

Appendix C

# Pink-tailed Worm Lizard (*Aprasia parapulchella*) impact assessment report





## **Googong Township**

### **Pink-tailed Worm-lizard (*Aprasia parapulchella*) Impact Assessment Report**

**A report prepared for CIC Australia Limited**

**January 2011**

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## ABBREVIATIONS AND COMMON TERMS

DECCW	NSW Department of Environment, Climate Change and Water (formerly NSW Department of Environment and Climate Change)
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (formerly Department of the Environment, Water, Heritage and the Arts)
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPI	Environmental Planning Instrument
Googong Township	The area encompassed by the Googong Township
LEP	Local Environmental Plan
LGA	Local Government Area
NPWS	NSW National Parks and Wildlife Service (now part of the DECCW)
Study Area	The area of the Googong Township assessed as <i>Aprasia parapulchella</i> habitat
PTWL	Pink-tailed Worm-lizard
PTWL Conservation Area	The area of the Study Area proposed to be dedicated and managed as a conservation area for Pink-tailed Worm-lizard.
TSC Act	<i>Threatened Species Conservation Act 1995</i>
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

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## 1.0 EXECUTIVE SUMMARY

Biosis Research Pty Ltd has been engaged by CIC Australia Limited (CIC) through the project management firm Manidis Roberts Pty Ltd to prepare an assessment of the impacts of the Googong Township upon an area of known Pink-tailed Worm-lizard (*Aprasia parapulchella*) habitat occurring within the proposed Googong Township. *A. parapulchella* is listed as 'vulnerable' pursuant to the Commonwealth EPBC Act and the NSW TSC Act.

The Study Area is located in the eastern section of the future Googong Township, directly adjoining Googong Foreshores along the township's eastern boundary. Habitat assessments carried out during broader ecological surveys completed by Biosis Research (2009) throughout the Googong Township identified the *A. parapulchella* potential habitat associated with the lower reaches of Montgomery Creek (i.e. the Study Area).

Targeted field surveys (including turning appropriate shelter rocks) were undertaken to ground-truth information obtained during a desktop review and previous field studies and to gather additional data from the Study Area. The combined information from field and desktop studies was then used to assess the quality and value of the ground-truthed *A. parapulchella* habitat throughout the Study Area.

Approximately 6200 suitably sized shelter rocks were over-turned and 13 live *A. parapulchella* individuals and three sloughs (shed skins) were recorded. Following the field surveys, the quality and value of the *A. parapulchella* habitat throughout the Study Area was mapped according to ranking criteria that incorporated the abundance and density of surface rocks as well as vegetation cover type. Thus, the Study Area has been segmented into areas of 'Very High', 'High', 'Medium' and 'Low' quality habitat for *A. parapulchella* using the ranking criteria.

Results of the field surveys and habitat value mapping were used to inform the preparation of an 'Assessment of Significance' and to make recommendations for the design and ongoing management of a proposed Pink-tailed Worm-lizard Conservation Area. CIC proposes to establish, rehabilitate and dedicate to public ownership, a 52 ha PTWL Conservation Area that would include the entire area mapped as 'Very High' quality habitat, the majority of the 'High' quality habitat and 'Medium' quality habitat as well as restore and protect areas of 'non-habitat', strategically located to increase habitat connectivity and reduce 'edge-effects'.

In addition to the above, CIC proposes to work collaboratively with the eventual land owner/manager(s) to implement a number of management measures to protect and enhance in the long-term, the *A. parapulchella* habitat within the PTWL Conservation Area.

The Significant Impact Criteria Assessment concluded a significant impact on *A. parapulchella* to be unlikely.



## 2.0 INTRODUCTION

Googong Township is a new master-planned town for a population of some 16,000 people. The vision is for a new, vibrant and sustainable community with an economic town centre and strong sense of place. It is the most significant urban development project undertaken by CIC Australia Limited (CIC) to date.

Biosis Research Pty Ltd has been engaged by CIC through the project management firm Manidis Roberts Pty Ltd to prepare an assessment of the impacts of the Googong Township upon an area of known Pink-tailed Worm-lizard (*Aprasia parapulchella*) habitat occurring within the Googong Township.

*Aprasia parapulchella* is listed as ‘vulnerable’ pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the New South Wales *Threatened Species Conservation Act 1995* (TSC Act). As such, this report will act to inform (via the ‘Referral of Matters of National Environmental Significance’ process) the Commonwealth Department of Sustainability, Environment, Water, Population and Communities’ (DSEWPC) assessment of the Googong Township against the provisions of the EPBC Act.

CIC and Manidis Roberts have consulted with SEWPAC and DECCW throughout the development of the Googong Township concept and design. Pre-referral meetings were held between CIC and Manidis Roberts and representatives of SEWPAC on the 23<sup>rd</sup> of November 2010 and 1<sup>st</sup> of December 2010. These pre-referral meetings were held to provide an opportunity for CIC and Manidis Roberts to present the proposed approach to *A. parapulchella* management within the Googong Township (as described herein), and to discuss this approach with the Commonwealth regulatory authority. The representatives of SEWPAC were supportive of the approach to *A. parapulchella* management proposed for incorporation into the development of the Googong Precinct.

With regard to the above, this report provides the following.

- A. In Section 3 Aims – A description of the aims and objectives of this study.
- B. In Section 4 Background about *A. parapulchella* and the Study Area – Background information relating to *A. parapulchella* (i.e. species morphology, habitat etc.), the Study Area, Googong Township and wider locality.
- C. In Section 5 Methodology – Details of the methodology used during the targeted surveys for *A. parapulchella* completed throughout the relevant section of the Googong Township (i.e. the Study Area).
- D. In Section 6 Results – Details of the results gained during the targeted surveys for *A. parapulchella* completed throughout the relevant section of the Googong Township (i.e. the Study Area).
- E. In Section 7 Recommendations for Detailed Design and Management – Detailed recommendations for design and management measures that should be implemented during detailed design and ongoing management of the Googong Township (specifically relating to the proposed Pink-tailed Worm-lizard Conservation Area (PTWL Conservation Area) and surrounds).

- F. In Section 8 Proposed Development – Details of the proposed management of *A. parapulchella* which will be incorporated into the development of the Googong Township.
- G. In Section 9 Impact Assessment – An impact assessment is provided in the form of an ‘Assessment of Significance’ as required pursuant to the EPBC Act.

### 3.0 AIMS

The general aim of this investigation is to assess the impact of the development of the Googong Township upon known *A. parapulchella* habitat which occurs within the eastern section of the Googong Township.

This general aim will be met through meeting the following specific objectives.

1. To accurately determine via field surveys using hand-held GPS equipment (accurate to +/- 3m), the actual on-ground location and extent of the *A. parapulchella* habitat within the Googong Township. This defined area is herein referred to as the Study Area.
2. To describe and map the vegetation cover throughout the Study Area. This mapping has then been used (in addition to published literature and other relevant completed consultant reports) to assess the habitat suitability of the land throughout the Study Area to *A. parapulchella* and thereby rate the quality and value of the habitat.
3. To conduct targeted surveys for *A. parapulchella* throughout the Study Area in order to record the presence or absence of the species across the Study Area. The data collected in this manner has been used to confirm the presence of *A. parapulchella* and to further inform the assessment of habitat quality and value.
4. To provide recommendations for the design and ongoing management of the proposed PTWL Conservation Area (the majority section of the Study Area proposed to be dedicated and managed as a conservation area for *A. parapulchella*) as part of the development of the Googong Township.
5. To assess the impacts upon *A. parapulchella* resulting from the proposed development of the Googong Township incorporating the dedication of the PTWL Conservation Area and appropriate ongoing management regime.

## 4.0 BACKGROUND

### 4.1 Description of Study Area and Surrounds

The Study Area is located in the eastern section of the future Googong Township, directly adjoining Googong Foreshores along the township's eastern boundary (refer Figure 1). The Study Area encompasses a section of Montgomery Creek and associated hillslopes and incorporates approximately 60 hectares of land located within the Queanbeyan River catchment, approximately 10 kilometres to the south of Queanbeyan, New South Wales. The land to the west, northwest and south of the Study Area is predominantly cleared of native woody vegetation and supports grazing land which has undergone varying degrees of pasture improvement.

#### 4.1.1 Landform, topography and soils

The Study Area contains a moderately to deeply incised section of the Montgomery Creek valley and sections of the surrounding hillslopes. The surrounding elevated lands to the west, north and south generally comprise gently undulating hills. Altitude ranges from 640 metres AHD at the point at which Montgomery Creek enters the Googong Foreshores to 720 meters AHD on the elevated ridges located in the southeast and eastern sections of the Study Area.

The geology of the local area consists of Silurian volcanics including the Colinton volcanics and the Capanana Formation (Jenkins 2000). There are various tuffs with minor siltstone, shale, sandstone and limestone (Jenkins 2000). Soils within the Study Area are shallow, infertile, strongly acidic and moderately drained, with outcropping granite rock (Jenkins 2000).

#### 4.1.2 Management history and current vegetation condition

The majority of the Googong Township was cleared of native tree cover by felling and firing carried out post European settlement of the area during the early to mid nineteenth century (Navin Officer 2003). The steepest sections of the Montgomery Creek hillslopes were not cleared, likely due to the skeletal nature of the soils and difficult topography. As is evidenced by the existence of granite tors, scattered surface rocks and the general unevenness of the landscape, it can be determined that the cleared land within and directly adjoining the Study Area has not been subject to cultivation or levelling. Excavation and soil movement within the vicinity of the Study Area appears to have been limited to that associated with the construction of dams across the branches of Montgomery Creek, upstream of the Study Area.

Notwithstanding the above, the Study Area and surrounding sections of the Googong Township have been subject to grazing (notably by sheep) at various intensities for an extended period, likely extending back to the onset of pastoralism post European settlement. The grassland/pasture throughout the more open and flat land located to the west, northwest and south of the Study Area has undergone substantial pasture improvement and modification. This improvement and modification has occurred in support of, and as a result of, the grazing of the land. The resulting grassland/pasture in the pasture improved areas, whilst supporting a native grass component (i.e. primarily *Austrostipa* spp. and *Austrodanthonia* spp.), is dominated by exotic pasture grasses and weeds. The

entirety of the area encompassed by the Googong Township was described by the Johnstone Centre (2004) as 'non-native grassland and agricultural'.

The groundstorey vegetation throughout the Study Area supports a much higher proportion and diversity of native grasses and forbs. Whilst much of the Study Area supports a component of exotic pasture grasses and weeds, native grasses and forbs represent a much larger component of the groundstorey biomass. Kangaroo Grass (*Themeda triandra*) and other native species more sensitive to intense grazing and elevated soil fertility, constitute a significant component of the groundstorey biomass throughout much of the Study Area. No evidence is present to suggest that the land within the Study Area has been subject to a lower intensity grazing regime (i.e. sheep grazing appears to have occurred throughout the entire eastern section of the Googong Township). It can therefore be envisaged that the persistence of native grasses (notably Kangaroo Grass) and forbs has occurred primarily through the exclusion of pasture improvement management practises carried out to elevate soil fertility (i.e. spreading of fertiliser (especially superphosphate), incorporation of clover and other exotic pasture species etc).

A number of dense stands of Burgan (*Kunzea ericoides*) occur within the Study Area. Burgan is a large dense spreading Tea-tree (*Leptospermum*) like native shrub growing to approximately four metres in height. Generally considered a pioneer species, it vigorously occupies areas devoid of groundstorey vegetation and often inhibits growth of native grasses and forbs.

With regard to the above, it can be determined that whilst the vegetation and landform within the Study Area have been impacted upon by a long history of grazing, the land and associated vegetation type and condition within the Study Area has not been degraded to the extent of that located throughout the surrounding areas of the Googong Township. The management of the Study Area for pastoral purposes has resulted in the introduction of exotic grasses, herbaceous and woody weeds and has reduced the dominance of native groundstorey vegetation. It would reasonably be expected that the condition of the groundstorey vegetation throughout the Study Area would continue to degrade if the past and current management regime is maintained.

## 4.2 Description, Habitat and Ecology of *Aprasia parapulchella*

Pink-tailed Worm-lizard (*Aprasia parapulchella*) is a small fossorial reptile from the family Pygopodidae (legless lizards), which has a maximum snout vent length of 14 cm and a total length of about 24 cm. *A. parapulchella* is oviparous (egg laying) with a clutch size of two. Females may need to reach an age of about 3 or 4 years before they can reproduce. There is little data on the breeding behaviour of this species (Osborne and Coghlan 2004). *A. parapulchella* is moderately common within the ACT region and is often the most abundant reptile at locations within its defined habitat type (Osborne *et al.* 1991).

The species lives beneath surface rocks and occupies ant burrows where it feeds on ants, particularly their eggs and larvae (Osborne and Jones 1995). Key habitat features for the presence of *A. parapulchella* are a cover of native grasses (particularly Kangaroo Grass), sparse or no tree cover, little or no leaf litter, and scattered small rocks with shallow embedment in the soil surface (Osborne and Jones 1995).

In the Canberra region, the species is found in areas containing acid volcanic rock types - Late Silurian acid volcanics - that are derived from decomposing rhyodacite, rhyolite or

dacite or other Silurian volcanic rocks (Osborne and Coghlan 2004). The distribution of the species is centred on the ACT and this appears to be related to less soil (and rock) disturbance evidenced by the presence of a native grass cover, particularly Kangaroo Grass, Red-leg Grass (*Bothriochloa macra*) and Wattle Mat-rush (*Lomandra filiformis*) (Osborne and Jones 1995). The likelihood of occurrence of *A. parapulchella* increases with increasing cover of Kangaroo Grass which is a key botanical indicator of suitable habitat in the ACT region, along with Red-leg Grass and Wattle Mat-rush (Jones 1992, 1999; Osborne & Coghlan 2004). Alternatively, dominance of Speargrasses (*Austrostipa falcata*, *A. bigeniculata*) and Tussock Grass (*Poa labillardieri*) decreases the likelihood of finding the species (Osborne and Coghlan 2004; ACT Government 2007; ACT Government 2005). Habitat sites in NSW, while not dominated by Kangaroo Grass, can still be described as native grassland (R. Rehwinkel pers. comm.).

*Aprasia parapulchella* habitat sites in the Queanbeyan region support native grassland, derived grassland and open and dry woodland habitats, usually with many loose and partially embedded rocks. Ground cover is typically dominated by Kangaroo Grass and Wallaby Grass (R. Rehwinkel pers. comm.). Open woodland habitats are dominated by Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*E. blakelyi*), while dry forest areas are dominated by Broad-leaved Peppermint (*E. dives*) and Candlebark (*E. rubida*) (Brown 2010).

However, moderate numbers of disturbed sites dominated by exotic ground cover species, such as Wild oats (*Avena* spp.), Fescues (*Vulpia* spp.), Flat weeds (*Hypocheirus* spp.) and Bromes (*Bromus* spp.) have been found to support at least some individuals, although it was not known if these sites support viable populations (Osborne and Coghlan 2004).

#### **4.2.1 Distribution of *Aprasia parapulchella***

##### **Regional**

*Aprasia parapulchella* occurs in south-eastern Australia, where it is widely but patchily distributed from Gunnedah in northern NSW through southern NSW and the ACT to Bendigo in central Victoria (Brown 2010). The species has been recorded from several widely separated locations between Gunnedah and Albury in NSW, from numerous localities in the ACT, while in Victoria the species has been recorded only from the Bendigo region (Brown 2010). Other locations within this geographic area include near Cooma, Yass, Albury, Cootamundra, Tarcutta and Queanbeyan (DEWHA 2008a; DECC 2009). Records cover a wide altitudinal range, from about 200 m altitude near Bendigo to over 800 m altitude in the ACT (Brown 2010).

##### **Locality**

*Aprasia parapulchella* is regarded as moderately common within the ACT and region where it has a wide and scattered distribution along the rocky hills and slopes of the Murrumbidgee, Molonglo and Queanbeyan River corridors (Brown 2010). *A. parapulchella* has been widely recorded throughout the Googong Foreshores and surrounding areas (Johnstone Centre 2004). Surveys completed by the Johnstone Centre (2004) throughout the wider locality (encompassing the Googong Township) recorded seventeen individuals at two locations: thirteen within the "Talpa" property located within the Queanbeyan River catchment approximately two kilometres to the north of the Study Area; and, four within the "McLean" property located within the Jerrabomberra Creek catchment approximately

three kilometres to the west of the Study Area. The entire “Talpa” property is currently zoned ‘7e. Environment Protection’ on the Queanbeyan Local Environmental Plan (Googong) 2009. The Study Area was not recognised as *A. parapulchella* habitat by the Johnstone Centre (2004) and no targeted surveys were completed within. It is relevant to note however that Reservoir Hill (located in the north-western section of the Googong Township) was considered to support an isolated area of potential habitat by the Johnstone Centre (2004) and surveys were completed with no *A. parapulchella* being recorded.

Habitat assessments carried out during broader ecological surveys completed by Biosis Research (2009) throughout the Googong Township identified the *A. parapulchella* potential habitat associated with the lower reaches of Montgomery Creek (i.e. the Study Area). This potential habitat (in addition to the previously recognised potential habitat on Reservoir Hill) was surveyed by Biosis Research with two live *A. parapulchella* and one slough (shed skin) being recorded within the Study Area (Biosis Research & Ecwise Environmental 2009). Owing to the results and observations of the current study and previous studies conducted by Biosis Research (2009) and the Johnstone Centre (2004), the *A. parapulchella* habitat associated with the lower reaches of Montgomery Creek is considered to constitute the only considerable area *A. parapulchella* habitat within the Googong Township.

#### **4.2.2 Threats to *Aprasia parapulchella***

The main threats to *A. parapulchella* as described in the ‘National Recovery Plan for the Pink-tailed Worm-lizard *A. parapulchella* (Draft)’ (Brown 2010) are:

- habitat loss and fragmentation;
- removal of rocks;
- heavy grazing and trampling;
- invasion of habitat by weeds;
- modification of habitat i.e. tree planting, invasion of woody shrubs in native grasslands;
- changed fire regimes, which lead to a change in vegetation structure;
- recreational activities; and
- predation by introduced predators.

#### **4.2.3 Existing conservation of *Aprasia parapulchella***

As described in the ‘National Recovery Plan for the Pink-tailed Worm-lizard *A. parapulchella* (Draft)’ (Brown 2010), a number of initiatives are already in place to conserve *A. parapulchella*, including the following:

- listing as threatened in the ACT, NSW, Victoria and nationally;
- development of a conservation strategy for some ACT populations (TMS 2007) and an ACT Recovery Plan, published in 1995 (Osborne & Jones 1995);
- identification of priority management actions for NSW and Victorian populations;

- protection of several key populations in conservation reserves in the ACT (Canberra Nature Park, lower Molonglo River Corridor, Murrumbidgee River Corridor), NSW (Nail Can Hill Flora and Fauna Reserve, Fairlane Flora and Fauna Reserve, Googong Foreshore Reserve) and Victoria (Greater Bendigo National Park, Mt Sugarloaf Nature Conservation Reserve);
- the population at One Tree Hill was further protected by the donation of land from Trust for Nature and the acquisition of adjacent undeveloped private land on which the species occurs (P. Johnson pers. comm.);
- establishment of Wildlife Refuges on two private properties near Bredbo where *A. parapulchella* occurs, and fencing undertaken to limit stock access to these areas;
- recent surveys and monitoring of Victorian and southern NSW populations; and
- current research on the distribution and conservation status of *A. parapulchella* populations in the ACT and an assessment of the impact of pastoralism on the taxon (D. Wong pers. comm.).



## 5.0 METHODOLOGY

### 5.1 Approach

The study involved three key tasks: a desktop review; targeted field surveys; and habitat assessment and mapping. The desktop review involved gathering and reviewing existing information on *A. parapulchella* and its ecology. Field surveys were undertaken to ground-truth information obtained during the desktop review and to gather additional data from the Study Area. The combined information from field and desktop studies was then used to assess the quality and value of the ground-truthed *A. parapulchella* habitat throughout the Study Area.

### 5.2 Desktop Study

Existing information on *A. parapulchella* was obtained from a range of sources, including: databases searches; relevant departmental web pages; and, previous studies undertaken on the species particularly with relevance to the local area. A full list of documents cited is provided in the References section of this report.

Local records of *A. parapulchella* were obtained in October 2010 from the NSW DECCW's web-based Wildlife Atlas database.

A number of specialist technical reports and other resources relating to *A. parapulchella* within the region were examined, these included:

- *The reptile, amphibian and mammal fauna of the Stony Creek Nature Reserve, Australian Capital Territory*. Technical Report 6 (DEC 2004; Rauhala 1993);
- *Ribbons of Life Draft Aquatic Species and Riparian Zone Conservation Strategy*. Acton Plan No. 29 (ACT Government 2007);
- *Recovery Plan for the Pink-tailed Worm Lizard Aprasia parapulchella* (Osborne and Jones 1995; Osborne and Jones 1995);
- *Habitat Survey for the Endangered Pink-tailed Legless Lizard Aprasia parapulchella in the Lower Molonglo Valley, ACT* (Jones 1993);
- *DECCW Species profile Aprasia parapulchella*  
<http://threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10061>;  
and
- *DSEWPC Species Profile and Threats Database for Aprasia parapulchella*  
[http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=1665](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1665).

## 5.3 Field Surveys

### 5.3.1 Delineation of extent of habitat

The location and extent of *A. parapulchella* habitat within the Googong Township was determined using hand-held GPS equipment (accurate to +/- 3m), to delineate the outermost boundary of potential habitat. Potential habitat was defined in accordance with the description of *A. parapulchella* habitat provided in Section 4.2 herein. With reference to the delineated location and extent of *A. parapulchella* habitat (i.e. the Study Area as illustrated on Figure 2), it is noted that in addition to this area, numerous small rocky outcrops occur to the west of the Study Area. These small rocky outcrops are isolated from the contiguous habitat within the Study Area, are surrounded by grazed improved exotic pasture and contain few small surface rocks. Nevertheless, surveys for *A. parapulchella* were conducted throughout these rocky outcrops without any *A. parapulchella* being recorded. In this regard, these small isolated rocky outcrops are not considered to support populations of, or habitat for, *A. parapulchella*.

### 5.3.2 Weather conditions

Targeted surveys for *A. parapulchella* were conducted over two days being the 2<sup>nd</sup> and 3<sup>rd</sup> of November 2010. Weather conditions during the fauna surveys were variable and consisted of short overcast periods with occasional scattered showers (<1mm) and extended periods of sunshine. The maximum temperatures recorded at Canberra on the 2<sup>nd</sup> and 3<sup>rd</sup> of November were 17.7 and 19 degrees Celsius respectively (Australian Bureau of Meteorology). These weather conditions were considered good to optimal for the survey method conducted.

### 5.3.3 Survey technique and effort

Targeted surveys for *A. parapulchella* involved approximately 16 person hours devoted specifically to turning suitable shelter rocks throughout the Study Area. *A. parapulchella* shelter under suitable rocks which they use to aid in thermoregulation (Osborne and Jones 1995). In this regard, suitable shelter rocks are considered to be those that are of a thickness that effectively aid in thermoregulation, considered to be 10 to 40cm in diameter and <20cm thick. These searches were carried out by two Biosis Research Ecologists moving across the Study Area in a zig-zag pattern. Surveys were carried out first on the northern side of Montgomery Creek, followed by the southern side. The number of rocks turned was tallied in half-hour increments and totalled approximately 6200 suitable shelter rocks. All rocks were immediately and carefully returned to their pre-disturbed position. Live individuals were measured (length), photographed and placed back at the base of the subject rock. All *A. parapulchella* individuals replaced in this manner promptly returned underneath the rock. Sloughs were also recorded and photographed and a GPS waypoint was marked at each recording location.

### 5.3.4 Vegetation and habitat quality mapping

The vegetation cover throughout the Study Area was recorded post completion of the targeted searches and concurrently with the delineation of the extent of the *A. parapulchella* habitat (referred to as habitat as apposed to potential habitat, post confirmation of *A. parapulchella* population during targeted surveys). The floristic

composition, structure and condition of the vegetation cover are important limiting factors for *A. parapulchella* potential habitat. These factors were recorded throughout the Study Area and used to make determinations relating to the quality of the *A. parapulchella* habitat.

### **5.3.5 Limitations**

The completed targeted surveys for *A. parapulchella* were not influenced by any significant limitations. The surveys were intensive, incorporated the entire Study Area and were conducted during suitable weather and at the optimal time of year. Furthermore, the wet 2010 winter and spring have resulted in plentiful growth of both native and exotic plant species, providing optimal conditions to assess the vegetation cover throughout the Study Area.

## 6.0 RESULTS

### 6.1 Targeted Surveys for *Aprasia parapulchella*

The targeted surveys for *A. parapulchella* conducted throughout the Study Area on the 2<sup>nd</sup> and 3<sup>rd</sup> of November 2010 resulted in the turning of approximately 6200 suitably sized shelter rocks and the recording of 13 live individuals and three sloughs. Figure 2 illustrates the locations in which the *A. parapulchella* were recorded. The locations of the *A. parapulchella* recorded during the surveys completed by Biosis Research in 2009 (two live individuals and one slough) have also been presented on Figure 2.

All *A. parapulchella* recorded during the November 2010 surveys were located within high quality habitat as described in Section 6.2 below. On two occasions, three live *A. parapulchella* were recorded sheltering under the same rock (each rock was located within the cluster of recordings illustrated on Figure 2 and was approximately 30cm in diameter and 5-10cm thick). The microhabitats under the rocks turned during the surveys supported an abundance of invertebrate fauna including scorpions, centipedes, spiders and various species of ant (a particular abundance of ant eggs and larvae was noted). It is evident from the cluster of individuals recorded in the central-southern section of the Study Area that a substantial population of *A. parapulchella* occurs in this location. However, it is also apparent from the additional recorded locations of individuals elsewhere within the Study Area that the species is widespread throughout the Study Area and certainly not confined to the area of optimal habitat surrounding the recorded cluster.

Plates 1 and 2 below show examples of the *A. parapulchella* recorded during the November 2010 surveys.



Plate 1. One *A. parapulchella* found sheltering under a rock.



Plate 2. Three *A. parapulchella* found sheltering under the same rock.

## 6.2 Habitat Assessment and Mapping

Two features of the landscape are considered to be limiting habitat features for the presence of *A. parapulchella*; these features are described as follows.

1. Surface rocks – Presence of scattered small surface rocks with shallow embedment in the soil surface. *A. parapulchella* require these rocks to shelter under during spring and early summer as they aid in thermoregulation. As such, the presence of suitable shelter rocks is widely recognised as a limiting habitat feature for the presence of the species (Osborne *et al.* 1991, Osborne and Jones 1995, Osborne and Coghlan 2004). It is also known that the scatter density of suitable shelter rocks within an area of habitat is an indicator of the quality of the habitat and its ability to sustain a viable population (i.e. higher scatter density generally indicates higher quality habitat (Osborne and Coghlan 2004; ACT Government 2007; ACT Government 2005).
2. Vegetation cover – High quality *A. parapulchella* habitat is characterised by a cover of native grasses, particularly dominated by Kangaroo Grass (*Themeda triandra*) and other native grasses and sedges including Red-leg Grass (*Bothriochloa macra*) and Wattle Mat-rush (*Lomandra filiformis*). Habitat suitability decreases with the presence of Speargrasses (*Austrostipa scabra* var. *falcata*, *A. bigeniculata*) and Tussock Grass (*Poa labillardieri*) and is greatly reduced by the presence of a considerable component of exotic pasture species and weeds (Osborne and Coghlan 2004; ACT Government 2007; ACT Government 2005). Suitability of habitat (and consequent presence of *A. parapulchella*) is reduced by tree and shrub cover (and associated leaf litter), however the species is still recorded within areas of open woodland which support the other limiting habitat features (i.e. native grass groundstorey and scattered surface rocks).

A component of this study has been to assess the quality and value of the *A. parapulchella* habitat throughout the Study Area in order to:

- inform the detailed design of the Googong Township regarding the areas of highest conservation value and opportunities that exist to offset the loss of habitat if necessary; and
- allow for an informed determination to be made regarding the significance the impacts upon *A. parapulchella* habitat that would occur during the development of the Googong Township.

With regard to the above, the Study Area has been segmented into areas of ‘Very High’, ‘High’, ‘Medium’ and ‘Low’ quality habitat for *A. parapulchella* using the ranking criteria detailed in Table 1 below. Representative photographs of each general vegetation cover type (excluding riparian vegetation) are provided as Plates 3 to 8 below.

**Table 1 – A. *parapulchella* habitat quality assessment.**

	Rock Scatter Density		
	High	Medium	Low
Native Themeda grassland – Predominantly undisturbed grassland (subject to recent low - moderate intensity grazing) dominated by or containing a significant component of Kangaroo Grass ( <i>Themeda triandra</i> ) and other native grasses, sedges and forbs including Red-leg Grass ( <i>Bothriochloa macra</i> ) and Wattle Mat-rush ( <i>Lomandra filiformis</i> ), Common Everlasting ( <i>Chrysocephalum apiculatum</i> ), Austral Bears-ear ( <i>Cymbonotus lawsonianus</i> ), and Pale Sundew ( <i>Drosera peltata</i> ). The small native shrub Grey Guinea Flower ( <i>Hibbertia obtusifolia</i> ) also occurs scattered throughout.	1	2	3
Native <i>Austrostipa</i> grassland – Moderately disturbed grassland (subject to recent moderate intensity grazing) dominated by Corkscrew ( <i>Austrostipa scabra</i> var. <i>falcata</i> ) and Wallaby Grasses ( <i>Austrodanthonia</i> spp.) and containing sparsely distributed Wattle Mat-rush ( <i>Lomandra filiformis</i> ). Exotic species include Flat Weeds ( <i>Hypochoeris</i> spp.) and Clovers ( <i>Trifolium</i> spp.).	4	5	6
Open woodland over native grassland – Open woodland with a canopy consisting of Yellow Box +/- Blakely's Red Gum +/- Apple Box ( <i>E. bridgesiana</i> ) and a groundstorey dominated by native grasses, sedges and forbs including Red-leg Grass, Mat-rushes ( <i>Lomandra longifolia</i> and <i>L. multiflora</i> ), Native Geranium ( <i>Geranium antrorsum</i> ). Exotic species include scattered Sweet Briar ( <i>Rosa rubiginosa</i> ), African Boxthorn ( <i>Lycium ferocissimum</i> ), Flat Weeds, Clovers and Proliferus Pink ( <i>Petrorhagia nanteuilii</i> ).	7	8	9
Exotic pasture – Exotic pasture dominated by Phalaris, Barley Grasses ( <i>Hordeum</i> spp.), Perennial Ryegrass ( <i>Lolium perenne</i> ), Fescue ( <i>Vulpia</i> spp.) and Cape Weed ( <i>Arctotheca calendula</i> ) with minor components of Wallaby Grasses.	10	11	12
Open woodland over exotic pasture – Open woodland with a canopy consisting of Yellow Box ( <i>Eucalyptus melliodora</i> ) and Blakely's Red Gum ( <i>E. blakelyi</i> ) and a groundstorey dominated by exotic pasture species and weeds including Safron Thistle ( <i>Carthamus lanatus</i> ), Barley Grasses, Cape Weed, Mallow ( <i>Mallow</i> spp.), Shepherd's Purse ( <i>Capsella bursa-pastoris</i> ) and Clovers.	13	14	15
Dense shrubland – Dense shrubland dominated by Burgan ( <i>Kunzea ericoides</i> ), Shiny Cassinia ( <i>Cassinia longifolia</i> ) and Hopbush ( <i>Dodonaea viscosa</i> ) with a generally sparse to absent groundstorey.	16	17	18
Native and exotic riparian vegetation – Mixed native and exotic riparian vegetation fringing Montgomery Creek. Dominant native species include River Tussock ( <i>Poa labillardieri</i> ), Tall Sedge ( <i>Carex appressa</i> ) and Common Rush ( <i>Juncus usitatus</i> ). Dominant exotic species include Serrated Tussock ( <i>Nassella trichotoma</i> ), Yorkshire Fog ( <i>Holcus lanatus</i> ) and Phalaris ( <i>Phalaris aquatica</i> ).	19	20	21

**Legend**



**Aprasia Habitat Quality**  
**Number = Polygon on Figure 2** (Note: Not all numbers are identified on Figure 2 as not all habitat permutations occur within the Study Area.)



Plate 3. Native *Themeda* grassland



Plate 4. Native *Austrostipa* grassland





Plate 5. Open woodland over native grassland



Plate 6. Exotic pasture



Plate 7. Open woodland over exotic pasture



Plate 8. Dense shrubland

## 7.0 RECOMMENDATIONS

It is clear that the Study Area supports a substantial population of *A. parapulchella*. Sections of the Study Area (notably areas identified as '1 – 2' on Figure 2) support 'Very High' quality habitat for *A. parapulchella*, consistent with that described for the species throughout the plentiful published literature available on the species (Refer Section 4.2 herein).

As the Study Area directly adjoins the Googong Foreshores (an area recognised as a significant area of habitat for *A. parapulchella*) along much of its eastern boundary, it can be envisaged that the population recorded within the Study Area is likely to comprise a component of the substantial contiguous population occurring throughout the Googong Foreshores and wider Queanbeyan River corridor.

Management measures recommended for incorporation into the detailed design and management of the Googong Township are detailed in Sections 7.1 and 7.2 below. The manner in which CIC proposes to incorporate these management measures is detailed in Section 8 below.

### 7.1 Management of Development Encroachment

Avoidance of development encroachment and other impacts upon the areas within the Study Area identified as supporting 'Very High', 'High' or 'Medium' quality habitat is recommended where practicable. In this regard, the following should be noted.

- Loss or significant disturbance of habitat identified as '1' or '2' on Figure 2 (considered 'Very High' quality habitat within the Study Area) would have an unacceptable impact and should be avoided.
- Loss or significant disturbance of sections of 'High' quality habitat identified as '4' on Figure 2 should be avoided where practicable. If the limited loss of habitat identified as '4' is unavoidable, it will be necessary to implement measures to offset for the loss. Recommended offset options are discussed in Section 7.2 below.
- Loss or significant disturbance of the areas of 'Medium' quality habitat (particularly relevant to areas identified on Figure 2 as '10' and '13') would be unlikely to have a significant impact upon the ongoing persistence of the population of *A. parapulchella* within the Study Area and locality. These areas whilst still providing 'Medium' quality habitat to the species, are outliers largely dominated by exotic groundstorey vegetation and with reduced connectivity to the 'Very High' quality habitat (identified as '1' or '2').
- Loss or significant disturbance of limited sections of the areas of 'Medium' quality habitat identified as '5' would be unlikely to have a significant impact upon the ongoing persistence of the population of *A. parapulchella* within the Study Area and locality. It should be noted however, that these areas (and the area of non-habitat between '5' and '4') have the potential to constitute contiguous 'High' Quality Habitat' if restored, rehabilitated and managed correctly.

## 7.2 Offsetting for Development Encroachment

Offsetting for the loss of limited areas of *A. parapulchella* habitat (excepting 'Very High' quality) could reasonably be achieved through two mechanisms. These are discussed as follows.

### 1. Direct Offsets –

- The rehabilitation of the gully located in the southeast of the Study Area. This would involve the removal of the Radiata Pine (*Pinus radiata*), the importation of suitable rocks removed during excavations carried out elsewhere in the Googong Township and the revegetation of the area with suitable native grasses (notably Kangaroo Grass and Redleg Grass). Note: to prevent importation of weeds, only rocks removed from adjacent sections of the Googong Township should be imported into the Study Area.
- The importation and placement of suitable rocks throughout the areas identified as '3'. Importing rocks into these areas would result in the habitat, in time, constituting 'Very High' quality habitat, thus improving habitat connectivity between the Study Area and the adjoining Googong Foreshores.
- The importation and placement of suitable rocks throughout sections of the area identified as '5' (in the southwest section of the Study Area) and the adjoining area of non-habitat located between '5' and '4'. It would also be necessary to carry out weed management and revegetation works (with native grasses) throughout these areas. These management measures would result in these areas, in time, constituting 'Very High' quality habitat, thus increasing the area of high quality contiguous habitat within the Study Area.

### 2. Indirect Offsets –

- Commissioning a broad-scale weed removal program to remove (via poisoning and physically removal) all non-native woody vegetation within the Study Area (i.e. Sweet Briar (*Rosa rubiginosa*), African Boxthorn (*Lycium ferocissimum*)).
- Commissioning a program to remove or substantially thin-out the areas which support dense stands of Burgan (*Kunzea ericoides*).
- Commissioning a targeted weed removal program to poison the Serrated Tussock (*Nassella trichotoma*) (approx 50 plants) located within the Montgomery Creek riparian zone. Eradication of this weed species is essential to prevent its spread and proliferation throughout the Study Area.
- Implementing an ongoing weed management program to reduce the weed infestations within the Study Area and to facilitate the eradication of woody weeds and significant weed species (i.e. Serrated Tussock).
- Commissioning a native grass revegetation/regeneration program throughout the Study Area, aimed at facilitating and encouraging the dominance of native grasses (notably Kangaroo Grass and Redleg Grass) within the areas of the Study Area where they are not currently the dominant

species. It is imperative that the revegetation/regeneration program is managed in a manner which maintains and enhances the grassland and grassy-woodland vegetation types required for the conservation of *A. parapulchella*.

- Preventing the collection of rocks within the Study Area (referred to as 'Bushrock Collection' which is a 'Key Threatening Process' for *A. parapulchella*).
- The removal or replacement of the fencing between the Study Area and the adjoining Googong Foreshores in order to allow the movement of Kangaroos between the two areas. An appropriate level of grazing by Kangaroos will assist in maintaining the grassland habitat desirable to *A. parapulchella*.
- Appropriate management of feral and domestic predators (primarily cats, dogs and foxes). A program should be implemented to manage feral cats and foxes within the Study Area. Such a program is likely to be best managed as an extension to the program implemented to manage such species within the Googong Foreshores (Googong Foreshores Draft Plan of Management 2007). In addition, measures should be put in place to prevent domestic cats and dogs from roaming within the Study Area.

## 8.0 PROPOSED MANAGEMENT

The following three principles have been applied by CIC in determining the proposed approach to the management of *A. parapulchella* within the Googong Township:

- excluding development from the ‘Very High’ quality areas of *A. parapulchella* habitat;
- providing a balanced outcome of urban development and a consolidated, contiguous Pink-tailed Worm-lizard Conservation Area (the ‘PTWL Conservation Area’) that reduces fragmentation and improves habitat for the species in the long term; and
- optimising the habitat connectivity of the PTWL Conservation Area to the adjoining Googong Foreshores.

These principles have been considered by CIC as ‘objectives’ to be met during the design and management of the Googong Township in order to facilitate development whilst ensuring that such development does not have a ‘significant impact’ (as defined pursuant to the Commonwealth EPBC Act) upon the population of *A. parapulchella* which occurs in the locality.

### 8.1 Establishment of PTWL Conservation Area

CIC proposes to establish and dedicate a PTWL Conservation Area (as illustrated on Figure 3) that will result in a qualitative and quantitative long-term net-benefit to *A. parapulchella* habitat within the locality. With regard to the location and extent of the proposed PTWL Conservation Area, the following salient points should be noted.

1. The entire 24.2 ha area of ‘Very High’ quality habitat would be retained and protected.
2. The majority (6.25 ha or 65.2%) of the ‘High’ quality habitat would be retained and protected. The loss of the balance 3.33 ha or 34.8% of ‘High’ quality habitat would be effectively compensated for by restoring and protecting ‘Medium’ quality habitat and areas of ‘non-habitat’, strategically located to increase habitat connectivity and reduce ‘edge-effects’.
3. The majority (15.38 ha or 64.7%) of the area of ‘Medium’ quality habitat will be retained, protected and rehabilitated. The retained areas would be restored and, over time, become higher quality habitat.

With regard to the above, it must be noted that approximately 33.77 ha of ‘Very High’ and ‘High’ quality habitat currently exists within the Study Area (as illustrated on Figure 2). The PTWL Conservation Area proposed by CIC will, in time, encompass a total of approximately 51.87 ha containing a minimum of approximately 45.11 ha of ‘Very High’ or ‘High’ quality habitat. In addition to this long-term net increase in ‘Very High’ and ‘High’ quality habitat, the habitat restoration and management measures proposed by CIC (refer further detail under Section 8.2 below) will:

- substantially improve habitat quality within the PTWL Conservation Area;
- maintain and improve connectivity within the PTWL Conservation Area; and
- improve connectivity between the PTWL Conservation Area and the adjoining Googong Foreshores.

## 8.2 Management of PTWL Conservation Area

The following management measures would be implemented to protect and enhance the *A. parapulchella* habitat within the PTWL Conservation Area.

### 8.2.1 Initial works to be undertaken by CIC Australia

CIC proposes to dedicate the PTWL Conservation Area to an appropriate party (e.g. Queanbeyan City Council, Googong Community Association or similar), for ownership and management in perpetuity. The following management measures would be implemented by CIC prior to dedication and handover.

1. The restoration of the areas indicated on Figure 3 with the objective of creating 'Very High' or 'High' quality habitat in the long-term. The specific restoration measures that would be required will be dependant upon the current conditions within the specific areas to be restored and may involve:
  - the removal of the exotic woody vegetation (Radiata Pine (*Pinus radiata*), Sweet Briar (*Rosa rubiginosa*), African Boxthorn (*Lycium ferocissimum*) etc);
  - the removal or substantial thinning-out of Burgan (*Kunzea ericoides*);
  - the importation of suitable rocks removed during excavations elsewhere in the Googong Township; and
  - the revegetation of the area with suitable native grasses (notably Kangaroo Grass (*Themeda triandra*) and Redleg Grass (*Bothriocloha macra*)).
2. The establishment of a 20 m wide 'Buffer Zone' around the boundary of the PTWL Conservation Area (refer Figure 3). This 'Buffer Zone' would be regularly monitored and any disturbance or additional weed establishment / encroachment would be promptly and sensitively controlled.
3. An appropriate salvage program will be implemented to capture *A. parapulchella* individuals prior to and during excavation works conducted in the area surrounding the PTWL Conservation Area. This program will involve the appointment of a suitably qualified and experienced person (Zoologist, Ecologist or similar) to turn all suitable shelter rocks in the areas to be disturbed, prior to disturbance. This person would also be present during the initial disturbance (soil scraping, rock removal etc). All live *A. parapulchella* captured would be immediately moved into the adjacent PTWL Conservation Area and released at the base of a suitable shelter rock.
4. Commissioning a broad-scale weed removal program to remove (via poisoning and physical removal) all non-native woody vegetation within the PTWL Conservation Area (primarily Sweet Briar and African Boxthorn).
5. Commissioning a targeted weed removal program to poison the Serrated Tussock (*Nassella trichotoma*) (approx 50 plants) located within the Montgomery Creek riparian zone. Eradication of this weed species is essential to prevent its spread and proliferation throughout the PTWL Conservation Area.
6. Commissioning a native grass revegetation/regeneration program throughout the PTWL Conservation Area, aimed at facilitating and encouraging the dominance of

native grasses (notably Kangaroo Grass and Redleg Grass) within the areas of the Study Area where they are not currently the dominant species.

7. Boundary minimisation. The boundary between the PTWL Conservation Area and the adjacent residential areas will be the area where 'edge effects' are most relevant and would require the highest degree of ongoing management. As such, all reasonable efforts would be made to minimise the length of the boundary between the PTWL Conservation Area and the adjacent residential areas (this has been effectively achieved in the proposed design of the PTWL Conservation Area (refer Figure 3).
8. Construction of boundary fencing. Rural type fencing (without barbed wire) would be sufficient to delineate the boundary of the PTWL Conservation Area and would be installed. The installation of gates into the PTWL Conservation Area would be restricted to those required to provide access to management personnel.
9. Facilitation of Kangaroo grazing. Kangaroo grazing throughout the PTWL Conservation Area would be facilitated and encouraged as it would assist in maintaining the grassland habitat for *A. parapulchella* and reduce fuel loads. To achieve this, fencing between the PTWL Conservation Area and the adjoining Googong Foreshores would include an appropriate gap along the Montgomery Creek corridor to enable movement of Kangaroos between the two areas.
10. Sealed roads/streets would be constructed around the boundary of the PTWL Conservation Area with residential lots located on the opposite side of the road/street. The placement of roads in this manner is effective in discouraging the dumping of rubbish and often well intentioned (however highly environmentally degrading) practice of spreading lawn clippings throughout the grassland over the back fence. Care would be taken to ensure that any topsoil placed between the road and the boundary fence is not contaminated with weed seed etc.
11. An appropriate domestic animal containment program would be implemented and enforced within the Township (Note: CIC have proposed to implement a domestic cat containment program throughout the entire Googong Township).
12. An appropriate community education program would be designed and implemented in consultation with relevant experts.



### **8.2.2 Ongoing management works**

A management plan (prepared in accordance with the NSW Local Government Act) would be prepared which would set out appropriate objectives, milestones and assessment criteria to be achieved in order to ensure that the PTWL Conservation Area is appropriately protected and habitat enhancement continues in perpetuity. This management plan would include:

- details relating to the ongoing weed management program implemented to reduce the weed infestations within the PTWL Conservation Area and to facilitate the eradication of woody weeds and significant weed species (i.e. Serrated Tussock);
- details regarding an appropriate ongoing native species regeneration and management program; and
- details regarding the weed management program and any Asset Protection Zone fuel reduction works required.

CIC will work collaboratively with the eventual land owner/manager(s) to manage the handover of bush regeneration and other measures commenced by CIC.

## 9.0 IMPACT ASSESSMENT – EPBC ACT 1999

The EPBC Act provides guidelines for assessing the impact of an activity on any Matter of National Environmental Significance (MNES). The EPBC Act identifies seven MNES:

- World Heritage properties;
- National heritage places;
- Wetlands of international importance (Ramsar wetlands);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and,
- Nuclear actions (including uranium mining).

The EPBC Act establishes requirements for assessing the impact of proposed activities or actions on any Matter of National Environmental Significance. If a proposed action has the potential to incur a significant direct or indirect impact on any threatened or migratory species or ecological communities (or their habitats) listed under the Act then the proposed action must be 'Referred' to DSEWPC for further consideration.

The 'significant impact criteria' (Commonwealth of Australia 2008) are designed to assist in determining whether the impacts of a proposed action on any MNES are likely to be significant impacts. The criteria provide general guidance on the types of actions that will require approval and the types of actions that will not require approval. They are not intended to be exhaustive or definitive.

The potential impact on the Nationally listed threatened species *A. parapulchella* has been considered in this assessment in accordance with the impact assessment criteria, *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Commonwealth of Australia 2008). An assessment of significance has been prepared and is provided below.

With reference to the above, it is noted that the impact assessment criteria under the EPBC Act are largely equivalent to those provided under the NSW TSC Act (i.e. the Seven Part Test). In this regard, the following impact assessment is considered an appropriate assessment of impacts as relevant to both the EPBC Act and the TSC Act.

## EPBC Act Assessment of Significance

The Pink-tailed Worm-lizard is listed as Vulnerable under the EPBC Act.

### **Is there a real chance or possibility the action will lead to a long-term decrease in the size of an important population of a species?**

The proposed development footprint for the Googong Township has been configured to retain and protect the entire approximate 24.2 ha area of 'Very High' quality habitat within the Googong Township area. This area of habitat is considered to constitute 'Very High' quality habitat for *A. parapulchella* as it supports:

- a medium to high density of suitable shelter rocks;
- high quality to optimal vegetation cover (i.e. Kangaroo Grass dominated native grassland); and
- good connectivity to expansive areas of similar habitat located within the adjoining Googong Foreshores.

In addition to the above, the majority of the *A. parapulchella* recorded during the targeted surveys conducted throughout the Study Area were recorded within the area identified as 'Very High' quality habitat.

Notwithstanding the above, the proposed development of the Googong Township will involve the initial loss of approximately:

- 3.33 ha (34.8%) of the area within the Googong Township determined to constitute 'High' Quality Habitat';
- 8.39 ha (35.3%) of the area within the Googong Township determined to constitute 'Medium' quality habitat; and
- 0.17ha (6.5%) of the area within the Googong Township determined to constitute 'Low Quality Habitat'.

In order to offset the above described loss of *A. parapulchella* habitat, CIC proposes to establish, rehabilitate and dedicate to public ownership, a 52 ha PTWL Conservation Area. With regard to the location and extent of the proposed PTWL Conservation Area, the following salient points should be noted.

1. The entire 24.2 ha area of 'Very High' quality habitat would be retained and protected.
2. The majority (6.25 ha or 65.2%) of the 'High' quality habitat would be retained and protected. The loss of the balance 3.33 ha or 34.8% of 'High' quality habitat would be effectively compensated for by restoring and protecting 'Medium' quality habitat and areas of 'non-habitat', strategically located to increase habitat connectivity and reduce 'edge-effects'.
3. The majority (15.38 ha or 64.7%) of the area of 'Medium' quality habitat will be retained, protected and rehabilitated. The retained areas would be restored and, over time, become higher quality habitat.

In addition to the above, CIC proposes to work collaboratively with the eventual land owner/manager(s) to implement the following management measures to protect and enhance in the long-term, the *A. parapulchella* habitat within the PTWL Conservation Area.

1. Restoration of extensive sections of the PTWL Conservation Area with the objective of creating 'High' quality habitat in the long-term. Specific details of the restoration measures that would be implemented are provided in Section 8.2 of this report.
2. Commissioning a broad-scale weed removal program to remove and manage weeds within the PTWL Conservation Area.
3. Commissioning a native grass revegetation/regeneration program throughout the PTWL Conservation Area, aimed at facilitating and encouraging the dominance of native grasses (notably Kangaroo Grass and Redleg Grass) within the areas of the PTWL Conservation Area where they are not currently the dominant species.
4. Boundary minimisation (to facilitate the minimisation of 'edge effects') and construction of appropriate boundary fencing.
5. Commissioning the preparation of a management plan which would set out appropriate objectives, milestones and assessment criteria to be achieved in order to ensure that the PTWL Conservation Area is appropriately protected and habitat enhancement continues post dedication to handover. Specific details of the restoration measures that would be implemented are provided in Section 8.2 of this report.

it must be noted that approximately 33.77 ha of 'Very High' and 'High' quality habitat currently exists within the Study Area (as illustrated on Figure 2). The PTWL Conservation Area proposed by CIC will, in time, encompass a total of approximately 51.87 ha containing a minimum of approximately 45.11 ha of 'Very High' or 'High' quality habitat. In addition to this long-term net increase in 'Very High' and 'High' quality habitat, the habitat restoration and management measures proposed by CIC (refer further detail under Section 8.2 of this report) will:

- substantially improve habitat quality within the PTWL Conservation Area;
- maintain and improve connectivity within the PTWL Conservation Area; and
- improve connectivity between the PTWL Conservation Area and the adjoining Googong Foreshores.

With regard to the above, it can be determined that the approach proposed by CIC will result in a qualitative and quantitative long-term net-benefit to *A. parapulchella* habitat within the locality. This net-benefit will work to facilitate a long-term increase in the population size of the population of *A. parapulchella* within the PTWL Conservation Area.

The proposed action is unlikely to lead to a long-term decrease in the size of an important population of *A. parapulchella*.

**Is there a real chance or possibility the action will reduce the area of occupancy of an important population?**

The *A. parapulchella* population associated with the Googong Foreshores and surrounds is considered to constitute an important population. As described above, the proposed development of Googong Township will result in an initial reduction in the area of *A. parapulchella* habitat within the Googong locality. This initial reduction will however, be more than offset via the dedication of the PTWL Conservation Area and associated extensive measures proposed to protect the population and increase and enhance habitat for the species.

The proposed action is unlikely to reduce the area of occupancy of an important population.

**Is there a real chance or possibility the action will fragment an existing important population into two or more populations?**

The Study Area directly adjoins the Googong Foreshores (an area recognised as a significant area of habitat for *A. parapulchella*) along much of its eastern boundary. In this regard, it can be envisaged that the population recorded within the Study Area is likely to comprise a component of the substantial contiguous population occurring throughout the Googong Foreshores and wider Queanbeyan River corridor.

The proposed location and extent of the PTWL Conservation Area has been determined in a manner which aims to substantially enhance habitat connectivity between the PTWL Conservation Area and the adjoining Googong Foreshores. In addition, the proposed PTWL Conservation Area will encompass the entire area of 'Very High' quality habitat within the Googong Township and the majority of the 'High' and 'Medium' quality habitat. The significant habitat protection and restoration works proposed within the PTWL Conservation Area will act to increase the area of 'High' quality habitat, improve habitat connectivity and consolidate habitat and associated populations of *A. parapulchella*.

The proposed action is unlikely to fragment an existing important population into two or more populations.

**Is there a real chance or possibility the action will adversely affect habitat critical to the survival of a species?**

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been listed for the Pink-tailed Legless Lizard (DEWHA 2008b). Whilst the *A. parapulchella* habitat within the Study Area is considered to be important to the preservation of the species, it is not of any higher or more ‘critical’ importance than that which occurs throughout the wider Googong Foreshores and Queanbeyan and Molonglo River Corridors. Nevertheless, as described above, significant land dedication and habitat restoration works are proposed as part of the development of the Googong Township. These measures will act to facilitate the long-term protection and enhancement of the habitat and associated population.

The proposed action will not adversely affect habitat critical to the survival of *A. parapulchella*.

**Is there a real chance or possibility the action will disrupt the breeding cycle of an important population?**

The Pink-tailed Legless Lizard is a fossorial species, which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae (Osborne and Jones 1995). The Pink-tailed Legless Lizard is oviparous (egg laying) with a clutch size of two. Females may need to reach an age of about 3 or 4 years before they can reproduce. There is little data on the breeding behaviour of this species. The Pink-tailed Legless Lizard is thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter (DEC 2005).

As described above, the proposed development of the Googong Township will result in an initial reduction in the area of *A. parapulchella* habitat within the Googong locality. It is proposed to offset this loss of habitat via the dedication, restoration and ongoing management of the PTWL Conservation Area incorporating all ‘Very High’ quality habitat and the majority of the balance habitat within the Googong Township. In this regard it is considered unlikely that the proposed action will disrupt the breeding cycle of the population occurring within the Study Area and adjoining Googong Foreshores.

The proposed action is unlikely to disrupt the breeding cycle of an important population.

**Is there a real chance or possibility the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?**

As detailed herein, the proposed establishment, restoration and ongoing management of the PTWL Conservation Area will act to increase the area of high quality contiguous *A. parapulchella* habitat within the Googong Township. In this regard, the *A. parapulchella* management measures proposed as part of the development of the Googong Township will result in a qualitative and quantitative long-term net-benefit to *A. parapulchella* habitat within the locality. The objective to be achieved in this manner is to facilitate the long-term protection and enhancement of the population and thus prevent any decline in the local population.

The action will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

**Is there a real chance or possibility the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?**

Feral European Rabbits (*Oryctolagus cuniculus*) were detected within the Study Area during the recent surveys. This species has been identified as an invasive species which suppresses the regeneration of natural grasses and forbs (NSW Scientific Committee 2002). The damaging grazing by Feral European Rabbits is likely to adversely impact upon *A. parapulchella* by reducing the abundance of native grasses. The proposed development of the Googong Township is not considered likely to increase the abundance or spread of the Feral European Rabbit within the PTWL Conservation Area or wider locality.

Several significant weed species and numerous exotic pasture species were identified as already being established within the Study Area (refer details provided in this report). The management plan that will be commissioned by CIC will set out appropriate objectives, milestones and assessment criteria to be achieved in order to ensure that the existing weed infestation within the PTWL Conservation Area are appropriately managed and/or eradicated. The management plan will also provide management measures to be implemented to ensure that additional exotic species do not become established within the PTWL Conservation Area.

Additional invasive plant species that may be detrimental to *A. parapulchella* are not likely to become established in this area as a result of the proposed action.

**Is there a real chance or possibility the action will introduce disease that may cause the species to decline?**

It is considered unlikely that the proposed action would introduce any diseases that may cause the species to decline.

**Is there a real chance or possibility the action will interfere substantially with the recovery of the species?**

The main recovery objectives for *A. parapulchella* as described in the 'National Recovery Plan for the Pink-tailed Worm-lizard *A. parapulchella* (Draft)' (Brown 2010) are as follows.

1. Refine knowledge of distribution and abundance.

The commissioning of this study has occurred in order to inform the proposed development of the Googong Township. The subsequent completion of the targeted field surveys and habitat assessment has acted to provide further information and refinement regarding the previously known distribution of *A. parapulchella* within the locality.

2. Protect and enhance habitat.

As detailed herein, a component of the proposed development of the Googong Township will be the establishment, dedication, protection and enhancement of the *A. parapulchella* habitat within a dedicated PTWL Conservation Area.

3. Minimise predation by introduced predators.

Measures would be implemented (detailed in the management plan to be developed) to suitably control introduced predators and thus minimise predation by same.

4. Investigate the optimal fire regime.

Advice resulting from investigations completed on the optimal fire regimes for *A. parapulchella* will be incorporated into the management plan to be developed.

5. Minimise disturbance by recreational activities.

Management measures relating to preventing detrimental recreational activities would be detailed in the management plan to be developed.

6. Investigate the ecology of *A. parapulchella* and impacts of disturbances on population survival.

7. Monitor management effectiveness.

The management plan for the PTWL Conservation Area will include a monitoring component to monitor the effectiveness of the management measures and regime implemented. A degree of 'adaptive management' will be incorporated into the management plan in order to allow amendments to be made to the management regime as deemed necessary.

8. Build community support for conservation.

CIC propose to implement an appropriate community education program. The management plan will provide details pertaining to the specific community education measures to be implemented.

The proposed development of the Googong Township will complement and certainly not interfere with the above listed recovery objectives for *A. parapulchella*.





## Conclusion

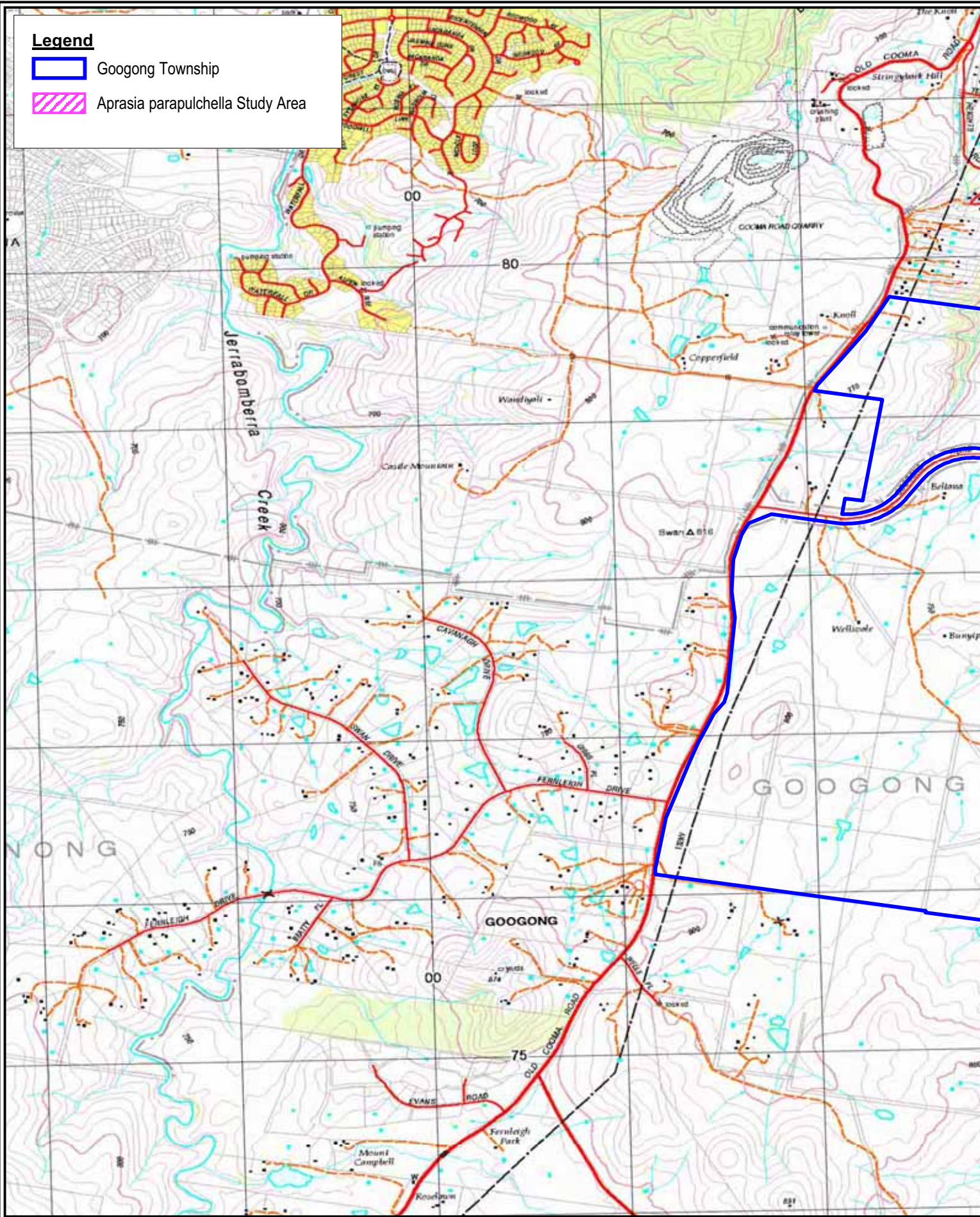
The loss of the areas of *A. parapulchella* habitat as indicated on Figure 2 (i.e. that located outside of the proposed PTWL Conservation Area) would be effectively offset by incorporating the PTWL Conservation Area design illustrated on Figure 3 and management measures detailed under Section 8.2 of this report. As detailed herein, it is determined that:

- the proposed location and extent of the PTWL Conservation Area (as illustrated on Figure 3) will result in a qualitative and quantitative long-term net-benefit to *A. parapulchella* habitat within the locality; and
- the proposed approach will ensure that the proposed development of the Googong Township will be unlikely to have a ‘significant impact’ (as defined under the Commonwealth EPBC Act Significant Impact Guidelines (refer Section 9 herein)).

## FIGURES

**Legend**

-  Googong Township
-  Aprasia parapulchella Study Area



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Figure 1: Locality Plan.

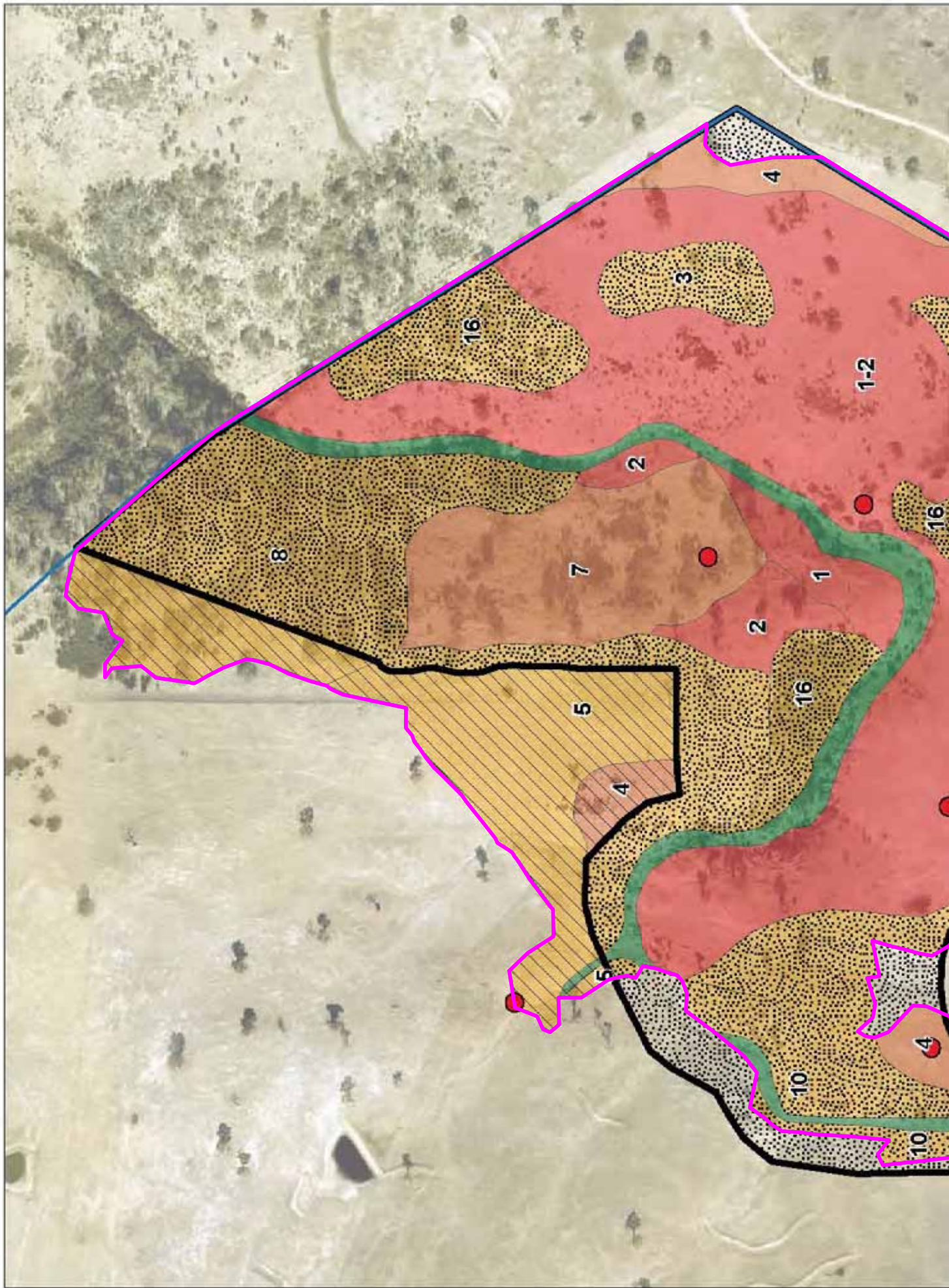
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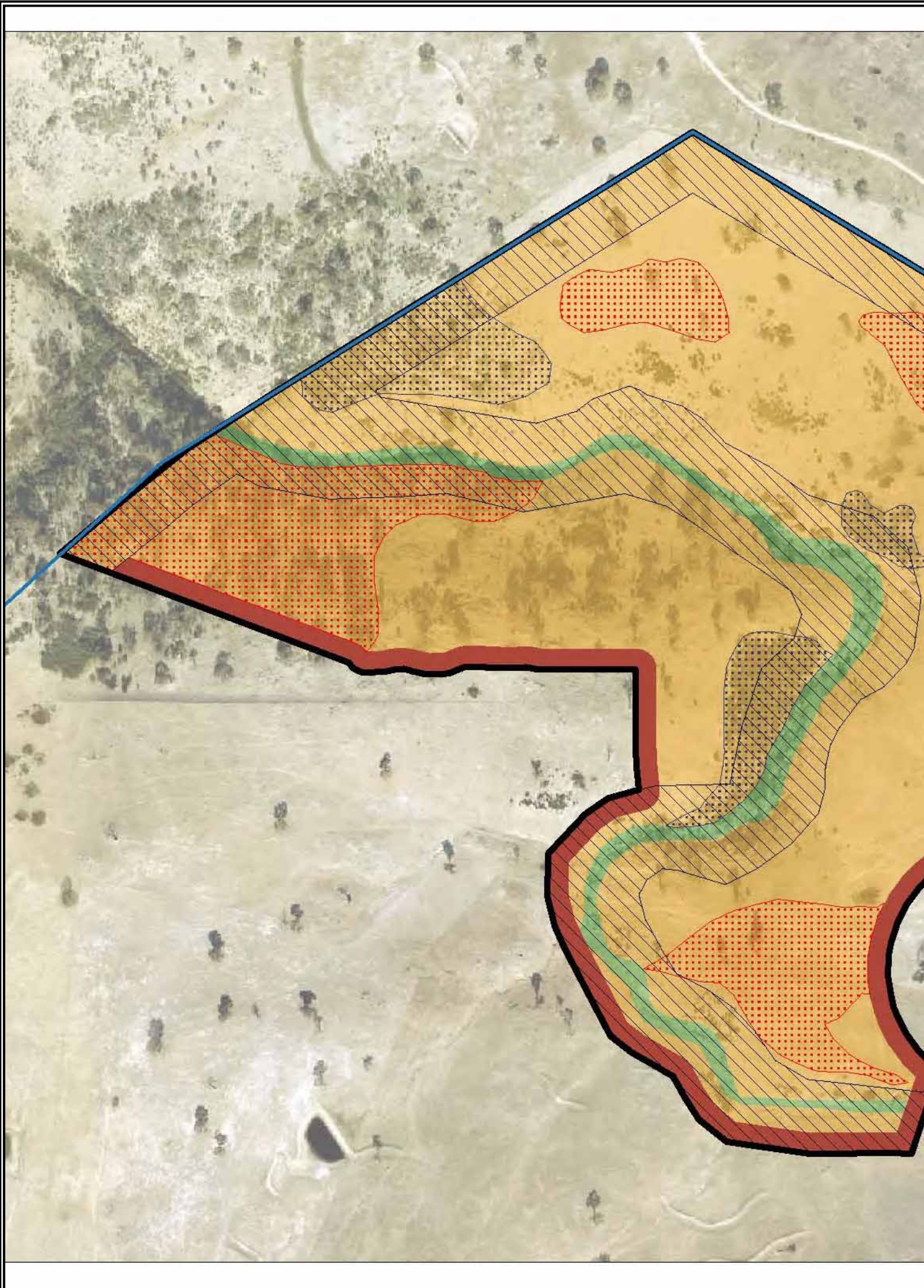
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Checked by: RS







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