

Appendix A

Googong bulk water pumping station – flora and fauna assessment report



Googong Bulk Water Pumping Station Flora & Fauna Assessment Report

A report prepared for CIC Australia

May 2011

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This document may be cited as: Biosis Research (2011). *Googong Bulk Water Pumping Station – Flora & Fauna Assessment Report*. Unpublished report to CIC Australia Limited.

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PROJECT	Googong Bulk Water Pumping Station Flora & Fauna Assessment Report
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BIOSIS PROJECT NO	12826
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REPORT FOR	CIC Australia
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REPORT TITLE:	Googong Bulk Water Pumping Station Flora & Fauna Assessment Report
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Final	Josephine Dessmann	Robert Speirs	DoP	04/04/2011
Final	Josephine Dessmann	Robert Speirs	DPI	20/04/2011
Final	Josephine Dessmann	Robert Speirs		16/05/2011

ABBREVIATIONS AND COMMON TERMS

DECCW	NSW Department of Environment, Climate Change and Water (formerly NSW Department of Environment and Climate Change)
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (formerly Department of the Environment, Water, Heritage and the Arts)
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPI	Environmental Planning Instrument
LEP	Local Environmental Plan
LGA	Local Government Area
NPWS	NSW National Parks and Wildlife Service (now part of the DECCW)
Study Area	The area considered within this assessment which includes both direct and indirect areas of potential impact.
Subject Site	The area of land considered to be directly impacted as a result of the proposed works.
TSC Act	<i>Threatened Species Conservation Act 1995</i>
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

CONTENTS

1.0 EXECUTIVE SUMMARY.....	7
2.0 INTRODUCTION.....	10
2.1 Project Description	10
3.0 AIMS	11
4.0 BACKGROUND.....	12
4.1 Description of Study Area and Surrounds.....	12
4.1.1 Landform, topography and soils.....	12
4.2 Legislative Context	12
4.2.1 Commonwealth.....	12
4.2.2 State	13
4.3 Definitions.....	13
5.0 METHODOLOGY.....	15
5.1 Taxonomy	15
5.2 Literature and Database Review	15
5.3 Flora Survey.....	15
5.3.1 Flora Habitat Assessment	15
5.3.2 Targeted Surveys	16
5.4 Fauna Survey.....	16
5.4.1 Fauna Habitat Assessment	16
5.4.2 Survey technique and effort	16
5.5 Limitations	17
6.0 RESULTS.....	18
6.1 Literature Review	18
6.2 Vegetation Communities	19
6.2.1 Vegetation mapping.....	19
6.2.2 Current Survey	20
6.3 Flora.....	26
6.3.1 Significant Flora.....	26
6.4 Fauna.....	26
6.4.1 Fauna Habitats	26
6.4.2 Fauna	27
6.4.3 Significant fauna.....	27
7.0 IMPACT ASSESSMENT.....	29
7.1 Extent of Impacts	29

7.1.1	Introduction.....	29
7.1.2	Key Threatening Processes	29
7.2	Part 3A Assessment of Impacts.....	31
7.2.1	Introduction.....	31
7.2.2	Assessment of Key Thresholds.....	31
7.2.3	Maintenance of Biodiversity Values	31
7.2.4	Potential Impacts on Endangered Ecological Communities (EEC's).....	32
7.2.5	Key Thresholds and potential impacts to Threatened Flora.....	32
7.2.6	Key Thresholds and potential impacts to Threatened Fauna	33
7.3	EPBC Act Assessments of Significance.....	39
7.3.1	Endangered Ecological Communities (EEC's).....	39
7.3.2	Threatened Flora Species	39
7.3.3	Threatened Fauna Species	40
7.3.4	Migratory Species.....	40
7.3.5	Commonwealth Land.....	40
8.0	RECOMMENDATIONS.....	42
9.0	CONCLUSION.....	43
	Appendix 1.....	45
	Flora and Fauna Survey Results.....	45
	Appendix 2.....	50
	Assessments of Impact according to Part 3A Guidelines for Threatened Species Assessment.....	50
	Appendix 3.....	61
	Assessments of Impacts according to EPBC Act Significant Impact Guidelines.....	61
	Appendix 4.....	65
	Flora and Fauna Potential Habitat Tables	65
	FIGURES	79

1.0 EXECUTIVE SUMMARY

Biosis Research Pty Ltd has been engaged by CIC Australia Limited (CIC) through the project management firm Manidis Roberts Pty Ltd to prepare a Flora and Fauna assessment of the impacts of a staged subdivision of the Googong township, 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 potable (drinking) water for the township. The Bulk Water Pumping Station (the 'proposal') will be assessed under 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 proposed Bulk Water Pumping Station (BWPS) site is located within Commonwealth land currently leased by the ACT Government. The subject site for this BWPS has been re-located following recent consultation with ACTEW, ActewAGL and Queanbeyan City Council. The requests of all three parties resulted in the re-location of the BWPS to the western side of the existing ACTEW bulk water supply pipeline and the re-location of the proposed access route and potable water rising mains to outside of the area that ACTEW sub-leases from the Commonwealth for the water treatment plant. The re-location of the BWPS and access route, as assessed in this report, address the potential land tenure and access issues that were raised.

The re-location of the BWPS subject site also allows for the avoidance of three populations of Hoary Sunray listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These populations are established across the dirt access track to the north of the current subject site. The previous proposed subject site was located further upslope and required the existing dirt track to be upgraded to provide access to the BWPS. The re-location of the proposed BWPS site further south now avoids all individuals of Hoary Sunray within these nearby populations.

The subject site is located to the south of the 'Talpa' property and upslope and to the north-west of the existing Googong Water Treatment Plant (refer Figure 2). The subject site consists of a north-west facing rocky slope supporting disturbed woodland. Unformed dirt access tracks currently fragment the woodland and during the current survey there was a high cover of exotic species in some parts of the study area, particularly adjoining the existing access track.

The study area supports a mosaic of Grassy Woodland / Dry Forest, varying in both floristic composition and degree of disturbance along its length. Within this mosaic, four discernable vegetation communities occur: Scribbly Gum / Red Box / Apple Box Dry Forest; Blakely's Red Gum / Red Box / Apple Box Grassy Woodland; Acacia Regrowth; and, Maintained Eucalypt Open Woodland. A total of 81 flora species were recorded within the study area, comprised of 57 native species and 24 exotic species (Appendix 1).

The small area (approximately 1210m²) of Blakely's Red Gum / Red Box / Apple Box Grassy Woodland was surveyed in detail and determined as meeting the criteria for the White Box / Yellow Box / Blakely's Red Gum Woodland ecological community, listed as endangered pursuant to the NSW *Threatened Species Conservation Act 1995* (TSC Act) and critically endangered pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An Assessment of Significance prepared in accordance

with the EPBC Act found that provided the proposal will be designed and located in a manner which will not require the clearance or significant disturbance of this Endangered Ecological Community (EEC), the proposal is unlikely to significantly impact upon the EEC.

Given the known occurrence of Button Wrinklewort (*Rutidosia leptorrhynchoides*) and Hoary Sunray (*Leucochrysum albicans* var. *tricolor*) within the wider locality, targeted surveys for Hoary Sunray and Button Wrinklewort were conducted throughout the study area with no individuals of either species being recorded. It is noted that Hoary Sunray was in flower at the time of the survey and would have been prominent if it were to occur within the study area. In this regard, it is considered unlikely that the proposal would have any impact (significant or otherwise) upon Hoary Sunray and Button Wrinklewort. No other plant species listed as threatened pursuant to the EPBC Act and/or the TSC Act were recorded within the study area.

Fauna recorded in the study area during the current survey include 18 bird species and nine mammals (one introduced species) (Appendix 1). Two threatened species were detected on site, Speckled Warbler (*Chthonicola sagittata*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) both listed as Vulnerable under the TSC Act. A range of threatened fauna species have previously been recorded in the locality.

Part 3A Assessments of Significance were prepared for the following animal species: Speckled Warbler, Brown Treecreeper (*Climacteris picumnus victoriae*), Rosenberg's Goanna (*Varanus rosenbergi*), Eastern Bentwing-bat and Eastern False Pipistrelle (*Falsistrellus tasmaniensis*). The assessments concluded that the proposal is considered unlikely to result in a major impact on these fauna species with known and/or potential habitat within the study area.

The assessment against the EPBC Act Significant Impact Criteria for the Box Gum Woodland EEC found that this community is unlikely to be significantly impacted by the proposed development and consequently a Referral under the provisions of the EPBC Act is not required.

While the proposal is considered unlikely to have a major impact on threatened species, populations or ecological communities, a number of recommendations have been made to ensure any potential impacts on the flora, fauna and biodiversity of the study area are minimised, including:

1. 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; implementing strict vehicle hygiene controls such as cleaning of tyres, wheel guards and bases of machinery before entry into any areas of bushland.
2. Where possible avoid the removal of and/or disturbance to termite mounds within the study area.
3. 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/zoologist 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.

4. Erosion, stormwater and runoff controls, consistent with NSW guidelines, will be required pre, during and post construction to prevent sedimentation in receiving 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.

2.0 INTRODUCTION

2.1 Project Description

The Googong Township is a new master-planned town for a population of some 16,000 people, south of Queanbeyan near Googong Dam, NSW. The vision is for a new, vibrant and sustainable community with an economic town centre and strong sense of place. It is the most significant urban development project undertaken by CIC Australia Limited (CIC) to date. The entire Googong proposal (not being assessed here) is for the development of five neighbourhoods, with schools, local shopping and employment opportunities. Each neighbourhood will be linked by parklands, with a total of more than 20% of the township dedicated to open spaces (CIC 2008). The Bulk Water Pumping Station is proposed as part of the water supply infrastructure for the township.

Biosis Research Pty Ltd has been engaged by CIC through the project management firm Manidis Roberts Pty Ltd to prepare a Flora and Fauna assessment of the impacts associated with the installation of the Bulk Water Pumping Station upon the immediate and surrounding area. This assessment considers all works associated with this proposal including the widening and improvement of an existing dirt track and creation of approximately 200m of new access road to service the Bulk Water Pumping Station.

The water cycle 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 cycle 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 relevant to the construction of the currently proposed Bulk Water Pumping Station.

3.0 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 road at Googong, NSW.

The specific aims are to:

- Conduct a literature review and database search for the area surrounding the study site;
- Undertake targeted field surveys for habitat of threatened terrestrial flora and fauna (including populations and ecological communities) 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;
- Provide a brief assessment of the habitat values of the site;
- Preparation of 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,
- Provide recommendations to minimise the environmental impacts of the proposed development.

4.0 BACKGROUND

4.1 Description of Study Area and Surrounds

The study area occurs on Commonwealth land currently leased by the ACT Government. To the west, of the subject site is the ‘Talpa’ property. The Googong Dam Water Treatment Plant is upslope and to the east and south-east of the subject site. The subject site is largely bound by steep topography with slopes on the north, west and east of the site. The Queanbeyan River lies approximately 500m to the east and the suburbs of Karabar and Jerrabomberra lie to the north-west of the study area. The study area lies approximately 6km to the south of Queanbeyan, New South Wales (refer Figure 1).

4.1.1 Landform, topography and soils

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

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

Soils are shallow (less than 60cm) 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 90cm) well drained red podzolic soils and yellow earths on crest and side slopes. The soils in the study area are acidic with low waterholding capacity and low fertility (Jenkins 2000).

4.2 Legislative Context

4.2.1 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 occurs on Commonwealth land currently leased by the ACT Government and is also adjacent to the 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.

4.2.2 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, populations and ecological 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).

4.3 Definitions

The following terms are used frequently throughout the report:

- ***The proposal*** is the development, activity or action proposed. In this case the impacts associated with the construction of the Bulk Water Pumping Station, (water main) pipeline and access road are being assessed.
- ***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 (i.e. development footprint plus a 5 m buffer).
- ***Study area*** is defined by DECC (DEC 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 by DECC (DEC 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.

5.0 METHODOLOGY

5.1 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 both their common name and scientific name in the first instance, and by their common name in subsequent references. Common and scientific names are included in the Appendices.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (DEWHA 2009a). 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.

5.2 Literature and Database Review

Records of threatened species, populations and ecological communities were obtained from the 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 ecological communities listed on the EPBC Act were obtained from the DSEWPC EPBC Online Protected Matters Database within a 10km radius of the study area. Database searches were conducted in January 2011.

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).

5.3 Flora Survey

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

5.3.1 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.

Unnatural: 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.

5.3.2 Targeted Surveys

A population of Hoary Sunray was recorded approximately 300m to the east of the study area during flora surveys conducted in April 2010 (Biosis Research 2010b). Given the known occurrence of the species within close proximity to the study area, targeted surveys for Hoary Sunray were conducted throughout the study area.

5.4 Fauna Survey

5.4.1 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 as 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.

5.4.2 Survey technique and effort

Anabats (ultrasonic call recording device) were deployed at two locations within the study area targeting microchiropteran bat (microbat) species. These were directed at hollow-bearing trees within the study area. Anabat one was directed at a large stag just to the north of the study

area beyond the subject site. Anabat two was directed at a hollow-bearing Scribbly Gum (*Eucalyptus rossii*) located along a gully that runs through the subject site (refer Figure 6).

A dedicated bird transect was undertaken along the length of the subject site. This was undertaken for approximately 30 minutes along and adjacent to the existing access track (refer Figure 5).

Opportunistic observations of bird species were noted during the late afternoon of the 27th January, and morning to midday on the 28th January 2011.

Table 1 – Fauna survey effort

Survey Type	Traps/Locations	Effort
Anabat recording	Two Anabat detectors at separate locations over one night each.	Two nights
Diurnal Bird Surveys	Single transect within the study area.	30 min
Habitat Assessment & Incidental Records	Across the entire study area over the late afternoon of the 27 th January and morning/midday of the 28 th January 2011.	9 person hours on site

5.5 Limitations

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 a narrow time period, 27th and 28th January 2011, 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 and as such, species are taken into account during the assessment even though they may not have been detected during the survey. Previous surveys undertaken in the study area during 2009 and 2010 were reviewed and species recorded during these investigations were taken into account.

6.0 RESULTS

6.1 Literature Review

Biosis Research has previously undertaken a flora and fauna assessment for the development of the Bulk Water Pumping Station immediately adjacent and overlapping with the current study area. Reports documenting studies undertaken in the area include;

- Johnstone Centre (2004) 'Environmental Assessment Googong Urban Investigation Area.' Charles Sturt University, Wagga Wagga.
- Biosis Research (2009) 'Terrestrial fauna assessment for Googong Water Reticulation. Report prepared for Ecowise Environmental.' Biosis Research, Sydney.
- Ecowise Environmental and Biosis Research (2009) 'Googong Water Cycle Project - ecological assessments - flora and fauna. Report prepared for Canberra Investment Corporation.'
- Biosis Research (2010) Terrestrial Flora and Fauna Assessment Report for Bulk Water Pumping Station, Googong.
- Biosis Research (2010) 'Googong Township - Pink-tailed Worm Lizard (*Aprasia parapulchella*) Impact Assessment Report.'

This report considers a larger study area and subject site than the previous terrestrial Flora and Fauna Assessment Report to accommodate any minor future changes to the location design of the Bulk Water Pumping Station and associated works.

The previous Biosis Research flora and fauna assessment for the Bulk Water Pumping Station identified populations of Hoary Sunray plants within the proposed study area along the existing dirt track. This plant species is listed as endangered under the EPBC Act. All populations within the study area were mapped and the location and proposed access track to the Bulk Water Pumping Station was adjusted to avoid these populations. This report assesses the revised subject site and study area for the proposed Bulk Water Pumping Station and access track.

The previous Biosis Research flora and fauna assessment for the Bulk Water Pumping Station considered the Pink-tailed Worm-lizard (*Aprasia parapulchella*) to have potential habitat within the study area based on the proximity of previous records (1.5km to the south-west within the 'Talpa' property) (Johnstone Centre 2004).

Targeted surveys for Pink-tailed Worm-lizards were undertaken on the 2nd and 3rd November 2010 which included the current Bulk water Pumping Station study area (Biosis Research 2010). Survey weather conditions and timing were considered optimal. No Pink-tailed Worm-lizards were found within the Bulk Water Pumping Station study area. Previous potential habitat mapping undertaken by the Johnstone Centre (2004) also does not include any of the woodland habitats which extend into the current study area as potential habitat. For these reasons the current Bulk Water Pumping Station study area is not considered to provide habitat for Pink-tailed Worm-lizards.

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 west of the current study area.

The Johnstone Centre carried out targeted surveys for threatened species including Pink-tailed Worm-lizards, Golden Sun Moth (*Synemon plana*), bats and birds (Johnstone Centre 2004). Reptile surveys found 17 Pink-tailed Worm-lizards. These were recorded on 'Talpa' (to the north-west of the current study area) and on the McLean property (to the west of the current study area). Pink-tailed Worm-lizards were also recorded at "Googong" south of the study area during 2009 and 2010 surveys conducted by Biosis Research (Biosis Research 2010).

The Golden Sun Moth was recorded on Crown land and on Robin Pty Ltd property to the west of the current study area. Unconfirmed sightings of Golden Sun Moth were made on 'Talpa'. Eastern Bentwing-bat and Eastern False Pipistrelle were recorded in the gully (Googong Creek) to the west of the study area. However, the confidences in identification for these species were considered 'possible' and 'probable' respectively for the Eastern Bentwing-bat and Eastern False Pipistrelle. Brown Treecreepers were recorded at a number of locations, including adjacent to 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 Bulk Water Pumping Station 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.

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, however, there could be a significant impact on the Pink-tailed Worm-lizard and the Golden Sun Moth (Ecowise Environmental and Biosis Research 2009). These two species were subsequently assessed in further detail in 2009, 2010 and 2011, concluding that there would be no significant impacts upon these species.

6.2 Vegetation Communities

6.2.1 Vegetation mapping

There has been limited regional vegetation mapping undertaken in the locality. 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 study area and subject site are broadly 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 stated to be fair to medium - this unit may include areas of exotic grassland.

Secondary Grassland is described as being derived from the 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'.

6.2.2 Current Survey

The study area supports a mosaic of Grassy Woodland / Dry Forest, varying in both floristic composition and degree of disturbance along its length. Within this mosaic, four discernable vegetation communities occur; these vegetation communities are described below.

Scribbly Gum / Red Box / Apple Box Dry Forest

The vegetation community occurring throughout the majority of the less-disturbed sections of the study area consists of a generally intact dry forest to woodland with a canopy 8m to 16m in height, dominated by Scribbly Gum (*Eucalyptus rossii*), Red Box (*E. polyanthemos*) and Apple Box (*E. bridgesiana*), occurring in varying proportions. The midstorey, 1m to 5 m in height, is dominated by Burgan (*Kunzea ericoides*) and Native Blackthorn (*Bursaria spinosa*) and is very dense in patches. The groundstorey varies greatly throughout this vegetation community with some areas supporting a high dominance and diversity of native grasses and forbs, and others dominated by exotic shrubs and herbs encroaching from the more disturbed upslope land. The current disturbance to this vegetation community is limited to that associated with the past construction and maintenance of the existing unformed dirt access track.

Whilst the area of this vegetation community within the study area is in 'good to moderate' condition, the vegetation community is common throughout the wider locality (and Southern Tablelands) and thus, does not have specified conservation status pursuant to the EPBC Act

or the TSC Act. The fact that this vegetation community occurs on shallow, gravelly (and therefore infertile) soils has meant that it has not been subject to widespread clearance for agricultural purposes. Plate 1 provides a representative photograph of this vegetation community and the distribution of the vegetation community within the study area is presented on Figure 3.



Plate 1 - Scribbly Gum / Red Box / Apple Box Dry Forest

Blakely's Red Gum / Red Box / Apple Box Grassy Woodland

A small patch of land (approximately 1210m²) occurring within the study area, generally surrounded by the above described Dry Forest, supports a moderately disturbed grassy woodland with a canopy 8m to 20m in height dominated by Blakely's Red Gum (*Eucalyptus blakelyi*) (10 mature trees), with Red Box and Apple Box occurring as subdominant components within the patch and dominant components in the surrounding areas. The sparse midstorey, 1m to 5m in height, consists of Burgan and Native Blackthorn. The groundstorey varies throughout this vegetation community: the areas associated with rocky outcrops support primarily native perennial grasses and forbs; and, the lower lying areas associated with the small drainage line and existing unformed dirt access track support a substantial component of exotic perennial and annual weeds. Overall, this vegetation community is considered to be in Good to Moderate condition. Plate 2 provides a representative photograph of this vegetation community and the distribution of the vegetation community within the study area is presented on Figure 3.

Further to the above, a detailed survey was conducted to determine whether this vegetation community meets the criteria for the EEC White Box / Yellow Box / Blakely's Red Gum Woodland. The assessment process followed that provided in the Commonwealth 'EPBC Act Policy Statement – White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands' (DEH 2006). The results are provided below.

1. **Criteria** - Is, or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum?

Assessment result - Yes, Blakely's Red Gum is the most common overstorey species of this vegetation community.



2. **Criteria** - Does the patch have a predominantly native understorey?

Assessment result - Yes, the perennial understorey throughout the majority of the patch comprises in excess of 50 percent native species.



3. **Criteria** - Is the patch 0.1 ha (1000m²) or greater in size?

Assessment result - Yes, the patch is approximately 1210m² in area (determined via canopy boundary delineation, using a hand-held GPS unit, accurate +/- 3m).



4. **Criteria** - Are there 12 or more native understorey species present (excluding grasses). There must be at least one important species.

Assessment result - Yes, as detailed in Table 2 below, 21 native understorey species (excluding grasses) were recorded and 7 of these are important species.

Table 2 – Native understorey species (excluding grasses)

Scientific name	Common Name	Important Species
<i>Astroloma humifusum</i>	Native Cranberry	
<i>Bracteantha viscosa</i>	Sticky Everlasting	
<i>Bursaria spinosa</i>	Native Blackthorn	
<i>Centipeda cunninghamii</i>	Common Sneezeweed	
<i>Cheilanthes austrotenuifolia</i>	Rock Fern	
<i>Desmodium varians</i>	Slender Tick-trefoil	Yes
<i>Euchiton gymnocephalus</i>	Creeping Cudweed	
<i>Geranium solanderi</i>	Native Geranium	
<i>Glycine tabacina</i>	Glycine Pea	Yes
<i>Goodenia hederacea</i>	Ivy Goodenia	Yes
<i>Hibbertia obtusifolia</i>	Hoary Guinea-flower	Yes
<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	
<i>Hypericum gramineum</i>	Small St John's Wort	Yes
<i>Kunzea ericoides</i>	Burgan	Yes
<i>Lepidospema laterale</i>	Sword Sedge	
<i>Lomandra filiformis</i>	Wattle Mat-rush	
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	
<i>Lomandra multiflora</i>	Many-flowered Mat-rush	
<i>Oxalis perennans.</i>	Grassland Wood Sorrel	
<i>Tricoryne elatior</i>	Yellow Autumn-lily	Yes
<i>Wahlenbergia communis</i>	Tufted Bluebell	

In accordance with the results of the above assessment, it is determined that this vegetation community meets the criteria for the EEC.

As detailed above, the small (i.e. approximately 1,210m²) patch of Blakely's Red Gum/Red Box/Apple Box Grassy Woodland was assessed and determined to support the size, floristic and structural characteristics required to meet the criteria for the White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands Endangered Ecological Community (EEC). This EEC is listed as 'Critically Endangered' pursuant to the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and 'Endangered' pursuant to the NSW Threatened Species Conservation Act 1995 (TSC Act).



Plate 2 - Blakely's Red Gum / Red Box / Apple Box Grassy Woodland

Acacia Regrowth

The section of the study area located between the proposed 'new access track' and the Googong Dam Water Treatment Plant supports a highly disturbed vegetation community characterised by an absent canopy, a midstorey consisting of Black Wattle (*Acacia decurrens*) and Red-leaf Wattle (*A. rubida*) regrowth and an understorey dominated by exotic woody and herbaceous weeds, notably Blanket Weed (*Verbascum thapsus*), Apple of Sodom (*Solanum linnaeanum*), Skeleton Weed (*Chondrilla juncea*), Horehound (*Marrubium vulgare*), Paterson's Curse (*Echium plantagineum*), St John's Wort (*Hypericum gramineum*) and Blackberry (*Rubus fruticosus*). It appears that this vegetation community has colonised this area post clearance for the construction of existing water supply infrastructure. This vegetation community is considered to be Unnatural in condition and floristic composition. Plate 3 provides a representative photograph of this vegetation community and the distribution of the vegetation community within the study area is presented on Figure 3.



Plate 3 - Acacia Regrowth

Maintained Eucalypt Open Woodland

The western section of the study area, generally located between the Googong Dam Water Treatment Plant and the Googong Foreshores Tourist Information Centre supports a highly disturbed open woodland community with areas of maintained (i.e. slashed areas) understorey. The canopy throughout this vegetation community supports scattered retained Eucalypt trees (primarily Scribbly Gum, Red Box, Apple Box and Red Stringybark (*Eucalyptus macrorhyncha*)) and various planted native trees. The understorey is largely cleared and supports scattered clumps of Black Wattle and Red-leaf Wattle regrowth. This vegetation community is considered to be in Unnatural in condition and floristic composition. Plate 4 provides a representative photograph of this vegetation community and the distribution of the vegetation community within the study area is presented on Figure 3.

The Acacia Regrowth and Maintained Eucalypt Open Woodland vegetation communities within the study area are highly disturbed (due primarily to past anthropological activities) and support exotic weed dominated groundstories. Such vegetation communities do not constitute any vegetation community with specific conservation status pursuant to the EPBC Act or the TSC Act.



Plate 4 - Maintained Eucalypt Open Woodland

6.3 Flora

A total of 81 vascular plant species were recorded from the study area, comprising 57 (70%) locally indigenous species and 24 (30%) exotic species. A list of plant species recorded is provided in Appendix 1.

Of the exotic species recorded, only Blackberry (*Rubus fruticosus*) is listed (Class 4) under the *Noxious Weeds Act 1993* and the *Noxious Weeds Amendment Act 2005* for the Queanbeyan LGA. The management requirements for Class 4 species (as specified by the NSW Department of Industry and Investment) are as follows:

The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.

6.3.1 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 10km radius of the study area (Table 8 in Appendix 4; Figure 4).

As stated in Section 5.3.2, a population of the endangered species Hoary Sunray was recorded approximately 300 m to the east of the study area during flora surveys conducted in April 2010 (Biosis Research 2010b). Given the known occurrence of the species close to the study area, targeted surveys for Hoary Sunray were conducted throughout the study area. No individuals of this species were recorded within the study area. Given that the species was in flower (and quite conspicuous) at the time that the surveys were conducted, it is considered that any plants located within the study area would have been readily identified. The study area may also represent potential habitat for the endangered species Button Wrinklewort, however the species was targeted and not recorded during the surveys.

6.4 Fauna

6.4.1 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. Several of the trees within the study area are hollow-bearing (Figure 7) which may provide habitat for a variety of fauna which depend upon hollows for nesting and shelter. 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. Termite mounds are found at moderate densities throughout the study area. These are a critical habitat component for the vulnerable Rosenberg's Goanna which relies on the constant temperatures within the mounds for egg

incubation. A small area of dense revegetation occurs within the study area which small birds were found to forage in regularly.

Common species recorded during the survey included Crimson Rosellas (*Platycercus elegans*), Superb Fairy-wrens (*Malurus cyaneus*) and Striated Thornbills (*Acanthiza lineata*).

Box-Gum Woodland

A small patch of Box-Gum Woodland occurs within the study area. Large trees of Blakey's Red Gum Eucalypts provide food for fauna in the form of nectar, flowers and exudates. These large trees are also known to hollow readily providing habitat for a range of fauna which rely on hollows for nesting and roosting such as several microbat species, Ring-tailed Possums and hollow-nesting birds such as parrots.

In general the habitat within the study area is considered to be of Moderate value to fauna, being relatively intact and providing a range of foraging and breeding resources for a variety of species.

6.4.2 Fauna

Two threatened fauna species – Speckled Warbler and Eastern Bentwing-bat both listed as Vulnerable under the TSC Act – were recorded during the current survey. A possible Eastern Bentwing-bat call was recorded on one of the ultrasonic recording devices (Anabats) deployed. There is ambiguity associated with the identification of this call; it can not be confidently attributed to Eastern Bentwing-bat. However, previous surveys (Johnstone 2004) detected Eastern Bentwing-bat in the locality and although the study area does not provide any suitable roosting habitat for this species (e.g. caves, culverts, etc), in accordance with the Draft Threatened Species Survey and Assessment Guidelines (DEC 2004) this species has been assumed to occur onsite despite the lack of certainty in identification. Fauna recorded in the current surveys are listed in Appendix 1 and include 18 birds and nine mammals (one introduced).

6.4.3 Significant fauna

A total of 36 threatened and/or migratory animal species or their habitat have been previously recorded within a 10km radius of the study area (DECCW Atlas of NSW Wildlife and DSEWPC Online EPBC Database). Of these, 27 animal species are listed under the TSC Act and 21 animal species are listed under the EPBC Act (13 animal species are listed under both Acts). 26 threatened and/or migratory animal species have been previously recorded within a 10km radius of the study area (refer Figure 5).

Two threatened animal species, Speckled Warbler and Eastern Bentwing-bat, both listed as Vulnerable under the TSC Act, were recorded during the current survey. Known and/or potential habitat for 15 threatened and/or migratory species listed on the TSC and EPBC Acts does occur within the study area (Table 7 in Appendix 4). These species are White-bellied Sea-eagle (*Haliaeetus leucogaster*), White-throated Needletail (*Hirundapus caudacutus*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Brown Treecreeper, Satin Flycatcher (*Myiagra cyanoleuca*), Regent Honeyeater (*Anthochaera phrygia*), Rainbow Bee-eater (*Merops ornatus*), Speckled Warbler, Diamond Firetail (*Stagonopleura guttata*), Hooded Robin (*Melanodryas cucullata cucullata*), Swift Parrot (*Lathamus discolor*), Spotted-tailed Quoll (*Dasyurus maculatus maculates*), Eastern False Pipistrelle, Eastern Bentwing-bat and

Rosenberg's Goanna. These species have been considered further in Section 7.0 (Impact Assessment) of this report.

7.0 IMPACT ASSESSMENT

7.1 Extent of Impacts

7.1.1 Introduction

Impacts arising from the proposal include disturbance and clearing of approximately 3ha of a varying mosaic of Grassy Woodland / Dry Forest vegetation. The proposed access road will include widening the existing unformed dirt track and creating a new length of all-weather access track diverging from this existing track to provide access to the proposed Bulk Water Pumping Station. The site of the Bulk Water Pumping Station will have a concrete slab measuring approximately 10m by 25m on which the Bulk Water Pumping Station would be constructed in stages. Underground pipes will follow the length of the road to connect to the Bulk Water Pumping Station. The pipes are expected to measure 225mm and 450mm in diameter and extend approximately 1,350m.

7.1.2 Key Threatening Processes

This section of the report has been provided in order to give 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 Appendix 2. 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 3ha of disturbed Grassy Woodland / Dry 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 3ha of existing habitat for the construction of the Bulk Water Pumping Station and an approximately 5m wide access road with pipeline main

embedded beneath (within a 20m subject site corridor). It is considered unlikely that the proposal will result in significant fragmentation of habitat within the study area. The approximate area to be cleared of each of the vegetation communities associated with the Grassy Woodland / Dry Forest are given below.

Vegetation Community	Approximate area of clearance (Ha)
Maintained Eucalypt Open Woodland	1.09
Acacia Regrowth	0.46
Blakely's Red Gum/Red Box/Apple Box Grassy Woodland	0
Scribbly Gum/Red Box/Apple Box Dry Forest	1.48

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).

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 1997; 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 vulpecular*)). Locally recorded threatened species requiring tree hollows for roosting include Brown Treecreepers and Gang-gang Cockatoos. Up to 16 hollow-bearing trees may be removed as a result of the proposal. Retention of hollow-bearing trees where possible is encouraged to reduce impacts on species that rely on them for breeding.

'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.

7.2 Part 3A Assessment of Impacts

7.2.1 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.

7.2.2 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.

7.2.3 Maintenance of Biodiversity Values

No threatened species, populations or communities are considered to be subject to a major impact as a result of the proposal. During the initial planning stages, the access road, pipeline and Bulk Water Pumping Station were proposed to be located in proximity to threatened species or EECs (i.e. Hoary Sunray or Blakely's Red Gum/Red Box/Apple Box Grassy Woodland). However, the development proposal design has been substantially modified to avoid impact to these biodiversity assets of high conservation value. Through these efforts the proposed works have endeavoured to maintain biodiversity values of the site and therefore biodiversity offsets are not considered necessary.

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 clearing of vegetation occurs along an existing access track where the native vegetation is in highly variable condition, subject to weed infestation and disturbance associated with the existing access track.

The proposed Bulk Water Pumping Station and associated access road will require the clearing and disturbance of approximately 3ha of intact to highly disturbed Dry Forest / Grassy Woodland. This vegetation community is currently fragmented by a number of access tracks,

and it is likely to be further fragmented by the construction of the proposed access road. Provided that the mitigation measures detailed in Section 8.0 are implemented, the proposed development is likely to maintain the biodiversity values of the locality.

7.2.4 Potential Impacts on Endangered Ecological Communities (EEC's)

A small area (approximately 1210m²) of the study area supports Blakely's Red Gum / Red Box / Apple Box Grassy Woodland which meets the floristic and structural criteria for the ecological community White Box / Yellow Box / Blakely's Red Gum Woodland listed as endangered pursuant to the NSW TSC Act (the EEC is also listed as critically endangered under the EPBC Act). The proposed access road (and associated disturbance area) will be located and designed in a manner that will not require any significant disturbance to this EEC. Nevertheless, it is recognised that the EEC is located within the study area for the proposal and thus within close proximity to the proposed disturbance areas.

An Assessment of Significance following the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (DEWHA 2009b) has been carried out regarding the potential impacts of the proposal on the patch of this EEC located in the study area (refer Appendix 3).

With reference to the above, it is noted that the impact assessment criteria for EEC's under the EPBC Act are largely equivalent to, and largely more thorough than, those provided under the NSW TSC Act (i.e. Part 3A Assessment). In this regard, the impact assessment provided in Appendix 3 is considered an appropriate assessment of impacts as relevant to both the EPBC Act and the TSC Act.

7.2.5 Key Thresholds and potential impacts to Threatened Flora

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

One threatened plant species listed on the TSC Act, Button Wrinklewort, is considered to have potential habitat in the study area but was not recorded during the current surveys of the study area, or during previous surveys of the study area and locality (The Johnstone Centre 2004, Biosis Research 2010b). The nearest known record of this species is approximately 2.5km south of the study area in the proximity of Googong Reservoir (refer Figure 4). Button Wrinklewort occurs in Box-Gum Woodland, secondary grassland derived from the clearance of Box-Gum Woodland and in Natural Temperate Grassland. The limitation of the distribution of this species to these EECs has largely resulted in the decline of the species in line with the decline of the EECs. Potential habitat (comprised of these EECs) occurs in patches throughout the wider locality, however no detailed mapping of the occurrence of these EECs throughout the wider locality has been completed.

Potential impacts upon the species were considered as a small patch of Blakely's Red Gum/Red Box/Apple Box Grassy Woodland (i.e. Box-Gum Woodland) occurs within the study area. Given the intensity at which this small patch of the EEC was surveyed during this study, it is highly unlikely that the species was present and not recorded. The survey was completed at a time of year (i.e. summer) when the species would have been in flower, and thus, readily identifiable.

Whilst the potential for Button Wrinklewort to be present as dormant stems or within a soil stored seed bank within this small patch of EEC is feasible, it is considered highly unlikely.

Furthermore, should this be the case, the proposed alignment of the access track and pipelines has been designed in a manner which will not substantially impact upon the patch of EEC, and thus, will have not substantially impact upon any of the flora occurring within.

Further to the above, 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 (3ha) 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 Button Wrinklewort are not considered necessary for this species, and as such, the species has not been considered further.

7.2.6 Key Thresholds and potential impacts to Threatened Fauna

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.

Table 3 below provides a brief discussion for each of the key thresholds that relate to threatened fauna with potential habitat in the study area. In accordance with the Guidelines for Threatened Species Assessment under Part 3A of the EP&A Act, 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.

Table 3 – Key Thresholds for Threatened Fauna

Threatened Fauna	Will the proposal reduce the long-term viability of a local population of the species?	Will the proposal accelerate the extinction of the species or place it at risk of extinction?	Will the proposal adversely affect critical habitat?
Birds			
Diamond Firetail	Unlikely. Habitat to be removed is not considered limiting for this species.	Unlikely	No
Brown Treecreeper	Unlikely. Some habitat will be removed including tree hollows potentially used for breeding. Refer to Part 3A Assessment in Appendix 2.	Unlikely	No
Speckled Warbler	Unlikely. Habitat to be removed is not considered limiting for this species. Refer to Part 3A Assessment in Appendix 2.	Unlikely	No
Hooded Robin	Unlikely. Habitat to be removed is not considered limiting for this species.	Unlikely	No
Gang-gang Cockatoo	Unlikely. Some habitat will be removed including tree hollows potentially used for breeding. However, no records for this species occur within the locality.	Unlikely	No
Swift Parrot	Unlikely. No preferred foraging habitat will be removed as a result of the proposal and no records for this species occur within 10 km of the study area.	Unlikely	No
Regent Honeyeater	Unlikely. No preferred foraging habitat will be removed as a result of the proposal and no records for this species occur within 10 km of the study area.	Unlikely	No
Mammals			
Spotted –tailed Quoll	Unlikely. Some woodland habitat will be impacted, however this habitat along existing access roads is unlikely to provide optimal foraging habitat for this species.	Unlikely	No
Eastern False Pipistrelle	Unlikely. Some habitat will be removed including tree hollows potentially used for breeding. Refer to Part 3A Assessment in Appendix 2.	Unlikely	No
Eastern Bentwing-bat	Unlikely. No limiting habitat such as preferred roosting or breeding sites are expected to be impacted as a result of the proposal. Refer to Part 3A Assessment in Appendix 2.	Unlikely	No
Reptiles			
Rosenberg's Goanna	Unlikely. Some woodland habitat will be impacted, however this habitat along existing access roads is unlikely to provide optimal foraging habitat for this species. Some small termite mounds occur within the subject site. Refer to Part 3A Assessment in Appendix 2.	Unlikely	Some termite mounds may be removed as a result of the proposal. Termite mounds are considered a critical habitat feature for the Rosenberg's Goanna.

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 the rootstock of specific native grass species).

Actual or potential habitat exists within the study area for a total of eleven threatened animal species listed on the TSC Act (Table 7, Appendix 2). Table 4 below summarises the possible impacts from the proposal on these threatened fauna, and determines the need for further assessment following the Part 3A Impact Assessment guidelines. Five species: Speckled Warbler, Brown Treecreeper, Rosenberg's Goanna, Eastern Bentwing-bat and Eastern False Pipistrelle, require further assessment due to the potential for impacts to limited foraging and/or breeding habitat, or due to being recorded during the current survey. Impact assessments using the Part 3A Assessment Guidelines Criteria have been prepared for the five threatened species and are provided in Appendix 2. The remaining six threatened species with potential habitat in the study area have not been considered further, as limiting resources would not be impacted by the proposal (Table 4).

Table 4 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?		
Birds							
Diamond Firetail	-	V	No	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
Brown Treecreeper	-	V	No	No	Yes	Yes	Potential breeding habitat in the form of small tree hollows may be modified and/or removed as a result of the proposal. A Part 3A Assessment is provided in Appendix 2.
Speckled Warbler	-	V	No	No	No	Yes	This species was observed foraging on site. For this reason a Part 3A Assessment has been prepared for this species (Appendix 2).
Hooded Robin	-	V	No	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
Gang-gang Cockatoo	-	V	No	No	No	No	No tree hollows of suitable size for the Gang-gang Cockatoo are expected to be removed as a result of the proposal. Foraging 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	No	No	No	No	No records for this species occur within 10 km of the study area and no preferred foraging resources will be removed. As such, this species is not considered further.
Regent Honeyeater	E	E1	No	No	No	No	No records for this species occur within 10 km of the study area. 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.

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?		
Mammals							
Spotted - tailed Quoll	E	V	No	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.
Eastern False Pipistrelle	-	V	Unlikely	No	Yes	Yes	This species has previously been recorded in proximity to the study area (Ecowise & Biosis Research 2009). Due to the removal of tree hollows which are considered a limiting resource for this species, a Part 3A Assessment has been prepared for the Eastern False Pipistrelle (Appendix 2).
Eastern Bentwing-bat	-	V	No	No	No	Yes	This species was possibly recorded on the Anabat during the field survey. Despite the ambiguity in the identification of this species, and the lack of preferred breeding and roosting habitat in the region, in accordance with the Guidelines for Threatened Species Assessment under Part 3A of the EP&A Act (DEC & DPI 2005), this species has been assumed to be present within the study area and a Part 3A Assessment has been prepared (Appendix 2).
Reptiles							
Rosenberg's Goanna	-	V	No	No	Yes	Yes	Foraging habitat within the study area is not considered limiting for this species. Given the large home ranges and this species' mobility the small area of foraging habitat to be disturbed is unlikely to impact Rosenberg's Goanna. Some termite mounds occur within the subject site which this species may use for incubation. The proposal may impact some termite mounds but will avoid these habitat features where possible. A Part 3A Assessment is provided in Appendix 2.

7.3 EPBC Act Assessments of Significance

7.3.1 Endangered Ecological Communities (EEC's)

A small area (approximately 1210m²) of the study area supports Blakely's Red Gum / Red Box / Apple Box Grassy Woodland. This woodland meets the floristic and structural criteria for the ecological community White Box / Yellow Box / Blakely's Red Gum Grassy Woodland and Derived Native Grasslands, listed as critically endangered pursuant to the EPBC Act. The proposed access road (and associated disturbance area) will be located and designed in a manner that will not require any significant disturbance to this EEC. Nevertheless, it is recognised that the EEC is located within the study area for the proposal and thus within close proximity to the proposed disturbance areas. As such, an Assessment of Significance following the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Commonwealth of Australia 2008) has been carried out regarding the potential impacts of the proposal on the patch of this EEC located in the study area (refer Appendix 3).

7.3.2 Threatened Flora Species

No threatened plant species as listed under the EPBC Act were recorded within the study area. Button Wrinklewort and Hoary Sunray are considered to have potential habitat in the study area however neither species was recorded during the current surveys of the study area.

As stated in Section 5.3.2, a population of Hoary Sunray was recorded approximately 300m to the east of the study area during flora surveys conducted in April 2010 (Biosis Research 2010b). Given the known occurrence of the species within the wider locality, targeted surveys for Hoary Sunray were conducted throughout the study area. No individuals of this species were recorded within the study area. Given that the species was in flower (and quite conspicuous) at the time that the surveys were conducted, it is considered that the any plants located within the study area would have been readily identified.

The potential for Button Wrinklewort or Hoary Sunray 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 these species is considered negligible due to the following:

- Impacts resulting from the proposal will be contained to a relatively small area of potential habitat (3ha) 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 Button Wrinklewort and Hoary Sunray are not considered necessary, and as such, the two species have not been considered further.

7.3.3 Threatened Fauna Species

Actual or potential habitat exists within the study area for a total of three threatened animal species listed on the EPBC Act (Table 7, Appendix 4). Table 4 above summarises the possible impacts from the proposal on these threatened fauna, and determines the need for further assessment following the Part 3A Impact Assessment guidelines. These three threatened species (Swift Parrot, Regent Honeyeater and Spotted-tailed Quoll) have not been considered further, as potential habitat would not be significantly impacted by the proposal (Table 4). Consequently no Assessments of Significance following the EPBC Significant Impact Criteria have been prepared.

7.3.4 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).

Ten species listed under the ‘migratory’ provisions of the EPBC Act were listed in Table 7 (Appendix 4) for investigation. Of these, the following have potential habitat in the study area: White-throated Needletail, White-bellied Sea-eagle, Rainbow Bee-eater and Satin Flycatcher. 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 important¹ for these migratory species. Minimal impact is expected on the potential habitat for these species in the study area. As such, no Assessments of Significance have been carried out for these species, in accordance with the Significant Impact Criteria (DEWHA 2009b).

7.3.5 Commonwealth Land

Under the EPBC Act, approval is required for an action taken by any person on or 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).

¹ Where ‘important’ habitat for a migratory species is defined in DEWHA (2009b).

The study area is located on Commonwealth land currently leased by the ACT Government. Whether or not a significant impact on the environment is likely by the proposal has been assessed according to the former Department of Environment, Water, Heritage and the Arts (DEWHA) *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies Significant impact guidelines 1.2 Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010), in conjunction with *Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2009b). The proposal is considered unlikely to result in a significant impact on the environment on Commonwealth land and as such, a Referral to the DSEWPC is not recommended.

8.0 RECOMMENDATIONS

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

1. 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; implementing strict vehicle hygiene controls such as cleaning of tyres, wheel guards and bases of machinery before entry into any areas of bushland;
2. Where possible avoid the removal and/or disturbance of termite mounds throughout the study area;
3. 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/zoologist 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,
4. Erosion, stormwater and runoff controls, consistent with NSW guidelines, will be required pre, during and post construction to prevent sedimentation in receiving 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.

9.0 CONCLUSION

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

The study area supports a mosaic of Grassy Woodland / Dry Forest, varying in both floristic composition and degree of disturbance along its length. Within this mosaic, four discernable vegetation communities occur: Scribbly Gum / Red Box / Apple Box Dry Forest; Blakely's Red Gum / Red Box / Apple Box Grassy Woodland; Acacia Regrowth; and, Maintained Eucalypt Open Woodland. A total of 81 flora species were recorded within the study area, comprised of 57 native species and 24 exotic species.

The small area (approximately 1210m²) of Blakely's Red Gum / Red Box / Apple Box Grassy Woodland was surveyed in detail and determined to meet the criteria for the White Box / Yellow Box / Blakely's Red Gum Woodland ecological community, listed as endangered pursuant to the TSC Act and critically endangered pursuant to the EPBC Act. Assessments of Significance prepared in accordance with the NSW EP&A Act and the EPBC Act found that provided the proposal will be designed, located and managed in a manner which will not require the clearance or significant disturbance of this EEC, the proposal is unlikely to significantly impact upon the EEC and a Referral under the EPBC Act is not required.

Given the known occurrence of the species within the wider locality, targeted surveys for Hoary Sunray and Button Wrinklewort were conducted throughout the study area with no individuals of either species being recorded. In this regard it is considered unlikely that the proposal would have any impact (significant or otherwise) upon Hoary Sunray and Button Wrinklewort. Nearby populations of Hoary Sunray were in flower during the time of the survey and would have been prominent if they were to occur within the study area. No other threatened plant species listed pursuant to the TSC Act and/or the EPBC Act were recorded within the study area.

Potential impacts from the proposal are likely to be minimal. The direct impacts resulting from the proposal involve clearing and disturbance of approximately 3ha of Grassy Woodland / Dry Forest. Given the disturbed nature of much of the study area, extent of habitat within the wider 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 15 threatened and/or migratory animal species. Of these 15 species, five required further assessment of impacts of the development due to loss of potential limiting foraging and/or breeding habitat, or due to their known presence in the study area; namely Speckled Warbler, Eastern False Pipistrelle, Eastern Bentwing-bat, Brown Treecreeper and Rosenberg's Goanna. The proposal is considered unlikely to have a major impact on any of these species.

With regard to the above, the proposal is considered unlikely to have a major impact on threatened species, populations or ecological communities listed under the TSC and/or the EPBC Acts. A Species Impact Statement (TSC Act) or a Referral (EPBC Act) is not considered necessary for any threatened or migratory flora or fauna as a result of the proposal.

A range of mitigation measures have been proposed to reduce the impacts of the proposal on biodiversity.

APPENDIX 1

Flora and Fauna Survey Results

Fauna Survey Results

Table 5 – Fauna species recorded on site

Family Name	Scientific name	Common Name	Observation Type
Birds			
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk	O
	<i>Aquila audax</i>	Wedge-tailed Eagle	O
Artamidae	<i>Strepera graculina</i>	Pied Currawong	W
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	O
Corvidae	<i>Corvus coronoides</i>	Australian Raven	OW
Dicruridae	<i>Rhipidura albiscapa</i>	Grey Fantail	OW
	<i>Rhipidura leucophrys</i>	Willie Wagtail	W
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren	W
Meliphagidae	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	O
	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater	OW
Pardalotidae	<i>Chthonicola sagittata</i>	Speckled Warbler	O
	<i>Pardalotus punctatus</i>	Spotted Pardalote	W
Petroicidae	<i>Eopsaltria australis</i>	Eastern Yellow Robin	W
Psittacidae	<i>Platycercus elegans</i>	Crimson Rosella	OW
Mammals			
Leporidae	<i>Oryctolagus cuniculus</i>	Rabbit*	I
Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	O
Molossidae	<i>Mormopterus sp 2</i>	Freetail bat	AP
	<i>Mormopterus sp 4</i>	Inland freetail bat	AD
	<i>Tadarida australis</i>	White-striped Freetail Bat	AD
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	AD
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	AP
	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	AP
	<i>Nyctophilus sp.</i>	long-eared bat	AM
	<i>Vespadelus darlingtoni</i>	Large Forest Bat	AP
	<i>Vespadelus sp</i>	Vespadelus	AM
	<i>Vespadelus vulturnus</i>	Little Forest Bat	AD

Key: Species in bold are listed as Vulnerable under the TSC Act and were recorded during the current survey.

*: introduced species O: Observed; OW: Seen and Heard; W: Heard; I: Incidental (scats, tracks, bones, etc), AD: Confidence in Anabat recording identification is definite; AP: Confidence in Anabat recording identification is probable; and, AM: Confidence in Anabat recording identification is possible.

Flora Survey Results

Table 6 – Flora species recorded on site

Note: * indicates exotic species

Family Name	Scientific name	Common Name
Adiantaceae	<i>Cheilanthes sieberi</i>	
Anthericaceae	<i>Tricoryne elatior</i>	Yellow Autumn-lily
Apiaceae	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort
Asclepiadaceae	* <i>Tweedia coerulea</i>	
Asteraceae	* <i>Arctotheca calendula</i>	Capeweed
	<i>Bracteantha viscosa</i>	Sticky Everlasting
	<i>Cassinia longifolia</i>	
	<i>Cassinia quinquefaria</i>	
	<i>Centipeda cunninghamii</i>	Common Sneezeweed
	* <i>Chondrilla juncea</i>	Skeleton Weed
	<i>Chrysocephalum apiculatum</i>	Common Everlasting
	* <i>Cirsium vulgare</i>	Spear Thistle
	* <i>Conyza bonariensis</i>	Fleabane
	<i>Cymbonotus lawsonianus</i>	Austral Bears-ear
	<i>Euchiton gymnocephalus</i>	Creeping Cudweed
	* <i>Hypochaeris radicata</i>	Catsear
	* <i>Lactuca serriola</i>	Prickly Lettuce
	* <i>Tolpis umbellata</i>	Yellow Hawkweed
	<i>Vittadinia cuneata</i>	Fuzzweed
	<i>Vittadinia muelleri</i>	
Boraginaceae	* <i>Echium plantagineum</i>	Paterson's Curse
Brassicaceae	* <i>Hirschfeldia incana</i>	Buchan Weed
	* <i>Lepidium africanum</i>	
Campanulaceae	<i>Wahlenbergia communis</i>	Tufted Bluebell
Caryophyllaceae	* <i>Petrorhagia nanteuillii</i>	Proliferous Pink
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush
Clusiaceae	<i>Hypericum gramineum</i>	Small St John's Wort
Cyperaceae	<i>Lepidosperma laterale</i>	
Dilleniaceae	<i>Hibbertia obtusifolia</i>	Hoary Guinea-flower
Epacridaceae	<i>Astroloma humifusum</i>	Native Cranberry
	<i>Lissanthe strigosa</i>	Peach Heath
	<i>Melichrus urceolatus</i>	Urn Heath

Family Name	Scientific name	Common Name
Fabaceae (Faboideae)	<i>Bossiaea buxifolia</i>	
	<i>Desmodium varians</i>	Slender Tick-trefoil
	<i>Glycine tabacina</i>	Glycine Pea
	<i>Hardenbergia violacea</i>	False Sarsaparilla
Fabaceae (Mimosoideae)	<i>Acacia decurrens</i>	Black Wattle
	<i>Acacia dealbata</i>	Silver Wattle
	<i>Acacia rubida</i>	Red-leaved Wattle
	<i>Acacia terminalis</i>	Sunshine Wattle
Geraniaceae	<i>Geranium solanderi</i>	Native Geranium
Goodeniaceae	<i>Goodenia hederacea</i>	Ivy Goodenia
Haloragaceae	<i>Gonocarpus tetragynus</i>	
Lamiaceae	* <i>Marrubium vulgare</i>	Horehound
Loranthaceae	<i>Amyema pendula</i>	Drooping Mistletoe
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Mat-rush
	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
	<i>Lomandra multiflora</i>	Many-flowered Mat-rush
Loranthaceae	<i>Amyema pendulum</i>	
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
	<i>Eucalyptus bridgesiana</i>	Apple Box
	<i>Eucalyptus macroryncha</i>	Red Sringybark
	<i>Eucalyptus polyanthemos</i>	Red Box
	<i>Eucalyptus rossii</i>	Inland Scribbly Gum
	<i>Kunzea ericoides</i>	Burgan
Oxalidaceae	<i>Oxalis perennans.</i>	Grassland Wood Sorrel
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn
Plantaginaceae	* <i>Plantago lanceolata</i>	Lamb's Tongues
	<i>Plantago varia</i>	
Poaceae	* <i>Aira</i> sp.	
	<i>Aristida</i> sp.	
	<i>Austrodanthonia carphoides</i>	Short Wallaby Grass
	<i>Austrostipa scabra</i>	Corkscrew
	<i>Austrostipa densiflora</i>	Brushtail Speargrass
	<i>Bothriochloa macra</i>	Redgrass
	<i>Elymus scaber</i>	Wheatgrass
	* <i>Hordeum</i> sp.	
	* <i>Holcus lanatus</i>	Yorkshire Fog

Family Name	Scientific name	Common Name
	<i>Microlaena stipoides</i>	Weeping Rice Grass
	<i>Panicum simile</i>	Two-colour Panic
	<i>Panicum effusum</i>	Hairy Panic
	<i>Poa sieberiana</i>	
Polygonaceae	* <i>Acetosella vulgaris</i>	Sheep Sorrel
Primulaceae	* <i>Anagallis arvensis</i>	Scarlet/Blue Pimpernel
Rosaceae	<i>Acaena ovina</i>	
	* <i>Rosa rubiginosa</i>	Sweet Briar
	* <i>Rubus fruticosus</i>	Blackberry
Scrophulariaceae	* <i>Orobanche minor</i>	
	* <i>Verbascum thapsus</i>	Blanket Weed
Sinopteridaceae	<i>Cheilanthes austrotenuifolia</i>	Rock Fern
Solanaceae	* <i>Solanum linnaeanum</i>	Apple of Sodom

APPENDIX 2

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

Eastern Bentwing-bat***Miniopterus schreibersii oceanensis***

The Eastern Bentwing-bat is listed as Vulnerable under Schedule 2 of the TSC Act.

The Eastern Bentwing-bat was detected during the field survey within the study area on an ultrasonic recording device (i.e. Anabat). The call was not confidently identified however the species has been previously recorded in proximity to the study area (Johnstone Centre 2004) and in accordance with the Draft Threatened Biodiversity Survey and Assessment Guidelines (DEC 2004), despite the ambiguity in the identification this species is assumed to be found on site.

An additional four records occur within 10km of the study area to the north, south-east and south-west. Three of these records occur within the locality.

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

The Eastern Bentwing-bat utilises caves for roosting and breeding. The Eastern Bentwing-bat uses a broad range of habitats including rainforests, wet and dry sclerophyll forests, open woodlands and open grasslands for foraging (Churchill 2008). The species breeds in caves, but can also use man-made structures such as mines and road culverts for roosting (Churchill 2008; Dwyer 1995). Specific caves are used as nursery sites, containing a large number of individuals, which can be used year after year (Churchill 2008; Dwyer 1995).

The study area provides known and/or potential foraging habitat in the form of eucalypt and riparian forests and woodlands. No breeding or preferred roosting habitat (i.e. caves) occurs in the study area.

The proposal is likely to directly remove and/or modify approximately 3ha of potential foraging habitat for this species with the remaining 8.9ha of the study area likely to be indirectly impacted temporarily. These indirect impacts include the potential for increased run off of sedimentation and weed dispersal down-slope. However, this increased erosion and weed dispersal potential will be managed to limit the effects on adjacent vegetation through the use of bunding and other sediment control procedures implemented during construction. It is unlikely that the proposal would remove or disturb caves within the study area; as such breeding habitat is unlikely to be impacted. Given the mobility of this species and extent of available foraging habitat within the locality, it is unlikely the lifecycle of the Eastern Bentwing-bat would be affected by the proposal.

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

Potential foraging grounds for Eastern Bentwing-bat may be impacted by vegetation clearing. However foraging grounds for this highly mobile species are not considered limiting given that they forage over a broad range of habitat types.

Approximately 3ha of potential habitat would be directly impacted with a further 8.9ha likely to be indirectly impacted through the increased potential for increased runoff and weed dispersal. Potential habitats are widely distributed within the locality; as such it is unlikely the proposal would have a major impact on potential habitat.

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

Eastern Bentwing-bat populations are found along the east and north-west coasts of Australia (DEC 2005e). The study area is not at, or near, the limit of distribution for the Eastern Bentwing-bat.

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

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed infestations, disturbance associated with the existing dirt track, and presence of feral rabbits.

The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station.

These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant itself is predominantly cleared, the widening of the track will not result in habitat fragmentation.

The Eastern Bentwing-bat is highly mobile; therefore it is unlikely that this bat species would be impacted by the reduced connectivity within the locality.

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 Eastern Bentwing-bat (DECC 2008).

Conclusion

Based on the above assessment the proposal is considered unlikely to have a major impact on the Eastern Bentwing-bat.

Rosenberg's Goanna***Varanus rosenbergi***

The Rosenberg's Goanna is listed as Vulnerable under Schedule 2 of the TSC Act.

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

A critical habitat component for Rosenberg's Goanna are termite mounds which this species requires for nesting (DEC 2005k). The eggs are laid within the termite mound which maintains constant temperatures to incubate the clutch of eggs buried within the mound. Juveniles dig themselves out of the mound upon hatching and like many other reptiles, are independent from birth.

The proposal will involve the removal and/or disturbance of up to 3ha of habitat containing termite mounds which are a critical habitat component for this species' reproductive cycle.

The woodland habitat supports a moderate density of termite mounds which have established over wooded debris accumulated throughout the site beneath the eucalypt trees. All termite mounds throughout the study area are small mounds, generally measuring less than 35cm in height.

Where possible the proposed access track will avoid disturbance to existing termite mounds, however a number of termite mounds occur within the subject site.

Given the study area supports a moderate density of termite mounds, the loss of up to five (mostly shallow) termite mounds within the subject site is expected to be a minor impact to the lifecycle of this species.

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

This species is a sandstone specialist found throughout a variety of habitats including open forests, heaths and woodlands. Like many predators, Rosenberg's Goanna occupies large home ranges over which it forages; feeding on carrion, birds, eggs, other reptiles and small mammals (DEC 2005k).

Rosenberg's Goanna may shelter within hollow logs, rock crevices and in burrows which they may dig themselves or occupy existing burrows including rabbit warrens (DEC 2005k).

The proposal will involve the removal and/or disturbance of up to 3ha of foraging and breeding habitat for this species. Given this species occupies large home ranges and is highly mobile, the area of habitat to be removed is considered to be a relatively small amount and would result in minor impacts to the Rosenberg's Goanna.

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

Rosenberg's Goanna occurs in isolated populations within NSW, VIC, SA and WA. Within NSW Rosenberg's Goannas are found within two disjunct populations. The northern population occurs on Sydney Sandstone from Wollemi National Park to the north-west of

Sydney. The southern population occurs throughout the Goulburn and ACT regions and near Cooma in the south. The proposal is located roughly in the middle of the southern NSW population, approximately 100km from the limit of the northern and southern distribution for this population and is therefore not at the limit of distribution for this species.

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

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed infestations, disturbance associated with the existing dirt track, and presence of feral rabbits.

The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station. These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant adjoining the track is predominantly cleared, the widening of the track will not result in habitat fragmentation. A small section of access track will be established which deviates from the existing track. This section will fragment a small section of the woodland which exists parallel to the current track.

The Rosenberg's Goanna moves over large home ranges and the widening and establishment of new track is not expected to hinder the movement of this species or disrupt habitat connectivity.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of 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 Rosenberg's Goanna (DECC 2008).

Conclusion

Based on the above assessment the proposed activities are unlikely to have a major impact on the Rosenberg's Goanna. **Speckled Warbler**
Pyrrholaemus saggitatus

The Speckled Warbler is listed as Vulnerable under Schedule 2 of the TSC Act (NSW Scientific Committee 2008a). A pair of Speckled Warblers was observed during the field

survey. This species has been recorded on four occasions within the locality and a further six times in within a 10km radius of the study area.

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

The proposal will involve the removal of up to 3ha of potential habitat for the Speckled Warbler. The Speckled Warbler nests in low dense shrubby vegetation. Nests are built from dry grass and tree bark, nestled in a slight hollow on the ground or at the base of a low dense plant, typically among fallen branches, leaf litter and organic debris (DEC 2005n). The habitat throughout the study area has patches of low suitably dense vegetation which the Speckled Warbler may breed in however for the most part the habitat is quite open and sparse.

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

The Speckled Warbler is found throughout a range of open canopy Eucalypt woodlands which possess a grassy native understorey, with sparse shrubs often on ridges or in gullies. They feed on seeds and insects gleaned from the understorey and ground beneath bushes and trees. They require relatively large undisturbed remnants of habitat. Pairs occupy home ranges of about 10 ha which may be larger in the non-breeding season (DEC 2005n).

The proposal will involve the removal and/or disturbance of up to 3ha of woodland habitat. Generally the Speckled Warbler has experienced a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive. The further fragmentation of habitats is a threat to this species which tend to occupy large home ranges (approximately 10ha) of relatively intact vegetation.

Given the vegetation to be removed is primarily along the existing track adjacent to the cleared land within the Water Treatment Plant facility, the proposal will only be establishing short distances of new road through sparse woodland avoiding densely wooded areas where possible.

Although the proposal will result in some fragmentation of woodland adjacent to the existing tracks and Water Treatment Plant, the works are considered to be a minor impact on the habitat available for the Speckled Warbler.

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

The Speckled Warbler distribution extends from south-eastern Queensland in the north to Victoria in the south (DEC 2005n). The study area does not occur at or near the limit distribution for the Speckled Warbler.

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

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed

infestations, disturbance associated with the existing dirt track, and presence of feral rabbits. The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station. These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant itself is predominantly cleared, the widening of the track will not result in habitat fragmentation. A small section of access track will be established which deviates from the existing track. This section will fragment a small section (approximately 200m) of the woodland which exists parallel to the current track.

The Speckled Warbler forages along the ground in clearings and open areas, although this species requires large relatively intact areas of habitat to persist. The widening of the existing track and establishment of approximately 200m of new track is expected to be a minor impact on habitat connectivity for 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 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 Speckled Warbler (DECC 2008).

Conclusion

Based on the above assessment the proposed activities are unlikely to have a major impact on the Speckled Warbler.

Brown Treecreeper

Climacteris picumnus victoriae

The Brown Treecreeper (eastern subspecies) is listed as Vulnerable under Schedule 2 of the TSC Act.

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 2005a).

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

The Brown Treecreeper is known to nest 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 11ha (generally around 4ha) (DEC 2005a).

Brown Treecreepers have been recorded in woodland adjacent to the study area. The study area itself is likely to provide breeding habitat for this species in the form of hollow-bearing trees.

The proposal will involve the removal of up to a maximum of 3ha of woodland habitats. The habitat to be removed primarily exists along an existing access track with narrow strips of roadside vegetation to be removed. The vegetation is generally sparse however some hollow-bearing Eucalypts may be removed as a result of the proposal. Where possible these trees will be avoided.

Consequently the proposal is likely to have a minor impact on the lifecycle of the Brown Treecreeper in the area through the removal of potential breeding resources.

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

The Brown Treecreeper lives in Eucalypt woodlands and dry open forests, usually dominated by stringy barks or other rough-barked Eucalypts, especially in areas of relatively flat open woodland, and which lack a dense shrub layer, contain short grass or bare ground and have fallen logs or dead trees present (DEC 2005a; Traill and Duncan 2000). The species forages within trees and on the ground.

The Brown Treecreeper is almost entirely insectivorous, but would occasionally take nectar. It forages for ants, beetles and larvae in trees and on the ground. In trees, the species mostly forages among crevices and holes on trunks and larger limbs, preferring rough-barked eucalypts. On the ground the species forages on fallen logs and under bark, at the base of grass tussocks and amongst leaf litter and other debris (DEC 2005a).

The study area provides potential habitat for the Brown Treecreeper in the form of woodland vegetation and hollow-bearing trees.

The proposal would involve some clearing of vegetation and trees, which includes some hollow-bearing trees. As such, the proposal is likely to have a minor impact on the habitat of the Brown Treecreeper in the area.

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

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 study area does not occur at or near the limit of distribution of the Brown Treecreeper.

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

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed infestations, disturbance associated with the existing dirt track, and presence of feral rabbits. The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station. These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant itself is predominantly cleared, the widening of the track will not result in habitat fragmentation. A small section of access track will be established which deviates from the existing track. This section will fragment a small section (approximately 200m) of the woodland which exists parallel to the current track.

The Brown Treecreeper forages in wooded areas, although this species requires large relatively intact areas of habitat to persist, the widening of the existing track and establishment of approximately 200m of new track is expected to be a minor impact on habitat connectivity for the Brown Treecreeper.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of 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 (DECC 2008).

Conclusion

Based on the above assessment the proposed activities are unlikely to have a major impact on the Brown Treecreeper.

Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>
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The Eastern False Pipistrelle is listed as Vulnerable under Schedule 2 of the TSC Act.

The species inhabits sclerophyll forests, preferring wet habitats where trees are more than 20m high (Churchill 1998). The Eastern False Pipistrelle hunts beetles, moths, weevils and other flying insects above or just below the tree canopy (Churchill 1998). There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary and enter torpor (Menkhorst and Lumsden 1995).

This species also appears to be highly mobile and records indicate movements of up to 12km between roosting and foraging sites (Menkhorst and Lumsden 1995). This species roosts in hollow-bearing trees (both dead and alive) and caves and buildings (Churchill 1998). Two observations have been made of roosts in stem holes of living Eucalypts (Phillips 1995).

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

The Eastern False Pipistrelle was recorded within the study area (in the gully of Googong Creek) during previous surveys (Johnstone Centre 2004). This species is known to roost in hollow-bearing trees (both dead and alive) and/or caves and buildings (Churchill 1998). No caves occur within the study area. Many hollow-bearing trees were recorded within the study area, however, all were in dry habitats not usually favoured by this species.

Clearing for the proposal would remove some hollow-bearing trees that could potentially provide roosting habitat for this species. This is unlikely to have an adverse effect on the life cycle of this species as hollows occur throughout the woodland in adjacent areas where the forests is more to this species' preference. The removal of existing vegetation in the study area is not likely to affect the life cycle of the Eastern False Pipistrelle.

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

The study area provides potential habitat for the Eastern False Pipistrelle in the form of sparse woodland vegetation and hollow-bearing trees.

Habitat throughout much of the area is considered suboptimal for the Eastern False Pipistrelle, however, foraging may occur on occasion. The proposal would lead to the removal of some foraging and roosting habitat in the area.

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

In NSW, the Eastern False Pipistrelle has a distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. It also occurs in Tasmania (Churchill 1998). The study area does not occur at or near the limit of distribution of the Eastern False Pipistrelle.

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

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed infestations, disturbance associated with the existing dirt track, and presence of feral rabbits. The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station. These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant itself is predominantly cleared, the widening of the track will not result in habitat fragmentation.

The Eastern False Pipistrelle is highly mobile; therefore it is unlikely that this bat species would be impacted by the reduced connectivity within the locality.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of 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 Eastern False Pipistrelle (DECC 2008).

The proposal will have a minimal impact on known and/or potential habitat for this species. Also, given the suboptimal nature of the habitat and high mobility of this species, it is not likely to be critical to the survival of this species.

Conclusion

Based on the above assessment the proposed activities are unlikely to have a major impact on the Eastern False Pipistrelle.

APPENDIX 3

Assessments of Impacts according to EPBC Act Significant Impact Guidelines

Significant impact criteria for Endangered Ecological Communities (EECs)

An action (i.e. the proposal) is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- reduce the extent of an ecological community;
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;
- adversely affect habitat critical to the survival of an ecological community;
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
 - assisting invasive species, that are harmful to the listed ecological community, to become established; or
 - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community;
- interfere with the recovery of an ecological community.

Assessment of current proposal

Is there a real chance or possibility the action will reduce the extent of an ecological community?

A small patch (i.e. approximately 1210m²) of Blakely's Red Gum / Red Box / Apple Box Grassy Woodland occurs within the study area (refer Figure 3). This vegetation community has been determined as meeting the floristic and structural criteria described for the EPBC Act-listed Critically Endangered Ecological Community known as White Box / Yellow Box / Blakely's Red Gum Grassy Woodland and Derived Native Grasslands. The proposal would result in the construction and ongoing maintenance of an all-weather access track which is to be located adjacent to the boundary of the EEC. The proposal would ensure that all earthworks (excavation, fill placement, etc), vegetation clearing and other disturbances are located outside of the EEC. As such, it is considered unlikely that the proposal would reduce the current extent of the patch of the EEC.

Is there a real chance or possibility the action will fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?

The EEC occurring within the study area exists as a small, isolated patch which is surrounded by a vegetation community characterised by a canopy which does not contain the Eucalypt species which are keystone to the EEC. Whilst not considered to substantially fragment the EEC, it is noted that an unformed dirt access track currently passes through the centre of the EEC. Although not built-up, this dirt access track does act to fragment the groundstorey and appears to have encouraged the establishment of weeds in the immediate surrounding area.

Should the proposed all-weather access track be established up slope of the EEC, the proposed disturbance would occur within a highly disturbed, predominantly cleared and weed-dominated area. In this manner, the proposal would not cause fragmentation between the EEC and any natural vegetation community.

Should the proposed all-weather access track be established down slope of the EEC, the proposed disturbance would occur within a largely intact Dry Forest vegetation community which is well connected to the EEC. In this manner, whilst not resulting in direct fragmentation within the EEC, the disturbance would result in the fragmentation of the EEC from the similar (and supporting) vegetation community which bounds the EEC on three sides.

In light of the above, the establishment of the all-weather access track up slope of the EEC would be preferable as it would not result in the fragmentation of the EEC from any similar vegetation communities.

Is there a real chance or possibility the action will adversely affect habitat critical to the survival of an ecological community?

No critical habitat for the community has been listed under the EPBC Act Register of Critical Habitat. In addition the proposal would ensure that all earthworks (excavation, fill placement, etc), vegetation clearing and other disturbance is located outside of the EEC. As such, it is considered unlikely that the proposal would adversely affect habitat critical to the survival of the EEC.

Notwithstanding the above, it would be imperative that suitable works boundaries are established and that no disturbance occurs outside of these defined boundaries. Similarly, suitable erosion and sediment control measures would be necessary to ensure that sediment and rubble does not encroach upon the EEC. Provided such measures are implemented, it is considered unlikely that the proposal would adversely affect habitat critical to the survival of the EEC.

Is there a real chance or possibility the action will modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?

The proposal would result in the construction and ongoing maintenance of an all-weather access track which is to be located adjacent to the boundary of the EEC. The proposal

would ensure that all earthworks (excavation, fill placement, etc), vegetation clearing and other disturbances are located outside of the EEC. The proposal is unlikely to result in a substantial alteration to groundwater levels or surface water drainage within the EEC, or that may impact upon the EEC. If the access track is to be located up slope of the EEC, appropriate drainage infrastructure would be installed in order to maintain the current overland flow patterns through the EEC. The proposal will not require the exportation or importation of materials that would substantially modify the nutrient levels and water retention capacity of the soils within the locality.

Is there a real chance or possibility the action will cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?

The works associated with the proposal would be limited to those required to construct and maintain an all-weather access track which would pass by the EEC. No significant impacts upon the current species composition and structure of vegetation communities are likely to occur outside of the defined disturbance corridor required for track construction (which would be located outside of the EEC). Refer response to the below criteria regarding the potential for infestation and proliferation of weed species within the EEC. No alteration to the current burning regime would occur as a result of the proposal and no flora or fauna harvesting would occur.

Is there a real chance or possibility the action will cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- assisting invasive species, that are harmful to the listed ecological community, to become established, or
- causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?

The most destructive and significant threat to this EEC is the clearing of the EEC for any purpose. Second to land clearing is the encroachment, establishment and proliferation of invasive plant species (weeds) which degrade the quality and integrity of the EEC. In severe cases, weed encroachment can result in the degradation of the groundstorey of the EEC, such that the patch no longer meets the floristic and structural criteria for consideration as the EEC.

The patch of this EEC occurring within the study area currently supports significant infestations of exotic weeds. In fact, the low-lying areas associated with the small drainage line which traverses the EEC are dominated by annual and perennial herbaceous weed species. In addition, the land between the EEC and the boundary of the Googong Dam Water Treatment Plant is dominated by exotic weeds with only sparsely scattered occurrences of disturbance tolerant native forbs and grasses. It is likely that the current weed infestations within the EEC have established from seed and propagules which have originated within the Googong Dam Water Treatment Plant, upslope of the EEC.

The proposed construction of an all-weather access track that would pass by adjacent to the patch of EEC is unlikely to result in a substantial increase in the proliferation of the current weed infestations with the EEC and surrounding areas. Conversely, establishment of the access track upslope of the EEC would provide an opportunity to remove and manage the dense weed infestation (and considerable source of weed propagules, etc) currently occurring between the EEC and the Googong Dam Water Treatment Plant.

In addition to the above, as part of the proposal it will be imperative to implement suitable measures to avoid the further introduction and transportation of weeds into the EEC. Such measures would include: the development of a weed distribution map across the study area; conducting a pre-construction weed control program; and, implementing strict vehicle hygiene controls such as cleaning of tyres, wheel guards and bases of machinery before entry into the area.

The proposal would not result in the use of fertilisers, herbicides or other chemicals or pollutants into the EEC in a manner that would impact upon the EEC. The use of herbicides within the vicinity of the EEC would be limited to that required for target specific weed treatment.

Provided suitable management measures are implemented prior to, during and post construction works, it is considered unlikely that the proposal would result in a substantial reduction in the quality or integrity of the EEC.

Is there a real chance or possibility the action will interfere with the recovery of an ecological community?

It is recognised that all occurrences of this critically endangered ecological community are of great importance to the national preservation of the EEC. Notwithstanding this, the significance of this patch to the wider recovery of the EEC is limited due to its very small size (i.e. 1210m²), isolated nature and existing considerable infestations of exotic weeds.

Given that the proposal would locate all disturbance outside of the EEC, incorporate suitable weed reduction and management measures and appropriately manage hydrological impacts (i.e. erosion, changes to flow patterns, etc), it is considered unlikely that the proposal would adversely interfere with the patch of EEC or the wider recovery of the EEC.

APPENDIX 4

Flora and Fauna Potential Habitat Tables

Potential Threatened Fauna Habitat

Table 7 – Potential Habitat for Threatened Fauna within the Study Area

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat		Potential Habitat?
Amphibians					
<i>Litoria aurea</i> 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 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).	No
<i>Litoria castanea</i> Yellow-spotted Tree Frog	E	E1		The Yellow-spotted Tree Frog has only recently (2010) been recorded in the wild again. Before this it had not been recorded in the wild since the 1970s (DEC 2005r). It has a disjunct distribution, being 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. It shelters during autumn and winter under fallen timber, rocks, other debris or thick vegetation (Robinson 1998; DEC 2005r).	No
<i>Litoria raniformis</i> 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

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
Birds				
<i>Circus assimilis</i> Spotted Harrier	-	V	The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast (NSW Scientific Committee 2010a). Preferred habitat consists of open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation (NSW Scientific Committee 2010a). The Spotted Harrier is more common in drier inland areas, nomadic part migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees (Marchant and Higgins 1993).	No
<i>Haliaeetus leucogaster</i> 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
<i>Hieraetus morphnoides</i> Little Eagle	-	V	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species (NSW Scientific Committee 2009b). It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests (Marchant and Higgins 1993).	No
<i>Apus pacificus</i> 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 metres high (Boehm 1944).	No
<i>Hirundapus caudacutus</i> White-throated Needletail	M	-	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia (Pizzey and Knight 1997).	Yes

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Ardea alba</i> 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
<i>Ardea ibis</i>	M	-	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands (Marchant and Higgins 1990).	No
Cattle Egret	--	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 1997).	Yes
<i>Climacteris picumnus victoricae</i> 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 , recent local records
<i>Myiagra cyanoleuca</i> 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

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Rhipidura rufifrons</i> 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
<i>Anthochaera phrygia</i> Regent Honeyeater	E	C1	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). Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: <i>E. microcarpa</i> , <i>E. punctata</i> , <i>E. polyanthemus</i> , <i>E. mollucana</i> , <i>Corymbia robusta</i> , <i>E. crebra</i> , <i>E. caleyi</i> , <i>C. maculata</i> , <i>E. mckieana</i> , <i>E. macrorrhyncha</i> , <i>E. laevopinea</i> and <i>Angophora floribunda</i> . Nectar and fruit from the mistletoes <i>A. miquelii</i> , <i>A. pendula</i> , <i>A. cambagei</i> are also eaten during the breeding season (DEC 2005). 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 2005)).	Yes, marginal potential habitat

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Epthianura albifrons</i> White-fronted Chat	-	V	<p>The White-fronted Chat occupies foothills and lowlands below 1000 m above sea level. In NSW it occurs mostly in the southern half of the state, occurring in damp open habitats along the coast, and near waterways in the western part of the state (Higgins <i>et al.</i> 2001).</p> <p>The White-fronted Chat is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands or lightly timbered lands. Along the coastline, they are found in estuarine and marshy grounds with vegetation less than 1 m tall. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the species is often observed in open grassy plains, saltlakes and saltpans that are along the margins of rivers and waterways (Higgins <i>et al.</i> 2001).</p> <p>In Victoria White-fronted Chats have been observed breeding from late July through to early March. Nests are built in low vegetation and in the Sydney region nests have also been observed in low isolated mangroves (NSW Scientific Committee 2009d).</p> <p>An Endangered Population occurs in the Sydney Metropolitan CMA area, at Newington Nature Reserve near Homebush and at Towra Point Nature Reserve (NSW Scientific Committee 2009e).</p>	No
<i>Merops ornatus</i> Rainbow Bee-eater	M	-	<p>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).</p>	Yes
<i>Daphoenositta chrysoptera</i> Varied Sittella	-	V	<p>The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts (Higgins and Peter 2002; NSW Scientific Committee 2010b). The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years (NSW Scientific Committee 2010b).</p>	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Chthonicola sagittata</i> 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 <i>et al.</i> 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 <i>et al.</i> 1984; NSW Scientific Committee 2008a). Home ranges vary from 6-12 hectares (NSW Scientific Committee 2008a).	Yes , observed on site during the current survey
<i>Stagonopleura guttata</i> 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 <i>et al.</i> 2006).	Yes
<i>Melanodryas cucullata cucullata</i> 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
<i>Petroica boodang</i> Scarlet Robin	-	V	During the breeding season the Scarlet Robin is found in eucalypt forests and temperate woodlands, often on ridges and slopes. During autumn and winter it moves to more open and cleared areas. It has dispersive or locally migratory seasonal movements. The Scarlet Robin forages amongst logs and woody debris for insects which make up the majority of its diet (NSW Scientific Committee 2009c). The nest is an open cup of plant fibres and cobwebs, sited in the fork of a tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than 2 m above the ground (NSW Scientific Committee 2009c). It is conspicuous in open and suburban habitats (Morcombe 2006).	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Petroica phoenicea</i> Flame Robin	-	V	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border (Australian Museum 2009). The species is also found in Tasmania. The preferred habitat in summer includes moist eucalyptus forests and open woodlands, whilst in winter prefers open woodlands and farmlands (NSW Scientific Committee 2009a). It is considered migratory. The Flame Robin breeds from about August to January (Morcombe 2006).	No
<i>Lathamus discolor</i> 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 <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxyloa</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> (DEC 2005p). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey and Knight 1997).	Yes, marginal potential foraging habitat
<i>Polytelis swainsonii</i> 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 trees within 9 km of feeding areas (Higgins 1999).	No
<i>Rostratula australis</i> 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
<i>Gallinago hardwickii</i> Latham's Snipe	M	-	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams (Pizzey and Knight 1997).	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
Invertebrates				
<i>Synemon plana</i> 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 groundlayer is dominated by wallaby grasses of the genus <i>Austrodanthonia</i> (DECC 2005a). It is believed that the females lay up to 200 eggs at the base of the <i>Austrodanthonia</i> tussocks. After hatching, the larvae tunnel underground where they remain feeding on the roots of <i>Austrodanthonia</i> (DEWHA 2008).	No
Mammals				
<i>Dasyurus maculatus maculatus</i> Spotted-tailed Quoll (south-eastern mainland)	E	V	Occurs along the east coast of Australia and the Great Dividing Range (Belcher <i>et al.</i> 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 <i>et al.</i> 2008).	Yes, some foraging habitat available
<i>Phascogale cinerea</i> Koala	N	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 <i>et al.</i> 2008). Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> (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 <i>et al.</i> 2008).	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Falstrellus tasmaniensis</i> Eastern False Pipistrelle	-	V	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes (Churchill 2008). Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails (Law <i>et al.</i> 2008). Has a large foraging range, up to 136 ha (Churchill 2008; Law <i>et al.</i> 2008). Records show movements of up to 12 km between roosting and foraging sites (Menkhorst and Lumsden 1995).	Yes
<i>Miniopterus schreibersii oceanensis</i> 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; Hoyer and Hall 2008).	Yes, possible call recorded on anabat during current and previous surveys
<i>Myotis macropus</i> 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 <i>et al.</i> 2008)).	No
Reptiles				
<i>Tympanocryptis pinguicollis</i> Grassland Earless Dragon	E	E1	Occurs at sites dominated by wallaby grasses (<i>Austrodanthonia</i> spp.), spear grasses (<i>Austrostipa</i> spp.), Poa Tussock (<i>Poa sieberiana</i>), Red Grass (<i>Bothriochloa macra</i>), and occasionally Kangaroo Grass (<i>Themeda australis</i>). 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

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Aprasia parapulchella</i> 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 (<i>Themeda australis</i>), sparse or no tree cover, little or no leaf litter, and scattered small rock with shallow embedment in the soil surface (Osborne and Jones 1995).	No
<i>Delma impar</i> 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 <i>Themeda triandra</i> , <i>Austrostipa</i> spp. and <i>Austrodanthonia</i> spp. Inhabits secondary grasslands only when they occur within 2km of primary grassland (Hadden 1995).	No
<i>Varanus rosenbergi</i> 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). Termite mounds are a critical habitat component (DEC 2005k).	Yes

Potential Threatened Flora Habitat

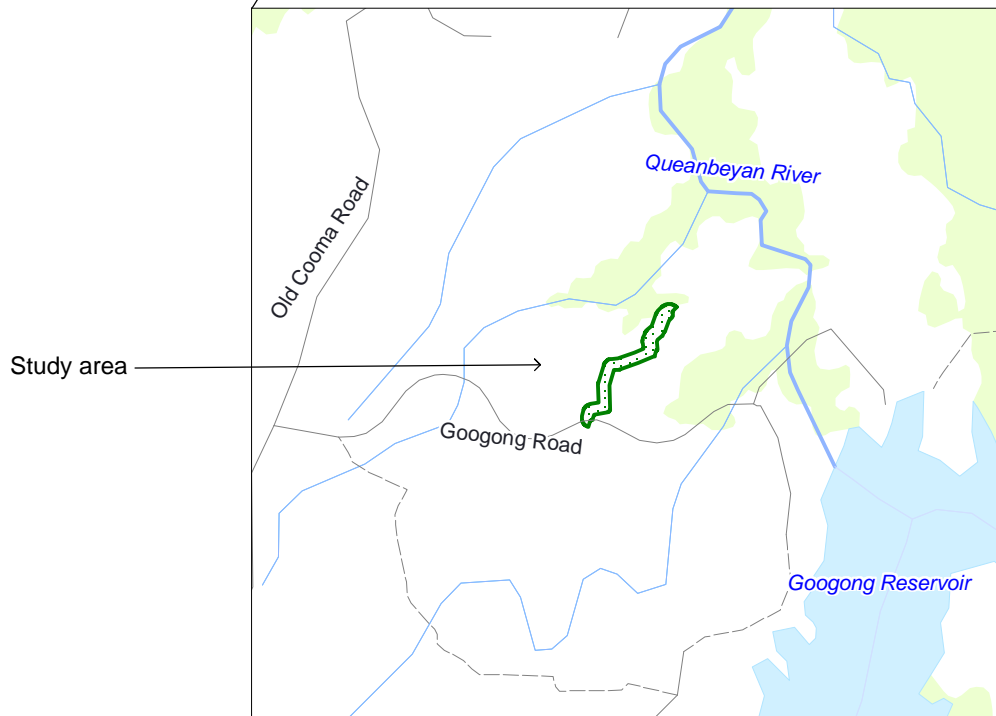
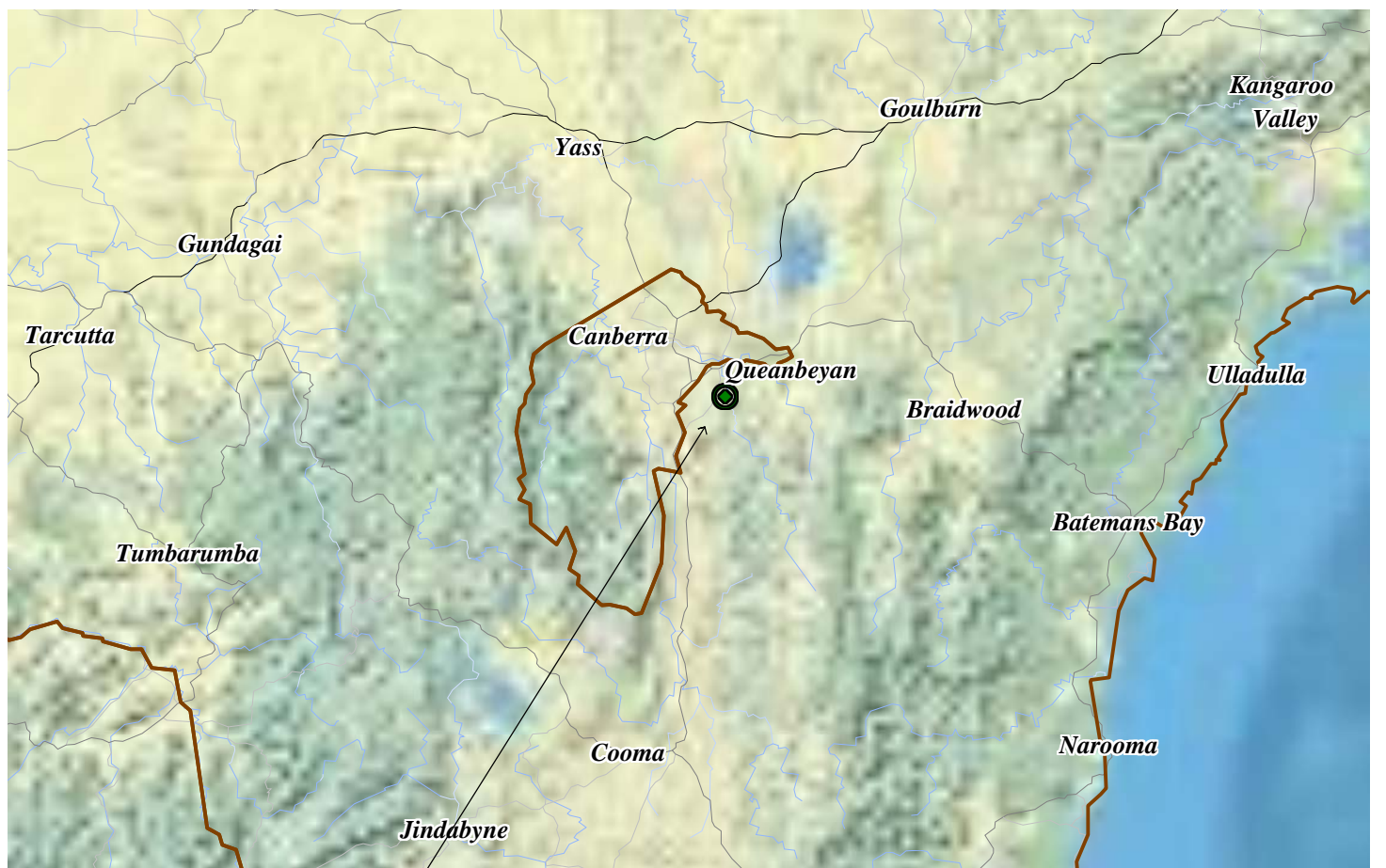
Table 8 – Potential Habitat for Threatened Flora within the Study Area

Scientific Name/ Common name	EPBC Act ¹	TSC Act ²	Habitat	Potential Habitat?
<i>Calotis glandulosa</i> 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 <i>Poa</i> spp.), Natural Temperate Grassland (dominated by <i>Themeda australis</i>) and Snow Gum (<i>Eucalyptus pauciflora</i>) 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
<i>Leucochrysum albicans</i> var. <i>tricolor</i> 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
<i>Rutidosis leptorrhynchoides</i> 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 2005b).	Yes



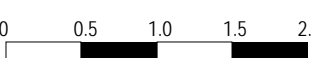
Scientific Name/ Common name	EPBC Act ¹	TSC Act ²	Habitat	Potential Habitat?
<i>Swainsona recta</i> Small Purple Pea	E	E1	Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum <i>Eucalyptus blakelyi</i> , Yellow Box <i>E. melliodora</i> , Candlebark Gum <i>E. rubida</i> and Long-leaf Box <i>E. goniocalyx</i> . It grows in association with understorey dominants that include Kangaroo Grass <i>Themeda australis</i> , poa tussocks <i>Poa</i> spp. and spear-grasses <i>Austrostipa</i> spp. Plants die back in summer, surviving as a 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 2005).	Yes, marginal habitat. Not recorded during surveys.
<i>Swainsona sericea</i> 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 <i>Eucalyptus pauciflora</i> Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes (DEC 2005).	Yes, marginal habitat. Not recorded during surveys.
<i>Caladenia tessellata</i> Tessellated Spider Orchid	V	E1	<i>Caladenia tessellata</i> is found in the following Catchment Management Regions Sydney Metropolitan, Southern Rivers, Hawkesbury/Nepean, and Hunter/Central Rivers. Currently known from three disjunct areas: Braidwood on southern tablelands, Ulladulla on the south coast and three populations in Wyong area on the Central Coast (DEC 2005c). 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). This species only grows in very dense shrubbery in coastal areas (Bishop 1996). Flowers appear between September and November, but generally late September or early October in extant southern populations (DEC 2005c).	No
<i>Pomaderris pallida</i> Pale Pomoderris	V	V	Pale Pomaderris 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 (<i>Eucalyptus mannifera</i>) and Red Stringybark (<i>E. macrorhynca</i>) or Callitris spp. Woodland (DEC 2005).	Yes, marginal habitat. Not recorded during surveys.

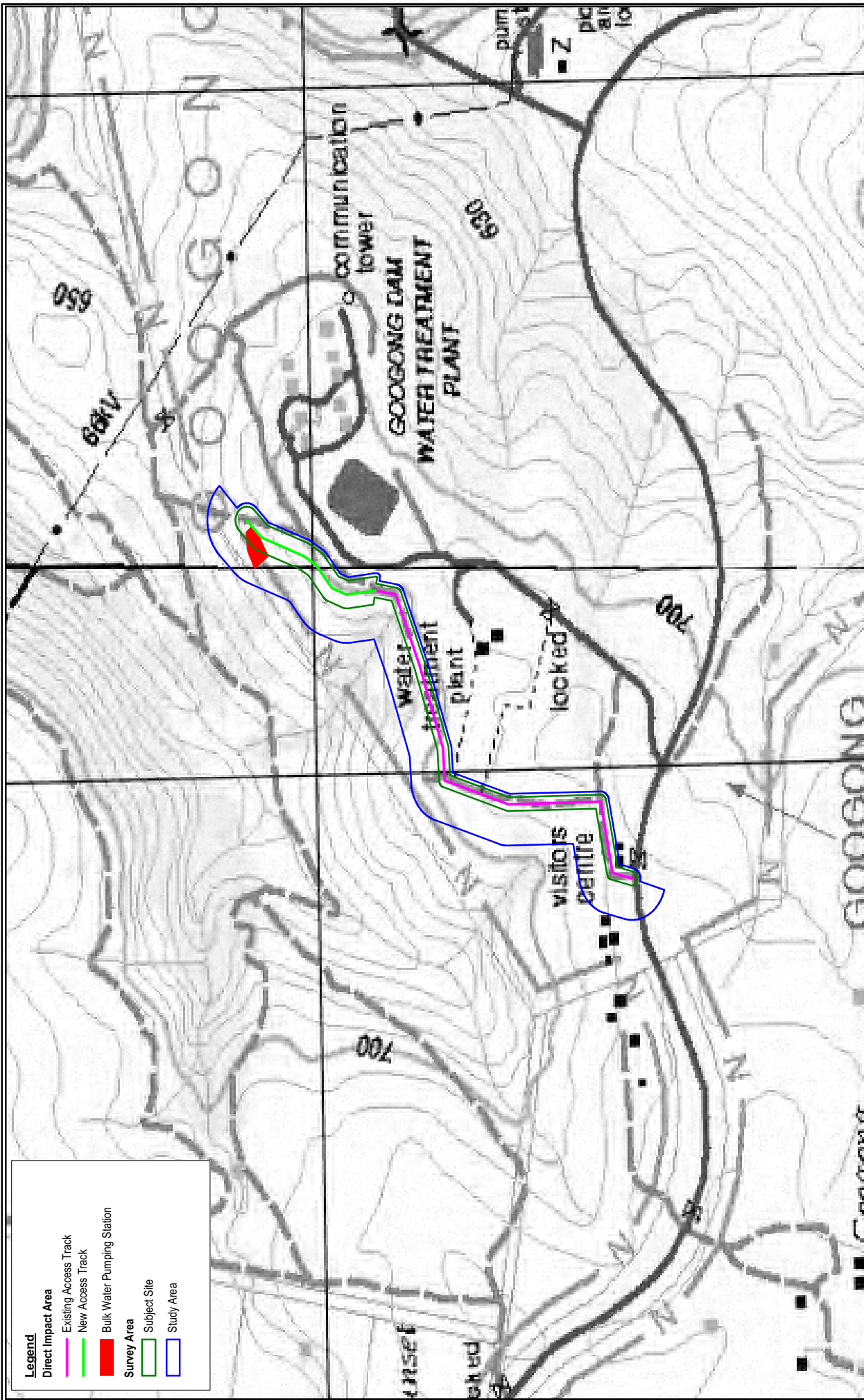
Scientific Name/ Common name	EPBC Act ¹	TSC Act ²	Habitat	Potential Habitat?
<i>Thesium australe</i> Austral Toad-flax	V	V	<p>Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands.</p> <p><i>Thesium australe</i> is a root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass (DEC 2005q). It is often found in damp sites in association with <i>Themeda australis</i>, but also found on other grass species at inland sites (G. Leonard pers. obs.).</p> <p>Occurs on clay soils in grassy woodlands or coastal headlands (James <i>et al.</i> 1999).</p>	No

FIGURES



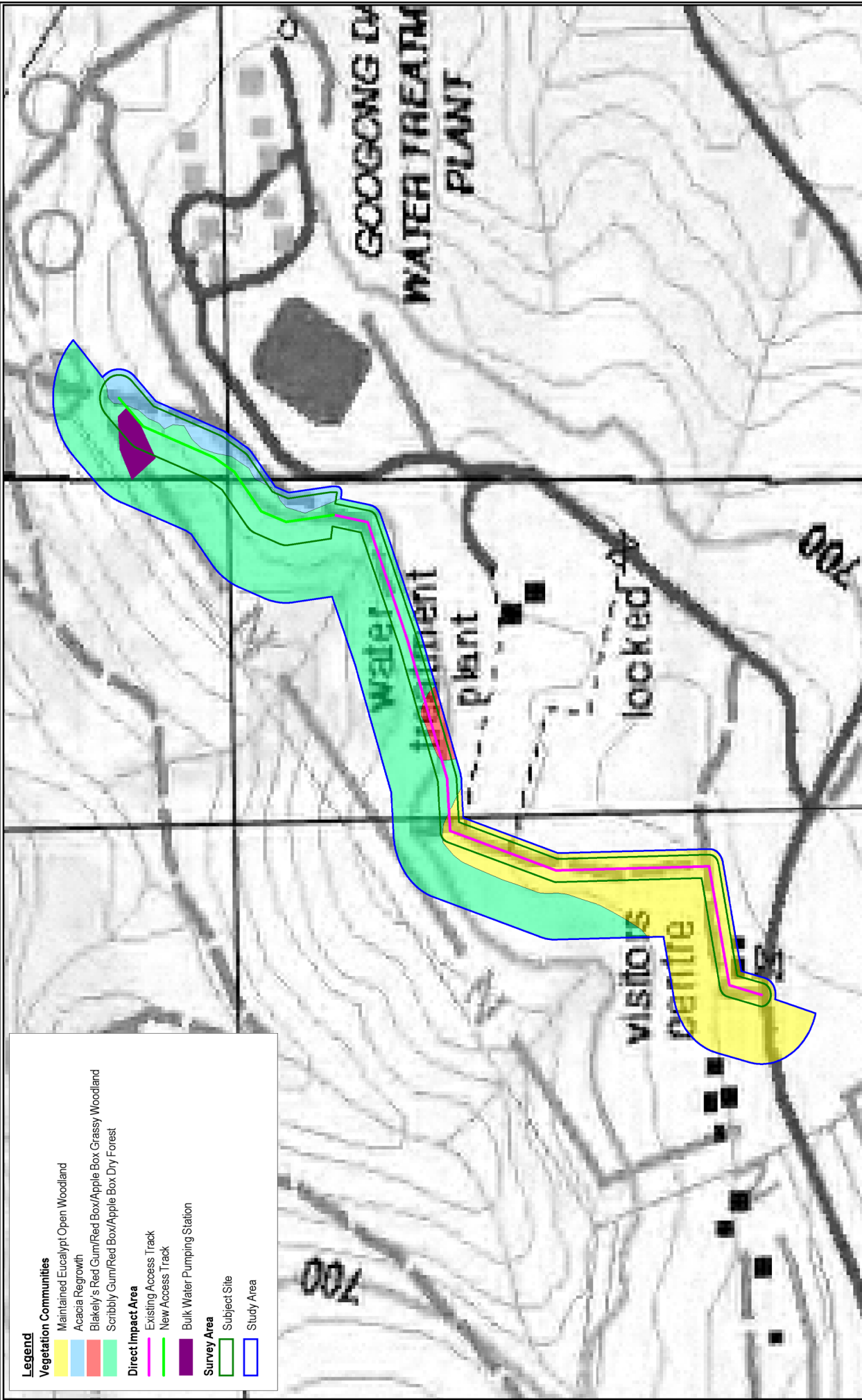
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 <p>BIOSIS RESEARCH Pty. Ltd. Unit 16 / 2 Yallourn St Fyshwick AUSTRALIAN CAPITAL TERRITORY 2609</p>	Figure 1: Location of the Study Area in a regional context			
	Date: 4 February 2011	Drawn by: ANP		Scale: 0 0.5 1.0 1.5 2.0  kilometres
	File number: 12826	Checked by: JKD		
	Location: P:\12800s\12826\Mapping\12826 F1_Locality.WOR			



Legend	
[Red Triangle]	Bulk Water Pumping Station
[Blue Outline]	Study Area
[Green Outline]	Subject Site
[Pink Line]	Existing Access Track
[Green Line]	New Access Track
[Black Outline]	Survey Area
[Black Outline]	Direct Impact Area

<p>BIOSIS RESEARCH Pty. Ltd. Unit 16/2 Yaloom St Fishwick AUSTRALIAN CAPITAL TERRITORY 2619</p>	<p>Figure 2: Overview of the Study Area and Subject Site.</p>	<p>Acknowledgements: Topographic Image from Land and Property Management Authority 1:25000 topographic map series (2006) This product incorporates Data which is copyright to the Commonwealth of Australia (c.2003-)</p>	<p>Scale: 1:5,000 at A3 Map Projection: Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid of Australia, Zone 56</p>
	<p>Date: 7 March 2011 File number: 12826 Location: P:\12808\12826\Mapping\12826_F2_Overview.WCR</p>		



- Legend**
- Vegetation Communities**
 - Maintained Eucalypt Open Woodland
 - Acacia Regrowth
 - Blakely's Red Gum/Red Box/Apple Box Grassy Woodland
 - Scrubby Gum/Red Box/Apple Box Dry Forest
 - Direct Impact Area**
 - Existing Access Track
 - New Access Track
 - Bulk Water Pumping Station
 - Survey Area**
 - Subject Site
 - Study Area

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Figure 3: Vegetation Communities

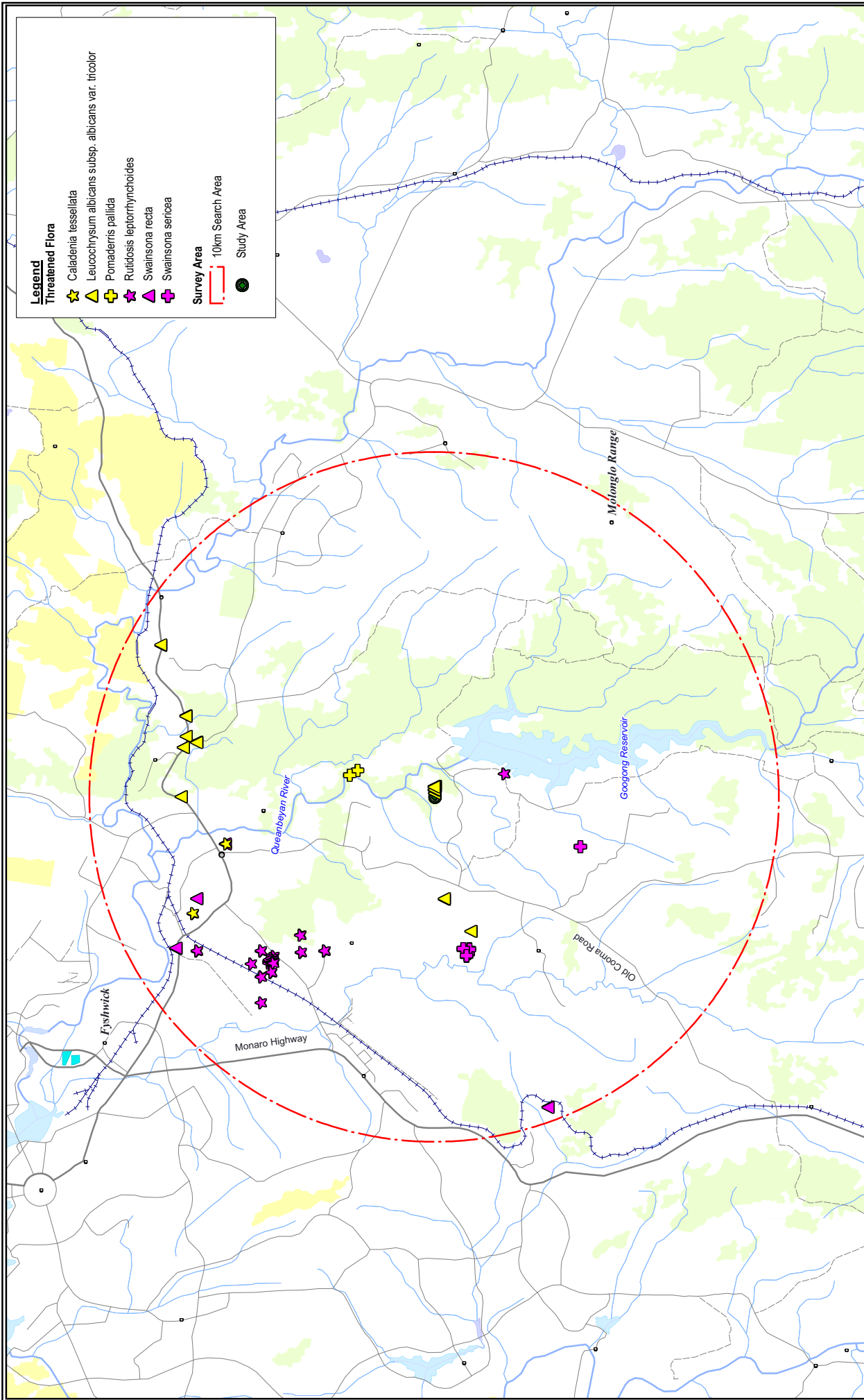
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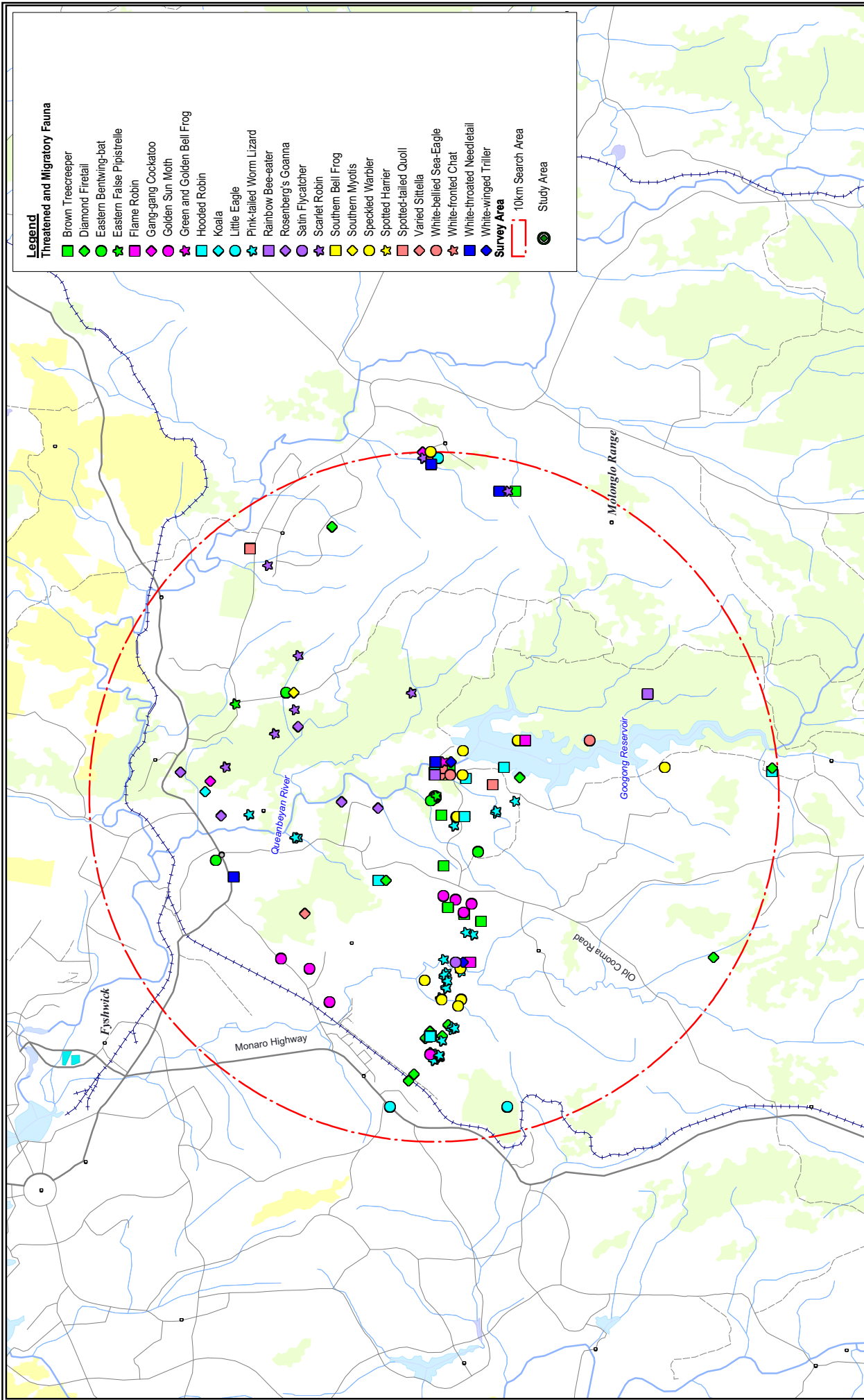
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 Map Projection: Transverse Mercator
 Horizontal Datum: Australian Datum of Australia 1984
 Grid: Map Grid of Australia, Zone 56

Figure 3



 <p>BIOSIS RESEARCH Pty. Ltd. 18-20 Mandible Street Alexandria NEW SOUTH WALES 2015</p>	<p>Date: 4 February 2011 File number: 12826 Location: P:\12800s\12826\Mapping\12826_F4_Flora.WOR</p>		<p>Drawn by: ANP Checked by: JKD</p>
	<p>Figure 4: Threatened flora species occurring within a 10km radius of the Study Area.</p>		
<p>Acknowledgements: Species data provided by DECCWNPWS and Biosis Research Pty Ltd This product incorporates Data which is copyright to the Commonwealth of Australia (c.2003-)</p>			
<p>Scale: 1:100,000 at A3 Map Projection: Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid of Australia, Zone 56</p>			
<p>Figure 4</p>			



- Legend**
Threatened and Migratory Fauna
- Brown Treecreeper
 - ◆ Diamond Firetail
 - ★ Eastern Bentwing-bat
 - ★ Eastern False Pipitrelle
 - ◆ Flame Robin
 - ◆ Gang-gang Cockatoo
 - ★ Golden Sun Moth
 - ★ Green and Golden Bell Frog
 - Hooded Robin
 - ◆ Koala
 - ★ Little Eagle
 - ★ Pink-tailed Worm Lizard
 - Rainbow Bee-eater
 - ◆ Rosenberg's Goanna
 - ★ Saini Flycatcher
 - ◆ Scarlet Robin
 - Southern Bell Frog
 - ◆ Southern Myotis
 - ★ Speckled Warbler
 - ★ Spotted Harrier
 - Spotted-tailed Quoll
 - ◆ Varied Sittella
 - ★ White-bellied Sea-Eagle
 - ★ White-fronted Chat
 - ★ White-throated Needletail
 - ◆ White-winged Triller
- Survey Area**
- - - 10km Search Area
● Study Area

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 18-20 Mandible Street
 Alexandria
 NEW SOUTH WALES 2015

Figure 5: Threatened fauna species occurring within a 10km radius of the Study Area.

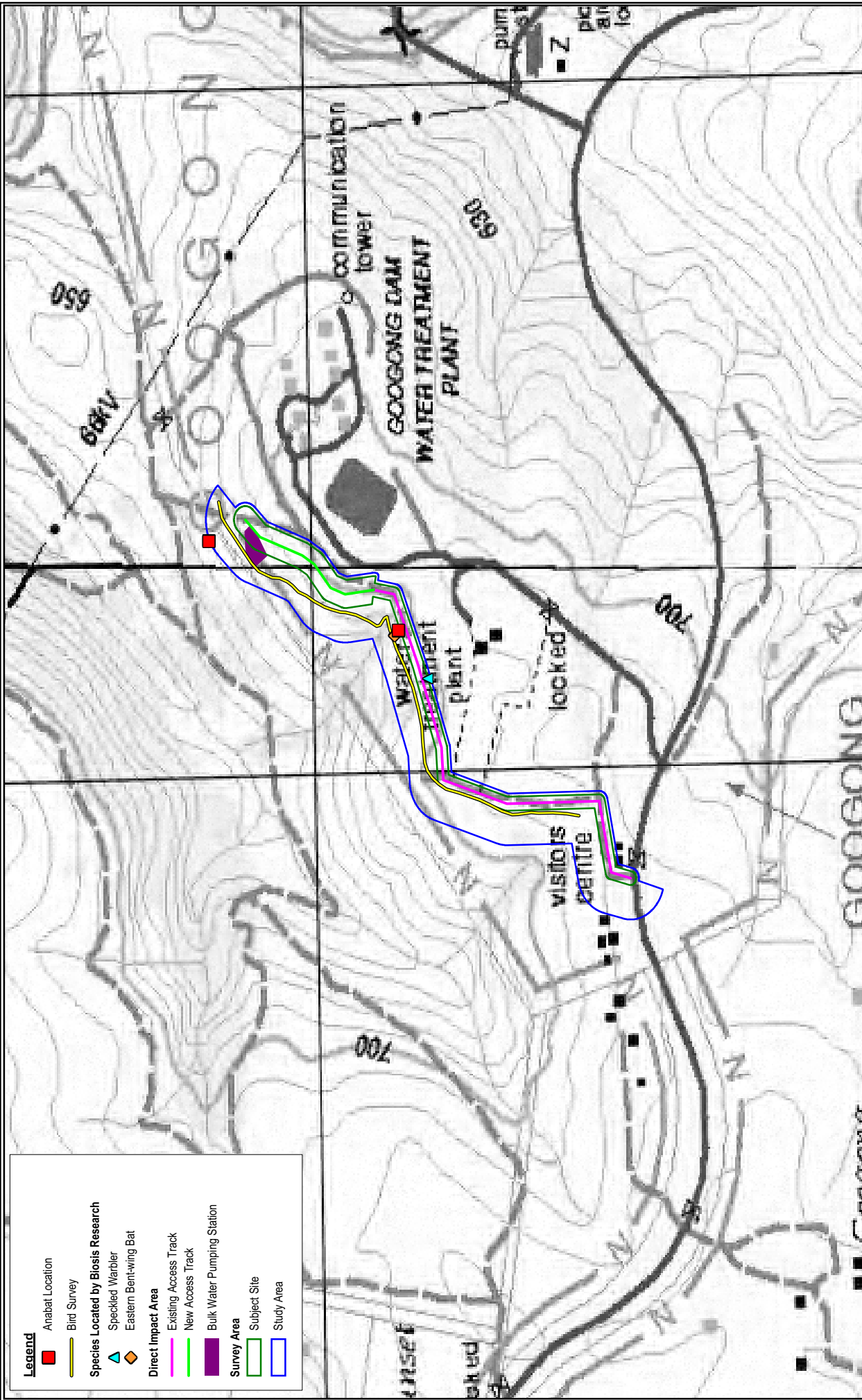
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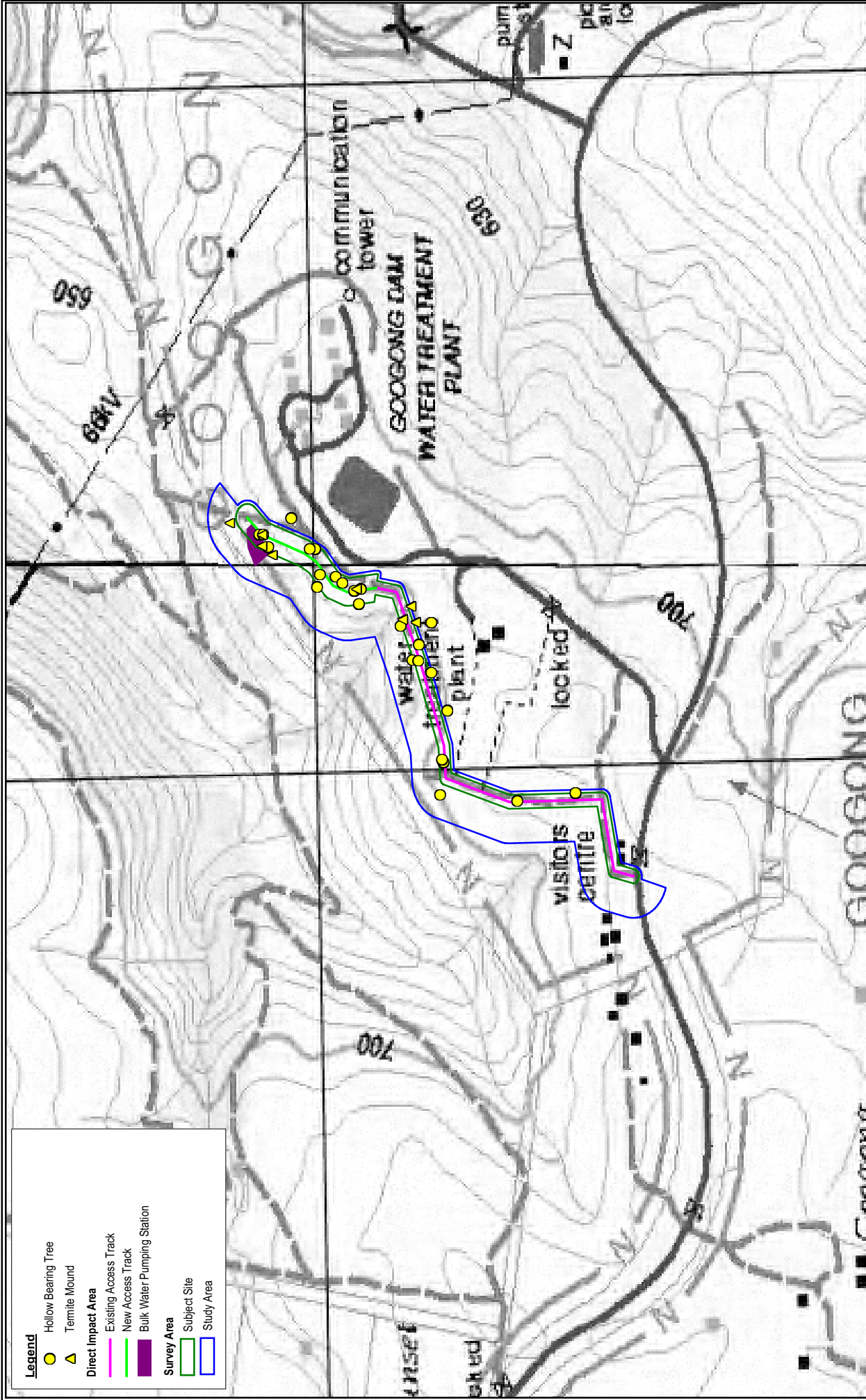
Acknowledgements:
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 Map Projection: Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid of Australia, Zone 56

Figure 5



 <p>BIOSIS RESEARCH Pty. Ltd.</p> <p>Unit 16 / 2 Yallourn St Fishwick AUSTRALIAN CAPITAL TERRITORY 2609</p>	<p>Date: 15 February 2011</p> <p>File number: 12826</p> <p>Location: P:\12800s\12826\Mapping\12826 F6_Survey Effort.WOR</p>	<p>Drawn by: ANP</p> <p>Checked by: JKD</p>	<p>Figure 6</p>
	<p>Figure 6: Survey effort map and threatened species recorded on site.</p>		
<p>Acknowledgements: Topographic Image from Land and Property Management Authority 1:25000 topographic map series (2006) This product incorporates Data which is copyright to the Commonwealth of Australia (c.2003-)</p>			
<p>Scale: 1:5,000 at A3 Map Projection: Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid of Australia, Zone 56</p>			



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 Fishwick
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Figure 7: Hollow bearing trees and termite mounds occurring within the Study Area.

Date: 20 April 2011
 File number: 12826
 Location: P:\12808\12826\Mapping\12826_F7_HBT_200411.WOR

Drawn by: ANPJMS
 Checked by: JKD

Acknowledgements:
 Topographic Image from Land and Property Management Authority
 1:25000 topographic map series (2006)
 This product incorporates Data which is copyright to the Commonwealth of Australia (c.2003-)

Scale: 1:5,000 at A3
 Map Projection: Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid of Australia, Zone 56

0 50 100 150 200 250 metres

Figure 7

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