11.1 Introduction

A flora and fauna assessment for the proposed Facilities and associated infrastructure at the Marulan Site and for the proposed gas pipeline was undertaken by URS.

This chapter provides a summary of the flora and fauna assessment which is presented in full in **Appendix F**.

11.2 Methodology

The methodology for this assessment included the following elements:

- literature review;
- flora and fauna surveys; and
- assessment of impacts.

These methods are discussed in more detail below.

11.2.1 Literature Review

A desktop literature review was undertaken to identify the representative spectrum of threatened species, populations and ecological communities listed under the EPBC Act and TSC Act that could be expected to occur within the study area, based on habitats present. To this end, the following documentation was reviewed prior to field investigations:

- NSW NPWS Wildlife Atlas database;
- EPBC online Protected Matters Database Search tool; and
- previous study (PB, 2005) undertaken in the area and on part of the Marulan Site.

A summary of literature review results is contained in **Appendix F**. This summary includes: species status; habitat requirements; likelihood of occurrence; and a comparison of flowering seasons for flora and breeding seasons for fauna (including field surveys conducted)**.**

11.2.2 Field Surveys

Summary of Survey Effort

URS ecology staff have conducted four separate field surveys on the Site between October 2006 and October 2007. Additionally, a previous preliminary survey was conducted on adjacent land and partly on the Marulan Site (PB ,2005). A summary of survey work conducted on the Site by URS staff and others is listed below in **Table 11-1**.

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Table 11-1 Summary of Survey Effort

Surveyor	Survey Type	Duration	Timing	Season
PB	Flora and fauna	5 days	10 - 14 October 2005	Spring
URS	Initial flora and fauna	3 days	3 - 5 October 2006	Spring
URS	Additional flora and fauna	1 day	10 May 2007	Autumn
URS	Additional flora and fauna	3 days	4 - 6 June 2007	Winter
URS	Targeted fauna and opportunistic flora	3 days	22 - 24 October 2007	Spring

Flora Survey

Initial flora surveys were conducted by URS field ecologists from 3 to 5 October 2006, with additional surveys undertaken on 10 May 2007 and 5 and 6 June 2007, and opportunistic observations made during further targeted fauna surveys undertaken between 22 and 24 October 2007. The primary objectives of the surveys were to:

- map and describe the vegetation communities occurring within the Site;
- compile a flora list of those species occurring within the vegetation communities, identifying any threatened, nationally, regionally or locally significant species and communities; and
- assess the likely impacts of the Project and provide recommendations to assist in minimising impacts to flora in the study area.

Survey locations were positioned to represent the variety of vegetation communities and to detect any threatened species that may be present on the Site.

The botanical surveys were generally consistent with *Threatened Biodiversity and Assessment; Guidelines for Developments and Activities Working Draft* (DEC, 2004). All vascular taxa observed were recorded on appropriate proforma field data sheets. The surveys included:

- mapping vegetation communities using aerial photography and design drawings (which were loaded onto a handheld GPS unit);
- quadrat surveys to sample the floristics and structure of the vegetation within the Site;
- 'random meander' searches for threatened plant species according to the technique of Cropper (1993) during all four surveys;
- describing the vegetation community structure according to classifications of Specht & Specht (1999); and
- surveying areas of weed infestation.

Vascular plants recorded during the surveys were compiled into a floristic list (Table 3 in **Appendix F)**. Vegetation communities were described according to structure and floristics, and with reference to vegetation mapping units identified in Tindall *et al* (2004).

The conservation significance of flora species and vegetation communities was determined at a State level according to the TSC Act and at a national level according to the EPBC Act.

Fauna Survey

Preliminary fauna surveys were carried out between 3 and 5 October 2006, with additional targeted fauna surveys on 10 May 2007 and on 4 and 5 June 2007. Survey techniques were generally consistent with the DEC (2004) working draft survey guidelines and included:

- habitat identification and assessment;
- diurnal bird counts;
- spot-lighting and stag watching;
- opportunistic observations of fauna species; and
- searches for signs of fauna.

Targeted fauna surveys were carried out from 22 to 24 October 2007 utilising the above listed methods, as well as the following techniques: ultrasonic call recording (Anabat) for microchiropteran bats; active searches for reptiles; and nocturnal call playback for forest owls. Woodland birds, particularly the Diamond Firetail *Stagonopleura guttata*, Hooded Robin *Melanodryas cucullata cucullata* and Gang-Gang Cockatoo *Callocephalon fimbriatum* were targeted at this time as it correlates with their breeding and/or peak activity periods.

The locations of trees containing hollows (stem and/or branch hollows, or hollow stags) were recorded using a hand-held GPS and subsequently mapped. GIS software was later used to calculate a mean density of hollow-bearing trees within the stands of woodland within the Site. Stag watching was conducted on hollows assessed as having the potential to shelter arboreal fauna, including mammals, bats and hollow-nesting birds. The sites of Anabat, stag watch and call playback positions are shown in Figure 3 in **Appendix F**.

11.2.3 Gas Pipeline

The flora and fauna assessment for the proposed gas pipeline was limited to a desktop literature review and air photo interpretation.

A literature review was undertaken to identify the representative spectrum of threatened species, populations and ecological communities listed under the TSC Act and the EPBC Act that could be expected to occur within the study area, based on habitats present. The following documentation was reviewed:

- NSW NPWS Wildlife Atlas database; and
- EPBC online Protected Matters Database Search tool.

Aerial photography interpretation was used to identify areas of native vegetation and potentially significant habitat along the proposed route.

No field assessment was undertaken. A detailed flora and fauna assessment would be undertaken in support of a future separate Project Application.

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11.2.4 Assessment of Impacts

As noted in **Chapter 5**, Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts of a proposed development on threatened species, populations or ecological communities (or their habitats) listed under the TSC Act. The so-called 7-part test is used to determine whether a proposed development is likely to impose 'a significant effect' on threatened biota.

Under Part 3A of the EP&A Act, however, there is no requirement for Section 5A of the EP&A Act to be addressed; hence there is no requirement for a Species Impact Statement. Instead, the flora and fauna assessment must be prepared according to the Environmental Assessment Requirements, which refer to the draft *Guidelines for Threatened Species Assessment* (DEC, 2005).

Notwithstanding the statutory requirements for Part 3A of the EP&A Act, the approach in the assessment has been to address Section 5A and complete the 7-part test as a guide to assessing impacts on threatened biota that could be affected by the Project.

11.3 Existing Environment

11.3.1 Results of Literature Review

Flora

The results of the desktop literature review indicate that 23 threatened plant species listed under the EPBC Act and/or the TSC Act have been previously recorded within the locality. Of these species, fourteen are classified as being Vulnerable and nine as Endangered under these Acts.

A review of the specific habitat requirements of these species, and the habitat offered by the Site and its surrounds identified that 22 of the listed species are likely to occur on the Site, of which 12 are Vulnerable and eight are Endangered (Table 1 in **Appendix F**).

Included in this list is *Diuris lanceolata* (Snake Orchid) which was recorded on the Site during the PB survey in October 2005. This species was described by PB as listed as endangered under the EPBC Act at the time of the survey. Contrary to this, the EPBC Act Threatened Species profiles database states that the threatened population of *D. lanceolata* is restricted to Tasmania. Mainland populations formerly known as *D. lanceolata* are now considered to be a separate species *D. chryseopsis* (Bishop, 2000) and are not listed under the TSC Act or EPBC Act.

The local area surrounding the Site consists of agricultural lands that have been previously cleared and used for agricultural purposes since the times of European settlement in the area. Consequently, clearing has resulted in the removal of most of the naturally occurring vegetation, which was generally representative of dry open woodlands and grasslands.

Fauna

Results from the fauna desktop reviews indicate that 21 threatened species listed under the TSC Act and/or the EPBC Act have been previously recorded within the locality. Of these species, 17 are classified as being Vulnerable and four as Endangered under the TSC and/or EPBC Acts. This list of threatened fauna species is presented in Table 2 in **Appendix F**. Review of the habitat requirements of these species allows the assessment of the likelihood of occurrence at the Site. A total of 12 threatened fauna species are considered likely to occur at the Site, all of which are listed as Vulnerable.

A selection of common fauna species were recorded during a previous field survey (PB 2005), including the Common Brushtail Possum (*Trichosurus vulpecular*), Eastern Grey Kangaroo (*Macropus rufus*), Common Wallaroo (*Macropus robustus*) and a variety of generalist and woodland species of bird. Additionally, the previous survey recorded four threatened fauna species. The TSC Act listed Powerful Owl (*Ninox strenua*) was recorded by call identification within 3km of the Marulan Site. Three microchiropteran bat species ('micro-bats') listed as Vulnerable under the TSC Act were recorded by ultrasonic call location during the previous survey (PB, 2005). The Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Little Bent-wing Bat (*Miniopterus australis*) were recorded within 5km of the Marulan Site, whereas the Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*) was recorded on the Marulan Site (Refer to **Appendix F**).

11.3.2 Results of Field Survey

Flora

A total of 91 flora species were identified from the field surveys. The species recorded on the Site are presented in Table 3 in **Appendix F**. None of these species are listed as threatened under either the TSC Act or EPBC Act.

Five vegetation communities were recorded across the study area, including:

- *Tableland Hills Grassy Woodland*: Woodland at the Site occupies approximately 57 ha and contains a well developed canopy layer, with a dense groundcover layer comprising native and exotic grasses and herbs. The shrub layer is sparse to absent. Dominant eucalypt species include *Eucalyptus cinerea, E. rossii* and *E. eugenioides.* This structure and suite of species is characteristic of Tableland Hills Grassy Woodland (Tindall *et al.*, 2004). The groundcover features exotic pasture species and herbs mixed with a reasonable diversity of native grasses (including *Themeda australis, Aristida vagans*, and *Austrostipa scabra* subs *scabra*) and herbs (including *Ajuga australis*, *Geranium spp* and *Crassula sieberiana*). The noxious pasture weed *Nasella trichotoma* (Serrated Tussock) is present, but in lower concentrations than in other communities onsite.
- *Cleared Grassland*: Cleared grassland occupies approximately 46 ha of the Site. These areas have been extensively modified by clearing, the introduction of pasture species and subsequent grazing. Patches of native grasses occur including *Themeda australis* and *Aristida vagans*; however, these are dominated by exotic pasture species including Kikuyu *Pennisetum clandestinum*, and the noxious weed Serrated Tussock. This community contains some native groundcover species including the herbs *Poranthera microphylla, Cheilanthes distans* and *Oxalis perennans*, though these are less abundant than herbaceous weeds such as *Plantago lanceolata* and *Hypochaeris radicata.*
- *Riverbank Forest*: There is a narrow strip of vegetation along both sides of the Wollondilly River for several kilometres of its length in the vicinity of the Site which has been classified as Riverbank Forest community. In the northern portion of the study area the river features broad (50 -100 m wide) banks within steep levee banks rising to the surrounding cleared farmland. This area supports *Casuarina cunninghamiana* Forest with an understorey of herbs and grasses. No shrub layer was present apart from clumps of Blackberry (*Rubus fruticosa* sp. agg.). The understorey contains Serrated Tussock and Kikuyu (*Pennisetum clandestinum*), the native grass Couch (*Cynodon dactylon)*, native herbs including *Dichondra repens* and *Poranthera microphylla* and

exotic pasture weeds including *Sonchus* spp. Within the river channel the exotic weed *Salix spp.* occurred as clumps of trees. *Triglochin procerum* was the most common emergent aquatic plant. Other aquatic species included *Ranunculus inundatus, Baumea* spp. and water lilies (Family Menyanthaceae).

- *Snow Gum Woodland*: There was a small area of Snow Gum *E. pauciflora* woodland near the eastern end of the proposed transmission line which features a moderately dense canopy and a dense grassy understorey dominated by Serrated Tussock. The vegetation is most closely aligned with the Tableland Grassy Box-Gum Woodland of Tindall *et al.* (2004). However, it is noteworthy that Snow Gum vegetation does not qualify as the Box-Gum Woodland EEC. The Scientific Committee determination for this EEC states 'the *Eucalyptus pauciflora* grassy woodlands of the cooler parts of the southern tablelands are not covered by this Determination' (NSW Scientific Committee, 2002).

Endangered Ecological Communities

The predominant vegetation on the Site was classified following the field survey as Tableland Hills Grassy Woodland. No Endangered Ecological Communities (EECs) were identified onsite although floristically, Tableland Hills Grassy Woodland is very similar to Tableland Grassy Box-Gum Woodland, which does form part of the EEC listed under the TSC Act, whereas the former community does not. The community identified on Site is considered to be Tableland Hills Grassy Woodland for the following reasons:

- *Floristics / Canopy Trees.* Dominant eucalypt species include *Eucalyptus cinerea, E. rossii* and *E. eugenioides.* This structure and suite of species is characteristic of Tableland Hills Grassy Woodland (Tindall *et al.* 2004). The key characteristic canopy species of Box-Gum Woodland are white box *Eucalyptus albens*, yellow box *E. melliodora* and Blakely's gum *E. blakelyi*. These species are not present within the Tableland Hills Grassy Woodland community.

- *Existing Data / Mapping*. Reference to the most recent publicly available regional vegetation mapping and report for the area (Tindall *et al.* 2004) indicates that Tableland Hills Grassy Woodland is not part of the Box-Gum Woodland association.

- The canopy species recorded on the Site that comprise the canopy of the Tableland Hills Grassy Woodland (*Eucalyptus cinerea, E. rossii* and *E. eugenioides*) are not listed as 'characteristic' species under the definition of Box-Gum Woodland in the *Final Determination* of the NSW Scientific Committee (2004).

- The Box-Gum Woodland *Identification Guidelines* (NPWS, undated) state that 'Whether the characteristic trees of the Site are (or are likely to have been) White Box, Yellow Box or Blakely's Red Gum'. As noted above, these species are not the characteristic species of the Site, and further, even if the woodland vegetation on the Site was argued to be a degraded form of the EEC, the Site would not be likely to regenerate over time (with or without management actions) to include these species.

Box Gum Woodland is also listed at a national level as 'critically endangered' under the EPBC Act. Review of the relevant guidelines and policy statements from the Commonwealth Department of Environment, Water, Heritage and the Arts indicates that the vegetation on the Site does not meet the definition for '*White box – Yellow box – Blakely's gum woodland and derived native grassland*' (referred to informally as 'Box-gum woodland and derived native grassland'). The guideline clearly states that 'Sites dominated by other tree species that do not have White Box, Yellow Box or Blakely's Red Gum as co-dominants are not considered to be part of the ecological community…'.

On the basis of the above, the vegetation on the Site does not qualify as the 'Box-gum woodland and derived native grassland' EEC listed under the EPBC Act.

Fauna

A total of 86 fauna species have been recorded on the site during the four URS surveys since October 2006, including six species of frog, 57 species of bird, one reptile and 22 native mammals (including 11 micro-bats). These species are listed in Table 4 in **Appendix F,** the majority of which are common and widespread. However, the birds Diamond Firetail (*Stagonopleura guttata*), Gang-gang Cockatoo (*Callocephalon fimbriatum*) and Hooded Robin (*Melanodryas cucullata*), and the micro-bats Eastern Falsistrelle (*Falsistrellus tasmaniensis*) and Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*) all recorded in woodland, are listed as Vulnerable under the TSC Act.

The bird species were recorded during both targeted surveys undertaken within woodland at the Site or opportunistically whilst traversing the Site. They included diurnal woodland, open country and wetland bird species. One nocturnal species, the Southern Boobook Owl was observed by call recognition. One exotic species, the Indian Mynah, was recorded. Woodland bird species observed include the Rufous Whistler, Jacky Winter, Varied Sitella, Chestnut-rumped Thornbill and Dusky Woodswallow. Wetland bird species have been recorded along the Wollondilly River, within other riparian vegetation and on farm dams, including the Little Pied Cormorant, Wood Duck, Eurasian Coot and Chestnut Teal.

A total of 22 native mammal species have been recorded on the Site. These include the Water Rat (*Hydromys chrysogaster*), Sugar Glider *(Petaurus breviceps)*, Common Wombat *(Vombatus ursinus)*, Eastern Grey Kangaroo *(Macropus giganteus)*, Red-necked Wallaby *(Macropus rufogriseus)* and 11 species of micro bats including Lesser Long-eared Bat (*Nyctophilus geoffroyi*), Gould's Wattled Bat (*Chalinolobus gouldii*) and Little Forest Bat (*Vespadelus vulturnus*). Eastern Grey Kangaroos and Common Wombat were observed directly throughout the Site, during all surveys. Red-necked Wallaby was recorded by scat identification. A Water Rat was observed opportunistically in the Wollondilly River, east of the proposed Plant Site. A Sugar Glider was recorded by call identification in woodland during the June 2006 survey. The Site was used for grazing cattle at the time of the surveys. A number of European Rabbits were physically observed across the Site. Scats of the Dog and Red Fox were also observed across the property.

No fauna were observed utilising tree hollows targeted during the stag watching surveys.

One unidentified reptile species was observed.

Six amphibian species (all native frogs) were observed by sight or call identification. *Crinea signifera* (Common Eastern Froglet), *Litoria peronii* (Peron's Tree Frog) and *Limnodynastes dumerilli* (Eastern Banjo Frog) were heard in the vicinity of the Wollondilly River. The Common Eastern Froglet, Peron's Tree Frog, *Limnodynastes tasmaniensis* (Spotted Marsh Frog), *Litoria ewingii* (Brown Tree Frog) and *Uperoloeia laevigata* (Smooth Toadlet) were seen and heard in the vicinity of Dam 1. No threatened frog species were recorded during the surveys.

Fauna Habitats and Resources

Figure 11-1 maps the significant habitat features on Site during the current and previous surveys. The habitat types and features recorded on the Site are described below.

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Tableland Hills Grassy Woodland

The Tableland Hills Grassy Woodland vegetation possesses a well developed canopy layer and a patchy to dense groundcover layer consisting of native and exotic grasses and herbs. The absence of a shrub layer is likely to limit the habitat value of this community for some woodland bird species. The common shrub layer foragers Superb Blue Wren and Red Browed Firetail were observed opportunistically in Wollondilly River Riparian Vegetation (see below) but were not recorded in the woodland targeted bird surveys. This may suggest that woodland on the Site does not provide suitable habitat for this guild of species (Keast *et al.,* 1985).

The groundcover featured exotic pasture species and herbs mixed with a reasonable diversity of native grasses and herbs. Native grasses and herbs are an important food source for many native species, but are reduced in many woodlands and grasslands in NSW by grazing. The woodland on the Site is likely to provide good quality foraging habitat for groundlayer foragers including the threatened species such as the Diamond Firetail.

Mature eucalyptus throughout the woodland provide foraging habitat for native birds and arboreal mammals. The TSC Act listed Gang-gang Cockatoo was observed feeding on *Eucalyptus eugenioides* fruits in the May and June 2007 surveys. Up to four adult birds were observed repeatedly through the northern portion of the Site. Evidence of feeding (chewed fruits) was observed throughout Tableland Hills Grassy Woodland on Site. This suggests that the species was targeting this food resource and that woodland in the study area is significant habitat for the species.

Fibrous barked trees such as *E. cinerea* and *E. eugenioides* throughout the woodland provide habitat resources for the TSC Act listed Brown Treecreeper. Other bark-foraging species, including the White Throated Treecreeper and Varied Sitella, were observed during the October 2006 and June 2007 surveys.

The woodland provides suitable breeding habitat for bird species. Four nests were observed during the October 2006 surveys, belonging to the Spotted Pardalote, Yellow Faced Honeyeater, Jacky Winter and Dusky Woodswallow. The absence of a shrub-small tree layer in this community may limit the number of species for which suitable breeding habitat is present. Suitable resources are present for canopy nesters (including the Jacky Winter observed), trunk nesters (including the Dusky Woodswallow observed) or earth bank nesters (including the Spotted Pardalote observed) (Simpson and Day, 1993; Keast *et al.,* 1985). However there are very limited opportunities for species which require dense undergrowth for nesting, including the TSC Act listed Diamond Firetail.

A number of standing and fallen hollow bearing trees were recorded throughout the Tableland Hills Grassy Woodland. The density of hollows for the area surveyed is approximately 3.6 hollows per hectare. These may provide roosting or nesting habitat for the Gang-gang Cockatoo, native parrot species including the Superb Parrot, arboreal mammals and micro bat species. Four threatened micro-bats have been recorded in the vicinity of the study area, and may utilise these hollows as diurnal roosts.

A number of stags (large, dead trees with hollows) were recorded during the PB survey. A Wedge-tailed Eagle was observed roosting in a stag adjacent to the Wollondilly River. No white wash or regurgitated pellets were detected beneath stags through the remainder of the Site.

There are large amounts of intact fallen timber and intact leaf litter throughout the woodland. These are likely to support a healthy and diverse invertebrate assemblage, which in turn provides good quality foraging habit for birds, reptiles and mammals. The position of large, hollow-bearing fallen timber was recorded and is presented on **Figure 11-1.** Such hollow logs can provide shelter for ground-dwelling native reptiles and mammals.

There are also stands of remnant grassy woodland that feature a highly disturbed understorey with little intact leaf litter and small amounts of fallen timber. The habitat value of these areas for small woodland birds, reptiles and native mammals is likely to be much lower than intact areas of grassy woodland. However these areas did contain large isolated paddock trees, including trees with hollows. These may provide significant habitat for native parrots, woodland birds, arboreal mammals and micro bats. Hollow-bearing trees can provide highly significant roosting habitat when located in extensively cleared landscapes, however in this context it is unlikely that they play this role considering the availability of hollow-bearing trees in intact woodland and forest habitat in close proximity.

Cleared Grassland

Areas of cleared grassland on Site are likely to provide moderate foraging habit for native mammals, particularly given the shelter provided by adjacent woodland and riparian vegetation. However, the moderate to severe Serrated Tussock infestation across the Site limits its value, as Serrated Tussock is poor quality feed. The habitat value of this area for native species is likely to increase if cattle are excluded from the Site as this may favour the regeneration of native herbs and grasses.

Cleared areas contain isolated hollow-bearing paddock trees and stags. These are likely to contain habitat for birds, and potentially for micro bats but may have less value than equivalent habitat located within vegetated areas on Site. Cleared grassland areas are most likely to favour generalist open country bird species, which are typically common.

Serrated Tussock forms thick tussocks and resists grazing by cattle, so may provide shelter for native invertebrates, reptiles and small mammals. Granitic rock outcrops occur in the south and western portions of the Site. These have weathered to form a diverse substrate of boulders and platey fragments which would provide quality shelter greatly increasing the habitat value of grassland in this area.

Clumps of the exotic weeds Blackberry and Hawthorn provide limited areas of shelter, foraging and breeding habitat for woodland bird species, including the Chestnut-rumped Thornbill which was observed nesting.

Woodland margins in the southern portion of the Site feature a greater diversity of native grasses and herbs than found elsewhere in this community. This may increase the value of these areas as habitat for native fauna assemblages, including the TSC Act listed Diamond Firetail, which selectively forages on native grass species.

Riverbank Forest

The Riverbank Forest in the northern portion of the riparian zone occupies a broad area (50-100 m wide) on the river banks. This area may provide significant grazing habitat for large native mammals due to the presence of shelter, water and comparatively succulent grass species including Couch and Kikuyu. The shrub layer was absent apart from clumps of Blackberry (*Rubus fruiticosa*). This community may provide foraging habitat for the threatened species the Gang-gang Cockatoo (*Callocephalon fimbriatum*) and Glossy Black Cockatoo (*Calyptorhynchus lathami*). The Glossy Black Cockatoo is less likely to occur on Site as it typically favours larger-fruited, forest and woodland Casuarinaceae species including *Allocasuarina torulosa* and *A. littoralis*.

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Through the central and southern portion of the riparian zone steep levee banks adjoin the river and support a narrower strip of vegetation. The dense small tree / shrub layer in this area provides shelter for species which utilise adjacent areas of grassland and woodland for foraging. The presence of shelter makes this area better foraging habitat than the Tableland Hills Grassy Woodland. Opportunistic sampling during random meanders through this area recorded large numbers and a diversity of bird species. These included shrub layer foragers, such as the Superb Blue Wren and Red Browed Firetail, which were largely absent from the woodland. Dense vegetation within this community provides quality foraging and breeding habitat for declining woodland birds and may support threatened bird species.

The strip of Riparian vegetation is significant in a regional context due to the connectivity that it provides between other patches of native vegetation along the Wollondilly River.

Snow Gum Woodland

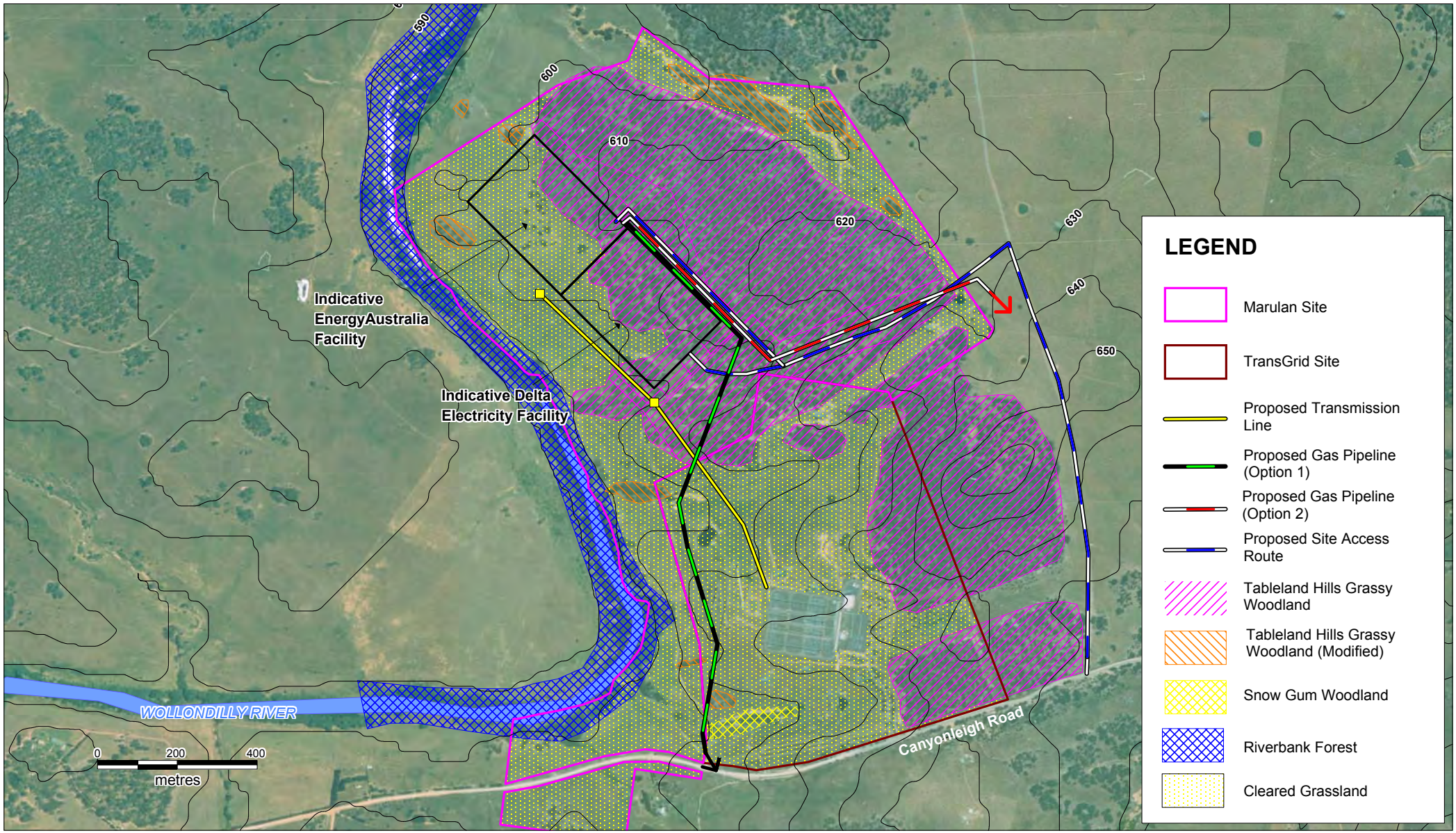
The Snow Gum *E. pauciflora* woodland in the southern edge of the Site features a moderate to dense canopy cover which would provide shelter and foraging habitat for native birds and possibly micro bats. The small size of the patch and absence of a shrubby understorey probably limit its habitat value for declining woodland birds and other threatened species. It is likely to favour common generalist species.

The ground layer was sparse and lacking in leaf litter, rock outcrop and dead wood which may limit its value as habitat for native invertebrates, reptiles and small mammals.

Waterbodies and drainage lines

There are three dams located on the Site: two small dams within the woodland close to the proposed access road and a larger dam downslope from the substation. There are drainage lines downslope of both dams which were dry at the time of the surveys. Both watercourses appear to only carry water immediately after rainfall events and are unlikely to provide significant aquatic habitat. The dams provide significant habitat for wetland birds but are unlikely to support the threatened Blue-billed Duck or Australian Painted Snipe due to their limited size and absence of fringing vegetation. The dams may provide habitat for many frog species due to the presence of macrophytes and natural vegetation in the surrounding area; however, they may not contain specific habitat requirements for the Giant Burrowing Frog, Littlejohns Tree Frog or other threatened frog species.

The locations of significant areas of habitat were recorded with a handheld GPS unit and are presented in **Figure 11-1**.



Source: Delta Electricity, Energy Australia

Client: DELTA ELECTRICITY AND ENERGY AUSTRALIA	Project: MARULAN GAS TURBINE FACILITIES	Title: **VEGETATION COMMUNITIES**
URS	Drawn: AJW; Approved: NB; Date: 14.03.08 Job No: **43177371**; File No: 43177371-064.wor	Figure: **11-1**

11.3.3 Gas Pipeline

Investigations indicate that the Study Area surrounding the proposed corridor consists of land that has been previously cleared and used for agricultural purposes since European settlement in the area. Consequently, clearing has resulted in the removal of most of the naturally occurring vegetation. **Figure 11-2** illustrates vegetation in the area being considered for the gas pipeline. A detailed flora and fauna assessment would be undertaken in support of a separate *Project Application*.

11.4 Impact Assessment – Common Shared Works

11.4.1 Construction Impacts

For the purposes of this assessment it has been assumed that the earthworks are conducted in a single stage, creating a single level pad to accommodate both Facilities. A laydown area for the Facilities would also be located on the Site. Other Common Shared Works include the proposed access road from Canyonleigh Road and transmission line connection to the TransGrid Switchyard. It has been conservatively assumed that the entire 70 m easement for these connections would be cleared. Bulk earthworks for the Common Shared Works on the Site would require clearing of the areas identified in **Table 11-1**. The Facilities within the Site, common infrastructure and Laydown Area have a footprint of approximately 34 ha and would require clearing of up to approximately 22 ha of Tableland Hills Grassy Woodland.

Table 11-1 Vegetation Clearing, Offset and Retention Areas

Area	Tableland Hills Grassy Woodland (ha)	Riverbank Forest (ha)	Cleared Grassland (ha)	Subtotal
Delta Electricity Facility	5.6	0	2.2	7.8
EnergyAustralia Facility	2.2	0	5.6	7.8
Laydown Area	4.3	0	0.0	4.3
Common Infrastructure	9.6	0	4.7	14.3
Construction Footprint (Sum)[1]	**21.7**[1]	**0**	**12.5**	**34.2**
Biodiversity Offset Area	**32.3**[2]	**0**	**6.8**[3]	**39.1**
Other Retained Vegetation	8.9	6.2	32.1	47.2
Total Area within Site[1]	**62.9**[1]	**6.2**	**51.4**	**120.4**[1]

Notes:

1 Includes approximately 2.6 ha of Cleared Grassland within the proposed transmission line easement within the TransGrid site.

2 Comprises 29.9 ha within the Woodland Offset Area and 2.4 ha within the Riparian Rehabilitation Area.

3 Comprises 0.2 ha within the Woodland Offset Area and 6.6 ha within the Riparian Rehabilitation Area.

[1] Includes approximately 2.6 ha of Cleared Grassland within the proposed transmission line easement within the TransGrid site.

Indicative EnergyAustralia Facility

Indicative Delta Electricity Facility

WOLLONDILLY RIVER

PADDYS RIVER

HUME HWY

Legend

- Valve Station
- Buildings (Includes houses and farmsheds)
- Marulan Site Gas Pipeline (Option 1)
- Marulan Site Gas Pipeline (Option 2)
- Sydney to Moomba Gas Main
- Gas Pipeline Corridor
- Marulan Site
- TransGrid Switchyard
- Patches of Native Woodland or Forest
- Scattered and Isolated Paddock Trees
- Dams

Source: Delta Electricity, Energy Australia

Client: DELTA ELECTRICITY AND ENERGYAUSTRALIA

Project: MARULAN GAS TURBINE FACILITIES

Drawn: AJW | Approved: NB | Date: 03.04.08

Job No: **43177371** | File No: 431773711-145.wor

Title: **PROPOSED GAS PIPELINE CORRIDOR**

Figure: **11-2**

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Flora

Development at the Marulan Site would require the clearing of approximately 34.2 ha of vegetation, comprising 21.7 ha of Tableland Hills Grassy Woodland and 12.5 ha of Cleared Grassland (**Table 11-1**). There is approximately 62.9 ha of this community present within the Site. Approximately 32.3ha (51 %) of the woodland would be permanently conserved within the proposed biodiversity offset area, with scattered patches of woodland totalling 8.9 ha (14 %) to be retained elsewhere on the Site (**Table 11-1**). Tindall *et al.* (2004) estimate that approximately 18,800 ha of Tableland Hills Grassy Woodland remains in south-eastern NSW. This community is not currently listed as threatened and no threatened flora species were recorded within the community.

Approximately 12.5 ha of cleared grassland would be removed during construction (**Table 11-1**), with 6.8 ha to be conserved in the offset area and 32.1 ha to remain elsewhere on the Site. No stands of Riverbank Forest would be affected by construction, with around 6.2 ha to remain along the Wollondilly River.

The area traversed by the proposed gas pipeline and transmission lines is dominated by exotic pasture and weed species, with limited diversity and abundance of native species. The proposal is unlikely to have a significant impact on native flora through these areas.

Fauna

Clearing of woodland habitat will result in the loss of nesting, roosting and foraging resources for native fauna. The Project footprint contains a number of habitat features including feed trees, hollow bearing trees, standing and fallen dead timber, and a good coverage of leaf litter and woody debris. Approximately 65 % of the mapped area of this habitat, and associated habitat values, will be retained within the Site. The habitat values of the vegetation surrounding the Site are likely to be equivalent to those within the Site and as such the loss of habitat associated with construction is unlikely to have a significant impact upon local populations of native fauna.

Clearing of woodland at the Site is unlikely to result in significant isolation or fragmentation of habitat. The position of the proposed Delta Electricity Facility and EnergyAustralia Facility footprints is such that contiguity of woodland is maintained in areas adjoining the proposed Facilities. There would be some fragmentation of remaining woodland to the south caused by the proposed access road, gas pipeline and transmission line (Refer to **Figure 11-2**). The gaps created by this common infrastructure are likely to have a minor impact upon the movement of native fauna due to the relatively small area of the disturbance (<20 m). In addition woodland on the Site is already highly fragmented by existing infrastructure including the TransGrid Switchyard, access tracks and transmission line easements.

Approximately 12.5 ha of cleared grassland would be removed during construction of the Project. Habitat values in cleared areas are low and so the construction of the proposed transmission line and gas pipeline within the Site is likely to have negligible impact on ecological values. Where possible, the route of these easements would avoid areas of higher habitat value such as remnant woodland, water bodies, paddock trees and rock outcrop identified in **Figure 11-2**. It is noted that the indicative alignment of the access road and Gas Pipeline Route 1 intersects with Dam 1. The final alignment of this infrastructure should avoid Dam 1, as it contains important habitat for native frogs and other fauna. There is ample room within the proposed infrastructure easements to avoid the dam and appropriate erosion controls should ensure no secondary impacts on aquatic habitat in the vicinity.

Threatened Fauna

Eight threatened species listed as Vulnerable under the TSC Act have either been recorded or are considered likely to occur at the Site (Diamond Firetail (*Stagonopleura guttata*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Hooded Robin (*Melanodryas cucullata cucullata*), Powerful Owl (*Ninox strenua*), and four threatened species of micro-bat: Eastern Falsistrelle (*Falsistrellus tasmaniensis*), the Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and the Little Bent-wing Bat (*Miniopterus australis*)).

Clearing of Tableland Hills Grassy Woodland would remove foraging habitat for these species. Accordingly, assessments pursuant to Section 5A of the EP&A Act (the so-called '*7*-Part Test') for these species were undertaken and are included as **Appendix F**. The results of these tests are summarised below:

- **Gang-gang Cockatoo:** It is possible that the Site supports a viable local population of the Gang-gang Cockatoo which may occur on a temporary or seasonal basis as part of annual migrations and depending on the seasonal availability of food resources. Impacts associated with the proposal are likely to be limited to the loss of potential foraging, roosting and breeding resources. Accordingly the proposed works are not likely to have an adverse effect on the life cycle of these species such that local populations of these species would be placed at risk of extinction. Substantial areas of equivalent grade habitat are available in the local area, including woodland within the Site that would not be impacted by the proposal. Therefore the habitat to be impacted is probably of minor importance to the long-term survival of the species in the locality.
- **Diamond Firetail:** The Diamond Firetail is likely to use foraging resources present on Site, but the absence of a dense, shrubby understorey on the Site means that it is unlikely to comprise breeding habitat. Impacts on the species are likely to be limited to the removal of foraging habitat. Accordingly the proposed works are not likely to have an adverse effect on the life cycle of these species such that local populations of these species would be placed at risk of extinction. The Project would probably constitute a minor impact on the foraging resources available to the Diamond Firetail in this locality as bird species are mobile and would travel to utilise suitable habitats. Significant areas of equivalent grade habitat are available in the local area, including extant woodland within the Site that would not be impacted by the Project. Therefore the habitat to be impacted is probably of minor importance to the long-term survival of the species in the locality.
- **Hooded Robin:** the Site could theoretically support a viable local population of the Hooded Robin, although there is insufficient evidence to support this theory at present. This population may occur on a temporary or seasonal basis during season expansion of a breeding pairs home range or may support breeding pairs during some seasons. The proposed works would not disturb known nesting or roosting sites for individuals, breeding pairs, or local populations of these species. Impacts associated with the Project are likely to be limited to the loss of potential foraging, roosting and breeding resources. Substantial areas of equivalent grade habitat are available in the local area, including woodland within the Site that would not be affected by the Project. Therefore the habitat to be impacted is probably of minor importance to the long-term survival of the species in the locality. Accordingly the proposed works are not likely to have an adverse effect on the life cycle of these species such that local populations of these species would be placed at risk of extinction.

- **Powerful Owl:** The Powerful Owl may utilise foraging habitat in woodland and forest communities across the Site and suitable roosting habitat is present in the tall, dense *Casuarina cunninghamiana* Riverbank Forest where the proposed transmission line crosses the Wollondilly River. No suitable Powerful Owl nesting trees were observed and so there is probably not suitable this species such that local populations of these species would be placed at risk of extinction.
- **Microbats:** four threatened micro-bat species, the Eastern Falsistrelle, Greater Broad-nosed Bat, Eastern Bent-wing Bat and Little Bent-wing Bat were recorded on or within the vicinity of the Site and are likely to utilise foraging habitat in the study area. Potentially suitable diurnal roost sites are present within hollow-bearing trees present throughout the woodland habitats within the Site. The removal or fragmentation of habitat would have a minor impact on the foraging resources available to these species as they are mobile and can travel to utilise suitable habitats. Significant areas of equivalent grade habitat are available in the local area, including extant woodland within the Site that would not be impacted by the Project. These areas are likely to contain equivalent quantities of suitable hollow-bearing trees and other resources. Therefore the habitat to be impacted is probably of minor importance to the long-term survival of the species in the locality.

Mitigating factors considered in determining the significance of potential impacts on the threatened biota listed above included: the limited area of habitat to be impacted; degradation of the Site by weed species and grazing; and availability of suitable habitat in the surrounding area. A Tree Clearance Protocol (Refer to **Section 11.7**) is also recommended to minimise impacts on hollow-dwelling fauna within the Project footprint, which is also likely to mitigate impacts on local populations of these species. The Facilities contractor, prior to commencement on the Site, would prepare detailed construction programs and methods in accordance with a CEMP.

Based on the factors summarised above (and described in detail in **Appendix F**), the proposed works are not likely to impose a significant effect on any threatened species, populations or ecological communities listed under the TSC Act.

Roads and Access

Site access to the Marulan Site would be via Canyonleigh Road. Internal roads would be constructed on the Site to facilitate the movement of construction and operation traffic to the proposed Facilities. Predicted traffic volumes during the construction phase are presented in **Chapter 10**.

Upgrade works to the existing road network would be determined at the detailed design stage. Accordingly, the amount of vegetation clearing, if any, would be determined at that point. Measures would be taken to minimise the removal trees and potential habitat.

Construction traffic may increase the risk of vehicle collisions with fauna utilising habitats along the entrance road and Canyonleigh Road. Collisions within this area are unlikely as ongoing disturbance from construction activities are likely to discourage fauna from using this area. Construction would only occur during daylight hours and so vehicle collisions with macro-fauna are unlikely to correspond to travel periods for species present in the area. Large native animals at risk of collision are predominantly nocturnal or crepuscular (most active at dawn and dusk).

The Wollondilly River and associated riparian vegetation lie in close proximity and downslope of the Project footprint. The CEMP would include safeguards and mitigation measures to minimise potential impacts from additional runoff, erosion and transported sediments (**Section 11.7**). Provided erosion and sediment controls and other mitigation measures outlined in the CEMP are followed then the Project is unlikely to result in significant impacts on these areas.

If the pad is constructed in a staged manner then it is proposed to employ temporary revegetation and/or other soil stabilisation methods to minimise the risk of erosion.

11.4.2 Operational Impacts

The Project involves the construction and operation of two Facilities at the Marulan Site. For the purpose of this assessment the two Facilities have been assumed to be constructed on similar sized pads and have similar operational impacts.

During the operational phase the proposed Facilities would operate as zero-discharge Sites.

Roads and Access

During the operational phase, staff levels would be low and would result in a minor increase in the risk of collisions. A maximum vehicle speed would be set in the OEMP to minimise the risk of fauna collisions.

11.4.3 EPBC Act Matters

No threatened species, ecological communities, migratory birds or other matters of national environmental significance listed under the EPBC Act were recorded during the field surveys on the Site. Consideration of the *Significant Impact Guidelines* (DEH, 2006) indicates that, given the absence of records for threatened species, ecological communities or migratory species listed under the EPBC Act, the Project is not likely to impose a significant impact on any matters of National Environmental Significance (NES). Hence, referral of the proposal to the Commonwealth Department of the Environment, Water, Heritage and the Arts for determination under the EPBC Act is not considered necessary.

11.5 Impact Assessment – Facilities

11.5.1 Construction Impacts

Although the construction footprint for the Facilities has largely been addressed in **Section 11.4**, additional flora and fauna impacts relate to potential for sediment and erosion, site management and night-time lighting.

The sediment and erosion controls employed during the construction of the pad would be maintained during the construction of the Facilities, particularly in and around areas of high traffic. If this is carried out according to the CEMP then the Project is unlikely to result in significant impacts on these areas.

Night-time lighting can potentially discourage habitat use where diffuse light penetrates into adjoining areas of vegetation. Nocturnal foraging regimes could be disrupted and may advantage predators such as cats, dogs and foxes as they are not strictly nocturnal foragers. Nocturnal species' (such as owls, gliders and possums) eyesight is hindered by bright lights, and where they are affected by this, they become more susceptible to predation.

It is assumed construction would occur during daylight hours and so it is unlikely that large floodlights would be required during the construction phase. It is likely that some lighting may be required for emergencies, maintenance or security. This lighting would be designed as 'down lights' and not spill outside the area directly disturbed by the Project footprint.

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11.5.2 Operational Impacts

As noted above, night-time security or operational lighting can potentially discourage habitat use.

It is likely that some lighting may be required for emergencies, maintenance or security. This lighting would be designed as 'down lights' and not spill outside the area directly disturbed by the development footprint.

Due to the fact that the Facilities will have a shared pad, it should also be noted that for each of the Facilities, vegetation may also need to be cleared for an approximately 10 m -15 m fire protection zone around each structure. Bushfire management is discussed further in **Chapter 16**.

11.6 Impact Assessment – Gas Pipeline

An impact assessment of the proposed gas pipeline can not be undertaken without adequate field investigations. Such investigations would need to be completed to support Project Approval for these works. Depending on engineering constraints, variations in the route alignment would be considered to avoid areas of high conservation value.

11.7 Mitigation Measures

The following mitigation measures are identified in order to avoid or minimise potential impacts on flora and fauna species from the proposed Facilities. No mitigation measures for the proposed gas pipeline are presented as its potential impacts were not able to be assessed.

11.7.1 Environmental Management Plan

An Environmental Management Plan (EMP) would be developed for the construction and operational phases of the proposal and would include measures for the minimisation or avoidance of impacts on native flora and fauna. An overview of the impact mitigation and environmental management measures recommended for flora and fauna is provided below. The EMP would contain further details regarding these measures, including performance indicators, timing and responsibilities.

11.7.2 Tree Fauna Management

Construction of the Facilities would require the removal of potential habitat trees (>40 cms diameter or any trees with hollows). Further, nesting birds were observed in the development footprint during field surveys and would potentially occupy the Site during construction. Due care during clearing is recommended to reduce direct impacts to any tree dwelling fauna species which may be utilising the area. The CEMP should detail procedures for a pre-clearance survey and fauna management including the following points:

- trees should be monitored for fauna before and during clearing operations;
- trees with resident fauna should be avoided as far as is practicable;
- hollow-bearing trunks and branches should be carefully sawn and placed intact in adjacent areas of native vegetation; and
- replacement habitat, such as nest boxes, should be provided where habitat trees are to be removed.

A detailed pre-clearance survey by qualified ecologists would be required prior to development of the Site. This would involve:

- diurnal searches for birds, nests and roosts;
- active searches for reptiles, including checking of woody debris within the development footprint,
- active searches for micro bats, including checking under exfoliating bark; and
- nocturnal surveys, including stag-watching of identified habitat trees, specifically focusing on observing use of trees by micro bats.

This survey would focus on locating individuals, and especially roosts of threatened species.

If nests or nestlings of threatened species are observed within, or close to, the development footprint then construction should be postponed until the nestlings have hatched and fully-fledged. If construction constraints mean that this delay is not practicable then DECC should be consulted to determine if relocating the species is acceptable.

11.7.3 Groundcover Clearance Protocol

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 CEMP. It is recommended that the protocol involve the following steps:

- remove large woody debris using excavator grabs or manual handling if practicable (raking);
- place intact large woody debris within adjacent areas of intact vegetation;
- scrape and stockpile leaf litter and topsoil separately from deeper fill material; and
- re-use leaf litter and topsoil in rehabilitation works.

11.7.4 Site Management

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

- set maximum speed limits during construction and operation traffic onsite to reduce fauna road fatalities;
- limit vehicular and personnel entry into retained vegetation (including offset areas) during construction and operation through temporary exclusion fencing during construction, locating access roads and paths to avoid biodiversity areas and use of signage where necessary; and
- employing down-lights and motion sensor lighting in order to reduce light spill and the associated secondary impact on nocturnal fauna species potentially utilising the adjoining vegetation.

11.7.5 Exclusion of Grazing

Fencing would be installed to exclude grazing by cattle as a partial offset against impacts from development at the Site and associated clearing of natural vegetation. This is likely to increase the habitat value of intact vegetation and may aid the regeneration of cleared areas and degraded remnants. Exclusion of grazing improves the growth of many native herbs and grass species which are important feed species for woodland birds and other native animals.

11.7.6 Weed and Pest Management

A Weed and Pest Management Plan would be undertaken as part of the EMP for the Site. Active control of feral animals, such as the Red Fox and European Rabbit, and noxious weeds, such as Blackberry and Serrated Tussock, would be required during and after construction.

To limit the spread of weeds into remnant vegetation during construction, intact areas would be fenced. This would be done prior to construction, restricting access by construction crew and machinery to remnant vegetation. Additionally, stockpiles of fill would not be placed in areas of remnant vegetation but instead in adjacent cleared grassland.

11.7.7 Bushfire Management

Where practicable, an Asset Protection Zone would be included in the detailed design, approximately 10 m to 15 m wide depending on the applicable Site boundary. This would assist infrastructure protection but may also play a mitigation role by minimising the risk that the development would increase the natural fire regime.

A Bushfire Management Plan would be prepared. This would consider the natural fire regimes and ecological values of surrounding vegetation and balance this with the need for Hazard Reduction burns. Further assessment of bushfire management is presented in **Chapter 16**.

11.7.8 Soil Erosion / Runoff

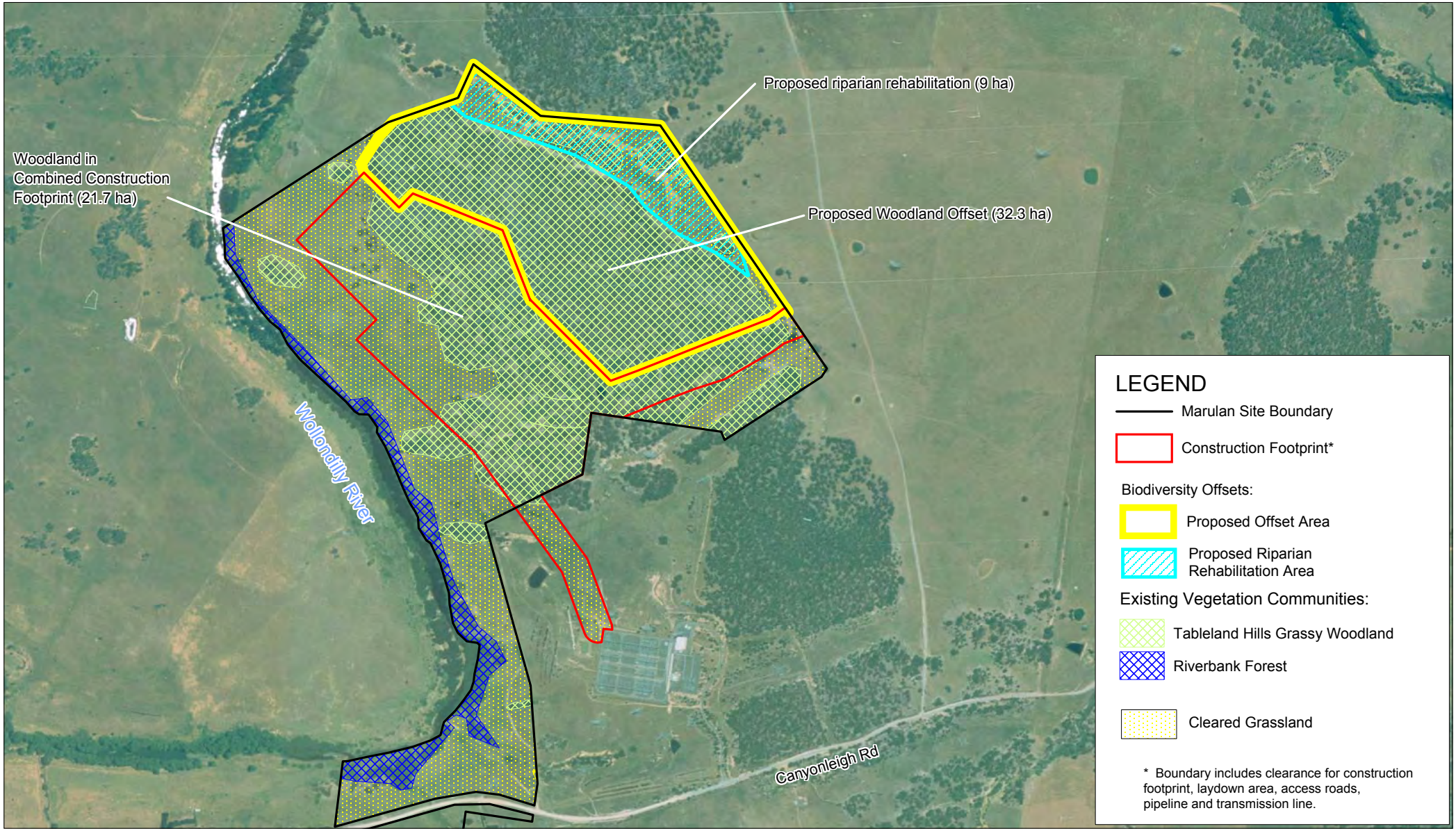
The CEMP would formulate safeguard measures to reduce soil erosion and pollutant runoff during both the construction and operational phases. Particular areas of concern are: Dam 1 and the drainage line downslope of the proposed access road; the dam and drainage line east of the TransGrid switchyard; and the west-facing slope adjacent to the Facilities footprint, which drains to the Wollondilly River.

11.7.9 Biodiversity Offsets

The proposed offset strategy recognises the scale and importance of the impact on the woodland and adopts the DECC principles for offsets. The key features of the strategy include:

- a woodland offset area, involving permanent conservation of a 32.3 ha portion of land that contains Tableland Hills Grassy Woodland; and
- a riparian rehabilitation area of 9 ha, located along a degraded drainage line in the northern parts of the Site.

Proposed offset areas are presented on **Figure 11-3**.



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metres

Source: Delta Electricity, Energy Australia

Client: DELTA ELECTRICITY AND ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITIES		Title: **PROPOSED OFFSET AREAS**
URS	Drawn: TE	Approved: BH	Date: 07.02.08
	Job No: **43177371**	File No: 43177371-178.wor	Figure: **11-3**

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Woodland Offset Area

The proposed woodland offset area contains 32.3 ha of Tableland Hills Grassy Woodland (**Figure 11-3**). The woodland within the proposed offset adjoins and is contiguous with woodland within the development footprint. Hence, the structure, species composition, density of trees with hollows and condition of the offset area are equivalent to woodland within the proposed construction footprint. The offset area also contains equivalent quantities of habitat resources such as feed trees, hollow bearing trees, standing and fallen dead timber, leaf litter and woody debris. It is likely to provide habitat for the threatened fauna species recorded on the Site and surrounding areas.

The understorey vegetation within the proposed offset area is patchy and of low density, probably due to historic grazing of the Site. It is likely that the condition of the vegetation would improve with the exclusion of grazing. Accordingly fencing and conservation of this area as a biodiversity offset is likely to improve the biodiversity value of the area over time. Additional management actions may achieve further conservation gains (see below).

Riparian Rehabilitation Zone

The other key offset is the conservation and rehabilitation of degraded riparian along the drainage line in the northern portion of the Site (shown as the Riparian Rehabilitation Zone on **Figure 11-3**). The riparian area contains approximately 6.6 ha of cleared grassland and 2.4 ha of highly modified woodland. The drainage line currently features severe gully erosion and adjacent cleared land is also seriously eroded. This is probably causing ongoing sedimentation and degradation of aquatic habitat in the Wollondilly River downstream. It is recommended that a rehabilitation program be undertaken within this area.

The rehabilitation of the zone would have an emphasis on controlling the gully erosion that is currently evident. Measures proposed include erosion control, complementary plantings, weed control, habitat enhancement and stock fencing. Plantings should be extended to bridge cleared areas between the proposed woodland offset area and Disturbed Woodland along the drainage line. This would provide an important linkage between the offset area, woodland to the north of the Site, and the riparian vegetation along the drainage line. Details of the rehabilitation program would be included in the EMP for the proposed works.

The Maintain or Improve Test

The DEC (2005) guidelines identify matters that are relevant to the assessment of impacts to threatened species, populations or ecological communities, or their habitats, arising from a development proposal assessed under Part 3A. A key principle presented in these guidelines is that proposals should maintain or improve biodiversity values (i.e., there is no net impact on threatened species or native vegetation). Where impacts cannot be avoided or mitigated then it is necessary to identify a suitable biodiversity 'offset' in order to maintain or improve biodiversity values.

This application of the 'maintain or improve' test to the proposal is summarised in **Table 11-2**.

Table 11-2 Comparison of Biodiversity Impacts and Offsets

Potential Impacts	Mitigation	Offsets
• Permanent removal of 21.7 ha of Tableland Hills Grassy Woodland during construction • Permanent loss of fauna habitat features (hollow-bearing trees, logs, leaf litter, ground debris, rocks and other resources) • Loss of 21.7 ha of threatened fauna species habitat	• Retention of fallen timber (salvage of selected felled trees in development footprint) • Temporary exclusion fencing during construction • Timing of construction to avoid breeding seasons of resident fauna (where practical) • Retention of woodland on other parts of the Site; • presence of similar woodland in the locality • Pre-clearing surveys for (and salvage of) resident native fauna • Installation of nest boxes for displaced arboreal fauna located in the development footprint	• Maintenance of woodland biodiversity values through permanent conservation of 32.3 ha of Tableland Hills Grassy Woodland. Land portion to be re-titled (with VCA or equivalent) for this purpose in perpetuity. • Permanent conservation of fauna habitat features (hollow-bearing trees, logs, leaf litter, ground debris, rocks and other resources) equivalent to those in impact area. • Improvement in biodiversity values through ongoing management of woodland offset area. Stock-proof fencing, retention of fallen timber, weed control, erosion control, feral animal control. • Rehabilitation of 9 ha of riparian vegetation and adjoining cleared land in Riparian Rehabilitation Zone. Creation of vegetated corridor connecting offset area to nearby woodland stands and adjacent riparian zone.

The biodiversity offset package is proposed as a means to ensuring that construction and operation of the proposed Facilities maintains or improves biodiversity values at the Site. The offset will protect and conserve, in perpetuity, threatened species habitats, vegetation types, habitat types and landscape features similar or equivalent to those found within the development footprint. Moreover, the proposed offset package will improve biodiversity values at the Site due to the following:

- the woodland offset area is larger than the area of woodland impacted by the Project;
- ongoing management of the offset area will improve its condition and biodiversity values;
- rehabilitation of the degraded drainage line in the northern portion of the Site will provide substantial improvements in the biodiversity values of riparian and aquatic habitats; and
- rehabilitation of the riparian corridor will also enhance corridor links between the woodland offset and similar woodland stands adjoining the Site to the north.

On the basis of the assessment, the proposed offset is consistent with the DECC guidelines for offsets and meets the key criterion for like-for-like trade-offs of biodiversity values. Adoption of the offset would adequately compensate for the loss of threatened species habitat associated with the Project and maintain biodiversity values.

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Ongoing management of the offset area would be required to comply with the DECC (2006a) guidelines and to maintain or improve biodiversity values. Management actions would include, as a minimum:

- exclusion of grazing through fencing;
- weed removal and control;
- erosion control;
- retention of selected fallen timber, hollow logs, leaf litter, rocks and other habitat resources;
- maintenance and monitoring of natural surface water quality and flows;
- control of feral animals, where appropriate and practical; and
- annual monitoring and reporting on biodiversity, results of management actions undertaken and general condition of the Site.

Full details of the proposed management regime would be included in a Vegetation Management Plan that would be included in the Environmental Management Plan for the Site.

Table 11-2 Summary of Mitigation Measures

Mitigation Measures	Implementation of mitigation measure		
	Common Shared works	Facilities	Gas Pipeline
As part of the Environmental Management Plan, prepare and implement a Vegetation Management Plan which complies with the DECC (2006a) guidelines.	✓ (Cons. & Ops)	✓ (Cons. & Ops)	
Management actions would include the implementation of an offset strategy and include measures (as appropriate) such as: • exclusion of grazing through fencing; • weed removal and control; • erosion control; • retention of fallen timber, hollow logs, leaf litter, rocks and other habitat resources; • installation of nest boxes for displaced arboreal fauna (if required); • maintenance and monitoring of natural surface water quality and flows; • control of feral animals, where appropriate and practical; • timing construction to recognise breeding seasons of resident fauna (where practical); • setting low maximum speed limits to reduce fauna road fatalities; • limiting vehicular and personnel entry to adjacent vegetation through appropriate fencing; and • using down-lights and motion sensor lighting in order to reduce impacts on fauna species using woodland.	✓ (Planning, Cons. & Ops)	✓ (Planning, Cons. & Ops)	

Mitigation Measures	Implementation of mitigation measure		
	Common Shared works	Facilities	Gas Pipeline
Implement an offset strategy with key measures such as: • maintenance of woodland biodiversity values through permanent conservation of approximately 32.3 ha of Tableland Hills Grassy Woodland. Land portion to be re-titled (with VCA or equivalent) for this purpose in perpetuity; • rehabilitation of 9 ha of riparian vegetation and adjoining cleared land in Riparian Rehabilitation Zone. Creation of vegetated corridor connecting offset area to nearby woodland stands and adjacent riparian zone; and • temporary exclusion fencing of offset area during construction.	✓ (Cons. & Ops)	✓ (Cons. & Ops)	
The CEMP should detail procedures for a pre-clearance survey and fauna management and groundcover clearance to reduce direct impacts to tree dwelling fauna and minimise impacts from clearing of vegetation.	✓ (Cons.)		
A Weed and Pest Management Plan would be prepared as part of the EMP for the Site, which would aim to actively control feral animals and noxious weeds.	✓ (Cons. & Ops)	✓ (Cons. & Ops)	
The CEMP would formulate safeguard measures to reduce soil erosion and pollutant runoff for the Site particularly for waterbodies.	✓ (Cons. & Ops)	✓ (Cons. & Ops)	
Disturbed sites would be quickly revegetated or covered with a non-erodable surface following construction.	✓ (Cons.)	✓ (Cons.)	
Further assessment would be undertaken of the gas pipeline route during the Project Approval phase for that component. Depending on engineering constraints, variations in the route alignment would be considered to avoid areas of high conservation value, where possible.			✓ (Design)
A CEMP would be developed to address the construction of the gas pipeline. It would also address revegetation of cleared areas following construction of the pipeline.			✓ (Cons.)