MBARK

Ecological Assessment Report

FEDERAL GOLF CLUB ILU PROJECT

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CONTENTS

1 INTRODUCTION 1
1.1 PURPOSE AND SCOPE OF THIS DOCUMENT 1
1.2 PROJECT DESCRIPTION 1
1.3 PROJECT NEED AND JUSTIFICATION 1
1.4 SITE CONTEXT 2
2 RELEVANT ENVIRONMENTAL LEGISLATION 4
2.1 COMMONWEALTH LEGISLATION 4
2.1.1 Environment Protection and Biodiversity Conservation Act 1999 4
2.1.2 Australian Capital Territory (Planning and Land Management) Act 1988 4
2.2 ACT LEGISLATION 5
2.2.1 Planning and Development Act 2007 5
2.2.2 Nature Conservation Act 2014 5
3 SITE ASSESSMENT METHODS 8
3.1 BACKGROUND REVIEW AND DESKTOP ASSESSMENT 8
3.2 SITE SURVEYS 8
3.2.1 Initial site assessment 8
3.2.2 Follow-up seasonal surveys 9
3.2.3 Survey Limitations 14
4 RESULTS 16
4.1 FLORA AND VEGETATION COMMUNITIES 16
4.1.1 Village development, ponds and hole realignments within central area of the FGC 16
4.1.2 Eastern and northern portions of the site supporting the practice fairway and maintenance facility 17
4.1.3 Areas within the RHNR for the Brereton Street emergency access and utility service connections ... 19
4.1.4 Gowrie Drive road upgrades 19
4.2 FAUNA 20
4.2.1 Birds 20
4.2.2 Mammals 21
4.2.3 Amphibians 22
4.2.4 Reptiles 22
5 ASSESSMENT OF IMPACTS 23
5.1 IMPACT ASSESSMENT APPROACH AND ASSUMPTIONS 23
5.2 IMPACTS ON VEGETATION COMMUNITIES 24

5.2.1 Village development, ponds and hole realignments within central area of the FGC 24
5.2.2 Eastern and northern portions of the site supporting the practice fairway and maintenance facility 25
5.2.3 Areas within the RHNR for the Brereton Street emergency access and utility service connections ... 25
5.2.4 Gowrie Drive road upgrades 26
5.2.5 Summary of cumulative impacts to vegetation communities 26
5.3 IMPACTS ON FLORA 31
5.4 IMPACTS ON FAUNA AND FAUNA HABITATS 31
5.4.1 Impacts on native terrestrial fauna 31
5.4.2 Impacts to native aquatic fauna 34
5.5 DETERMINATION OF THE SIGNIFICANCE OF IMPACTS 36
5.5.1 Assessment of Impact on listed Threatened Ecological Communities 36
5.5.2 Assessment of impact on listed threatened fauna species 38
5.6 CUMULATIVE IMPACTS 43
6 CONCLUSIONS AND RECOMMENDATIONS 44
6.1 CONCLUSIONS 44
6.2 RECOMMENDATIONS 45
7 REFERENCES 46
1. EPBC PROTECTED MATTERS SEARCH RESULTS 1-I
2. THREATENED SPECIES EVALUATIONS 2-I
3. FLORA AND FAUNA SPECIES LIST 3-I
4. TREE TABLES 4-I
5. CONSTRUCTION (FLORA AND FAUNA) MANAGEMENT PLAN 5-I

TABLES

Table 1 Survey effort completed within the subject site 13
Table 2 Weather conditions recorded during the fauna field surveys. 13
Table 3 Summary of impacts to vegetation communities 28
Table 4 Hollow-bearing tree removal 32
Table 5 Assessment of significance of impact on the Box Gum Woodland TEC 36
Table 6 Assessment of significance of impact on the Superb Parrot 39

FIGURES

Figure 1 Proposed Works at the Federal Golf Club 1

Figure 2 Site Locality 3

Figure 3 Overview of Survey Effort and Survey Sites 15

Figure 4 Extent of Box Gum Woodland TEC impacted by proposed works 29

Figure 5 Extent of *native vegetation* (under ACT NC Act) impacted by proposed works 30

Figure 6 Location of hollow-bearing trees in the study area impacted by the proposed works 35

EXECUTIVE SUMMARY

NGH Environmental were commissioned by Mbark Pty Ltd to undertake an assessment of the ecological values and potential impacts on those values associated with the proposed development of a retirement village and associated works at the Federal Golf Club (FGC), at Red Hill, ACT. This report provides a summary of the detailed site investigations (including both general and targeted field surveys and desktop assessment approaches) at the FGC and surrounding lands at Red Hill, ACT.

The site investigations identified the following important biodiversity values at the site:

- The presence of numerous large hollow-bearing trees which support important breeding and shelter habitat for numerous arboreal fauna types.
- The presence of the Vulnerable Superb Parrot at the site.
- The presence of the Box Gum Woodland Threatened Ecological Community (TEC) at the site margins, bordering the Red Hill Nature Reserve (RHNR).

The assessment of the potential impacts of the proposed development on these values concluded that the project is unlikely to result in a significant adverse impact. Specifically, the proposal will result in the removal of up to 19 identified hollow-bearing trees, out of a total of 78 hollow-bearing trees recorded within the study area associated with the development assessment (with more hollow-bearing trees likely to be present in the southern parts of the site, outside of the study area, as well as in the adjacent lands surrounding the site to the north and east). The removal of these trees has the potential impact on hollow-dependant fauna at the site, including the Vulnerable listed Superb Parrot (*Polytelis swainsonii*).

In order to mitigate the impacts of the removal of the hollow-bearing trees, the project proposes to undertake the clearing in the cooler months (April – September), outside of the key breeding periods for most hollow-dependant fauna types, as well as to undertake a strategy of salvage and relocation of the removed hollows (i.e. reinstatement of trees or hollows in an upright position or attached to existing arboreal structures) so that the overall number of available arboreal hollows within the FGC is not reduced.

The recorded Box Gum Woodland TEC is also considered unlikely to be significantly impacted by the development. This TEC was found to occur across the northern and eastern parts of the site, and extends into the adjacent RHNR. The project will require the "removal" of 0.37 ha of this TEC, associated with the necessary establishment of the passing bays along Gowrie Drive and the required emergency access road from the end of Brereton Street to Gowrie Drive, as well as the installation of a new electricity and water mains connections from existing infrastructure located in Brereton Street. The alignments of these minor road works have been designed to avoid the removal of mature locally indigenous trees, and to a large extent will occur in already partly disturbed areas such as along cleared parts of the Gowrie Drive road verge (for the passing bays), and along the general alignment of an existing concrete path (for the emergency access road from Brereton Street). Given the minor extent of removal (approximately 0.37 ha out of more than 250 ha of Box Gum Woodland in the adjacent RHNR, and across the far northern edge of the FGC), and it's location along the outer edge of the TEC which would not result in any notable fragmentation of the community, the impact of the project on the TEC is not regarded as significant.

The above considerations have been supported by an Assessment of Significance for the listed threatened matters (Superb Parrot and Box Gum Woodland TEC), in accordance with the EPBC Significant Impact Guidelines. In applying these criteria, the assessment concluded the project is unlikely to result in a significant impact to these entities. In addition, an evaluation of the likelihood of occurrence and potential impact of the project on other listed entities included in the background database searches was also conducted, and concluded that the project is unlikely to impact on any of these other threatened matters.

Construction management measures are also detailed in this report which are considered appropriate to ensure that the proposed development is unlikely to result in a significant adverse environmental impact.

ACRONYMS AND ABBREVIATIONS

ACT	Australian Capital Territory
BOM	Australian Bureau of Meteorology
Cwth	Commonwealth
DoEE	Commonwealth Department of Environment and Energy
C/EEC	(Critically) Endangered ecological community – as defined under relevant law applying to the proposal
CFFMP	Construction Flora and Fauna Management Plan
DA	Development Application
EIA	Environmental Impact Statement
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Cwth)
ESD	Ecologically Sustainable Development
ESO	Environmental Significance Opinion
EVNT	Endangered, vulnerable, near threatened (flora and fauna species)
FFMP	Flora and Fauna Management Plan
FGC	Federal Golf Club
ha	hectares
km	kilometres
m	metres
MNES	Matters of National Environmental Significance under the EPBC Act (*c.f.*)
NCA	National Capital Authority
NC Act	ACT *Nature Conservation Act 2014*
NSW	New South Wales
P&D Act	ACT *Planning and Development Act 2007*
PCS	ACT Parks and Conservation Service
RHNR	Red Hill Nature Reserve
SPRAT	Species Profile and Threats Database
sp/spp	Species/multiple species
TEC	Threatened Ecological Community

1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This Ecological Assessment Report (EAR) has been prepared on behalf of Mbark Pty Ltd to support a Development Application for the proposed development of a retirement and over 55's community village at the Federal Golf Club (FGC). Red Hill, ACT. The report describes the existing biodiversity values of the golf course site (as determined by a combination of detailed desktop and site survey assessment techniques) and provides an assessment of the anticipated ecological impacts associated with the proposed development.

Specifically, the aims of this report are to:

- Describe the biodiversity values of the site and surrounding area including identifying protected and threatened flora and fauna species, populations and ecological communities and their habitats;
- Identify the direct and indirect impacts of the proposal on flora and fauna species, populations, ecological communities and important habitat features;
- Assess the significance of the impact of the proposal on species, ecological communities and populations listed under ACT or Commonwealth legislation, applying the appropriate significant impact assessment criteria; and
- Propose environmental management measures to avoid, minimise, mitigate and, if necessary, offset impacts.

The scope of this report includes all aspects of the proposed works associated with the development, including the main village development as well as all ancillary works including:

- road improvements,
- future anticipated improvements/amendments to the FGC to accommodate the village development, such as the provision of new waterbodies and other water management infrastructure and fairway realignments, and
- service (electricity, sewer, water) connections.

This report addresses the impacts to be assessed as part of the project approval requirements under both ACT and Commonwealth planning legislation, as detailed in Section 2. It includes the application for Works Approval from the National Capital Authority (NCA) for works occurring in Designated Areas of the National Capital (outside of the Federal Golf Club lease boundary), as well as supporting the submission of a referral to the Commonwealth Department of the Environment and Energy (DoEE) under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report also provides information necessary to support an application to the ACT Conservator for Flora and Fauna for an Environmental Significance Opinion (ESO), in accordance with the legislative requirements for submitting a Development Application, as set out in Section 2.

1.2 PROJECT DESCRIPTION

The proposed development at the FGC incorporates a seniors living village that will:

1. Integrate into and complement the existing golfing activities and operations
2. Provide the capital needed to complete necessary upgrades to the water security and storage of FGC
3. Diversify the income sources of FGC

4. Introduce additional members to FGC
5. Achieve excellent environmental outcomes for the community
6. Underpin the tenure of FGC to ensure its longevity is secured for the community

Specifically, the proposal includes seniors housing of up to 125 residences that are purpose designed and built. A mixture of freestanding homes, apartments (maximum 3 stories) and town homes will be incorporated, as well as a mix of 1, 2 and 3 bedroom options. It is expected that the completed community would comprise around 200 residents and 350 bedrooms. The proposal also includes a new clubhouse building to replace the existing aging and capital intensive facilities and provide a social hub for FGC members, seniors living residents and the broader community.

Additional components and ancillary works to the project will also include the following:

- Construction of a new maintenance area in the north-east corner of the FGC lease, with new access from Gowrie Drive.
- Construction of a new practice fairway and practice greens in the eastern portion of the site where the old disused fairway occurs, bordering Gowrie Drive.
- Construction of new stray ball safety fencing between the practice fairway and Gowrie Dr. Further details of this fencing is provided below in the assessment of impacts associated with this development component.
- Construction of fairway, greens and tee realignments.
- Construction of 4 x new water detention devices (dams) will be required to replace the existing large dam next to the maintenance area which will be removed to support the village development, as well as to provide ongoing water security for the future sustainable operation of the golf course.
- Emergency vehicle access would be augmented via a proposed gated link from Brereton Street into FGC. This will include a 7.5 m wide road from the north-eastern end of the Brereton Street cul-de-sac and running generally along the western half of the alignment of the existing concrete footpath in this location, and joining with Gowrie Drive near the major bend before the entry gate.
- The traffic safety of Gowrie drive will be improved within the existing road alignment, including four localised periodic widenings (i.e. passing bays) provided at strategic points to allow safe passing, and to continue to limit speeds as already exists for this road. The four nominated passing bay locations have been chosen to utilise existing cleared verges so as to avoid the need to remove any trees in these areas.
- New electricity and potable water supply line connections from the existing mains along Brereton Street. These new lines will be located in a 6 m wide easement that will pass through the westernmost section of the RHNR (Block 2, Section 56, Garran), along/near the boundary to the existing residential block.
- A new sewer line will be provided from the village area to tie-into an existing Icon Water sewer main. The exact alignment of the sewer will finalised during detailed design, but will generally run in a southwest connection, and will be within Fairway 18 and micro-sited to minimise the requirement for any tree removal.

Figure 1 provides a general overview of proposed works as described above. A detailed description of how the impact (area) of each of the above development components was determined is provided in Section 4, including the rationale behind the establishment of impact area buffer areas (to ensure that the impact assessment is based on a worst-case scenario that would not be exceeded).

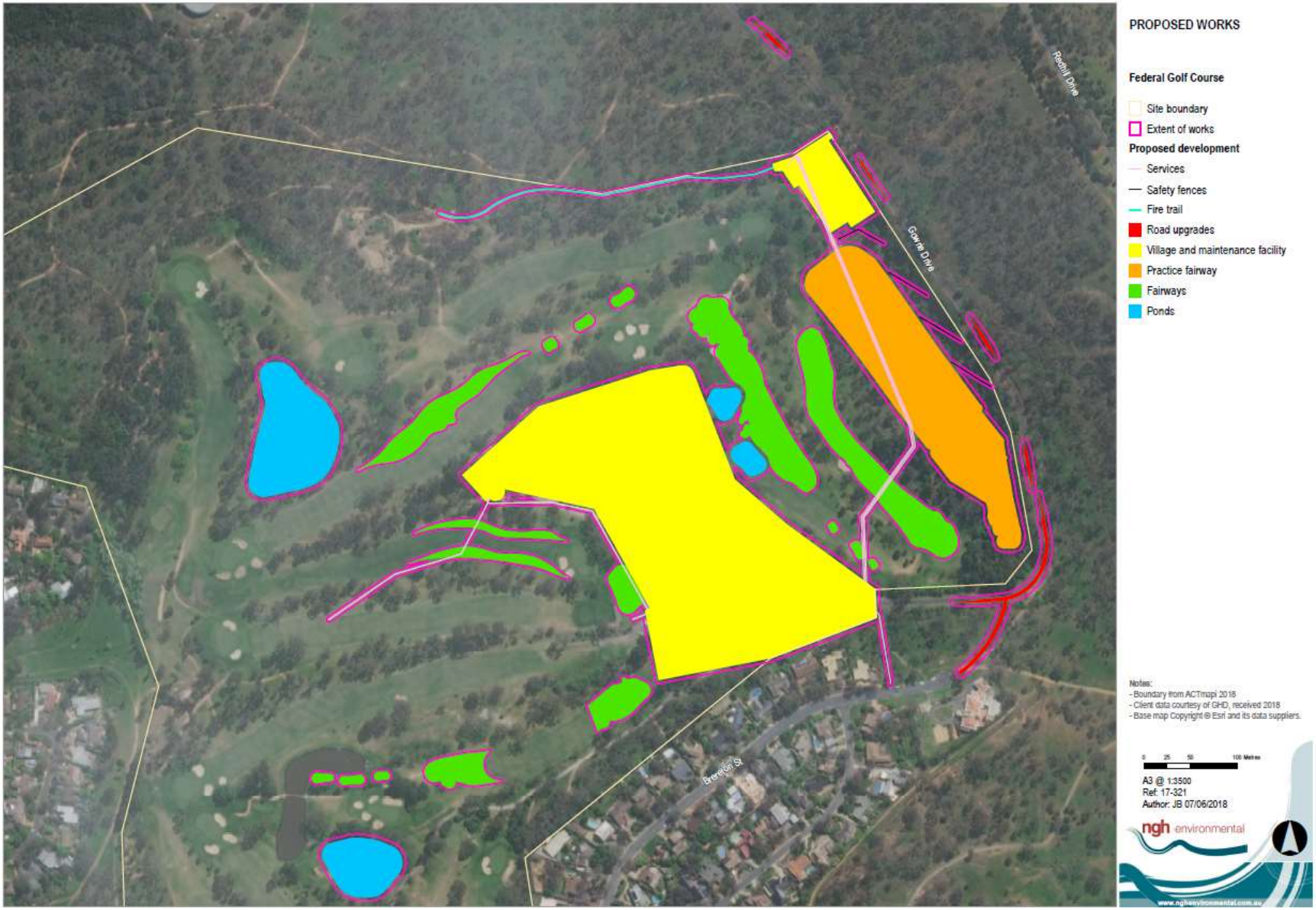

Figure 1 Proposed Works at the Federal Golf Club

In terms of physical works:

1. All works would be governed by a Construction and Environmental Management Plan (CEMP) with particular focus and consultation on any areas or interfaces with increased environmental sensitivity;
2. All existing access points to FGC would be maintained and improved;
3. Early works will focus on improving water security and distribution as a priority;
4. Civil works and housing are likely to be delivered on a staged basis;
5. Construction of the new clubhouse would be delivered on a staged basis to allow FGC to continue as close to normal operations as possible;

1.3 PROJECT NEED AND JUSTIFICATION

The FGC is operationally sound with membership numbers that position it in the top 6% of golf courses nationally. FGC proudly represents a premier bushland golf experience in the ACT. Being a public access course, FGC is a community asset which the club's board and management believes should be maintained and protected for all Canberrans and visitors to enjoy. FGC continually face the risk of extended drought periods placing a very high demand on potable water use, which the club may not be able to financially sustain in the longer term. Efforts to reduce this risk over the last 15 years have focused on minimising the reliance of the course on potable water, including increased water storage, laying of more drought tolerant turf and the introduction of additional bore water. These strategies have been effectively implemented and have made a material difference, helping the FGC through some difficult weather patterns. Despite this, the course remains susceptible during drought. Further steps that can be taken to strengthen the FGC's position and increase its immunity to adverse weather patterns, including importantly, broadening its income streams. It is noted that to achieve the two primary objectives in relation to water security – increased storage, and more efficient distribution, the combined level of capital required is in the range of $2m – $3m, figures that are unachievable by the club without substantial investment.

In addition to the water security issues, the FGC's clubhouse is noticeably aging. The clubhouse is core to the FGC's central functions not only for members but also to the large number of private, corporate and community functions held there. Addressing this will require significant investment over the short term.

With both the imminent investment required in water infrastructure and the short to medium term investment requirements of the clubhouse, FGC therefore needs a solution of a sufficient scale to solve the magnitude of its financial capital shortage. The Club has previously investigated its options to diversify its income to allow greater capital investment into this community asset. A report commissioned in ~2012 considered FGC's options and concluded that four options should be investigated further, including:

1. Establishment of a Child Care Centre
2. Establishment of a Gymnasium
3. Establishing Hotel / Golfing Tourism
4. Development of a Seniors Living Village

Further assessment by FGC has determined that options 1 and 2 cannot provide the commercial returns necessary to address the issues it faces. Option 3 is operationally intense and can be subject to cyclical and seasonal events. Option 4 was therefore seen as the most viable preference and is supported by the Club's view that provision of age-appropriate housing that allows seniors to stay close to their local community rather than move to the urban fringes is important.

1.4 SITE CONTEXT

The site of the proposed residential development and associated improvements/amendments to the golf course is situated within the existing Federal Golf Club lease, over Block 1 Section 56, Red Hill, and zoned *PRZ2: Restricted Access Recreation Zone*. Block 1, Section 56 Red Hill occupies a total area of approximately 86 ha.

The associated intersection upgrades are located to the immediate south of the junction of Gowrie Drive and Red Hill Drive, within Block 1, Section 55, Red Hill, and the proposed emergency access road from the end of Brereton Street to Gowrie Drive is located within Block 2, Section 56, Garran, and Block 1, Section 55, Red Hill. The proposed electricity service easement is also located within Block 2, Section 56, Garran. Both of these blocks are situated within a *Designated Area* of the National Capital Plan, and are also subject to a *Pc: Nature Reserve* overlay of the ACT Territory Plan.

The site location is shown in Figure 2. The applicable planning jurisdictions is describe further in Section 2 as it relates to the statutory planning controls and required approvals for the project.

Figure 2 Site Locality

2 RELEVANT ENVIRONMENTAL LEGISLATION

2.1 COMMONWEALTH LEGISLATION

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of the Environment and Energy (DoEE). Under the EPBC Act, if the Minister determines that an action is a 'controlled action' which would have or is likely to have a significant impact on a Matter of National Environmental Significance (MNES) or Commonwealth land, then the action may not be undertaken without prior approval of the Minster.

The EPBC Act identifies the following nine MNES:

- World Heritage properties.
- National heritage places.
- Ramsar wetlands of international significance.
- Threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).
- Water resources (in relation to coal seam gas development and large coal mining development).

Actions that adversely affect these matters may be deemed to be a 'controlled action' under the Act.

Further information is provided in Section 5 of this report on the potential of the project to have a significant impact on any of the above-listed matters of NES, and the subsequent requirement for a referral to be made to the DoEE under the provisions of the EPBC Act.

2.1.2 Australian Capital Territory (Planning and Land Management) Act 1988

The *Australian Capital Territory (Planning and Land Management) Act 1988* (ACT PALM Act) establishes the National Capital Planning Authority (NCA) as a Commonwealth Government agency with the role of (amongst other things) to prepare and administer a National Capital Plan (NCP). The ACT PALM Act also stipulates that the NCP may specify areas of land that have the special characteristics of the National Capital as *Designated Areas*. Proposals to undertake "work[1]" within a Designated Area of the National Capital Plan, or upon *National Land* outside of a *Designated Area*, are required to be approved by the NCA and must be consistent with the requirements of the NCP.

The proposed works associated with the intersection upgrades to Gowrie and Red Hill Drives, as well as improvements (i.e. passing bays) along Gowrie Drive, are located within a Designated Area of the NCP and as such,

[1] Work is defined under the PALM Act as including:
(a) the construction, alteration, extension or demolition of buildings or structures;
(b) landscaping;
(c) tree-felling; or
(d) excavations;
but excludes anything done inside buildings or structures.

are required to be approved by the commonwealth government, represented by the NCA, and in accordance with the applicable principles, policies and special requirements of the NCP.

2.2 ACT LEGISLATION

2.2.1 Planning and Development Act 2007

The proposed development of the village precinct and associated carparking within the FGC lease of Block 1 Section 56 Red Hill is located within Territory land and therefore any proposal to develop the site is subject to the legislative controls of the ACT *Planning and Development Act 2007* (P&D Act) and associated development codes established under the ACT Territory Plan.

Under the P&D Act, development applications can be assessed in either the Code, Merit or Impact track. The proposed development of the FGC may potentially impact matters listed under Schedule 4 of the P&D Act (notably, items 1 and 2 of Part 4.3), and as such *may* trigger the requirement for an Environmental Impact Statement (EIS) to be completed. In accordance with Section 123 of the P&D Act, proposals that are of a kind mentioned in Schedule 4 are to be assessed in the Impact Track. However, for the specific triggers mentioned (Items 1[2] and 2[3], Part 4.3), the proponent may apply under s 138AA (2) for an Environmental Significance Opinion (ESO) from the ACT Conservator of Flora and Fauna that the proposal is not likely to have a significant adverse environmental impact. The production of the opinion by the agency will take the proposal out of the impact track unless other reasons apply.

The assessment of the potential impacts of the proposed development included in this EAR notes that the proposal does have the potential to impact on a listed threatened species, and also, is likely to involve the clearing of more than 0.5 ha of native vegetation as defined under the ACT *Nature Conservation Act 2014* (see below). Accompanying this EAR is a report addressing the requirements for an ESO application in accordance with the requirements set out in the *Proponent's Guide to Environmental Significance Opinions* (ACT Gov't, 2017), including an assessment of whether the anticipated impacts are likely to be significant in accordance with the risk assessment criteria.

2.2.2 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 ACT and for the management of the conservation reserve network. The Act protects native plants and animals, establishes ACT's reserved areas (i.e. Nature Reserves) and provides management authority for conservation lands. It provides the legal underpinning of nature conservation policy, management and action across the Territory.

The key elements of the NC Act include the establishment of the following:

- Conservator's roles and functions
- Research and Monitoring
- Conservation officers
- The Scientific Committee
- ACT Nature Conservation Strategy

[2] proposal that is likely to have a significant adverse environmental impact on, amongst other things, a listed threatened species

[3] proposal involving the clearing of more than 0.5ha of native vegetation in a native vegetation area,

- Listed threatened species, ecological communities and threatening processes (including the Listing processes)
- Action Plans
- Protected Native Species
- Controlled Native Species Management Plans
- Offences and penalties
- Reserve Management Plans
- Activities Declarations

Under the NC Act it is an offence to interfere with a native animal, including to kill or take a native animal except in accordance with a licence. Similarly it is an offence to, except in accordance with a licence, take a plant that—

a) has special protection status; or
b) is a protected native plant; or
c) is a native plant growing on unleased land.

Also under the NC Act it is an offence to clear native vegetation within a reserved area unless the clearing of native vegetation is:

a) in accordance with a licence under this Act; or
b) in accordance with a development approval under the Planning and Development Act 2007, chapter 7; or
c) in accordance with a fuel management plan under the Bushfire Act 1936, part 6 (Bushfire-prone government land); or
d) in accordance with a strategic bushfire management plan under the Emergencies Act 2004.

Native vegetation for an area, means any of the following kinds of vegetation indigenous to the area:

a) trees;
b) understorey plants;
c) groundcover consisting of any kind of grass or herbaceous vegetation;
d) plants occurring in a wetland or stream in the area.

A *native vegetation area*, means an area where:

a) either -

   (i) 10% or more of the area is covered with vegetation (whether dead or alive); and
   (ii) no more than 60% of the ground layer vegetation cover is exotic annual (at any time of year); and
   (iii) more than 50% of the perennial ground layer vegetation cover is native vegetation; or

b) trees or shrubs indigenous to the area have a canopy cover of 10% or more in any stratum over the area.

The definition of clearing native vegetation includes any of the following:

a) cutting down, felling, thinning, logging or removing native vegetation;
b) burning native vegetation;
c) doing anything else that kills or is likely to kill native vegetation.

Native vegetation is cleared in an area if vegetation cleared in the area is substantially native vegetation. The act does not include any specific allowances for clearing of regrowth. Advice from the conservator of flora and fauna should be sought as to whether the removal of regrowth constitutes clearing of native vegetation.

The NC Act defines a reserve as:

(i) a wilderness area; and
(ii) a national park; and
(iii) a nature reserve; and
(iv) a catchment area; and

includes any other area of public land that is—

(i) reserved in the territory plan under the Planning and Development Act 2007, section 315 (Reserved areas — public land); and
(ii) prescribed by regulation to be a reserve

Of relevance to the project, the proposed works include work located within a *nature reserve* (the Red Hill Nature Reserve), as well as the clearing of (more than 0.5 ha of) *native vegetation*, represented by the removal of the treed areas between and along the edges of fairways which were observed to support areas of predominantly native tree cover (see Sections 4.1 and 5.2), and thus would meet the definition of *native vegetation* as described above.

3 SITE ASSESSMENT METHODS

The assessment of the site's biodiversity values included a combination of desktop searches and other available relevant information as well as general and targeted site surveys as described further below.

3.1 BACKGROUND REVIEW AND DESKTOP ASSESSMENT

Background database searches were conducted to identify any existing known or recorded environmental values within the study site that may be affected by the proposed development, and which may require further or specific consideration. These database searches include the following:

- Online Database searches including:
    - ACT ACTMapi *Significant Species, Vegetation Communities and Registered Trees* database maps (latest search, 15 Nov 2017), and
    - EPBC protected Matters Search Tool (with a 10km search area centred at the mid-point of the project area. Search completed on 09 Aug 2017)
- Commonwealth Threatened Species Profiles
- Information available from the Red Hill Regeneration (RHR) Group (including documents provided by Mbark through discussions with the RHR or documents provided by RHR direct to Mbark)

The results of these background searches are summarised in the results section and a copy of the PMST report is provided at Appendix 1. An evaluation of the likelihood of occurrence of each species within the project area is provided at Appendix 2.

3.2 SITE SURVEYS

The site surveys conducted for the project included an initial preliminary site assessment to observe general site values and identify potential constraints to the project, or potential site values that may require further seasonal/targeted surveys, as well as secondary seasonal and targeted surveys for specific matters, as described below.

3.2.1 Initial site assessment

A preliminary site inspection was conducted by two experienced ecologists on Wednesday 2 August 2017 to assess the terrestrial biodiversity (flora and fauna) values within the proposed development areas, including:

- Areas of the golf course within and immediately surrounding the proposed retirement village development, including the playing course realignments
- The old disused fairway area in the north of the site (north of and adjacent to Fairway 14)
- The works along Gowrie Drive to provide passing bays as well as the emergency access from Brereton Street to Gowrie Drive

The specific survey techniques employed are summarised below.

Flora survey

A systematic meander was undertaken across the three areas in question to record plant species and identify broad vegetation conditions and types. In some cases plant material was taken for subsequent identification. The survey was completed over a period of approximately 7 hours on Wednesday 2 August 2017. The survey timing

was not compatible with the seasonal emergence and flowering times of some warm season herbaceous species, which includes several threatened species that are known to have local occurrences.

Fauna survey

The fauna survey involved a systematic meander across the three areas in question to opportunistically record fauna species observed in or near the project area, as well as to record broad fauna habitat values, as described below.

The survey was completed over a period of approximately 7 hours on Wednesday 2 August 2017. The time of year and conditions were generally suitable for observing a number of fauna species, although it is likely that some reptiles may still be relatively inactive at this time of year. Additionally, this preliminary survey did not involve any nocturnal spotlighting, and so a number of nocturnal species, particularly mammals and owls that may utilise hollow-bearing trees in the area, were not able to be recorded if present at the site during this initial survey period.

Habitat assessment

An assessment of the site's overall habitat values was undertaken to determine the potential value of the project area for listed threatened species and communities. The habitat assessments included a determination of the present of the following habitat features:

- Terrestrial habitat, including:
    - Hollow-bearing tree survey (involved inspecting all mature trees to record the presence of tree hollows within or immediately adjacent to the likely development footprint). The area covered by this assessment is shown in Survey Effort Plan (Figure 3).
    - Presence of coarse woody debris (i.e. fall logs and large branches over 150 mm diameter and more than 3 m long);
    - Rocky outcrops, crevices and piles;
    - Fauna burrows;
    - Grassy tussock habitats (taller than 200 mm);
    - Types and level of disturbances;
- Aquatic habitat, including natural and artificial waterbodies, creeks/streams, and extent and condition of fringing riparian vegetation/macrophytes, submerged and floating vegetation.

The mapped location of recorded habitat features, including the location of each hollow-bearing tree is provided in Figure 6. The raw data for the hollow-bearing tree inventory is presented at Appendix 4.

Survey conditions and access

Weather conditions during the survey were mild/warm (approx. 14^0C) and sunny with good visibility. There were no restrictions of access across the study area, and all applicable/relevant parts of the development site were able to be inspected.

3.2.2 Follow-up seasonal surveys

Based on the results of the desktop assessment, and with consideration to likely/potential matters raised during the assessment of the proposed development, the following species were considered for further survey during the follow-up seasonal surveys conducted in November 2017.

- Button Wrinklewort (*Rutidosis leptorrhynchoides* - existing records in Red Hill Nature Reserve in proximity to proposed intersection works on Red Hill and Gowrie Drives, ACTMapi).
- Smoky Mouse (*Pseudomys fumeus* – mapped habitat in eastern parts of Red Hill Nature Reserve, ACTMapi)
- Spotted-tailed Quoll (*Dasyurus maculatus* – mapped habitat to southwest of project area, ACTMapi)
- Greater Glider (*Petauroides Volans* – habitat may occur in the area, EPBC PMST)
- Koala (*Phascolarctos cinereus* - – habitat may occur in the area, EPBC PMST)
- Grey-headed Flyiing-fox (*Pteropus poliocephalus* – habitat may occur in the area, EPBC PMST)
- Various birds included in EPBC PMST results as having habitat that may occur in the area

The specific surveys conducted to assess the above entities are described further below.

Flora survey

Targeted searches for the Button Wrinklewort were undertaken in the vicinity of the proposed upgrade works to Gowrie Drive. The survey was completed over a period of approximately 5 hours on Tuesday 31 October 2017, as well as a follow-up search of approximately 2 hours on 6 February 2018. The survey timing aimed to capture both early and late season flowering plants and was compatible with the seasonal emergence and flowering periods of the Button Wrinklewort.

Fauna survey

The second seasonal fauna survey involved a series of systematic and targeted surveys across the site over a period of 4 days and nights as described below:

Small-mammal trapping

A total of 25 Elliot Type-A small mammal traps were deployed across 9 trap site locations as shown in Figure 3. The traps were set for a minimum of 3 nights, although most traps were set for 4 nights, and were deployed on the afternoon of 21 Nov 2017, and collected on the morning of 25 Nov 2017. The traps were opened at approximately 7pm, and then checked and closed the next morning at about 8am.

Suitable habitats targeted for placement of the traps included areas of fallen logs, and thicker scrubby underbrush. Note that suitable rocky outcrops were observed that would have also been targeted for placement if present. It was noted that generally there were very few areas within the site that provided suitable habitat for targeting trap locations, primarily as a result of the active management of the land to keep fairways and the majority of the areas between or immediately surrounding fairways clear of debris for golfing, which includes regular removal of fallen limbs, and managing understorey regrowth (refer to results and discussion for further details on this). As a consequence, the traps were deployed typically across the outer edges of the golf course, which were not as actively managed and which supported some habitat structure for smaller mammals (being mainly fallen logs and some denser understorey vegetation). These areas also maintain some connectivity to larger surrounding remnants (i.e. across the north, north-west, and parts of the south, south-west of the golf course), and therefore are considered to have more potential to support species in the these surrounding areas that could potentially also occur within the golf course.

Each trap was baited with the “universal bait mix” (consisting of a mixture of rolled oats, peanut butter and maple syrup), with fresh bait placed in traps on the second night. Refer to Table 1 for details on the trapping survey timing and effort.

Remote motion-activated cameras

A total of 7 remote motion activated cameras were deployed at various locations within the site from 21 November 2017. The cameras were deployed in the same habitats and locations as the small mammal traps described above (although not at every trap site). The cameras were deployed for 17 nights, and collected on 8 December 2017, resulting in a total camera survey effort of 119 camera survey nights.

As one of the main target species was the Smoky Mouse, cameras were deployed low to, and focussed toward the ground (i.e. cameras were set generally less than one metre from the ground, and pointing downward). The cameras were deployed in the same habitats and locations as the small mammal traps described above (although a camera was not deployed at every trap site). Additionally, where possible, cameras were directed toward/along potential fauna trails so as to increase the chance of capturing fauna that may use these on a regular basis. The camera locations were baited on the first night of deployment, and then re-baited with fresh bait on the morning that the traps were collected (irrespective of whether the original bait had been taken).

Cameras were programmed to be triggered both during the day and night (i.e. 24 hours) and set to record video footage for 20 seconds once triggered, with a one-minute lock out before being able to be triggered again.

The cameras functioned correctly throughout the survey period, and the recorded footage of each camera was analysed back in the office. The details recorded included:

- Date
- Time
- Species/fauna group recorded*
- Number of individuals observed within each recording
- Notes on behaviour

Stagwatching

Stag watching was conducted on selected hollow bearing trees within the site to observe any fauna emerging from tree hollows. Stagwatching generally involved the observer being positioned with a good view of as many hollow-entrances as possible, and at approximately 15 minutes before sunset and carefully watching the hollows for a period of at least 45 minutes. Where possible/suitable, more than one hollow-bearing tree may be observed if a second tree is located in close proximity and is able to also be observed from about the same observer position established for watching the first tree.

Stagwatching was conducted by one observer over 4 nights from the 21/11/2017 to the 24/11/2017 (equating to a total of 3 person-hours of stagwatching survey).

The stagwatching locations were chosen to cover the majority of the FGC area to maximise the chance of detecting species presence across the site, and as such, some of the stagwatch locations were situated outside of the proposed village development footprint. This was considered appropriate as there is little merit in limiting the stagwatch sites to only the impact footprint as many nocturnal fauna are highly mobile and could potentially utilise large parts of the site, not just the area within the development footprint, and also, the usage of hollows may change over time. The main focus of the study was to confirm what species are present, or likely to be present, at the site.

Furthermore, given that construction works may not commence for some time yet (possibly more than a year from the current survey time), observing an animal using a particular tree hollow during this survey, does not mean that the animal will still be using the hollow in 12 months' time or more, or, that a hollow observed to be unoccupied now, would still be unoccupied in 12 months' time or more. To address this issue (of confirming species presence within a particular hollow), it has been recommended that additional targeted stagwatching of trees within the development footprint be conducted as part of the pre-clearance surveys to be conducted closer

to when the works are to take place (i.e. within about a week of clearing) as part of the recommended measures of the construction flora and fauna management plan.

Weather conditions for the stagwatch surveys are recorded in Table 2 and the stagwatching locations are shown in Figure 3.

Spotlighting

Nocturnal spotlighting was conducted across the majority of the golf course, and involved random meander traverses on both foot and by golf cart (generally including driving along fairway edges at slow speed/brisk walking pace), scanning all trees, as well as along the ground for nocturnal fauna.

The spotlighting was conducted by one observer for a period of at least two hours (generally from 8.30 pm to 10.30 pm or later), and over 4 nights from the 21/11/2017 to the 24/11/2017 (equating to a total of 8 person-hours of spotlighting survey). The spotlighting was conducted using a hand-held torch of 600 lumens.

The timing of the nocturnal survey was deliberately chosen to avoid the full moon, with the moon phase at half or less during the four nights' of the survey, as well as being timed for warm nights with nil or low rainfall. Weather conditions for the spotlighting surveys are recorded in Table 2.

Call Playback

To support the spotlighting survey, call playback techniques were also employed to maximise the chance of detection of arboreal and nocturnal animals within the site. This survey technique involved undertaking an initial spotlight search within a defined area of the course for a period of approximately 10 minutes to detect any nocturnal arboreal mammals in the area. After this initial period, recorded calls (where available) of threatened species identified as having the potential to occur within the site (based on the desktop assessment) were played for approximately 5 minutes through a megaphone, which was then followed by 5 minutes of quietly listening for any return calls of individuals, followed by a period of about another 10 minutes of carefully searching the immediate surrounding area to check for any nocturnal animals that may have been attracted by the calls but not vocalising return calls.

The following species were targeted in the call playback:

- Spotted-tailed Quoll.
- Koala.

Bird surveys

Bird surveys consisted of three timed 30 minute dawn and dusk point-count surveys (equating to a total of three person hours of survey effort) on the mornings of 22, 23 and 24 November, 2017. Additionally, any opportunistic sightings made during the overall site surveys were also recorded. The bird surveys were conducted at/near the two large dams, as well as near the old practice range and Fairway 14.

Summary of survey effort and conditions

Table 1 details the survey effort and Table 2 details the weather conditions recorded during the site surveys. Overall, conditions during the survey period were considered appropriate for detecting the target species.

Table 1 Survey effort completed within the subject site.

Survey Type	Date(s)	Survey Effort	Target Species
Flora			
Random meander surveys of FGC to determine vegetation status & potential for threatened flora	2 August 2017	7 person hours	All flora species
Targeted threatened species searches	31 October 2017	5 person hours	Button Wrinklewort
Fauna			
Opportunistic records across study area (diurnal)	2 August 2017	7 person hours	All fauna species
Hollow-bearing Tree Survey	2 August 2017	7 person hours	All arboreal fauna species
General habitat assessment	2 August 2017	7 person hours	All fauna species
Small mammal trapping	21-25 November 2017	25 traps / 4 nights = 100 trap nights	Small mammal species
Remote camera surveys	21 November – 8 December	7 cameras / 17 nights = 119 camera survey nights	Small – medium mammal species
Stagwatching	21-24 November 2017	4 x 45 minutes = 3 person hours' stagwatch	All arboreal nocturnal fauna species
Spotlighting	21-24 November 2017	4 x 2 hours = 8 person hours spotlighting	All nocturnal fauna species
Call Playback	21-24 November 2017	4 x 10 minutes = 40 minutes call playback	Spotted-tailed Quoll. Koala.
Timed bird surveys	22-25 November 2017	8 x 30 minutes = 4 person hours bird surveys	All bird species present at time of survey (some seasonal migrants may not have been captured)

Table 2 Weather conditions recorded during the fauna field surveys.

Date	Temp Min (°C)	Temp Max (°C)	Cloud cover	Rain (mm)	Moon	Wind (km/h)
21 November 2017	7	26	1/8	0	<10% (Sickle)	light-moderate
22 November 2017	9	27	1/8	0	<10% (Sickle)	light-moderate
23 November 2017	12	27	6/8	0	approx 10%	moderate
24 November 2017	9	30	4/8	1.5	approx 15%	light

3.2.3 Survey Limitations

The ability to detect plants and accurately identify them to species level can vary greatly with season, prevailing climatic conditions and the presence of reproductive material (e.g. flowers, fruit and seed capsules). The survey undertaken as part of this assessment, while only representing a 'snapshot' in time, included both an initial (7 August 2017) and follow-up targeted seasonal survey (31 October 2017) to increase the chance of detecting native forb species within areas of the site to confirm if the areas meet the criteria for Box Gum Woodland as well as to detect the possible presence of the Button Wrinklewort, if present. The flora survey timing and effort was considered sufficient to meet the requirements for accurately determining the site's flora values, and no further surveys for flora at the site are considered necessary.

With regard to the fauna surveys, while the timing was considered sufficient to detect most fauna species, including most reptiles which may have been inactive during the preliminary survey in August, the timing was not ideal for detecting all species of fauna with some potential to occur at the site. For example, some species with seasonal presence in the ACT, including notably the Superb Parrot and Gang-gang were likely to be present at the site in mid-late November, with the Superb Parrot in particular, not usually arriving in the ACT until early-mid December. Notwithstanding this, a brief follow-up visit to the site on 6 February (as part of a site consultation meeting with Darren LeRoux, ACT Parks and Conservation Service (PCS)) was undertaken, where both of the above-mentioned bird species was observed (refer to results in Section 4). As such the overall fauna survey effort and timing is regarded as being sufficiently comprehensive to detect the potential presence of most species considered to have some potential to occur at the site.

A key component of the follow-up fauna surveys included stagwatching methods to determine potential usage or occupation of hollows in selected trees. Given this method requires an intensive focus on only one tree at a time (or potentially two-three trees if located in very close proximity to each other), only a small number of trees were able to be surveyed using this method. Similarly, the hollow-bearing tree survey involved spending only a brief amount of time (approx. 2-3 minutes) observing each tree for the presence of hollows. This length of time is not sufficient to detect whether those hollows are being used by fauna (which would otherwise require extensive periods of time, and over separate days and seasons, as well as both daytime and nocturnal observations at each tree). As such, a detailed assessment of the overall occupation rates and species utilisation of all of the hollow-bearing trees at the site is not possible.

To address any potential limitations in relation to the surveys conducted, we have, where required, assumed a precautionary approach, assuming a species is likely to be present unless good reasons exist to preclude its use of the site.

In addition, management measures have been recommended to address these limitations to ensure that risk to fauna associated with the clearing of hollow-bearing is minimised to the greatest extent possible.

Figure 3 Overview of Survey Effort and Survey Sites

4 RESULTS

The assessment of the site's biodiversity values was divided into four main areas or components, as follows:

1. Areas within the central parts of the FGC lease that will support the proposed retirement village development, as well as the fairway/green/tee realignments (of holes 9, 14, 15, 17, and 18) and the proposed new ponds, as well as some utility services.
2. Areas along the outer eastern and northern portions of the FGC lease that will support the proposed practice fairway and associated stray-ball safety fence as well as the new maintenance facility, and the upgrades to the existing fire trail in this area.
3. Areas within the RHNR bordering the south-eastern corner of the FGC that will support the new emergency vehicle access track from Brereton Street to Gowrie Drive as well as the new utility service installations from existing mains connections in Brereton Street.
4. Areas within the RHNR along the eastern boundary of the FGC lease that will support the proposed minor road upgrades (i.e. passing bays and widening of the verge at the major bend) along Gowrie Drive.

The site's biodiversity values within each area are described separately below with regard to the flora and vegetation community values and fauna and fauna habitat values.

4.1 FLORA AND VEGETATION COMMUNITIES

4.1.1 Village development, ponds and hole realignments within central area of the FGC

Vegetation communities

The existing fairways and surrounds (rough) across practically the entirety of the FGC (and particularly where the proposed village and playing hole realignments will take place) are highly modified and have been seeded with exotic grass varieties, fertilised and maintained since the 1950's. As such they no longer resemble to the original (pre-development of the golf course) native vegetation type. The fairways are predominately Couch '*Santa Ana*' with rough areas containing a wider variety of exotic ground cover species including Fescue, Brome, Lolium and herbaceous weeds, mixed with occasional native grasses (such as Spear Grass, Wallaby Grass and Common Wheatgrass). Most fairway trees and shrubs have been planted and comprise a wide variety of native and non-native species.

Whilst a large proportion of the existing trees are non-local eucalypts, there is a substantial number of large mature trees (i.e. Yellow Box and Blakely's Red Gum) that could be considered remnants of the original vegetation community. Given the mix of locally indigenous and planted tree species as well as the modified understorey vegetation layers, these areas are not considered to form part of the EPBC-listed *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* critically endangered ecological community (CEEC) or the ACT NC Act-listed *Yellow Box Red Gum Grassy Woodland* endangered ecological community (EEC) (primarily due to the lack of native understorey species).

Notwithstanding the above, parts of the treed areas between fairways would meet the criteria for *Native Vegetation* under the ACT NC Act as described in Section 2, as whilst is noted that the ground layer vegetation across practically the entire site (with the exception of the very outer edges of the FGC lease) was highly modified and comprised of predominantly introduced non-native species, some of the woodland areas support locally indigenous trees (mainly the remnant Blakely's Red Gum, Yellow and Apple Box trees), which in places would have a canopy cover of 10% or more, and thus would meet the definition of native vegetation. It is further noted

however that this vegetation category is not formally listed as any specific type of vegetation community, but is collectively a generic identification of vegetation communities that have a predominantly native component in one or more strata. This has ramifications for the statutory planning process and specifically, the triggering of the requirement to complete an EIS as mentioned in Section 2 and assessed further in Section 5. The mapped extent of native vegetation within the study area is shown in Figure 5.

Threatened flora

With regard to threatened flora species included in the desktop assessment/database records, the site assessment did not record any of these species within this part of the golf course redevelopment, and due to the previous development of the site and ongoing management regimes as a golf course, there is considered to be little potential of these species occurring at the site (refer to the threatened species evaluations at Appendix 2).

While there was no evidence of any local threatened ground cover species within this section of the FGC two non-local eucalypt varieties (Narrow-leaved Black Peppermint *Eucalyptus nicholii* and Camden Woollybutt *Eucalyptus macarthurii)* listed as threatened under the Commonwealth EPBC Act have been planted along the Practice Fairway and Fairways 14 and 15. As these specimens are planted, they would not satisfy the criteria for identifying and subsequently protecting as listed threatened species.

A full list of the flora species observed within the golf course survey area is provided at Appendix 3.

4.1.2 Eastern and northern portions of the site supporting the practice fairway and maintenance facility

Vegetation communities

This area of the FGC lease is generally in a highly modified condition. The area where the proposed practice fairway is to be located displays features of a former maintained golf fairway, albeit overgrown and containing a wider variety of both exotic and native herbaceous plants. Greater than 50% of the central and southern portions of this area are covered with non-native perennial and annual grasses. The northern section of this area is partially covered with unconsolidated soil which is sparsely vegetated and exhibits erosion.

The tree canopy bordering this area to the northeast and southeast, between the old fairway and Gowrie Drive, is dominated by Monterey Pine *Pinus radiata*, although there are some sporadic native eucalypts in this area, including a number of mature and semi-mature Yellow Box *Eucalyptus melliodora* and Blakely's Red gum *E. blakelyii*, however the occurrence of these species would not comprise more than 10% of the overall canopy cover in this area.

The north-eastern corner of the site where the proposed maintenance fairway is to be located supports a mostly mixed and patchy groundcover vegetation layer. Unlike other parts of the golf course this area has not been maintained for many years, perhaps decades, and is now infested with a variety of exotic herb species and invasive weeds. There were however some small components where native perennial grasses did persist (and which comprised Tall Speargrass *Austrostipa bigeniculata*, Common Wheatgrass *Anthosachne scabra* and Wallaby Grass *Rytidosperma* sp.). Overall, the native forb abundance and diversity in this area was low, and while there were occasional patches of native perennial grasses, the estimated non-native cover was likely to exceed 50%.

This part of the site also contained a wide range of native and exotic shrub species including a variety of wattle species, however, exotic shrubs were widespread and often dominant occasionally forming dense thickets, most notably noxious Service Tree *Sorbus domestica* and Blackberry *Rubus* sp. (Blackberry appeared to have been treated with herbicide), although other exotic and noxious shrubs were present and abundant in this area.

Unlike in other parts of the FGC, which contained a wide range of local and non-local eucalypt varieties, this part of the site contained just three native tree species: Yellow Box *Eucalyptus melliodora*, Apple Box *E. bridgesiana* and Blakey's Red Gum *E. blakelyi*, which have seemingly recruited naturally and their presence is indicative of former Box Gum Woodland community. The eastern and northern margins of this part of the site were marked by rows of mature Monterey Pine *Pinus radiata* (Note: the ground layer beneath pine trees was generally sparse and covered in fallen pine needles, which inhibit germination and growth of other plants).

While there was evidence of *Eucalyptus melliodora* recruitment native tree health was not encouraging. This was evidenced from the presence of stags, fallen trees and the general poor health of *in situ* eucalypt specimens. The exact cause of this is unknown but completion from exotic shrubs and their possible allelopathic effects may play some role.

Based on the vegetation conditions described above, the majority of this area of the FGC is not considered to form part of the EPBC-listed *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* critically endangered ecological community (CEEC) or the ACT NC Act-listed *Yellow Box Red Gum Grassy Woodland* endangered ecological community (EEC). However, the land to the immediate north, into Block 2, Section 54, Red Hill (RHNR) supports the Box Gum Woodland TEC, and the TEC does extend partially into the northernmost parts of the FGC lease, particularly across the area of the existing fire trail which is proposed to be upgraded (although not extending further east to the proposed maintenance facility area, refer to Section 5.2 for further details).

Additionally, the predominance of non-native species in this area, including the dominance of non-native grasses (more than 60% of the groundcover vegetation layer), as well as the dominance of Pine trees in the canopy layers and the dominance of African Boxthorn in the shrub layers (where present) means that large parts of the vegetation in this area would not meet the definition of a *native vegetation* under the NC Act criteria, although the narrow band of vegetation between the cleared old disused fairway and the pine trees along the eastern site boundary, as well as between the old disused fairway and hole 14, as well as in the north-eastern corner of the site where the proposed practice facility is to be located would meet the definition of *native vegetation* under the NC Act (Figure 5).

Threatened flora

The site assessment did not record any threatened flora species, including those species included in the desktop assessment/database records, within this area. Due to the previous development of this part of the site and its disturbed condition, there is considered to be little potential of these species occurring within this part of the site.

The uncommon Yellow Burr-daisy *Calotis lappulacea* was recorded on the soil mound at the northern end of the fairway. The adjacent surrounding treed area contains a wider variety of both native and non-native herbs and shrubs and may contain other uncommon plants such as *Dianella longifolia* and *Senecio hispidulus*, although no specimens of either species were recorded during the site inspection. Whilst locally uncommon, these species are not listed as threatened.

In general, the flora values of this area were limited, and found to be dominated by a number of noxious species occurred including Serrated Tussock *Nassella trichotoma*, possibly Chilean Needlegrass *Nassella nessiana*, *Acacia baileyana*, African Boxthorn, Cotoneaster, Monterey Pine and Blackberry.

A full list of the flora species observed within the old fairway area is provided at Appendix 3.

4.1.3 Areas within the RHNR for the Brereton Street emergency access and utility service connections

Vegetation communities

This area of the proposed works lies within the RHNR and contains mostly native woodland vegetation, which comprises a mixed-age stand of regrowth and mature trees (predominantly Yellow Box, Blakey's Red Gum and some Apple Box), with some Acacia and other native shrubs including Cauliflower Bush *Cassinia longifolia* and Sifton Bush *Cassinia quinquefaria* common in the understorey layers as well as other shrubs including *Hakea spp*, and *Bursaria spp*.. This area also supported a mixed though predominately native ground cover of gasses and other forbs including native forbs such as Rock Ferns *Cheilanthes sp.,* Blue Flax-lily *Dianella longifolia*, Rosemary Grevillea *Grevillea rosmarinifolia,* Everlasting daisies (*Chrysocephalum spp*.) and Grassland Wood-sorrel *Oxalis perennans* and native grasses including Common Wheatgrass *Elymus scaber*, Tall Speargrass *Austrostipa bigeniculata*, Rough Spear-grass *A. scabra*, and Wallaby grass *Rytidosperma sp*..

This area is mapped as supporting both the ACT and EPBC Act listed Box Gum Grassy Woodland on the ACT ACTMapi website. The observed vegetation values of these areas based on site investigation is consistent with the EPBC definition of this community. The ground layer contained more than 12 native non-grass herbaceous species (in the immediate vicinity) and at least one uncommon ground cover plant (*Dianella longifolia*). The mapped extent of the community in this area is shown in Figure 4.

Threatened flora

With regard to threatened flora species included in the desktop assessment/database records, the site assessment did not record any of these species within this area. In particular, given the occurrence of numerous records of the endangered Button Wrinklewort (*Rutidosis leptorrhynchoides*) in the surrounding areas, a targeted survey was conducted for this species as described in Section 3.2.2. While the species was not recorded within any parts of the development footprint, it has been previously recorded in the local area, and therefore it is possible that this species could occur within the nearby areas of the proposed works, particularly on an infrequent basis given it may be present in the soil seed bank and could emerge in some years and not in others. As such, the presence of this species within the works footprint, although unlikely, cannot be discounted.

A full list of the flora species observed in this area is provided at Appendix 3.

4.1.4 Gowrie Drive road upgrades

Vegetation communities

This area of the proposed works is situated primarily within the existing (cleared) verges of Gowrie Drive, and is located within and along the outer western edges of the RHNR where it borders the FGC lease. The area generally about where the proposed works are to occur contained mostly native woodland vegetation, which comprised a mixed-age stand of regrowth and mature trees (predominantly Yellow Box, Blakely's Red Gum and Apple Box), and generally is similar in structure and species composition as the area described above where the emergency access from Brereton Street is proposed. Specifically, the area was observed to support some *Acacia, Bursaria, Cassinia*, *Grevillea* and *Hakea* species in the sub-canopy, as well as a mixed though predominately native ground cover of gasses and forbs including Speargrasses (*Austrostipa* spp.), Wallaby Grasses (*Rytidosperma* spp.), Everlasting daisies (*Chrysocephalum spp*.), Narrow-leaf New Holland Daisy *Vittadinia muelleri*, Bluebells, (*Wahlenbergia sp.*), Flax Lillies (*Dianella spp.*) and False Sasparilla *Hardenbergia violacea*.

The entirety of the Gowrie Drive alignment from the intersection with Red Hill Drive to the FGC entry gate, particularly along the northern side of the road, is mapped as supporting both the ACT and EPBC Act listed Box

Gum Grassy Woodland. The observed vegetation values of these areas based on site investigation is consistent with the EPBC definition of this community. The ground layer contained more than 12 native non-grass herbaceous species (in the immediate vicinity) and at least one uncommon ground cover plant (*Dianella longifolia*).

The mapped extent of the community in this area is shown in Figure 4.

Threatened flora

With regard to threatened flora species included in the desktop assessment/database records, the site assessment did not record any of these species within this area. In particular, given the occurrence of numerous records of the endangered Button Wrinklewort (*Rutidosis leptorrhynchoides*) in the surrounding areas, a targeted survey was conducted for this species as described in Section 3.2.2. While the species was not recorded within any parts of the development footprint, it has been previously recorded in the local area, and therefore it is possible that this species could occur within the Gowrie Drive road reserve and adjacent areas, particularly on an infrequent basis given it may be present in the soil seed bank and could emerge in some years and not in others. As such, the presence of this species within the works footprint, although unlikely, cannot be discounted.

A full list of the flora species observed along the Gowrie Drive alignment is provided at Appendix 3.

4.2 FAUNA

Fauna studies conducted on site resulted in 55 species of fauna being recorded, listed in Appendix 3. In summary, the total number for each fauna group included:

- 34 bird species;
- 12 species of mammals (excluding microbats, although at least one species of unidentified microbat is known to occur at the site based on visual observations) of which seven species are introduced;
- 5 amphibian species; and,
- 4 reptile species.

Given the high mobility of most of the fauna species observed, the results below are provided for the entire project site, rather than for specific parts of the site (as established for the description above of the flora and vegetation community values of the site), although where relevant, notes on the locations of observed notable (i.e. threatened or otherwise iconic) species are provided.

4.2.1 Birds

A total of 34 bird species were recorded within the project area during the survey period. The bird species encountered during the site survey included primarily common species that are well-adapted to urban and peri-urban environments (such as Cockatoos, Galahs, Eastern and Crimson Rosellas, Magpies, Noisy Miners and waterbirds).

The project area was found to support good foraging, nesting and roosting habitat for a variety of bird species with a large number of tree hollows observed to occur throughout the entire golf course area (refer to the Hollow-bearing tree plan, Figure 6). During the August tree survey, regular observations were made of birds displaying nesting behaviour (i.e. entering and leaving hollows), with Galahs, Cockatoos and the two Rosella species observed on most of these occasions.

Aquatic areas for birds are limited across the project area, restricted mainly to the two large dams in the central part of the golf course. A variety of waterbirds were observed using these dams, including the Pacific Black and Wood Ducks as well as Purple Swamphens and Dusky Moorhens.

Threatened bird species listed under the EPBC Act and/or NC Act observed at the site include the Superb Parrot (*Polytelis swainsonii*, listed as Vulnerable under both the EPBC and NC Acts), which was recorded during the site meeting with the PCS officer on 6 February 2018. During this time, several pairs and small groups (of up to 6 birds) of Superb Parrots were observed flying through the FGC area near to the existing clubhouse and practice fairways/greens, as well as feeding from the ground, particularly near the western end of the practice driving range. This species relies on hollows in large old eucalypts for breeding, and on a few occasions, were observed having territorial fights with Noisy Miners. It is possible/likely that the species is using (or trying to use) hollow-bearing trees at the site for nesting habitat.

A single pair of Gang-gang Cockatoos (*Callocephalon fimbriatum*), was also observed flying through the site on the morning of 6 February 2017. While not listed as threatened in the ACT or nationally, the Gang-gang Cockatoo is considered iconic as the faunal emblem of the ACT. This species also requires hollows in large old eucalypts for nesting habitat, and it is possible that the species is using hollow-bearing trees at the site for nesting habitat.

A full list of all species recorded at the site is provided at Appendix 3.

4.2.2 Mammals

Eleven species of mammal (not including the unidentified microbat species) were recorded within the project area during surveys, including five introduced species. The native species recorded in the project included relatively common species such as the Eastern Grey Kangaroo (*Macropus giganteus*), Brushtail Possums (*Trichosurus vulpecula*), Ringtail Possums (*Pseudocheirus peregrinus*), Short-beaked Echidna (*Tachyglossus aculeatus*), and Sugar Gliders (*Petaurus breviceps*) which were observed on exiting hollows from a large dead stag tree located between Fairways 2 and 7.

The Grey-headed Flying-fox (*Pteropus poliocephalus*) was also observed flying over the site at night (although none were observed to land and feed in any trees on the site). This species is listed as Vulnerable under the EPBC Act.

As stated, a number of microbats were observed during the spotlighting surveys, including an observation during stagwatching of at least 6 microbats existing spout hollows on a dead stag tree located along the northern edge of Fairway 14. Because trapping or bat call detector surveys were not employed during this survey, it is not possible to accurately determine what species of bat these were, or, the species of microbat that were seen flying around other parts of the site during the spotlighting surveys. As such, it is possible that there is more than one species of microbat present at the site. It is noted that no species of microbats likely to occur in the ACT region are listed as threatened under the EPBC Act or under the NC Act.

The habitat values at the site for native mammals are limited mainly to the presence of a relatively dense and linear tree canopy cover between and along fairways and golf course edges, consisting of mixed species and age classes, and which include numerous large mature trees, some of which provide hollows that are important habitat for native arboreal mammal species. However, given the highly managed nature of the understorey, with an almost complete lack of any shrubby or grassy/tussocky vegetation layers, combined with the location of the golf course within an urbanised environment, these arboreal values are limited to use by mainly common and highly mobile species.

Similarly, in terms of habitat values for terrestrial ground-dwelling native mammals, the highly managed groundcover provides good habitat for kangaroos (and other non-native mammals such as rabbits), but is not suitable for a number of smaller native mammals which typically require relatively dense vegetation cover, as well as other habitat structures such as fallen logs and rocky habitats, all of which have been and are regularly removed from the majority of the golf course area. As such, species such as the Spotted-tailed Quoll and the Smoky Mouse are considered unlikely to occur at the site given the lack of these necessary habitat features. This assumption is supported by the lack of any evidence of these species occurring at the site through the survey program which

included the use of baited traps and motion-detection cameras. In fact other than a single sighting of an Echidna at the outer north-eastern edge of the FGC lease (and outside of the main playing areas), the only native ground-dwelling mammals recorded at the site was the Eastern Grey Kangaroo. Although not specifically surveyed for population abundance/density, it is estimated that the local population of Kangaroos would be between 80 – 150 individuals.

4.2.3 Amphibians

Five species of amphibian were found during surveys within the project area. The species recorded are all considered common to the region. Habitat for amphibians is on the whole relatively good with two large and predominantly permanent dams with moderate quality and which support some moderate fringing riparian vegetation cover. No threatened amphibians were recorded on site, and none are considered likely to occur within the project area (refer to threatened species evaluation table at Appendix 2). A full list of the amphibian species recorded at the site is provided at Appendix 3.

4.2.4 Reptiles

Four species of reptile were recorded on site during surveys, including three relatively common skink species, and the Eastern Long-necked Turtle (*Chelodina longicollis*), which is also relatively common in dams. Habitat in general for reptiles was found to be limited given the highly managed groundcover which was practically devoid of suitable structures such as rocks, important for both shelter and basking habitat, as well as fallen logs and grassy tussocks which are important for both shelter as well as foraging. Notwithstanding this, it is possible that other species such as the more common ACT snake species (i.e. Red-bellied Black Snakes, Brown Snakes and Tiger Snakes) would be present at the site from time to time (particularly Red-bellied Black Snakes which prey on frogs and small skinks which are present at the site), although none were observed during the site visits.

No listed threatened reptile species were recorded during the site surveys, and none are included in the ACTMapi Significant Species database as having been previously recorded either within or nearby to the golf course. Given the generally poor habitat values for any of the threatened reptiles of the ACT region within the majority of the golf course area, it is considered likely that any no listed threatened reptile species would occur at the site.

5 ASSESSMENT OF IMPACTS

5.1 IMPACT ASSESSMENT APPROACH AND ASSUMPTIONS

In completing the impact assessment calculations a number of assumptions/criteria have been applied as described further below. This includes primarily the establishment of a buffer zone around each impact footprint area as supplied by the golf course architects and engineer. The initial impact footprint supplied by the architect and engineer represents the anticipated outermost extent of earthworks/vegetation removal, based on a worst-case scenario. A buffer zone has been added to this to allow for any unexpected changes during final detailed design, as well as to allow for additional impacts that may occur associated with vehicle movements, temporary machinery/vehicle parking, temporary storage and stockpiling, and installation of any additional controls include construction/tree protection fencing, and sediment and erosion controls.

The buffers applied are defined as follows:

- For the proposed village, maintenance facility, retention ponds and practice fairway, a **4 m** wide buffer zone has been applied around the perimeter of the development footprint supplied by the architects and engineers.
- For golf course re-alignment works (holes 14, 15, 17, 18 & 9), a **2 m** wide buffer zone has been applied around the perimeter of the footprint of the realignments supplied by the architects and engineers. This reduced buffer width has been applied given the "softer" nature of the works, including that only limited/minor earthworks are required for these areas, and that individual trees along the edges could be retained on a case-by-case basis. Additionally, any stockpiling/storage requirements will occur on the existing fairway side to limit the buffer zone required to accommodate any storage/stockpiling or vehicle/machinery movements and temporary parking.
- For the proposed road works, the buffers has been established as follows:
    - For the Gowrie Dr upgrades/passing bays a **4 m**-wide buffer zone has been established around the outer perimeter of the works area provided by the engineers.
    - For the Brereton St emergency access track, the proposed future access track will be a 7.5 m wide corridor (comprised of a 3.5m approx. paved surface and a 2 m wide grassed verge on either side). A **2 m**-wide buffer zone has been established around the outer perimeter of the works area provided by the engineers for calculating the impact footprint of these works. This buffer is regarded as sufficient given the relatively flat nature of the area, requiring minimal earthworks, and that the new track will be effectively similar in nature to a concrete driveway, and thus does not require the same engineering and construction standards as a public road. Applying this buffer results in a total impact corridor width, including buffers, of 11.5 m. It is noted that part of the new access track alignment will follow the existing concrete path from Brereton Street for a distance of about 40-50 m, and the works here would involve upgrading this existing section of the concrete path to become a restricted (emergency) access track. As such, the overall extent of clearing for this path will be less than what is actually quoted here.
- For the northern fire trail, a **3 m** wide buffer has been established either side of the nominal centreline of this existing track (i.e. 6 m total width for the trail), as supplied by the engineer. As there is an existing trail through this area which represents an existing cleared track with a nominal width of at least 3 m, and the works involve only a minor upgrade to resurface and undertake very

minor widening of the trail to meet emergency access requirements (expected to be generally less than a metre either side of the existing track), the maximum extent of clearing impacts associated with this work would be approximately 1.5 m either side of the existing track (for a combined total linear clearing of 3 m along the existing fire trail used for the calculating the impact area).

- For proposed services infrastructure works, there is some level of flexibility with the alignment of the reticulation services required. This will be further studied after DA approval with the aim to minimise impact to high value native vegetation, Box Gum Woodland, or Hollow-bearing Trees. At this DA stage, we have nominated a relatively direct and unconstrainted alignment of services, and have applied a **6 m** wide buffer (i.e. 3 m either side of the nominated centreline alignment) for calculating the impacts of these works as a worst-case scenario. This buffer for calculating the impact is considered sufficient to cater for both the electricity and water connections in the same corridor easement whilst meeting/exceeding the required separation distance between each service – nominated at 2 m, and also is considered more than adequate to cater for machinery movements and the like to complete the construction. Note at this stage, open trenching is proposed for installation of services. This will be conducted in accordance with an approved construction management plan that will include measures to limit impacts to adjacent areas such as through construction fencing, sediment and erosion, and weed management controls, as well as post-construction site re-instatement/rehabilitation.

Given the above consideration, the final calculation of impacts is considered to be a worst-case scenario, such that for the final detailed design, it is highly unlikely that these clearing limits would be exceeded, and if anything, will be less than what is quoted here.

5.2 IMPACTS ON VEGETATION COMMUNITIES

The impacts of the proposed development on the vegetation communities identified at the site is described below. Given the observed differences in vegetation communities across the various parts of the project area proposed to be developed, and the complexities in identifying vegetation communities across all parts of the study area where development may occur, the assessment of impacts to vegetation communities has been separated into the four main areas of the study site that were used for describing the site's vegetation communities in Section 4.

A detailed breakdown of the extent of removal of the Box Gum Woodland TEC and vegetation meeting the definition of *native vegetation* under the ACT NC Act is provided in Table 3 and shown in Figures 4 and 5 respectively.

5.2.1 Village development, ponds and hole realignments within central area of the FGC

As stated in the results, the vegetation that occurs within the central parts of FGC lease area subject to the proposed village, ponds and hole realignment developments does not meet the criteria for mapping as the EPBC-listed *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (CEEC) or the ACT NC Act-listed *Yellow Box Red Gum Grassy Woodland* endangered ecological community (EEC), collectively referred to as the Box Gum Woodland TEC. As such, no impacts to this or any other listed threatened ecological community (TEC) is expected to occur as a result of the proposed village development, pond works or hole realignments within the FGC leased area.

As also stated in the results at Section 4.1, most of the woodland areas between fairways would meet the criteria for a *Native Vegetation Area* under the ACT NC Act. Based on the proposed layout, approximately 3.83 ha of *Native Vegetation* would be cleared.

A detailed summary of the impact calculations for both Box Gum Woodland and native vegetation associated with each individual component of work is provided in Table 3 and shown in Figures 4 and 5 respectively.

5.2.2 Eastern and northern portions of the site supporting the practice fairway and maintenance facility

As stated in the results at Section 4.1, the area of the proposed practice fairway shows evidence that it was previously developed as a fairway and is highly modified. This area supports predominantly non-native perennial and annual grasses, and is not considered to form part of the EPBC-listed *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* critically endangered ecological community (Box Gum Woodland TEC).

The area of the proposed maintenance facility in north-eastern corner of the site does not appear to have been previously developed except for the construction of a narrow fire trail along the northern site boundary, with an access track from Gowrie Drive. This area supports a mostly mixed and patchy groundcover vegetation layer, although it appears to have not been maintained for many years and is now infested with a variety of exotic herb species and invasive weeds. Overall, the native forb abundance and diversity in this area was low, the estimated non-native cover was likely to exceed 50%. This area also is not considered to form part of the EPBC-listed *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* critically endangered ecological community (Box Gum Woodland TEC).

Given the above, no impacts to the Box Gum Woodland TEC or any other listed TEC is expected to occur as a result of the proposed practice fairway or maintenance facility within this part of the FGC leased area.

The very far northern portion of the site where the existing fire trail is located is mapped as supporting the Box Gum Woodland TEC. Based on the proposed design to upgrade this trail (including clearing approximately 1.5 m either side of the existing cleared track, a total of 0.11 ha of the Box Gum Woodland TEC would be removed for these works.

As stated in Section 4.1, most of the treed areas of this part of the site, with the exclusion of the narrow band of pine trees along the eastern boundary as well as the large area of pine trees that occur from the south of the old disused fairway down to Gowrie Drive, would meet the definition of n*ative vegetation* under the NC Act. Based on the proposed layout, approximately 1.57 ha of *Native Vegetation* would be cleared for the practice fairway, maintenance facility and fire trail upgrades.

5.2.3 Areas within the RHNR for the Brereton Street emergency access and utility service connections

As stated in the results at Section 4.1, the area of the proposed emergency access as well as the utility service connection from Brereton Street occur within the RHNR and the vegetation in this area is mapped as supporting the EPBC-listed *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* critically endangered ecological community (Box Gum Woodland TEC). These works would require the removal of up to 0.13 ha of this TEC.

This area would also meet the definition of n*ative vegetation* under the NC Act, and consequently up to 0.13 ha of *Native Vegetation* would be cleared for these works.

5.2.4 Gowrie Drive road upgrades

As stated in the results at Section 4.1, the area of the proposed road upgrades (passing bays and widening of the road at the major bend) occur within the RHNR and the vegetation in this area is mapped as supporting the EPBC-listed *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* critically endangered ecological community (Box Gum Woodland TEC). These works would require the removal of up to 0.13 ha of this TEC.

This area would also meet the definition of n*ative vegetation* under the NC Act, and consequently up to 0.13 ha of *Native Vegetation* would be cleared for these works.

5.2.5 Summary of cumulative impacts to vegetation communities

Based on the above assessments of the cumulative extent of removal of vegetation communities for all components of the project includes the removal of up to 0.37 ha of the EPBC and ACT listed Box Gum Woodland TEC, and up to 5.77 ha of native vegetation under the NC Act, as detailed in Table 3 and as shown in Figures 4 and 5 respectively. These impacts are discussed separately below.

Impacts on the Box Gum Woodland TEC

The removal of 0.37 ha of the Box Gum Woodland TEC is associated only with the proposed works for the fire trail upgrade, emergency access and utility service connections from Brereton Street, and the proposed widenings of Gowrie Drive for the passing bays and improved safety at the major bend before entering the FGC. No Box Gum Woodland TEC will be removed for the village development, ponds, hole realignments, maintenance facility, practice fairway and safety fence.

As noted in Table 3, the Gowrie Drive road upgrades (four passing bays) will require the removal of up to 0.13 ha of the TEC. In reality, this work will require very little vegetation removal as the passing bay locations have been chosen at existing sections of the road verge that are generally comprised of a wide gravel shoulder. As such, the Box Gum Woodland in these specific work areas is considered to be of generally low quality. These works are of a minor nature generally involving the widening of the shoulder to approximately 4 m width (from the existing tarmac surface), and for lengths of up to 50m.

The proposed fire trail upgrade (widening) will require the removal of up to 0.11 ha of the TEC, which will consist of clearing vegetation along the fringe of the existing trail to a width of about 1.5 m on either side of the tail. The emergency access and utility service connections from Brereton Street will require the removal of 0.13 ha of the TEC. The emergency access road would be approximately 7.5 m wide, and up to 130 m in length, although the construction width for earthworks could be up to 10 m wide, and would be rehabilitated post-construction. About half of this alignment would follow the existing concrete pathway through this area. The utility service connections would be located in two one-metre wide trenches, located within a single clearing easement of about 6 m wide, and close to the boundary of the RHNR with the adjacent residential dwellings of Brereton Street. There is some flexibility in this design to either micro-site the alignment or tunnel bore to avoid any important features such as hollow-bearing trees or any important flora species (should they be discovered prior to works commencing, noting that the area has already been surveyed and hollow-bearing trees recorded). The Box Gum Woodland community in these areas is considered to be of moderate quality.

An assessment of the significance of the impact of the removal of the Box Gum Woodland TEC in accordance with the criteria in the EPBC *Significant Impact Guidelines 1.1. Matters of National Environmental Significance* (DoE, 2013) is provided at Section 5.5 which describes the nature of this impact in more detail. The assessment concluded that the project is unlikely to result in a significant impact to the Box Gum Woodland TEC.

In summarising the assessment, it is noted that the works would not result in a notable reduction in the extent of the TEC area, representing a development footprint of approximately 0.37 ha out of a total of over 250 ha of the Box Gum Woodland TEC within the Red Hill Nature Reserve area and immediate surrounds (but not including the large of Box Gum Woodland in Symonston, south of Hindmarsh Drive, of several hundred hectares of additional Box Gum Woodland TEC). Additionally, the works are considered unlikely to fragment the community as they are located near the outer edge of the TEC area. Further given the emergency services tracks/fire trail would only be used for emergency purposes and otherwise remain restricted from public access via bollards and locked gates, with very infrequent traffic use, will ensure that fauna would be able to safely move through this area. Overall, the works would not interrupt the broader movement of flora and fauna, or interrupt gene flow or other ecological process that are important for maintaining the longer term viability of the TEC. As such, no local populations of any flora or fauna would become isolated as a consequence of the works. These works would also be completed under a Construction and Environmental Management Plan which would include measures for the control of weeds, as well as the control and management of erosion and sediment run-off which would mitigate any indirect impacts on the TEC area from these works.

Impact on Native Vegetation

The project will cumulatively remove a total of 5.77 ha of *native vegetation* under the NC Act, including 5.51 ha of native vegetation within the FGC lease, and which is subject to the ACT planning legislation (noting that works located in the adjacent RHNR are within a Designated Area and therefore not subject to ACT planning legislation). Accordingly, these works would trigger the requirement for an EIS to be completed in accordance with Item 2 of Part 4.3, Schedule 4 of the P&D Act.

As stated in Section 2, under this particular trigger an option exists to seek an Environmental Significance Opinion (ESO) from the Conservator (which if provided, removes the requirement for an EIS to be completed). A detailed assessment of the risk of a significant adverse environmental impact associated with the removal of the native vegetation is provided separately to this report as part of the submission requirements for an ESO.

In summarising the impacts associated with the removal of native vegetation, it is noted that the village development will, collectively, result in the removal of up to 70 mature and semi-mature (defined by a trunk diameter of more than 0.15 m) trees that are considered locally endemic to the area (as well as other native, non-endemic trees) (refer to the landscape plans prepared by Redbox Design and included with the DA submission). This removal will have some impact through the reduction in the overall extent of woodland, including more natural components of the woodland areas within the FGC site. Specifically, these impacts include the loss of a potential source for future recruitment/formation of mature hollow-bearing trees, as well as a reduction in shelter and foraging habitat for a number of native species (as discussed further below). To offset this impact, the proponent will be committing to a planting strategy of replacing each of these locally endemic trees at a ratio of 10:1, using suitable native species, and planted in clusters/patches in a manner consistent with the character of the golf course area (as detailed in the Landscape Plans included with the application). Some of the planted trees will be along the village perimeter, whilst many more are expected to be planted in future fairway realignment works. The proponent has also had discussions with the RHR group about the prospect of assisting with the planting of native species in the RHNR area, and will be working with the RHR group to deliver future planting projects over time.

Given the above, the removal of up to 5.77 ha of native vegetation defined under the ACT NC Act is not considered likely to result in any significant adverse environmental impact as almost all of this vegetation does not meet the criteria as the Box Gum Woodland TEC (assessed separately above), and further, the locally indigenous flora species at the site are common species in the ACT and not listed as threatened. Additionally, there are extensive areas of similar native vegetation located within the FGC lease, outside of the development footprint, as well as

the occurrence of the adjacent RHNR, which, combined with the proposed replanting, means that there will no notable reduction in the extent of this vegetation in the longer term.

Table 3 Summary of impacts to vegetation communities

Environmental Feature and Impact Type	Area to be impacted (ha)
ACT & EPBC Box Gum Woodland Community	
Village	0.00
Maintenance facility	0.00
Fairway/Green/Tee realignments	0.00
Practice fairway	0.00
Stray-ball Safety Fences	0.00
Fire trail	0.11
Ponds	0.00
Roads	0.13
Brereton St Emergency Access	0.09
Services	0.04
Total area Box Gum Woodland to be removed	**0.37**
Native Vegetation (under the ACT NC Act) within the FGC lease	
Village	2.08
Maintenance facility	0.65
Fairway/Green/Tee realignments	0.46
Practice fairway	0.74
Stray-ball Safety Fences	0.07
Fire trail upgrades	0.11
Ponds	1.29
Gowrie Dr Road Upgrades	0.13
Brereton St Emergency Access	0.09
Services	0.14
Total area Native Vegetation to be removed	**5.77**

Figure 4 Extent of Box Gum Woodland TEC impacted by proposed works

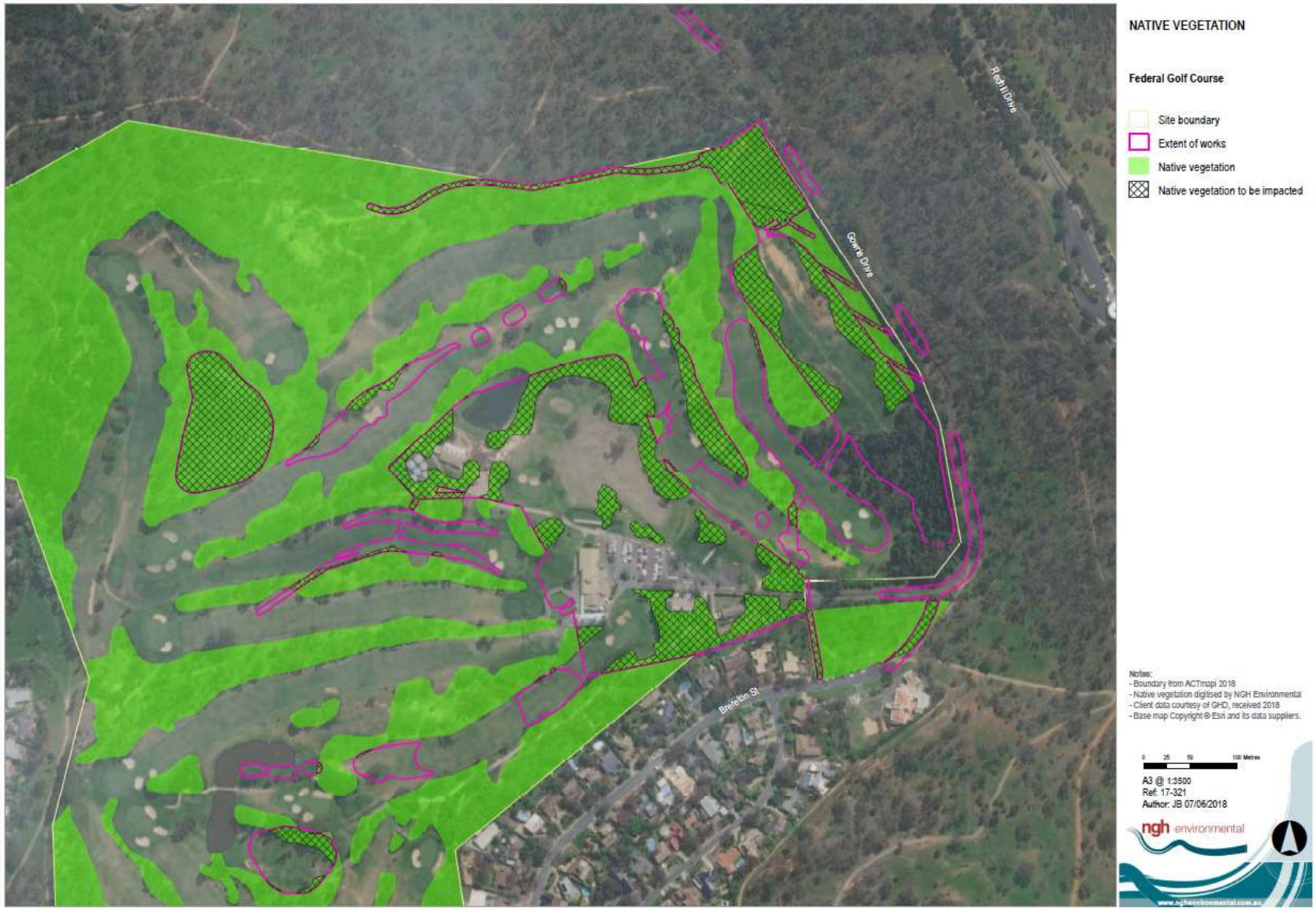

Figure 5 Extent of *native vegetation* (under ACT NC Act) impacted by proposed works

5.3 IMPACTS ON FLORA

As stated in Section 4, two listed-threatened eucalypt species, the Narrow-leaved Black Peppermint and Camden Woollybutt, recorded along the practice fairway and near holes 14 and 15. These trees are planted specimens and are non-local. As such, the removal of these trees is not regarded as being likely to result in an impact to the species, or a naturally occurring local populations of the species, or would affect the conservation status of the species. Therefore, the removal of these trees would/should not trigger the requirement for an EIS under ACT legislation, or require referral to the commonwealth government under the EPBC Act.

No other listed threatened flora species were found within any parts of the development footprint of the project area that would be adversely affected by the works. As noted in Section 4, although not found despite targeted searches, it cannot be completely discounted that the Button Wrinklewort might occur within the area of the proposed road upgrades along Gowrie Drive. Notwithstanding this, even if a few specimens did happen to occur in these areas, the impacts of the proposed works are unlikely to be significant given that the works would not affect the local population of the species in the Red Hill Nature Reserve area. Furthermore, the species has been noted to favour some minor disturbance, and so it is possible that individuals could germinate in the disturbed verges after completion of the road works. Given this, the proposed works along Gowrie Drive should not trigger the requirement for an EIS under ACT legislation, or require referral to the commonwealth government under the EPBC Act in relation to impacts to listed threatened flora species.

5.4 IMPACTS ON FAUNA AND FAUNA HABITATS

5.4.1 Impacts on native terrestrial fauna

The impacts to native terrestrial fauna at the site as a consequence of the development are discussed below, and separated into impacts to arboreal fauna species and impacts to ground dwelling fauna species. The impacts described below are summarised for the entirety of the project development works, with reference made to specific parts of the project works area where relevant/required.

Impacts to arboreal fauna species

Impacts to arboreal fauna species at the site as a consequence of the development relate primarily to the removal of hollow-bearing trees. These trees may provide or are being used for nesting habitat by hollow-dependant fauna species, including both bird and mammal species.

The main hollow-nesting bird species recorded at the site, and likely to account for much of the use or occupation of the available hollows include a number of common species such as Galahs, Sulphur-crested Cockatoos, Crimson and Eastern Rosellas, and Wood Ducks. In addition, some less common species observed at the site (infrequently and in low numbers) and likely to use the hollows for nesting habitat include the Gang-gang Cockatoo as well as the Superb Parrot (listed as Vulnerable under both ACT and Commonwealth legislation).

The hollow-nesting mammal species recorded at the site include Brush-tailed and Ringtail Possums, Sugar Gliders (with a family group observed exiting a hollow during stagwatch surveys – refer to Section 4 for details) and various microbat species (with a small group of microbats seen exiting a spout hollow during stagwatch surveys – refer to Section 4 for details).

A total of 78 hollow-bearing trees were recorded at the site during the tree survey, noting that not all trees within the entire FGC lease were surveyed (refer to Survey Effort at Section 3 as well as Figures 3 and 6 for the survey area and location of identified trees within the survey area). A hollow-bearing tree assessment table is included

at Appendix 4 which provides a summary of all hollow-bearing trees located in the study area, including an indication as to whether each tree will be retained or removed. It is likely that many more hollow-bearing trees occur within the FGC lease outside of the surveyed area (such as in the undeveloped woodland areas across the outer golf course perimeter of Fairways 2, 11, 12 and 13, as well as across much of the southern parts of the site along Fairways 2 through to 8 which are well away from the development areas and are outside of the study area), and which would not be affected by the proposed development.

The proposed development will require the removal of up to 19 (or 24%) of the identified hollow-bearing trees situated within the study area. A summary of the hollow-bearing tree removal required for each component of the project is provided in Table 4. As can be seen in Table 4 the majority of the trees to be removed (12 of the 19) are located within the village footprint, whilst three hollow-bearing trees will require removal for the development of the practice fairway and three hollow-bearing trees will require removal for the development of one of the ponds. Another hollow-bearing tree will also require removal for the development of the maintenance facility.

Given the importance of hollow-bearing resources, and noting that the removal of hollow-bearing trees has been nominated by the ACT conservation Council as a Key Threatening Process under the NC Act, a substantial effort has been made to limit the potential for the removal of these important to result in impacts to hollow-dependant fauna, described further below. Generally, only those hollow-bearing trees located within areas subject to extensive earthworks (cut and fill) are proposed to be removed, given there are practically no opportunities or alternative to enable the retention of these trees. Trees located at/near the edge of the development footprint (i.e. trees 7, 18, 35, and 81) are proposed to be retained, and will be subject to the detailed design measures at the final detailed design and construction stage to ensure their protection.

Table 4 Hollow-bearing tree removal

Environmental Feature and Impact Type	No. of HBT to be removed
Village	12
Maintenance facility	1
Fairway/Green/Tee realignments	0
Practice fairway	3
Stray-ball Safety Fences	0
Firetrail	0
Ponds	3
Roads	0
Services	0
Total # HBT removed	**19**

For the hollow-bearing trees proposed to be removed, it is noted that the proponent will be committing to a process of ensuring that every single hollow present within the impact area is salvaged and relocated to nearby areas. This includes a strategy to either relocate the entire hollow-bearing tree to a suitable nearby area in a standing upright position (i.e. concreted into the ground – refer to sample photos of this process at Appendix 5), or where not possible or feasible, for the hollow-bearing section of the tree (limb or trunk) to be cut-out from the tree and attached to another existing nearby tree. Additional habitat supplementation measures, including preliminary strategies for when the relocation of the hollow is not successful (such as through accidental damage

during the removal and relocation process) will be implemented as required. This may include the provision of nest boxes, glider poles, and trunk cases that mimic exfoliating bark that some microbat species use for shelter.

The overall aim of these measures are to ensure that there is no net loss of hollow resources at the site as a consequence of the proposed development. Furthermore, the removal and relocation process is to be timed to be undertaken outside of the breeding season for most of the key species that would be affected by this process (particularly the Superb Parrot). These management actions are described in more detail in the accompanying Construction (Flora and Fauna) Management Plan at Appendix 5.

Also, as stated in Section 5.2, the village development will, collectively, result in the removal of up to 70 mature and semi-mature local endemic trees (including both hollow and non-hollow bearing trees). This removal will have some impact on native fauna through the reduction in the overall extent of woodland, which provides shelter and foraging habitat for many of the native species that occur at the site. This level of habitat removal is not considered likely to substantially impact native fauna given that it represents only a small percentage in reduction of the total extent of woodland habitat both at the FGC site as well as the extensive woodland habitat in the adjacent RHNR, which is contiguous with the woodland vegetation at the site, and will still remain contiguous post-development. Fauna movements through the site and into/between the RHNR woodland habitat are therefore not likely to be substantially affected by the development. In addition, the removal of this woodland vegetation would be conducted in accordance with tree clearing protocols set-out in the Construction (Flora and Fauna) Management Plan (Appendix 5) to avoid potential risks of injury or death to native faun during the clearing activities.

As stated in Section 5.2, to further offset the minor impact of this removal, the proponent is committing to a planting strategy of replacing each of these locally endemic trees at a ratio of 10:1 within and surrounding the site and in the RHNR area.

The above commitments, as well as other protective and mitigation measures proposed in the management plan, will ensure that the impacts to arboreal and hollow-dependant fauna species are minimised to the greatest extent possible. Specifically, the potential impacts to significant fauna, primarily the Superb Parrot (as the only listed threatened species recorded, or considered likely to occur at the site), are not considered likely to be significant. An assessment of the significance of the impact on the Superb Parrot using the EPBC Significant Impact Guidelines is provided in Section 5.5. This assessment concluded that, based on the mitigation measures proposed, the development is not considered likely to result in a significant impact to this species.

Impacts to ground-dwelling terrestrial fauna

The impacts to ground-dwelling fauna species as a consequence of the proposed development are generally considered minimal. Specifically, within the FGC precinct, there is a general paucity of good quality habitat for ground-dwelling fauna species, primarily as a result of the very high levels of active management of the golf course which has resulted in and almost complete lack of any understorey vegetation structure, with regularly mown grasses that are cut to a very low height (generally below 50 mm) and hence provide no tussock/inter-tussock spaces and generally is of a very low structural complexity, as well as the previous (and continual) removal of any fallen timber, and the lack of any other structures such as boulder piles or rock outcrops.

The dominant native ground-dwelling fauna species found at the site is the Eastern Grey Kangaroo, which is well adapted to golf course environment and observed to be highly abundant within the FGC precinct (the local population was not surveyed but estimated to be between 80 – 150 individuals). Other native ground-dwelling fauna species were found to be very low in numbers and diversity, and limited mainly to a few common reptile (skink) species, with only one other native ground-dwelling mammal species recorded at the site, being a single record of an Echidna at the outer north-eastern edge of the FGC lease, outside of the main playing areas. All other mammal records were introduced species).

The proposed development will result in a reduction in the overall abundance/availability of foraging habitat for Eastern Grey Kangaroos. Specifically, the project would result in the permanent removal of about 3.5 ha of potential foraging habitat out of a total of (at least) about 60 ha of potential foraging habitat across the site (not including the more closed woodland areas at the outer northern edges of the property which would still likely provide some foraging habitat for Kangaroos). This equates to about a 5% reduction in the overall extent of potential foraging habitat for Kangaroos within the golf course. Whilst detailed information on the health of the population, its fecundity, and overall foraging resource requirements are well beyond the scope of this study, the reduction in potential foraging habitat of about 5% is not considered likely to result in a substantial impact to the longer-term health and viability of the local Kangaroo population. Notwithstanding this, it is recommended that a Kangaroo population health monitoring and management program be established in conjunction with the ACT Government to effectively deal with this matter in the longer term.

No other notable impacts to native ground-dwelling fauna are considered likely and no other specific recommendations for any particular native ground-dwelling fauna species are considered necessary beyond the more general measures included in the Construction (Flora and Fauna) Management Plan included at Appendix 5.

5.4.2 Impacts to native aquatic fauna

Impacts to native aquatic fauna are limited to the removal (dewatering and infilling) of the existing large pond near the maintenance area. The species likely to be impacted by this include a number of common frog species, Eastern Long-necked Turtles and to a lesser extent some of the waterbirds that occur in the pond. Whilst no fish were surveyed for in the ponds, very small fish (likely introduced Mosquito-fish, *Gambusia spp*.) were observed at the pond margins.

The impacts to the observed aquatic species at the site are not considered to be extensive given that these are all common species, and that there is another large pond situated less than 400 m away, which can provide an alternative habitat area for them (until the new ponds are constructed, and which may occur before decommissioning of the existing pond). Post-development, there will be a net increase in the extent of available aquatic habitat given the proposed development of four new ponds.

Although the species using the pond are common, and as such, the impacts are not considered likely to be significant, it is nevertheless recommended that a fauna catcher be present during the final stages of the pond dewatering to catch any aquatic species from the pond, and to relocate these to the other pond(s) to reduce the risk of injury or death to native fauna. This recommendation is included in the Construction (Flora and Fauna) Management Plan included at Appendix 5.

Given the above, no further assessment of the significance of the impact, or any further specific mitigation measures are considered necessary.

Figure 6 Location of hollow-bearing trees in the study area impacted by the proposed works

5.5 DETERMINATION OF THE SIGNIFICANCE OF IMPACTS

5.5.1 Assessment of Impact on listed Threatened Ecological Communities

As discussed above, the project may have the potential to impact on the Box Gum Woodland TEC. The significance of the impacts is assessed against the criteria included in the EPBC *Significant Impact Guidelines 1.1. Matters of National Environmental Significance* (DoE, 2013). Under the significant impact criteria for threatened ecological communities, an action will likely have a significant impact if there is a real chance or possibility that it will:

i. reduce the extent of an ecological community
ii. fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
iii. adversely affect habitat critical to the survival of an ecological community
iv. 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
v. 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
vi. cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
    a. assisting invasive species, that are harmful to the listed ecological community, to become established, or
    b. 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
vii. interfere with the recovery of an ecological community.

An assessment of the significance of the impact of the project on the Box Gum Woodland TEC against the above criteria is provided in Table 5.

Table 5 Assessment of significance of impact on the Box Gum Woodland TEC

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
Reduce the extent of an ecological community
The proposed action would result in the removal of up to 0.37 ha of mapped Box Gum Woodland (comprised of about 0.13 ha of low quality woodland within the Gowrie Drive road upgrades/passing bays, and up to about 0.24 ha of moderate quality woodland within the area of the emergency access road and utility service connections from Brereton Street, and across the north of the FGC lease where the proposed upgrades to the existing fire trail will occur). A total of more than about 250 ha of Box Gum Woodland TEC occurs across the RHNR. This equates to a reduction of less than 1% of the extent of this community across the RHNR area. This extent in the reduction of the EEC is not considered significant as it would not place the community at risk of a substantial reduction in its ecological function or process, particularly as the works will occur at the very outer edges of the mapped community, and have been designed to avoid the removal the removal of any mature trees to the greatest extent possible, and will not involve the removal of any other important flora species. The removal is also unlikely to substantially affect any fauna species that rely on this ecological community. Further, the works would be undertaken in accordance with a

construction management plan that will manage/avoid impacts associated with erosion and sediment run-off and/or the spread of weeds into the community.
fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
The works to be undertaken within the community are located at the outer edges of the mapped extent of the Box Gum Woodland TEC, and involve the minor widening (at only short, selected sections for passing bays) of an existing road (Gowrie Drive), as well as the construction of a short section of new emergency access road (from Brereton street) of about 7.5 m in width, and which will be closed to public use (and as such will have very little/infrequent traffic use) and the installation of underground utility service connections (within a 6 m wide construction corridor that would be rehabilitated post-construction). Fauna movement, and the dispersal and gene flow of native plants and animals are not expected to be restricted as a consequence of these minor works. As such, the proposed works would not be expected to fragment or increase fragmentation of the Box Gum Woodland TEC.
adversely affect habitat critical to the survival of an ecological community
The location of the proposed works is not considered to support habitat critical to the survival of the Box Gum Woodland TEC in this area. Specifically, the works to take place within the Box Gum Woodland TEC are minor in scope , and would be located at the outer edges of the community where it interfaces with the golf course and residential areas. More important ecological values for the TEC occur within the main parts of the RHNR, well to the north of the works area, and which would not be affected by the proposed works. The project is therefore unlikely to affect the long-term viability of the Box Gum Woodland TEC in the local area or regionally.
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 is considered unlikely to modify or destroy abiotic factors to the extent that the community's survival would be placed at risk. The project is unlikely to affect groundwater levels, given that no groundwater extractions are proposed, and earthworks would be minor and/or generally would be undertaken in locations that are already likely to have been modified to some extent (i.e. during the original construction of Gowrie Drive and the fire trails/pathways). Soil nutrient levels would not be changed from existing circumstances, and surface water drainage patters are also unlikely to be substantially different to the existing situation within the road corridor, and appropriate erosion and sediment controls would be put in place to ensure the TEC is not affected by any run-off from the road works.
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
Given the minor nature of the works to improve the existing road as well as to construct a short and narrow emergency access road (rarely to be used) combined with the implementation of construction management plans, including post-construction rehabilitation using appropriate species, and some ongoing weed management controls, a substantial change in the species composition and occurrence of the Box Gum Woodland TEC is considered unlikely. The project is also not considered likely to cause

a decline or loss of functionally important species. Micrositing of road works have been designed to avoid, where possible, any important values within the EEC such as remnant trees.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: a. assisting invasive species, that are harmful to the listed ecological community, to become established, or b. 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
a) A variety of non-native invasive flora and fauna species have been recorded in the local area, including within the Box Gum Woodland TEC. Weed management controls will be developed for the works which will outline mitigation and monitoring measures to reduce the likelihood of spreading invasive flora and fauna found on site. It is not expected that the project will increase the number or populations of invasive species if measures are followed. b) Weed management measures are to be developed in accordance with any applicable requirements of the Environment Protection Authority (2011) *Environment protection guidelines for construction and land development in the ACT*, ACT Government, Canberra and to the satisfaction of the ACT Environment Protection Authority (EPA) and PCS. This may include the use of some herbicides to assist in the localised control of invasive weeds, particularly in disturbed and rehabilitated areas. These measures will include notes on the application of any herbicides or fertilisers to ensure it is done according to manufacturer specifications and industry standards to avoid any mobilisation of herbicides into the adjacent Box Gum Woodland TEC. In addition, the CEMP will include spill management measures to manage these impacts, including development of spill response measures (i.e. spill kits etc) and spill avoidance (such as having dedicated machinery refuelling depots).
interfere with the recovery of an ecological community.
The proposed works within the mapped area of the TEC is of a minor scale, is located at the edges of the community's occurrence and will be undertaken in accordance with appropriate construction management practices. It is therefore not expected to interfere with the recovery of this ecological community.
Conclusion: Given the factors described above, including notably the minor scale of works within the TEC, the retention of more than 99% of the mapped extent of this TEC within the RHNR area, as well as further occurrences of the TEC in the local area (i.e. Symonston), and the development of appropriate management and rehabilitation plans, the project is not expected to interfere with the recovery of this ecological community.

5.5.2 Assessment of impact on listed threatened fauna species

The listed threatened species recorded or considered likely to occur at the site includes the Superb Parrot, listed as Vulnerable under the EPBC Act. Under the EPBC significant impact criteria for threatened species listed as vulnerable, an action will likely have a significant impact if there is a real chance or possibility that it will:

i. lead to a long-term decrease in the size of an important population of a species

ii. reduce the area of occupancy of an important population

iii. fragment an existing important population into two or more populations

iv. adversely affect habitat critical to the survival of a species

v. disrupt the breeding cycle of an important population

vi. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

vii. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

viii. introduce disease that may cause the species to decline, or

ix. interfere substantially with the recovery of the species.

An assessment of the significance of the impact of the project on the Superb Parrot against the above criteria is provided in Table 6.

Table 6 Assessment of significance of impact on the Superb Parrot

Superb Parrot (*Polytelis swainsonii*)
lead to a long-term decrease in the size of an important population of a species
While a number of pairs and small flocks (of up to 6 birds) of Superb Parrots were observed at the site, no nesting activity (such as birds seen entering or leaving any hollows) was recorded during the site visits, and there is very little available information on the population size for the species in the local area. Furthermore, there is no accurate available information on which hollow-bearing trees within the FGC are used by the species (given no nesting behaviour was observed), therefore it is uncertain as to whether the site supports an important population of the species. It is noted however that according to records of the species on the Birdata website (https://birdata.birdlife.org.au/explore#map=-31.1047922_144.2313452_7&species_id=277), that the majority of the records for the species in the ACT region, occur across the northern parts of the ACT, suggesting that the site is unlikely to regularly support an important population[4]. Notwithstanding the above, and taking the precautionary principle, it is noted that that the project would require the removal of up to 19 hollow-bearing trees, out of a total of at least 78 trees observed within the general vicinity of the proposed works (and that there would be many more hollow-bearing trees present within the local area, including within the southern and western parts of the course that are well away from the works and for which a detailed hollow-bearing tree assessment was not conducted, as well as within the projected RHNR area). Notwithstanding this, the proposed removal of some existing hollow-bearing trees has the potential to impact on breeding success of some pairs of the species, and may also result in the death or injury of individuals if undertaken in an inappropriate manner. To ensure the project does not result in death, injury or reduced breeding success of Superb Parrots, a number of mitigation strategies have been recommended in the accompanying Construction (Flora and

[4] An 'important population' is a population 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:

- key source populations either for breeding or dispersal;

- populations that are necessary for maintaining genetic diversity, and/or

- populations that are near the limit of the species range.

Fauna) Management Plan (Appendix 5). A summary of these measures include the following general strategies:

- All existing hollows are to be salvaged and relocated to suitable areas outside of the development footprint (such as in areas between fairways or at the edges of the golf course site). This includes either the relocation of the entire tree, or, the relocation of the hollow-bearing section of the tree (i.e. the limb/branch/trunk section containing the hollows). Based on this, no hollows are expected to be lost.
- Where a hollow has not been able to be successfully relocated, it is be replaced by another acceptable hollow feature, such as an artificially hollowed section of branch, or, an appropriately designed nest box structure.
- Removal and relocation of hollows is only to occur outside of the breeding season of the Superb Parrot and after fledglings are likely to have left the nest (i.e. trees should be removed/relocated between April and September).

Assuming that the above measures are successfully implemented and that no hollows would be completely lost from the site (only relocated), and that the timing of the removal is outside of the breeding period for the species, it is considered unlikely that the project would lead to a long-term decrease in the population of the species.

Reduce the area of occupancy of an important population

The removal and salvage/relocation of up to 19 hollow-bearing trees out of a total of at least 78 hollow-bearing trees observed in the vicinity of the works (plus many more unmapped but observed hollow-bearing trees within the broader FGC precinct and within the RHNR) may result in a minor reduction in the area of potential occupancy of the species. However, the proposed relocation of all hollows into suitable adjacent areas (and replacement of hollows by other suitable structures where the relocation has been unsuccessful) means that there would be no overall net loss of potential breeding habitats for the species. In addition to this, based on the available records for the species in the region, it appears that the species occurs in greater numbers across the northern parts of the ACT, and as such, it is questionable as to whether the FGC and surrounds supports and "important population".

Given the above, it is considered unlikely that there would be a substantial reduction in the area of occupancy of an important population of the species to the extent that the population would be placed at risk of localised extinctions.

Fragment an existing important population into two or more populations

The proposed development is not expected to result in any fragmentation of a local population of the species. Superb Parrots are highly mobile species, and capable of flying past/over buildings such as those proposed for this project. Additionally, birds could fly around the development staying with/along the tree-lined fairways to the west of the village. Furthermore, potential breeding habitat will still occur within the FGC site, both in terms of existing hollow-bearing trees located outside of the development footprint, as well as hollow-bearing trees within the footprint that will be relocated to suitable areas outside of the development footprint.

No other components of the project are anticipated to result in fragmentation of a local population.

adversely affect habitat critical to the survival of a species

The project will require the clearing of vegetation which includes hollow-bearing trees located within the development footprint that may be used by the species for nesting habitat, however, as stated above, it is the intention of the project to relocate all of these trees to suitable areas outside of the development footprint, and providing replacement hollows where relocation has been unsuccessful or not possible, such that there would be no overall net loss of tree hollows. Additionally, the removal and relocation of tree hollows would occur outside of the breeding period of the species.

The land surrounding the proposed village would still remain as a functional golf course under the same general management arrangement. Additionally, the local area (including the entirety of the FGC as well as the RHNR) would remain unchanged from the existing situation, so that there is still large areas of suitable habitat for the species to occupy this part of the ACT. As such, the few hollow-bearing trees present within the development footprint are not, by themselves, the only available habitat for the species in the local area. Given the above, it is unlikely that the project will result in a substantial adverse effect on habitat critical to the survival of the species that would result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the species.
disrupt the breeding cycle of an important population
Hollow bearing trees are an important component of breeding habitat for the species. The project will result in the temporary removal and subsequent relocation of these features into suitable areas outside of the development footprint, such that there is expected to be no overall net loss of hollows in the FGC precinct. Further, these proposed works are to take place outside of the breeding period of the species (i.e. relocations of hollows/hollow-bearing trees is to occur between April and September). Given these measures, and the availability of numerous other hollow-bearing trees outside of the development footprint, the project is not expected to result in any notable disruption to the breeding cycle 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 project will result in the modification of potential nesting habitat for the species, given that the hollow-bearing trees to be removed and relocated, whilst still providing hollows, will be somewhat different in their occurrence than their current natural occurrence, particularly when the relocation involves the attached of a section of hollow-bearing limb onto another tree. It is expected that the species will be able to tolerate this modification to a small percentage of the overall available habitat which otherwise will remain intact. The addition of a residential village is also not expected to substantially modify their environment, as the site is located within the central parts of Canberra, and is surrounded to the northwest, west, and south by existing (older) residential suburbs). As noted above, the project is not considered unlikely to result in the destruction, removal or isolation of nesting habitat as the project aims to retain all existing hollows via relocation into nearby areas that the species would still be capable of accessing. In retaining these natural hollows, as opposed to using artificial nest boxes, the overall quality of habitat is not expected to decline. Foraging habitat for the species is considered unlikely to be substantially modified, removed or destroyed given the majority of the FGC leased area will remain as a functional golf course with predominantly the same foraging habitat quality and quantity. Given the above, and the fact that the site is likely to support only a small proportion of the species locally (with most records of the species occurring in the northern parts of the ACT), it is considered unlikely that the project would modify, destroy, remove or 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.
Domestic cats and Indian Mynas, which respectively may prey upon, or competitively exclude Superb Parrots (DoEE, 2018), have been recorded on site or in adjacent residential properties and so are already present in the area. The village management will provide controls over pet ownership, with a likely restriction on cats.

The project therefore would not result in the new introduction of these species becoming established in the species habitat.

Introduce disease that may cause the species to decline

Wild populations of the Superb Parrot may be subject to disease, and specifically, Beak and Feather Disease which is an infectious affliction suffered by parrots, caused by the Beak and Feather Disease circovirus. This common disease apparently originated in Australia. It is capable of causing very high death rates in nestlings, and the potential effects of the disease on parrot populations vary from inconsequential to devastating, depending on environmental conditions, and the general health and immunity of the parrots. Lesions suggesting Beak and Feather Disease virus have been identified in Superb Parrots. It can be introduced to threatened populations of parrots via the movements of common species carrying the disease (DEH 2005q).

Superb Parrots have been reported to be adversely affected by insecticides sprayed onto crops to control insect pests, and it has been reported that Superb Parrots had previously suffered declines as a result of poisoned grains used by farmers to kill crop raiders such as Galahs and Rabbits (DoEE, 2018).

The proposed development, in and of itself, is not expected to result in the introduction or spread of these diseases or poisons that would cause the species to decline.

Interfere substantially with the recovery of a species

The proposed development is not expected to substantially interfered with the recovery of the species. According to the *National Recovery Plan for the Superb Parrot* Polytelis swainsonii (Baker-Gabb, 2011), the main threats to the species include:

- Loss and degradation of habitat
- Irrigation and regulated flows
- Firewood collection
- Timber production
- Disturbance
- Illegal removal of wild birds
- Road-kills
- Poisoning
- Competition for nest hollows

The proposed development of the FGC is not expected to exacerbate any of the above threats. As mentioned previously, the proposal will seek to avoid the loss or degradation of hollows through a comprehensive hollow relocation program. Also, the proposal will not directly lead to increased competition for nest hollows, and disturbance will be not be significantly different from the current situation, with the continuation of the golf course activities surrounded by residential area, and located within the older, central parts of the ACT. The other threats listed above are not considered relevant or likely to occur as a consequence of the development.

In addition to the above, the development is not expected to interfere with any of the listed recovery actions or objectives for the species included in the National Recovery Plan.

Conclusion: the project's impacts will result in the removal of up to 19 hollow-bearing trees. These trees will be removed outside of the breeding season for the species, with the hollow-bearing trees, or hollow-bearing limbs, to be relocated to nearby areas. Given this, and that this part of the ACT is not known as a key breeding area for the species (with the majority of records located across the northern parts of the ACT), and that the project would not increase or exacerbate any key threats to the species, the project is considered unlikely to result in a significant impact to the Superb Parrot.

5.6 CUMULATIVE IMPACTS

The removal of up to 0.37 ha of the Box Gum Woodland TEC, located at the outer edges of an existing protected patch of more than 250 ha is not considered likely to result in any cumulative impacts to this community. No further development that may require additional removal of this community is considered necessary. Additionally, the proponent has been in discussions with the RHR group and members of the ACT Government about the possible contribution of resources toward ongoing rehabilitation programs in the RHNR, as well as the possible donation of unneeded land across the north of the site to be included in an expanded area of the RHNR in the north of the FGC lease (though it is important to note that no specific offset requirements are triggered by this proposal, and any contribution is on a voluntary basis).

The clearing of hollow-bearing trees has been nominated as a Key Threatening Process, and is considered a major factor in the loss of biological diversity, particularly for hollow-dependant fauna species diversity and abundance, and the removal of hollow-bearing trees for this proposal could contribute to (or exacerbate) this process. The cumulative impact of projects, particularly where the removal of hollow-bearing trees is involved, can be considerable given that many of these trees occur as isolated paddock trees on private rural lands. Small losses of these trees, which may be insignificant at a project level, may accumulate over time to cause a significant reduction in the extent of this resource remaining in a region.

Cumulative impacts are considered best addressed by avoiding and minimising impacts on a case by case basis.

The proposal will seek to remove up to 19 identified hollow-bearing trees within the village footprint. Given the importance of these natural resources, and the long periods of time, and sometime unique circumstances they take to develop, the proponent is making a commitment to mitigate and offset these losses by undertaking a process of relocating hollow-bearing trees, or hollow section of trees, to nearby areas, and ensuring that these are re-instated in an appropriate manner (such as concreting larger trunks and trees in the ground in an upright position, or attaching hollow sections of limbs or smaller trunks to other nearby trees). This will ensure that these important trees can continue to function as a habitat resource for hollow-dependant arboreal fauna in the future. This strategy is outlined in the Construction (Flora and Fauna) Management Plan at Appendix 5.

Assuming the successful implementation of this strategy (which includes additional supplementation measures and processes for when a relocation attempt has been unsuccessful), the project is not considered likely to exacerbate this Key Threatening Process to an unacceptable level.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Mbark are working with the Federal Golf Club to assist the club in strengthening its ability to increase its immunity to adverse weather patterns and to update its clubhouse and associated facilities, as well as generally to broaden its income streams to deliver the above two needs as well as to remain a viable entity for its members and other public users in the future. The most viable pathway to this objective is the provision of age-appropriate housing that allows seniors to stay close to their local community rather than move to the urban fringes is important.

This report provides a summary of the detailed site investigations (including both general and targeted field surveys and desktop assessment approaches) at the Federal Golf and surrounding lands at Red Hill, ACT. Based on the site investigations conducted, the key biodiversity values identified at the site include the following:

- The presence of numerous large hollow-bearing trees which support important breeding and shelter habitat for numerous arboreal fauna types
- The presence of the Vulnerable Superb Parrot at the site.
- The presence of the Box Gum Woodland TEC in surrounding areas

The assessment of the potential impacts on the above values as a consequence of the proposed development of the Federal Golf Club has concluded that the project is unlikely to result in a significant adverse impact to these identified matters. Specifically, the proposal will result in the removal of up to 19 identified hollow-bearing trees, out of 78 hollow-bearing trees recorded within the study area (and likely to be many more in the southern parts of the site, outside of the study area). In order to mitigate these impacts, the project proposes to undertake the clearing in the cooler months (April – September), outside of the key breeding periods for most hollow-dependant fauna types, as well as to undertake a strategy of salvage and relocation of the removed hollows so that the overall number of available hollows within the FGC is not reduced. These measures are considered adequate to avoid a significant impact on key hollow-dependant fauna species, including notably, the threatened Superb Parrot, as well as other important species such as the Gang-gang Cockatoo and microbats.

The recorded Box Gum Woodland TEC is also considered unlikely to be significantly impacted by the development. This TEC was found to occur across the northern and eastern parts of the site, and extend into the adjacent RHNR. The project will require the "removal" of up to 0.37 ha of this TEC that will be associated with the necessary establishment of the passing bays along Gowrie Drive, the upgrade (minor widening) of the existing fire trail across the north of the site, as well as the required emergency access road and utility service connections from the end of Brereton Street.

The alignments of these minor road works have been designed to avoid the removal of mature locally indigenous trees, and to a large extent will occur in already partly disturbed areas such as along the Gowrie Drive road verge (for the passing bays), along an existing cleared fire trail, and along the general alignment of an existing concrete path (for the emergency access road). Given the minor extent of removal (in comparison with the more than 250 ha of Box Gum Woodland in the adjacent RHNR, and across the far northern edge of the FGC), and it's location along the outer edge of the TEC which would not result in any notable fragmentation of the community, the impact of the project on the TEC is not regarded as significant.

The above considerations have been supported by an Assessment of Significance for the listed threatened matters (Superb Parrot and Box Gum Woodland TEC), in accordance with the EPBC Significant Impact Guidelines which concluded the project is unlikely to result in a significant impact to these entities. In addition, an evaluation of the likelihood of occurrence and potential impact of the project on other listed entities included in the background

database searches was also conducted, and concluded that the project is unlikely to impact on any of these other threatened matters.

In order to ensure the project does not result in a significant adverse environmental impact, a number of mitigation measures are recommended, as set out in the following section.

6.2 RECOMMENDATIONS

A summary of the mitigation measures that are recommended to avoid or otherwise mitigate or reduce the potential for a significant adverse environmental impact occurring as a consequence of the proposed development include:

- The removal of hollow-bearing trees is to be undertaken in accordance with the measures recommended in the Construction (Flora and Fauna) Management Plan (CFFMP) at Appendix 5. This includes the careful removal of the tree during the clearing stage, and the subsequent relocation of either the whole tree or large trunk/limb sections of the tree into suitable nearby areas. The final decision on each tree's relocation treatment (in terms of whether it is the whole tree or a section of the tree as well as whether it is positioned to be standing up or attached to another tree will come to further assessment of each tree at final detailed design and will require an arborist inspection as well as discussions with an appropriate contractor to determine the viability of moving each tree intact. This information is beyond the scope of this study, however an indicative process for assessing the feasibility of the tree relocation is provided in the CFFMP).
- Final detailed designs should include consideration of retaining walls and the like at the building fringe, as opposed to more extensive areas of gently sloping batters, to maximise the retention of trees located along the development fringe. Further, tree protection measures during the construction stage are to be designed to ensure that all trees located along the development fringe are suitably protected from construction impacts.
- The timing of the removal of hollow-bearing trees is to occur outside the breeding season of the Superb Parrot (i.e. is to occur between April and September).
- The tree plantings proposed should include a component comprised of local endemic species, and provided at a ratio of approximately 10:1 of the removed trees. The tree plantings should also be done to reflect natural settings (i.e. clumping of planting to form small woodland patches), and can be provide across suitable areas of the FGC site, as well as through contributions to planting within the RHNR
- All works at the site, and particularly, in the adjacent offsite areas within the mapped Box Gum Woodland TEC is to proceed in accordance with the management measures recommended in the Construction (Flora and Fauna) Management Plan at Appendix 5, particularly in regards to the establishment of erosion and sediment controls and weed hygiene protocols.
- A Kangaroo population health monitoring program should be established in conjunction with the ACT Government for assessing the health of the local population over time, and providing a management framework for any actions required to actively intervene or undertake specific actions should they be required. As this is part of a broader ACT-wide issue, the responsibility for this matter should not fall on the individual landowner to address and take action on, but should be a collaborative process with ACT Parks and Conservation Service.

7 REFERENCES

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APPENDICES

1. EPBC PROTECTED MATTERS SEARCH RESULTS

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 09/08/17 09:47:33

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 10.0Km

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	4
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	33
Listed Migratory Species:	14

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	22
Commonwealth Heritage Places:	72
Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	25
Regional Forest Agreements:	1
Invasive Species:	35
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties [Resource Information]

Name	State	Status
Historic		
Australian Academy of Science Building	ACT	Listed place
Australian War Memorial and the Memorial Parade	ACT	Listed place
High Court - National Gallery Precinct	ACT	Listed place
Old Parliament House and Curtilage	ACT	Listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	800 - 900km upstream
Hattah-kulkyne lakes	500 - 600km upstream
Riverland	700 - 800km upstream
The coorong, and lakes alexandrina and albert wetland	800 - 900km upstream

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
Litoria castanea Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Endangered	Species or species habitat likely to occur within area
Insects		
Synemon plana Golden Sun Moth [25234]	Critically Endangered	Species or species habitat known to occur within area
Mammals		
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
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Caladenia actensis Canberra Spider Orchid [76138]	Critically Endangered	Species or species habitat known to occur within area
Eucalyptus aggregata Black Gum [20890]	Vulnerable	Species or species habitat likely to occur within area
Lepidium ginninderrense Ginninderra Peppercress [78474]	Vulnerable	Species or species habitat likely to occur within area
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat may occur within area
Leucochrysum albicans var. tricolor Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat known to occur within area
Muehlenbeckia tuggeranong Tuggeranong Lignum [64934]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pelargonium sp. Striatellum (G.W.Carr 10345) Omeo Stork's-bill [84065]	Endangered	Species or species habitat may occur within area
Pomaderris pallida Pale Pomaderris [13684]	Vulnerable	Species or species habitat known to occur within area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
Rutidosis leptorrhynchoides Button Wrinklewort [7384]	Endangered	Species or species habitat likely to occur within area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat known to occur within area
Delma impar Striped Legless Lizard [1649]	Vulnerable	Species or species habitat known to occur within area
Tympanocryptis pinguicolla Grassland Earless Dragon [66727]	Endangered	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

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

Name	Threatened	Type of Presence
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [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.

Name
Defence - 10 WHYALLA ST - FYSHWICK
Defence - 139 CANBERRA AVE - FYSHWICK
Defence - 169 GLADSTONE ST - FYSHWICK
Defence - ADC / JSSC - WESTON
Defence - ADFA MARINE FACILITY - YARRALUMLA
Defence - AIDAB Building
Defence - AUSTRALIAN DEFENCE FORCE ACADEMY
Defence - CAMPBELL PARK
Defence - DEAKIN OFFICES
Defence - DEFENCE RECRUITING UNIT - GIO BUILDING
Defence - HEWLETT PACKARD BUILDING - FERNHILL PARK
Defence - HMAS HARMAN - SYMONSTOWN
Defence - MAWSON OFFICE ACCOMM
Defence - NAVAL COMBAT DATA SYSTEM CENTRE - FYSHWICK
Defence - NCC BUILDING - CANBERRA CITY
Defence - NORTHBOURNE HOUSE
Defence - NORTHCOTT DRIVE PLAYING FIELDS (Addison Rd)
Defence - PHYSICS FIELD TESTING STATION - CANBERRA
Defence - RAAF BASE FAIRBAIRN
Defence - ROYAL MILITARY COLLEGE - DUNTROON
Defence - RUSSELL HILL COMPLEX
Defence - WERRIWA DEPOT

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
State Circle Cutting	ACT	Listed place
Indigenous		
Aboriginal Embassy Site	ACT	Within listed place
Historic		
Acton Conservation Area	ACT	Listed place
Acton Peninsula Building 1	ACT	Listed place

Name	State	Status
Acton Peninsula Building 15	ACT	Listed place
Acton Peninsula Building 2	ACT	Listed place
Acton Peninsula Limestone Outcrops	ACT	Listed place
Anzac Memorial Chapel of St Paul	ACT	Listed place
Apostolic Nunciature	ACT	Listed place
Apple Shed Asset C58	ACT	Listed place
Australian American Memorial and Sir Thomas Blamey Square	ACT	Listed place
Australian Forestry School (former)	ACT	Listed place
Australian National Botanic Gardens (part)	ACT	Listed place
Australian War Memorial	ACT	Listed place
Blowfly Insectary Numbers 1 and 2	ACT	Listed place
Blundells Farmhouse, Slab Outbuilding and Surrounds	ACT	Listed place
CSIRO Main Entomology Building	ACT	Listed place
Canberra School of Art	ACT	Listed place
Canberra School of Music	ACT	Listed place
Captains Quarters Assets B1 to B4	ACT	Listed place
Carillon	ACT	Listed place
Casey House and Garden	ACT	Listed place
Changi Chapel	ACT	Listed place
Commandants House Asset B9	ACT	Listed place
Commencement Column Monument	ACT	Listed place
Communications Centre	ACT	Listed place
Drill Hall Gallery	ACT	Listed place
Duntroon House and Garden	ACT	Listed place
East Block Government Offices	ACT	Listed place
Edmund Barton Offices	ACT	Listed place
General Bridges Grave	ACT	Listed place
High Court - National Gallery Precinct	ACT	Listed place
High Court of Australia	ACT	Listed place
Institute of Anatomy (former)	ACT	Listed place
John Gorton Building	ACT	Listed place
King George V Memorial	ACT	Listed place
Lennox House Complex	ACT	Listed place
National Gallery of Australia	ACT	Listed place
National Library of Australia and Surrounds	ACT	Listed place
National Rose Gardens	ACT	Listed place
Old Parliament House Gardens	ACT	Listed place
Old Parliament House and Curtilage	ACT	Listed place
Parade Ground and Associated Buildings Group	ACT	Listed place
Parliament House Vista	ACT	Listed place
Parliament House Vista Extension - Portal Buildings	ACT	Listed place
Patent Office (former)	ACT	Listed place
Phytotron	ACT	Listed place
R G Menzies Building ANU	ACT	Listed place
RMC Duntroon Conservation Area	ACT	Listed place
Redwood Plantation	ACT	Listed place
Reserve Bank of Australia	ACT	Listed place
Residence Asset B5	ACT	Listed place
Residence Asset B7	ACT	Listed place
Residence Asset C12	ACT	Listed place
Residence Asset C13	ACT	Listed place
Residence Asset C14	ACT	Listed place
Residence Asset C15	ACT	Listed place
Residence Asset C7	ACT	Listed place
Residence Asset C8	ACT	Listed place
Russell Precinct Heritage Area	ACT	Listed place
Sculpture Garden National Gallery of Australia	ACT	Listed place
The CSIRO Forestry Precinct	ACT	Listed place
The Lodge	ACT	Listed place
The Royal Australian Mint	ACT	Listed place
The Surveyors Hut	ACT	Listed place
Toad Hall ANU	ACT	Listed place
University House and Garden	ACT	Listed place
West Block and the Dugout	ACT	Listed place
Westridge House & Grounds	ACT	Listed place
Yarralumla and Surrounds	ACT	Listed place

Name	State	Status
York Park North Tree Plantation	ACT	Listed place
Russell Cafeteria	ACT	Within listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Aranda Bushland	ACT
Australian National	ACT
Black Mountain	ACT
Bruce Ridge	ACT
Callum Brae	ACT
Cooleman Ridge	ACT
Farrer Ridge	ACT
Gossan Hill	ACT
Isaacs Ridge	ACT
Jerrabomberra Wetlands	ACT
McQuoids Hill	ACT
Mt Ainslie	ACT
Mt Mugga Mugga	ACT
Mt Painter	ACT
Mt Pleasant	ACT
Mt Taylor	ACT
O'Connor Ridge	ACT
Oakey Hill	ACT
Queanbeyan	NSW
Red Hill	ACT
The Pinnacle	ACT
Unnamed	ACT
Urambi Hills	ACT
Wanniassa Hills	ACT
West Jerrabomberra	ACT

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Southern RFA	New South Wales

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		

Name	Status	Type of Presence
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands

[Resource Information]

Name	State
Jerrabomberra Wetlands	ACT

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-35.32914 149.10885

Acknowledgements

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

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

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

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

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2. THREATENED SPECIES EVALUATIONS

The tables in this appendix present the habitat evaluation for threatened species, ecological communities and endangered populations included in the database search results using a 10km buffer around project site, for those identified as potentially occurring in the area according to the Commonwealth EPBC *Protected Matters Search Tool*[5].

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

Presence of habitat

Present:	Potential or known habitat is present within the study area
Marginal:	Habitat present is not typical but may be suitable or habitat type is suitable but condition and microhabitat requirements of species are not present
Absent:	No potential or known habitat is present within the study area

Likelihood of occurrence

None:	Species known or predicted within the locality but no suitable habitat present within the study area
Unlikely:	Species known or predicted within the locality but unlikely to occur in the study area
Possible:	Species could occur in the study area
Present:	Species was recorded during the field investigations

Possibility of an impact

No:	The proposal would not impact this species or its habitats. No Assessment of Significance (AoS) is necessary for this species
Yes:	There is a chance that the proposal could impact this species or its habitats. An AoS has been applied to these entities

[5] This online tool is designed for the public to search for matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is managed by the Commonwealth Department of the Environment, Water, Heritage and the Arts.

2.1 EVALUATION OF THE LIKELIHOOD AND EXTENT OF IMPACT ON THREATENED FLORA SPECIES

The flora species and ecological communities list is derived from a search of the Commonwealth's EPBC Protected Matters Search Tool (using a 10km search buffer around the works area) as well as records of species in the local area included in the ACT Government's ACTMapi online mapping database.

It was assumed that this search area and use of government databases would bring in all of the relevant species, although the list of species below omits many irrelevant ones found in aquatic habitats (i.e. fish species), or within the coastal escarpment areas.

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Canberra Spider Orchid *Caladenia actensis* CE EPBC	The Canberra Spider-orchid is endemic to the ACT where it is currently only known from two populations on the western lower slopes of Mount Ainslie and Mount Majura. The species grows on shallow gravelly brown clay loam soils of volcanic origin. Plants occur amongst a ground cover of grasses, forbs and low shrubs, often among rocks. The Canberra Spider-orchid grows in transitional vegetation zones between open grassy woodland (dominated by *Eucalyptus blakelyi, E. melliodora*, and *E. pauciflora*) and dry sclerophyll forest (dominated by *E. rossii*).	Marginal	Unlikely, due to extreme rarity, and lack of suitable understorey habitat	No
Black Gum *Eucalyptus aggregata* V EPBC	The Black Gum is a rare species found from Capertee and Bathurst in central New South Wales, south through the central and southern tablelands. It typically grows in low lying areas with soils that are generally poorly drained, alluvial or swampy, and also in areas where there are natural frost hollows.	Absent	None	No

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Ginninderra Peppercress *Lepidium ginninderense* V EPBC	This short-lived forb species is known from only one site on Belconnen Naval Station, on the Ginninderra Creek floodplain, growing in grassland.	Absent	None	No
Basalt Peppercress *Lepidium hyssopifolium* E EPBC	This short-lived forb species occurs in a variety of habitats including woodland with a grassy understorey and grassland. It appears to respond to disturbance, having appeared after soil disturbance at one site near Bungendore.	Marginal	Unlikely, due to rarity and lack of suitable understorey.	No
Hoary Sunray *Leucochrysum albicans subsp. albicans var. tricolor* E EPBC	This species may be locally common on the Southern Tablelands,. It grows in natural and secondary grasslands and grassy woodlands, often colonising disturbed sites such as road verges and other areas with thin soils, but does not persist well in grazed situations.	Marginal	Unlikely. Potential habitat in Gowrie Dr verge, but not found in work areas. Very low potential with FGC lease	No
Tuggeranong Lignum *Muehlenbeckia Tuggeranong* E EPBC	The Tuggeranong Lignum is known from only a few sites on flood terraces on the eastern banks of the Murrumbidgee River south of Canberra. It occurs on a river bank terraces that are prone to occasional flooding, and on an adjacent gentle slopes in medium to coarse-textured alluvium.	Absent	Unlikely	No
Omeo Stork's-bill *Pelargonium sp. Striatellum* E EPBC	The Omeo Stork's-bill is known to occur in New South Wales, with four populations known in the Southern Tablelands at altitudes of 680–1030 metres above sea level, and in habitats that are usually located just above the high water level of irregularly inundated or ephemeral lakes.	Absent	Unlikely	No

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Pale Pomaderris *Pomaderris pallida* E-EPBC	The Pale Pomaderris is currently known from the ACT, southern NSW and eastern Victoria. In the ACT, this species is scattered along the Cotter, Paddys and Murrumbidgee Rivers and through the Molonglo Gorge. The Pale Pomaderris is found at numerous small sites along the plateau edge and very steep upper slopes and cliffs of river valleys at 480-600 m above sea level. The ACT sites are only on the eastern banks of the rivers, with an aspect ranging from north-westerly through westerly to southerly. The soils are shallow, pale brown sandy loams over granite rock and large, exposed granite boulders may be present.	Absent	Unlikely	No
Tarengo Leek Orchid *Prasophyllum petilum* E-EPBC	Known from three sites on the Southern Tablelands, at Boorowa, and Captain's Flat in NSW and Hall in the ACT, growing in grassland, Box-Gum Woodland or moist grassy flats, with kangaroo grass or wallaby grasses (*Austrodanthonia spp*). Flowers Oct-Nov (Bishop 1996).	Marginal	Unlikely	No
Button Wrinklewort *Rutidosis leptorhynchoides* E EPBC	This perennial forb grows in scattered populations in natural temperate grassland or grassy woodland on the Southern Tablelands. It is known from the Red Hill Nature Reserve	Present in RHNR	Possible. Potential habitat in Gowrie Dr verge, but not found in work areas. Very low potential with FGC lease	No
Small purple-pea *Swainsona recta* E EPBC	Grows in grassland or grassy woodland on the Southern Tablelands and western slopes.	Marginal – level of ongoing disturbance likely to be too high	Low, not found within the site	No

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Austral Toadflax *Thesium australe* V EPBC	This species is found in small populations across eastern NSW, on the coast and from the Northern to Southern Tablelands. It occurs in grassland or grassy woodland, sometimes in damp sites, and is almost invariably associated with kangaroo grass (*Themeda australis*).	Marginal – level of ongoing disturbance likely to be too high	Low, not found	No
EEC's				
Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory	Natural Temperate Grassland occurs on ridges, crests, hillsides, undulating plains, valleys and lower slopes, creeks, drainage lines and river flats. It is usually associated with heavy textured soils with low nutrient levels. Natural temperate grassland comprises of closed grassland, grassland and open grassland whose biomass is dominated by two or more of the perennial native tussock grasses *Themeda triandra* (Kangaroo Grass), *Austrodanthonia spp* (*wallaby grasses*), *Austrostipa spp* (speargrasses), *Bothriochloa macra* (Red Grass, Red-leg Grass) and/or *Poa* spp (snowgrasses). Mature tussock grasses range in height from moderately tall (25–50 cm) to tall (50–100 cm) (Commonwealth Endangered Species Scientific Subcommittee 2000). The spaces between the dominant grass tussocks are occupied by graminoids (grasses and grass-like plants) and a wide range of forbs (herbaceous, non-graminoid plants) which may comprise up to 70% of all plant species and form a distinct, lower layer of vegetation (Environment ACT 2005). Many forbs are from the daisy family (Asteraceae), or are lilies or native legumes. The perennial native grasses together with the native graminoids and forbs usually comprise more than 50% of the total plant cover (Environment ACT 2005).	Absent	Low – the dominance of introduced weeds and the management regimes of the site does not provide the vegetation composition of habitat values necessary to support this ecological community.	No

Species	Description of habitat	Presence of habitat	Likelihood of occurrence	Possible impact?
Box Gum Woodland CEC EPBC	White Box, Yellow Box, Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open grassy woodland community (sometimes occurring as a forest formation) , in which the dominant species are White Box *Eucalyptus albens*, Yellow Box *E. melliodora* or Blakely's Red Gum *E. blakelyi*.	Present	Present within the RHNR, and along Gowrie Drive, as well as extending into the far northern portion of the FGC lease (but outside village footprint).	Yes AoS provided (Section 5.4)

V EPBC = listed as Vulnerable under the Commonwealth *EPBC Act 1999*

CEEC EPBC = Critically Endangered Ecological Community listed under the Commonwealth *EPBC Act 1999*

2.2 EVALUATION OF THE LIKELIHOOD AND EXTENT OF IMPACT ON THREATENED FAUNA

The fauna species list is derived from a search of the EPBC Protected Matters Search Tool, both utilising a 10km buffer around the subject site. With regards to the evaluations provided below for each species included in the search results, fish species and marine waterbirds/shorebirds were collectively discounted from the evaluations given the complete lack of any identifiable suitable aquatic habitat that could potentially support these species.

Species and Status	Description of habitat[6]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Aves				
Regent Honeyeater *Anthochaera phrygia* E EPBC	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia, particularly Box-Ironbark woodland, and riparian forests of River She-oak. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. The species is a generalist forager, mainly feeding on nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks or in mistletoe clumps.	Very marginal. The site does not provide breeding habitat, and there is little/no suitable nectar producing trees or mistletoe, and lack of shrubby understory within the actual development areas.	Unlikely	No
Curlew Sandpiper *Calidris ferruginea* CE - EPBC	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-	Marginal – limited to golf course dams	Dams unlikely to be suitable for this species	No

[6] Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's *Species Profiles and Threats* database (SPRAT) unless otherwise stated.

OEH threatened species database: http://www.threatenedspecies.environment.nsw.gov.au/index.aspx
SPRAT: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Species and Status	Description of habitat[6]	Presence of habitat	Likelihood of occurrence	Potential for impact?
	tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. 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.			
Painted Honeyeater *Grantiella picta* V EPBC	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution The species inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	Absent. Very little mistletoe present on trees in work areas, and lack of suitable understorey habitat within FGC area.	Unlikely	No
Swift Parrot *Lathamus discolor* E EPBC	Abundance of flowering eucalypts and banksias is required by this species, whose range includes southern Queensland to South Australia. This nectar feeder can gather in large groups when feed trees are in flower. It breeds in Tasmania and migrates to the south-east mainland between March and October.	Marginal. Some flowering trees in the surrounding area.	Unlikely	No. Breeds only in tasmania
Superb Parrot *Polytelis swainsonii* V EPBC	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west, although the species has been moving south into the ACT in recent years (OEH, 2018). Inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. Nests in large tree hollows. Species known to be used for nesting are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants.	Present.	Present	Yes. AoS provided at Section 5.4

Species and Status	Description of habitat[6]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Australian Painted Snipe *Rostratula australis* E EPBC	Little is known of the ecology, habitat requirements and reproductive biology of Australian Painted Snipe. They feed in shallow water or at the waters' edge and on mudflats. Most records of Australian Painted Snipe are from temporary or infrequently filled freshwater.	Marginal Th dams are unlikely to provide suitable habitat	Unlikely	No
EPBC Migratory Species				
Fork-tailed swift *Apus pacificus* M EPBC	The Fork-tailed Swift is almost exclusively aerial. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh.	Marginal	Unlikely	No
White-throated needletail *Hirundapus caudacutus* M EPBC	This species is almost exclusively aerial. It has been recorded in the airspace above woodlands, forests and farmlands. It feeds on flying insects. This species migrates to Australia from mid-October and is a regular summer migrant until April when it returns to the northern hemisphere to breed.	Marginal	Possible	No
Black-faced Monarch *Monarcha mlanopsis* M EPBC	The Black-faced Monarch is found along the coast of eastern Australia, becoming less common further south. It is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating. Resident in the north of its range, but is a summer breeding migrant to coastal south-eastern Australia.	Absent, site is outside normal range	Unlikely	No
Satin Flycatcher *Myiagra cyanoleuca* M EPBC	This species is normally found in heavily vegetated gullies in tall forests, woodlands wherever a shrub layer is present. During migration it is often found in coastal forests, woodlands and trees in open country.	Absent	None	No

Species and Status	Description of habitat[6]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Rufous Fantail *Rhipidura rufufrons* M EPBC	This species generally prefers wetter habitats. It is found in the undergrowth of rainforests, and wet eucalypt forests and gullies.	Absent	None	No
Latham's Snipe *Gallinago hardwickii* M EPBC	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation. However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	Marginal – dams provide limited suitable habitat	Unlikely	No
Mammals				
Spotted-tailed Quoll *Dasyurus maculatus* E EPBC	This species is found in a variety of habitat types including rainforest, open forest, woodland, coastal heath and inland riparian forest from the subalpine zone to the coastline. Species requires hollow bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	Absent. The road corridor and work areas along the access track near the top of the hill are generally too open with no suitable denning habitat, and very limited foraging habitat. Presence of dogs in adjacent properties are also likely to deter species from occupying this area.	Unlikely due to isolation from other forest.	No
Greater Glider *Petauroides Volans* V - EPBC	The greater glider is the largest gliding possum in Australia, and is largely restricted to eucalypt forests and woodlands in eastern Australia. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The species has relatively low persistence in small forest fragments, and disperses poorly across vegetation that is not native forest. Modelling suggests that they require native forest patches of at least 160 km2 to maintain viable populations.	Marginal. General woodland vegetation characteristics not considered suitable (i.e. too open and dry).	Unlikely – area is considered too small to support viable population	No

Species and Status	Description of habitat[6]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Koala *Phascolarctos cinereus* V EPBC	This species inhabits eucalypt woodlands and forests over a broad but 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; they are also know from several sites on the southern tablelands.	Marginal	Unlikely	No
Grey-headed Flying-fox *Pteropus poliocephalus* V EPBC	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria. Occur in 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, commonly found in gullies, close to water, or in vegetation with a dense canopy. The closest is likely to be the large colony at Batemans Bay. Forage on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia,* and fruits of rainforest trees and vines. Travel up to 50 km to forage.	Marginal – few fruit trees.	Unlikely – no camp site exists at the site. Individuals may fly over and occasionally land in trees at the site, but would not be a regular inhabitant.	No
Amphibians				
Green and Golden Bell Frog *Litoria aurea* V - EPBC	The Green and Golden Bell Frog occurs mainly along coastal lowland areas of eastern NSW and Victoria. The furthest inland record of the species is at a recently discovered population near Hoskinstown in the Southern Tablelands (referred to as the Molongolo population) (Osborne et al. 2008). The species was previously known from elsewhere in the Southern Tablelands, but is now considered to have disappeared from the ACT and central slopes around Bathurst. Green and Golden Bell Frogs have been found in differing habitat in NSW and Victoria. In NSW, the species commonly occupies disturbed habitats, and breeds largely in ephemeral ponds , but also need various other habitats for different aspects of their life cycle including foraging, breeding, over-wintering and dispersal.	Absent	None	No

Species and Status	Description of habitat[6]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Yellow-spotted Tree Frog *Litoria castanea* E EPBC	Requires large permanent ponds or slow flowing 'chain-of-ponds' streams with abundant emergent vegetation such as bulrushes and aquatic vegetation. Adults are active during spring and summer and bask on sunny days, and moves and forages at night on grassy banks.	Absent	None	No
Reptiles				
Pink-tailed Worm-lizard *Aprasia parapulchella* V EPBC	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South West Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. The species inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda australis*). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites.	Absent. No suitable rocky outcrops are present within the site.	None.	No
Striped Legless Lizard *Delma impar* V EPBC	The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes and possibly the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma and Tumut areas. Also in the ACT, Victoria and south-eastern South Australia. Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component and 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 australis*, *Austrostipa* spp,. *Poa* spp., and occasionally wallaby grasses *Rytidosperma* spp. Goes below ground or under rocks or logs over winter.	Marginal. There is very limited suitable tussocky grassland within the site. Disturbance from passing vehicles and occasional management of verges is also likely to deter this species from occupying the site.	Unlikely.	No

Species and Status	Description of habitat[6]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Grassland Earless Dragon *Tympanocryptis pinguicolla* E EPBC	The grassland earless dragon is a native grassland specialist inhabiting natural temperate grasslands (as described above in Appendix A), where it occupies burrows of the wolf spider (*Lycosa* spp.) and wood cricket (*Coorabooorama canberrae*), embedded surface rocks and tussocks.	Absent	None	No
Insects				
Golden Sun Moth *Synemon plana* CE EPBC	The golden sun moth has been recorded in native grasslands and grassy woodlands containing wallaby grass (*Austrodanthonia* spp.), speargrass (*Austrostipa* spp.), and Bothriochloa, as well as in degraded grasslands dominated by the exotic Chilean needlegrass (*Nassella nessiana*), a weed of national significance.	Marginal	Unlikely	No

E TSC = listed as Endangered under Schedule 1 of the NSW *Threatened Species Conservation Act 1995*

E EPBC = listed as Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

CE EPBC = listed as Critically Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

V TSC = listed as Vulnerable under Schedule 2 of the NSW *Threatened Species Conservation Act 1995.*

CAMBA = Chinese-Australia Migratory Bird Agreement

V EPBC = listed as Vulnerable under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

JAMBA = Japan-Australia Migratory Bird Agreement

M EPBC = listed as Migratory under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

3. FLORA AND FAUNA SPECIES LIST

3.1 FLORA SPECIES LIST

Family	Scientific name	Common Name	Presence			Notes
			Central FGC area	Practice Fairway & Maintenance Area	Roads/Services in RHNR	
Native Species						
Apiaceae	*Daucus glochidiatus*	Native Carrot			1	
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort	1	1	1	
Asteraceae	*Calotis lappulacea*	Yellow Burr Daisy		1		Regionally uncommon
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting		1		
Asteraceae	*Chrysocephalum semipapposum*	Clustered Everlasting		1	1	
Asteraceae	*Cotula australis*	Common Cotula	1			
Asteraceae	*Senecio quadridentatus*	Cotton Fireweed	1			
Asteraceae	*Xerochrysum viscosum*	Sticky Everlasting			1	
Asteraceae	*Cassinia longifolia*	Cauliflower Bush			1	
Asteraceae	*Cassinia quinquefaria*	Sifton Bush			1	
Asteraceae	*Pseudognathalium luteoalbum*	Jersey Cudweed	1	1	1	
Asteraceae	*Vittadinia cuneata*	Fuzzweed		1	1	
Asteraceae	*Vittadinia muelleri*	Narrow-leaf New Holland Daisy		1	1	
Campanulaceae	*Wahlenbergia sp.*	a bluebell	1		1	
Casuarinaceae	*Casuarina cunninghamiana*	River Oak	1			Planted native
Chenopodaceae	*Einadia nutans*	Climbing Saltbush			1	
Convolvulaceae	*Convolvulus erubescens*	Blushing Bindweed			1	
Fabaceae	*Hardenbergia violacea*	False Sasparilla			1	
Fabaceae	*Acacia baileyana*	Cootamundra Wattle	1	1		Planted, non-local native, naturalised, invasive

Family	Scientific name	Common Name	Presence			Notes
			Central FGC area	Practice Fairway & Maintenance Area	Roads/Services in RHNR	
Fabaceae	*Acacia cardiophylla*	Wyalong Wattle		1		Native, non-local
Fabaceae	*Acacia decurrens*	Green Wattle	1	1	1	Native
Fabaceae	*Acacia floribunda*	White Sally Wattle	1			Planted native
Fabaceae	*Acacia implexa*	Hickory Wattle		1	1	Planted FGC & natural recruitment Red Hill
Fabaceae	*Acacia mearnsii*	Black Wattle			1	
Fabaceae	*Acacia buxifolia*	Red-stemmed Wattle	1			Planted native
Fabaceae	*Acacia pravissima*	Wedge-leaved Wattle	1			Planted native
Fabaceae	*Acacia rubida*	Red-stemmed Wattle		1	1	
Geraniaceae	*Geranium ? solanderi*	Native Geranium		1	1	
Haloragaceae	*Gonocarpus tetragynus*	Common Raspwort		1		
Juncaceae	*Juncus australis*	Rush	1	1		
Juncaceae	*Juncus filicaulis*	Rush		1		
Lomandracea	*Lomandra filiformis*	Wattle Mat-rush		1	1	
Myrtaceae	*Eucalyptus bicostata*	Southern Blue Gum	1			Planted, non-local
Myrtaceae	*Eucalyptus blakelyi*	Blakely's Red Gum	1	1	1	Planted FGC & natural recruitment Red Hill
Myrtaceae	*Eucalyptus botryoides*	Bangalay	1			Planted, non-local
Myrtaceae	*Eucalyptus bridgesiana*	Apple Box		1	1	Planted FGC & natural recruitment Red Hill
Myrtaceae	*Eucalyptus cinerea*	Argyle Apple	1			Planted
Myrtaceae	*Eucalyptus cladocalyx*	Sugar Gum	1			Planted, non-local
Myrtaceae	*Eucalyptus elata*	River Peppermint	1			Planted, non-local
Myrtaceae	*Eucalyptus kitsoniana*	Gippsland Mallee	1			Planted, non-local
Myrtaceae	*Eucalyptus leucoxylon*	White Ironbark	1			Planted, non-local

Family	Scientific name	Common Name	Presence			Notes
			Central FGC area	Practice Fairway & Maintenance Area	Roads/Services in RHNR	
Myrtaceae	*Eucalyptus macuarthurii*	Camden Woollybutt	1			Planted, non-local (Vulnerable: NSW & Cth). Schedule 2 NC Act 1980
Myrtaceae	*Eucalyptus macrorhyncha*	Red Stringybark	1			Planted native
Myrtaceae	*Eucalyptus mannifera*	Brittle Gum	1	1		Planted FGC & natural recruitment?
Myrtaceae	*Eucalyptus melliodora*	Yellow Box	1	1	1	Planted FGC & natural recruitment Red Hill
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	1			Planted, non-local (Vulnerable: NSW & Cth). Schedule 2 NC Act 1980
Myrtaceae	*Eucalyptus polyanthemos*	Red Box	1	1		Planted FGC & natural recruitment Red Hill
Myrtaceae	*Eucalyptus sideroxylon*	Mugga Ironbark	1			Planted, non-local
Myrtaceae	*Eucalyptus viminalis*	Ribbon Gum	1			Planted
Myrtaceae	*Melaleuca armillaris*	Bracelet Honey-myrtle	1			Planted
Myrtaceae	*Melaleuca ? decussata*	Totem Poles	1			Planted, non-local
Oxalidaceae	*Oxalis perennans*	Grassland Wood-sorrel	1	1	1	
Phormiaceae	*Dianella ? longifolia*	Blue Flax-lily			1	Rare in ACT
Pittosperaceae	*Bursaria spinosa*	Blackthorn			1	
Pittosperaceae	*Pittosoprum ? undulatum*	Sweet Pittosporum	1			Planted, non-local
Plantaginaceae	*Veronica calycina*	Forest Speedwell	1			
Poaceae	*Austrostipa bigeniculata*	Tall Speargrass		1	1	
Poaceae	*Austrostipa scabra*	Rough Spear-grass		1	1	
Poaceae	*Chloris truncata*	Windmill Grass	1			
Poaceae	*Cynodon dactylon*	Couch	1	1		
Poaceae	*Elymus scaber*	Common Wheatgrass	1	1	1	
Poaceae	*Poa ? sieberiana*	Poa	1		1	

Family	Scientific name	Common Name	Presence			Notes
			Central FGC area	Practice Fairway & Maintenance Area	Roads/Services in RHNR	
Poaceae	*Rytidosperma ? caespitosum*	Ringed Wallaby Grass			1	
Poaceae	*Rytidosperma sp.*	a wallaby grass	1	1	1	
Proteaceae	*Grevillea ? juniperina fortis*	Prickly Spider-flower			1	
Proteaceae	*Grevillea sp.*		1			Planted
Proteaceae	*Grevillea robusta*	Silky Oak	1			Planted, non-local
Proteaceae	*Grevillea rosmarinifolia*	Rosemary Grevillea			1	Planted self propagating non-local. Historical significance
Proteaceae	*Hakea salicifolia*	Willow-leaved Hakea	1			Planted cultivar, non-local. Fruit not nodular
Pteridaceae	*Cheilanthes ? sieberi*	Rock Fern			1	
Rosaceae	*Acaena ovina*	Sheep's Burr			1	
Rosaceae	*Rubus parvilolius*	Native Raspberry			1	
Rutaceae	*Correa* sp. cultivar	White Correa	1			Planted cultivar
Total Native Species			**42**	**28**	**36**	
Apocynaceae	**Vinca major*	Blue Periwinkle	1			
Asteraceae	**Carthamus lanatus*	Saffron Thistle		1		
Asteraceae	**Cirsium vulgare*	Spear Thistle	1	1	1	
Asteraceae	**Conyza ? bonariensis*	Fleabane	1	1	1	
Asteraceae	**Hypochaeris radicata*	Flatweed	1	1	1	
Asteraceae	**Lactuca serriola*	Prickly Lettuce	1	1		
Asteraceae	**Taraxacum officionale*	Dandelion	1	1	1	
Asteraceae	**Tolpis barbata*	Yellow Hawkweed	1	1		
Brassicaceae	**Hirschfeldia incana*	Buchan Weed	1	1		

Family	Scientific name	Common Name	Presence			Notes
			Central FGC area	Practice Fairway & Maintenance Area	Roads/Services in RHNR	
Brassicaceae	**Lepidium africanum*	Common Peppercress	1	1		
Caryophyllaceae	**Cerastium* sp.	a chickweed	1	1		
Caryophyllaceae	**Paronychia brasiliana*	Brazilian Whitlow	1			
Caryophyllaceae	**Petrorhagia nanteuilii*	Proliferous Pink		1	1	
Euphorbiacea	**Euphorbia peplus*	Petty Spurge	1			
Fabaceae	**Medicago arabica*	Spotted Medic	1			
Fabaceae	**Trifolium angustifolium*	Narrow-leaved Clover			1	
Fabaceae	**Trifolium* subterraneum	Subterraneum Clover		1		
Fabaceae	**Trifolium* sp.	a clover		1	1	
Gentianaceae	**Centaurium erythraea*	Common Centaury		1		
Geraniaceae	**Erodium botrys*	Long Storksbill	1		1	
Geraniaceae	**Erodium cicutarium*	Common Storksbill	1		1	
Hypericaceae	**Hypericum perforatum*	St Johns Wort		1	1	
Malvaceae	**Malva neglecta*	Dwarf Mallow	1	1		
Malvaceae	**Modiola caroliniana*	Red-flowered Mallow	1	1		
Oleaceae	**Fraxinus ? oxycarpa*	Ash	1			
Pinaceae	**Cedrus deodora*	a Cedar	1			
Pinaceae	**Pinus radiata*	Monterey Pine		1		
Plantaginaceae	**Plantago lanceolata*	Lamb's Tongue	1	1	1	
Poaceae	**Avena* sp.	Oats		1		
Poaceae	**Bromus* sp.	a Brome	1	1	1	
Poaceae	**Cynodon 'Santa Ana'*	Winter Grass	1	1		

Family	Scientific name	Common Name	Presence			Notes
			Central FGC area	Practice Fairway & Maintenance Area	Roads/Services in RHNR	
Poaceae	**Cynosurus echinatus*	Rough Dog's Tail		1		
Poaceae	**Dactylis glomerata*	Cocksfoot	1	1	1	
Poaceae	**Eleusine tristachya*	Goose Grass	1			
Poaceae	**Fescue sp.*	Fescue		1		
Poaceae	**Lolium perenne*	Perennial Rye Grass	1			
Poaceae	**Nassella trichotoma*	Serrated Tussock		1		
Poaceae	**Nassella neesiana*	Chilean Needle Grass	1	1		
Poaceae	**Phalaris aquatica*	Phalaris		1	1	
Poaceae	**Poa annua*	Winter Grass	1			
Poaceae	**Vulpia* sp.	Squirrel-tail Fescue	1	1		
Rosaceae	**Cotoneaster sp.*	a cotoneaster		1		
Rosaceae	**Crataegus monogyna*	Hawthorn		1		
Rosaceae	**Prunus* sp.	Plum cultivar	1			
Rosaceae	** Rosa rubiginosa*	Sweet Briar	1	1		
Rosaceae	** Rubus* sp.	Blackberry	1	1	1	
Rosaceae	** Sanguisorba minor*	Sheep's Burnet			1	
Rubiaceae	**Galium aparine*	Goosegrass		1		
Salicaceae	**Salix babylonica*	Weeping Willow	1			
Scrophulariaceae	**Orobanche minor*	Lesser Broomrape			1	
Scrophulariaceae	**Verbascum thapsus*	Great Mullein		1		
Solanaceae	** Lycium ferocissimum*	African Boxthorn		1		
Ulmaceaea	**Ulmus* sp.	Elm	1	1		

Family	Scientific name	Common Name	Presence			Notes
			Central FGC area	Practice Fairway & Maintenance Area	Roads/Services in RHNR	
Urticaceae	**Urtica ? urens*	Small Nettle	1			
Verbenaceae	**Verbena* sp.	Purpletop	1			
Exotic Total			**35**	**37**	**17**	
Total – All Species			**77**	**65**	**53**	

3.2 FAUNA SPECIES LIST

Common name	Scientific name	Observation Method
Birds		
Australian King Parrot	*Alisterus scapularis*	
Australian Magpie	*Cracticus tibicen*	
Australian Raven	*Corvus coronoides*	
Australian Wood Duck	*Chenonetta jubata*	
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	
Bell Miner	*Manorina melanophrys*	
Common Bronzewing Pigeon	*Phaps chalcoptera*	
Common or Indian Myna*	**Acridotheres tristis*	
Common Starling*	**Sturnus vulgaris*	
Crested Pigeon	*Ocyphaps lophotes*	
Crimson Rosella	*Platycercus elegans*	
Dusky Moorhen	*Gallinula tenebrosa*	
Eastern Rosella	*Platycercus eximilis*	
Galah	*Eolophus roseicapillus*	
Gang-gang Cockatoo	*Callocephalon fimbriatum*	
Laughing Kookaburra	*Dacelo novaeguineae*	
Little Corella	*Cacatua sanguinea*	
Magpie-lark	*Grallina cyanoleuca*	
Masked Lapwing	*Vanellus miles*	
Noisy Friarbird	*Philemon corniculatus*	
Noisy Miner	*Manorina melanocephala*	
Pacific Black Duck	*Anas superciliosa*	
Pied Currawong	*Strepera graculina*	
Purple Swamphen	*Porphyrio porphyrio*	
Red Wattlebird	*Anthochaera carunculata*	
Silvereye	*Zosterops lateralis*	
Southern Boobook	*Ninox boobook*	
Sulphur-crested Cockatoo	*Cacatua galerita*	
Superb Fairy-wren	*Malurus cyaneus*	
Superb Parrot	*Polytelis swainsonii*	
Welcome Swallow	*Hirundo neoxena*	
White-winged Chough	*Corcorax melanorhamphos*	
Willy Wagtail	*Rhipidura leucophrys*	
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	
Mammals		
Brown Rat*	*Rattus norvegicus*	
Common Brushtail Possum	*Trichosurus vulpecula*	

Common Ringtail Possum	*Pseudocheirus peregrinus*	
Eastern Grey Kangaroo	*Macropus giganteus*	
European Brown Hare*	*Lepus europeus*	
European or Common Rabbit*	**Oryctolagus cuniculus*	
European Red Fox*	*Vulpes vulpes*	
Grey-headed Flying-fox	*Pteropus poliocephalus*	
House Mouse *	*Mus musculus*	
Short-beaked Echidna	*Tachyglossus aculeatus*	
Sugar Glider	*Petaurus breviceps*	
Unidentified microbat species	*n/a*	observed exiting spout hollows of stag tree and seen flying around site during spotlighting surveys
Frogs		
Common Eastern Froglet	*Crinia signifera*	
Eastern Sign-bearing Froglet	*Crinia parinsignifera*	
Peron's Tree Frog	*Litoria peronii*	
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	
Striped Marsh Frog	*Limnodynastes peronii*	
Reptiles		
Grass Skink	*Lampropholis delicata*	
Garden Skink	*Lampropholis guichenoti*	
Eastern Long-necked Turtle	*Chelodina longicollis*	
Eastern Striped Skink	*Ctenotus robustus*	

*Introduced Species

4. TREE TABLES

4.1 HOLLOW-BEARING TREE ASSESSMENT TABLE

HBT No.	Species	Location		Size (est)		Hollows							Removed Y/N
		Easting	Northing	Height (m)	DBH (mm)	LT	MT	ST	LL	ML	SL	Total	
1 (C31)	*E. melliodora*	691796	6088244	28	1000					2	2	4	Y
2 (C145)	*E. blakelyi*	691786	6088215	22	1000				2	2	2	6	Y
3 (C143)	*E. melliodora*	691770	6088229	25	1200	1		1				2	
4 (C24)	*E. blakelyi*	691831	6088128	26	1000					1	1	2	Y
5	*E. blakelyi*	691790	6088104	20	800					3	2	5	
C51	*Stag*	691855	6088073	18	1200			1			1	2	
7	*E. blakelyi*	691764	6088062	25	900			1				1	
8	*E. blakelyi*	691731	6088073	15	900						1	1	
9	*E. blakelyi*	691691	88062	5	600							0	
10	*E. blakelyi*	691650	6088040	15	700		3					3	
11	*E. melliodora*	691727	6087982	25	800		1			1	1	3	
12	*E. melliodora*	691473	6087969	25	1000					1	1	2	
13	*E. mannifera*	691580	6088109	23	800			2				2	
14	*E. rubida*	691631	6088119	25	700		1					1	
15	*E. rubida*	691645	6088123	25	1000		1					1	
16	*E. mannifera*	691730	6088116	30	900		1					1	
17	*E. nicholii*	691773	6088134	28	1500			1				1	
18	*Stag*	691689	6088205	10	600		2					2	
19	*E. melliodora*	691634	6088198	30	1000		2					2	
20	*E. melliodora*	691601	6088172	25	1000	1				1	1	3	
21	*E. melliodora*	691583	6088201	30	1200	2						2	
22	*E. globulus*	691481	6088224	25	1200			1				1	

23	*E. rubida*	691495	6088237	25	900		1	1				2	
24	*E. bridgesiana*	691533	6088274	25	1200		1					1	
25	*Stag*	691523	6088336	15	1200	1			1	4	2	8	
26	*E. melliodora*	691539	6088389	30	1000	1	1			1		3	
27	*E. bridgesiana*	691567	6088287	25	900	1						1	
28 (A19)	*E. melliodora*	691745	6088285	25	1500				2	2	1	5	Y
29	*E. bridgesiana*	691752	6088447	25	1400		2				1	3	
30	*E. melliodora*	691767	6088429	20	900					2		2	
31	*E. bicostata*	691773	6088406	25	1200		1	1				2	
32 (B37)	*E. melliodora*	691866	6088322	22	1000					1		1	Y
33 (B29)	*E. blakelyi*	691872	6088361	18	800			1			1	2	Y
34 (B27)	*E. blakelyi*	691891	6088355	20	1200				4	2		6	Y
35	*E. melliodora*	692028	6088210	28	1200					1		1	
36 (D13)	*E. blakelyi*	692003	6088184	20	700			1				1	Y
37 (D25)	*E. blakelyi*	691948	6088173	22	600		1					1	Y
38 (C10)	*E. melliodora*	691920	6088172	24	800			1				1	Y
39 (D31)	*E. blakelyi*	691930	6088203	22	1000					4	5	9	Y
40	*E. blakelyi*	692126	6088458	25	800		1			1		2	
41	*E. melliodora*	692010	6088507	20	1000	2	1		1			4	Y
42	*E. melliodora*	692018	6088482	25	900					1	1	2	Y
43 (C115)	*E. blakelyi*	691953	6088110	18	800		1					1	Y
47	*E. melliodora*	691621	6088271	20	800					1	1	2	
50	*E. mannifera*	691490	6088394	18	500					1		1	
51	*E. mannifera*	691469	6088412	18	500		1					1	
52	*E. globulus*	691388	6088412	26	800	1	1					2	
53	*Stag*	691461	6088363	20	1200		2					2	Y
54	*E. globulus*	691451	6088362	22	600	1						1	Y
55	*Stag*	691379	6088308	18	600					1	1	2	

56	*E. globulus*	691389	6088273	22	700	1						1	
57	*E. bridgesiana*	691370	6088261	20	800					1		1	
58	*Stag*	691436	6088294	26	700		1					1	Y
59	*E. globulus*	691497	6088315	26	1000	1						1	
60	*E. globulus*	691506	6088327	24	800	1	1					2	
61	*E. bridgesiana*	691665	6088473	18	1500	2			2			4	
62	*E. bridgesiana*	691705	6088471	22	2000	2						2	
63	*E. bridgesiana*	691718	6088477	16	1500				1	1		2	
64	*E. melliodora*	691836	6088507	20	2-800					1		1	
65	*E. melliodora*	691861	6088518	24	1200				1	2		3	
66	*Stag*	691931	6088524	18	700	1	1		2			4	
67	*Stag*	692030	6088404	8	500			1			3	4	
68	*E. blakelyi*	692038	6088297	16	600		1					1	
69	*E. mannifera*	692104	6088284	16	600						1	1	
70	*E. melliodora*	692168	6088414	24	700					1	2	3	
71	*E. blakelyi*	692168	6088317	18	600					2		2	Y
72	*E. blakelyi*	692196	6088126	20	900	1				1	1	3	
73	*E. blakelyi*	692193	6088119	18	1200			1			1	2	
74	*E. blakelyi*	692165	6088127	18	1800		1			1	1	3	
75	*E. melliodora*	692156	6088118	18	500		1					1	
76	*Stag*	692205	6088343	10	400			1				1	
77	*Stag*	692208	6088364	14	500		1					1	
78	*Stag*	692170	6088508	14	600			1			2	3	
79	*E. melliodora*	692129	6088518	18	1000		1	1		2	1	5	
80	*Stag*	692135	6088521	8	500			1				1	
81	*E. melliodora*	692052	6088574	15	600			1				1	
82	*Stag*	692046	6088595	6	500					1	2	3	Y
83	*Stag*	692061	6088603	8	850			2		1		3	
	TOTAL					**20**	**33**	**21**	**16**	**47**	**39**	**176**	**19/78**

CODE:

LT = Large Trunk Hollow

MT = Medium Trunk Hollow

ST = Small Trunk Hollow

LL = Large Limb Hollow

ML = Medium Limb Hollow

SL = Small Limb Hollows

Tree to be retained – detailed design measures to be developed and implemented for protection

5. CONSTRUCTION (FLORA AND FAUNA) MANAGEMENT PLAN

MBARK

Construction (Flora and Fauna) Management Plan

FEDERAL GOLF CLUB RETIREMENT VILLAGE PROJECT

FEBRUARY 2018

ngh environmental

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CONTENTS

1 INTRODUCTION 2

1.1 CONTEXT 2

1.2 BACKGROUND 2

2 EXISTING ENVIRONMENT AND IMPACTS 2

2.1 EXISTING ENVIRONMENT 2

2.1.1 Vegetation communities 3

2.1.2 Flora 3

2.1.3 Fauna 3

2.2 CONSTRUCTION IMPACTS AND RISKS 4

3 PROPOSED MITIGATION AND MANAGEMENT MEASURES 4

3.1 PROTECTION OF NATIVE VEGETATION TO BE RETAINED 4

3.2 REMOVAL AND DISPOSAL OF VEGETATION AND HABITAT 5

3.2.1 Vegetation Removal – General 5

3.2.2 Vegetation Removal –Hollow-bearing Trees 5

3.2.3 Aquatic Habitat Removal 8

3.2.4 Vegetation Disposal 8

3.3 HABITAT REPLACEMENT, RESTORATION & SUPPLEMENTATION 8

3.4 EXCAVATION AND OPERATION OF EQUIPMENT (INCLUDING TRENCHING AND STOCKPILE MANAGEMENT) 9

3.5 WEED MANAGEMENT 9

3.6 REHABILITATION 9

4 COMPLIANCE MANAGEMENT 10

4.3 ROLES AND RESPONSIBILITIES 10

4.4 TRAINING 10

4.5 MONITORING 10

APPENDIX A. EXAMPLES OF TREE RELOCATIONS AND HABITAT SUPPLEMENTATION FEATURES ..... B-I

APPENDIX B WEED MANAGEMENT MEASURE ..... B-I

APPENDIX C REHABILITATION PROTOCOL ..... C-I

1 INTRODUCTION

1.1 CONTEXT

This (preliminary) Construction (Flora and Fauna) Management Plan (CFFMP) has been prepared to establish the environmental management framework for managing impacts on vegetation and fauna during the construction stage of the Federal Golf Club Retirement Village Project (the Project).

This CFFMP has been prepared to address the requirements of the mitigation and management measures listed in the *Federal Golf Club Retirement Village Project Ecological Assessment Report*.

1.2 BACKGROUND

The project is for the proposed development of a retirement and over 55's community village at the Federal Golf Club (FGC). Red Hill, ACT, including seniors housing of up to 125 residences including a mixture of freestanding homes, apartments (maximum 3 stories) and town homes. It is expected that the completed community would comprise around 200 residents and 350 bedrooms. The proposal also includes a new clubhouse building to replace the existing aging and capital intensive facilities and provide a social hub for FGC members, seniors living residents and the broader community.

To support the project, other ancillary developments include upgrades to Gowrie Drive to provide for safer passing opportunities, a new emergency fire access route from the end of the Brereton Street cul-de-sac to join with Gowrie Drive, a new water storage feature (dam) to replace the existing large dam near the existing maintenance area which will be redeveloped within the village area, the realignment of some fairways, greens and tees, including relocating the existing practice facilities to the existing disused area north of Fairway 15, and, provision of a new potable water supply line from the existing water mains at Gowrie Drive.

2 EXISTING ENVIRONMENT AND IMPACTS

2.1 EXISTING ENVIRONMENT

The Federal Golf Course (FGC) is characterised by existing cleared and highly managed fairways, greens and tees, with associated water features, bunkers and the like, with tree-lined fairways ("roughs") supporting a mix of mature remnant trees, as well as introduced native and non-native trees of various ages/size classes. These areas are also highly managed, with an almost complete absence of any shrubby understory vegetation, with the groundcover vegetation consisting predominantly of non-native grasses that are regularly mown to a low height. Additionally, these rough areas are kept free of other debris/structures such as fallen limbs/trunks, rocks and the like.

A number of the larger remnant native trees were found to support tree hollows, and were observed to support a variety of native fauna including various hollow-nesting birds and mammals, including possums, Sugar Gliders and microbats.

The site is currently accessed only via Gowrie Drive, and is bordered to the east and northeast by the Red Hill Nature Reserve, and the south, west and northwest by existing residential areas.

A summary of the site's ecological (flora and fauna) values is provided below.

2.1.1 Vegetation communities

The FGC does not support any identifiable listed threatened ecological community (TEC) at the local or commonwealth level, although some parts of the "roughs" which support predominantly indigenous canopy trees (i.e. Blakely's Red Gum, Yellow Box and Apple Box), does meet the definition of a Native Vegetation area under the ACT *Nature Conservation Act 2014* (NC Act).

The Red Hill Nature Reserve, as well as some parts of the very outer eastern and northern site boundaries, including the Gowrie Drive road corridor, is mapped as supporting the *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* critically endangered ecological community (CEEC), listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and the ACT NC Act-listed *Yellow Box Red Gum Grassy Woodland* endangered ecological community (EEC).

2.1.2 Flora

Threatened flora species

Despite active and targeted surveys, no naturally occurring listed threatened flora species were recorded within the FGC leased area, or within immediately surrounding parts of the site that are also subject to development (such as for the Gowrie Drive road upgrades, or the new emergency access from Brereton St, or the new water line from Gowrie Drive).

As noted in the Ecological Assessment Report (EAR), two non-local eucalypt varieties (Narrow-leaved Black Peppermint *Eucalyptus nicholii* and Camden Woollybutt *Eucalyptus macarthurii)* listed as threatened under the Commonwealth EPBC Act have been planted along the Practice Fairway and Fairways 14 and 15.

Weeds and invasive Species

A number of noxious species occurred including Serrated Tussock *Nassella trichotoma*, possibly Chilean Needlegrass *Nassella nessiana*, *Acacia baileyana*, African Boxthorn, Cotoneaster, Monterey Pine and Blackberry.

2.1.3 Fauna

Fauna studies conducted on site resulted in 57 species of fauna being recorded, listed in **Appendix 4.** In summary, the total number for each fauna group included:

- 34 bird species;
- 12 species of mammals (excluding microbats, although at least one species of unidentified microbat is known to occur at the site based on visual observations) of which seven species are introduced;
- 7 amphibian species; and,
- 4 reptile species.

Threatened fauna species

Threatened species listed under the EPBC Act and/or NC Act observed at the site include the Superb Parrot (*Polytelis swainsonii*, listed as Vulnerable under both the EPBC and NC Acts). A number of pairs and small flocks (up to 6 birds) were recorded at the site in early February 2018.

No other listed threatened fauna species were recorded or are considered likely to occur at the site.

Pest Animals

Pest animals identified onsite included:

- Rabbit (*Oryctolagus cuniculus*)
- Red Fox (*Vulpes vulpes*)
- Brown Rat (*Rattus rattus*)
- House mouse (*Mus musculus*)

2.2 CONSTRUCTION IMPACTS AND RISKS

Key aspects of the Project that could result in impacts to vegetation and fauna include:

- Vegetation and habitat clearance. The consequences of this impact may include:
    - Direct loss of fauna habitat
    - Injury and mortality to fauna during clearing of fauna habitat, including primarily hollow-bearing trees
    - Introduction and spread of noxious weeds and pathogens that may negatively affect native flora and fauna
    - Mobilisation of sediments into adjacent habitats that could smother/suppress vegetation and lead to reduced species diversity of grasses and other native plants
- Noise and vibration which may disturb nesting fauna

The recommended measures to avoid or mitigate these impacts are described further below.

3 PROPOSED MITIGATION AND MANAGEMENT MEASURES

The following measures describe how impacts on vegetation and fauna will be minimised and managed during construction of the Project.

3.1 PROTECTION OF NATIVE VEGETATION TO BE RETAINED

- Prior to the commencement of work, a physical vegetation clearing boundary at the approved clearing limit is to be clearly demarcated and implemented. The delineation of such a boundary would include the use of temporary fencing, flagging tape, parawebbing or similar.
- Works are to avoid and minimise impacts to retained mature eucalypts, wherever possible. This includes avoiding any activity within the dripline of trees, such as excavation, machinery movements, vehicle parking, materials laydown or stockpiling of spoil in these areas. Tree

protection standards should comply with Australian standard AS4970-2009 *Protection of trees on development sites* (Standards Australia, 2009).

- Use (existing) disturbed areas or areas to be developed for vehicle and machinery access, materials laydown, stockpiling of cleared vegetation and the deposition and retrieval of spoil whenever practicable.

3.2 REMOVAL AND DISPOSAL OF VEGETATION AND HABITAT

3.2.1 Vegetation Removal – General

Aside from mature eucalypts and hollow-bearing trees, described specifically below, all other vegetation is to be removed in the following manner:

Native Vegetation

Native vegetation including small trees and shrubs are to be stockpiled separately and mulched. The mulch is then to be stockpiled separately and used as mulch in landscape planting areas

Non-native vegetation

Non-native vegetation including shrubs and trees are to be stockpiled separately and disposed of in an appropriate manner, likely to be taken to the Mugga Lane Resource Management Centre for composting. This vegetation is not to be re-used as mulch in any landscape planting areas given the risk that the material may contain seeds or other vegetative material that could assist in spreading invasive, non-native species (such as African Boxthorn and Blackberry etc).

Topsoil and grassed vegetation

Given the majority of the groundcover grasses at the site are of non-native species, and that the topsoil layers may contain a substantial amount of seed from these species (including non-native species) there is no specific requirement to re-use this material. Should this material be re-used, it is recommended that it be stockpiled separately from the native vegetation described above, and only used in landscaped areas that include non-native/ornamental species plantings. This material is not to be used in area landscaping of areas in or near the mapped occurrence of the Box Gum Woodland community.

3.2.2 Vegetation Removal –Hollow-bearing Trees

The overall aim of this component of the vegetation removal is to ensure that all hollows located within the development footprint are not destroyed, and are safely relocated into a new, suitable location and position.

The removal of hollow-bearing trees is to be proceed generally as follows:

1. Prior to commencement of clearing, all identified and mapped hollow-bearing trees are to be clearly demarcated to ensure they are not accidentally cleared during the removal of other trees/vegetation. This should include the use of BOTH flagging tape AND spray-paint. The construction site foreman is to be made clearly aware that intent of the marking is for their successful relocation.
2. Prior to commencement of clearing, a final relocation strategy for each individual hollow-bearing trees is to be developed, and will include;

a. Clearly identify those trees that are to be removed and relocated wholly (i.e. the entire tree to be relocated), versus those trees where only a portion of the tree may be relocated (i.e. only the section of the trunk/branch supporting the hollow is to be relocated). The process for determining this is generally as follows:
    i. Trees that support multiple hollows (3 or more) and in different parts of the trees, including both trunk and limb hollows, as well as hollows on different limbs, or different parts/sections of the trunk are to be relocated as a whole tree in the ground in an upright position. Refer to the photos below for an example of this process at other sites in the ACT.
    ii. Trees that support only one or two hollows can be sectioned (i.e. the hollow-bearing limb or trunk that supports the hollow can be cut-out from the rest of the tree), and that section relocated. For sections of trunks or large limbs (>200 mm dia), as much of that section of the tree as possible is to be retained, and that section to be relocated in the ground in an upright position. Note that at least a 4 m length of that section should be retained for establishing in an upright position, such that any relocated hollows are a minimum of 2.5 m above ground level wherever possible. If obtaining a 4 m length of section is not possible, then that shorter section should be attached to another tree (if possible), or if not possible to attach to another tree (such as very large limbs >200 mm dia), then that section is to be placed on the ground as habitat for smaller terrestrial fauna, and a replacement arboreal hollow is to be provided (see below and Section 6.5). Potential methods of attachment are discussed further below.
    iii. Trees that are placed in the ground in an upright position are to be adequately supported to ensure they remain in an upright position for as long as possible. This would involve the excavation of a sufficiently large hole in the ground for installation of the trunk, and would require engineering design for stabilisation, which may involve concrete footings to be poured or some other suitable stabilisation method.
    iv. For sections of limbs smaller than 200 mm dia, and which are to be attached to another existing tree, the method of re-attachment is to be clearly identified and measures for the attachment ready and in place prior to the removal of the limb, so that the time between removal and relocation is minimised to the greatest extent possible.
b. Confirmation on the exact location where the relocated tree/limbs/trunk is to be relocated (such as an identified and clearly marked position on the ground or on an existing tree, including provision of the GPS coordinates of the relocated location)
c. For sections of limbs <200 mm dia that are to be attached to another existing retained tree, care is to be taken to ensure that the supporting tree is suitably protected. In particular, care is to be taken to avoid:
    - Overstressing the tree as a result of additional weight
    - Ring barking from strapping
    - Any physical impact from other methods of installation?

    Methods that involve the use of any drilling and screwing into the tree is to be avoided. Suitable methods may include the use of thick strapping, or some other softer yet durable material to pad and protect the trunk/limb of the tree being used for attachment. One possible method is to attach the limb to a pully system that is

fixed to the existing tree, with the pully wire then fixed to the ground. This has the added benefit of allowing the limb to be brought back to ground easily/gently if required. Thin wire should not be used around any living tree or limb. The final method of attachment should be developed and finalised in consultation with a suitably qualified arborist.

   d. Trees selected with the assistance of an arborist for use as attachment points should be mature and healthy trees. Trees displaying evidence of sickness should not be used, and similarly younger trees should also not be used as the attachment may prevent the tree's ability to grow (depending on the final method of re-attachment used).

3. Prior to clearing, all hollow-bearing trees to be removed are to be (re) assessed by a qualified arborist to confirm any issues around the structural integrity of the tree and its ability to safely be moved, including confirmation of any specific measures/recommendations for individual trees to be removed that may require special/individual or on-standard treatment to ensure the highest chance of success in the removal process. This can include the following possible measures:
   a. For whole trees to be removed, advice on the locations of where the sling should be placed, how many slings to be used, and how the sling should be placed around the tree
   b. For sections of trees (i.e. trunk/limbs) to be cut and relocated, an assessment on where the cuts should be made is to be completed by the arborist. This is particularly important to ascertain the depth of the hollow so as to ensure that the cut is made into solid wood and not at points where the hollows could extend to, otherwise risk of death or injury to fauna could occur. If necessary, inspection cameras should be used to provide further accuracy on this assessment.
4. During the clearing and relocation process of hollow-bearing trees/limbs, all smaller outer non-hollow-bearing limbs/branches (smaller than 100 mm dia) should be cleared and the tree/limb given a general tidy-up. Note that this could happen either before, during or immediately after the removal and relocation process.
5. A qualified and experienced fauna spotter will be present during the removal and relocation of all hollow-bearing trees or trunks/limbs
6. The removal and relocation of hollow-bearing trees is to occur in the period from beginning of April to the beginning of September which is outside of the likely breeding period of most fauna species, and particularly, the Vulnerable Super Parrot (*Polytelis swainsonii*) which breeds from about late September/early October, and is likely to be present at the site and could be using some of the hollows.
7. Heavy machinery should not be used for pruning, trimming or felling. Appropriate tools to use are loppers, chain saws and vehicle mounted saws.
8. For circumstances where a removed hollow is not able to be relocated in an upright position or on another tree (either through accidental damage or the shape/nature of the hollow-bearing section of trunk/limb is such that attachment to another tree is not possible), then that section of the tree should be placed on the ground in suitable areas (see comments in Section 6.4.4 below) for ground-dwelling fauna habitat supplementation, and a replacement hollow feature is to be provided (see below in Section 6.5 for habitat replacement and supplantation notes).

3.2.3 Aquatic Habitat Removal

For the dewatering and decommissioning of the existing large dam, a qualified and experienced ecologist will be present during the final stages of the dewatering (i.e. once water levels drop to about 1m in depth) to inspect dams and to capture and relocate any stranded aquatic fauna (such as frogs, turtles and native fish if present). Introduced fish are to be euthanised in a humane manner.

3.2.4 Vegetation Disposal

Cleared vegetation (not including salvaged hollow limbs and trunks as described above) is to be sorted and stockpiled for re-use as per the general process below:

- All weed species are to be disposed of at an appropriate facility for treating such material (i.e. Mugga Waste Management Centre). This material is not to be re-used for any purpose at the FGC.
- All non-invasive non-native shrubs and trees, as well as smaller native trees (<150 mm trunk dia) and shrubs are to be mulched and respread over cleared areas that are planned to be rehabilitated after bulk earthworks have been progressively completed, or, be beneficially used such as in sediment and erosion measures (i.e. to assist in bank stabilisation etc)
- All larger native trees (>150 mm trunk dia), including any larger limbs that have been lopped/pruned from hollow-bearing trees, are not to be mulched and are to be placed into suitable areas of the FGC, typically at the edges of the course and not within the playing boundaries of the course (i.e. in "out of bounds" areas where a penalty stroke would normally apply).

3.3 HABITAT REPLACEMENT, RESTORATION & SUPPLEMENTATION

The following measures are recommended for habitat restoration (replacement) and supplementation.

As stated above, all identified hollows are to be relocated with the priority of relocating the tree or larger hollow-bearing trunks and limbs (>200 mm diameter and >4 m length) inserted into the ground and in an upright position. Where this is not possible, or with smaller sections of trunks/limbs (<200 mm dia and <4 m length) that they be attached to another existing tree to be retained.

Where this is not possible (such as the shape/size of the hollow-bearing section is not suitable for either attaching safely/securely to another tree or inappropriate for relocating in an upright position, or, the hollow section is accidentally damaged during the removal and relocation process), the loss of that arboreal habitat resource is to be replaced. This replacement can include the use of artificially created hollow limbs such as by using sections of limbs of approximately 1 m length and about 150-200 mm diameter, and artificially creating a hollow within the limb. This can be done by drilling out parts of the internal pith and heartwood layers of the limb to a diameter of at least 100 mm dia. These artificially created hollow limbs should then be attached to a retained tree, or, if necessary, can be attached to a feature such as a pole as depicted in the sample photo at Appendix A. If these artificially hollowed limbs are to be used, ideally a variety of size classes would be incorporated to reflect the natural diversity in hollow sizes found to naturally occur on remnant trees, and which are portioned in their use by different fauna types.

When attempts to relocate an existing hollow tree or limb have failed, such as under the circumstances described above, that section of hollow trunk/limb is to be placed on the ground in suitable areas (such as the outer edge of the golf course, or even, if possible, into the RHNR) to provide habitat supplementation for ground-dwelling fauna species (noting that in doing this, the requirement to provide a "replacement"

arboreal hollow still applies; provision of ground habitat does not compensate for the removal of the arboreal habitat).

All larger, solid, trunks and limbs (>100 mm dia) should not be mulched and should be placed on the ground as potential habitat for ground-dwelling fauna. This material can be placed at the outer edges of the golf course, or within areas of rough between or at the edges of fairways that would be deemed out of bounds during normal play.

Any excavated rocks brought up during earthworks should be stockpiled and placed in boulder piles within areas of Box Gum Woodland, either at the outer northern edge of the golf course or in the RHNR

In addition to the above, additional habitat restoration and supplementation can include the following:

- The attachment of thick bark, or bark-like structures to the trunks of existing retained trees to provide additional habitat for microbat species that favour this type of habitat feature
- Standard nest boxes created from plywood may be used as additional habitat supplementation, however these cannot be used (or credited) as a replacement of a lost hollow resource.

For the above two listed measures, these are not to be considered mandatory requirements, and can be done if the opportunity and resources exist to undertake this work. There is no formal requirement for the developer to make any commitment to this work, however, the proponent is happy to consult with the government to look at these opportunities as additional habitat supplementation provisions.

3.4 EXCAVATION AND OPERATION OF EQUIPMENT (INCLUDING TRENCHING AND STOCKPILE MANAGEMENT)

- Management of dust and erosion from works and stockpiling activities will be addressed in the Construction and Environmental Management Plan.
- Works will be avoided during and immediately following heavy rainfall events to protect soils and vegetation at the site.
- Aquatic habitat to be retained will be protected by installation and monitoring of site specific sediment erosion controls in accordance with best practice guidelines.
- Trenches should be backfilled as soon as possible to minimise the chance of fauna becoming trapped. Any trench sections left open for greater than a day would be inspected daily, early in the morning and any trapped fauna removed. The use of ramps or ladders to facilitate trapped fauna escape is recommended (dependent on the size of trench needed).
- When feasible construction materials will not be stockpiled on site for extended periods of time as local fauna may take up residence and be injured when the materials are moved.
- Minimise night works and when undertaking nightworks ensure lights (during nightworks and operation where necessary) are directed away from vegetation and adjacent habitats.

3.5 WEED MANAGEMENT

Implement weed management measures outlined in Appendix B.

3.6 REHABILITATION

Implement rehabilitation measures outlined in Appendix C.

4 COMPLIANCE MANAGEMENT

4.3 ROLES AND RESPONSIBILITIES

All employees and contractors have a general duty of care under applicable local environmental protection legislation. Notwithstanding any specifications in this CFFMP, the developer and the contractors must:

9. Report environmental incidents to their immediate superior and participate in the investigation and corrective action required to reduce environmental harm or the re-occurrence of the incident; and
10. Comply with the requirements of environmental legislation.

Roles and responsibilities will be assigned to individuals to implement this management plan.

4.4 TRAINING

All employees, contractors and utility staff working on site will undergo site induction training relating to flora and fauna management issues.

4.5 MONITORING

Monitoring will be undertaken to ensure works are being carried out in accordance with this CFFMP.

APPENDIX A. EXAMPLES OF TREE RELOCATIONS AND HABITAT SUPPLEMENTATION FEATURES

APPENDIX B WEED MANAGEMENT MEASURE

PURPOSE

The purpose of this Weed Management Measure is to describe how significant weed species present will be managed and controlled throughout pre-construction and construction of the Project to prevent the introduction of weeds to the site and spread of weeds from the site into adjacent sensitive areas.

EXISTING ENVIRONMENT

Notable and problematic weed species present at the site include Serrated Tussock *Nassella trichotoma*, African Boxthorn (*Lycium ferocissimum*), Blackberry (*Rubus fruticosus*), Cotoneaster (*Cotoneaster glaucophyllus*) and Monterey Pine (*Pinus radiata*).

CONSTRUCTION IMPACTS AND RISKS

Key aspects of the Project that could result in the introduction of weeds to the site, spread of weeds within the site, or transportation of weeds from the site, include:

- Movement of weed seed or propagules off and around the Project site by vehicles, plant, equipment and personnel on.
- Movement and stockpiling of weed infested topsoil.
- Clearing and Grubbing and stockpiling of weed infested mulch.
- Inappropriate treatment of weeds or weedy material.
- Inappropriate disposal of weeds.

Potential impacts associated with weeds at the Project site include:

- Spread of weeds into previously non-infested areas (both inside and outside the Project area, including into the Red Hill Nature Reserve and areas of Box Gum Woodland TEC).
- Degradation of native flora and fauna habitat.
- Degradation of native vegetation communities and Endangered Ecological Communities.

ENVIRONMENTAL MITIGATION MEASURES

Environmental mitigation measures to manage weeds include:

- Existing weed management
- Weed hygiene protocols
- Weed Stockpiling, Transportation and Disposal
- Ongoing Weed Control and Monitoring

Existing Weed Management

Environmental mitigation measures to manage existing weeds at the site include:

- Identification and mapping of significant weeds located in construction areas prior to disturbance. Log GPS point, species, and extent of infestation. This will support a clear determination of 'clean' and 'infested' construction zones to assist in weed management.
- Where significant weeds are recorded within the disturbance footprint; treat or remove weeds progressively prior to construction commencing in each area.
- Laydown sites for excavated spoil, equipment and construction materials would be weed-free or treated for weeds prior to use.

Weed Hygiene Protocols

To prevent the spread of weeds through the project site and surrounding areas, all operations will be planned and carried out to ensure that no weeds are imported into the construction area, and that no weeds are spread of existing weed areas within the construction area.

All plant and machinery that enters the site is inspected and free of weeds. The wheels of all machinery and equipment will be washed down before transportation to the site, to avoid the risk of importation of root-rot fungus, other pathogens or weeds into the local area. Plant and equipment will be inspected and cleaned before leaving a worksite that is infested with weeds, to remove any soil and vegetation. This will occur in the plant washdown area in the site compound. Any water from the washdown area will be directed to the compound water quality pond.

Sediment control materials and imported materials would be weed free. Imported materials such as sand and gravel would be sourced from sites which do not show evidence of noxious weeds or Phytophthora infection.

Weed Stockpiling, Transportation and Disposal

All invasive plant species on site are not to be disturbed unless necessary to do so. If they are to be disturbed all material will be disposed of in accordance with any applicable environmental protection legislative requirements, which may include:

a) burying the matter in the ground at a depth that ensures any seeds or vegetative material being disposed of cannot grow; or
b) transporting the matter directly to a waste facility if the matter is –
    i. in a sealed container or a covered vehicle; or
    ii. Covered in a way that prevents the restricted matter from being lost or released during transport; or
c) sealing the matter in plastic and leaving the matter in the sun until any vegetative material being disposed has decomposed.

Under no circumstances are weeds or exotic species to be used to make up any shortfall of mulch.

Ongoing Weed Control and Monitoring

Regular monitoring throughout construction is required to determine the success of weed control treatments. Monitoring will involve monitoring of weed infested areas to determine effectiveness of weed control measures. if previous weed treatments are found to have been ineffective, an Action Plan, and weed treatments will be modified and re-applied as necessary.

APPENDIX C REHABILITATION PROTOCOL

OBJECTIVE OF REHABILITATION

The objective of rehabilitation is to progressively re-establish stable ground surfaces, resistant to erosion and weed ingress, and maximise the potential for colonisation by native ground cover where appropriate. This section applies to the construction phase however monitoring and maintenance will be required throughout the early operational stages of the project and may be required throughout the life of the Project.

The key to effective rehabilitation will be using strategies appropriate to the location and condition of the area disturbed. Ideally, rehabilitation will be achieved with vegetative cover where possible. However, it is accepted that in some areas this will not be achievable such as where there is insufficient topsoil to support vegetative growth.

This rehabilitation protocol is to be read alongside the landscape plans prepared by Redbox Design Group. Where any inconsistencies occur in the recommended planting strategy, the Redbox Design Group plans will take precedence. This plan is to be read as a general overview of the objectives for rehabilitation to ensure that the biodiversity features of the site are appropriately managed and maintained through an effective rehabilitation program. The key focus of this plan is to ensure that exposed surfaces are stabilised to prevent/minimise potential for erosion and sedimentation, to limit the potential for the spread of weeds, and to provide an overview of the planting strategy to replace and/or improve the site's biodiversity and flora values to the greatest extent possible.

AREAS TO BE REHABILITATED

The areas disturbed by the construction process, that do not have or support built form (such as dwellings, roads, clubhouse etc), will be rehabilitated progressively, with the initial objective of first stabilising any bare ground, particularly those with batter slopes of more than 1:1.5, followed by targeted planting in accordance with the landscape management plans prepared by Redbox Design Group.

The initial stabilisation of soils is expected to include early deposition of mulch as soon as possible, followed by planting of appropriate species. This may include the use of grasses and other smaller groundcovers to help establish vegetation as quickly as possible to allow the roots of these plantings to further improve soil stability.

Temporary construction compounds, laydown sites or stockpile sites are also to be rehabilitated as soon as possible upon completion of the works (or the removal of the compound/stockpile).

Ornamental garden beds that are on relatively flat/stable ground can be planted as/when required, and generally, should not be prioritised over sloping ground, or areas that interface with any natural areas (such as adjacent to Box Gum Woodland areas).

GENERAL MEASURES FOR REHABILITATION

- Ensure areas disturbed during construction are stabilised progressively during construction and re-vegetated with appropriate species (i.e. native in native dominated areas) as soon as practical.
- Where possible, plantings and/or seeding within disturbed areas will be comprised of local indigenous species with the primary objective of addressing erosion and sedimentation issues, but also to be consistent with the biodiversity values of the existing surrounding vegetation (e.g. species selections are to be consistent with the surrounding Box Gum

Woodland community). Generally, the planting palette should target an overall ratio of 10:1 native species plantings for every locally indigenous tree species removed (shrubs and immature tree seedlings are not included in this ratio).

- Appropriate planting and/or seeding techniques to be specified for the different areas of the site, in consideration of climatic conditions (sterile cover crops may be required as an intermediate step to ensure early stabilisation of disturbed areas along slopes).
- Include monitoring to meet clear targets, regarding ground cover establishment (see below).

REHABILITATION BENCHMARKS AND INDICATORS

Before and after records are required for areas requiring treatment, including site notes and photographs. Rehabilitation objectives (i.e. stabilisation versus revegetation) will differ depending on site characteristics. Generally, the objective will be to restore existing conditions:

- In steep areas, stabilisation may be the primary objective
- In flatter terrain or where vegetation cover currently occurs, restoring vegetation cover (either natural or assisted) may be the objective.

Indicators may be established and monitored to determine success of rehabilitation and maintenance requirements and whether additional action is required.

TIMING OF REHABILITATION

Rehabilitation will be undertaken progressively as the works are completed. Disturbed areas planned for rehabilitation, will be rehabilitated as soon as practicable following completion of works in each disturbance area.

REHABILITATION SPECIES

Where rehabilitation is undertaken, plantings or seedings will be comprised of local indigenous species with the objective of maintaining the diversity of the existing vegetation.

Direct seeding of grasses will also be considered for areas that require immediate stabilisation. If necessary (as determined by location and surrounding environment), more appropriate plantings can occur once the seeded grasses have stabilised the disturbed area.

Note that the requirement for using local indigenous species does not extend to the ornamental plantings such as street trees and private courtyard areas etc. The use of local indigenous species should be focussed toward the interfaces between the development and the existing woodland areas, as well as within larger areas of open space etc.