# Appendix P

## BWPS ecological survey report

Googong Township water cycle project

Environmental Assesment

**November 2010**

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# Terrestrial Flora and Fauna Assessment for Bulk Water Pumping Station

July 2010

*Natural & Cultural Heritage Consultants 18-20 Mandible St Alexandria NSW 2015*

**BIOSIS**
RESEARCH

# Report for Manidis Roberts

July 2010

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# ACKNOWLEDGMENTS

Biosis Research acknowledges the contribution of the following people and organisations in preparing this report:

Manidis Roberts

- Paul Keighley

Biosis Research Pty. Ltd.

- Ashleigh Pritchard (GIS Operator)
- Brendan Smith (Senior Botanist)

# ABBREVIATIONS

| | |
|---|---|
| DECCW | NSW Department of Environment, Climate Change and Water |
| DEWHA | Commonwealth Department of the Environment, Water, Heritage and the Arts |
| DoP | NSW Department of Planning |
| EIS | Environmental Impact Statement |
| EP&A Act | NSW *Environmental Planning and Protection Act* 1979 |
| EPBC Act | Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 |
| LGA | Local Government Area |
| MNES | Matter of National Environmental Significance |
| NPWS | National Parks and Wildlife Service (now part of DECC) |
| SIS | Species Impact Statement |
| TSC Act | NSW *Threatened Species Conservation Act* 1995 |
| sp. | Species (singular) |
| spp. | Species (plural) |
| subsp. | Subspecies |
| var. | Variety |

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# 1.0 SUMMARY

CIC Australia Limited (CIC) is progressing with the environmental assessment of a staged subdivision of the new Googong town, south of Queanbeyan near Googong Dam, NSW. This report focuses on the potential impacts to flora and fauna as a result of the proposed Bulk Water Pumping Station, which is to provide for the development of residential housing. The Bulk Water Pumping Station (the proposal) will be assessed via Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as part of the Googong township water cycle project. This report should be read in conjunction with the Googong water cycle project Terrestrial Flora and Fauna Assessment (Ecowise Environmental and Biosis Research 2009).

The subject site is located within Commonwealth land currently leased by ActewAGL. To the north of the subject site is the 'Talpa' property. The existing Googong Water Treatment Plant is upslope and to the south of the subject site (See Figure 1).

The subject site consists of a north-west facing rocky slope supporting disturbed woodland. Dirt access tracks currently fragment the woodland and there was high cover of exotic species in some parts of the study area, particularly adjoining the existing access track.

The vegetation of the study area consisted of disturbed woodland dominated by *Eucalyptus polyanthemos* and *E. rossii* with an understorey ranging from shrubby to grassy. A total of 55 flora species were recorded, comprised of 38 native species and 17 exotic species. One endangered species listed under the Commonwealth EPBC Act, *Leucochrysum albicans* var. *tricolor* (Hoary Sunray) was recorded to the south and east of the subject site. A total of 1641 plants were counted in three sub-populations.

Fauna recorded in the study area during the current survey include 25 bird species, one mammal (introduced) and one reptile (Appendix 1). No threatened species were detected on site. A range of threatened species have previously been recorded in the locality including the Pink-tailed Legless Lizard (*Aprasia parapulchella*) listed under both the EPBC and TSC Acts which was previously recorded 900 m north-west and 1.5 km west of the study area.

Part 3A assessments of significance were prepared for the following species; Speckled Warbler, Hooded Robin, Diamond Firetail, Brown Treecreeper and Pink-tailed Legless Lizard. The assessments for the woodland birds concluded that the proposal is considered unlikely to significantly impact these avian fauna species with potential habitat within the study area. A Species Impact Statement would not be required for these species.

The assessment of significance and EPBC Act significant impact criteria for the Pink-tailed Legless Lizard concluded that if a local population of this species were present in the area, it could be significantly impacted by the proposed Bulk Water Pumping Station. It is recommended that a Referral under the provisions of the EPBC Act be prepared for this species and that further surveys be undertaken in Spring to determine whether there is a population on the site. To minimise the potential impact to the Pink-tailed Legless Lizard, pre-clearing surveys are also recommended.

The assessment against the EPBC significant impact criteria for the endangered species *Leucochrysum albicans* var. *tricolor* (Hoary Sunray) found that this species is unlikely to be significantly impacted by the proposed development. However given the proximity of the surveyed population to the proposed development and the potential habitat for the species in the development area, a Referral under the provisions of the EPBC Act is recommended for this species.

A range of mitigation measures are proposed to reduce impact of the proposal on biodiversity:

- Specific measures for *L. albicans* var. *tricolor* should be included within management and operational plans for the Googong water cycle project and the Googong Foreshores Plan of Management.

- Immediately prior to construction a qualified ecologist/botanist should inspect the site and mark out areas of occurrence of *L. albicans* var. *tricolor* within and adjoining the construction area. These areas should be protected and avoided during construction.

- Avoid the introduction and transportation of weeds into surrounding areas of better quality vegetation. Measures that should be implemented to minimise the transportation of weeds include: the development of a weed distribution map across the study area; conducting a pre-construction weed control program; implement strict vehicle hygiene controls such as cleaning of tyres, wheel guards and bases of machinery before entry into any areas of bushland;

- Avoid removal of hollow-bearing trees and branches in the study area. Where the removal of hollow-bearing trees and branches is found to be unavoidable, the work should be undertaken by an appropriately qualified arborist under the observation of a qualified ecologist/zoologist. Hollows should be inspected for resident fauna by a qualified ecologist prior to felling or trimming. If resident fauna are found, the appropriate action to follow should be determined in consultation with the qualified ecologist/zoologist; and,

- Erosion, storm water and runoff controls, consistent with the ACT and NSW guidelines, will be required pre, during and post construction to prevent sedimentation in major waterways. This may include the appropriate use of temporary sediment fencing or sediment control bunding. These structures will need to meet appropriate standards and be well maintained throughout the construction phase.

- Further targeted surveys for the Pink-tailed Legless Lizard should be undertaken in spring to determine what action should be undertaken and the extent of habitat for this species within the study area. If individuals are encountered following spring surveys, pre-clearing inspections will be required prior to construction to translocate individuals into adjacent habitat. Where and if the subsequent survey effort results in substantial project delays a statement of commitments should be made with the planning application to ensure surveys are undertaken prior to any construction works.

# 2.0 INTRODUCTION

## 2.1 Project Description

CIC Australia Limited is progressing with the environmental assessment of the two-staged subdivision of Neighbourhood 1 of the new Googong town, south of Queanbeyan near Googong Dam, NSW. The entire Googong proposal (not being assessed here) is for the development of five neighbourhoods, with local shopping and employment opportunities, and schools. Each neighbourhood will be linked by parklands, with a total of 20% of the township dedicated to open spaces (CIC 2008).

The water reticulation project, which is to support the subdivision, will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Ecowise Environmental and Biosis Research (2009) previously assessed the impacts to flora and fauna of the water reticulation project. The location of the Bulk Water Pumping Station, part of the water reticulation project, has been revised and the new proposed location is outside the study area covered by the previous assessment. The current study focuses on the potential impacts on flora and fauna as a result of the currently proposed Bulk Water Pumping Station.

## 2.2 Aims

The general aim of this report is to undertake a terrestrial flora and fauna assessment of the proposed Bulk Water Pumping Station and associated access roads at Googong, NSW.

The specific aims are to:

1. conduct a literature review and database search for the area surrounding the study site;

2. undertake targeted field surveys for habitat of threatened terrestrial fauna and populations that are listed on the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and have been identified as potentially occurring in the area;

3. provide a brief assessment of the habitat values of the site;

4. assess the need for Assessments of Significance (for threatened species listed on the TSC Act) and requirements for Referral (for threatened species listed on the EPBC Act) for significant flora and fauna, populations and ecological communities existing or potentially occurring in the study area; and,

5. provide recommendations to minimise the environmental impacts of the proposed development.

## 2.3 Study Area

The study area occurs on Commonwealth land currently leased by ACTEW AGL. To the north, of the subject site is the 'Talpa' property. The Googong Dam Water Treatment Plant is upslope and to the south of the subject site (See Figure 1).

The site is largely bound by steep topography with slopes on the north, west and east of the site. The Queanbeyan River lies approximately 500 m to the east and the suburbs of Karabar and Jerrabombera lie to the north west of the study area.

## 2.4 Legislative Context

### 2.4.1 Commonwealth

***Environment Protection and Biodiversity Conservation Act 1999***

The EPBC Act is a Commonwealth mechanism that requires proposed actions to be assessed in terms of their potential impact upon "Matters of National Environmental Significance" (MNES). MNES currently listed under the EPBC Act that are relevant to this project include:

- threatened species and ecological communities; and,
- migratory species.

Other matters that require assessment under the EPBC Act include where actions proposed are on, or will affect Commonwealth land and the environment. The study area is adjacent to Googong Foreshores, which is Commonwealth Land.

Where a potential impact on a MNES or Commonwealth land is likely to occur as a result of a proposed action, the significance of that impact must be assessed. Guideline criteria for determining whether an impact is significant are provided under the Act. Where a proposed action will, or is likely to, have a significant impact, a Referral to the Commonwealth Environment Minister must be prepared. The purpose of the Referral is to determine whether a proposed action requires approval and/or controls under the EPBC Act.

### 2.4.2 State

***Environmental Planning and Assessment Act 1979***

One objective of the EP&A Act is to encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats. A second objective is to encourage the principles of ecologically sustainable development, including the precautionary principle as defined under the *Protection of the Environment Administration Act 1991*.

Part 3A of the EP&A Act provides a single assessment and approval regime for major State infrastructure projects, development that previously was classified as State significant development and other projects, plans or programs declared by the Minister for Planning. The Director General will prepare the environmental assessment requirements for the individual project after consulting with relevant public authorities, such as the Department of Environment Climate Change and Water (DECCW). Approved major projects are exempt from having to obtain various approvals normally required for developments, and are not required to prepare a Species Impact Statement (SIS). The Minister for Planning is the consent authority for all major projects and critical infrastructure assessed under Part 3A.

***Threatened Species Conservation Act 1995***

The TSC Act protects all threatened plants and animals native to NSW (with the exception of fish and marine plants). It provides for the identification, conservation and recovery of threatened species and their populations and communities. It also aims to reduce the threats faced by those species.

If a planned development or activity will have an impact on a threatened species, this must be taken into account in the development approval process. DECCW have prepared guidelines for the assessment of impacts on threatened species for projects being assessed under Part 3A of the EP&A Act (DEC & DPI 2005).

## 2.5 Definitions

The following terms are used frequently throughout the report:

- ***The proposal*** is the development, activity or action proposed.
- ***Subject site*** is defined in *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC 2004b) and means the area directly affected by the proposal (ie development footprint plus a 5 m buffer).
- ***Study area*** is defined in DECC (2004b) as the subject site and any additional areas that are likely to be affected by the proposal. In this report the study area refers to the area investigated by Biosis Research including areas likely to be directly and indirectly impacted (Figure 2).
- ***Local population*** is defined in DECC (2004b) as the population of a species within the study area. Potential impacts to a local population with potential habitat in the study area are considered in the context of known records and potential habitats within the locality (see below).
- ***Locality*** is the area within a 5 km radius of the study area.
- ***Threatened*** biota refers to threatened species, populations and ecological communities as listed on the TSC and EPBC Act.

# 3.0 METHODS

## 3.1 Taxonomy

The plant taxonomy (method of classification) used in this report follows Harden (1990, 1992, 1993, 2002) and subsequent advice from the National Herbarium of NSW. In the body of this report plants are referred to by their scientific names only. Common names where available have been included in the Appendices.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by Department of Environment and Heritage (DEH). In the body of this report Vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the Appendices.

## 3.2 Literature and Database Review

Records of threatened species, populations and communities were obtained from the Department of Environment, Climate Change and Water (DECCW) Atlas of NSW Wildlife within a 10 km radius of the study area, using the Canberra 1:100 000 map sheet. Records for threatened species, populations and communities listed on the EPBC Act were obtained from the Department of Environment, Water, Heritage and the Arts (DEWHA) EPBC Online Database within a 10 km radius of the study area. Database searches were conducted in April 2010.

The study area and surrounding areas have previously been assessed for their ecological significance (Johnstone Centre 2004; Biosis Research 2009; Ecowise Environmental and Biosis Research 2009).

## 3.3 Flora Survey

Plant species and their habitat were surveyed by undertaking both habitat based assessments and targeted searches.

### 3.3.1 Flora Habitat Assessment

The condition of the vegetation was assessed according to the degree to which it resembled relatively natural, undisturbed vegetation using the following criteria:

- species composition (species richness, degree of weed invasion); and
- vegetation structure (representation of each of the original layers of vegetation).

The four categories used to evaluate general habitat value were Good, Moderate, Poor and Unnatural as detailed below:

**Good**: containing a high number of indigenous species; no weeds present or weed invasion restricted to edges and track margins; vegetation community contains original layers of vegetation; vegetation layers (ground, shrub, canopy etc) are intact;

**Moderate**: containing a moderate number of indigenous species; moderate level of weed invasion; weeds occurring in isolated patches or scattered throughout; one or more of original layers of vegetation are modified; vegetation layers (ground, shrub, canopy etc) are largely intact;

**Poor**: containing a low number of indigenous species; high level of weed invasion; weeds occurring in dense patches or scattered throughout; one or more of the original layers of vegetation are highly modified; one or more original vegetation layers (ground, shrub, canopy etc) are modified or missing; and,

**Unnatural landscape:** highly modified landscape containing few or no indigenous species; exotic species dominant; original native vegetation layers removed; natural soil profile disturbed; unable to be regenerated to natural condition; high input intervention required to revegetate.

### 3.3.2 Targeted Surveys

Targeted surveys for *Leucochrysum albicans* var. *tricolor* (Hoary Sunray) were undertaken on the 13th April, 2010. The survey focused on the population of *L. albicans* var. *tricolor* adjoining the existing access track that was identified during a site inspection on 30 March 2010. The boundaries of the population were recorded using a handheld GPS and an approximate count of individuals was made. Searches extended downslope to the north and east, and were discontinued when suitable habitat was no longer evident.

## 3.4 Fauna Survey

### 3.4.1 Fauna Habitat Assessment

The three categories used to evaluate habitat value were Good, Moderate or Poor, as detailed below:

**Good**: ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer intact and undisturbed; a high level of breeding, nesting, feeding and roosting resources available; a high richness and diversity of native fauna.

**Moderate**: ground flora containing a moderate number of indigenous species; vegetation community structure, ground log and litter layer moderately intact and undisturbed; a moderate level of breeding, nesting, feeding and roosting resources available; a moderate richness and diversity of native fauna.

**Poor**: ground flora containing a low number of indigenous species, vegetation community structure, ground log and litter layer disturbed and modified; a low level of breeding, nesting, feeding and roosting resources available; a low richness and diversity of native fauna.

Other habitat features such the value of the study area as a habitat corridor, the presence of remnant communities or unusual ecological vegetation community structures were also used to assess habitat quality.

### 3.4.2 Targeted Surveys

Survey for the Pink-tailed legless Lizard (*Aprasia parapulchella*) was undertaken on the 13th April, 2010 within some portions of the study area. The most appropriate method for surveying the Pink-tailed Legless Lizard is turning over suitable rocks, preferably during Spring. Comprehensive targeted surveys for the Pink-tailed legless Lizard were beyond the scope of the current study. Given the number of previous records in vicinity of the study area and the presence of suitable habitat, further targeted survey for this species within the development footprint have been recommended during spring.

## 3.5 Limitations

This study was by design a habitat-based assessment and was conducted in accordance with the methodology that would be employed for an assessment under Section 5A of the EP&A Act. Therefore, no trapping, spotlighting, call playback or vegetation quadrat sampling techniques were used.

Some plant species that occur in the local area are annuals (completing their life cycle within a single season) and are present only in the seed bank for much of the year. Other plant species are perennial, but are inconspicuous unless flowering or in fruit. Furthermore, some animal species are only detectable at certain times of the year. Therefore, as the field surveys were conducted over two days, one in November, 2009 and one in April, 2010 it is likely that some species that are present on the site were not detected. Despite these limitations, the assessment of impact is based on the presence or absence of suitable habitat for threatened flora and fauna (which is adequate to satisfy the requirements of the EP&A Act), and as such, species are taken into account during the assessment even though they may not have been detected during the survey.

# 4.0 RESULTS

## 4.1 Literature Review

The Johnstone Centre (2004) carried out environmental investigations in an area west of Googong Dam near Queanbeyan for inclusion in the Googong Urban Investigation Area Local Environment Study (LES). The study area for these investigations consisted of a number of private landholdings including the 'Talpa' property to the north of the current study area.

The Johnstone Centre carried out targeted surveys for threatened species including Pink-tailed Legless Lizards, Golden Sun Moth, bats and birds (Johnstone Centre 2004). Reptile surveys found seventeen Pink-tailed Legless Lizards. These were recorded on "Talpa" (to the north of the current study area) and on the McLean property (to the west of the current study area). Pink-tailed Legless Lizard was also recorded at "Googong" south of the study area during 2009 surveys conducted by Biosis Research (Biosis Research 2009).

The Golden Sun Moth was recorded on Crown land and on Robin Pty Ltd to the west of the current study area. Unconfirmed sightings of Golden Sun Moth were made on "Talpa". Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*) and Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) were recorded in the gully (Googong Creek) to the west of the study area. Brown Treecreepers (*Climacteris picumnus victoriae*) were recorded at a number of locations, but not within the current study area (Johnstone Centre 2004).

Ecowise Environmental and Biosis Research (2009) assessed the impacts of the Googong Water Cycle project on flora and fauna. The study area for this previous assessment included a section of the Googong Foreshores, comprising the Googong Dam Road corridor, the roadway that leads to the Googong Water Treatment Plant and a section of land within the WTP. The revised BWPS location is to the north of the previous study area, and there is a small overlap in the study areas for both assessments. The small section of Googong Foreshores sampled by Ecowise Environmental and Biosis Research (2009) was regarded as heavily fragmented and not representing any particular vegetation community. The endangered ecological community White Box Yellow Box Blakely's Red Gum Woodland was recorded adjoining Googong Creek, to the north of the current study area.

Two threatened fauna species, the Eastern Bent-wing Bat and the Pink-tailed Legless Lizard, were recorded in the study area. Assessments of significance were carried out for a number of threatened species and EECs. It was concluded

that a significant impact on EECs and threatened flora species was unlikely as a result of the proposed water cycle project, but that there could be a significant impact upon the Pink-tailed Legless Lizard and the Golden Sun Moth, which was recorded in close proximity to the study area (Ecowise Environmental and Biosis Research 2009).

### 4.1.1 Landform and Soil

The landscape of the study area is relatively steep with abundant rock outcrops as tors. Slope elevations range from 650 m in the north-east to 700 m in the south-west, with gentler slopes at the crest of the hill adjoining the Googong Dam Water Treatment Plant (Jenkins 2000).

Soils are shallow (less than 60 cm) well drained lithosols and tensols (earthy sands) on the steep slopes. The steep slopes are subjected to mass movement hazards and minor to moderate sheet erosion. The crest and side slopes occur on moderately deep (less than 90 cm) well drained red podzolic soils and yellow earths on crest and side slopes (Jenkins 2000).

The soils in the study area are acidic with low waterholding capacity and low fertility (Jenkins 2000). Given the low fertility, most of the land within this soil landscapes are unlikely to be used or have periodic forestry or limiting grazing activities.

## 4.2 Vegetation Communities

### 4.2.1 Vegetation mapping

There has been limited regional vegetation mapping undertaken in the study area. The Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands (Fallding 2002) provides modelling of broad vegetation types for the region. The broader study area is mapped as Secondary Grassland (higher probability of occurrence), Dry Forest and Box-Gum Woodland. The subject site was largely mapped as Secondary Grassland (higher probability of occurrence).

Dry Forest is described as (p22):

> *Various forest ecosystems with trees occurring in a density of >30% canopy cover. Dominated by one or more of the following tree species: Red Stringybark, Red Box, Scribbly Gum, Brittle Gum, Broad-leafed Peppermint, Red Box, Bundy and Mealy Bundy. Understorey vegetation is often sparse and dominated by shrubs or tussock grass species such as Red-*

*anthered Wallaby Grass. Occur on shallower soils and steeper slopes than those do that support grassy woodlands.*

Box-Gum Woodland is described as (p21):

*Grassy communities with a tree cover of between 10 - 30%. Dominant tree species include White Box, Yellow Box and Blakely's Red Gum, and some other species. Occur on the deeper soils of the footslopes and midslopes, and occasionally on upper slopes.*

The accuracy of the mapping of this Dry Forest is stated by Fallding (2002) to be good, and of Box-Gum Woodland is fair to medium - this unit may include areas of exotic grassland.

Secondary Grassland is described as being derived from clearing of Woodland vegetation types, including Box-Gum Woodland.

The Johnstone Centre (2004) Local Environment Study (LES) mapped the vegetation communities of the Googong Urban Investigation Area. The north-western boundary of the study area adjoins the Googong Urban Investigation Area. The vegetation adjoining the study area is mapped as 'Box woodland and forest'.

### 4.2.2 Current Survey

The vegetation of the study area has been disturbed by construction of the existing tracks. The most disturbed areas were those immediately adjoining the track, especially on the northern downslope edge, where piled boulders and soil were observed and there was a high cover of exotic species including *Verbascum thapsus, Solanum linnaeanum, Chondrilla juncea* and *Marrubium vulgare.*

The vegetation of the site consisted of a disturbed woodland dominated by *Eucalyptus polyanthemos* and *E. rossii* with *E. bridgesiana* occurring less frequently. There was a shrub layer of *Kunzea ericoides* and *Bursaria spinosa* in the areas downslope of the track. The ground layer varied from sparse with scattered native grasses and forbs to dense cover of exotic shrubs and herbs.

The vegetation at the top of the slope adjoining the existing Googong Dam Water Treatment Plant consisted of grassy woodland dominated by *E. polyanthemos.* There was evidence of shrub growth of *Kunzea ericoides* that had been cut back to stumps and was resprouting. The ground layer was characterised by grasses including *Aristida* sp. and *Austrodanthonia carphoides* and herbs such as *Vittadinia* sp. and *Hydrocotyle laxiflora.*

Downslope in the south-east of the study area was less disturbed woodland dominated by *Eucalyptus rossii* with a sparse grassy understorey. This area was

on gently sloping land and was less rocky and also had lower cover of exotic species.

A population of the endangered species *Leucochrysum albicans* var. *tricolor* was recorded in and adjoining the existing access track and in the less disturbed woodland in the south-east of the study area. The population was dense on the more disturbed soils, but the species had only sparse occurrence in areas with high exotic cover.

The vegetation on the site is most similar to the description of Dry Forest in Fallding (2002). The vegetation does not meet the criteria for the endangered ecological community White Box Yellow Box Blakely's Red Gum Woodland, as none of the characteristic tree species of this community - *Eucalyptus albens* (White Box), *E. melliodora* (Yellow Box) or *E. blakelyi* (Blakely's Red Gum) – were recorded.

## 4.3 Flora

A total of 60 vascular plant species were recorded from the study area, comprising 41 (68 %) locally indigenous species and 19 (32 %) exotic species. A list of plant species recorded is provided in Appendix 1.

None of the exotic species recorded are listed under the *Noxious Weeds Act 1993* and the *Noxious Weeds Amendment Act 2005* for the Queanbeyan LGA.

### 4.3.1 Significant Flora

A total of eight plant species listed on the TSC Act and/or EPBC Act, or their habitat have been previously recorded within a 10 km radius of the study area (Table 1, Figure 3).

One endangered plant species under the EPBC Act was recorded in the study area. This species has been considered further in Section 5 of this report. The study area may also represent potential habitat for the endangered species *Rutidosis leptorrhynchoides.*

**Table 1**: Terrestrial flora listed on the TSC and/or EPBC Acts that may occur in the local area

*Key: 1) Listed on the EPBC Act as Endangered (E) or Vulnerable (V)*
*2) Listed on the TSC Act as Endangered (E1) or Vulnerable (V)*

| Scientific Name/ Common Name | EPBC Act [1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| *Caladenia tessellata* | V | E1 | Currently known from three disjunct areas: Braidwood on the southern tablelands, Ulladulla on the south coast and three populations in the Wyong area on the Central | No |

| Scientific Name/ Common Name | EPBC Act [1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| *Tessellated Spider Orchid* | | | Coast (DEC 2005c).<br>It is generally found in grassy, dry sclerophyll forests/woodland, particularly those associated with clay loam, or sandy soils. However, there is one population at Braidwood in lowland on stony soil (DEC 2005c). | |
| *Calotis glandulosa*<br>Mauve Burr-daisy | V | V | Occurs at higher altitudes between Eden and Dubbo where it grows in grassland and sclerophyll forest (Harden 1992). The main distribution is in the Monaro and Kosciuszko regions. There is a known site in the upper Shoalhaven catchment and record from near Oberon. There are old, highly dubious records from the Dubbo area and Mt Imlay. Found in montane grasslands in the Australian Alps and subalpine grassland (dominated by *Poa* spp.), Natural Temperate Grassland (dominated by *Themeda australis*) and Snow Gum (*Eucalyptus pauciflora*) Woodlands on the Monaro and Shoalhaven area. Appears to be a coloniser of bare patches, which explains why it is often seen on roadsides. Apparently common on roadsides in parts of the Monaro. Does not persist in heavily-grazed pastures of the Monaro. Dispersed by the sticky burrs (DEC 2005d). | No |
| *Leucochrysum albicans* var. *tricolor*<br>Hoary Sunray | E | - | In the ACT Hoary Sunray can be seen in spring in abundance on the roadside along Fairbairn Avenue and into Mt Ainslie Nature Reserve, on the western slopes of Mt Majura and adjacent to the Federal Highway road easement (ACT Government 2004). In NSW it is distributed on the inland slopes and plains including grassland on the Monaro. The species occurs from Queensland to Victoria and in Tasmania. The species is usually found in ungrazed and lightly grazed areas, along roadsides in particular. It appears to be very sensitive to grazing, but responds to disturbance as a coloniser and appears to tolerate mowing (ACT Government 2004). Flowers spring to summer (Harden 1992). | Yes – population recorded on site |
| *Rutidosis leptorrhynchoides*<br>Button Wrinklewort | E | E1 | Occurs in the ACT and Monaro region where it grows in grassland and woodland. This species flowers mostly in summer (Harden 1992). Occurs in Box-Gum Woodland, secondary grassland derived from Box-Gum Woodland or in Natural Temperate Grassland; and often in the ecotone between the two communities. Grows on soils that are usually shallow, stony red-brown clay loams; tends to occupy areas where there is relatively less competition from herbaceous species (either due to the shallow nature of the soils, or at some sites due to the competitive effect of woodland trees). Exhibits an ability to colonise disturbed areas (e.g. vehicle tracks, bulldozer scrapings and areas of soil erosion) (DEC 2005k). | Possible |
| *Swainsona recta*<br>Small Purple Pea | E | E1 | Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum *Eucalyptus blakelyi*, Yellow Box *E. melliodora*, Candlebark Gum | No |

| Scientific Name/ Common Name | EPBC Act [1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| | | | *E. rubida* and Long-leaf Box *E. goniocalyx*. It grows in association with understorey dominants that include Kangaroo Grass *Themeda australis*, Poa tussocks *Poa* spp. and spear-grasses *Austrostipa* spp. Plants die back in summer, surviving as rootstocks until they shoot again in autumn. Generally tolerant of fire, which also enhances germination by breaking the seed coat and reduces competition from other species (DEC 2005l). | |
| *Swainsona sericea*<br><br>Silky Swainson-pea | - | V | Grassland and eucalypt grassy woodland, sometimes with Callitris species (Harden 2002; NSW Scientific Committee 2008b). Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Found in Natural Temperate Grassland and Snow Gum *Eucalyptus pauciflora* Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes (DEC 2005n). | No |
| *Pomaderris pallida*<br><br>Pale Pomaderris | V | V | *Pomaderris pallida* has been recorded from near Kydra Trig, north-west of Nimmitabel, Tinderry Nature Reserve, and the Queanbeyan River. A record from Byadbo in Kosciuszko National Park has not been relocated. The main distribution is along the Murrumbidgee in the ACT. It was recorded recently in eastern Victoria. This species usually grows in shrub communities surrounded by Brittle Gum (*Eucalyptus mannifera*) and Red Stringybark (*E. macrorhyncha*) or *Callitris* spp. Woodland (DEC 2005i). | No |
| *Thesium australe*<br><br>Austral Toad-flax | V | V | Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands.<br><br>*Thesium australe* is a root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass (DEC 2005p). It is often found in damp sites in association with *Themeda australis*, but also found on other grass species at inland sites (G. Leonard pers. obs.).<br><br>Occurs on clay soils in grassy woodlands or coastal headlands (James *et al.* 1999). | No |

# 4.4 Fauna

## 4.4.1 Fauna Habitats

### Disturbed Woodland

Woodland habitat within the study area has been previously disturbed by construction of the Googong Water Treatment Plant and associated infrastructure (including tracks). Myrtaceaeous trees, mostly eucalypt species (including

*Eucalyptus polyanthemos*, *E. rossii* and *E. bridgesiana*) dominate the upper canopy in these areas and supply direct (foliage, nectar, exudates) and indirect food (arthropods) for a range of vertebrates, particularly birds. The understorey is sparse with a mixture of shrubs and regenerating Eucalypts providing shelter and foraging habitat for small birds and mammals. The groundcover contains a mixture of both native and exotic grasses and forbs. Species recorded included Crimson Rosellas (*Platycercus elegans*), White-throated Gerygones (*Gerygone olivacea*) and Yellow-rumped Thornbills (*Acanthiza chrysorrhoa*).

### 4.4.2 Fauna

No threatened species were recorded during the current survey. Fauna recorded in the current surveys are listed in Appendix 1 and include 25 birds, one reptile and one introduced mammal.

### 4.4.3 Significant fauna

A total of 29 threatened and/or migratory animal species or their habitat have been previously recorded within a 10 km radius of the study area (DECCW Atlas of NSW Wildlife and DEWHA Online EPBC Database). Of these, 21 animal species are listed under the TSC Act (Figure 4) and 20 animal species are listed under the EPBC Act (12 animal species are listed under both Acts).

No threatened animal species were recorded during the current survey, however, potential habitat for five threatened and/or migratory species listed on the TSC and EPBC Acts does occurs within the study area (Table 2). These species have been considered further in Section 5 (Impact Assessment) of this report.

**Table 2: Terrestrial fauna listed on the TSC Act or EPBC Act that have the potential to occur in the local area.**

| Latin Name/ Common Name | EPBC Act[1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| Amphibians | | | | |
| *Litoria aurea*<br><br>Green and Golden Bell Frog | V | E1 | Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC (NSW Government 2009). The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (NPWS 1999a; White and Pyke 1996), although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill | No |

| Latin Name/ Common Name | EPBC Act[1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| | | | areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 6 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species (DEC 2005f). | |
| *Litoria castanea*<br><br>Yellow-spotted Tree Frog | E | E1 | Has not been recorded in the wild since the 1970s. Disjunct distribution, recorded on the New England Tableland and on the southern highlands from Lake George to Bombala. There are unconfirmed reports from near Bathurst and Orange. Found in large permanent ponds, lakes and dams with an abundance of bulrushes and other emergent vegetation. Shelter during autumn and winter under fallen timber, rocks, other debris or thick vegetation (Robinson 1998; DEC 2005q). | No |
| *Litoria raniformis*<br><br>Southern Bell Frog | V | E1 | In NSW the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral swamps or billabongs with an abundance of bulrushes and other emergent vegetation along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Outside the breeding season animals disperse away from the water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks (Robinson 1993; DEC 2005m). | No |
| Birds | | | | |
| *Haliaeetus leucogaster*<br><br>White-bellied Sea-eagle | M | - | A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive (Marchant and Higgins 1993). Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees (Marchant and Higgins 1993). | Yes |
| *Apus pacificus*<br><br>Fork-tailed Swift | M | - | Almost exclusively aerial. The fork-tailed swift breeds in Asia but migrates to Australia from September to April (Higgins 1999). Individuals or flocks can be observed hawking for insects at varying heights from only a few metres from the ground and up to 300 m high (Boehm 1944). | No |
| *Hirundapus caudacutus*<br><br>White-throated Needletail | M | - | An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breed in Asia (Pizzey and Knight 1997). | No |

| Latin Name/ Common Name | EPBC Act[1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| *Ardea alba*<br><br>Great Egret | M | - | Terrestrial wetlands, estuarine and littoral habitats and moist grasslands. Inland, prefer permanent waterbodies on floodplains; shallows of deep permanent lakes (either open or vegetated), semi-permanent swamps with tall emergent vegetation and herb dominated seasonal swamps with abundant aquatic flora. Also regularly use saline habitats including mangrove forests, estuarine mudflats, saltmarshes, bare saltpans, shallows of salt lakes, salt fields and offshore reefs. Breeding requires wetlands with fringing trees in which to build nests including mangrove forest, freshwater lakes or swamps and rivers (Marchant and Higgins 1990). | No |
| *Ardea ibis*<br><br>Cattle Egret | M | - | Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands (Marchant and Higgins 1990). | No |
| *Callocephalon fimbriatum*<br><br>Gang-gang Cockatoo | - | V | In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests (Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest (Forshaw and Cooper 1981). In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas (Shields and Crome 1992). It requires tree hollows in which to breed (Gibbons and Lindenmayer 1997a). | Yes |
| *Climacteris picumnus victoriae*<br><br>Brown Treecreeper (eastern subspecies) | - | V | Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present (Traill and Duncan 2000). | Yes |
| *Myiagra cyanoleuca*<br><br>Satin Flycatcher | M | - | Migratory species that occurs in coastal forests, woodlands and scrubs during migration. Breeds in heavily vegetated gullies (Pizzey and Knight 1997). | Yes |
| *Rhipidura rufifrons*<br><br>Rufous Fantail | M | - | Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey and Knight 1997). | No |

| Latin Name/ Common Name | EPBC Act[1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| *Anthochaera Phrygia*<br><br>Regent Honeyeater | E | E1 | A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS 1999b; Pizzey and Knight 1997).<br><br>Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and sheoaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female (DEC 2005j). | Yes |
| *Merops ornatus*<br><br>Rainbow Bee-eater | M | - | Usually occurs in open or lightly timbered areas, often near water. Nest in embankments, including banks of creeks and rivers, in sand dunes, in quarries and in roadside cuttings. Breeding occurs from November to January. It has complex migratory movements in Australia. NSW populations migrate north for winter (Higgins 1999). | Yes |
| *Chthonicola sagittata*<br><br>Speckled Warbler | - | V | This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a grassy understorey, often on ridges or gullies (Blakers *et al.* 1984; NSW Scientific Committee 2008a). The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Blakers *et al.* 1984; NSW Scientific Committee 2008a). Home ranges vary from 6-12 ha (NSW Scientific Committee 2008a). | Yes |
| *Stagonopleura guttata*<br><br>Diamond Firetail | - | V | Found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs (Pizzey and Knight 1997). Often occur in vegetation along watercourses (Higgins *et al.* 2006). | Yes |
| *Melanodryas cucullata cucullata*<br><br>Hooded Robin (south-eastern form) | - | V | This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas (Traill and Duncan 2000). | Yes |
| *Lathamus discolour*<br><br>Swift Parrot | E | E1 | The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects (Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields and Crome 1992). Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested | Yes |

| Latin Name/ Common Name | EPBC Act[1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| | | | trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis* (DEC 2005o). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey and Knight 1997). | |
| *Polytelis swainsonii*<br><br>Superb Parrot | V | V | Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Breeds in hollow branches of tall Eucalypt tress within 9 km of feeding areas (Higgins 1999). | No |
| *Rostratula australis*<br><br>Australian Painted Snipe | VM | E1 | Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant and Higgins 1993). | No |
| Invertebrates | | | | |
| *Synemon plana*<br><br>Golden Sun Moth | Z | E1 | The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which ground-layer is dominated by wallaby grasses of the genus *Austrodanthonia* (DECC 2005a). It is believed that the females lay up to 200 eggs at the base of the *Austrodanthonia* tussocks. After hatching, the larvae tunnel underground where they remain feeding on the roots of *Austrodanthonia* (DEWHA 2008). | No |
| Mammals | | | | |
| *Dasyurus maculatus maculates*<br><br>Spotted-tailed Quoll (southeastern mainland) | E | V | Occurs along the east coast of Australia and the Great Dividing Range (Belcher *et al.* 2008). Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman and Read 1992). Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas (NPWS 1999k). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar and Belcher 1995). 70% of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage (NPWS 1999c). The home range of a female is between 180 – 1000 ha, while males have larger home ranges of between 2000 – 5000 ha. Breeding occurs from May to August (Belcher *et al.* 2008). | Yes |

| Latin Name/ Common Name | EPBC Act[1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| *Phascolarctos cinereus*<br><br>Koala | - | V | In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region (DEC 2005g). Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally (Martin *et al.* 2008). Primary feed trees include *Eucalyptus robusta, E. tereticornis, E. punctata, E. haemostoma* and *E. signata* (DoP 1995). They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 ha and overlap, while in semi-arid country they are usually discrete and around 100 ha (Martin *et al.* 2008). | No |
| *Miniopterus schreibersii oceanensis*<br><br>Eastern Bentwing Bat | - | V | Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways (Churchill 2008; Hoye and Hall 2008). | No |
| *Myotis macropus*<br><br>Large-footed Myotis | - | V | Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects (Richards *et al.* 2008). | Yes |
| Reptiles | | | | |
| *Tympanocryptis pinguicolla*<br><br>Grassland Earless Dragon | E | E1 | Occurs at sites dominated by wallaby grasses (*Austrodanthonia spp.*), spear grasses (*Austrostipa spp.*), Poa Tussock (*Poa sieberiana*), Red Grass (*Bothriochloa macra*), and occasionally Kangaroo Grass (*Themeda australis*). Introduced pasture grasses occur at many of the sites supporting this species. It apparently prefers areas with a more open structure, characterised by small patches of bare ground between the grasses and herbs. Partially embedded surface rocks, and spider and insect holes are used for shelter. Rocks and arthropod holes provide important thermal refuges during temperature extremes (DECC 2005b). | No |

| Latin Name/ Common Name | EPBC Act[1] | TSC Act [2] | Habitat | Potential Habitat? |
|---|---|---|---|---|
| *Aprasia parapulchella*<br><br>Pink-tailed Legless Lizard | V | V | Fossorial species, which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae (Osborne and Jones 1995). Thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter (DEC 2005h). Key habitat features are a cover of native grasses, particularly Kangaroo Grass (*Themeda australis*), sparse or no tree cover, little or no leaf litter, and scattered small rock with shallow embedment in the soil surface (Osborne and Jones 1995). | Yes |
| *Delma impar*<br><br>Striped Legless Lizard | V | V | Generally occurs in lowland native grasslands occurring on gently undulating plains having soils of basaltic origin (Coulson 1990). Grasses are dominated by perennial, tussock-forming grasses such as *Themeda triandra, Austrostipa* spp. and *Austrodanothonia* spp. Inhabits secondary grasslands only when they occur within 2 km of primary grassland (Hadden 1995). | No |
| *Varanus rosenbergi*<br><br>Rosenberg's Goanna | - | V | This species is a Hawkesbury/Narrabeen sandstone outcrop specialist (Wellington and Wells 1985). Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests (Cogger 1992). | No |

# 5.0 IMPACT ASSESSMENT

## 5.1 Extent of Impacts

### 5.1.1 Introduction

Impacts arising from the proposal include disturbance and clearing of approximately 0.45 ha of mostly woodland vegetation. The proposed access road will extend from the existing road in the Googong Water Treatment Plant along the 685 m contour to the Proposed Bulk water Pumping Station.

### 5.1.2 Key Threatening Processes

This section of the report has been provided in order to provide specific contextual information regarding potential impacts considered to result from the proposal. The extent of the following impacts on each species and community would vary. Assessments of the likely impacts on each species are provided in Appendices 2 and 3. A range of Key Threatening Processes (KTPs) may result from the proposal; however the most likely are clearing of native vegetation, bushrock removal, loss of hollow-bearing trees and removal of dead wood and dead trees. These are discussed in more detail below.

**Clearing of vegetation and associated habitat loss**

'Clearing of native vegetation' is listed as a Key Threatening Processes (KTP) under Schedule 3 of the TSC Act, 'Land clearance' is listed as a KTP under the EPBC Act and clearing of native vegetation is also subject to the *Native Vegetation Act 2003* (NV Act). Impacts of the clearing of native vegetation on biological diversity include:

- Destruction of habitat resulting in the loss of local populations of individual species;
- Fragmentation;
- Expansion of dryland salinity;
- Riparian zone degradation;
- Increased habitat for invasive species;
- Loss of leaf litter layer;
- Loss or disruption of ecological function; and,

- Changes to soil biota.

Approximately 0.74 ha of disturbed forest will be potentially impacted as a result of the proposal. Not all of this area will be permanently cleared, however there may be vegetation disturbance during construction. The major impact on habitat values will be the removal or disturbance of approximately 0.45 ha of existing habitat for the construction of the BWPS and an approximately 4 m wide access road. It is considered unlikely that the proposal will result in significant fragmentation of habitat on the site.

**Removal of Bushrock**

'Removal of bushrock ' is listed as a KTP under Schedule 3 of the TSC Act (NSW Scientific Committee 2007a). Bushrock Removal is the removal of natural surface deposits of rock from rock outcrops or from areas of native vegetation. Bushrock removal does not include: the removal of rock from approved quarrying activities; the salvage of rock where the removal of the rock is necessary for carrying out an approved development or the removal of rock from paddocks when it constitutes a necessary part of a routine agricultural activity (NSW Scientific Committee 2007a).

Surface rocks in the study area are an important habitat feature for the Pink-tailed Legless Lizard. Removal of rock may be approved as part of the project.

**Loss of hollow-bearing trees and removal of dead wood and dead trees**

'Loss of hollow-bearing trees' is listed as a KTP under Schedule 3 of the TSC Act (NSW Scientific Committee 2007b). In NSW, terrestrial vertebrate species that are reliant on tree hollows for shelter and/or nests include at least 46 mammals, 81 birds, 31 reptiles and 16 frogs (Gibbons and Lindenmayer 1997b; Gibbons and Lindenmayer 2002). Of these, 40 species are listed as threatened under the TSC Act (NSW Scientific Committee 2007b).

Hollow-bearing trees in the subject site are likely to provide suitable den and nesting habitat for a range of common birds (such as parrots) and possibly arboreal mammal species (such as Common Brush-tailed Possums *Trichosurus vulpecula*). Locally recorded threatened species requiring tree-hollows for roosting include Brown Treecreepers and Gang-gang Cockatoos. Retention of hollow-bearing trees where possible is encouraged to reduce impacts on species that rely on them for nesting.

'Removal of dead wood and dead trees' is also listed as a KTP under Schedule 3 of the TSC Act (NSW Scientific Committee 2003). The removal of standing dead wood reduces the availability of hollows over time and the input of material to the litter layer (NSW Scientific Committee 2003). Fallen branches and bark

provide refuge and nesting habitat for a range of terrestrial animals. Many invertebrates and amphibians rely on these 'moisture-retaining' microhabitats to over-winter or as refuge during periods of drought. Similarly, many reptiles rely on ground litter and debris for shelter and foraging.

## 5.2 Part 3A Assessment of Impacts

### 5.2.1 Introduction

The impacts of the proposal on threatened biota listed under the TSC Act have been undertaken following the Guidelines for Threatened Species Assessment under Part 3A of the EP&A Act (DEC & DPI 2005). Where threatened biota is recorded within a study area, an impact assessment is required under the EP&A Act. When threatened biota is not recorded during a survey, the presence of potential habitat for this species is used to determine the need to undertake an impact assessment under the EP&A Act. Where there is no potential habitat in the study area for threatened biota, there is unlikely to be any impact on these species and therefore these species are not required to be considered further.

### 5.2.2 Assessment of Key Thresholds

The Part 3A Guidelines of the EP&A Act (DEC & DPI 2005) set out a number of key thresholds which need to be addressed to justify the impacts of the proposal on threatened species, populations or ecological communities. The key thresholds are:

- whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts, will maintain or improve biodiversity values;
- whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community;
- whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction; and
- whether or not the proposal will adversely affect critical habitat.

Based on the impact assessments following the Guidelines for Threatened Species Assessment under Part 3A of the EP&A Act (Appendix 2), the proposal is unlikely to reduce the long-term viability of, accelerate the extinction of and/or adversely affect critical habitat for threatened species, populations and/or ecological communities within the study area.

**Maintenance of Biodiversity Values**

The subject site is currently disturbed with piled boulders and soil observed adjoining the existing access track and high cover of exotic species in some areas, particularly adjoining the track and in the area downslope of the Googong Water Treatment Plant.

The proposed Bulk Water Pumping Station and associated access road will require the clearing and disturbance of approximately 0.45 ha of disturbed woodland. The woodland is currently fragmented by a number of access tracks, and the proposed access road is likely to further fragment the woodland. It is recommended that a management plan be prepared for the area within and adjoining the existing track to protect the population of the Commonwealth listed plant species *L. albicans* var. *tricolor.*

Provided that the mitigation measures detailed in Section 6.0 are implemented, the proposed development is likely to maintain the biodiversity values of the locality.

### 5.2.3 Potential Impacts on Endangered Ecological Communities

The vegetation on the subject site does not meet the criteria for the endangered ecological community White Box Yellow Box Blakely's Red Gum Woodland, as none of the characteristic tree species of this community - *Eucalyptus albens* (White Box), *E. melliodora* (Yellow Box) or *E. blakelyi* (Blakely's Red Gum) – were recorded. The vegetation on the subject site is not consistent with any endangered ecological communities listed under the TSC Act.

The Johnstone Centre (2004) Local Environment Study (LES) mapped areas to the north-west of the study area as 'Box woodland and forest'. These mapped areas are approximately 50 m north of the subject site and are not likely to be impacted by the proposal.

### 5.2.4 Potential Impacts on Threatened Plant Species

No threatened plant species as listed under the NSW TSC Act were recorded in the study area.

One species, *Rutidosis leptorrhynchoides* is considered to have potential habitat in the study area but was not been recorded during the current surveys of the study area, or during previous surveys of the study area and nearby areas (The Johnstone Centre 2004). The nearest known record of this species is approximately 2.5 km south of the study area in proximity to Googong Reservoir (see Figure 3). The potential for *Rutidosis leptorrhynchoides* to be present as

dormant stems or within a soil stored seed bank in the study area is feasible; however, if present in the soil, the proposal would have a negligible impact. Further to this, impacts to the potential habitat of this species are considered negligible due to the following;

- Impacts resulting from the proposal will be contained to a relatively small area of potential habitat (0.45 ha) and extensive areas of potential habitat will be retained in the study area and locality;
- The proposal will not result in the isolation or fragmentation of potential habitat;
- The proposal is unlikely to interfere with the pollination and dispersal of native plant species; and,
- The proposal is unlikely to interfere with the existing fire regimes of the study area.

On the basis of the above, detailed impact assessments for *Rutidosis leptorrhynchoides* are not considered necessary for this species and has not been considered further.

### 5.2.5 Potential Impacts on Fauna Habitats

The direct impacts of the proposal on potential fauna habitats include the removal of trees and disturbance of ground cover. Indirect impacts such as sediment runoff and increased weed invasion are likely to occur. Recommendations have been included within this report to minimise the potential for impacts on fauna habitats within the study area.

### 5.2.6 Potential Impacts on Threatened Fauna

Where there is potential habitat (foraging or breeding resources) for threatened species in the study area, further consideration must be given to the potential impact of the proposal on these species. The proposal may impact on threatened species by causing any of the following:

- death or injury of individuals;
- loss or disturbance of limiting foraging resources; and/or,
- loss or disturbance of limiting breeding resources.

Limiting resources are specialised habitat components that species are dependent on for their ongoing survival. Such limiting resources are predominantly associated with specialised breeding habitats (such as tree hollows or suitable nest/maternity roost sites) that occur at low densities, with high levels of competition from a range of species. However, for some species, limiting

resources include specialised foraging habitats that have a restricted distribution (such as Golden Sun Moths feeding only on specific grassland species).

Actual or potential habitat exists within the study area for a total of 10 threatened animal species listed on the TSC Act (Table 2). Table 3 below summarises the possible impacts from the proposal on these threatened fauna, and determines the need for further assessment using the Part 3A Impact Assessment guidelines. Five species Pink-tailed Legless Lizard and woodland birds (Hooded Robin, Speckled Warbler, Diamond Firetail and Brown Treecreeper), require further assessment due to the potential for impacts to limited foraging and/or breeding habitat. The remaining five threatened species have not been considered further, as potential habitat would not be significantly impacted by the proposal (Table 3). Impact assessments using the Part 3A Assessment Guidelines Criteria have been prepared for the five threatened species in Appendix 2.

**Table 3: Potential impacts on threatened fauna**

| Common Name | EPBC Act | TSC Act | Potential Impacts on Threatened Species | | | Impact Assessment required? | Reasoning |
|---|---|---|---|---|---|---|---|
| | | | Individual death or injury? | Loss or disturbance of limiting foraging resources? | Loss or disturbance of limiting breeding resources? | | |
| Pink-tailed Legless Lizard | E | E1 | Possible | Yes | Yes | Yes | Pink-tailed Legless Lizard has been recorded in the locality. This species relies on grassland habitats. Potential habitat exists in the study area and will be cleared as a result of the proposal. Further assessment of impacts is required. |
| Diamond Firetail | - | V | Possible | Yes | Yes | Yes | Potential foraging and breeding habitat may be modified and/or removed as a result of the proposal. Further assessment of impacts is required. |
| Brown Treecreeper | - | V | Possible | Yes | Yes | Yes | Potential foraging and breeding habitat may be modified and/or removed as a result of the proposal. Further assessment of impacts is required. |
| Speckled Warbler | - | V | Possible | Yes | Yes | Yes | Potential foraging and breeding habitat may be modified and/or removed as a result of the proposal. Further assessment of impacts is required. |
| Hooded Robin | - | V | Possible | Yes | Yes | Yes | Potential foraging and breeding habitat may be modified and/or removed as a result of the proposal. Further assessment of impacts is required. |
| Gang-gang Cockatoo | - | V | Unlikely | No | No | No | Habitat within the study area is not considered limiting for this species, given the species mobility and small area of habitat loss/modification. As such this species is not considered further |
| Swift parrot | E | E1 | Unlikely | No | No | No | The Swift Parrot unlikely to breed in the locality, and no limiting foraging resources will be removed. As such, this species is not considered further. |
| Regent Honeyeater | EM | E1 | Unlikely | No | No | No | The Regent Honeyeater has been recorded in the locality. This species is unlikely to breed in the locality, and no limiting foraging resources will be removed. As such, this species is not considered further. |
| Spotted –tailed Quoll | E | V | Unlikely | No | No | No | The study area contains potential foraging habitat and adjacent and surrounding woodland may contain potential den sites. However given the extent of foraging habitat within the immediate vicinity of the study area, mobility of this species and small area to be disturbed this species is not considered further. |

| Common Name | EPBC Act | TSC Act | Potential Impacts on Threatened Species | | | Impact Assessment required? | Reasoning |
|---|---|---|---|---|---|---|---|
| | | | Individual death or injury? | Loss or disturbance of limiting foraging resources? | Loss or disturbance of limiting breeding resources? | | |
| Large-footed Myotis | - | V | Unlikely | No | No | No | The study area is not proximity to any water bodies (over approximately 650 m from Queanbeyan River) and does not provide preferred roosting or foraging habitat in the form of vegetation overhanging water. Individuals may occasionally forage in the study area but these resources are not considered limiting and this species has not been considered further. |

## 5.3 EPBC Act Assessments of Significance

### 5.3.1 Endangered Ecological Communities

The vegetation in the study area does not meet the criteria for the endangered ecological community White Box Yellow Box Blakely's Red Gum Woodland, or any other endangered ecological communities listed under the EPBC Act.

### 5.3.2 Threatened Flora Species

One threatened plant species was recorded in the study area, namely *Leucochrysum albicans* var. *tricolor*.

The disturbance created by the construction of the existing dirt access road is likely to have encouraged the spread of the population of the Commonwealth endangered species *Leucochrysum albicans* var. *tricolor* on the site.

A significance assessment using the EPBC Act Significant Impact Guidelines has been carried out for the population of *L. albicans* var. *tricolor* in the study area.

### 5.3.3 Threatened Fauna Species

Actual or potential habitat exists within the study area for a total of 10 threatened animal species listed on the EPBC Act (Table 2). Table 3 above summarises the possible impacts from the proposal on these threatened fauna, and determines the need for further assessment using the Part 3A Impact Assessment guidelines. One species, Pink-tailed Legless Lizard, requires further assessment due to the potential for impacts to limit foraging and/or breeding habitat. The remaining three threatened species have not been considered further, as potential habitat would not be significantly impacted by the proposal (Table 3). An impact assessment using the EPBC Significant Impact Criteria has been prepared for the Pink-tailed Legless Lizard in Appendix 2.

### 5.3.4 Migratory Species

The list of Migratory species under the EPBC Act is a compilation of species listed under four international conventions: China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Twelve species listed under the 'migratory' provisions of the EPBC Act were listed in Table 2 for investigation. Of these, the following have potential habitat in the study area: White-bellied Sea-eagle, Regent Honeyeater, Swift Parrot, Cattle Egret (*Ardea ibis*), Rainbow Bee-eater (*Merops ornatus*) and Satin Flycatcher (*Myiagra cyanoleuca*). Individuals of these species that have been or may be recorded in the study area are not considered likely to be an ecologically significant proportion of the population. Potential habitat in the study area is not considered important for the Migratory species. Minimal impact is expected on the potential habitat for these species in the study area. As such, no assessments have been carried out for these species, in accordance with the Significant Impact Criteria (DEH 2006).

### 5.3.5 Commonwealth Land

Under the EPBC Act, approval is required for an action taken by any person outside of Commonwealth land that is likely to have a significant impact on the environment on Commonwealth land. 'Environment' is defined in the EPBC Act as:

(a) ecosystems and their constituent parts including people and communities ('ecosystem' is defined in the EPBC Act as 'a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functioning unit');

(b) natural and physical resources;

(c) qualities and characteristics of locations, places and areas;

(d) heritage values of places; and

(e) the social, economic and cultural aspects of a thing mentioned in paragraphs (a), (b) or (c).

The study area is located on Commonwealth land currently leased by ActewAGL. Impacts to Commonwealth land as a result of the proposal are assessed in Appendix 3.

# 6.0 RECOMMENDATIONS

Recommendations have been made to reduce the impact of the proposal on native flora and fauna occurring in the study area:

- A referral for the endangered species *Leucochrysum albicans* var. *tricolor* under the provisions of the EPBC Act is recommended.

- Specific measures for *L. albicans* var. *tricolor* should be included within management and operational plans for the Googong water cycle project and the Googong Foreshores Plan of Management.

- Immediately prior to construction a qualified ecologist/botanist should inspect the site and mark out areas of occurrence of *L. albicans* var. *tricolor* within and adjoining the construction area. These areas should be protected and avoided during construction.

- Avoid the introduction and transportation of weeds into surrounding areas of better quality vegetation. Measures that should be implemented to minimise the transportation of weeds include: the development of a weed distribution map across the study area; conducting a pre-construction weed control program; implement strict vehicle hygiene controls such as cleaning of tyres, wheel guards and bases of machinery before entry into any areas of bushland;

- Avoid removal of hollow-bearing trees and branches in the study area. Where the removal of hollow-bearing trees and branches is found to be unavoidable, the work should be undertaken by an appropriately qualified arborist under the observation of a qualified ecologist/zoologist. Hollows should be inspected for resident fauna by a qualified ecologist prior to felling or trimming. If resident fauna are found, the appropriate action to follow should be determined in consultation with the qualified ecologist/zoologist; and,

- Erosion, storm water and runoff controls, consistent with the ACT and NSW guidelines, will be required pre, during and post construction to prevent sedimentation in major waterways. This may include the appropriate use of temporary sediment fencing or sediment control bunding. These structures will need to meet appropriate standards and be well maintained throughout the construction phase.

- Given the possible direct impact to a localised population, and the precautionary principle, it is recommended that a Referral under the provisions of the EPBC Act be prepared for the Pink-tailed Legless Lizard.

- Further targeted surveys for the Pink-tailed Legless Lizard should be undertaken in spring to determine what action should be undertaken and the extent of habitat for this species within the study area. If individuals are encountered following spring surveys, pre-clearing inspections will be required prior to construction to translocate individuals into adjacent habitat. Where and if the subsequent survey effort results in substantial project delays a statement of commitments should be made with the planning application to ensure surveys are undertaken prior to any construction works.

# 7.0 CONCLUSION

This report assesses the ecological significance of threatened flora and fauna and endangered populations that occur, or have the potential to occur, within the area affected by the proposed Bulk Water Pumping Station and associated access road, in accordance with the requirements of the EP&A, TSC and EPBC Acts.

The vegetation of the study area consisted of a disturbed woodland dominated by *Eucalyptus polyanthemos* and *E. rossii* with an understorey ranging from shrubby to grassy. A total of 55 flora species were recorded, comprised of 38 native species and 17 exotic species. The woodland does not meet the criteria for any endangered ecological communities listed under the EPBC Act or TSC Act.

One endangered species listed under the Commonwealth EPBC Act, *Leucochrysum albicans* var. *tricolor* (Hoary Sunray) was recorded to the south and east of the subject site. A total of 1641 plants were counted in three sub-populations. An assessment of the impact of the proposal on this taxon using the EPBC Significant Impact Criteria found that there is unlikely to be a significant impact on the population in the study area. However given the proximity of the surveyed population to the proposed development and the potential habitat for the species in the development area, a Referral under the provisions of the EPBC Act is recommended for this species.

Potential impacts from the proposal are likely to be minimal. The direct impacts resulting from the proposal involve clearing and disturbance of approximately 0.45 ha of woodland. Given the disturbed nature of the study area, extent of habitat within the locality, and nature of the proposal, the proposal is unlikely to result in the death or injury of individuals, loss or disturbance of limiting foraging resources and/or loss or disturbance of limiting breeding resources for the majority of threatened animal species.

The study area contains potential habitat for 13 threatened or migratory animal species. Of these 13 species, only five required assessment of impacts of the development due to loss of potential limited foraging and/or breeding habitat, namely Pink-tailed Legless Lizard and woodland birds (Hooded Robin, Speckled Warbler, Diamond Firetail and Brown Treecreeper). The proposal is considered unlikely to have a significant impact on the woodland birds.

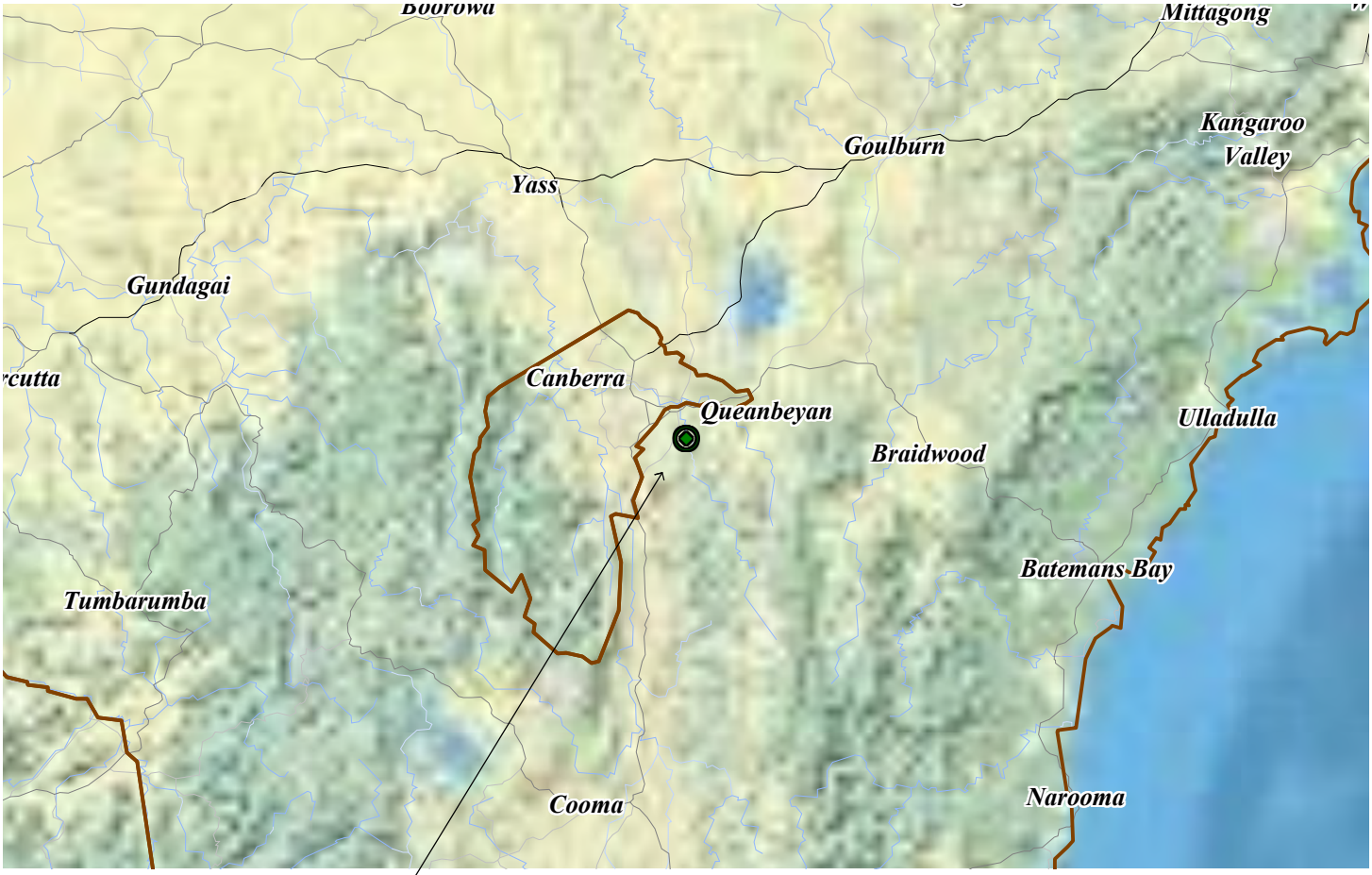
The proposed access track may have an impact on potential Pink-tailed Legless Lizard habitat. Although the Pink-tailed Legless Lizard was not recorded during the current surveys it is recommended that further surveys be undertaken in spring (the onset of the breeding season when the species may be more detectable). If the Pink-tailed Legless Lizard were to occur within the study area,

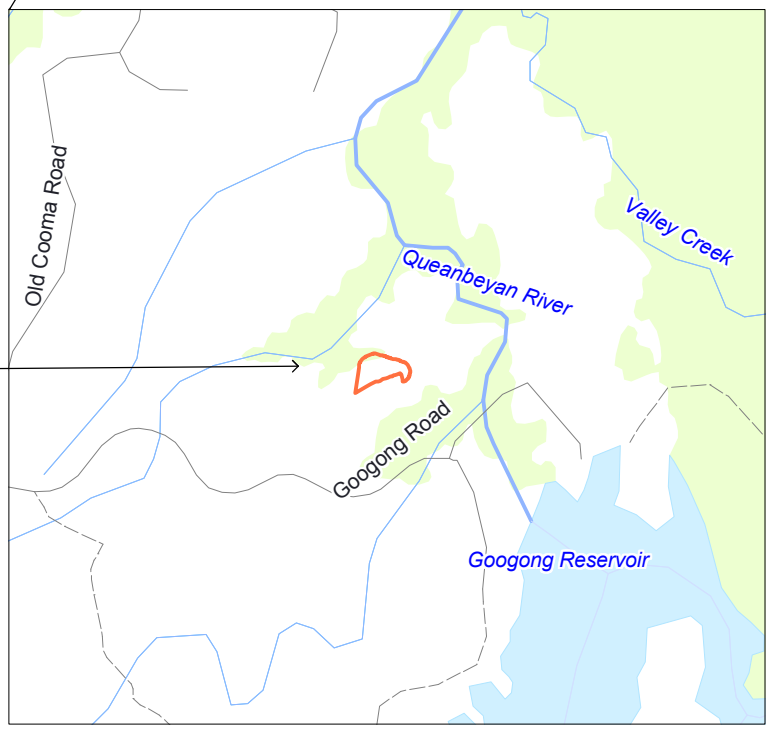
disruption to potential habitat could impact on the breeding cycle and dispersal of this species. As such a Species Impact Statement and a Referral would be required.

However, should it be determined that the Pink-tailed Legless Lizard does not inhabit the study area it is unlikely that the proposal would lead to the long term decrease in the size of a local population. Furthermore mitigation measures will be implemented prior and during construction phase of the project to minimise impacts to potential Pink-tailed Legless Lizard habitat.

It is unlikely that the Proposal would result in a significant impact to other fauna species with potential habitat within the study area. A range of mitigation measures are proposed to reduce impact of the proposal on biodiversity.

# FIGURES



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AUSTRALIAN CAPITAL TERRITORY 2609

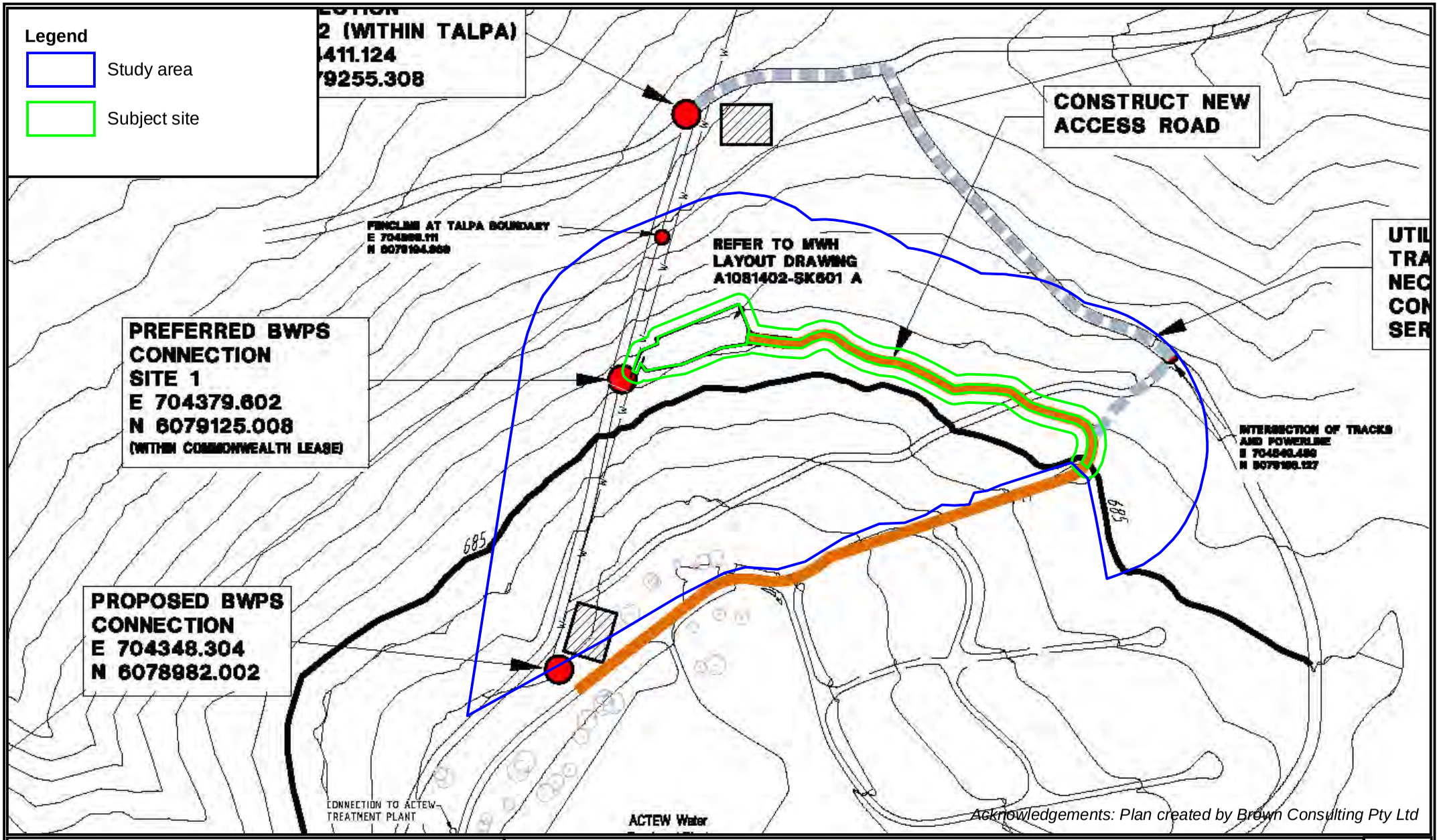
Figure 1: Location of the Study Area in a regional context

| | |
|---|---|
| Date: 11 June 2010 | Drawn by: ANP |
| File number: S5681 | Checked by: TE |

Location: ...\\venus\nsw_projects\N5000s\N5600s\N5681\Mapping\S5681 F1_Locality.WOR

Scale: 0 0.5 1.0 1.5 2.0 kilometres

N W E S




*Acknowledgements: Plan created by Brown Consulting Pty Ltd*

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Figure 2. The proposed development

| | |
|---|---|
| Date: 10 June 2010 | Drawn by: JER |
| File number: 5681 | Checked by: JER |
| Location:P:...\N5600s\N5681\Mapping\F2_Proposal.WOR | |

Scale: 0 25 50 75 100 125 metres

Figure 2

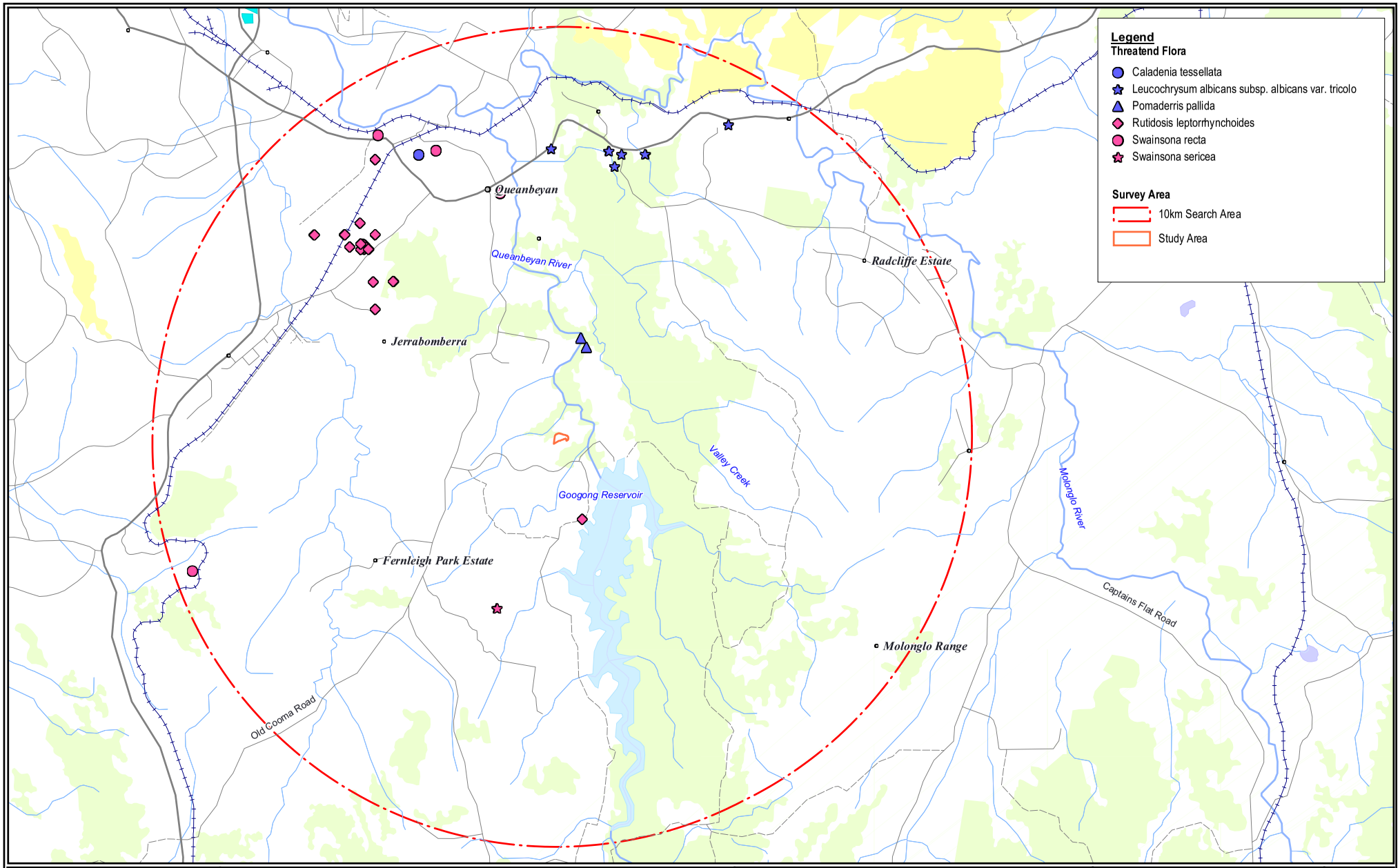


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Figure 3: Threatened flora listed on the TSC Act that have been recorded within 10 km of the study area.

| | |
|---|---|
| Date: 11 June 2010 | Drawn by: ANP |
| File number: S5681 | Checked by: TE |
| Location:-..\\Venus\nsw_projects\N5000s\N5600s\N5681\Mapping\S5681 F3_Flora.WOR | |

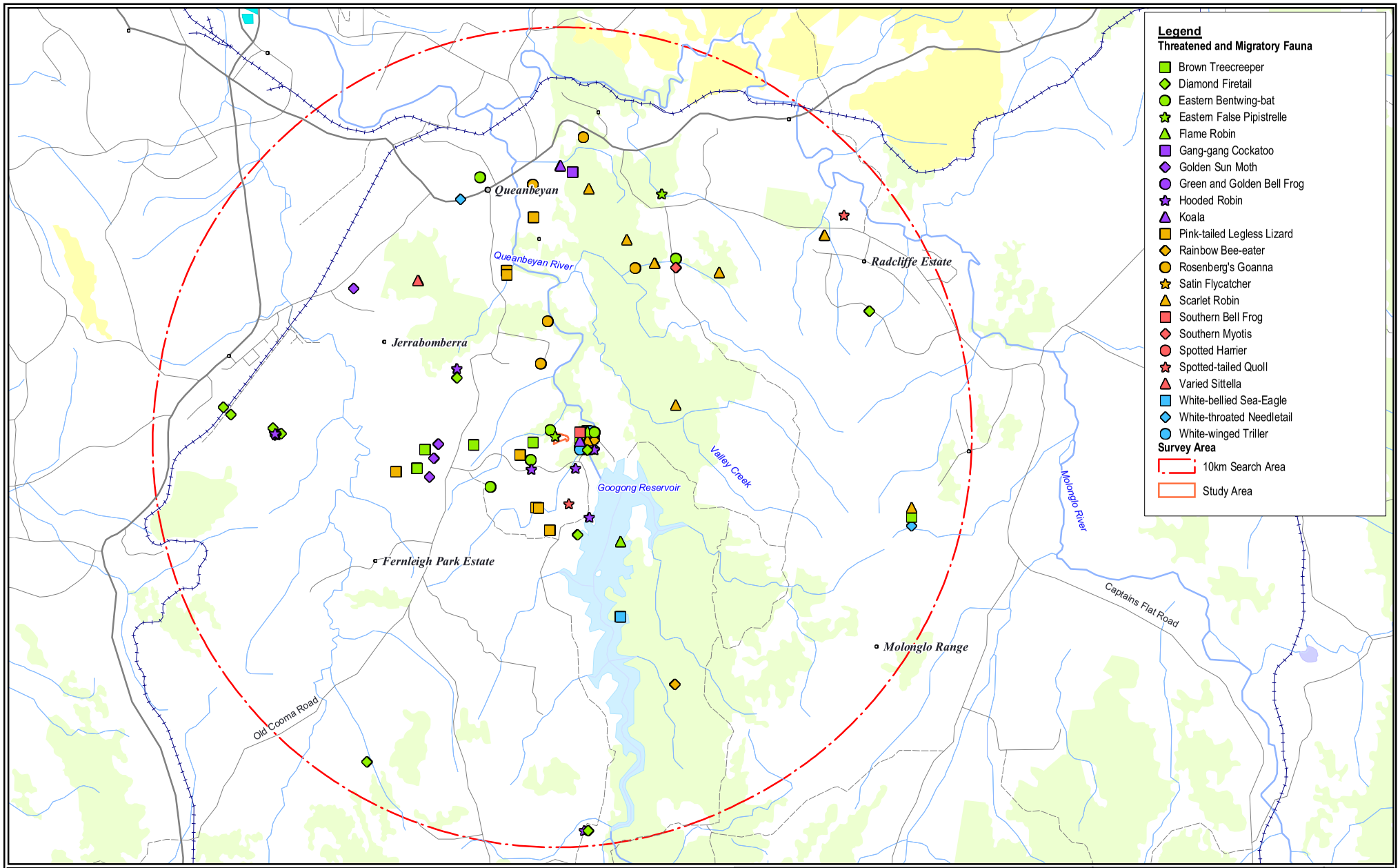
*Acknowledgements:*
*Data from DECCW/NPWS*
*This product incorporates Data which is copyright to the Commonwealth of Australia (c.2003-)*

0 0.85 1.7 2.55 3.4 4.25
kilometres

Scale: 1:85,000 at A3
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N W E S

Figure 3

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TERRITORY 2609

Figure 4: Threatened fauna listed on the TSC Act that have been recorded within 10 km of the study area

| | |
|---|---|
| Date: 11 June 2010 | Drawn by: ANP |
| File number: S5681 | Checked by: TE |
| Location:-..\\Venus\nsw_projects\N5000s\N5600s\N5681\Mapping\S5681 F4 Fauna.WOR | |

*Acknowledgements:*
*Data from DECCW/NPWS*
*This product incorporates Data which is copyright to the Commonwealth of Australia (c.2003-)*

0 0.85 1.7 2.55 3.4 4.25
kilometres

Scale: 1:85,000 at A3
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

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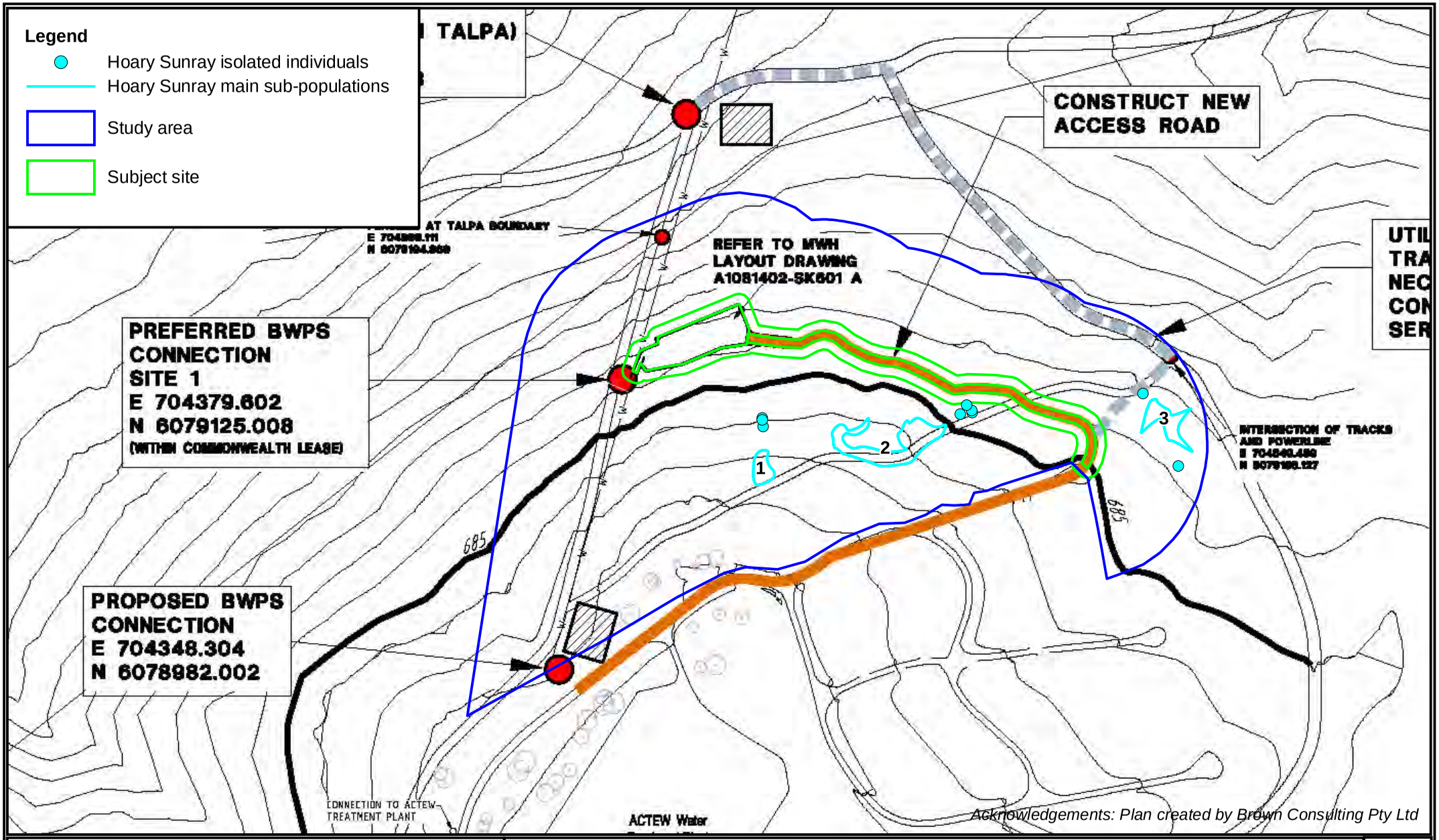
Figure 4




*Acknowledgements: Plan created by Brown Consulting Pty Ltd*

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Figure 5: Locations of Leucochrysum albicans var. tricolor populations in the study area in relation to the proposed development

| | |
|---|---|
| Date: 10 June 2010 | Drawn by: JER |
| File number: 5681 | Checked by: JER |
| Location:P:...\N5600s\N5681\Mapping\F5_Hoary Sunray populations.WOR | |

Scale: 0 25 50 75 100 125 metres

Figure 5

# PLATES

**Plate 1: *Leucochrysum albicans* var. *tricolor* habitat downslope of existing access track**

**Plate 2: *L. albicans* var. *tricolor* colonising existing access track**

**Plate 3: Shrubby regrowth vegetation adjoining existing access track**

**Plate 4: Vegetation in the vicinity of the proposed Bulk Water Pumping Station**

# APPENDICES

# APPENDIX 1

## Flora and Fauna Results

## Flora recorded within the study area during the current surveys

Note: * indicates exotic species; + indicates threatened species

| Family Name | Scientific name | Common Name |
|---|---|---|
| Adiantaceae | *Cheilanthes sieberi* | |
| Apiaceae | *Hydrocotyle laxiflora* | Stinking Pennywort |
| Asclepiadaceae | * *Tweedia coerulea* | |
| Asteraceae | * *Arctotheca calendula* | Capeweed |
| | *Bracteantha viscosa* | Sticky Everlasting |
| | *Cassinia longifolia* | |
| | *Cassinia quinquefaria* | |
| | * *Chondrilla juncea* | Skeleton Weed |
| | *Chrysocephalum apiculatum* | Common Everlasting |
| | * *Cirsium vulgare* | Spear Thistle |
| | * *Hypochaeris radicata* | Catsear |
| | * *Lactuca serriola* | Prickly Lettuce |
| | + *Leucochrysum albicans var. tricolor* | Hoary Sunray |
| | *Vittadinia cuneata* | Fuzzweed |
| | *Vittadinia muelleri* | |
| Boraginaceae | * *Echium plantagineum* | Paterson's Curse |
| Brassicaceae | * *Hirschfeldia incana* | Buchan Weed |
| | * *Lepidium africanum* | |
| Campanulaceae | *Wahlenbergia communis* | Tufted Bluebell |
| Chenopodiaceae | *Einadia hastata* | Berry Saltbush |
| Cyperaceae | *Lepidosperma laterale* | |
| Dilleniaceae | *Hibbertia obtusifolia* | |
| Epacridaceae | *Lissanthe strigosa* | Peach Heath |
| | *Melichrus urceolatus* | Urn Heath |
| Fabaceae (Faboideae) | *Bossiaea buxifolia* | |
| | *Desmodium varians* | Slender Tick-trefoil |
| | *Hardenbergia violacea* | False Sarsaparilla |
| Fabaceae (Mimosoideae) | *Acacia dealbata* | Silver Wattle |
| | *Acacia rubida* | Red-leaved Wattle |
| | *Acacia terminalis* | Sunshine Wattle |
| Geraniaceae | *Geranium solanderi* | Native Geranium |
| Goodeniaceae | *Goodenia hederacea* | |
| Haloragaceae | *Gonocarpus tetragynus* | |
| Lamiaceae | * *Marrubium vulgare* | Horehound |

| Family Name | Scientific name | Common Name |
|---|---|---|
| Lomandraceae | *Lomandra longifolia* | Spiny-headed Mat-rush |
| | *Lomandra multiflora* | |
| Loranthaceae | *Amyema pendulum* | |
| Myrtaceae | *Eucalyptus bridgesiana* | Apple Box |
| | *Eucalyptus polyanthemos* | Red Box |
| | *Eucalyptus rossii* | Inland Scribbly Gum |
| | *Kunzea ericoides* | Burgan |
| Oxalidaceae | *Oxalis* sp. | |
| Pittosporaceae | *Bursaria spinosa* | Native Blackthorn |
| Plantaginaceae | * *Plantago lanceolata* | Lamb's Tongues |
| | *Plantago varia* | |
| Poaceae | * *Aira* sp. | |
| | *Aristida* sp. | |
| | *Austrodanthonia carphoides* | Short Wallaby Grass |
| | *Austrostipa scabra* | |
| | * *Hordeum* sp. | |
| | *Microlaena stipoides* | Weeping Rice Grass |
| | *Panicum simile* | Two-colour Panic |
| | *Poa sieberiana* | |
| Polygonaceae | * *Acetosella vulgaris* | Sheep Sorrel |
| Primulaceae | * *Anagallis arvensis* | Scarlet/Blue Pimpernel |
| Rosaceae | *Acaena ovina* | |
| | * *Rosa rubiginosa* | Sweet Briar |
| Scrophulariaceae | * *Orobanche minor* | |
| | * *Verbascum thapsus* | Blanket Weed |
| Solanaceae | * *Solanum linnaeanum* | Apple of Sodom |

## Fauna recorded within the study area during the current surveys

| Latin Name | Common Name | Subject Site |
|---|---|---|
| BIRDS | | |
| *Acanthiza chrysorrhoa* | Yellow-rumped Thornbill | O |
| *Anthochaera carunculata* | Red Wattlebird | OW |
| *Cacatua galerita* | Sulphur-crested Cockatoo | OW |
| *Calyptorhynchus funereus* | White-winged Chough | O |
| *Corcorax melanorhamphos* | Yellow-tailed Black Cockatoo | O |
| *Coracina novaehollandiae* | Black-faced Cuckoo Shrike | W |
| *Cormobates leucophaea* | White-throated Treecreeper | W |
| *Eopsaltria australis* | Eastern Yellow Robin | O |
| *Gerygone olivacea* | White-throated Gerygone | O |
| *Gymnorhina tibicen* | Australian Magpie | O |
| *Lichenostomus chrysops* | Yellow-faced Honeyeater | W |
| *Lichenostomus leucotis* | White-eared Honeyeater | W |
| *Malurus cyaneus* | Superb Fairy-wren | O |
| *Manorina melanocephala* | Noisy Miner | O |
| *Neochmia temporalis* | Red-browed Finch | O |
| *Ocyphaps lophotes* | Crested Pigeon | O |
| *Pachycephala pectoralis* | Golden Whistler | O |
| *Pardalotus punctatus* | Spotted Pardalote | W |
| *Platycercus elegans* | Crimson Rosella | O |
| *Platycercus eximius* | Eastern Yellow Rosella | O |
| *Rhipidura albiscapa* | Grey Fantail | O |
| *Rhipidura leucophrys* | Willie Wagtail | OW |
| *Strepera graculina* | Pied Currawong | W |
| MAMMALS | | |
| *Oryctolagus cuniculus* | European Rabbit | I |

Key:; O: Observed; OW: Seen and Heard; W: Heard; I: Incidental (scats, tracks, bones…)

# APPENDIX 2

## Assessments of Impact according to Part 3A Guidelines for Threatened Species Assessment

## Woodland Birds

The Diamond Firetail *Stagonopleura guttata,* Brown Treecreeper *Climacteris picumnus victoriae,* Speckled Warbler *Chthonicola sagittata* and Hooded Robin *Melanodryas cucullata cucullata* are listed as Vulnerable under Schedule 2 of the TSC Act. Potential habitat for these woodland bird species occurs within the study area and these species have been grouped on the basis of their similar habitat requirements and local recordings.

All of these threatened woodland bird species occur in eucalypt woodlands with a grassy understorey, mostly west of the Great Dividing Range, with some populations occurring in the drier woodland areas of the tablelands and east of the range, including the local area. These species are considered sedentary and are often recorded in pairs or small family groups.

The Brown Treecreeper nests in hollows, usually in dead branches or spouts, but also in trunks of living or dead trees. The species breeds in pairs or co-operatively in territories which range in size between approximately one and 11 ha (generally around 4 ha). The species is found in eucalypt woodlands (mainly dominated by stringybarks or other rough-barked eucalypts) and dry open forest, usually with an open grassy understorey, although sometimes with one or more shrub species (DEC 2005b).

The Diamond Firetail prefers nesting in mistletoe (Cooney and Watson 2005), but would also nest in the shrubby understorey, or higher up, especially under hawk's or raven's nests (DEC 2005e). The Diamond Firetail requires large remnants (more than 200 ha) of native vegetation to persist in an area (NSW Scientific Committee 2001).

The Hooded Robin (south-eastern form) has a scattered and widespread distribution throughout NSW, with most records occurring west of the Great Dividing Range. The species is not frequently recorded east of the Great Dividing Range, except in the Hunter region (Higgins and Peter 2002).

Speckled Warblers are sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches (Higgins and Peter 2002). Home ranges vary from 6-12 ha (NSW Scientific Committee 2008a). Large, relatively undisturbed remnants (>100 ha) are required for the Speckled Warbler to persist in an area (Barrett *et al.* 1994).

All of these species have previously been recorded in proximity to the study area. The proposed development would remove or disturb approximately 0.45 ha of

woodland and scattered tree habitat (some of which is in poor condition) for these species.

**How is the proposal likely to affect the lifecycle of a threatened species and/or population?**

The study area provides potential foraging and breeding habitat for the four woodland birds within the disturbed woodland habitat. The proposal would impact this potential habitat through the removal of trees and groundcover for the Bulk Water Pumping Station and access road and disturbance of adjoining areas during construction. Indirect impacts such as noise, dust and edge effects are expected to be minor.

The area of woodland and disturbed grassland habitat to be removed represents a very small proportion of other similar woodland/grassland habitats within the locality. Given the small amount of potential habitat to be removed, the disturbed nature of the woodland, the presence of large areas of potential habitat in surrounding areas, the conspicuous nature of the species and the high mobility of the species, it is considered unlikely that the proposal would disrupt the life cycle of the Diamond Firetail, Brown Treecreeper, Speckled Warbler, and Hooded Robin to the extent that the lifecycle of these threatened species will be disrupted.

**How is the proposal likely to affect the habitat of a threatened species, population or ecological community?**

Direct impacts are limited to the removal or disturbance of 0.45 ha of woodland habitat. The amount of habitat to be modified and /or removed by the proposal represents a very small proportion of the available habitat for these species within the locality. As such given the mobility of this species and small area of impact, disturbance to potential habitat is considered minor.

The study area is currently fragmented by agriculture and existing infrastructure such as roads and telecommunication lines. The proposal would involve the removal of a few trees within the study area, however it is unlikely that this would create a movement barrier for the seven Woodland birds, which are highly mobile species. The proposal would result not result in further fragmentation or isolation of areas of habitat for these species.

Potential habitat for the four Woodland birds within the study area forms part of a large continuous area of habitat in the locality. The proposed impact footprint is considered to be relatively small compared to the larger areas of potential habitat in the locality. Given the mobility of the bird species, the loss of 0.45 ha of potential habitat within the locality is unlikely to have long-term negative consequences for the species' local occurrence.

**Does the proposal affect any threatened species that are at the limit of its known distribution?**

The study area is not at the limits of the known distribution for any of the four woodland bird species:

- The eastern subspecies of Brown Treecreeper (*Climacteris picumnus victoriae*) occurs from the western slopes to the coastal watersheds of the Great Dividing Range, south of the Bunya Mountains in south-eastern Queensland through NSW and Victoria and west to the Grampians (Higgins *et al.* 2001).

- The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW (DEC 2005e).

- The Hooded Robin is found across Australia, except for the driest deserts and the wetter coastal area, however it is common in few places, and rarely found on the coast (Morcombe 2006).

- The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast (Morcombe 2006).

**How is the proposal likely to affect the current disturbance regimes?**

The study area has previously been disturbed through the construction of the existing access track where rocks have been stockpiled either side of the road and some weeds have established. Following construction of the Bulk Water Pumping Station, disturbance will be limited by vehicle movements on the access road and maintenance of the Pumping Station. The existing dirt track, which also represents potential habitat for this species, may be subject to less disturbance as a result of the development; this will depend on future management plans for this area.

**How is the proposal likely to affect habitat connectivity?**

The study area has been subject to some disturbances previously but generally the habitat connectivity for the subject species remains intact. The removal and or disturbance of 0.45 ha of vegetation including the construction of a 4 m wide road will not fragment habitats or disrupt habitat connectivity such that the highly mobile bird species would be adversely affected. The proposal is not likely to impact habitat connectivity for the Brown Treecreeper, Diamond Firetail, Hooded Robin or the Speckled Warbler.

**How is the proposal likely to affect critical habitat?**

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Brown Treecreeper, Diamond Firetail, Hooded Robin or the Speckled Warbler (DECC 2008).

The proposal will have only minor impacts on potential habitat for these species, and given the large home ranges of these species it is not likely to be critical to the survival of these species.

**Conclusion**

Based on the above assessment the Brown Treecreeper, Diamond Firetail, Hooded Robin and the Speckled Warbler are unlikely to be significantly impacted by the proposed Bulk Water Pumping Station and associated access road. The proposal will clear only a small area of potential habitat for the species in comparison with the large areas of similar habitat in the locality and will not fragment habitat for these highly mobile species.

| **Pink-tailed Legless Lizard** | ***Aprasia parapulchella*** |
|---|---|

The Pink-tailed Legless Lizard is listed as Vulnerable under the EPBC Act and TSC Act. This species' status under the NC Act was recently upgraded from 'special conservation' to Vulnerable.

The study area is situated on a slope with a moderate density of surface rock scattered across the hillside. The vegetation community most resembles dry forest or woodland with an understorey varying from grassy to shrubby. Along the existing unsealed track there has been previous disturbance where rocks and boulders have been stockpiled to either side of the road and exotic vegetation has become established.

No individuals of Pink-tailed Legless Lizard were recorded during site surveys, however this species requires seasonal targeted survey during spring and will require further investigation at the site.

Commonly found beneath the rocks turned during the habitat assessment were termites, ants, scorpions and centipedes. These species are often found in association with Pink-tailed Legless Lizards as they provide food and/or shelter through the use of their burrows. It is considered that the surface rocks within the study area provide potential habitat for the Pink-tailed Legless Lizard.

**How is the proposal likely to affect the lifecycle of a threatened species and/or population?**

The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region (DEC 2005h). The study area is at the south-eastern limit of the distribution for this species. Pink-tailed Legless Lizards have previously been recorded approximately 900 m west of the study area (Johnstone Centre 2004) and were also recorded in the Googong township area, approximately 1.5 km to the south-west of the current study area (Ecowise Environmental and Biosis Research 2009).

It is possible that the gully system where the previous records of Pink-tailed Legless Lizards were found supports a population which may extend to the surrounding rocky outcrops in the area, inclusive of the study area.

The Pink-tailed Legless Lizard is a fossorial species, which lives beneath surface rocks and occupies ant burrows. It feeds 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 2005h).

Any disturbance to the surface rock in the vicinity of a population of Pink-tailed Legless Lizards could impact on the available habitat for the localised population. Any reduction in habitat could impact the size of the population, and therefore its genetic diversity. Significant disturbance to the amount of surface rock could significantly impact this species. Approximately 0.45 ha of woodland will be cleared or disturbed as a result of the proposal; this area includes potential habitat for the Pink-tailed Legless Lizard which may affect the lifecycle of a local population if present.

**How is the proposal likely to affect the habitat of a threatened species, population or ecological community?**

The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region (DEC 2005h). The study area is at the south-eastern limit of the distribution for this species. Pink-tailed Legless Lizards have previously been recorded approximately 900 m west (Johnstone Centre 2004) and 1.5 km south-west of the study area {Ecowise Environmental and Biosis Research, 2009 20104 /id}.

Key habitat features for the presence of the Pink-tailed Legless Lizard are a cover of native grasses, particularly Kangaroo Grass (*Themeda australis*), sparse or no tree cover, little or no leaf litter, and scattered small rock with shallow embedment in the soil surface. 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*. The likelihood of occurrence of Pink-tailed Legless Lizard increases with increasing cover of Kangaroo Grass. By contrast, increase in cover of speargrasses (*Austrostipa scabra* subsp. *falcata* and *A. bigeniculata*) and Common Tussock Grass (*Poa labillardieri*) decreases the likelihood of finding the species (ACT Government 2007).

The proposed development will require the clearing and disturbance of 0.45 ha of woodland, including potential habitat for the Pink-tailed Legless Lizard. The proposed access route extends from an existing sealed road approximately 200 m north-west to the proposed site for the Bulk Water Pumping Station. The area immediately surrounding the existing track has been previously disturbed with rocks and boulders stockpiled to each side. The area is considered to be disturbed woodland with a groundcover of both introduced and native species. The presence of weed species is likely to be a result of the previous disturbances which have affected the site. Due to the partially disturbed nature of the site, particularly where surface rock has been buried or stockpiled, the habitat is considered to be of moderate quality.

The proposal would impact the potential habitat for Pink-tailed Legless Lizard through the removal of groundcover and rocks in the development and road footprint and the disturbance of adjoining groundcover during construction. Indirect impacts such as noise, dust and edge effects are expected to be minor.

**Does the proposal affect any threatened species that are at the limit of its known distribution?**

The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region (DEC 2005h). The study area is at the south-eastern limit of the distribution for this species.

**How is the proposal likely to affect the current disturbance regimes?**

The study area has previously been disturbed through the construction of the existing access track where rocks have been stockpiled either side of the road and some weeds have established. There is evidence of rabbits in the area which are a recognised threat to the Pink-tailed Legless Lizard by reducing the regeneration of native forbs and grasses. Following construction of the Bulk Water Pumping

Station, disturbance will be limited by vehicle movements on the access road and maintenance of the Pumping Station. The existing dirt track, which also represents potential habitat for this species, may be subject to less disturbance as a result of the development; this will depend on future management plans for this area.

**How is the proposal likely to affect habitat connectivity?**

The study area and its surrounding locality is generally rocky, becoming boulderous in some patches. It is possible that these rocky areas are linked to other rocky regions to the north and west. A population of Pink-tailed Legless Lizard has been recorded approximately 900 m to the west of the subject site (Johnstone Centre 2004). The proposed site for the Bulk Water Pumping Station is approximately 115 m north of the Googong Water Treatment Plant and the proposed access road intersects an existing dirt track. The study area has been subject to previous disturbances through the construction of these features. The 0.45 ha impact area spread over a 200 m length of the proposed access road and Bulk Water pumping Station is considered unlikely to create a barrier which would disrupt connectivity to populations to the north or north-west of the study area.

**How is the proposal likely to affect critical habitat?**

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Pink-tailed Legless Lizard (DECC 2008; DEWHA 2009).

The proposed Pumping Station will directly impact on 0.45 ha of habitat containing surface rock which the Pink-tailed Legless Lizard may utilise for food resources and shelter (DEC 2005h).

**Conclusion**

Based on the above assessment a local population of the Pink-tailed Legless Lizard could feasibly, if present in the study area, be significantly impacted by the proposed activities. The Pink-tailed Legless Lizard has previously been recorded approximately 900 m west of the study area (Johnstone Centre 2004). There appears to be continuous habitat between this record and the study area which provides moderate quality potential habitat for the Pink-tailed Legless Lizard. Based on the precautionary principle, if a population of Pink-tailed Legless Lizards are present within the study area, the removal of 0.45 of vegetation and surface rock may significantly impact this population. It is recommended that further surveys be undertaken in Spring to determine whether

there is a population on the site. To minimise the potential impact to the Pink-tailed Legless Lizard pre-clearing surveys are also recommended.

# APPENDIX 3

## EPBC Act Significant Impact Criteria

| **Hoary Sunray** | ***Leucochrysum albicans var tricolor*** |
|---|---|

**Background**

*Leucochrysum albicans* var. *tricolor* (Hoary Sunray, also known as White Sunray), is nationally listed as 'endangered' under the EPBC Act.

It is an erect, low, tufted, perennial or annual plant with greyish-green, narrow linear leaves growing to about 30 cm high. The everlasting daisy flower head is 20-25 cm wide, with a yellow disc, surrounded by papery bracts that are either white or yellow. A yellow-flowered form is found east of Canberra, while the form common in the Canberra region has white flowers; both forms are erect (Eddy *et al*. 2007). Flowering is in spring and summer.

*L. albicans* var. *tricolor* occurs in many parts of the Southern Tablelands, including the Lake George rangelands and in grassy woodlands. It is described as uncommon, but widespread in the region (Eddy *et al*. 2007) and large numbers sometimes colonise disturbed sites.

*L. albicans* var. *tricolor* sites in the Canberra-Queanbeyan area include Stony Creek Nature Reserve, located approximately 5 km east of Queanbeyan; Cuumbeun Nature Reserve and Wanna Wanna Nature Reserves on the range east of Queanbeyan; the Australian Defence Forces Academy site in Canberra, and Mount Majura and Mount Ainslie in Canberra.

On the subject site, *L. albicans* var. *tricolor* were observed growing in the dirt access track and adjacent to the track in areas of high light availability and low groundcover. Downslope to the north of the track, there were some small patches of suitable habitat for *L. albicans* var. *tricolor*, but most of this area had a tree canopy or dense cover by the native shrubs *Kunzea ericoides* and *Bursaria spinosa*, along with scattered large rocks. *L. albicans* var. *tricolor* was generally not observed in areas with high cover by exotic species, with the exception of isolated individuals.

Three 'sub-populations' of *L. albicans* var. *tricolor* were recorded in the study area (Figure 6). The definition of sub-populations was based on a minimum distance of 25 m between individuals.

| **Sub-population** | **Approximate no. of individuals** | **Approximate area occupied** |
|---|---|---|
| Sub-population 1 | 130 | 133 $m^2$ |

| Sub-population | Approximate no. of individuals | Approximate area occupied |
|---|---|---|
| Sub-population 2 | 1276 | 569 $m^2$ |
| Sub-population 3 | 235 | 218 $m^2$ |
| **Total** | 1641 | 920 $m^2$ |

The closest record of *L. albicans* var. *tricolor* to the subject site on the DECCW Wildlife Atlas is approximately 6.8 km to the north in Cuumbeun Nature Reserve. This taxon has also been recorded in the vicinity of the approved Edwin Land Parkway between Jerrabomberra and Karabar, approximately 4 km to the north-west of the site (Queanbeyan City Council/ GHD 2009). A previous survey, conducted by the Johnstone Centre, Charles Sturt University, located a population on Mueller's Property, over 3 km to the south-west of the study area (Johnstone Centre, 2004).

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

There are several hundred known populations of *L. albicans* var. *tricolor* considered likely to comprise 0.4 to 1 million plants in total, with an estimated 200,000 plants in NSW and the ACT (Sinclair 2009). Several significant populations of *L. albicans* var. *tricolor* have been identified, including at Cuumbeun Nature Reserve approximately 1.5 km to the east of the site (Sinclair 2010).

The proposed access road for the BWPS utilises the existing access track in the Googong Water Treatment Plant and extends north-west along the contour from the end of this track. The proposed track does not intersect any of the recorded locations of *L. albicans* var. *tricolor*. The subject site is on Commonwealth land leased by Actew AGL and the existing access track may be utilised for purposes not associated with the current proposal.

The vegetation on the subject site, particularly in areas adjacent to the existing dirt track, is currently modified with evidence of disturbance from the construction of the track, such as piled dirt and boulders at the edges. Exotic species are abundant, particularly adjoining the track and the boundary of the Water Treatment Plant.

The proposed development will include clearing of native vegetation and potentially disturbing roadside vegetation supporting the population or potential habitat for the population. Most of the area to be cleared for the BWPS and

associated access track does not represent habitat for *L. albicans* var. *tricolor*. Some of the areas within and adjoining the existing track within the proposed development area may represent potential habitat. There is a section of the subject site located approximately 6 m downslope of the edge of Sub-population 2; it should be noted that the individuals recorded in this area were isolated and there was a high cover of exotic species adjoining the existing track.

It is considered unlikely that the proposed Bulk Water Pumping Station and associated access roads will lead to a long-term decrease in the size of the *L. albicans* var. *tricolor* population on the site, however the future use and management of the existing dirt track needs to be considered by the land manager in the context of conservation of the population. The taxon appears to be colonising the bare soil on the track as well as disturbed areas on the edges of the track.

**Is there a real chance or possibility that the action will reduce the area of occupancy of the species?**

The Hoary Sunray grows in a wide range of communities and habitats, from peaty upland to stony plains. It is widespread in Southern Tablelands. However, it has suffered extensive losses, due to cultivation and pasture improvement and is now mainly confined to road reserves and areas which have remained relatively intact.

The area currently occupied by *L. albicans* var. *tricolor* in the study area is greater than 920 $m^2$, and the area of potential habitat is likely to be higher. The proposed development will not reduce the existing area of occupancy for the population, although some potential habitat is likely to be cleared. It is possible that the plant could further colonise the road and extend the current area of occupancy into the subject site.

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

Of the three 'sub-populations' of *L. albicans* var. *tricolor* identified on site, sub-populations 2 and 3 are currently separated by a distance of approximately 84 m. The proposed access road will run between the two sub-populations, however it is considered unlikely that it will form a barrier to dispersal or genetic exchange between the populations. Pollination of the taxon is effected by a number of flying insects including bees and flies, and seed can probably be dispersed over many kilometres (Sinclair 2010).

There is no real chance or possibility that the action will fragment the existing population into two or more populations.

**Is there a real chance or possibility that 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. The Minister, under the EPBC Act, maintains a Register of Critical Habitat. To date, no critical habitat has been listed for *L. albicans* var. *tricolor* (DEWHA, 2008d).

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

*L. albicans* var. *tricolor* is pollinated by flying insects including bees and flies (Sinclair 2010) and the proposal is unlikely to disrupt the breeding cycle of the population.

**Is there a real chance or possibility that 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?**

Land clearing, degradation and fragmentation of habitat and/or populations by residential and agricultural developments, including road widening and re-routing, are major known causes of the decline of *L. albicans* var. *tricolor* populations. Other threats include frequent fire, weed infestation, bush rock removal, grazing, and rubbish dumping (DEC 2007).

The study area is currently modified with disturbed soils and patches of high weed cover adjoining the access track and downslope of the Googong Water Treatment Plant. The populations of *L. albicans* var. *tricolor* mainly occur in areas with low or no exotic cover, with only isolated individuals recorded in weedy areas. The proposed development will require clearing and disturbance of 0.45 ha of woodland and has the potential to increase the spread of exotic weed species in the study area. Most of the proposed access road is downslope of the recorded populations of *L. albicans* var. *tricolor*.

The proposed development is likely to reduce the area of potential habitat for *L. albicans* var. *tricolor* through the clearing and disturbance of 0.45 ha of woodland. However provided there is a strategy in place to manage the recorded population of the taxon in the study area, the taxon is unlikely to decline as a result of the proposal.

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

Weed invasion is considered to be a high level threat to *L. albicans* var. *tricolor* (Sinclair 2010). This taxon does not tolerate heavy competition, and is at high risk from weed competition throughout its range. Weeds listed in the recovery plan as currently threatening the taxon include *Hypochaeris radicata* (Cat's Ear), *Trifolium* spp. (Clovers), *Phalaris aquatica* (Toowoomba Canary-grass), *Agrostis capillaris* (Brown-top Bent), *Paspalum dilatatum* (Paspalum), *Dactylis glomerata* (Cocksfoot) and *Romulea rosea* (Onion-grass).

The subject site is already significantly modified and has a high abundance of weed species in some of the more disturbed areas, particularly adjoining the existing access track. The current use of the track is likely to contribute to the spread of exotic species via weed seed and material transported on vehicle tyres.

The construction of the proposed road and Bulk Water Pumping Station has the potential to introduce exotic species and spread. Measures to minimise the further transportation of weeds in the subject site have been recommended in section 6.0 of this report.

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

No diseases have been identified as threats to the survival of *L. albicans* var. *tricolor*. It is unlikely that the Proposal would introduce any diseases that may cause the species to decline.

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

A Draft Recovery Plan for *L. albicans* var. *tricolor* was prepared in October 2009 (Sinclair 2010). The philosophy of the strategy for recovery is habitat conservation, restoration and management as well as furthering understanding of the ecology and biology of the taxon.

The specific objectives for recovery are to:

1. Determine distribution, abundance and population structure

2. Determine habitat requirements

3. Ensure that key populations and their habitat are managed appropriately

4. Manage threats to populations

5. Identify key biological functions

6. Determine growth rates and viability of populations

7. Build community support for conservation

The population of *L. albicans* var. *tricolor* occurring in the study area has not previously been recorded and should contribute to the current knowledge of the distribution and habitat condition of this taxon. Provided that a management strategy is implemented for the conservation of the population on the site, the proposed development should not interfere with the recovery of the species.

**Conclusion**

Based on the above assessment, *Leucochrysum albicans* var. *tricolor* is considered unlikely to be significantly impacted by the proposed development. However given the proximity of the surveyed population to the proposed development and the potential habitat for the species in the development area, a Referral under the provisions of the EPBC Act is recommended for this species.

| **Pink-tailed Legless Lizard** | ***Aprasia parapulchella*** |
|---|---|

The Pink-tailed Legless Lizard is listed as Vulnerable under the EPBC Act .

Key habitat features for the presence of the Pink-tailed Legless Lizard are a cover of native grasses, particularly Kangaroo Grass (*Themeda australis*), sparse or no tree cover, little or no leaf litter, and scattered small rock with shallow embedment in the soil surface. 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*). The likelihood of occurrence of Pink-tailed Legless Lizard increases with increasing cover of Kangaroo Grass. By contrast, increase in cover of speargrasses (*Austrostipa scabra* subsp. *falcata, A. bigeniculata*) and Common Tussock Grass (*Poa labillardierei*) decreases the likelihood of finding the species (ACT Government 2007).

The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region (DEC 2005h). The study area is at the south-eastern limit of the distribution for this species. This species was previously recorded approximately 900 m west (Johnstone Centre 2004) and 1.5

km south-west of the study area {Ecowise Environmental and Biosis Research, 2009 20104 /id}.

**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?**

There have been no records of Pink-tailed Legless Lizards within the study area although surveys were conducted in Autumn rather than the preferred Spring survey season. Pink-tailed Legless Lizard individuals were recorded within the locality, approximately 900 m and 1.5 km from the subject site (Johnstone Centre 2004, Ecowise Environmental and Biosis Research, 2009 20104 /id}. The population of Pink-tailed Legless Lizard associated with these outcrops may extend to other outcrops in the area, including the study area. Any disturbance to the surface rock in this location could impact on the available habitat for the localised population.

The vegetation of the study area is considered disturbed woodland with an understory of both exotic and native species. The surface rock within the proposal site has been previously disturbed through the construction of the access dirt track and the existing water pumping station. Although previously disturbed the potential habitat within the study area is in the form of a cover of loose rocks providing burrowing, nesting and foraging opportunities for the Pink-tailed Legless Lizard. It is likely that individuals will use the same rocks over time which maintain specific thermoregulatory properties. There is little known about the movement patterns of the Pink-tailed Legless Lizard but it is expected that they will not venture far from shelter and consequently be relatively localised.

Given the proposal will involve the removal or disturbance of 0.45 ha of woodland habitat, if a population is present on this site, a long-term decrease in the size of the population is possible to result from the proposal.

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

Significant disturbance to the amount of surface rock could impact the area of occupancy of the species in the study area. While a resident population could be impacted, the works are expected to occur only within a 0.45 ha narrow footprint extending approximately 200 m from an established sealed road within moderate quality habitat. It is recommended that Spring surveys be conducted to ascertain whether a population is present on site. The area of occupancy for a resident population will be reduced as a result of the proposal although it is not likely to be reduced significantly.

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

The study area and its surrounding locality are generally rocky, becoming boulderous in some patches. It is possible that these rocky areas are linked to other rocky regions to the north and west. A population of Pink-tailed Legless Lizard has been recorded 1.5 km to the west and 912 m to the north-west (Johnstone Centre 2004). The proposed site for the Bulk Water Pumping Station is approximately 115 m north of the Googong Water Treatment Plant and the proposed access road intersects an existing dirt track. The study area has been subject to previous disturbances through the construction of these features. The 0.45 ha is a narrow impact area spread over a 200 m length of the proposed access road and Bulk Water Pumping Station which is not likely to create a barrier which would fragment an existing 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 2009).

**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 2005h).

The study area provides numerous surface rocks which support termites, ants, scorpions and centipedes which are often found in association with the Pink-tailed Legless Lizards as they provide food and/or shelter through the use of their burrows. It is considered that the surface rocks within the study area provide potential habitat for the Pink-tailed Legless Lizard. Any disturbance to the surface rock in this location could reduce the available habitat for the localised population. Any reduction in habitat could impact the size of the population, and therefore its genetic diversity. If a population is present within the study area, the reduction in suitable habitat availability may disrupt this population's breeding cycle.

**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?**

The vegetation community of the study area most resembles dry forest with an understorey varying from grassy to shrubby. Along the existing unsealed track there has been previous disturbance where rocks and boulders have been stockpiled to either side of the road and exotic vegetation has become established. Due to the previous disturbances which have resulted in buried rocks and the establishment of some weed species, the habitat is considered to be of moderate quality for the Pink-tailed Legless Lizard.

The proposed development will involve some excavation at the site of the Pumping Station and installation of pipes to and from the Pumping Station as well as the construction of an access road. This will involve the removal or disturbance of 0.45 ha of potential habitat for the Pink-tailed Legless Lizard. If a population is present on site the removal of 0.45 ha of moderate habitat may impact on the local population, however, the impacts are not likely to lead to the overall decline of the species.

**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 were detected on the subject site during the recent surveys (Biosis Research 2010). This species has been identified as an invasive species which suppresses the regeneration of natural grasses and forbs (DEC 2005a). The damaging grazing by Feral European Rabbits does put pressure on the Pink-tailed Legless Lizard by reducing the abundance of native grasses, however, the proposal is not considered likely to increase the abundance or spread of the Feral European Rabbit.

Several weed species were identified as already being established within the study area. Other invasive plant species that may be harmful to the Pink-tailed Legless Lizard are not likely to become established in this area as a result of the proposal.

**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 proposal 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?**

No recovery plan has been prepared for this species, however, the DECCW has provided a number of priority actions and recovery strategies to assist with its recovery (DEC 2005h). Relevant actions include:

- Provide incentive payments for protection and enhanced management of known sites;
- Develop and implement a site management plan for Googong Foreshore Reserve;
- Reserve or ensure long-term management of known populations;
- Ensure remnant populations remain connected or linked to each other; and,
- Develop guidelines for habitat identification, enhancement and management.

Measures can be implemented to minimise the likelihood of further disturbing potential habitat, however, there is no guarantee, that a potential on site population will be reserved or managed in the long-term.

**Conclusion**

Given the possible direct impact to a localised population, and the precautionary principle, it is recommended that a Referral under the provisions of the EPBC Act be prepared for this species. It is also recommended that Spring surveys be conducted to determine if there is a population of the Pink-tailed Legless Lizard present on site and that pre-clearing surveys be conducted to limit the potential impact on this species.

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