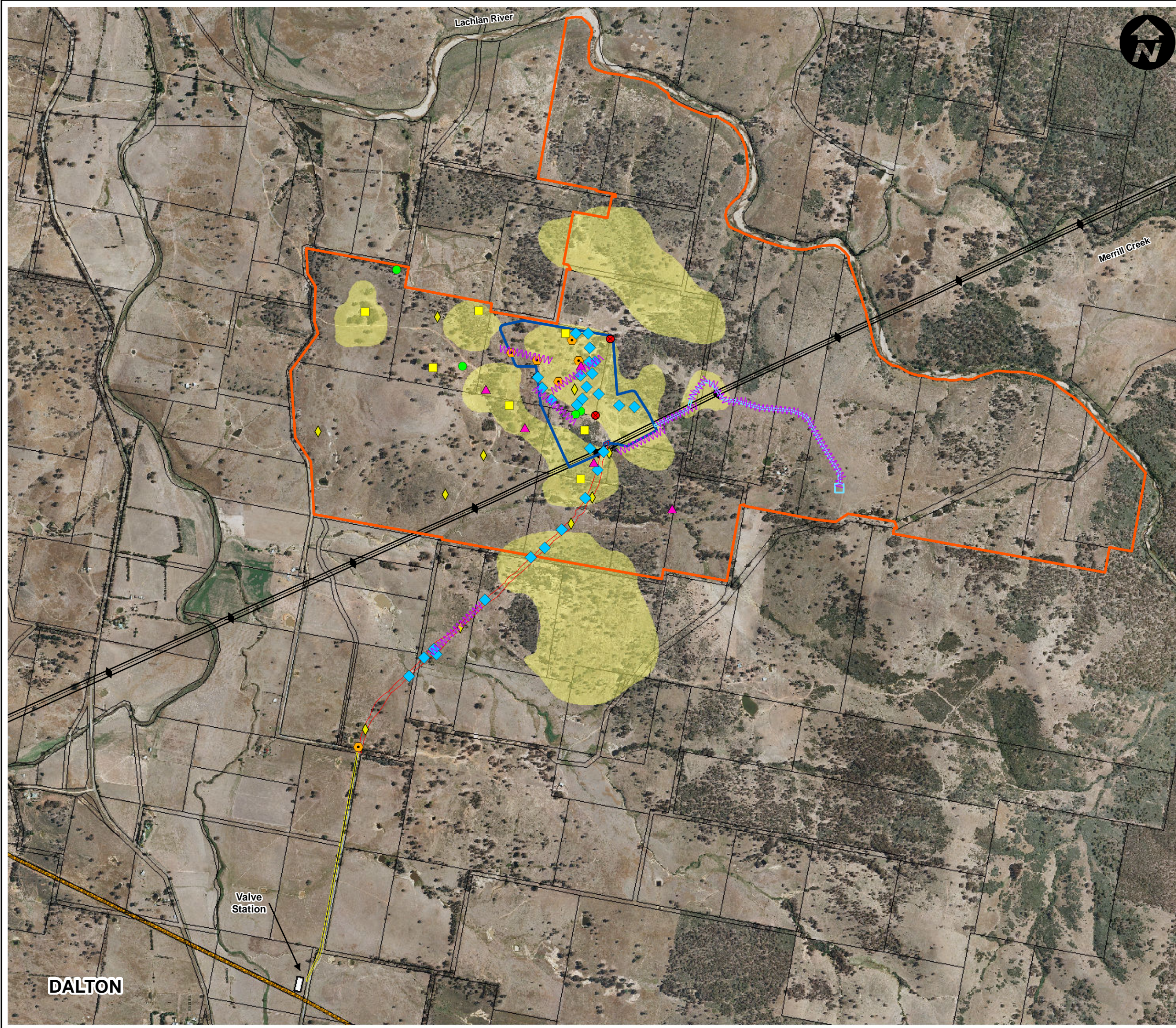


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**Legend**

- AGL Site Boundary
- Plant Footprint
- Gas Pipeline (northern) and Access Road
- Gas Pipeline (southern)
- Communications Tower and Hut Footprint
- Communications Tower Services and Access Track
- Moomba-Sydney Pipeline
- Transmission Line
- Walking Transects
- Diurnal Bird Survey

**Fauna Survey Methods**

- Active Hand Search
- Anabat
- Call Playback
- Funnel Trap Line
- Golden Sun Moth Active Search
- Infra-red Motion-sensor Camera
- Spotlighting

0 0.25 0.5 1

Kilometres

Source: Aerial Image from AGL

Drawn: SB	Approved: JM	Date:23/06/2011
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Project		
DALTON POWER PROJECT		
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FAUNA SURVEY SITES		
Figure: 5		



## 4 Methodology

### 4.2.4 Survey Limitations

Survey effort and results was influenced by weather conditions in the months prior to all survey times, as well as the current and previous land uses in the area. Field surveys were generally limited by the lack of survey during spring, as a result of project timing. Additionally, the weather conditions prior and during survey times were not always ideal for the target species.

As some species are cryptic and may only occur on site on a seasonal, transient or periodic basis, a habitat assessment was conducted to ensure the majority of species that may be impacted by the proposal were accounted for during field surveys and the impact assessment process. Even so, it is possible that some species that utilise the site on a periodic or seasonal basis were not likely to use the Site during the survey period.

In addition, some threatened flora species flower according to a range of seasonal conditions including annual, ephemeral or cryptic species, such as orchids. The habitat assessments conducted for the study area has allowed for identification of potential habitat for such species.

Further, lack of previous surveys in the area may result in a lack of target species during field surveys. Consequently, the full list of species 'known or predicted' to occur within the CMA-subregion was assessed to ensure that as many species as possible were accounted for.

Field surveys were limited in some areas by physical constraints such as steep gullies, rocky access preventing vehicular access, fence lines and access to private property. Additionally, time and scope of works posed constraints to the duration and type of surveys that were able to be conducted.

The impact of previous weather conditions and land uses posed a significant limitation to the vegetation mapping survey effort. The initial survey was undertaken following a period of prolonged drought and long-term grazing of grassland vegetation within the development footprint. Biotic conditions on site were severely degraded, with little to no grassland present in areas that had been grazed. The little grassland vegetative material that was present was severely desiccated and had been grazed.

Many areas that presented as grassland in later survey periods, were previously bare earth paddocks covered in sheep droppings. The second vegetation survey took place following periods of rainfall, and after stock was removed from much of the proposed footprint. Significant improvement in biotic and vegetation conditions was apparent during these surveys, with large tracts of grassland present on site.

Final vegetation surveys were undertaken in the months following heavy and prolonged rain events, and after several months of stock exclusion. Improvement in vegetation condition was obvious throughout the Site, with large areas of grassland present. Recovery was evident in understorey diversity, and in vegetation condition i.e. vegetation was no longer desiccated or grazed and soil condition had improved.

Changes in the abiotic and biotic conditions on site since surveys commenced has resulted in significant changes to the vegetation communities on site, and has demonstrated the resilience of the Site given appropriate management regimes and more benign climatic conditions.

## Results

### 5.1 Literature Review

The results of the online DECCW Atlas of NSW Wildlife database search show no records of any threatened flora or fauna species within 10 km of the study area since 1980 (**Appendix A**).

A request to the Spatial Data Programs department of the NSW DECCW returned the following previous records for fauna within 10 km of the Site, shown on **Figure 3**:

- Diamond Firetail (*Stagonopleura guttata*);
- Varied Sittella (*Daphoenositta chrysoptera*);
- Scarlet Robin (*Petroica boodang*);
- Brown Treecreeper (*Climacteris picumnus*); and
- Speckled Warbler (*Pyrrholaemus saggitatus*).

A request to the Spatial Data Programs department of the NSW DECCW indicated that no records of threatened flora species exist within 10km of the Site (**Figure 3**). Records of several threatened species exist outside of the 10 km radius. However, the majority of these records are confined to large conservation reserves to the west of the Site that appear to form a fairly contiguous corridor (**Figure 8**).

The Commonwealth EPBC Online Protected Matters Database search tool indicated that 14 threatened species or their habitat may occur within 10 km of the Site, including four birds, one frog, one insect, one mammal, two ray-finned fish, two reptiles and three flora species. In addition, two threatened ecological communities are also noted as “likely to occur within area” (**Appendix B**).

The DECCW ‘Find by Geographic Region’ threatened species, populations and ecological communities online search tool for the Lachlan Catchment Management Authority (CMA) Murrumbateman sub-region indicated that 34 threatened species are known or predicted to occur within the sub-region (including 3 flora species), as well as two endangered ecological communities (**Appendix C**).

The I&I NSW ‘Find threatened fish or marine vegetation by region’ online search tool for the Lachlan CMA indicates that five threatened species, one endangered population and one endangered ecological community are predicted to occur within the CMA (**Appendix D**).

Following the advice that this project was declared a controlled action by the Commonwealth, Supplementary Director-General’s Requirements (Supplementary DGRs) were issued by the NSW DoP (**Appendix N**). These Supplementary DGRs specify species that must be considered within the survey process. Species listed in the Supplementary DGRs requiring assessment were:

- Golden Sun Moth (*Synemon Plana*);
- Grassland Earless Dragon (*Tympanocryptus pinguicollis*);
- Pink-tailed Worm-lizard (*Aprasia parapulchella*); and
- Striped Legless Lizard (*Delma impar*).

## 5 Results

Based on the results of the desktop literature review it was concluded that the Grassland Earless Dragon was not likely to occur within the study area. The current distribution of the species is restricted to areas defined within the *National Recovery Plan for the Grassland Earless Dragon* *Tympanocryptis pinguicolla* (Robertson and Evans, 2009), all of which occur within or south of the Australian Capital Territory, and much further to the south than the proposed Site. Given the known range of the species, it is considered unlikely that the species occurs within the Dalton locality (Tim McGrath, SEWPaC, pers. comm., July 8, 2010). Consequently, this species has not been considered further within this report.

### 5.2 Field Survey

#### 5.2.1 Flora

##### *Flora Species*

During URS quadrat surveys 138 species were identified within the study area, with a focus on the development footprint. A full species list is presented in **Appendix G**.

##### *Vegetation Communities*

Data included within the NSW Biometric vegetation community data *Definitions of vegetation types for CMA areas* (DECC 2008a) was used as a guide to vegetation communities that were likely to occur within the locality. This was supplemented by *Ocean Shores to Desert Dunes: the native vegetation of New South Wales and the ACT* (Keith 2004), which was used as reference material for vegetation community descriptions within the site. Existing vegetation mapping including Keith (2004) and the *Forest Ecosystem Classification and Mapping for the Southern Comprehensive Regional Assessments (SCRA) Region* (Thomas *et al.* 2000) was used as a basis for URS mapping. Vegetation community floristics described by URS are a combination of URS mapping and biometric vegetation communities (DECC 2008a) and are described below. The study area is located within the Lachlan CMA, in the Murrumbateman subregion.

Vegetation communities recorded within the study area including their conservation significance, are summarised in **Table 5-3** and discussed below. The distribution of vegetation communities within the study area is shown in **Figure 6**.

Vegetation survey mapping was modified during the course of the project based on ongoing seasonal survey efforts in a range of weather patterns, including drought, by suitably qualified botanists. This accounts for differences in the vegetation mapping presented in the EPBC Referral of the project, and the current and final vegetation mapping presented within the EA and this Flora and Fauna Assessment.

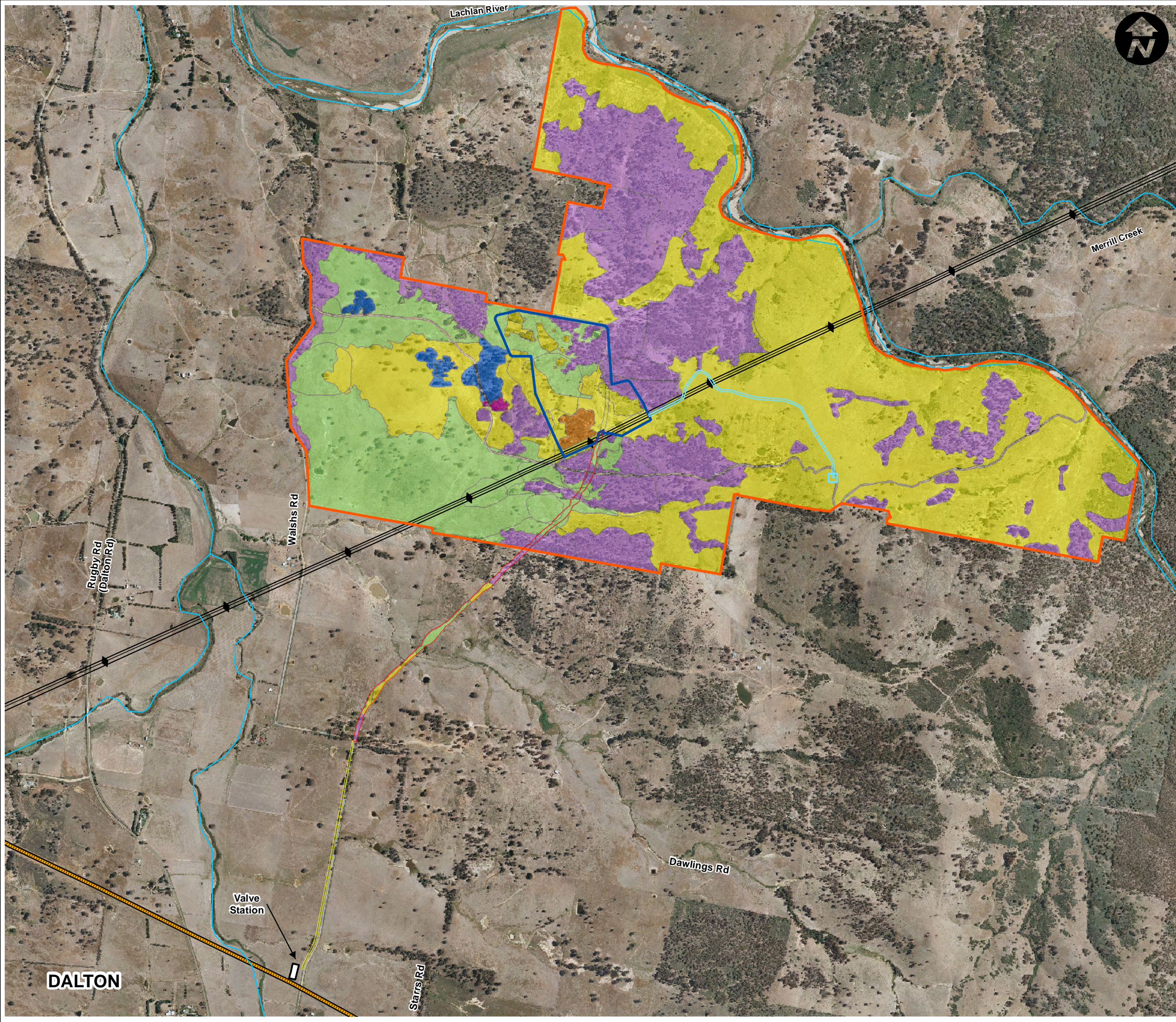
**Table 5-3 Vegetation Communities Recorded Within the Site**

Vegetation Community	EPBC Act Status	TSC Act Status	Total Area Mapped	Area within Plant Footprint	Area within Gas Pipeline (northern and southern portions) and Access Road	Area within Communications Tower Services and Access Track	Area within Communications Tower and Hut Footprint	Total Area in Development Footprint
Grey Box over Exotic Pasture	Not Listed	Not Listed	6.20	0.00	0.00	0.00	0.00	0.00
Red Stringybark over Exotic Pasture	Not Listed	Not Listed	0.49	0.00	0.00	0.00	0.00	0.00
Exotic Pasture	Not Listed	Not Listed	258.72	12.17	1.73	1.20	0.13	15.23
Box Gum Woodland	N/A*	Endangered Ecological Community	147.24	4.72	1.22	0.00	0.00	5.94
Natural Temperate Grassland	Endangered Ecological Community	Not Listed	92.58	7.31	1.76	0.00	0.00	9.07
Disturbed Shrubland	Not Listed	Not Listed	2.19	2.19	0.00	0.00	0.00	2.19
<b>Total (hectares)</b>			<b>507.43</b>	<b>26.39</b>	<b>4.71</b>	<b>1.20</b>	<b>0.13</b>	<b>32.43</b>

\* Community condition does not meet the condition criteria (Appendix H) to be classified as Box Gum Woodland, under EPBC Act.



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**Legend**

- AGL Site Boundary
- Plant Footprint
- Gas Pipeline (northern) and Access Road
- Gas Pipeline (southern)
- Communications Tower and Hut Footprint
- Communications Tower Services and Access Track
- Moomba-Sydney Pipeline
- Transmission Line

**Vegetation Communities (URS):**

- Natural Temperate Grassland^
- Box Gum Woodland\*
- Grey Box over Exotic Pasture
- Red Stringybark over Exotic Pasture
- Disturbed Shrubland
- Exotic Pasture

\* TSC Act Listed Community  
^ EPBC Act Listed Community



Source: Aerial Image from AGL

Drawn: SB    Approved: JM    Date: 24/06/2011

Job No.: 43177661    File No.: 43177661.034.mxd

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Project  
  
DALTON POWER PROJECT

Title  
  
VEGETATION COMMUNITIES

Figure: 6



DALTON



## 5 Results

Vegetation community descriptions are provided below:

### **Natural Temperate Grassland**

**Survey:** Random Meander, Quadrat floristics, BioBanking Transect Quadrats, Extent Mapping.

**Conservation status:** Endangered Ecological Community as listed in the EPBC Act, not listed in TSC Act

**Extent mapped:** 92.58 ha (**Figure 6**)

*Natural Temperate Grassland of the southern Tablelands of NSW and the ACT*, referred to as Natural Temperate Grassland, listed as an EEC under the EPBC Act occurs within the development footprint and surrounding area as tracts of grassland. Native Temperate Grassland within the site is dominated by; *Themeda australis* (Kangaroo Grass), *Poa* (Tussock Grass) species and *Austrostipa* (Speargrass) species with a variety of other native grass species and assorted exotic pasture grass species scattered throughout. There are sparse canopy trees (approximately one every 100-200m), with the midstorey absent. This community occurs in areas where grazing has been excluded, and abruptly grades into exotic pasture where grazing has occurred recently.

This vegetation community was mapped over approximately 9.07 ha of the development footprint (including the facility and the gas pipeline (northern portion) and access road easement).

As a result of initial survey efforts the development footprint and surrounding site was found to support the Commonwealth listed EEC, Native Temperate Grassland. Consequently, an EPBC Referral (May 11, 2010) was made to the Minister of the (then) Department of Environment, Water, Heritage and the Arts (now SEWPaC). As a result of the Referral, on 11 June 2010, the Project was declared a Controlled Action under the EPBC Act.

Since this time further survey effort has been undertaken across the development footprint and surrounding site to assess all vegetation formations with a particular emphasis on Native Temperate Grassland and its extent and condition. During initial field visits, the community was fairly degraded in terms of diversity and structure, with few native grass species occurring within it and a lack of native forbs and herbs. During subsequent botanical field surveys, the community appeared to have improved in condition, with a greater diversity of native grass species, increased numbers and diversity of native herbs as well as an increase in extent. This improvement was largely due to changes to the grazing pressures and regimes on site as well as seasonal weather pattern changes over time such as increased rainfall.

There are several areas across the Site currently mapped as exotic pasture that with appropriate management, have the potential to improve in condition such that they meet the criteria for inclusion as the EEC Natural Temperate Grassland. Appropriate management techniques to improve this exotic pasture are outlined within Section 7. Vegetation throughout the Site and the development footprint has demonstrated this ability to recover, following the removal of stock and following periods of improved growing conditions, i.e. rainfall.

### **Box Gum Woodland**

**Survey:** Random Meander, Quadrat floristics, BioBanking Transect Quadrats, Extent Mapping.

**Conservation status:** Endangered Ecological Community as listed in the TSC Act, not listed in the EPBC Act

## 5 Results

**Extent mapped:** 147.24 ha (**Figure 6**)

*White Box – Yellow Box – Blakely’s Red Gum Woodland*, referred to as Box Gum Woodland and as defined by the NSW TSC Act, is the dominant woodland community across the development footprint and surrounding study area. The broader community is dominated by *Eucalyptus melliodora* and *E. blakelyi* with scattered *E. moluccana*, *E. rubida* subsp. *rubida* and *E. macrorhyncha*. The midstorey is largely absent; however occasional *Cassinia* spp. and *Acacia* spp. occur at low densities. The understorey is primarily composed of exotic pasture grass species interspersed with occasional native grasses (*Themeda australis*, *Poa* spp. and *Austrostipa* spp.), or bare earth as a result of extreme grazing pressure.

As a result of initial survey efforts it was thought that the development footprint and surrounding site may support the Commonwealth listed EEC, Box Gum Woodland. Consequently, an EPBC Referral (11 May, 2010) was submitted to the Minister of the (then) Department of Environment, Water, Heritage and the Arts. As a result of the Referral, on 11 June 2010, the Project was declared a Controlled Action under the EPBC Act.

Since this time further survey effort has been undertaken across the development footprint and surrounding site to assess all vegetation formations with a particular emphasis on Box Gum Woodland and its extent and condition. As a result of this work, an assessment by qualified botanists has determined that the Box Gum Woodland on Site did not adequately meet the Commonwealth criteria for this community to be classed as Box Gum Woodland EEC as defined under the EPBC Act (**Appendix H**) although it did meet the definition required under the NSW TSC Act for recognition as an EEC..

This vegetation community was mapped over approximately 5.94 ha of the development footprint (including the facility and the pipeline and access road easement).

### **Red Stringybark over Exotic Pasture**

**Survey:** Quadrats and Random Meander

**Conservation status:** Not listed in the TSC Act or EPBC Act.

**Extent mapped:** 0.49 ha (**Figure 6**)

Red Stringybark over exotic pasture occurs as a small parcel of vegetation dominated by *Eucalyptus macrorhyncha*, with a sparse shrub layer dominated by *Cassinia* spp. and the broader understorey dominated by exotic pasture species.

This vegetation community does not occur within the development footprint.

This community is fairly degraded in terms of diversity and structure, with few native grass species occurring within it, and a lack of native forbs and herbs.

### **Grey Box over Exotic Pasture**

**Survey:** Quadrats and Random Meander

**Conservation status:** Not listed in the TSC Act or EPBC Act.

**Extent mapped:** 6.20 ha (**Figure 6**)

Grey Box over Exotic Pasture does not occur within the development footprint. This community occurs as three parcels of woodland vegetation, one of which is bisected by an existing farm track.



## 5 Results

This community is dominated solely by *Eucalyptus moluccana*, with an understorey comprising of exotic pasture species. The midstorey is absent. Many of the *E. moluccana* trees are very large and mature.

The community is highly degraded in terms of diversity and structure, and lacks diversity in understorey species. There are predominantly mature canopy species, no *E. moluccana* regenerating.

### **Disturbed Shrubland**

<b>Survey:</b>	Random Meander
<b>Conservation status:</b>	Not listed in the TSC Act or EPBC Act.
<b>Extent mapped:</b>	2.19 ha ( <b>Figure 6</b> )

Disturbed Shrubland within the development footprint occurs as patches of vegetation dominated by *Cassinia* spp. and *Leptospermum phyllicoides* along with a variety of exotic annuals and dead shrubby vegetation that was unidentifiable. This vegetation occurs in areas adjacent to the existing transmission line easement.

This community is not consistent with any vegetation units described by the vegetation type database (DECC 2008a).

There is a sparse canopy layer lopped to approximately 2-3 m. The understorey is dominated by exotic pasture species with scattered grasses, primarily *Austrodanthonia* spp. and *Austrostipa* spp.

This vegetation community was mapped over approximately 2.19 ha of the development footprint.

The community is highly degraded in terms of diversity and structure, a lack of native forbs and herbs, and significant signs of senescence in nearly all midstorey species.

### **Exotic Pasture**

<b>Survey:</b>	Random Meander
<b>Conservation status:</b>	Not listed on TSC Act or EPBC Act.
<b>Extent mapped:</b>	258.72 ha ( <b>Figure 6</b> )

The total extent of this community may alter depending on land use within the site. This community has the potential to improve in condition and may in some areas have the potential to become part of the Natural Temperate Grassland EEC community, if weed control and stock exclusion methods are adopted.

This community is not consistent with any vegetation units described by the vegetation type database (DECC 2008a).

Exotic Pastureland occurs as tracts of pasture dominated by exotic pasture species. The canopy and midstorey are largely absent and no native species were observed in the ground layer. This vegetation community features large areas of bare ground, thought to be a result of grazing pressure from sheep and rabbits.

There are scattered paddock trees, typically along fence lines. In areas where grazing has been excluded, this community grades into degraded Box Gum Woodland and Natural Temperate Grassland.



## 5 Results

This vegetation community was mapped over approximately 12 ha of the development footprint.

This community is not comparable to any EEC listed under the EPBC Act or TSC Act.

The community is highly modified and is dominated by exotic species.

### Noxious Weeds

The NSW *Noxious Weeds Act 1993* (NW Act) provides for the declaration of noxious weeds in local government areas. Landowners and occupiers must control noxious weeds according to the control category specified in the Act. Public authorities must control noxious weeds according to the control category to the extent necessary to prevent their spread to adjoining land, as identified by I&I NSW.

Five declared noxious weeds for Upper Lachlan Shire Council were recorded on site. These include:

- Scotch Thistle (*Onopordum acanthium*);
- Sweet Briar (*Rosa rubiginosa*);
- Fireweed (*Senecio madagascariensis*);
- St. John's Wort (*Hypericum perforatum*); and
- Patterson's Curse (*Echium plantagineum*).

**Table 5-4** shows the noxious weed species, their class and the legal requirements for their control.

**Table 5-4 Noxious Weeds Recorded Within the Site and Relevant Control Requirements.**

Weed Species	Class	I&I NSW Control Requirements
Scotch Thistle	4	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
Sweet Briar	4	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
Fireweed	4	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
St. John's Wort	4	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
Patterson's Curse	4	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

### Threatened Species

The results of the desktop literature review indicate that seven threatened flora species listed under the EPBC Act and/or TSC Act have been previously recorded or are predicted to occur within the locality (10 km radius around the Site and the larger CMA-subregion area). Previous records of TSC Act listed species within the locality are shown in **Figure 3**. The full list of threatened plant species, including their habitat requirements, conservation status and potential occurrence in the study area is presented in **Appendix E**. Additionally, species listed within the Supplementary DGRs (**Appendix N**) for the project have been considered. Habitat for four of these species was considered likely to occur within the development footprint. These species were:

- Yass Daisy (*Ammobium craspedioides*);
- Hoary Sunray (*Leucochrysum albicans* var. *tricolor*);
- Button Wrinklewort (*Rutidosia leptorrhynchoidea*); and
- Silky Swainson-pea (*Swainsona sericea*).



## 5 Results

No TSC Act or EPBC Act listed flora species were recorded on the Site during the present study. The habitat table and assessment in **Appendix E** provides the likelihood of occurrence of the habitat for these species within the development footprint.

Due to survey and project limitations it was not possible to undertake a seasonal spring survey for flora. Consequently, there is the possibility that the occurrence of spring flowering species such as *Ammobium craspedioides* may not have been located. Therefore the presence of this species and other species likely to occur has been assumed, and therefore relevant NSW and Commonwealth assessments have been undertaken (**Appendix K and L**), and mitigation measures recommended in **Section 7**.

### Endangered Populations

The results of the desktop literature review indicate that no endangered flora populations listed under Schedule 1 (Part 2) of the TSC Act have previously been recorded within the vicinity of the development footprint.

### Endangered Ecological Communities

The results of the desktop literature review indicate three endangered ecological communities (EECs) listed under the EPBC Act, FM Act and/or the TSC Act have been previously recorded or are predicted to occur in the locality:

- *Natural Temperate Grassland of the southern Tablelands of NSW and the ACT* (Natural Temperate Grassland) – EPBC Act;
- *White Box – Yellow Box – Blakely’s Red Gum Woodland* (Box Gum Woodland) – TSC Act;
- *The Aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River* (Lachlan River EEC) – FM Act.

Box Gum Woodland and Natural Temperate Grassland occur within the development footprint and surrounding area.

Natural Temperate Grassland is a naturally treeless or sparsely treed community, in which the most obvious components are species of native grasses (DEC 2005a; TSSC 2006). Several patches of grassland dominated by the native grasses *Themeda australis*, *Poa* spp. and various *Austrostipa* spp. and *Austrodanthonia* spp. (Spear and Wallaby Grasses) were observed within the development footprint and larger Site area, with 9.07 ha present within the proposed development footprint.

Several forms of Box Gum Woodland EEC of varying condition were recorded throughout the Site, as vegetation communities dominated by *Eucalyptus melliodora* and *E. blakelyi*, with scattered *E. moluccana*, *E. rubida* subsp. *rubida* and *E. macrorhyncha*.

Approximately 5.94 ha of TSC Act listed Box Gum Woodland occurs within the development footprint.

The TSC Act definition of Box Gum Woodland includes substantially modified remnants ‘*where the vegetation, either understorey, overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and the associated seed bank are at least partially intact*’ (NSW Scientific Committee, 2002). If stock grazing was eliminated from the Site and weed control was implemented, the understorey quality amongst the stands of Box Gum Woodland would return, albeit over considerable time, to an understorey of predominantly native grass and forb species.



## 5 Results

With regard to the EPBC Act definition of Box Gum Woodland, '*in order for an area to be included in the listed ecological community, a patch must have a predominantly native understorey*' (Threatened Species Scientific Committee 2006), amongst other factors. None of the Box Gum Woodland vegetation in the study area qualifies as Box Gum Woodland under the EPBC Act for one or more of the following reasons:

- the understorey is not predominantly native;
- the patch is not greater than 0.1 ha in size; and/or
- there are not 12 or more non-grass native understorey species present including one 'important' species such as *Themeda australis* (see **Appendix H**).

The vegetation community on Site resembling the *Aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River*, whilst identified through the desktop findings as possibly an EEC does not in fact meet the definition of the EEC due to the elevation of the development footprint. This EEC encompasses "*all native fish and aquatic invertebrates within all natural rivers, creeks, streams and associated lagoons, billabongs, lakes, wetlands, paleo-channels, flood-runners, floodplains and effluent streams of the Lachlan River*". Despite the close proximity to the Lachlan River, this EEC definition excludes all watercourses above an altitude of 500 m above sea level. Consequently the community on the Site is excluded from being identified as this EEC.

### 5.2.2 Fauna

A total of 107 fauna species, comprising 69 birds, 19 reptiles and 19 mammals were recorded during the field surveys, as listed in **Appendix I**.

Terrestrial mammals recorded included the common and widespread Eastern Grey Kangaroo (*Macropus giganteus*), European Rabbit (*Oryctolagus cuniculus*), cattle and sheep. These grazing species were abundant, and presumed to be responsible for large amounts of degradation across the Site. Rabbit warrens were seen across the development footprint, leading to extensive erosion in some areas. Fox (*Vulpes vulpes*) scats were recorded at a number of locations across the Site, limiting the quality of the Site for native mammals. The Short-beaked Echidna (*Tachyglossus aculeatus*) was observed outside of the project footprint but within AGL owned property. One of the mammals recorded was recorded by scat only; the Common Wombat (*Vombatus ursinus*). One *Rattus* sp was observed from infra-red motion-sensor camera traps.

Microbats were recorded by Anabat and included definite observations of White-striped Freetail Bat (*Austronomus australis*), Chocolate Wattled Bat (*Chalinolobus morio*) and a *Nyctophilus* sp (**Appendix J**).

Two arboreal mammals were recorded, these being the Common Brushtail Possum (*Trichosurus vulpecula*) and the Common Ringtail Possum (*Pseudocheirus peregrinus*).

A total of 19 species of reptile were recorded including the Common Bearded Dragon (*Pogona barbata*) and the Water Dragon (*Physignathus lesseurii*), as well as the Shingle-back (*Tiliqua rugosa*). Additional information is provided in **Appendix O** on targeted reptile surveys results.

The majority of birds observed were common, open country species including Australian Magpie (*Gymnorhina tibicen*), Galah (*Cacatua roseicapilla*), Noisy Miner (*Manorina melanocephala*), Australian Magpie-Lark (*Grallina cyanoleuca*) and Eastern Rosella (*Platycercus eximius*). A total of 69



## 5 Results

bird species were recorded, including nine species listed as threatened, and one species listed as migratory, detailed below.

The infra-red motion-sensor cameras captured good quality photographs during the survey period, with only one species being unidentifiable by URS ecologists (*Rattus* sp). There was no 'noise' or interference (e.g. plants blowing in the wind triggering the camera), with all photographs taken of fauna species. The only animals recorded on the motion sensor cameras were Australian Ravens, European Red Foxes, Rats, Rabbits and Eastern Grey Kangaroos.

### Threatened Species

Nine threatened species, listed as vulnerable under the TSC Act (Schedule 2) were recorded within the Site or on land immediately adjacent to the Site during field surveys:

- Gang Gang Cockatoo (*Callocephalon fimbriatum*);
- Speckled Warbler (*Pyrrholaemus saggitatus*);
- Brown Treecreeper (*Climacteris picumnus victoriae*);
- Diamond Firetail (*Stagonopleura guttata*);
- Flame Robin (*Petroica phoenicea*);
- Little Eagle (*Hieraaetus morphnoides*);
- Varied Sitella (*Daphoenositta chrysoptera*);
- Scarlet Robin (*Petroica boodang*); and
- White-fronted Chat (*Epthianura albifrons*).

Two Gang Gang Cockatoos were observed foraging in Box Gum Woodland along the existing access track to the west of the Site. The Brown Treecreeper, Speckled Warbler, Diamond Firetail, Scarlet Robin and Flame Robin were observed opportunistically across the Site, on AGL owned property and on Walshs Road. One Little Eagle was observed opportunistically flying over the Site, and was not observed landing anywhere within the Site. No breeding sites of the Little Eagle were observed within the Site. A small flock of Varied Sittellas were observed outside of the Site but still within AGL owned land. A moderate sized flock of White-fronted Chats were observed foraging on property outside of, but immediately adjacent to AGL owned land.

One Commonwealth listed migratory species, under the EPBC Act was recorded during field surveys:

- Rainbow Bee-eater (*Merops ornatus*)

These threatened fauna species and the location where they were mapped during the survey effort is identified in **Figure 3**. The location of the Little Eagle sighting is not shown on **Figure 3**, due to the height at which it was observed, and the lack of observed use of the proposed development footprint for foraging or breeding.

The results of the infra-red motion-sensor camera survey provided numerous photographs, with 4925 photographs captured. The cameras were set with the aim of attracting Spotted-tail Quolls, with raw chicken used as bait. There were several fauna species observed in images produced by the cameras, predominantly Australian Ravens, with European Red Foxes, *Rattus* sp., Wallabies, European Rabbits and an Echidna all visible within photographs. No Spotted-tail Quolls were found to occur within the development footprint, despite survey being undertaken in the optimal survey period, and as per SEWPaC (2011h) guidelines.



## 5 Results

### ***Threatened Populations***

No endangered terrestrial populations, as listed under Schedule 1 (Part 2) of the TSC Act, of any fauna species are noted as occurring in the locality (radius of 10 km). One aquatic endangered population of the Olive Perchlet (*Ambassis agassizii*) is predicted to occur within the wider Lachlan CMA. However, no suitable habitat for this species exists within the development footprint or broader Site.

### ***Fauna Habitat***

Habitat assessments were conducted across the Site to evaluate habitat quality and assess the potential for threatened species not observed during field surveys to occur in the development footprint. Habitat related values were mapped (**Figure 6, 7 and 8**) and recorded. These features include:

- structural and floristic diversity of vegetation layers, particularly presence or absence of midstorey (shrubs and juvenile canopy species) and/or presence of native tussock grasses;
- presence of litter layer and fallen dead timber;
- shelter, breeding, roosting and nesting resources available;
- presence of hollows and the associated tree species, and hollow location (branch, trunk and fissure);
- exfoliated bark, feed trees and shrubs;
- connectivity;
- waterways;
- presence of rocky outcrops or partially buried rocks; and
- size of remnant communities.

Fauna related habitat assessments for each of the vegetation communities recorded in the development footprint are described below.

### ***Natural Temperate Grassland***

The Natural Temperate Grassland within the development footprint ranges in condition from degraded (with low species diversity), to high (with good species diversity, and hence, increased structural diversity). However, it has overall characteristically low structural diversity, lacking canopy and midstorey species (DEC 2005). As such, significant habitat trees are absent within this community. Within the site, this community ranges in terms of species diversity, with some exotic paddock grasses and weeds as well as natives such as *Themeda australis* (Kangaroo Grass), *Poa spp* and *Austrodanthonia spp.* (Wallaby Grasses) present throughout much of its occurrence; however some areas have much lower diversity than others, and are dominated by a single species. DEC (2005) notes that “*intact remnants that contain a high diversity of flora species are now rare*”.

The community is dominated by the native grasses *Themeda australis*, *Poa spp*, *Austrostipa spp*, and *Austrodanthonia spp* and provides potential habitat for two threatened reptiles and one insect:

- Striped Legless Lizard (*Delma impar*) – Vulnerable (EPBC Act and TSC Act);
- Pink-tailed Worm Lizard (*Aprasia parapulchella*) – Vulnerable (EPBC Act and TSC Act); and
- Golden Sun Moth (*Synemon plana*) – Critically Endangered (EPBC Act) and Endangered (TSC Act).



## 5 Results

Whilst it is noted that within this grassland community within areas of rock outcropping it is possible that there may also be suitable habitat for Grassland Earless Dragon (*Tympanocryptis pinguicolla*), the study area is located outside the known geographical distribution of the species, as such this species has not been assessed further in this report.

*Delma impar*, *Aprasia parapulchella* and *Synemon plana* all require grasslands dominated by native tussock grass species and the reptiles require rocky outcrops for shelter, both of which are present within this community. Survey effort was conducted in accordance with; DEC 2004 guidelines, DEWHA (2009b) *EPBC Act Policy Statement 3.12 - Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana)* and expert advice has been undertaken for each of these three species with no presence recorded.

Golden Sun Moth surveys were undertaken in optimal weather conditions. However, they were also undertaken during early to mid February, outside the optimal survey time recommended by DEWHA (2009b). This survey effort included two people performing targeted surveys within suitable habitat over 16 person hours over two days from 10 - 11 February, 2011, and one person performing opportunistic surveys over three suitable days between 21 – 24 February, 2011. As such, a total of 28 person hours was spent performing searches for this species, over five days of suitable weather conditions. **Figure 5** shows the location of searches performed for this species.

Areas of potential habitat for the Golden Sun Moth include areas of Natural Temperate Grassland within the development footprint and proposed offset area. However according to DEWHA (2010g) and advice provided by Alistair Cockburn, Rainer Reywinkle and Geoff Robertson of Friends of Grasslands (pers comm February 2011), suitable habitat should be dominated by the following grass species

- *Austrodanthonia carphoides*;
- *Austrodanthonia auriculata*;
- *Austrodanthonia setacea*;
- *Austrodanthonia eriantha*;
- *Themeda australis*; and
- *Austrostipa* spp.

Following surveys within the Native Temperate Grassland community *Austrodanthonia* species were found to be sparsely present across the site. In fact the only *Austrodanthonia* sp found on site from the above required list was *Austrodanthonia setacea*. It is important to note that grassland within the; plant footprint, gas pipeline, communications tower, hut footprint, services and access track lacks diversity of native grasses, generally, and is particularly deficient in *Austrodanthonia* species, which in turn limits potential habitat for Golden Sun Moth.

The lack of structural diversity in the grassland habitat is likely to limit its value for many bird species (Keast *et al*, 1985), including threatened species, due to a lack of structural resources that allow birds to nest and shelter nearby to potential food resources. The community may provide an important food source for grainivorous bird species that were able to travel to other areas of the development footprint to access roosting habitat. The majority of bird species observed within this community were aggressive colonisers (e.g. Noisy Miner *Manorina melanocephala*) or overfly woodland species such as the Eastern Rosella (*Platycercus eximius*). The community also provides important foraging habitat for the grainivorous Diamond Firetail (*Stagonopleura guttata*).



## 5 Results

Habitat resources within Natural Temperate Grassland includes occasional pieces of coarse woody debris, tussock grasses, scattered stag and hollow-bearing trees, and loose and embedded rocks. There are occasionally some patches of bare ground, typically in areas that have experienced severe stock grazing impacts. The community provides suitable habitat for a range of invertebrates, reptiles and small mammals.

Natural Temperate Grassland is present as a series of remnants within the development footprint, sometimes connected by tracts of exotic pastureland. However, these are often located near areas of bare ground devoid of vegetation. Grassland vegetation appears to be heavily influenced by grazing intensity and land use. Despite the fragmented nature, this community is still likely to provide an important refuge for fauna migrating across open country, as well as providing suitable foraging and hunting habitat for a variety of raptors and woodland birds.

### **Box Gum Woodland**

Box Gum Woodland as defined under the TSC Act has a moderate structural diversity, with an intact canopy dominated by mature box species and showing signs of regeneration in a few locations. As with most woodland the midstorey is largely absent, comprising of a few scattered shrubs (typically *Cassinia* spp. and *Leptospermum* spp.). The understorey of this community is dominated by some native tussock grasses and exotic pasture species.

Where it occurs within the development footprint, this vegetation community is often degraded, due to past land use including intensive grazing. The canopy layer is largely intact; however the understorey typically has low species diversity, significantly reducing its value as habitat for a number of species. Despite this, the canopy layer provides significant breeding, roosting and foraging habitat in the form of hollow bearing trees, and flowering Eucalypts.

This community provides potential habitat for a range of threatened species, including birds and arboreal mammals (see **Appendix F** for the habitat requirements of threatened species that potentially occur within the development footprint). No nesting or breeding sites of threatened bird species were observed within the development footprint. As per Native Temperate Grasslands above, this community specifically has the potential for; Striped Legless Lizard, Pink-tailed Worm Lizard and Golden Sun Moth to be present and hence was the subject of targeted threatened species surveys.

The ground layer within this community is dominated in parts by bare ground, with scattered tussock grasses and embedded rock, with little in the way of leaf litter. There is a moderately good accumulation of woody debris ranging from smaller branches through to large fallen trees and logs (**Figure 7**) shows locations of habitat resources recorded within the development footprint). This community is likely to provide adequate habitat for invertebrates, reptiles and small mammals.

Due to existing habitat fragmentation within the region this community is likely to provide a valuable corridor for a range of species, with remnant stands providing important refuge, nesting and foraging resources for many species.

### **Red Stringybark over Exotic Pasture**

Red Stringybark over Exotic Pasture has a fairly low structural diversity, with an intact canopy dominated by young *Eucalyptus macrorhyncha* (Red Stringybark). The midstorey is absent throughout. The understorey is dominated by exotic pasture species and native tussock grasses, with large areas of bare ground.

## 5 Results

Where it occurs, this community is degraded due to past land use including intensive grazing. Most of the canopy trees are regrowth *Eucalyptus macrorhyncha* with stands having an average diameter at breast height (DBH) of 40 cm.

The immature Red Stringybarks provide are unlikely to support many hollows (see **Appendix F** for the habitat requirements of threatened species that potentially occur within the development footprint).

The ground layer in this community is dominated by bare ground with scattered tussock grasses and very little leaf litter. There is a low to moderate accumulation of woody debris ranging from smaller branches through to a few large fallen trees and logs and a moderate amount of embedded rock (**Figure 7** shows locations of habitat resources recorded within the development footprint). This is likely to provide adequate cover for native invertebrates, reptiles and possibly small terrestrial mammals.

### **Grey Box over Exotic Pasture**

Grey Box over Exotic Pasture has a fairly low structural diversity, with an intact canopy dominated by mature *Eucalyptus moluccana*. The midstorey is absent throughout. The understorey is dominated by exotic pasture species and native tussock grasses, with large areas of bare ground.

Where it occurs, this community is degraded due to past land use including intensive grazing. The mature *Eucalyptus moluccana* provide some hollows (see **Appendix F** for the habitat requirements of threatened species that potentially occur within the development footprint).

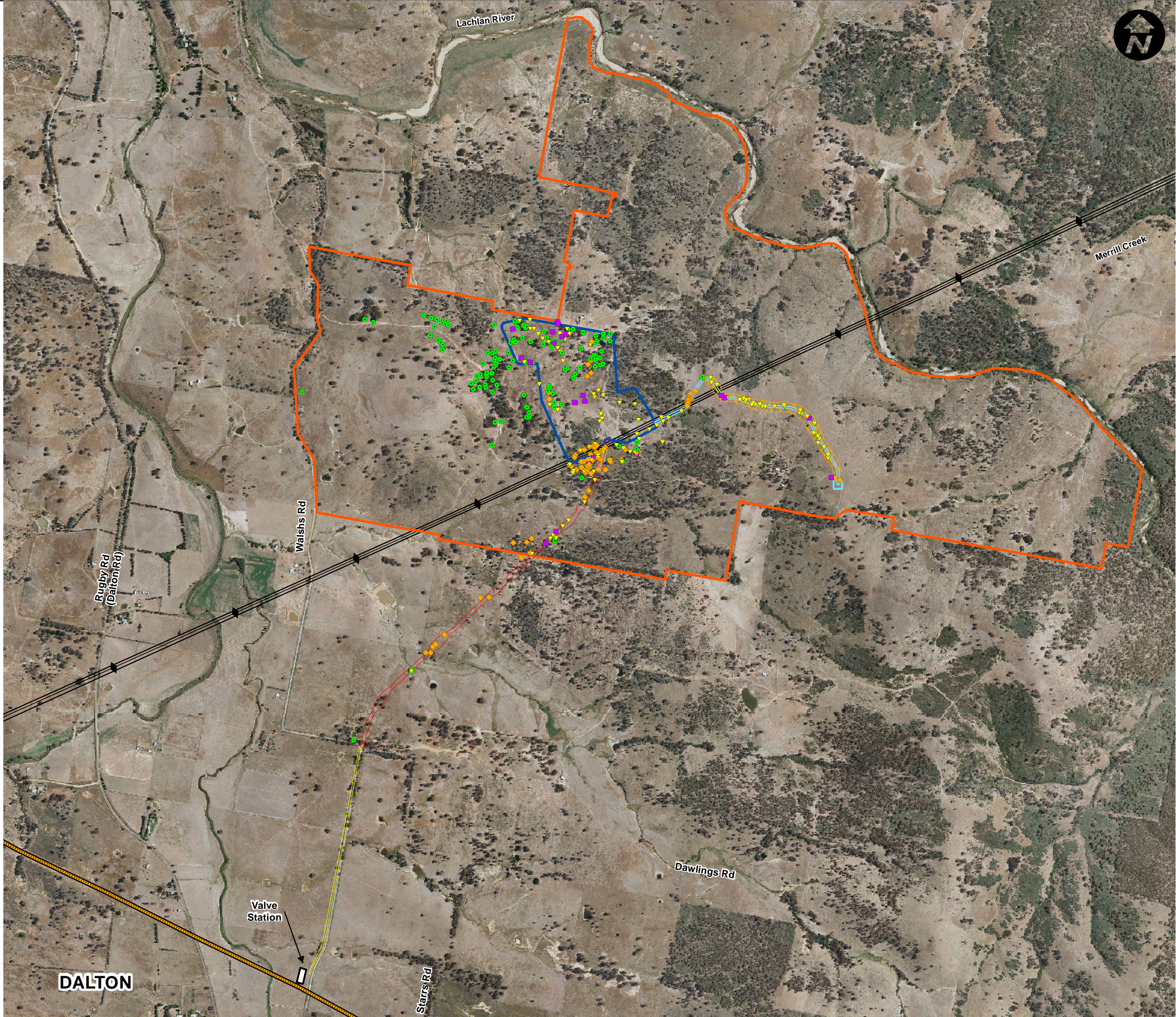
The ground layer in this community is dominated by bare ground with scattered tussock and exotic grasses and very little leaf litter. There is a moderate accumulation of woody debris ranging from smaller branches through to a few large fallen trees and logs and a moderate amount of embedded rock (**Figure 7** shows locations of habitat resources recorded within the development footprint). This is likely to provide adequate cover for native invertebrates and reptiles.

### **Disturbed Shrubland**

Disturbed Shrubland provides limited foraging habitat for a range of species, however typical midstorey species required by many threatened species (e.g. Banksias, Acacias, Grevilleas etc) are not present. The community is relatively dense in places, providing a good refuge for scrub species such as wrens.

The community occurs in close proximity to an existing transmission line easement. Maintenance of this easement results in regular disturbance to the area, increasing edge effects and decreasing its potential as habitat for a number of threatened species. The community occurs between an area of severely degraded exotic pastureland that is primarily composed of bare ground and an area of Box Gum Woodland, so may provide limited corridor values for a few species.





**Legend**

- AGL Site Boundary
- Plant Footprint
- Gas Pipeline (northern) and Access Road
- Gas Pipeline (southern)
- Communications Tower and Hut Footprint
- Communications Tower Services and Access Track
- Moomba-Sydney Pipeline
- Transmission Line

**Habitat Features**

- Coarse Woody Debris / Fallen Timber
- Hollow Bearing Tree
- Rocky Habitat
- Stag
- Rock Outcrops



Source: Aerial Image from AGL

Drawn: SB    Approved: JM    Date: 23/06/2011

Job No.: 43177661    File No.: 43177661.038.mxd

Client  
  
AGL

Project  
  
DALTON POWER PROJECT

Title  
  
HABITAT RESOURCES WITHIN  
DEVELOPMENT FOOTPRINT

Figure: 7





## 5 Results

### Exotic Pasture

Exotic Pasture provides good quality foraging habitat for native and exotic herbivores including birds and mammals. However it provides marginal shelter and foraging habitat for native reptiles and small mammals. These areas are likely to be utilised by open country generalists such as the Noisy Miner, Galah and Australian Magpie and Grey Kangaroo. These species are widespread and common throughout the region.

This community may provide foraging habitat for grainivorous native birds, including the TSC Act listed Diamond Firetail (*Stagonopleura guttata*). Grassland-woodland margins may also provide habitat for birds of open woodland including the TSC Act listed Speckled Warbler (*Pyrrholaemus sagittatus*).

Exotic Pasture provides limited potential habitat for microbats and owls that occur within the area.

### Other Habitat Resources

The DEC (2004) draft guidelines for threatened species surveys identify 'special habitats' (e.g. hollow bearing trees, water bodies and rocky outcrops) that are likely to support specific fauna assemblages. These resources may be significant for threatened species.

Tree hollows are of particular significance for native fauna as diurnal or nocturnal shelter sites, for rearing young, for feeding, for thermoregulation, and to facilitate ranging behaviour and dispersal.

Accordingly, habitat resources within the development footprint have been surveyed and assessed as part of the current assessment (**Figure 7**). Habitat resources, such as tree hollows, fallen logs and debris, and roosting sites are quite abundant within the study area, despite its disturbance history associated with agricultural activities.

Across the development footprint, the density of hollows is relatively high, especially within the stands of Box Gum Woodland (**Figure 7**). However, there are relatively few habitat trees in the Disturbed Shrubland, as a result of past clearing and transmission line management activities. There are a number of old growth habitat trees scattered throughout the Exotic Pasture. These trees are generally of a mature age class and feature large, deep hollows.

**Appendix O and P** details surveys undertaken to map and describe hollow bearing trees within the development footprint and proposed offset area. Hollow bearing tree searches were conducted by walking and driving transects across the study area and proposed offset areas. The size and location on the tree of all hollows was recorded. The findings of this survey demonstrate that the proposed offset site contains at least one comparable hollow to replace every hollow that will be removed as part of the proposed works. The proposed offset area contains more hollows than the development footprint, with 33 hollows identified within the development footprint, and 49 hollows identified within the proposed offset area. **Section 7.2.1** and **7.3** of this report outlines the requirement for replacement habitat in offset areas, and the findings of field surveys demonstrate suitable replacement habitat within these proposed offset areas. **Appendix P** also shows the results of additional surveys undertaken by URS to capture the size and location of hollow bearing trees within the development footprint.

It should be noted that ground based field surveys may underestimate the quantity of suitable tree hollows present in a vegetation community. Conversely many hollows visible from the ground may not have the required depth, orientation or other attributes required to constitute suitable shelter (Gibbons and Lindenmayer, 2002). Therefore the above assessment should be considered a tentative estimate of the quality and quantity of tree hollows.



## 5 Results

There were frequent rocky outcrops and boulder piles within the study area, many of which have been mapped (**Figure 7**) where observed. No caves were observed within the development footprint. Similarly, the presence of limestone caves within the region (e.g. Carey's Cave, in Wee Jasper, approximately 65 km to the south-west of the study area, Abercrombie Caves near Taralga to the north-east of the study area, and Wombeyan Caves, further south-east etc) and underlying geology), suggests that there may be other caves within the region that provide suitable habitat for species such as microbats.

### *Aquatic Habitat*

Minimal aquatic habitat is present within the development footprint. Although the Lachlan River is to the north of the Site, it is extremely degraded, with limited fringing vegetation and at the time of the field surveys, no water flows, instead being restricted to a series of shallow sandy pools.

Water resources within the development footprint are restricted to several farm dams, which appear to be quite shallow and up to 10 m<sup>2</sup> in size. Most dams observed had a small amount of fringing vegetation, with growth of sedges and occasional macrophytes, and were in close proximity to Box Gum Woodland Vegetation.

No wetland areas were recorded on development footprint, however several ephemeral creeklines were observed. These were largely dry, save for one small tributary traversing the south of the Site. Based on habitat requirements the development footprint is highly unlikely to support any threatened aquatic species, or species that require wetland habitat, such as Booroolong Frog (*Litoria booroolongensis*) Australian Painted Snipe (*Rostratula australis*), Macquarie Perch (*Macquaria australasica*) or Murray Cod (*Maccullochella peelii peelii*). However, all water bodies in the study area provide potential foraging habitat for microbats, given the proximity to intact woodland and hollow-bearing trees.

### *Koala Habitat*

No evidence of koalas or koala habitat was recorded during the field surveys. SEPP 44 defines 'potential koala habitat' as 'an area of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component'. No trees listed in Schedule 2 were recorded during the field surveys of the study area; hence no areas qualify as potential koala habitat.

Core koala habitat, is defined as 'an area of land with a resident breeding population of koalas, evidenced by attributes such as breeding females and recent sightings and historical records of a population'. No evidence of koala activity was recorded during field surveys and there are no recent records of koalas within 10 km of the study area.

### 5.2.3 Critical Habitat

The NSW National Parks and Wildlife Service is responsible for the identification of critical habitat within NSW. Critical habitat is an area of land that is crucial to the survival of a particular threatened species, populations or ecological communities.

There are no areas of recommended or declared critical habitat listed on the register of Critical Habitat kept by the Director-General, OEH or I&I NSW that are relevant to the development footprint or the surrounding locality.

## Impact Assessment

This Section assesses the potential impacts of the proposal on the flora and fauna within the development footprint.

### 6.1 Threatened Species, Populations and Ecological Communities

The results of the habitat assessments (**Appendix E** and **F**) indicate that 23 threatened fauna species, four threatened flora species and two endangered ecological communities listed under the TSC and/or EPBC Act have either been recorded or are considered as likely to occur within the development footprint, based on habitats present. Accordingly, impact assessment in line with the requirements of guidelines issued in relation to Part 3A of the EP&A Act (the NSW assessment of significance) and Commonwealth significant impact criteria assessments for these species under the EPBC Act were undertaken. These are included as **Appendix K** and **L**. The results of these tests are summarised below.

#### 6.1.1 Threatened Flora

Of the total seven threatened flora species listed in **Appendix E** that have the potential to occur on the development footprint according to the results of the various online database searches. Following more detailed consideration of these results it was concluded that the development footprint provides *potential* habitat for four of those threatened flora species:

- Yass Daisy (*Ammobium craspedioides*);
- Silky Swainson-pea (*Swainsona sericea*);
- Button Wrinklewort (*Rutidosis leptorrhynchoides*); and
- Hoary Sunray (*Leucochrysum albicans* var. *tricolor*).

Notwithstanding this, no threatened flora species were identified during field surveys. It should be noted that, due to project constraints, there was no spring period survey undertaken. As *Ammobium craspedioides* flowers in Spring, this report (see **Section 7.2**) recommends further Spring surveys prior to construction. An assessment of the significance and significant impact criteria assessments of the proposed development on these threatened species has been undertaken. The assessment outcomes concur that the proposed development will not have a significant impact on any threatened flora species (see **Appendix K** and **L** for detailed assessments of significance and significant impact criteria assessments).

#### 6.1.2 Threatened Fauna

Of the total 42 threatened fauna species listed in **Appendix F** that have the potential to occur on the development footprint according to the results of the various online database searches, the development footprint provides *potential* habitat for 23 of these species. Nine threatened species were identified during field surveys conducted by URS and EnviroKey, namely:

- Gang Gang Cockatoo (*Callocephalon fimbriatum*);
- Speckled Warbler (*Pyrrholaemus sagittatus*);
- Brown Treecreeper (*Climacteris picumnus victoriae*);
- Diamond Firetail (*Stagonopleura guttata*);
- Flame Robin (*Petroica phoenicea*);
- Little Eagle (*Hieraaetus morphnoides*);



## 6 Impact Assessment

- Varied Sitella (*Daphoenositta chrysoptera*);
- Scarlet Robin (*Petroica boodang*); and
- White-fronted Chat (*Epthianura albifrons*).

One Commonwealth listed migratory species, under the EPBC Act was recorded during EnviroKey field surveys. This was:

- Rainbow Bee-eater (*Merops ornatus*).

Of the 23 potentially present species, targeted surveys have been undertaken for all species during appropriate survey times, with the exception of the Golden Sun Moth. Call playback has been undertaken for the Barking Owl, Powerful Owl and Squirrel Glider, along with spotlighting amongst suitable trees located within the development footprint. No owl roost trees or glider scratches or scats for any of the species were observed anywhere within AGL-owned land.

There is no suitable habitat for the Squirrel Glider within the development footprint, given the lack of midstorey species. The Squirrel Glider is noted to require “*abundant hollow-bearing trees and a mix of eucalypts, acacias and banksias. Within a suitable vegetation community at least one flora species should flower heavily in winter and one or more of the eucalypts should be smooth-barked*” (NPWS 1999). The midstorey species are required provide food at times when Eucalypt species are not flowering. The development footprint (and surrounding AGL owned land), do not meet these requirements, with a lack of winter-flowering species present, and a lack of *Acacia* and *Banksia* species. There are several *Acacias* on site, however not enough to sustain feeding during periods when Eucalypt species on site are not flowering. Although the development footprint lacks appropriate habitat, assessment for the Squirrel Glider in the form of an assessments of significance have been undertaken nonetheless.

It should also be noted that due to project constraints the survey effort for Golden Sun Moth was undertaken outside the optimal survey period. Therefore **Section 7.2** recommends further December surveys to be undertaken prior to construction. In addition to the recommended spring surveys for this species, information regarding project staging is provided in **Chapter 4 of the EA** to provide guidance on the likely season of impacts resulting from this Project.

An assessment of the significance of the proposed development on these threatened species (in the form of NSW assessments of significance and Commonwealth significant impact criteria assessments) have been undertaken (**Appendix K and L**), to inform the assessment of potential project impacts and a summary of this is provided in this report. The assessment concluded that the proposed development is considered unlikely to have a significant impact on any threatened fauna species, provided recommended mitigation measures are adopted.

### Threatened Populations

No listed threatened populations were identified through the desktop review process nor were any identified during URS field surveys conducted within the study area.

#### 6.1.3 Endangered Ecological Communities

Two endangered ecological communities were found to occur within the development footprint;

- Box Gum Woodland (TSC Act); and
- Natural Temperate Grassland (EPBC Act).

## 6 Impact Assessment

Approximately 5.94 hectares of Box Gum Woodland and 9.07 hectares of Natural Temperate Grassland will be cleared as a result of the proposal. An assessment of significance of the proposed development has been undertaken for Box Gum Woodland (**Appendix K**) and a significant impact criteria assessment for Natural Temperate Grassland (**Appendix L**), with a summary presented in this report. The outcome is that the proposed development will not have a significant impact on any endangered ecological community as listed under the TSC Act. The results of the significant impact criteria assessment for Natural Temperate Grassland conclude that the project will have a significant impact on the community. As such, a referral to the Minister has been undertaken.

### 6.2 Key Threatening Processes

The proposal could potentially cause an increase in the following NSW listed key threatening processes (KTPs) listed under Schedule 3 of the TSC Act:

- bushrock removal;
- clearing of native vegetation;
- competition and grazing by the feral European rabbit;
- competition from feral honeybees;
- invasion of native plant communities by exotic perennial grasses;
- loss of hollow bearing trees;
- predation by the European red fox;
- removal of dead wood and dead trees; and.
- alteration to the natural flow regimes of rivers, streams, floodplains & wetlands

Section 7 broadly addresses these KTPs and the outlines plans for the mitigation of these processes and their associated ecological impacts.

#### ***Bushrock Removal***

The proposal will involve the clearing of approximately 32.43 ha of vegetation including exotic pasture. Several areas of the development footprint visited during the field surveys contained significant rocky outcrops and/or bushrock, and the clearing of land for construction of the proposed facility is likely to involve the clearing of bushrock from within the development footprint.

#### ***Clearing of Native Vegetation***

The KTP, 'Clearing of native vegetation', is relevant to the current proposal. The proposal includes clearing of a maximum of 17.20 ha of native vegetation, comprising of Box Gum Woodland (5.94 ha), Natural Temperate Grassland (9.07 ha) and a smaller area (2.19 ha) of disturbed shrubland (refer to **Table 5-3**).



## 6 Impact Assessment

### ***Competition and Grazing by the Feral European Rabbit***

Numerous rabbit warrens were observed during field surveys conducted within the study area, and several rabbits were observed throughout the site. Clearing as a result of the proposal will potentially increase the amount of habitat available for the European rabbit. Grazing and burrowing by rabbits can cause significant erosion problems, reduce recruitment and survival of native plants, and alter entire landscapes. Rabbits also threaten the survival of a number of native animal species by altering habitat, reducing native food sources, displacing small animals from burrows and attracting introduced predators such as foxes.

### ***Competition from Feral Honeybees***

With the removal of approximately 17.20 ha of native vegetation from within the development footprint, some of which is known to contain hollow bearing trees, there will be increased competition for remaining tree hollows within the Site. The aggressive nature of feral honeybees may result in native species being displaced from hollow bearing trees, or a reduction in the amount of available hollows for native mammals, microbats and birds.

### ***Invasion of Native Plant Communities by Exotic Perennial Grasses***

A large proportion of the Site is currently or has been grazing land dominated by exotic grasses. Clearing of vegetation within the development footprint as a result of the proposal has the potential to increase the distribution of exotic perennial grasses across the Site. Additionally, works undertaken in areas adjacent to areas of Natural Temperate Grassland are likely to create disturbance that may allow increased rates of competition from exotic grass species.

### ***Loss of Hollow Bearing Trees***

The proposal will involve the clearing of approximately 17.20 ha of native vegetation, some of which is known to contain hollow bearing trees, from within the development footprint. Thus, the clearing of vegetation will result in the loss of hollow bearing trees within the development footprint.

Hollows occur primarily in old eucalypts trees, and are uncommon in many other native and introduced species. Hollows with large internal dimensions are the rarest and occur predominantly in large old trees, which are rarely less than 220 years old. Larger, older trees also provide a greater density of hollows per tree. As such, large old hollow bearing trees are relatively more valuable to hollow-using fauna than younger hollow bearing trees. The latter are important as a future resource. Refer to **Section 7.3** for details about hollow bearing trees for planned for offset.

### ***Predation by the European Red Fox***

Clearing of vegetation associated with the proposed works is likely to increase the potential habitat for foxes within the development footprint. Foxes are known to use edges and artificial corridors for hunting and moving through the landscape. Foxes are an adaptable and elusive predator common in rural and urban areas throughout southern Australia. They do not appear to favour any particular habitat and the main determinants of their population size and distribution appear to be food supply, disturbance of natural habitats and refuge availability. Since their introduction into Australia in the 1870s, foxes have contributed to severe declines and extinctions of a suite of native fauna, particularly among medium-sized ground-dwelling and semi-arboreal mammals and ground-nesting birds.

## 6 Impact Assessment

### *Removal of Dead Wood and Dead Trees*

The proposal will involve the clearing of approximately 32.43 ha of vegetation in total (including exotic pasture). Many areas of the Site visited during the field surveys contained significant amounts of fallen timber and stag trees. The clearing of the development footprint to enable construction and operation of the proposed development is likely to involve the clearing of some of these habitat resources from within the development footprint.

Dead wood and dead trees provide essential habitat for a wide variety of native animals and are important to the functioning of many ecosystems. The removal of dead wood can have a range of environmental consequences, including the loss of habitat (as they often contain hollows used for shelter by animals), disruption of ecosystem process and soil erosion. Removal of dead old trees (either standing or on the ground) results in the loss of important habitat such as hollows and decaying wood (Gibbons & Lindenmayer 2002) for a wide variety of vertebrates, invertebrates and microbial species and may adversely affect numerous threatened species.

### *Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands*

DEC (2005b) describes this threatening process as an alteration to natural flow regimes, reducing or increasing flows, altering seasonality of flows, changing the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and subsurface water levels and changing the rate of rise or fall of water levels.

A number of human processes have been identified as the cause of changes in natural flow regimes, one of which may be relevant to the impact of the Project: diversion of flows by creation of structures to enable creek crossings for heavy vehicle access into the site. The construction of such structures within waterways in the project area may alter or divert the natural flow of the creek when it is flowing.

## 6.3 Site Establishment Impacts

### 6.3.1 Flora

The proposed works will require clearing a total of 32.43 ha of vegetation from within the development footprint and comprises:

- 26.39 ha for the facilities footprint;
- 1.33 ha for the communications tower, hut and services access track; and
- 4.71 ha for the gas pipeline (northern portion) and access road easement and gas pipeline (southern portion) and Valve Station.

Vegetation to be removed to allow the connection to the Moomba to Sydney gas pipeline is dominated by exotic pasture within an area currently used for grazing. No trees will need to be removed to facilitate construction of the Valve Station. However, the exotic pasture to be removed for construction will be permanently cleared with a concrete slab and small building placed on the site. Additional detail including figures outlining the components of the facility is provided in **Chapter 4.3 of the EA**. Vegetation clearing to allow construction of the Valve Station is included in the vegetation clearing amounts provided throughout this report.

Clearing of native vegetation would be the main impact on flora arising from the proposed works.



## 6 Impact Assessment

The maximum area (in hectares) of each vegetation community to be cleared is summarised in **Table 6-1**.

**Table 6-11 Vegetation Communities Affected by the Proposed Works**

Vegetation Community	Total extent mapped (ha)	Maximum area cleared for proposed works (ha)	Conservation significance (EPBC Act; TSC Act)
Grey Box over Exotic Pasture	6.20	0	N/A
Red Stringybark over Exotic Pasture	0.49	0	N/A
Exotic Pasture	258.72	15.23	N/A
Box Gum Woodland (TSC)	147.24	5.94	N/A; EEC
Natural Temperate Grassland	92.58	9.07	EEC; N/A
Disturbed Shrubland	2.19	2.19	N/A
<b>Total</b>	<b>507.43</b>	<b>32.43</b>	

No threatened flora populations listed under the TSC Act or EPBC Act are likely to be significantly impacted by the proposed works.

Box Gum Woodland as defined by the TSC Act is likely to be impacted by the proposed works, with clearing of approximately 5.94 ha within the development footprint.

Natural Temperate Grassland (listed under the EPBC Act) is considered likely to be impacted, with the removal of 9.07 ha from within the development footprint. As noted earlier in this report, following a referral to the Minister the project was declared a controlled action. Proposals to address Commonwealth policy principles relating to the maintenance or improvement of biodiversity outcomes from the Project are discussed below in relation to offsetting of impacts (**Section 7**).

### 6.3.2 Fauna

Clearing required for the proposed development will result in the loss of approximately 5.94 ha of Box Gum Woodland as defined by the TSC Act, and 9.07 ha of Natural Temperate Grassland. Both vegetation communities may provide habitat for native fauna, and this is discussed in **Section 5**.

The development footprint contains a number of habitat features including feed trees (flowering eucalypts), rocky outcrops, fallen timber and hollow bearing trees. Habitat values of surrounding vegetation are likely to be equivalent to that within the development footprint and as such the loss of woodland and grassland habitat is unlikely to have a significant impact upon local populations of native fauna, provided the mitigation measures are adopted and upheld.

Scattered woodland trees, rocky outcrops, stags and fallen dead timber are present in moderate densities throughout the Site and provide habitat for fauna through food resources and shelter. The loss of isolated remnant trees within the development footprint will displace any resident birds and bats roosting in hollows. However, as these species are generally mobile, tree removal is not likely to cause the extinction of local populations. In addition to this, hollows will be replaced with nest boxes to provide compensatory habitat.

## 6 Impact Assessment

Clearing of vegetation for the proposed works is unlikely to result in significant habitat fragmentation or loss of habitat corridors because the development will not bisect/isolate any substantial areas of native vegetation. The proposed development is unlikely to have an impact upon the movement of native fauna within the region due to existing habitat fragmentation and isolation within the region (**Figure 8**), and the small amount of clearing required for the proposal.

### *Woodland Birds*

A reasonable diversity of native bird species occupy the development footprint and will be impacted by the removal of native vegetation and other habitat resources. The impacts on these species are not considered significant given that the majority of these species are mobile, widespread and common, and there are large quantities of equivalent habitat and resources in the surrounding region.

Mitigation measures outlined in **Section 7** are likely to minimise impacts on these species.

### *Birds of Prey*

Several birds of prey were observed during field surveys within the study area. However, all of these species were observed flying over the study area, not perched, breeding or hunting within the study area. It is unlikely that the proposed development would significantly impact upon birds of prey within the study area as no breeding sites were observed, and birds were typically observed flying over the vicinity of the study area without returning.

Mitigation measures outlined in **Section 7** are likely to minimise impacts on these species.

### *Micro Bats*

A total of three species of microbat were recorded within the study area; none of these species are threatened. An additional four species were 'possibly' detected; however call analysis was not certain, and none of these species are threatened. Of the three definite identifications of microbats within the study area, one species relies solely on hollow bearing trees for roosting.

A detailed assessment of the impact of the proposed works upon microbats within the study area is provided in the form of a NSW assessment of significance in **Appendix K**.

Mitigation measures outlined in **Section 7** are likely to minimise impacts on these species.

### *Reptiles*

A moderate diversity of native reptiles is likely to occupy the development footprint. It is likely that individuals will be displaced or injured during clearing, particularly species that burrow or shelter beneath woody debris and rocky outcrops. Mitigation measures outlined in **Section 7** are likely to ameliorate these impacts. These include: a pre-clearance survey and relocation of individuals where practicable; and careful removal of large woody debris and rocks and placement within adjacent areas. The loss of habitat from within the development footprint is likely to have only a minor impact on local populations of these species given the large amount of potential habitat within the Site and region.

Mitigation measures outlined in **Section 7** are likely to minimise impacts on these species.



## 6 Impact Assessment

### Mammals

A moderate diversity of common native mammal species is likely to use habitat resources within the development footprint, such as Ringtail and Brushtail Possums observed during the field surveys. The disturbance associated with the proposed works is unlikely to permanently impact upon these species, as limited suitable habitat exists within the footprint. Larger, more connected remnants of woodland occur elsewhere within the Site, which are likely to provide more suitable habitat for these species. The proposed action will have a negligible impact on mammals travelling across the Site.

Mitigation measures outlined in **Section 7** are likely to minimise impacts on these species.

### Insects

A moderate diversity of common native insect species are likely to utilise habitat resources within the development footprint, including spiders, ants, grasshoppers, crickets and moths, as observed during field surveys of the study area. These species are likely to use areas with coarse woody debris and rocky outcrops for shelter and burrowing sites. Disturbance associated with the proposed works are likely to permanently remove potential habitat for some species from within the proposed footprint, however extensive habitat for many species exists elsewhere within the Site.

The critically endangered Golden Sun Moth or suitable habitat to support the species was not found to occur within the development footprint or broader Site, despite targeted surveys carried out for the species. Given the timing of these surveys (February), it is recommended that additional surveys be undertaken in December to confirm if the species occurs within the development footprint or larger Site, prior to construction. Should the findings of the surveys to date that the species is not found to occur within the development footprint be confirmed, it is considered that the proposed works would not have a significant impact upon the species.

### 6.3.3 Threatened Species

#### Flora

As no threatened flora species were identified in surveys, the proposed development is unlikely to have any direct site establishment impacts on any threatened flora species. The majority of the development footprint was walked during the field surveys, in an attempt to locate any threatened species or potential habitat. No threatened species were observed, although potential habitat was found to exist within the footprint area. Additional suitable potential habitat for threatened flora species occurs outside of the development footprint; this will not be impacted by the proposal.

Four threatened flora species listed under the TSC Act were found to have the potential to occur within the development footprint, based on habitats present, and are subject to more detailed impact assessments in this report (**Appendix K**):

- Yass Daisy (*Ammobium craspedioides*);
- Silky Swainson-pea (*Swainsona sericea*);
- Button Wrinklewort (*Rutidosia leptorrhynchoidea*); and
- Hoary Sunray (*Leucochrysum albicans* var. *tricolor*).

The detailed assessments of impact associated with the proposed development on these three threatened flora species are provided in this report (**Appendix K**). It was concluded that the proposed actions would not have a significant impact on these species.

## 6 Impact Assessment

Three threatened flora species listed under the EPBC Act were found to have the potential to occur within the site, based on suitable habitats present. Significant impact criteria assessments have been completed for these species (**Appendix L**). They are:

- Yass Daisy *Ammobium craspedioides* – Vulnerable;
- Hoary Sunray *Leucochrysum albicans* var. *tricolor* – Endangered; and
- Button Wrinklewort *Rutidosia leptorrhynchoides* – Endangered.

The results of the significant impact criteria assessments indicate that the project will not have a significant impact on any of these species.

### Fauna

The proposed development will remove identified suitable habitat for threatened fauna species listed in **Appendix F**.

An assessment of impacts associated with the proposed development on threatened fauna species previously recorded, or considered to have a medium to high likelihood of occurrence in the study area has been completed and is included in **Appendix K**.

Impact assessments were carried out for the following threatened species listed under the TSC Act:

- Reptiles – Pink-tailed Worm Lizard and Striped Legless Lizard;
- Parrots – Gang-gang Cockatoo, Turquoise Parrot, Swift Parrot, Little Lorikeet and Superb Parrot;
- Woodland Birds – Brown Treecreeper, Hooded Robin, Speckled Warbler, Varied Sittella, White-fronted Chat, Scarlet Robin, Flame Robin and Diamond Firetail;
- Mammals – Spotted-tailed Quoll; Eastern False Pipistrelle; Squirrel Glider;
- Owls – Barking Owl and Powerful Owl;
- Birds of Prey – Spotted Harrier and Little Eagle; and
- Insects – Golden Sun Moth.

The assessment of impacts associated with the proposed development on these threatened fauna species concluded that the project would not have a significant impact upon any TSC Act listed fauna species.

Significant impact criteria assessments have been completed (**Appendix L**) for the following species listed under the EPBC Act:

- Reptiles – Pink-tailed Worm-lizard (*Aprasia parapulchella*) – Vulnerable; Striped Legless Lizard (*Delma impar*) – Vulnerable
- Birds – Swift Parrot (*Lathamus discolor*) – Endangered; Superb Parrot (*Polytelis swainsonii*) – Vulnerable;
- Mammals – Spotted-tail Quoll (*Dasyurus maculatus maculatus*) (SE mainland population) – Endangered; and
- Insects – Golden Sun Moth (*Synemon plana*) – Critically Endangered

The results of the significant impact criteria assessment indicate that the proposed works will not significantly impact on any fauna species listed under the EPBC Act, provided recommended mitigation measures are adopted.



## 6 Impact Assessment

### 6.3.4 Endangered Ecological Communities

Two endangered ecological communities (EECs) occur in the development footprint and would be impacted during site establishment. One listed under the TSC Act (Box Gum Woodland), and one under the EPBC Act (Natural Temperate Grasslands).

An assessment of impacts has been completed for Box Gum Woodland (**Appendix K**). It was concluded that the proposed development would have the following impacts on Box Gum Woodland;

- Approximately 5.94 ha of this EEC will be cleared as part of the proposal;
- The proposal will increase fragmentation of this EEC; and
- Increase in the impact of some KTPs.

The proposal is considered **not likely** to result in a significant impact this EEC because;

- the habitat to be impacted by the proposal is not considered to be important for the long term survival of the EEC in the locality; and
- larger areas of the EEC occur elsewhere within the site and locality.

A significant impact criteria assessment has been completed for Natural Temperate Grasslands (**Appendix L**). The proposed development will require the clearing of 9.07 ha of Natural Temperate Grasslands. The results of the significant impact criteria assessment indicate that the project has the potential to significantly impact upon this community. A referral to the Commonwealth Minister has been completed and the project was declared a controlled action. Mitigation measures have been proposed in accordance with biodiversity 'maintain and improve' principles required under the Commonwealth's offsetting policy (**Section 7**).

## 6.4 Indirect and Operational Impacts

### 6.4.1 Artificial Lighting

Night time security or operational lighting can potentially discourage native species from using habitat where diffuse light penetrates into adjoining areas of vegetation. The foraging and nesting regimes of some nocturnal native mammals and birds can therefore be disrupted by lighting and can become vulnerable to predation by cats, dogs and foxes. The eyesight of nocturnal species (such as owls, gliders and possums) is hindered by bright lights, and where they are affected by this, they become more susceptible to predation.

As activity would occur over a 24 hour basis, when required, light spill into adjoining areas of habitat can be expected in some parts of the study area. In addition, it is likely that some lighting will be required for emergencies, maintenance or security.

### 6.4.2 Roads and Access

Collisions with wildlife (such as macropods, ground dwelling and arboreal mammals) within the development footprint are unlikely. However, collisions along the proposed access road and surrounding local roads are possible, particularly during dusk and dawn when macropods are active. Mitigation measures should aim to provide guidance on traffic management to ensure the potential impact of increased traffic within the area is addressed.

## 6 Impact Assessment

### 6.4.3 Groundwater and Hydrology

Detailed design of the Project should include safeguards and mitigation measures to minimise the impacts on surface and groundwater flow regimes.

The site contains a number of sensitive receptors which could be impacted by changes to surface and groundwater flows, including:

- Rivers and creeks;
- Ephemeral drainage lines; and
- Farm dams which may provide important aquatic habitat within the degraded and dry local environment.

All project works would aim to limit the amount of increased sedimentation and/or run-off that results from proposed actions.

### 6.4.4 Edge Effects and Habitat Fragmentation

Operation of the proposed facility is likely to result in changes to the condition and distribution of the EEC, through increased edge effects and fragmentation.

Edge effects are described as an ecological impact of two or more interfacing habitat types. Edge effects are inherent or natural in nature but can have negative impacts if its creation alters ecological processes. They also change habitat conditions (such as degree of humidity and exposure to light or wind) created at or near the boundary between areas. In general, edge effects increase in relation to the dissimilarity between adjoining habitats.

Removal of vegetation often induces edge effects as it causes a number of new environmental conditions to develop along the edges of the cleared environments, in particular in environments that originally contain the upper strata levels (canopy and/ or shrub layer) of vegetation. The removal of vegetation generally promotes the invasion of exotic species and/or disturbance tolerant native plants. With the invasion of these new species it often becomes difficult for the original plant species to recolonise once disturbed.

The clearing of vegetation may in turn promote the influx of pest species such as foxes or feral cats, which use the edge of vegetated areas to stalk and ambush prey species that use cleared areas for foraging. Native species such as owls also use edge environments for hunting. Investigations by Berry (2002) indicated that predation by introduced mammals and native avians is often higher on the interface between communities with diverse vegetation structure (canopy, shrub and ground layer) and clearings.

In general potential edge effects associated with clearing for development can include the degradation of adjacent habitat through:

- changes in microclimate (e.g. temperature, wind, light humidity);
- changes in hydrology (i.e. surface and sub-surface water flows);
- changes in floristics (i.e. species composition and abundance);
- creation of new ecotones;
- alteration to the pattern and frequency of fire;
- invasion by exotic plant and animal species;
- increase in sedimentation;
- increase in tree death (e.g. dieback, impact on root zone); and



## 6 Impact Assessment

- improved access for predators.

The clearing of native vegetation often leads to the fragmentation of habitats which impact habitat corridors. Habitat corridors provide essential pathways for the movement of native flora and fauna and ensuring the long term genetic viability of species. Vegetation within the region is highly fragmented as a result of past and current land use (**Figure 8**). Currently, landscape corridors are restricted to protected vegetation as well as creeklines and waterways which provide connectivity within the region.

There are areas of protected vegetation to the east and south west of the study area, including Mundoonen Nature Reserve, Bungonia Recreation Area, Morten National Park, Wingello State Forest and Tarlo River National Park. Major vegetation corridors are restricted to waterways to the north of the site and scattered remnants to the west (**Figure 8**).

The proposed works should not contribute further to existing fragmentation within the region as vegetation within the study area is already highly fragmented and isolated. The proposed works will not reduce the width of any primary connections.

### 6.5 Long Term Impacts

The proposed development will operate for the foreseeable future, and so most operational impacts will be long term.

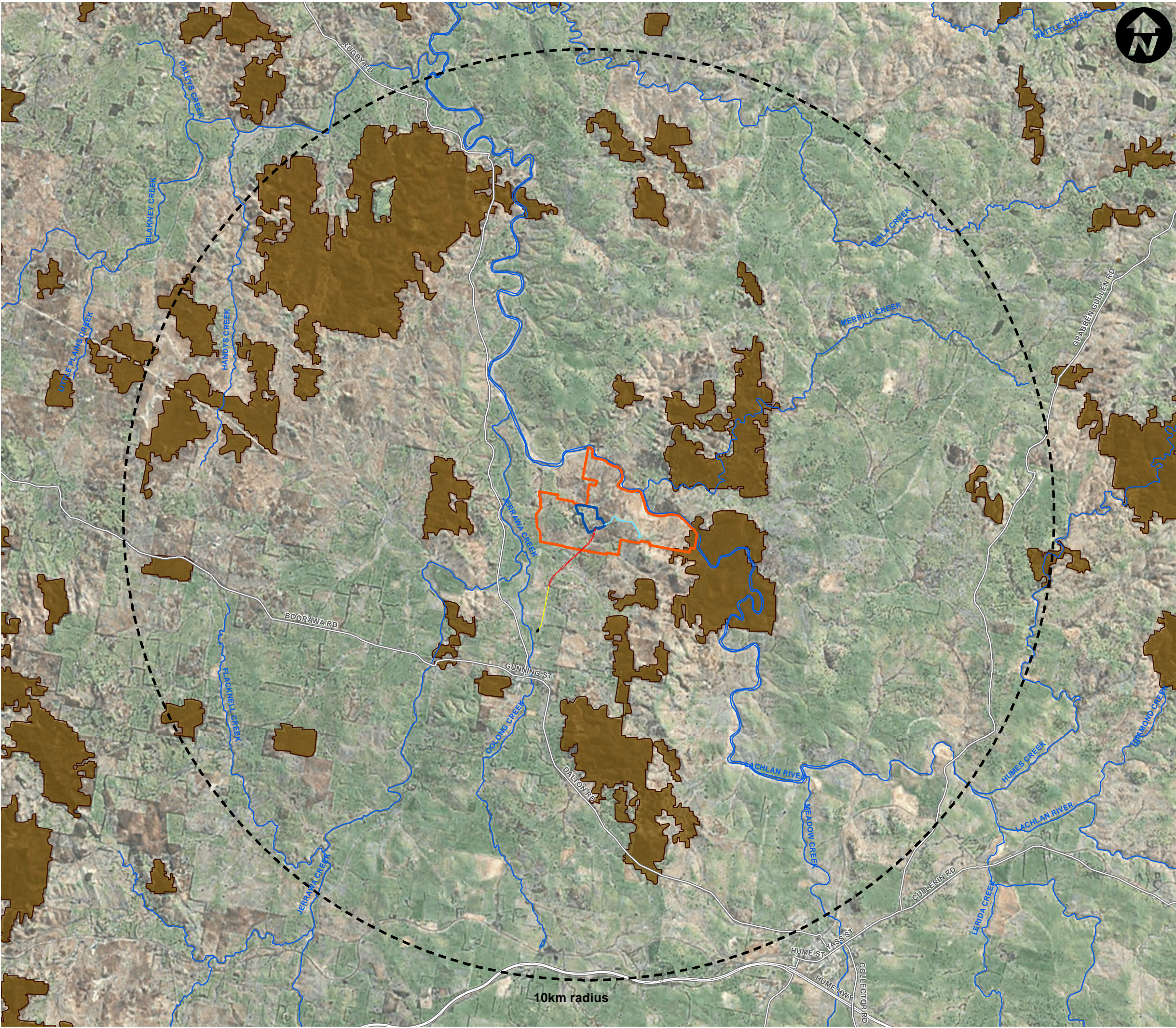
Long term impacts on native flora and fauna will include the permanent loss of habitat. This includes:

- Areas of Box Gum Woodland and Natural Temperate Grassland;
- Hollow bearing trees;
- Feed trees;
- Recruitment trees that would develop hollows over time;
- Structurally diverse vegetation, with a number of age classes and mature emergents;
- A healthy soil seed bank, with sufficient number and diversity of propagules to allow the native vegetation to regenerate following disturbances such as bushfire; and
- Rocky outcrops.

Provided the mitigation measures outlined in **Section 7** are adopted, the long term impacts resulting from the proposed actions are unlikely to be detrimental to threatened species within the area, as there is sufficient habitat in the surrounding local area. Further mitigation measures are likely to ameliorate many of the flora and fauna associated impacts.



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**Legend**

- AGL Site Boundary
- Plant Footprint
- Gas Pipeline (northern) and Access Road
- Gas Pipeline (southern)
- Communications Tower and Hut Footprint
- Communications Tower Services and Access Track
- Waterways
- Key Vegetation Patches



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Drawn: SB    Approved: JM    Date: 24/06/2011

Job No.: 43177661    File No.: 43177661.040.mxd

Client  
  
AGL

Project  
  
DALTON POWER PROJECT

Title  
  
CONNECTIVITY MAP

Figure: 8





## Biodiversity Maintenance and Improvement

The following section identifies measures in order to avoid, mitigate and offset impacts on biodiversity values associated with the Project. This section has been structured according to the principals stated in DECC (2005) guidelines for Part 3A biodiversity assessments.

### 7.1 Impact Avoidance

**Chapter 3** of the EA and **Section 2.1.2** of this report provides detailed information on the project area selection process and alternative options for selection of the proposed development site.

Impacts on biodiversity have been avoided where possible, through the following means.

- Locating the proposed development footprint to feature in areas where native vegetation is of poor condition.
- Positioning of the valve station, gas pipeline and communications tower footprint and associated hut and services to avoid EECs where possible.
- Positioning of the gas pipeline, access road and communications tower footprint and associated hut and services to reduce overall impact in terms of vegetation clearance.
- The development footprint and communications tower footprint and associated hut and services has been located in previously and currently grazed areas that have lower ecological value.
- In addition, AGL commits to engaging a qualified biologist to carry out Spring surveys for the Golden Sun Moth prior to determination.

### 7.2 Impact Mitigation

An overview of the impact mitigation and environmental management measures recommended for flora and fauna is provided. Each of these mitigation measures should be addressed during the construction and operational phases of the proposed Dalton Power Project.

#### 7.2.1 Management Planning

##### *Construction Environmental Management Plan*

A Construction Environmental Management Plan (CEMP) should be developed to ensure appropriate mitigation measures are employed during the construction stage of the facility. The CEMP should address mitigation measures outlined within this section such as; timing of works to minimise disturbance on breeding periods, minimising interaction with native fauna to reduce potential stress in animals, and actions to limit access to areas outside of the development footprint to reduce overall disturbance.

The CEMP would address potential habitat and the implications of development for all threatened species identified as likely to occur or with potential habitat within the development footprint, as outlined in **Appendix E** and **F**. The CEMP should address (at a minimum) the strategies and plans outlined within this section of the report.

##### *Operational Environmental Management Plan*

An Operational Environmental Management Plan (OEMP) would be developed to ensure appropriate mitigation measures are employed during the operation of the proposed facility. This plan should address long term management actions designed to mitigate and minimise the ongoing impacts and potential impacts upon the natural environment as a result of the proposed action. The OEMP should incorporate all measures outlined in this section, plus any other measures that become necessary in the face of changing environmental conditions.



## 7 Biodiversity Maintenance and Improvement

The OEMP would address potential habitat and the implications of development for all threatened species identified as likely to occur or with potential habitat within the development footprint, as outlined in **Appendix E** and **F**.

The CEMP and OEMP would also include ongoing monitoring requirements, performance indicators, timing and responsibilities. The OEMP should include (at a minimum) the following mitigation measures, plans and strategies discussed below to ensure adequate flora and fauna protection.

### *Flora and Fauna Management Plan*

A Flora and Fauna Management Plan (FFMP) would be developed as part of the CEMP and include measures for the minimisation or avoidance of impacts on threatened as well as common native flora and fauna. The FFMP would contain further details regarding these measures, including performance indicators, timing and responsibilities. The FFMP would address flora and fauna impacts separately, to ensure adequate management.

Mitigation measures would be implemented to avoid mortality of animals during clearing, ensure the protection of nesting habitat, promote long-term connectivity within the landscape and control feral predators where necessary. Mitigation measures would be developed and implemented to mitigate impacts on flora as a result of habitat clearing associated with the Project, and to avoid the removal of any threatened plants during clearing, to ensure the protection of any local populations of threatened species.

The proposed development would require the removal of potential habitat trees (>40 cm diameter or any trees with hollows). Due care during clearing is recommended to reduce direct impacts to any tree dwelling fauna species which may be utilising the area. The FFMP should detail procedures for a pre-clearance survey and fauna management.

Of high importance within the FFMP is the management of native fauna in regards to increased traffic volumes within and around the Site. Reduced speed limits, sensitive lighting, fauna-proof fencing, fauna corridors and underpasses etc should be assessed for practicality and use within the locality.

Mitigation measures to minimise impacts on fauna as a result of habitat clearing associated with the Project would be developed. The following strategies and mitigation measures listed below would be incorporated as part of the plan:

- Management of threatened species and fauna habitat;
- Management of nesting resources;
- Management of connectivity; and
- Management of invasive species.

The FFMP would also need to address each of the matters of National Environmental Significance (NES) identified in **Table 7-1** relevant to the Project Area. **Table 7-1** details the potential impacts and mitigation measures for each matter of NES as well as State (TSC Act) listed species that have been identified, or are considered as having the potential to occur within the Project Area.

## 7 Biodiversity Maintenance and Improvement

**Table 7-1 Potential impacts & mitigation measures for Matters of NES**

Matters of National Environmental Significance (NES)		EPBC Act Status*	TSC Act Status*	Potential Impacts	Mitigation Measures
Common Name	Scientific Name				
Flora					
Button Wrinklewort	<i>Rutidosia leptorrhynchoides</i>	E	E	<ul style="list-style-type: none"><li>Potential habitat loss due to infrastructure development; and</li><li>Weed invasion.</li></ul>	<ul style="list-style-type: none"><li>Protect areas of known habitat;</li><li>Undertake weed control on site;</li><li>Ensure appropriate fire regimes;</li><li>Perform pre-clearing surveys prior to construction; and</li><li>Avoid undertaking ploughing in area.</li></ul>
Yass Daisy	<i>Ammobium craspedioides</i>	V	V	<ul style="list-style-type: none"><li>Loss of potential habitat due to land clearing;</li><li>Destruction of plants by rabbits; and</li><li>Weed invasion.</li></ul>	<ul style="list-style-type: none"><li>Protect areas of known habitat;</li><li>Perform pre-clearing surveys prior to construction;</li><li>Implement feral animal control (especially rabbit control); and</li><li>Undertake weed control on site.</li></ul>
Hoary Sunray	<i>Leucochrysum albicans</i> var. <i>tricolor</i>	E	-	<ul style="list-style-type: none"><li>Potential habitat loss due to infrastructure development; and</li><li>Weed invasion.</li></ul>	<ul style="list-style-type: none"><li>Protect areas of known habitat;</li><li>Perform pre-clearing surveys prior to construction; and</li><li>Undertake weed control on site.</li></ul>
Silky Swainson-pea	<i>Swainsona sericea</i>	-	V	<ul style="list-style-type: none"><li>Potential habitat loss due to land clearing and development; and</li><li>Weed invasion.</li></ul>	<ul style="list-style-type: none"><li>Protect areas of known habitat;</li><li>Perform pre-clearing surveys prior to construction; and</li><li>Undertake weed control on site.</li></ul>
Mammals					
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	-	V	<ul style="list-style-type: none"><li>Loss &amp; fragmentation of potential habitat;</li><li>Loss of hollow-bearing trees;</li><li>Disturbance to potential roost &amp; breeding sites;</li><li>Poisoning from application of pesticides in area; and</li><li>Injury from barb-wired fences.</li></ul>	<ul style="list-style-type: none"><li>Retain areas of known habitat e.g. understorey and midstorey shrubs;</li><li>Conserve hollow-bearing trees;</li><li>Protect roost and den sites from disturbance;</li><li>Minimise the use of pesticides in the area; and</li><li>Avoid using barb-wired fences on site</li></ul>
Squirrel Glider	<i>Petaurus norfolcensis</i>	-	V		

## 7 Biodiversity Maintenance and Improvement

Matters of National Environmental Significance (NES)		EPBC Act Status*	TSC Act Status*	Potential Impacts	Mitigation Measures
Common Name	Scientific Name				
Spotted-tail Quoll	<i>Dasyurus maculatus</i>	E	V	<ul style="list-style-type: none"> <li>Clearing &amp; fragmentation of native vegetation</li> <li>Feral species impacts (e.g. foxes); and</li> <li>Increased road mortality.</li> </ul>	<ul style="list-style-type: none"> <li>Protect areas of known or potential habitat where possible, e.g. latrine sites; hollow logs, rocky outcrops and riparian vegetation</li> <li>Implement feral animal control (especially cats and foxes); and</li> <li>Limit vehicle speeds in and around site.</li> </ul>
<b>Reptiles</b>					
Grassland Earless Dragon	<i>Tympanocryptis pinguicolla</i>	E	E	<ul style="list-style-type: none"> <li>Potential habitat loss and fragmentation;</li> <li>Bush-rock removal;</li> <li>Altered irrigation;</li> <li>Weed invasion; and</li> <li>Feral species impacts (e.g. rabbits).</li> </ul>	<ul style="list-style-type: none"> <li>Protect areas of known habitat;</li> <li>Conserve rocks and rocky outcrops wherever possible;</li> <li>Maintain natural-historic irrigation on site;</li> <li>Undertake weed control on site; and</li> <li>Implement feral species control (especially targeting rabbits).</li> </ul>
Pink-tailed Worm Lizard	<i>Aprasia parapulchella</i>	V	V	<ul style="list-style-type: none"> <li>Potential habitat loss &amp; fragmentation;</li> <li>Bush-rock removal;</li> <li>Feral species impacts (e.g. rabbits)</li> <li>Weed invasion; and</li> <li>Inappropriate replanting strategies (e.g. replanting tree species within grassland areas), resulting in reduction of potential habitat.</li> </ul>	<ul style="list-style-type: none"> <li>Protect areas of known habitat;</li> <li>Conserve rocks and rocky outcrops;</li> <li>Implement feral animal control (especially rabbit control); and</li> <li>Undertake weed control on site.</li> <li>Ensure appropriate replanting in all rehabilitation works; and</li> <li>Implement feral animal control (especially rabbit control); and</li> <li>Undertake weed control on site.</li> </ul>
Striped Legless Lizard	<i>Delma impar</i>	V	V	<ul style="list-style-type: none"> <li>Loss of potential habitat;</li> <li>Feral species impacts (e.g. cats, dogs, foxes); and</li> <li>Weed invasion.</li> </ul>	<ul style="list-style-type: none"> <li>Protect areas of known habitat;</li> <li>Implement feral animal control (especially targeting cats, dogs, foxes);</li> <li>Conserve rocks and rocky outcrops;</li> <li>Conduct construction activities outside of warmer months where possible; and</li> <li>Undertake weed control on site.</li> </ul>
<b>Parrots</b>					
Swift Parrot	<i>Lathamus discolor</i>	E	E	<ul style="list-style-type: none"> <li>Clearing &amp; fragmentation of potential habitat in wintering range;</li> <li>Feral species impacts (mainly competition for nectar resources)</li> </ul>	<ul style="list-style-type: none"> <li>Protect areas of potential habitat where possible;</li> <li>Implement feral animal control (especially targeting species such as the introduced Feral Bumblebee); and</li> </ul>



## 7 Biodiversity Maintenance and Improvement

Matters of National Environmental Significance (NES)		EPBC Act Status*	TSC Act Status*	Potential Impacts	Mitigation Measures
Common Name	Scientific Name				
					<ul style="list-style-type: none"><li>Rehabilitation works to include flowering Eucalypt species suitable for use by this species where possible.</li></ul>
Superb Parrot	<i>Polytelis swainsonii</i>	V	V	<ul style="list-style-type: none"><li>Clearing, degradation &amp; fragmentation of potential habitat;</li><li>Potential hydrological changes;</li><li>Loss of hollow bearing trees</li><li>Feral species impacts (mainly competition for nest sites);</li><li>Use of insecticide sprays resulting in poisoning; and</li><li>Loss of potential recruitment trees (those trees that will form hollows over time).</li></ul>	<ul style="list-style-type: none"><li>Protect areas of known or potential habitat where possible;</li><li>Maintain natural hydrological regimes;</li><li>Conserve hollow-bearing trees where possible;</li><li>Implement feral animal control targeting species such as the Indian Myna &amp; feral honey bee; and</li><li>Revegetation to include species suitable for use by the species such as Box Gum Woodland canopy species.</li></ul>
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	-	V	<ul style="list-style-type: none"><li>Clearing &amp; fragmentation of potential habitat;</li><li>Loss of hollow-bearing trees; and</li><li>Feral species impacts</li></ul>	<ul style="list-style-type: none"><li>Retain areas of known or potential habitat where possible;</li><li>Conserve hollow-bearing trees where possible; and</li><li>Implement feral animal control targeting cats, foxes and the feral honeybee.</li></ul>
Turquoise Parrot	<i>Noephema pulchella</i>	-	V		
Little Lorikeet	<i>Glossopsitta pusilla</i>	-	V		
Woodland Birds					
Brown Treecreeper	<i>Climacteris picumnus</i>	-	V	<ul style="list-style-type: none"><li>Clearing &amp; fragmentation of potential habitat, including remnant woodland;</li><li>Loss of hollow-bearing trees;</li><li>Removal of habitat resources (e.g. stags, course woody debris and ground litter); and</li><li>Feral species impacts (especially nest predation); and</li><li>Weed invasion.</li></ul>	<ul style="list-style-type: none"><li>Retain areas of known or potential habitat such as remnant vegetation and paddock trees where possible;</li><li>Undertake revegetation or regeneration works to enhance habitat connectivity post construction; and</li><li>Conserve hollow-bearing trees and other habitat resources such as stags, ground litter and source woody debris where possible.</li><li>Fencing of known or potential habitat adjacent to the development footprint to protect natural features;</li><li>Implement feral animal control, targeting cats, foxes, black rats; and</li><li>Undertake weed control on site</li></ul>
Hooded Robin	<i>Melanodryas cucullata</i>	-	V		
Speckled Warbler	<i>Chthonicola sagittatus</i>	-	V		
Varied Sittella	<i>Daphoenositta chrysoptera</i>	-	V		
Diamond Firetail	<i>Stagonopleura guttata</i>	-	V		

## 7 Biodiversity Maintenance and Improvement

Matters of National Environmental Significance (NES)		EPBC Act Status*	TSC Act Status*	Potential Impacts	Mitigation Measures
Common Name	Scientific Name				
Flame Robin	<i>Petroica phoenicea</i>	-	V		
Scarlet Robin	<i>Petroica boodang</i>	-	V		
Birds of prey					
Spotted Harrier	<i>Circus assimilis</i>	-	V	<ul style="list-style-type: none"><li>Clearing, degradation and disturbance of potential habitat;</li><li>Secondary poisoning from rodenticides and rabbit baiting</li></ul>	<ul style="list-style-type: none"><li>Retain areas of known or potential habitat, especially those areas likely to be used for nesting or foraging activities; and</li><li>Rehabilitate areas of potential habitat following completion.</li></ul>
Little Eagle	<i>Hieraaetus morphnoides</i>	-	V		
Owls					
Barking Owl	<i>Ninox connivens</i>	-	V	<ul style="list-style-type: none"><li>Loss, fragmentation and degradation of potential habitat;</li><li>Loss of hollow-bearing trees;</li><li>Disturbance to potential nest sites</li><li>Removal of potential habitat resources (e.g. stags and course woody debris);</li><li>Secondary poisoning from pest control activities; and</li><li>Feral species impacts (especially fledgling predation).</li></ul>	<ul style="list-style-type: none"><li>Retain areas of potential habitat where possible;</li><li>Conserve hollow-bearing trees where possible;</li><li>Retain buffer around known nest sites (≥ 200 m) if any found within Project site;</li><li>Protect riparian vegetation to preserve potential roosting areas;</li><li>Retain habitat resources e.g. course woody debris, stags and hollow bearing trees; and</li><li>Implement feral animal control (especially cats, dogs and foxes).</li></ul>
Powerful Owl	<i>Ninox strenua</i>	-	V		
Insects					
Golden Sum Moth (GSM)	<i>Synemon plana</i>	CE	E	<ul style="list-style-type: none"><li>Loss &amp; degradation of Wallaby-grass dominated grassy woodlands;</li><li>Soil disturbance at potential Golden Sun Moth sites;</li><li>Impacts resulting from landscaping works such as mowing and slashing;</li><li>Use of glyphosate-herbicide; and</li><li>Planting of trees in grasslands resulting in reduction of potential habitat areas.</li></ul>	<ul style="list-style-type: none"><li>AGL comitts to engaging a qualified biologist to carry out Spring GSM surveys prior to determination;</li><li>Retain potential habitat (grassland areas) where possible;</li><li>Conduct activities outside of Golden Sun Moth breeding season where possible;</li><li>Design fences to allow passage of Golden Sun Moth;</li><li>Undertake weed control on site;</li><li>Implement a biomass management program on site;</li><li>Fence habitat on 3 sides; and</li><li>Implement feral animal control (especially rabbits).</li></ul>

\* CE - Critically Endangered, E - Endangered, V - Vulnerable

## 7 Biodiversity Maintenance and Improvement

To enable the effective management of threatened fauna and fauna habitat, the following mitigation measures should be incorporated into the FFMP:

- Threatened fauna species previously recorded in the project area (**Figure 3**) or considered likely to occur would be targeted during pre-clearing surveys, and habitat or potential habitat would be identified and clearly marked for protection.
- Vegetation would be cleared as per the two-stage clearing strategy outlined in detail below.
- Wash down protocols should be developed and applied to prevent the spread of amphibian chytrid disease *chytridiomycosis*. Protocols would be consistent with OEH guidelines (DECC 2008d). Wash down would occur whenever vehicles enter or leave a new drainage area. Wash down protocols would also stop further spread of the introduced fish, Eastern Gambusia (*Gambusia holbrooki*) by removing any individuals or eggs that may be collected in the engines of plant, machinery or vehicles crossing any waterways, including seasonal drainage lines.
- Any rescued fauna would be transferred to appropriate areas within adjacent habitat or placed in the care of WIRES or other certified wildlife rescue organisations within the local area, if injured.
- Wherever remnant vegetation patches become isolated, revegetation works should aim to re-establish connections, where possible, with adjacent potential wildlife corridors.
- Fire regime requirements of threatened fauna species would be considered should asset management burning be proposed.

### Vegetation Clearing Strategy

A number of mitigation measures have been proposed to minimise the impacts of clearing on native vegetation within and adjacent to the development footprint. Measures have focused on minimising the impacts on existing vegetation, EECs and potential habitat for threatened flora, and are listed below:

- A suitably qualified ecologist/botanist would undertake targeted pre-clearance assessments within the development footprint for threatened flora species considered to have the potential to occur, as per the Pre-clearing Survey Strategy outlined below.
- EPBC Act and TSC Act listed threatened flora species considered to have the potential to occur in the project area would be targeted during the Pre-clearing Survey period by a suitably qualified botanist, and if identified within the development footprint, would be clearly marked and protected from construction activities wherever possible.
- Retention of hollow bearing trees wherever possible. This would be assessed on a case by case basis.
- Areas to be cleared within the development footprint would be clearly marked prior to the commencement of construction or disturbance works, using highly visible flagging tape or equivalent to prevent accidental clearing.
- Retention of top soil from areas of high quality native vegetation for use in rehabilitation works within the development footprint.
- Areas mapped as EEC vegetation would be shown on all construction plans to ensure all site staff are aware of their presence to avoid unnecessary disturbance or clearing.
- Access should be restricted to the development footprint, to ensure adjacent vegetation areas are not disturbed.
- Vegetation within the development footprint should be cleared only where necessary. To ensure impacts outside of the development footprint are kept to a minimum, the footprint, pipeline easement and access road should be fenced off to prevent machinery and equipment being stored, dumped or driven into adjacent woodland or grassland areas.



## 7 Biodiversity Maintenance and Improvement

All clearing should follow the Pre-clearing Survey Strategy and the Two-stage Clearing Strategy approaches outlined below.

### Pre-clearing Survey Strategy

Detailed ecologically focused pre-clearance surveys will be undertaken within all areas planned for vegetation clearance by qualified ecologists prior to all clearing activities. This would involve:

- Spring survey for potentially present threatened flora that has not been surveyed during optimal flowering seasons, namely for the Yass Daisy (*Ammobium craspedioides*). Such targeted threatened flora surveys would aim to again search for other potentially occurring threatened flora likely to be present, including but not limited to; Hoary Sunray (*Leucochrysum albicans* var. *tricolor*), Button Wrinklewort (*Rutidosia leptorrhynchoides*) and Silky Swainson-pea (*Swainsona sericea*).
- December surveys for potentially present Golden Sun Moth according to the DEWHA (2009b) recommended survey guidelines.
- Diurnal searches for birds, nests and roosts including a targeted search for all potentially present threatened birds as well as threatened birds recorded during URS surveys;
- Active reptile searches for potentially present threatened reptiles
- Active searches for microbats, including checking under exfoliating bark; and
- Nocturnal surveys, including stag-watching of identified habitat trees, specifically focusing on use of trees by microbats, gliders and large forest owls.

Pre-clearing surveys should also be carried out to target the following threatened fauna species habitat according to OEH and SEWPaC defined appropriate habitat:

- Reptiles – Pink-tailed Worm Lizard and Striped Legless Lizard;
- Parrots – Gang-gang Cockatoo, Turquoise Parrot, Swift Parrot, Little Lorikeet and Superb Parrot;
- Woodland Birds – Brown Treecreeper, Hooded Robin, Speckled Warbler, Varied Sittella, Scarlet Robin, Flame Robin, White-fronted Chat and Diamond Firetail;
- Mammals – Spotted-tailed Quoll; Eastern False Pipistrelle; Squirrel Glider;
- Owls – Barking Owl and Powerful Owl;
- Birds of Prey – Spotted Harrier and Little Eagle; and
- Insects – Golden Sun Moth.

Pre-clearing surveys targeting threatened flora species within the development footprint should also be undertaken during the flowering period of each species. Target species during these surveys include the Yass Daisy, Hoary Sunray, Button Wrinklewort and Silky Swanson Pea. Similarly, if any of these species are found within the development footprint, OEH/SEWPaC should be consulted regarding requirements for further action.

This survey would focus on locating den or roost sites of threatened species, with the implication that any trees, stags or fallen timber with resident fauna should be avoided as far as is practicable.

If nesting threatened species are observed within, or close to the development footprint then clearing should be postponed until the nestlings have hatched and fully-fledged. If operational constraints mean that this delay is not practicable then the DECCW/SEWPaC should be consulted to determine if relocating the species is acceptable. If any threatened species are observed or found to occur within the development footprint during pre-clearing surveys, DECCW / SEWPaC should be contacted and suitable protection and recovery methods should be undertaken as per DECCW / SEWPaC guidelines.

## 7 Biodiversity Maintenance and Improvement

Pre-clearing surveys should be undertaken with timing sympathetic to the active periods of the majority of species likely to occur within the development footprint, namely during spring. This would provide a greater likelihood of finding species such as Superb Parrots and Turquoise Parrots that may occur within the area but were not observed during autumn and summer field surveys. To provide an indication of the likely timing of impacts resulting from this Project, **Chapter 4 Project Description** within **Volume 1** of the EA provides information on project staging. Pre-clearing surveys should take into account this indicative staging, as well as optimal survey periods for threatened species considered to have the potential to occur.

### *Two-stage Clearing Strategy*

Vegetation would be cleared using the two-stage approach in areas identified as containing habitat trees (trees with hollows and other habitat features such as nests, drays etc). Areas containing habitat trees would be identified during pre-clearance surveys of structure locations and access tracks. This approach involves the following process:

- All habitat trees to be marked accordingly and all construction staff made aware of the locations and significance.
- Non-habitat trees would be removed, leaving 2 – 3m wide connections between stands of habitat trees.
- All prior marked habitat trees would be knocked (gently tapped with plant equipment) and left intact, once all non-habitat trees have been removed at the end of each day.
- Around 48 hours after partial clearing, habitat trees would be removed and checked for fauna in the presence of a suitably qualified ecologist, fauna rescue personnel or certified wildlife handler.
- Suitably qualified personnel would guide the plant equipment operators on 'how' and to what side to fell habitat trees to facilitate fauna observation and rescue.
- Felled habitat trees to be placed in adjacent offset areas where possible to act as a habitat resource.

### *Habitat Replacement Strategy*

To ensure that habitat resources do not become scarcer than they already are within a fragmented and degraded agricultural setting, replacement habitat in the adjoining proposed offset area should be provided in order to compensate for all habitat removed. Where adequate hollows do not exist other alternatives can be explored such as nest boxes. The proposed offset area contains more hollows than will be cleared within the development footprint, refer to **Section 7.3**.

All fauna habitat resources including large fallen timber, coarse woody debris, dead stags and large hollow bearing trees should be relocated to adjacent woodland or exotic pastureland to ensure that the overall amount of habitat present within the Site is not significantly reduced as a result of the proposed action. Where possible these nesting resources should be placed intact in adjacent vegetation outside the area of works.

Similarly, as far as practicable, rock resources removed from within the development footprint should be placed into adjacent areas to provide habitat for fauna such as reptiles and small mammals. Rock emplacement should be sympathetic to species which may already use the area, and should be undertaken under the guidance of a qualified ecologist.

The following mitigation measures should be incorporated into the strategy:



## 7 Biodiversity Maintenance and Improvement

- Habitat features such as felled hollow bearing trees and coarse woody debris can be placed in areas where vegetation is retained to provide fauna corridors. Density of coarse woody debris would be consistent with that found in surrounding vegetation communities. Specific guidelines would be developed for the Project to guide contractors and prevent heaping of debris in adjacent woodland.
- In areas where embedded or rock outcrops occur, care would be taken to avoid their removal. Where unavoidable, a suitably qualified ecologist or certified wildlife handler would be present for fauna rescue and translocation of reptiles and amphibians.
- Where unavoidable, clearing of hollow bearing trees would follow the two-stage clearing strategy.
- Clearing of habitat trees would be undertaken outside of the breeding/nesting months wherever possible (i.e. not during spring or early summer).

### *Habitat Corridor and Connectivity Plan*

Vegetation corridors facilitate the safe movement of fauna between patches of habitat and prevent local extinction of mobile populations (Bolger *et al*, 1997). Any planned remediation works should aim to increase the value of the Site in regards to connectivity with other remnants in the landscape, through the revegetation of habitat corridors within the offset area. Additional corridors could be implemented through landscaping works within the development footprint. Such remediation works should encourage the use of native flora species, sourced from local nurseries, typical to that of the native vegetation structure and floristics to complement existing corridors of NTG and BGW. Habitat corridors should provide a range of stratum to allow a wide variety of fauna species to use them, and should aim to address any areas of bare ground that have been severely degraded as a result of agricultural use.

Management measures to maintain or improve the connectivity of vegetation around the development footprint should include:

- Native vegetation (including groundcover vegetation) should be left intact wherever possible to allow connectivity and encourage fauna passage.
- Strategic replanting of native species in areas adjacent to the footprint should be undertaken to increase habitat corridors within the region, where possible, without increasing bushfire risk.
- Consideration should be given to the desired vegetation community and association required to ensure use of appropriate replanting material.
- Habitat resources removed from within the development footprint should be placed into adjacent areas where possible to minimise habitat losses within the region.

### *Groundcover Clearance Strategy*

Groundcover substrate and especially large woody debris provides important habitat for native fauna, including threatened species. It is recommended that a groundcover clearance protocol be incorporated into the FFMP. It is recommended that the protocol involve the following steps:

1. Removal of large woody debris using excavator grabs or manual handling if practicable (e.g. raking);
2. Placement of intact large woody debris within adjacent areas of intact vegetation, ideally within the proposed offset area;
3. Scraping and stockpiling of leaf litter and topsoil separately from deeper fill material and placement within adjacent areas of intact vegetation; and

## 7 Biodiversity Maintenance and Improvement

4. Reuse of leaf litter and topsoil in rehabilitation works.

### *Site Management Plan*

The following mitigation measures are recommended in order to minimise potential impacts on native fauna associated with the operation of the proposed development:

- Maintain low vehicle speed limits on Site and in the surrounding locality to reduce fauna road fatalities.
- Restrict all vehicular and personnel entry into retained vegetation through exclusion fencing, signage, locating access roads and paths to avoid habitat damage.
- Educate workers as to the appearance and location of all threatened species and ecological communities as well as noxious weeds present or likely to be present within the Site, and mark their locations onto site plans.
- Employ down-lights and motion sensor lighting in order to reduce light spill and the associated secondary impact on nocturnal fauna species potentially using the adjoining vegetation. All lighting should be directed inwards so as to minimise any spill outside the areas of activity.
- Areas identified for clearing should be clearly marked prior to construction using highly visible flagging tape or spray paint to prevent unnecessary clearing.

### *Grazing Management Plan*

Employment of fencing of selected areas of retained vegetation to exclude grazing by cattle and sheep is recommended as a means of improving the habitat value and floristic diversity of retained vegetation. Such a Grazing Management Plan is likely to aid the regeneration of cleared areas and degraded remnants. Exclusion of grazing will not only improve the vegetation communities and their natural regeneration but will also improve the growth of many native herbs and grass species which are important feed species for declining woodland birds and other native animals (Garnett and Crowley, 2000).

### *Edge Effects Strategy*

Mitigation measures to minimise edge effects are typically associated with reducing impacts outside the construction zone, reducing the contrast of the edge and controlling impacts at their source within the development footprint.

The proposed action will result in increased edge effects, which can result in impacts such as those outlined in **Section 6.4.4**. Edge effect over the Site could be reduced via methods such as revegetation and stock exclusion to limit grazing pressure to create larger areas of intact native vegetation.

In areas within the site where Natural Temperate Grassland is known or predicted to occur, landscaping and revegetation works should be appropriate for the protection and enhancement of this ecological community. As such, canopy species should not be introduced at high densities and care should be taken to introduce native grass and forb species appropriate to the community.

Where reduction in edge effect is not practical, the impacts associated with an increased edge effect should be managed.

To reduce the impacts associated with increased edge effects and fragmentation the following mitigation measures have been recommended:



## 7 Biodiversity Maintenance and Improvement

- Use of temporary fences to exclude remnant vegetation from impacts associated with the proposed actions.
- Locating access tracks, storage areas and footprint in areas such that disturbance to water bodies is avoided.
- Parking construction machinery in cleared or disturbed areas away from waterways and other sensitive areas, including intact vegetation.
- Avoidance of native vegetation when stockpiling material, with stockpile areas ideally located in disturbed or cleared areas.
- Management of construction activities to ensure waste material is disposed of, off site at an appropriate waste facility, in an appropriate manner.
- Implementation of soil erosion and sedimentation controls prior to vegetation clearing work commencing in an area.
- Access to be restricted in sensitive areas of the Site (e.g. EECs and threatened species habitat) during the construction phase by the installation of fencing and signs surrounding such areas.
- Appropriate weed control measure to be employed for noxious and general weeds.
- Using locally indigenous plants for revegetation, with guidance as to appropriate species sought from local Landcare groups or the Lachlan CMA where needed.

### *Sediment and Erosion Control Plan*

Standard industry measures for erosion control and sediment run-off on urban developments should be implemented according to the 'Blue Book' (Landcom 2004). Specific erosion, sedimentation and pollution runoff controls should be developed for significant zones within the study area as apart of the CEMP during the initial phases of pre-clearing works. Significant zones may consist of sensitive vegetation zones (EECs or known threatened species habitat areas) or areas that drain into the local water catchment (e.g. creeks or ephemeral drainage lines and gullies). Sediment and erosion control measures should be implemented to manage disturbance to the Site during construction and operation of the proposed facility. Necessary practices may include;

- Sediment and erosion control measures would be implemented prior to vegetation and soil disturbance to manage impacts to sites during construction and operation of the transmission line. All works would be carried out in accordance with industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction Volume 1*, and (DECC, 2008) Volume 2, *The blue book Volumes 1 and 2*. Where necessary practices would include:
  - Endemic seeds and plants to be used for all revegetation and erosion control works.
  - Mulching or revegetation of cleared areas to be undertaken as soon as possible to permanently stabilise the soil and reduce erosion and run-off.
  - Construction of diversion banks and channels to intercept and divert water away from disturbed ground.
  - Appropriate physical stabilisation techniques to be employed, including terracing and the use of geotextiles.
  - Limiting the removal of ground covering vegetation.
  - Weed control matting that is fauna-friendly.
  - Construction of cross banks and drains in disturbed areas including unsealed access tracks.
  - Maintenance of drains and culverts to minimise the impacts of erosion of unsealed tracks.
  - Limiting the removal of ground covering vegetation to that required for the construction and operation of the facility.

## 7 Biodiversity Maintenance and Improvement

- All water way crossings to be designed and constructed in accordance with the I&I NSW Policy and Guidelines for Fish Friendly Waterway Crossings and Why Do Fish Need to Cross the Road? (Fairfull and Witheridge, 2003; NSW DPI, 2004).
- Stockpiling of material would avoid areas of native vegetation and be restricted to cleared or disturbed areas.
- Stockpiling to be appropriately sediment fenced to avoid scouring and runoff into any drainage areas, nearby creeklines or vegetated areas.

### **Weed and Pest Management Plan**

A weed and pest management plan should be completed as part of the site management procedures.

Weed control should be undertaken as needed to ensure preservation of all EECs and to control all noxious or environmental weed species, taking care not to use chemicals unsafely or in manners that may endanger threatened fauna species such as insectivorous bats, birds and gliders.

Noxious weeds to be controlled according to the NW Act and I&I NSW specifications for the Upper Lachlan Shire Council area.

Active control of feral animals, such as the Red Fox (*Vulpes vulpes*) and European Rabbit (*Oryctolagus cuniculus*) should be undertaken during the construction and operation of the facility.

Fragmentation of native ecosystems can facilitate the spread of feral species such as foxes (*Vulpes vulpes*), cats (*Felis catus*), dogs (*Canis familiaris*) and rabbits (*Oryctolagus cuniculus*). Establishment of the proposed works has the potential to increase the movement of feral species within the area. The associated impacts of feral animals on native flora and fauna could potentially include increased predation and grazing. Foxes and rabbits were recorded in the area during all URS field surveys.

The weed and pest management plan should address the following items:

- Measures to reduce the spread of weeds via vehicles and machinery where risk identified.
- Targeting areas of potential new weed outbreaks including soil stockpiles, roadsides and any other disturbed areas.
- Targeted weed control programs in the areas surrounding the development footprint.
- Measures to control noxious weeds should they be found.
- Monitoring and control programs for weeds, including noxious listed weeds, during construction and operation of the Project.
- Where weed management is undertaken in areas mapped as EECs, care would be taken to avoid killing any native understorey species that form part of any EEC.

### **Complementary Planting and Rehabilitation Plan**

Planting and rehabilitation strategies should utilise plant species to replicate Box Gum Woodland and Natural Temperate Grassland floristic composition. Using local provenance seed, propagules, or saplings where possible for plantings is recommended. Similarly, utilising best practice bush regeneration techniques is recommended for consideration, as these techniques are likely to provide the greatest benefit to a range of native flora and fauna species.

It is recommended that a monitoring program be established to investigate the condition of areas left for natural regeneration. An example of an appropriate monitoring program may consist of: