants and the potential for this leading to genetic problems for components of the communities, i.e. small populations of fauna and flora
- invasion of exotic weeds, and the conversion of the ecological community to modified exotic pastures
- overgrazing by domestic stock or kangaroos
- physical soil disturbance by feral animals, dumping, trampling, and motor vehicles
- inappropriate fire regimes, or wildfire
- use of fertilisers, pesticides, and spray drift from adjacent Sites
- changes to drainage patterns
- mowing/slashing
- planting of canopy species shading the ground layer
- over-harvesting of seeds from a community.

F1.2 SPECIFIC IMPACTS

The proposed action would involve clearing or disturbance of up to 15.8 ha of grassland which is consistent with *Natural Temperate Grassland of the South Eastern Highlands* Threatened ecological community. Of this, 13.97 ha would be permanently cleared and 1.84 ha would be temporarily impacted for construction access and underground infrastructure (water and sewer) and could be revegetated.

F1.3 EPBC ACT SIGNIFICANCE ASSESSMENT

Natural Temperate Grassland of the South Eastern Highlands is listed as Critically Endangered under the EPBC Act. The following assessment has been undertaken following the MNES, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts, 2013).

AN ACTION IS LIKELY TO HAVE A SIGNIFICANT IMPACT ON A CRITICALLY ENDANGERED OR ENDANGERED ECOLOGICAL COMMUNITY IF THERE IS A REAL CHANCE OR POSSIBILITY THAT IT WILL:

REDUCE THE EXTENT OF AN ECOLOGICAL COMMUNITY

Up to 15.8 hectares of Natural Temperate Grassland would be cleared as a result of the proposed development.

Estimates of extent of this community remaining vary greatly, ranging from 15,000 to 94,500 hectares, and may not include all occurrences of this community. Based on these estimates, the proposed development would result in clearing of between 0.02 and 0.11 per cent of the community.

Early surveys and options planning focussed the proposed development in areas adjacent to existing disturbance, areas with higher weed cover and past disturbance. The vegetation within the proposed development footprint is adjacent to areas of significant disturbance and exotic vegetation, has high edge to area ratio with weed incursions and has been subject to past disturbance as a result of historic land use.

Through this process, areas of this community within the Site with highest conservation value including areas with core habitat and high density of Threatened Golden Sun Moth, Striped Legless Lizard and Ginninderra Peppercress habitat have been avoided and would be retained and managed for conservation. The majority of the community within the Site, covering 84.61 ha, would be retained and managed for conservation including areas of highest biodiversity value.

While the proposed action will reduce the extent of the ecological community by 15.8 hectares, the majority of the community within the Site, covering 84.61 ha, would be retained and managed for conservation including areas of highest biodiversity value. The areas of temporary construction impacts, covering 1.84 ha would be revegetated following completion of works.

FRAGMENT OR INCREASE FRAGMENTATION OF AN ECOLOGICAL COMMUNITY, FOR EXAMPLE BY CLEARING VEGETATION FOR ROADS OR TRANSMISSION LINES

The location of the development within the Site means that the areas of the community being cleared are adjacent to existing cleared areas on the edges of a larger patch of Natural Temperate Grassland and are suffering degradation from edge effects such as weed invasion. A small area of Natural Temperate Grassland in the south of the referral area connects the larger patches of the community in the east and west of the proposed conservation area. Proposed construction in this area would result in narrowing of the link at its narrowest location from approximately 58 m to 15 m and fragmentation of the grassland habitat through the construction of a two lane road.

ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF AN ECOLOGICAL COMMUNITY

No critical habitat has been listed for the Natural Temperate Grassland of the South Eastern Highlands ecological community under the EPBC Act.

However, the Conservation Advice for the community states that "*The areas considered critical to the survival of the ecological community cover all patches that meet the key diagnostic characteristics and condition thresholds for the ecological community plus buffer zones"* (recommended buffer of 30 m).

As such, all Natural Temperate Grassland meeting the condition criteria for listing under the EPBC Act within the Project study area is considered habitat critical to the survival of this community and the proposed development will include clearing of 15.8 ha.

MODIFY OR DESTROY ABIOTIC (NON-LIVING) FACTORS (SUCH AS WATER, NUTRIENTS, OR SOIL) NECESSARY FOR AN ECOLOGICAL COMMUNITY'S SURVIVAL, INCLUDING REDUCTION OF GROUNDWATER LEVELS, OR SUBSTANTIAL ALTERATION OF SURFACE WATER DRAINAGE PATTERNS

The proposed action would include clearing of up to 15.8 ha of Natural Temperate Grassland. The areas of temporary construction impacts, covering 1.84 ha would be revegetated following completion of works.

The proposed development will include mitigation measures to minimise sedimentation and hydrological impacts. These measures will be outlined in the Construction Environmental Management Plan.

The proposed subdivision layout includes a perimeter road which provides a buffer between the residential development and the retained grassland. Water sensitive urban design will be included in the detailed design to minimised potential indirect impacts resulting from alteration of drainage patterns.

Based on the implementation of proposed mitigation measures, the proposed development is considered unlikely to substantially modify or destroy abiotic factors necessary for the community's survival in adjacent retained areas.

CAUSE A SUBSTANTIAL CHANGE IN THE SPECIES COMPOSITION OF AN OCCURRENCE OF AN ECOLOGICAL COMMUNITY, INCLUDING CAUSING A DECLINE OR LOSS OF FUNCTIONALLY IMPORTANT SPECIES, FOR EXAMPLE THROUGH REGULAR BURNING OR FLORA OR FAUNA HARVESTING

Up to 15.8 ha of the Critically Endangered Natural Temperate Grassland community would be cleared as a result of the proposed development. The areas of temporary construction impacts, covering 1.84 ha would be revegetated following completion of works.

Mitigation measures will be put in place to limit indirect impacts of the proposed development in the design as well as construction and operation phases (section 6) and include:

- perimeter road around residential development providing a buffer between retained grassland and residences
- water sensitive urban design to control runoff from development
- construction environmental management plan to manage construction impacts.
- implementation of Biodiversity Management Plan for the residual land at the Site which outlines biodiversity conservation management measures for the retained land within the broader Site to maintain and improve the condition of this community.

Indirect impacts to retained areas are considered unlikely to substantially change the species composition of the retained vegetation.

CAUSE A SUBSTANTIAL REDUCTION IN THE QUALITY OR INTEGRITY OF AN OCCURRENCE OF AN ECOLOGICAL COMMUNITY, INCLUDING, BUT NOT LIMITED TO:

ASSISTING INVASIVE SPECIES, THAT ARE HARMFUL TO THE LISTED ECOLOGICAL COMMUNITY, TO BECOME ESTABLISHED, OR

CAUSING REGULAR MOBILISATION OF FERTILISERS, HERBICIDES OR OTHER CHEMICALS OR POLLUTANTS INTO THE ECOLOGICAL COMMUNITY WHICH KILL OR INHIBIT THE GROWTH OF SPECIES IN THE ECOLOGICAL COMMUNITY, OR

The Project Site is situated within the urban landscape. As the Project is a residential development, the Project will bring homes closer to the retained areas of the ecological community.

There is potential for the mobilisation of fertilisers, herbicides or other chemicals or pollutants to impact on the remaining area of the ecological community proposed for conservation. However, the detailed design of the development includes water sensitive design principles and measures to minimise and control urban runoff.

The Site is already subject to the occurrence of invasive pest species, including foxes, rabbits and starlings, and it is not considered likely that invasive pest species would become further established as a result of the Project. Mitigation measures include providing signage indicating Lawson's designation as a cat containment suburb..

Spread of weeds during construction would be controlled through the implementation of a construction environmental management plan.

A biodiversity management plan for the Site outlines adaptive management and monitoring including weed management and conservation management actions to maintain and improve the condition of the retained area. The proposed retention and conservation of 84.61 ha of high condition vegetation including management of this area for conservation will ensure existing and future edge effects will be reduced.

With the implementation of the mitigation measures (section 6) and the biodiversity management plan, the project is unlikely to result in a substantial reduction in the quality or integrity of the retained areas of the ecological community.

INTERFERE WITH THE RECOVERY OF AN ECOLOGICAL COMMUNITY

The objectives outlined in the National Recovery Plan for the previous listing Natural Temperate Grassland of the Southern Tablelands (NTG-ST) states (Environment ACT, 2005) include:

- identify and evaluate the extent and quality of NTG-ST and component species
- maintain an information database to support protection, management and monitoring activities
- establish a comprehensive, adequate and representative system of NTG-ST areas protected either by reservation or conservation agreements (including MOUs)
- ensure 'best practice' management is applied to Sites containing NTG-ST
- ensure participation of the community in the conservation of NTG-ST
- enhance the ability of government and non-government organisations at the national, regional and local levels (including consent authorities) to recognise and incorporate NTG-ST conservation issues into all planning processes.

The proposal is unlikely to interfere with any of the recovery actions outlined.

The relatively small impact of the clearing of 15.8 ha of vegetation consistent with the Critically Endangered Natural Temperate Grassland ecological community, equivalent to less than 0.11 per cent is not expected to interfere significantly with the recovery of the ecological community.

F1.4 CONCLUSION

Approximately 15.8 ha of the Critically Endangered Natural Temperate Grassland ecological community would be cleared for the proposed development. Mitigation measures would be implemented to minimise the impact and the areas of temporary construction impacts, covering 1.84 ha would be revegetated following completion of works. However, as all occurrences of this community are considered critical to the survival of the ecological community, this is considered to be a significant impact.

Through the design and planning process, the proposed action was located in disturbed areas and areas adjacent to existing disturbance, areas with higher weed cover and past disturbance. Areas of this community within the Site with highest conservation value including areas with core habitat and high density of Threatened Golden Sun Moth, Striped Legless Lizard and Ginninderra Peppercress habitat have been avoided and would be retained and managed for conservation. As a result, the majority of the community within the broader Site (totalling 84.61 ha), would be retained and managed for conservation including areas of highest biodiversity value.

F2 BOX GUM GRASSY WOODLAND AND DERIVED NATIVE GRASSLAND

F2.1 COMMUNITY PROFILE

F2.1.1 STATUS

The White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community is listed as Critically Endangered under the EPBC Act and the NC ACT.

F2.1.2 DESCRIPTION

White Box Yellow Box Blakely's Red Gum Grassy Woodland (commonly referred to as *Box-Gum Woodland*) is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box *Eucalyptus albens***,** Yellow Box *E. melliodora* and Blakely's Red Gum *E. blakelyi* tree-cover is generally discontinuous and consists of widely-spaced trees of medium height.

In its pre-1750 state, this ecological community was characterised by:

- a ground layer dominated by tussock grasses
- an overstorey dominated or co-dominated by White Box, Yellow Box or Blakely's Red Gum, or Grey Box in the Nandewar bioregion
- a sparse or patchy shrub layer.

The Australian Government listing of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is slightly different to the NSW listing. Areas that are part of the Australian Government listed ecological community must have either:

- an intact tree layer and predominately native ground layer; or
- an intact native ground layer with a high diversity of native plant species but no remaining tree layer.

Box-Gum Grassy Woodland occurs along the western slopes and tablelands of the Great Dividing Range from southern Queensland through New South Wales and the Australian Capital Territory to Victoria.

Due to the ecological community's occurrence on fertile soils it has been extensively cleared for agriculture and intact remnants, including both trees and unmodified understorey, are now extremely rare. Clearing and fragmentation for urban, rural residential, agricultural and infrastructure development remain on-going threats to this ecological community, while degradation resulting from inappropriate management and weed invasion by introduced perennial grasses continues to erode the conservation value of remnant areas.

F2.1.3 THREATS

Threats to the community as outlined in the National Recovery Plan (Department of Environment, 2010) include:

- changes in the use and management of land containing Box-Gum Grassy Woodland or adjacent lands
- clearing and modification of the ecological community for agricultural and horticultural development
- clearing and modification as a result of rural residential and urban development
- clearing for mining
- infrastructure maintenance, upgrade activities, and management within travelling stock routes, road reserves and railway corridors containing the ecological community

- conflicting management practices including grazing regimes, pasture management, firewood collection, changed fire regimes, increased soil nutrients and use of chemicals, mowing or slashing regimes, revegetation management
- degrading landscape process such as weed invasion, climate change, salinity, acid soils, declining tree health and regeneration
- other potential threats such as pest animals, disease, collection/removal of native flora.

F2.1.4 DISTRIBUTION

Box-Gum Woodland is widespread across eastern Australia, but is now highly fragmented. It is found along the slopes and tablelands of Queensland and NSW, and through the ACT and Victoria. This community once formed an almost continuous band comprising several million hectares, but since European settlement has lost the majority of its extent to the agricultural industry. The 2010 National Recovery Plan for the community estimates that 416,325 ha of the pre-1750 area of 5,011,655 ha of this community remains across the four states and territories (Department of Environment, Climate Change and Water NSW, 2010). In the ACT an estimated 10, 865 ha of the community is thought to remain, which equates to 34 per cent of the estimated pre-1970 area (Department of Environment, Climate Change and Water NSW, 2010).

F2.1.5 SPECIFIC IMPACTS

The proposed action would involve clearing or disturbance of up to 1.31 ha of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community. . Of this, 0.43 ha would be permanently cleared and 0.88 ha would be temporarily impacted for construction access and underground infrastructure (water and sewer) and would be revegetated following completion of construction. Approximately 7.65 ha of the community within the site would not be impacted by the proposed action.

F2.2 EPBC ACT SIGNIFICANCE ASSESSMENT

Box-Gum Woodland is listed as Critically Endangered under the EPBC Act. The following assessment has been undertaken following the MNES, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts, 2013).

AN ACTION IS LIKELY TO HAVE A SIGNIFICANT IMPACT ON A CRITICALLY ENDANGERED OR ENDANGERED ECOLOGICAL COMMUNITY IF THERE IS A REAL CHANCE OR POSSIBILITY THAT IT WILL:

REDUCE THE EXTENT OF AN ECOLOGICAL COMMUNITY

The proposed action would result in a reduction of up to 1.31 ha of the Box Gum Woodland (less than 15% of the extent within the Site). Of this, 0.88 ha would be temporarily impacted and would be revegetated following construction. Up to 0.43 ha (4.8 % of the extent within the Site) would be permanently cleared.

The ecological community within the Site exists as relatively small patches which have been subject to high levels of grazing historically by sheep and more recently by kangaroos.

Within the site, the Box Gum Woodland met EPBC criteria due to size and regeneration rather than floristic diversity. The Box Gum Woodland area that would be cleared in the west of the Site is consist of sparse remnant trees and an area of dense. The vegetation in the east of the Site consists of native ground cover with regenerating Eucalypts.

In the ACT an estimated 10,865 ha of the community is thought to remain, which equates to 34 per cent of the estimated pre-1970 area (Department of Environment, Climate Change and Water NSW, 2010). The ACT Lowland Woodland Conservation Strategy (Environment ACT, 2004) reports an estimated 30 per cent of the community remains within the ACT. The removal of this community associated with the proposed action, would represent 0.01 per cent of the estimated extent of the remaining community within the ACT, and less than 0.004 per cent of the estimated extent nationally.

FRAGMENT OR INCREASE FRAGMENTATION OF AN ECOLOGICAL COMMUNITY, FOR EXAMPLE BY CLEARING VEGETATION FOR ROADS OR TRANSMISSION LINES

The Box Gum Woodland occurs as small patches within a grassland area surrounded by urban development. Existing connectivity is predominantly limited to road reserves, waterways and urban reserves.

The Site is isolated from other known patches of the community within the ACT, with the closest known patch over two kilometres away (ACT Government, 2019).

The proposed development would result in clearing of part of the Box Gum Woodland within the Site, but would not result in increased fragmentation of the community. However, the clearing would result in minor increases distance between general woodland habitat across the landscape which could impact mobile species such as birds and bats in the medium term until tree plantings within the proposed development reach suitable size.

ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF AN ECOLOGICAL COMMUNITY

No critical habitat has been listed for the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community under the EPBC Act (Department of the Environment and Energy, 2019e).

Habitat critical to the survival of ecological communities also refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

The National Recovery Plan for the ecological community (Department of Environment, Climate Change and Water NSW, 2010) specifies that all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria should be considered critical to the survival of this ecological community. While the site could be potentially be considered critical habitat, the proposed impacts would impact only a small portion of the local remnant, and the majority of impacts would be temporary and restored following completion of works. As such, it is unlikely the proposal will adversely affect habitat critical to the survival of the community and the retained areas are likely to persist in the long-term..

MODIFY OR DESTROY ABIOTIC (NON-LIVING) FACTORS (SUCH AS WATER, NUTRIENTS, OR SOIL) NECESSARY FOR AN ECOLOGICAL COMMUNITY'S SURVIVAL, INCLUDING REDUCTION OF GROUNDWATER LEVELS, OR SUBSTANTIAL ALTERATION OF SURFACE WATER DRAINAGE PATTERNS

The Project would include the clearing of up to 1.31 ha of Box-Gum Woodland. Design of the proposed development includes water sensitive urban design and is unlikely to substantially alter the surface water drainage or groundwater levels or other abiotic factors required for the survival of the retained area (covering 7.65 ha) of this community. Mitigation measures will be implemented to minimise sedimentation and hydrological impacts during construction in the Construction environmental management plan. The Project is considered unlikely to substantially modify or destroy abiotic factors.

CAUSE A SUBSTANTIAL CHANGE IN THE SPECIES COMPOSITION OF AN OCCURRENCE OF AN ECOLOGICAL COMMUNITY, INCLUDING CAUSING A DECLINE OR LOSS OF FUNCTIONALLY IMPORTANT SPECIES, FOR EXAMPLE THROUGH REGULAR BURNING OR FLORA OR FAUNA HARVESTING

The Project would include clearing of up to 1.31 ha of Box-Gum Woodland.

Mitigation measures will be put in place to limit indirect impacts of the proposed development in the design as well as construction and operation phases (section 6) and include:

- perimeter road around residential development providing a buffer between retained woodland and residences
- water sensitive urban design to control runoff from development

- construction environmental management plan to manage construction impacts
- implementation of a Biodiversity Management Plan for the residual land at the Site which outlines biodiversity conservation management measures for the retained land within the broader Site to maintain and improve the condition of this community.

Indirect impacts to retained areas are considered unlikely to substantially change the species composition of the retained vegetation.

CAUSE A SUBSTANTIAL REDUCTION IN THE QUALITY OR INTEGRITY OF AN OCCURRENCE OF AN ECOLOGICAL COMMUNITY, INCLUDING, BUT NOT LIMITED TO:

ASSISTING INVASIVE SPECIES, THAT ARE HARMFUL TO THE LISTED ECOLOGICAL COMMUNITY, TO BECOME ESTABLISHED, OR

CAUSING REGULAR MOBILISATION OF FERTILISERS, HERBICIDES OR OTHER CHEMICALS OR POLLUTANTS INTO THE ECOLOGICAL COMMUNITY WHICH KILL OR INHIBIT THE GROWTH OF SPECIES IN THE ECOLOGICAL COMMUNITY, OR

The Site is situated within the urban landscape of Canberra. As the proposed action is a residential development, it will bring homes closer to the retained areas of the ecological community. There is potential for the mobilisation of fertilisers, herbicides or other chemicals or pollutants to impact on the remaining area of the ecological community proposed for conservation. However, the detailed design of the development includes water sensitive design principles and measures to minimise and control urban runoff.

The Site already subject to the occurrence of invasive pest species, including foxes, rabbits, hares and starlings, and it is not considered likely that invasive pest species would become further established as a result of the Project. Mitigation measures include providing signage indicating Lawson's designation as a cat containment suburb.

Spread of weeds during construction would be controlled through the implementation of a construction environmental management plan including wash down procedures for construction equipment and vehicles.

A biodiversity management plan for the Site outlines adaptive management and monitoring including weed management and conservation management actions to maintain and improve the condition of the retained area.

With the implementation of the mitigation measures (section 6) and the biodiversity management plan, the project is unlikely to result in a substantial reduction in the quality or integrity of the retained areas of the ecological community.

INTERFERE WITH THE RECOVERY OF AN ECOLOGICAL COMMUNITY

The National Recovery Plan for Box-Gum Woodlands (Department of Environment, Climate Change and Water NSW, 2010) outlines the following recovery actions in Table 3:

- establish agreed protocols across jurisdictions for the assessment of Box-Gum Grassy Woodland condition in Year 1 of the recovery plan implementation and apply these on an ongoing basis
- share data and reporting between jurisdictions, government and nongovernment agencies
- investigate the occurrence of Box-Gum Grassy Woodland in South Australia
- collate existing survey and mapping data relating to Box-Gum Grassy woodland into a central, updatable repository for use by stakeholder government agencies in mapping extent, protected areas and priority areas. Update repository on an annual basis
- identify gaps in survey and mapping data across the predicted distribution of Box-Gum Grassy Woodland and engage communities and conduct future surveys to fill these gaps
- Investigate the further use of remote sensing and other assessment techniques to assist with the preceding actions and with Actions 2.2, 2.3 and 2.4
- establish and apply protocols for non-technical monitoring of remnant areas. These should include as many of the elements as possible of the condition assessment protocols developed in Action 1.1. These protocols are to reflect the condition assessment protocols developed under Action 1.1

- identify gaps in current monitoring to ensure the geographic range and ecological variation within the ecological community is represented, and to coordinate implementation and analysis of all monitoring
- improve baseline knowledge of condition and generate benchmark data against which Sites can be assessed for management actions and cost effectiveness of revegetation ranked.

The proposal is unlikely to interfere with any of the recovery actions outlined.

F2.3 CONCLUSION

The proposed development includes the clearing of Box Gum Woodland from two small patches. These have been subject to intensive grazing over a long period by sheep (historically) and kangaroos. With the removal of sheep and ongoing management of kangaroos, there is evidence of regeneration of the community including regeneration of canopy species.

A small portion of the Box Gum Woodland within the Site would be impacted by the proposed action, covering 1.31 ha, which is equivalent to approximately 0.01 per cent of the remaining extent of the community in the ACT. Of this, 0.43 ha would be permanently cleared and 0.88 ha would be temporarily impacted for construction access and underground infrastructure (water and sewer) and would be revegetated following completion of construction. The majority of the local remnant, approximately 7.65 hectares of this community would be retained and managed for conservation. Therefore it is considered unlikely the proposed development would have a significant impact to White Box Yellow Box Blakely's Red Gum Woodland.

F3 GOLDEN SUN MOTH

F3.1 DESCRIPTION

F3.1.1 STATUS

Golden Sun Moth (*Synemon plana*) is listed as Vulnerable under the Commonwealth EPBC Act and Endangered under the NC Act.

F3.1.2 ECOLOGY AND HABITAT

Golden Sun Moth was once widespread in south-eastern Australia, and relatively continuous throughout its range. Its historical distribution shows a close correlation between the distribution of temperate grasslands dominated by *Rytidosperma* spp. (Wallaby Grasses) (ACT Government, 2017c). It is estimated that the remaining remnants of temperate grassland in Australia is only 1% of that at the time of European settlement. Today, the species is found in native grassland, native pasture, open grassy woodland and secondary grassland (ACT Government, 2017c). In 2010, the known area of occupied habitat of the species is approximately 150 km^2. At least 36 sites occur in Victoria, at least 59 sites in NSW and at least 78 sites in the ACT (Department of Agriculture Water and the Environment, 2021a). The known NSW and ACT subpopulations generally occur at elevations between 480 m and 720 m above sea level. ACT populations occur in lowland areas, predominately in small Sites within the city of Canberra. Populations separated by more than 200 m are considered to be isolated and are therefore counted as separate Sites due to the low mobility of the species, particularly the females (ACT Government, 2017c, Department of Agriculture Water and the Environment, 2021a) .

In the ACT, 88% of Golden Sun Moth habitat is without trees or very sparse woodland. It is suggested, that their presence in woodland is a result of the species spreading outside its preferred habitat due to the clearing of trees (ACT Government, 2017c).

The species in the larval stage feeds on the roots of native C3 grasses, particularly *Rytidosperma* spp. (Wallaby Grasses) and *Austrostipa* spp. (Speargrasses) grasses. The species also feeds on exotic *Nasella neesiana* (Chilean Needlegrass) roots, and there is evidence to suggest they can also feed on *Nasella trichotoma* (Serrated Tussock). The species has been recorded in grassland patches comprised of solely *Nassella nessiana*, with larvae attaining greater weight then those found in native grassland (ACT Government, 2017c). Chilean Needlegrass has allowed the moth to survive in disturbed habitats and could potentially connect isolated populations through the grasses invasion along roadsides and creeklines (ACT Government, 2017c). Other grass species *Microlena stipoides* (Weeping Grass), *Bothriochloa macra* (Redleg Grass), and *Aristida ramosa* (Purple Wiregrass), have also been linked to *S. plana* through observations including apparent oviposition, pupal cases protruding from tussocks, and larvae associated with roots (ACT Government, 2017c). Tussocks are an important structural feature in habitat for the species, which is utilised for shelter, egg-laying and larval development (ACT Government, 2017c). *S. plana* prefers a sparser grassland vegetation structure, with relatively low herbage mass, and larger proportion of open-inter tussock space. This allows flying males to better locate females after emergence (Richter et al., 2012) and space for basking to increase body temperature (ACT Government, 2017c).

Adult Moths are diurnal and live for 1–4 days following emergence. During this time, males are observed flying in a zigzag pattern above the grass sward searching for receptive females in suitable conditions. Females remain on the ground and displaying their brightly coloured orange hind wings. Females are rarely observed flying, and when they do, are typically only observed travelling a few meters (up to 20) in a single flight. Males are observed flying for several hundred meters. After mating, the female crawls among many grass tussocks and lay between 80 and 100 eggs at their base (Richter et al., 2012). The flying season typically lasts six to eight weeks between mid-October and early January

depending on local climate and typography. The species is active on sunny, cloudless days during the warmest part of the day (1000-1500) with low to moderate wind speeds (Richter et al., 2012).

F3.1.3 THREATS

The Conservation Advice for *Synemon plana* (Golden Sun Moth) (Department of Agriculture Water and the Environment, 2021a) outlines key threats for the Golden Sun Moth. These include:

- habitat loss, degradation and fragmentationinvasive species
- installation of artificial structures
- fire
- climate change.

F3.2 PRESENCE WITHIN THE PROPOSAL AREA

Golden Sun Moth was detected in grassland areas within the referral area as well as in the broader Site. Core habitat areas occur to the west of the proposed development. Low numbers were also recorded within the referral area and grassland to the east. Based on the existing grassland linkages the population within the broader Site is considered to be a single population.

A total of 11.7 ha of habitat was mapped within the impact area with an average density of 11 males per hectare. Within the broader Site, 40.5 ha of high density core habitat was mapped within an average density of 56 males per hectare.

F3.3 SPECIFIC IMPACTS

A total of 11.6 ha of habitat for the species will be removed as a result of the Project. The density of male moths varied within different areas of the Referral area from 1 to 35 males per hectare. The average density across the Referral area was 11 males per hectare.

Table F.2 Golden Sun Moth habitat and density estimates

PATCH	HABITAT NOTES	DENSITY ESTIMATE (MALES PER HECTARE)	AREA OF HABITAT IMPACTED (HA)
G1	Good condition vegetation, dominated by preferred species such as *Rytidosperma* spp. and *Austrodanthonia*.	7	0.14
G2	Moderate condition, includes patches of preferred habitat.	9	0.48
G3	Dominated by dense *Themeda triandra*, known food source occurred in small localised patches on higher ground.	24	0.22
G4	Dominated by dense *Themeda triandra*, known food source occurred in small localised patches.	17	1.26
G5	Dominated by *Themeda triandra*, known food sources scattered throughout in low density.	21	1.64
G6	Sparse grassland dominated by *Austrostipa bigeniculata*, *Bothriochloa macra* and exotic pasture species. Good condition grassland including C3 grasses in the southern section.	1	5.78

PATCH	HABITAT NOTES	DENSITY ESTIMATE (MALES PER HECTARE)	AREA OF HABITAT IMPACTED (HA)
G11	Good condition vegetation, dominated by preferred species such as *Rytidosperma* spp. and *Austrodanthonia*.	35	0.46
G12	Patch of sparse grassland with high cover of *Rytidosperma* spp. Past disturbance evident. Tall grassland with dense weeds in surrounding area.	22	1.66
Total			**11.6**

F3.4 EPBC ACT SIGNIFICANCE ASSESSMENT

Golden Sun Moth (*Synemon plana*) is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the MNES, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts, 2013).

IS THIS PART OF AN IMPORTANT POPULATION?

Under the EPBC Act, an important population is one that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Important populations need to meet one of the criteria listed above and be viable over the long-term.

The population within the site is likely to be viable in the long term. Disperal of the species is limited and the Site is within an urban area with limited dispersal opportunities. The site is not at the limit of the species range.

The population is considered to be important based on the size and condition of habtiat and the population size. The population may be important for maintaining genetic diversity for future conservation.

AN ACTION IS LIKELY TO HAVE A SIGNIFICANT IMPACT ON A VULNERABLE SPECIES IF THERE IS A REAL CHANCE OR POSSIBILITY THAT IT WILL:

LEAD TO A LONG-TERM DECREASE IN THE SIZE OF AN IMPORTANT POPULATION OF A SPECIES

Grassland areas within the referral area were generally dominated by non-preferred species such as *Themeda triandra* and/or did not contain grassland structure preferred by the species, namely low, open grassland. Despite this, the species was detected in relatively low number within the Referral area. The proposed development is estimated to impact 11.6 ha of habitat for the species with an average density of 11 males /hectare within this area.

The population existing within the Site occurs primarily outside of the Referral area. The grassland to the west contains large areas of core habitat which supports a significant proportion of the population. Outside the referral area, the average density was 56 males/hectare (2018). The species is known to occur in higher numbers and density adjacent to the referral area within the large patch of native grassland occurring directly to the west as well as in the grassland to the east.

The 11.6 ha of habitat which would be impacted by the proposed action was generally of lower quality than adjacent areas of habitat to be retained based on the lower abundance of preferred grass species and lower golden sun moth counts.

While 11.6 ha of habitat will be impacted, relatively low numbers of moths were recorded in this area (average male density of 11) and it is not expected that this impact will lead to a long-term decrease in the size of the population which occurs predominantly to the immediate west of the Referral area.

REDUCE THE AREA OF OCCUPANCY OF AN IMPORTANT POPULATION

The proposed action would remove 11.6 ha of habitat for the species. The area of habitat to be cleared is of lower condition and supported lower population density than the core areas be retained for conservervation (45.55 ha).

FRAGMENT AN EXISTING IMPORTANT POPULATION INTO TWO OR MORE POPULATIONS

Significant Impact Guidelines for the species (Department of Environment Water Heritage and the Arts, 2009) identifies barrier to dispersal could include breaks in habitat of >200 m and structures that prohibit movement. The former development area and associated planting with the proposal area acts as a barrier to species movement. However, the habitat to the east and west of the proposed development are currently connected by two narrow areas of grassland in the north and south of the study area. The northern connection is disrupted by an existing access road which is proposed to be upgraded and widened as a part of the Project. This road and associated plantings may already have some impact on the dispersal of the species across the road, however it would not be considered a barrier to male moth dispersal, as the width is approximately 30 m. Based on the existing grassland linkages the population within the broader Site is considered to be a single population.

The Project would result in the removal of native vegetation in the north currently linking the eastern and western areas of habitat of the broader Site. The proposed residential development in north of the site would create a barrier to dispersal between the eastern and western areas of retained habitat.

In the south of the study area, a grassland area will be retained along the southern boundary which would provide some connectivity of the eastern and western portions of the population. The proposed development includes construction of a new access road which would occur in this linkage but is unlikely to present a significant barrier to dispersal.

While the Project will decrease connectivity of an existing population with the removal of a linkage in the north of the Site, dispersal is likely to continue to occur at the southern portion of the Site.

ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF A SPECIES

Habitat critical to the survival of a species refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

No critical habitat for this species is currently listed under the EPBC Act (Department of the Environment and Energy, 2019e). According to the recent Conservation Advice for *Synemon plana* (Golden Sun Moth) (Department of Agriculture Water and the Environment, 2021a), habitat critical to survival "likely includes all native grassland and open grassy woodland habitat occupied by the species across its range. As the species has specialised habitat requirements with a fragmented distribution, all occupied habitat is important for the breeding activity of the associated subpopulation and the recovery of the species. Large subpopulations or smaller well-connected subpopulations occurring in high quality habitat would classify for their importance in the long-term maintenance of the species, including maintenance of genetic diversity and long-term evolutionary development. High quality habitat for this purpose should be defined as medium to large sites containing native grassland with an abundant component of larval food species (i.e. Rytidosperma spp. and/or Austrostipa spp.) with low weed cover, inter-tussock spaces, and land-use/ management that is consistent with the ecological values of the site. Sites occurring at or toward the limit of the species range, or sites that are a long distance from other known subpopulations are also likely to be defined as habitat critical to the survival of the species for their importance toward conserving the full range in genetic diversity."

The habitat for the Golden Sun Moth at the Belconnen Naval Station was listed on the Commonwealth Heritage List due to its size and condition, and the extant population and therefore its importance for the long-term conservation of the Golden Sun Moth (Department of the Environment and Energy, 2018b).

While the habitat within the broader Site is of high significance and importance, the proposed action occurs within areas supporting low numbers of the species and not containing significant areas of preferred habitat. Mitigation measures have been provided to minimised indirect impacts to core areas of habitat which occur to the west of the proposed development. With the siting of the proposed development in areas of low abundance and lower habitat condition, and the implementation of mitigation measures, the proposal is unlikely to significantly impact habitat critical to the survival of the species.

MODIFY, DESTROY, REMOVE OR ISOLATE OR DECREASE THE AVAILABILITY OR QUALITY OF HABITAT TO THE EXTENT THAT THE SPECIES IS LIKELY TO DECLINE

The proposed action would see the removal of 11.6 ha of habitat for the species and a reduction of connectivity for the population. However, given the size and quality of habitat patches adjacent to the proposal Site and the high population estimate in core areas of habitat to the west of the proposed development, these impacts are not considered likely to modify, destroy, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

RESULT IN INVASIVE SPECIES THAT ARE HARMFUL TO A VULNERABLE SPECIES BECOMING ESTABLISHED IN THE VULNERABLE SPECIES' HABITAT

The proposed action is a residential development. It is not likely that invasive species (such as introduced predators) that are harmful to the Golden Sun Moth would become further established as a result of the action. Mitigation measures will minimise likelihood of invasive species becoming established providing signage indicating Lawson's designation as a cat containment suburb as well as weed control measures.

Retained vegetation within the broader Site include the core areas of habitat and these will be managed in accordance with a Biodiversity Management Plan.

INTRODUCE DISEASE THAT MAY CAUSE THE SPECIES TO DECLINE, OR THERE ARE CURRENTLY NO KNOWN DISEASES AFFECTING THE SPECIES.

There are no known diseases that are likely to increase in the area as a result of the Project. Mitigation measures will be implemented as part of the construction environmental management plan including sedimentation controls, wash down facilities and no-go fending will minimise likelihood of introduction of disease.

INTERFERE SUBSTANTIALLY WITH THE RECOVERY OF THE SPECIES.

The Conservation Advice for *Synemon plana* (Golden Sun Moth) (Department of Agriculture Water and the Environment, 2021a) outlines a number of conservation and recovery actions for this species. The primary conservation objective is to "Protect Golden Sun Moth subpopulations from decline through:

- Retaining and protecting native grassland remnants within the known distribution of the species.
- Ensuring remnant subpopulations remain connected or linked to each other; in cases where remnants have lost connective links, investigate the potential to re-establish links (e.g. revegetating sites to act as stepping stones for dispersal).

The proposed action will impact an estimated 11.6 ha of habitat for the species and will decrease connectivity of an existing population with the removal of a linkage in the north of the Site. However, dispersal is likely to continue to occur at the southern portion of the Site.

The proposed Action has avoided the majority of Golden Sun Moth habitat, including core areas with high density and these will be retained for conservation and protected..

F3.5 CONCLUSION

The proposed Action has avoided the majority of Golden Sun Moth habitat, including core areas with high density (estimated 56 males/hectare) and these will be retained for conservation and protected. Although the proposal avoids highest condition habitat with high density of moths, the proposed action would include clearing of 11.6 ha of habitat for the species, with lower density of moths (11 males per hectare). This clearing is considered to be a significant impact based on habitat loss from a large, continuous habitat area.

F4 STRIPED LEGLESS LIZARD

F4.1 DESCRIPTION

F4.1.1 STATUS

Striped Legless Lizard (*Delma impar*) is listed as Vulnerable under both the EPBC Act and the NC Act.

F4.1.2 HABITAT AND ECOLOGY

The Striped Legless Lizard is a grassland species with a likely historical distribution throughout native grasslands in south-eastern Australia (ACT Government, 2017b). It has been recorded from New South Wales, through the Australian Capital Territory, Victoria and into the south-eastern corner of South Australia (Department of the Environment and Energy, 2019a). Habitat loss has led to significant decline of the species, and remaining populations are thought to be small and isolated (Department of the Environment and Energy, 2019a). In the ACT, the species is known to occur in four discrete areas: the Jerrabomberra Valley, Central Canberra on land adjacent to Yarramundi Grassland on Lake Burley Griffin, Gungahlin/ Belconnen area, and the Majura Valley in the vicinity of Canberra Airport (ACT Government, 2017a). These four populations are isolated and may represent genetically distinct sub-populations.

Potential habitat for the species includes native grasslands, grassy woodlands or areas previously consisting of one or both communities across the historical range of the species (Department of the Environment and Energy, 2019a). The species could be persisting in Sites retaining suitable tussock (intermediate biomass), suitable soil type and structure, and having avoided major disturbance activities such as ploughing (Department of the Environment and Energy, 2019a). This includes degraded Natural Temperate Grasslands that are now dominated by exotic species (ACT Government, 2017a).

Primary habitat is grassland dominated by perennial tussock-forming grasses, such as Kangaroo Grass (*Themeda triandra*), Spear-grasses (*Austrostipa* spp.) and Poa tussocks (*Poa* spp.), and occasionally wallaby grasses (*Austrodanthonia* spp.) (Office of Environment & Heritage, 2018b). Habitat most often has a minimum cover of 20% tussock-forming grasses, and often exceeding 50% (Department of the Environment and Energy, 2019a). The species is also known to occur in some areas dominated by introduced species such as Harding Grass (*Phalaris aquatica)*, Serrated Tussock (*Nasella trichotoma*), Cocksfoot (*Dactylis glomerata*) and Flatweed (*Hypocharis radicata)* (Department of the Environment and Energy, 2019a). A key habitat feature for the species is shelter which could be in the form of grass tussocks, thick ground cover, spider burrows, soil cracks, rocks and woody debris. Some of these features are less common in the ACT, where the species commonly uses grass tussocks and burrows for shelter (Department of the Environment and Energy, 2019a).

A comprehensive assessment of habitat study carried out by Hadden (1995), found that structure of tussock grasses at known population Sites varied from widely spaced tussocks of open grassland to a dense sward of closed grassland (Hadden, 1995). Further, the study found that the species persisted almost equally in areas grazed and ungrazed by introduced herbivores. However, more recently, a study (Howland et al., 2014) indicated that the species is more likely to be detected in areas subject to moderate grazing intensity by large herbivores, i.e. where grass height, biomass, and percent grass cover was moderate. A further study presented that exotic grasses are preferred by the species when grass structural complexity was low, and native grasses favoured when grass structural complexity is high (Howland et al., 2016).

In times of fire, it is thought that the species may utilise refuges within or adjoining their habitat; such as unburnt areas, beneath rocks or remain within the soil until vegetation recovers (Department of the Environment and Energy, 2019a). The species can remain in areas where activities such as grazing, slashing, and fire regimes result in short grass sword, if deep-cracking soil or scattered surface rock is present for refuge (ACT Government, 2017b). These habitat features are

not considered a feature of habitat in the ACT where other forms of shelter are utilised but may not provide the same refuge opportunities (ACT Government, 2017b).

The Striped Legless Lizard feeds on a variety of invertebrates found in grasslands. Preference appears to be for spiders, cockroaches, crickets, and caterpillars (ACT Government, 2017b). The species appears to be diurnal in the wild, and captive animals have been observed burrowing into soil in the late afternoon and re-emerging in the morning as temperatures increase (ACT Government, 2017b).

Highly variable distances moved by the species have been recorded. Areas of between 25 m^2 (5 m x 5 m) and 100 m^2 (10 m x 10 m) appears to be a reasonable generalisation for home range based on pitfall and tile recapture data, however individuals have been recorded travelling 60 m in just two days (ACT Government, 2017b). In 1998 Dunford (in ACT Government, 2015) captured an individual that was 160 m away from where it has been captured three years previously. It is suspected that individuals only move short distances, however are capable of moving into new adjacent habitat, and probably move between habitats that become suitable or unsuitable under certain weather conditions (ACT Government, 2015).

For the long-term conservation of the species it is considered important to conserve areas that contain large (>500 individuals) and medium (>200 individuals) sized populations. Areas where small populations (<200 individuals) occur can still provide contribution the conservation of the species, particularly if they are connected to important populations (Department of Sustainability, Environment, Water, Population and Communities, 2011.

F4.1.3 THREATS

Conservation advice supplied by the Threatened Species Scientific Committee identified the major threats to the species as (Threatened Species Scientific Committee, 2016):

- loss, modification, degradation, and fragmentation of habitat
- urban development
- overgrazing by livestock or kangaroos
- rock collection or destruction
- ploughing and pasture improvement
- invasion of weed species
- predation by cats and foxes
- inappropriate fire regimes, or wildfire.

F4.2 PRESENCE WITHIN THE PROPOSAL AREA

One individual was recorded in the Referral area.

Outside the Referral area, the species was recorded:

- in *Rytidosperma* dominated grassland in the north west of the Site to the west of the proposed development - only two individuals were recorded at two out of eight grid Sites (recorded at grid D1 and D6) over a 10 week survey period suggesting the species occurs in low density in this grassland area
- Dry *Themeda* grassland within the eastern area of the Site- the species was recorded in higher density in this area with up to 8 individuals recorded at one tile grid in a single day (grid A2).

It is likely that the individuals recorded in the north and east of the Site belong to two sub-populations which have been isolated from one another as a result of previous land use; specifically the current infrastructure and plantings which exist within the referral area, and periods of intense grazing and prolonged drought altering suitability of habitat. The possibility of two sub-populations occurring within the Site is based on the lack of records at survey locations in-between known occurrences, the distinct difference in abundance of individuals between habitat areas, and the potential barriers to movement (e.g. a road, non-preferred grassland habitat, planted trees). Additionally, while further research is required into the home range of individuals, an area between 25 m^2 (5 m x 5 m) and 100 m^2 (10 m x 10 m) has been reported as a

reasonable generalisation based on pitfall and tile recapture data (ACT Government, 2017b). Based on this estimate, and the distance between records of the species in the east and north of the Site, it is considered unlikely that mixing of individuals between these two sub-populations is currently occurring. The shortest distance through potential habitat between known records in the east and north of the Site is approximately 450 meters. The Site, while not likely to support a large population based on results of this and previous surveys, does contain habitat of predominantly tussock-forming grass species which would be both viable over the medium to long-term and has potential to support a growing population.

Surveys for the species were undertaken in spring/summer of 2018 when rainfall was below average and drought conditions were impacting on the condition of vegetation across the Site. More recently, rainfall above monthly average has been experienced and as a result condition of the Site has improved. Seasonal fluctuations in rainfall, plant growth and grazing impacts have resulted in changes in habitat condition including increased grass cover and fluctuations in exotic cover. In autumn 2020, habitat condition is noted to have improved since spring 2018 surveys with exotic grass cover lower and grass cover and height across the Site increasing. In turn, potential habitat for the species has also improved and there is potential for the species distribution to expand across the Site.

F4.3 SPECIFIC IMPACTS

Within the referral area, habitat quality has been assigned with consideration of the structure and density of grass tussocks, the number of records, past soil disturbance, and the presence of canopy cover. Approximately 26.76 ha of habitat for the species will be removed as a result of the Project, including:

- 4.72 ha of high quality
- 14.13 ha of moderate quality
- 7.68 ha of low quality potential habitat.

Additionally, there is potential for indirect impacts to the remaining areas of habitat for the species occurring adjacent to the referral area as a result of edge effects and weed invasion.

Mitigation measures will be implemented to reduce indirect impacts to the species, such as the construction of permanent fencing around areas of habitat, requirement for dogs to be on leads within the conservation areas, providing signage indicating Lawson's designation as a cat containment suburb,, sediment and erosion control plans, weed management, and funding for the management and monitoring program for retained grassland habitat.

During construction, reptile proof construction fencing would also be installed to prevent terrestrial fauna accessing the development impact area, and the pre-clearance survey and translocation of captured individuals from the development impact area. Additionally, a Biodiversity Management Plan is currently being developed for the Site which will outline management actions to maintain and improve biodiversity values within the Site.

F4.4 EPBC ACT SIGNIFICANCE ASSESSMENT

Striped Legless Lizard is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the MNES, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts, 2013).

IS THIS PART OF AN IMPORTANT POPULATION?

Under the EPBC Act, an important population is one that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Important populations need to meet one of the criteria listed above and be viable over the long-term.

In the ACT region, four disjunct populations are recognised: Gungahlin/Belconnen area, Yarramundi Reach, Majura Valley and Jerrabomberra Valley (Department of the Environment, 2016). The Site is isolated from other nearby occurrence of the species in the suburbs of Kaleen, Crace and Mitchell by urban residential development. Within the Site, there are potential barriers to movement (e.g. a road, low quality habitat, planted trees) between the records in the east and north of the Site. The lack of records in areas of potential habitat linking these two areas and variations in habitat quality and the small home range of individuals (between 25 m^2 and 100 m^2) suggest that no or limited migration or emigration occurs between these areas. It is therefore considered unlikely that either location is a key source for breeding or dispersal.

The Site, while not connected to other known occurrences, could provide importance for maintaining genetic diversity in the future if the mixing of individuals was facilitated through translocation.

The Site does not occur near the limit of the species range. The species occurs to the south of the ACT in NSW and Victoria, and extends further east (Queanbeyan and Cooma areas), west (Tumut) and north (up to Muswellbrook) into NSW (Office of Environment and Heritage, 2020).

A conservative approach has been taken for this assessment, and the impacted habitat has been considered to be supporting an important population. Due to the large area of habitat within the Site, and the potential for the species to be important for maintaining genetic diversity for future conservation.

AN ACTION IS LIKELY TO HAVE A SIGNIFICANT IMPACT ON A VULNERABLE SPECIES IF THERE IS A REAL CHANCE OR POSSIBILITY THAT IT WILL:

LEAD TO A LONG-TERM DECREASE IN THE SIZE OF AN IMPORTANT POPULATION OF A SPECIES

A total of 26.53 ha of potential habitat for the species will be impacted as a result of the Project.

Through design and planning the proposed action has avoided impacts to the majority of the core Themeda grassland area and includes retention of 6.71 ha of high quality habitat for conservation within the referral area as well as 77.02 ha of moderate quality habitat and 14.11 ha of poor quality habitat in the western section of the Site. These areas are larger than the minimum patch size threshold for medium to long-term habitat and population viability of ≥ 0.5 hectares of tussock-forming grass species (native or non-native) (Department of the Environment Water Heritage and the Arts, 2013) and as such the retained habitat is likely to continue to support a viable population.

To minimise likelihood of long-term decrease in size of the population, the following mitigation measures that will be employed as part of the Project:

- provision of reptile proof fencing during construction to prevent terrestrial fauna accessing the development impact area
- construction environment management plan which includes sediment and erosion control plans as well as weed control measures, and environmental inductions
- pre-clearance survey and translocation of captured individuals from the development impact area
- providing signage indicating Lawson's designation as a cat containment suburb
- funding for management and monitoring program for retained grassland.

Conservation management of retained areas will be undertaken following the Biodiversity Management Plan which includes ongoing habitat management with the aim to maintain and improve the biodiversity values within the Site.

Based on the retention of 6.06 ha of known habitat in good condition and a significant area of habitat with low density of individuals with potential expansion for the species, the Project is unlikely to lead to a long-term decrease in the size of a population.

REDUCE THE AREA OF OCCUPANCY OF AN IMPORTANT POPULATION

The Project will result in the removal of up to 26.53 ha of habitat for the species. Retained habitat within the Site, covering 97.84 ha is proposed for conservation.

The habitat being removed is on the edges of the existing development and infrastructure within the Site. While the area of occupancy is potentially being reduced, only one individual was recorded within the referral area, and the habitat remaining (over 6 ha, 77 ha and 14 ha) is considerably larger than the 0.5 ha which is the minimum patch size threshold for medium to long-term viable habitat.

A biodiversity management plan for the retained areas includes management and monitoring with the aim of maintaining and improving habitat condition and increasing populations within the Site.

FRAGMENT AN EXISTING IMPORTANT POPULATION INTO TWO OR MORE POPULATIONS

The species has been recorded in two general areas of the Site, the eastern *Themeda* grassland and in *Rytidosperma* grassland in the central north. The shortest distance through potential habitat between known records in the east and north of the Site is approximately 450 meters. The existing bitumen access road (approximately 3.5 meters in width) is likely to provide a hostile barrier to movement between these recorded locations in the north and east even if habitat in between is utilised. In addition to the road surface, tree plantings extend along the northern roadside, increasing the barrier to movement. However, grassland along the southern boundary would provide some connectivity of potential between the eastern and western portions of the population.

Given the lack of records in between these survey areas during the 2018 artificial shelter site and previous pitfall trapping surveys undertaken in 2008 (SMEC), the variation in habitat quality, the presence of existing infrastructure, and current knowledge on the limited movement of the species, it is considered likely that currently no or limited mixing of individuals from these two areas of the Site occurs.

The proposed development includes construction of a new access road into the Site from the south which would likely create a permanent barrier to potential connectivity. While the mixing of individuals across this area is currently considered to be limited/not occurring, the potential for this to occur in in future cannot be discounted, and as such, the Project is likely to result in the permanent fragmentation of the population within the Site by the creation of the new access road in the south.

ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF A SPECIES

To date, no critical habitat has been listed for this species on the Register of Critical habitat under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment Water Heritage and the Arts, 2009).

The area of habitat being impacted would not be considered critical to the survival of the species as 97.84 ha of viable habitat will remain which supports foraging and breeding activities. Further, it is not considered necessary for long-term maintenance of the species, or to maintain genetic diversity or for the reintroduction of populations or recovery of the species as several other populations of the species, occur within the ACT which all contribute to the maintaining genetic diversity, and in the future if could be used for reintroductions or recovery of the species if required. disrupt the breeding cycle of an important population

The removal of 26.53 ha of potential habitat for the species is unlikely to disrupt the breeding cycle of the population as two patches of viable habitat will remain. The minimum patch size threshold for medium to long-term habitat and

population viability is ≥ 0.5 hectares, which supports predominantly tussock-forming grass species (native or non-native) (Department of the Environment Water Heritage and the Arts, 2009). The two patches of habitat remaining both contain predominantly native tussock-forming grasses and area over 6 ha and over 77 ha.

MODIFY, DESTROY, REMOVE OR ISOLATE OR DECREASE THE AVAILABILITY OR QUALITY OF HABITAT TO THE EXTENT THAT THE SPECIES IS LIKELY TO DECLINE

Direct and indirect impacts are unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. The direct removal of potential habitat is 26.53 ha. Approximately 97.84 ha of known and potential habitat will be retained within the Site and this is significantly above the 0.5 ha threshold area of minimum viability. A number of other populations remain in the ACT, including several large populations which are in reserved areas (ACT Government, 2017b). Populations of over 100 individuals within the ACT are likely to occur in Crace, Gungaderra, and Mullanggari grassland reserves, Kenny, Majura Training Area, Majura West, and grassland east of the Monaro Highway in the Jerrabomberra Valley (ACT Government, 2017b). It is considered unlikely that the removal of 26.53 ha of potential habitat will result in the decline of the species. Mitigation measure (section 6) will be implemented so that significant indirect impacts to habitat adjacent to the referral area are avoided.

RESULT IN INVASIVE SPECIES THAT ARE HARMFUL TO A VULNERABLE SPECIES BECOMING ESTABLISHED IN THE VULNERABLE SPECIES' HABITAT

It is not likely that invasive species (such as introduced predators) that are harmful to the Striped Legless Lizard would become further established as a result of the action, is a residential development. Mitigation measures including providing signage indicating Lawson's designation as a cat containment suburb and management of the retained habitat in accordance with the Biodiversity Management Plan being prepared for the Site will incorporate measures for pest control and retained grassland areas being dog on leash area.

INTRODUCE DISEASE THAT MAY CAUSE THE SPECIES TO DECLINE, OR THERE ARE CURRENTLY NO KNOWN DISEASES AFFECTING THE SPECIES. INTERFERE SUBSTANTIALLY WITH THE RECOVERY OF THE SPECIES.

The loss and degradation of native grassland, is primarily responsible for the decline of the Striped Legless Lizard (Smith and Robertson, 1999). The National Recovery Plan for the species lists 10 specific conservation objectives aimed at focusing resources on achieving the primary objective of ensuring the long-term survival of the species throughout its distribution. The primary recovery criterion for this main objective is viable populations or clusters of populations of the species are represented and maintained in reserves or appropriately managed Sites across the known distribution of the species. The 10 specific conservation objectives are as follows:

- establish and maintain national forums for the discussion and organisation of *D. impar* across its natural distribution
- determine the distribution of potential *D. impar* habitat
- determine the current distribution and abundance of *D. impar* in Victoria, New South Wales, the Australian Capital Territory and South Australia
- establish a series of reserves and other managed areas such that viable populations are maintained across the known distribution of the species
- determine the habitat use and ecological requirements of *D. impar*
- identify the nature and extent of the threatening processes affecting *D. impar*
- undertake a program of monitoring to provide a basis for adaptive management of *D. impar*
- increase community awareness and involve the community in aspects of the recovery program
- assess the need for salvage and translocation, determine their feasibilities, develop protocols and undertake a trial translocation if appropriate
- ensure that captive population(s) are used to support education and research elements of the Recovery Plan.

The Proposed action includes the retention of viable populations of the species within a proposed conservation area with a biodiversity management plan with detailed management actions and monitoring plan to maintain and improve the condition of grassland. The Proposed action is unlikely to interfere with any of the recovery actions outlined.

F4.5 CONCLUSION

The extent of habitat removal for Striped Legless Lizard associated with the proposed action is small in terms of the available habitat for the Striped Legless Lizard in the broader Site being retained. The Proposed action includes the retention of viable populations of the species within a proposed conservation area with a biodiversity management plan with detailed management actions and monitoring plan which aims to maintain and improve the condition of the grassland. This includes the area of high condition habitat known to support the highest density of the species within the Site. The Project does have the potential to permanently fragment the eastern and western portions of habitat being retained for the species, and this may result in a significant impact to the population within the Site.

F5 SUPERB PARROT

F5.1 DESCRIPTION

F5.1.1 STATUS

The Superb Parrot (*Polytelis swainsonii*) is listed as Vulnerable under both the EPBC Act and the NC Act.

F5.1.2 ECOLOGY AND HABITAT

The Superb Parrot occurs in south-eastern Australia on the inland slopes of the Great Divide and its adjacent plains. It mainly utilises eucalypt forests and woodland especially areas along river systems which consist of *Eucalyptus camaldulensis* (River Red Gum), *E. melliodora* (Yellow Box) and *E. macrocarpa* (Grey Box) (Department of the Environment and Energy, 2019b).

The species is a summer breeding migrant to the ACT and is gradually extending its range into the ACT from western woodlands (Canberra Ornithologists Group, 2017). Within the region individuals inhabit Yellow Box-Red Gum Grassy Woodlands, with Blakey's Red Gum (*E. blakelyi*) being an important source for nesting hollows (ACT Government, 2005). The species has been recorded across the ACT, however breeding records appear to be concentrated in the north of the territory, around the Belconnen and Gungahlin regions (Canberra Ornithologists Group, 2017).

The Superb Parrot feeds on a variety of foods found within eucalypt woodlands but primarily feeds on grasses and herbs such as *Rytidosperma caespitose* (Ringed Wallaby-grass) and agricultural cereal crops, such as, wheat, oats and canola (Department of the Environment and Energy, 2019b). When foraging in the canopy, the species will target blossoming and fruiting eucalypts, fruiting mistletoe and lerps (Department of the Environment and Energy, 2019b). Superb Parrots are obligate hollow users. It nests in hollows in branches and tree trunks with breeding occurring between September and December. In much of its range, the species breeds in agricultural landscapes with scattered hollow-bearing trees (Manning et al., 2012). A study undertaken during the 2015/2016 breeding season in the ACT found the species selected for *Eucalyptus rossii* (Scribbly Gum) and *E. blakelyi* (Blakely's Red Gum) nest trees with a minimum diameter (at breast height) of 75 cm, and more commonly above 100 cm (Rayner et al., 2016). Active nest hollows that successfully fledged young, had an entrance diameter ranging from 8 to 18 cm, a mean chamber depth of 74 cm, and were located 4 to 9 m above ground (Rayner et al., 2016).

F5.1.3 THREATS

Key threats to this species have been identified as (Department of the Environment and Energy, 2019b; Baker-Gabb, 2011;Office of Environment and Heritage, 2017b):

- habitat loss and degradation
- grazing
- hydrological changes including irrigation and regulated flows placing remnant stands of trees under stress, often resulting in tree death
- beak and feather disease
- poor regeneration of nesting trees and food resources
- competition for hollows with feral bees, arboreal mammals, and other hollow-nesting birds
- disturbance from human activity leading to birds becoming agitated and avoiding entering nest hollows
- firewood collection
- timber production
- direct impact with motor vehicles

- poisoning
- illegal removal of wild birds to the aviculture trade
- lack of knowledge regarding the species population trends, breed ecology, flight paths and movement corridors.

F5.2 PRESENCE WITHIN THE PROPOSAL AREA AND MITIGATION MEASURES

No Superb Parrots were recorded during surveys, however the species is known to occur within the locality with several records near the referral area. Remnant native habitat for the species exists within the proposal area in the form of Box Gum Woodland and native grassland. The species utilises tree hollows for nesting, of which eight hollow-bearing eucalypts with hollows considered to be of suitable dimension for the species are present within the devleopment impact areas (Rayner et al., 2016). Of these, four occur within Box Gum Woodland and Derived Native Grassland vegetation. The species may also forage in urban greenspace areas and as such its potential to occur in planted vegetation across the Site cannot be discounted however would not be considered preferred habitat.

F5.3 POTENTIAL IMPACTS AND MITIGATION MEASURES

A total 1.31 ha of preferred potential foraging habitat associated with remnant Box Gum Woodland and Derived Native Grassland including three hollow-bearing eucalypts considered to be suitable for breeding will be removed as a result of the proposed action. While suitable hollows for breeding will be impacted, common bird species (Galah and Rosellas) have been recorded utilising hollows within the referral area in 2018/2019 and would compete with the species for nest sites. Approximately 7.65 ha of potential preferred habitat for this species would be retained within the Site in the form of Box Gum Woodland and Derived Native Grassland.

F5.4 EPBC ACT SIGNIFICANCE ASSESSMENT

Superb Parrot is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the MNES, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts, 2013).

IS THIS PART OF AN IMPORTANT POPULATION?

Under the Act, an important populations is one that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

The breeding range of the Superb Parrot is confined to three main areas. These areas are along the Murrumbidgee River, along the Murray and Edward Rivers, and an area bounded by Molong, Yass, and Young (Department of the Environment and Energy, 2019b). The proposed action area does not occur within one of these three main areas known to be important for breeding. However, only a single population of the species exists and therefore any individuals occurring within the locality would be considered part of this single and important population (Department of the Environment and Energy, 2019b). Additionally, the Site occurs toward the eastern edge of the current limit of the species range. Habitat within the referral area is considered to have the potential to be used by the Superb Parrot population.

AN ACTION IS LIKELY TO HAVE A SIGNIFICANT IMPACT ON A VULNERABLE SPECIES IF THERE IS A REAL CHANCE OR POSSIBILITY THAT IT WILL:

LEAD TO A LONG-TERM DECREASE IN THE SIZE OF AN IMPORTANT POPULATION OF A SPECIES

The removal of 1.31 ha of potential habitat for the species, and the removal of three trees suitable for nesting is unlikely to lead to a long-term decrease in the species. The extent of occurrence of the species is thought to be approximately 81 000 km^2 (Garnett and Crowley 2000 in Department of the Environment and Energy, 2019b) where it occupies open woodlands. The Superb Parrot is highly mobile and its movement ecology is poorly understood. It is primarily recorded breeding in the South Western Slopes and Riverina bioregions and is observed further north and west in the central and north western slopes and plains during the non-breeding autumn and winter months (ACT Government, 2019). The species is mainly observed in the ACT region during the breeding season (September to January) where the majority of sightings in the ACT regions have been in the northern districts of Belconnen and Gungahlin (ACT Government, 2019). The removal of 1.31 ha of potential habitat alone in which the species has not been recorded foraging or breeding is unlikely to lead to a decrease in the size of the species population. Nevertheless, removal of habitat a key threat to the species, and cumulative impacts of small losses of woodland habitat could impact on the size of the species population.

REDUCE THE AREA OF OCCUPANCY OF AN IMPORTANT POPULATION

The removal of 1.31 ha of potential habitat for the species associated with the proposed is unlikely to lead to a reduction in the area of occupancy of the species. A low reliability estimate for the species area of occupancy is 1000 km^2 (Garnett and Crowley 2000 in Department of the Environment and Energy, 2019b) in which the ACT occurs at the eastern edge of its current range. The removal of 7.65 ha of potential habitat in which the species has not previously been recorded, despite survey, for the proposed development is not considered likely to reduce the current area of occupancy for the species.

FRAGMENT AN EXISTING IMPORTANT POPULATION INTO TWO OR MORE POPULATIONS

The species occurs only in south-eastern Australia and is considered to be a single population (Department of the Environment and Energy, 2019b). The removal of 1.31 ha of potential habitat will not fragment this highly mobile species into two of more populations.

ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF A SPECIES

To date, no critical habitat has been listed for this species on the Register of Critical habitat under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment Water Heritage and the Arts, 2009).

The area of habitat being impacted would not be considered critical to the survival of the species as it is not known foraging or breeding habitat. Other larger patches of woodland are known to support breeding and foraging activities for the species including Mulligans Flat and Goorooyarroo Nature Reserves. If the referral area was used by the species it would likely only provide supplementary foraging habitat for this highly mobile species which typically forages within 9 km of nesting habitat (ACT Government, 2019).

DISRUPT THE BREEDING CYCLE OF AN IMPORTANT POPULATION

The species has not been recorded within the Site. No suitable nesting trees within Box Gum Woodland would be removed. Three potential nest trees within landscaped vegetation of former naval village would be cleared. Competitive

species such as Galah, Crismon Rosella and Starlings were recorded utilising hollows within the site. Given the lack of records and limited habitat within the Site, availability of known breeding resources within the locality, and the location being outside of key breeding areas, it is unlikely that the breeding cycle of the Superb Parrot would be impacted as a result of the proposed action.

MODIFY, DESTROY, REMOVE OR ISOLATE OR DECREASE THE AVAILABILITY OR QUALITY OF HABITAT TO THE EXTENT THAT THE SPECIES IS LIKELY TO DECLINE

The removal of 1.31 ha of potential habitat for the species, including the removal of seven potential nesting trees is unlikely to lead to a long-term decrease in the species. The extent of occurrence of the species is thought to be approximately 81 000 km^2 (Garnett and Crowley 2000 in Department of the Environment and Energy, 2019b) where it occupies open woodlands. The Superb Parrot is highly mobile and its movement ecology is poorly understood. It is primarily recorded breeding in the South Western Slopes and Riverina bioregions and is observed further north and west in the central and north western slopes and plains during the non-breeding autumn and winter months (ACT Government, 2019). The species is mainly observed in the ACT region during the breeding season (September to January) where the majority of sightings in the ACT regions have been in the northern districts of Belconnen and Gungahlin (ACT Government, 2019). The removal of 1.31 ha of potential habitat alone in which the species has not been recorded foraging or breeding is unlikely to lead to a decline in the species. Nevertheless, removal of habitat a key threat to the species, and cumulative impacts of small losses of woodland habitat could contribute to a decline in the species.

RESULT IN INVASIVE SPECIES THAT ARE HARMFUL TO A VULNERABLE SPECIES BECOMING ESTABLISHED IN THE VULNERABLE SPECIES' HABITAT

As the proposed action is a residential development, domestic dogs and cats which pose a threat to the Superb Parrot will increase in the referral area. However, dogs and cats will be enclosed within yards as Lawson is a designation as a cat containment suburb. Additionally, dogs are required to be on-leash in all public areas of the ACT with the exception of designated off-leash areas. Management of the retained habitat in accordance with the Biodiversity Management Plan being prepared for the Site will incorporate measures for pest control.

INTRODUCE DISEASE THAT MAY CAUSE THE SPECIES TO DECLINE, OR

Psittacine circoviral disease (PCD) is a virus which affects parrots and related species and is listed as a Key Threatening Process under the EPBC Act. The virus causing the disease has been identified in many wild populations and is believe to occur naturally (Department of the Environment and Heritage, 2004). This disease is not considered likely to increase in the area as a result of the proposed action.

INTERFERE SUBSTANTIALLY WITH THE RECOVERY OF THE SPECIES.

Threat abatement strategies outlined in the National Recovery Plan for the species include actions such as the development and implementation of a Superb Parrot 'Habitat Retention and Enhancement' policy to protect Box-Gum Woodland from clearing, and actions to protect breeding seasonal foraging habitat within 20 km of colonies (Baker-Gabb, 2011). While no Superb Parrot 'Habitat Retention and Enhancement' policy is currently enforced, the referral area would be within 20 km of known breeding habitat in the north of the ACT. Additionally, the loss of hollow-bearing trees has been identified as a particular challenge to the species conservation in the ACT Action Plan (ACT Government, 2019). While potential habitat including the loss of hollow-bearing trees will occur as a result of the proposed action, given the scale of these impacts, the proposed action along is not considered likely to interfere substantially with the recovery of the species.

F5.5 CONCLUSION

The extent of native vegetation clearing and habitat removal associated with the proposed action is small in terms of the available habitat for the Superb Parrot in the surrounding landscape. Although the loss of habitat for the species is considered to be a small loss of suitable habitat locally, the proposed action is not likely to have a significant impact upon the species.

F6 GREY-HEADED FLYING-FOX

F6.1 DESCRIPTION

F6.1.1 STATUS

The Grey-headed Flying Fox (*Pteropus poliocephalus*) is listed as Vulnerable under the EPBC Act and the NC Act.

F6.1.2 ECOLOGY AND HABITAT

The Grey-headed Flying Fox occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly. At a regional scale, broad trends in the distribution of plants with similar flowering and fruiting times support regular annual cycles of migration. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, elsewhere, during spring, Grey-headed Flying-foxes are uncommon south of Nowra and widespread in other areas of their range. The species is widespread throughout their range in summer, whilst in autumn it occupies coastal lowlands and is uncommon inland. In winter, the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW (associated with flowering Spotted Gum *Corymbia maculata*) and on the northwest slopes (generally associated with flowering White Box *Eucalyptus albens* or Mugga Ironbark *E. sideroxylon*). Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. The species commutes daily to foraging areas which are usually within 15 km of the day roost Site (Department of the Environment and Energy, 2019d), but up to 50 km (Office of Environment and Heritage, 2017c). The species feeds on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees, vines, and exotic species (Office of Environment and Heritage, 2017c, Department of the Environment and Energy, 2019d).

F6.1.3 THREATS

Some of the key threats to the species have been identified as (Department of the Environment and Energy, 2019c) (Office of Environment and Heritage, 2017a):

- biological factors including a strict breeding season and single birth per year. The species evolved in conditions where natural levels of mortality were low, and the species had long survival times in the wild, however since European settlement mortality rates have increased
- habitat loss and fragmentation
- exploitation – illegal shooting of the species to protect fruit crops
- indirect Competition and hybridisation with the black flying-fox
- heat stress
- pollutants, electrocution and pathogens
- incomplete knowledge regarding abundance and distribution across species' range.

F6.2 PRESENCE WITHIN THE PROPOSAL AREA

No roost camps were identified within the project development area and no individuals were recorded (diurnal surveys only). In 2008, surveys recorded the species within the former naval village (Precinct A of the DCP) and was presumed to be foraging on planted fruit trees (SMEC, 2008) and on another occasion the species was also observed flying over the Site.

F6.3 POTENTIAL IMPACTS

The proposed action would result in the removal of 20.37 ha of foraging habitat for the species which includes up to 19.06 ha of planted woodland (native and exotic) and 1.31 ha of Box Gum Woodland. Approximately 19.65 ha of potential foraging habitat would be retained within the Site.

F6.4 EPBC ACT SIGNIFICANCE ASSESSMENT

Grey-headed Flying-fox (*Pteropus* poliocephalus) is listed as Vulnerable under the EPBC Act and the NC Act. The following assessment has been undertaken following the MNES, Significant Impact Guidelines 1.1 (Department of the Environment, 2013a).

IS THIS PART OF AN IMPORTANT POPULATION?

Grey-headed Flying-foxes occur across a range of wooded habitats where their favoured food, eucalypt blossom occurs. They set up roosting camps in association with blossom availability, which are usually situated in dense vegetation and associated with water.

The referral area does not contain a roost camp, however individuals visiting the Site may fly from the nearby roost camp in Commonwealth Park, which is approximately 7.5 km away. The roost camp in Commonwealth Park does not currently meet the criteria for a nationally important camp as outlined in the 'Referral guidelines for management actions in grey-headed and spectacled flying-fox camps', however it is likely in the suture and could become one at any time (Ecosure, 2020). A precautionary approach has been taken, and this assessment considers any individual visiting the Site as part of an important population.

AN ACTION IS LIKELY TO HAVE A SIGNIFICANT IMPACT ON A VULNERABLE SPECIES IF THERE IS A REAL CHANCE OR POSSIBILITY THAT IT WILL:

LEAD TO A LONG-TERM DECREASE IN THE SIZE OF AN IMPORTANT POPULATION OF A SPECIES

The loss of 20.37 ha of foraging habitat as a result of the proposed action is highly unlikely to result in a long-term decrease in the size of an important population. The camp at Commonwealth park is occupied seasonally (Ecosure, 2020) and when occupied the species will forage within the locality. Foraging distance range up to 20 km and are usually around 15 km from roost Sites. Given the availability of foraging resources within the landscape, the referral area would only provide supplementary foraging habitat for the species during times when available resources are flowering or fruiting. As such, the removal of 20 ha of supplementary foraging habitat is unlikely to lead to a long-term decrease in the size of the population occurring at Commonwealth Park.

REDUCE THE AREA OF OCCUPANCY OF AN IMPORTANT POPULATION

Given the species forages widely on a range of native and introduced vegetation, the loss of 20.37 ha of foraging habitat is unlikely to reduce the area of occupancy of the local population.

FRAGMENT AN EXISTING IMPORTANT POPULATION INTO TWO OR MORE POPULATIONS

The species is highly mobile with the population roosting at Commonwealth Park likely foraging across the majority of the ACT region. As such the proposed action would not result in the fragmentation of the local population.

ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF A SPECIES

To date, no critical habitat has been listed for this species on the Register of Critical habitat under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community.

The proposed action would remove approximately 20.37 ha of foraging habitat for the species. This consists of 19.06 ha of planted woodland (native and exotic) and 1.31 ha of Box Gum Woodland. No roosts have been recorded within the site and the loss of this relatively small area of habitat is highly unlikely to be necessary to support the species during its breeding season. As such, the habitat present for the species within the referral area is not considered critical to the species survival.

DISRUPT THE BREEDING CYCLE OF AN IMPORTANT POPULATION

The referral area is approximately 7.5 km away from the nearest roost Site, and as such does not provide breeding habitat for the species. Additionally, the amount of habitat is highly unlikely to be necessary to support the species during its breeding season. As such the proposed action would be unlikely to disrupt the breeding cycle of an important population.

MODIFY, DESTROY, REMOVE OR ISOLATE OR DECREASE THE AVAILABILITY OR QUALITY OF HABITAT TO THE EXTENT THAT THE SPECIES IS LIKELY TO DECLINE

Given the availability of foraging resources within the landscape and the size of the area being impacted, the referral area would only provide supplementary foraging habitat for the species during times when available resources are flowering or fruiting. As such, the removal of less than 20 ha of supplementary foraging habitat is highly unlikely to result in a decline in the species.

RESULT IN INVASIVE SPECIES THAT ARE HARMFUL TO A VULNERABLE SPECIES BECOMING ESTABLISHED IN THE VULNERABLE SPECIES' HABITAT

As the proposed action is a residential development, domestic dogs which pose a threat to the Grey-headed Flying-fox will increase in the referral area. However, dogs will be enclosed within yards or in public areas dogs are required to be on-leash in the ACT with the exception of designated off-leash areas.

INTRODUCE DISEASE THAT MAY CAUSE THE SPECIES TO DECLINE, OR

There are no known diseases that are likely to increase in the area as a result of the proposed action which may impact on Grey-headed Flying-fox.

INTERFERE SUBSTANTIALLY WITH THE RECOVERY OF THE SPECIES

Habitat loss, including foraging habitat, is considered to be a key threat to the Grey-headed Flying-fox in the Draft Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (Department of the Environment and Energy, 2017). However, given the availability of foraging habitat within the locality, and the highly mobile nature of the species, the removal of 20 ha of foraging habitat is unlikely to interfere substantially with the recovery of the species.

F6.5 CONCLUSION

The extent of native vegetation clearing and habitat removal associated with the proposed action is small in terms of the available habitat for the Grey-headed Flying-fox in the surrounding landscape. Although the loss of foraging habitat for the species is considered to be a small loss of suitable habitat locally, the proposed action is not likely to have a significant impact upon the species.

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APPENDIX G

PROTECTED MATTERS SEARCH

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 09-Dec-2021

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	49
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	6
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	6
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Lowland Grassy Woodland in the South East Corner Bioregion	Critically Endangered	Community likely to occur within area	In buffer area only
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community likely to occur within area	In feature area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community may occur within area	In buffer area only
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area	In feature area
FROG			
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area	In feature area
Litoria castanea Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Mixophyes balbus](#)			
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area	In buffer area only
INSECT			
[Synemon plana](#)			
Golden Sun Moth [25234]	Vulnerable	Species or species habitat may occur within area	In feature area
MAMMAL			
[Chalinolobus dwyeri](#)			
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Dasyurus maculatus maculatus (SE mainland population)](#)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
[Isoodon obesulus obesulus](#)			
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat may occur within area	In buffer area only
[Petauroides volans](#)			
Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Petrogale penicillata](#)			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)](#)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Potorous tridactylus tridactylus](#)			
Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat may occur within area	In feature area
[Pteropus poliocephalus](#)			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
PLANT			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Baloskion longipes Dense Cord-rush [68511]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Calotis glandulosa Mauve Burr-daisy [7842]	Vulnerable	Species or species habitat known to occur within area	In feature area
Commersonia prostrata Dwarf Kerrawang [87152]	Endangered	Species or species habitat may occur within area	In buffer area only
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diuris ochroma Pale Golden Moths [64565]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Dodonaea procumbens Trailing Hop-bush [12149]	Vulnerable	Species or species habitat may occur within area	In feature area
Eriocaulon australasicum Austral Pipewort, Southern Pipewort [7649]	Endangered	Species or species habitat known to occur within area	In feature area
Eucalyptus aggregata Black Gum [20890]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eucalyptus kartzoffiana Araluen Gum [19330]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Leptospermum thompsonii Monga Tea-tree [21806]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat known to occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pomaderris cotoneaster Cotoneaster Pomaderris [2043]	Endangered	Species or species habitat likely to occur within area	In feature area
Pomaderris pallida Pale Pomaderris [13684]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pomaderris parrisiae Parris' Pomaderris [22119]	Vulnerable	Species or species habitat may occur within area	In feature area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area	In feature area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area	In feature area
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Zieria adenophora Araluen Zieria [24538]	Endangered	Species or species habitat likely to occur within area	In buffer area only
REPTILE			
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area	In feature area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

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

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Telstra Corporation & Bruce Anthony Keeley & Phyllis Rae Keeley [16435]	NSW	In buffer area only
Commonwealth Land - Telstra Corporation Limited [16436]	NSW	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Araluen	Nature Reserve	NSW	In buffer area only
Berlang	State Conservation Area	NSW	In buffer area only
Deua	National Park	NSW	In buffer area only
Frogs Hole	Nature Reserve	NSW	In buffer area only
Majors Creek	State Conservation Area	NSW	In buffer area only
Monga	National Park	NSW	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
Southern RFA	New South Wales	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Dargues Gold Mine Third Modification, Majors Creek, NSW	2015/7539	Controlled Action	Post-Approval	In feature area
Dargues Reef Gold Mine Project	2010/5770	Controlled Action	Post-Approval	In feature area
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

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