

# Ecological Assessment Report FV18-03 (Yebna)

Date	Rev	Reason For Issue	Author	Checked	Approved
10/02/2014	A	Draft	LS	PB/SL	EK
20/02/2014	0	Issue for use	LS	SL	EK

## Contents

Abbreviations.....	4
1. Introduction .....	6
1.1. Project Description.....	6
1.2. Scope and Purpose.....	6
2. Site Location.....	7
3. Methodology.....	7
3.1. Desktop Assessment .....	7
3.2. Field survey methodology.....	8
3.2.1. Water .....	9
3.2.2. Land.....	9
3.2.3. Fauna.....	10
3.2.4. Survey Limitations.....	10
4. Results and discussion .....	11
4.1. Water .....	11
4.1.1. Referable Wetlands.....	11
4.1.2. Lakes.....	11
4.1.3. Springs.....	11
4.1.4. Watercourses .....	11
4.2. Land.....	13
4.2.1. Threatened Ecological Communities .....	13
4.2.2. Environmentally Sensitive Areas (ESAs).....	13
4.2.3. Regional Ecosystems (Biodiversity status).....	13
4.2.4. Vegetation Communities .....	14
4.2.5. Essential Habitat Mapping .....	17
4.2.6. MNES and EVNT Flora Species .....	17
4.2.7. Type A Restricted Plants .....	17
4.3. Fauna.....	18
4.3.1. Fauna Habitat Values of the Site.....	18
4.3.2. MNES and EVNT Fauna Species .....	19
4.3.3. Fauna Habitat Assessment for MNES and EVNT Fauna Species .....	20
4.3.4. Koalas .....	21

4.3.5.	Pest Fauna Species Observed on Site .....	22
4.4.	Ecosystem functionality .....	22
5.	Summary and Recommendations .....	23
5.1.	Summary .....	23
5.2.	Recommendations .....	24
6.	Reference Documents.....	24
6.1.	Project References .....	24
6.2.	Other Reference Documents .....	25
7.	Attachments.....	26
	<b>Attachment 8.1 - Ecological Assessment Area .....</b>	<b>27</b>
	<b>Attachment 8.2 - Quaternary Data Sheets .....</b>	<b>28</b>
	<b>Attachment 8.3 - DEHP Referable Wetlands Mapping .....</b>	<b>37</b>
	<b>Attachment 8.4 - DEHP Vegetation Management Supporting Map.....</b>	<b>38</b>
	<b>Attachment 8.5 – Flora and Fauna Species Lists .....</b>	<b>39</b>
	<b>Attachment 8.6 - Habitat Assessment and Likelihood of Occurrence of MNES and EVNT Species</b> <b>.....</b>	<b>44</b>

## Abbreviations

Abbreviation	Definition
ATP	Authority To Prospect
AVPA	Arcadia Valley Project Area
CG	Coordinator-General
CG Report	Coordinator-General's evaluation report for an environmental impact statement Gladstone Liquefied Natural Gas - GLNG project. May 2010.
CSG	Coal Seam Gas
CDZ	Construction Disturbance Zone
DERM	Department of Environment and Resource Management
DEHP	Department of Environment and Heritage Protection
DOTE	Department Of The Environment
E	Endangered
EA	Environmental Authority
EMP	Environmental Management Plan
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPBC Approval	EPBC Act Approval dated 22 October 2010 in respect of referral EPBC No 2008/4059
ESA	Environmentally Sensitive Area
EVNT	Endangered, Vulnerable and Near Threatened species under the <i>Nature Conservation Act 1992</i>
Field MP	Field MP Field Management Procedures
FMP	FMP Fauna Management Plan
FPA	Fairview Project Area
GTP	Gas Transmission Pipeline
GIS	Geographic Information System
GLNG	Gladstone Liquefied Natural Gas
GLNG ESC Manual	GLNG Project Upstream Activities Erosion and Sediment Control Manual
GPS	Global Positioning System
GBR	Great Barrier Reef
HVR	High Value Regrowth

LC	Least Concern
LNG	Liquefied Natural Gas
M	Migratory
MNES	Matters of National Environmental Significance
NC Act	Nature Conservation Act 1992
NT	Near Threatened
OC	Of Concern
PL	Petroleum Lease
PPL	Petroleum Pipeline Licence
PWMP	Pest and Weed Management Plan
QLD	Queensland
QWP	Queensland Wetlands Program
RE	Regional Ecosystem
RVMM	Regulated Vegetation Management Map
SEVT	Semi-evergreen Vine Thicket
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SSMP	Significant Species Management Plan
TAR	Type A Restricted Plant
TARPSMP	Type A Restricted Plant Species Salvage Management Plan for the Coal Seam Gas Fields
TEC	Threatened Ecological Community
The Project	The GLNG Project
The Protocol	The Environmental Protocol for Constraints, Planning and Field Development
V	Vulnerable
VM Act	<i>Vegetation Management Act 1999</i>
VMSM	Vegetation Management Supporting Map

# **1. Introduction**

## **1.1. Project Description**

The Gladstone Liquefied Natural Gas (GLNG) Project (the GLNG Project) involves the construction and operation of coal seam gas fields (CSG Fields) in the Bowen and Surat Basins, a gas transmission pipeline (GTP) and an LNG liquefaction and export facility (LNG Facility) in Gladstone, Queensland. The CSG field's component of the Project is operated by Santos Limited (Santos) on behalf of the GLNG joint venture.

The Commonwealth Minister for the Department of the Environment (DOTE) (formerly the Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC) granted conditional approvals to the Project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 22 October 2010. These include approval no. 2008/4059 which relates to the CSG Fields component of the Project (EPBC Approval).

The evaluation report for the Project under the *State Development and Public Works Organisation Act 1971* (Qld) (SDWPO Act) was prepared by the Co-ordinator General and published in May 2010 (CG Report). The CG Report included an evaluation of the CSG Fields. The development of the CSG fields will be undertaken pursuant to petroleum authorities under the *Petroleum and Gas (Production and Safety) Act 2004*, and the *Petroleum Act 1923*, environmental authorities under the *Environment Protection Act 1994* (Qld) (EP Act), the EPBC Approval and in accordance with the requirements of the *Nature Conservation Act 1992* (Qld) (NC Act).

## **1.2. Scope and Purpose**

This report specifically outlines the survey methods utilised and the results of a preclearance ecological survey of a proposed well lease pad and access track referred to as FV18-03 on the property identified as Yebna.

The requirement to conduct preclearance ecological surveys of proposed disturbance areas has arisen from environmental conditions required by relevant Commonwealth and State authorities. More specifically DOTE requires the proponent to conduct all activities in accordance with conditions outlined in EPBC Act Approval 2008/4059 and the Queensland Department of Environment and Heritage Protection (DEHP) requires preclearance surveys to be conducted in accordance with the relevant project area Environmental Authority (EA). The FV18-03 pre-clearance ecological survey has been conducted in accordance with the Fairview Project Area (FPA) Environmental Authority (EA) as current at the time of the survey.

## 2. Site Location

The lease site FV18-03 is located at 715084E, 7148002N on Lot 2 Plan AB247 approximately 58km east – northeast of Injune, Queensland. The location of the Site is illustrated in Figure 1 - Locality Plan.



Figure 1 – Locality Plan

## 3. Methodology

### 3.1. Desktop Assessment

Prior to the field investigations, a preliminary desktop assessment was undertaken. This information was used to inform the field survey as well as identifying target species that may inhabit the area.

The following Santos GIS layers were included in the desktop assessment:

- **Regional Ecosystem and Remnant Map (Biodiversity status) Version 7.0;**
- **High-value Regrowth Vegetation Version 2.1;**
- **Essential Habitat Mapping Version 2.1**
- **EPBC Threatened Ecological Communities (TECs);**
- **Threatened Fauna Habitat (“Constraints Fauna” layer);**
- **Herbarium Records Database of Specimens (HERBRECS);**
- **Referable Wetlands (including High Ecological Significance (HES) Wetlands, HES Wetlands in Great Barrier Reef (GBR) Catchments and General Ecological Significance (GES) Wetlands;**
- **Wetlands defined under the Queensland Wetlands Program(QWP);**
- **Watercourses “Ordered drainage”;**
- **Hydrology waterbodies (i.e. lakes);**
- **Springs; and**
- **Aerial photography.**

In addition, the following mapping, databases and other sources were included in the desktop assessment:

- **Vegetation Management Supporting Map;**
- **Biodiversity Status of Pre-clearing Vegetation (spatial dataset V.2009);**
- **Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Database.** The EPBC Act Protected Matters search was conducted for a 5 km radius surrounding coordinates 715084E and 7148002N;
- **Wildlife Online.** A Wildlife Online Database search was conducted for a 5 km radius surrounding coordinates 715084E and 7148002N;
- **Koala Habitat Mapping** under the *Nature Conservation (Koala) Conservation Plan 2006* “the Koala Plan”;
- **Significant Species Management Plan.** A review of General/Indicative and Essential Microhabitat in the SSMP for significant fauna and flora species identified during database searches was undertaken; and
- **Existing reports and previous studies.**

### 3.2. Field survey methodology

The survey was undertaken on the 12<sup>th</sup> December 2013 and 13<sup>th</sup> December 2013 by Santos Senior Ecologist Peter Black and Santos Ecologist Lincoln Smith (Commonwealth approved terrestrial (flora and fauna) ecologists).

Table 1 presents the ecological values surveyed within the “Construction Disturbance Zone (CDZ)” and relevant buffer distances (as stipulated in the EA) measured from the CDZ. The CDZ and associated buffers are hereafter collectively referred to as “the Site”. The CDZ and associated buffers are illustrated in Attachment 8.1.

A GPS equipped Motion J3500 Tablet was used to record the spatial locations of significant ecological values including threatened species<sup>1</sup>, habitat features and Type A Restricted (TAR) Plants in accordance with Santos Drilling and Completions Methodology.

Table 1 – Required Assessments

Ecological Assessments	Construction Disturbance Zone (CDZ)	Buffer	Buffer Size
<b>Water</b>			
Watercourses (Water Act)	Yes <sup>3</sup>	Yes	100m
Referable Wetlands	Yes	Yes	200m
Lakes	Yes	Yes	200m
Springs	Yes	Yes (within 200m)	200m
<b>Land</b>			

<sup>1</sup>Threatened species are species of flora or fauna listed under the *Nature Conservation Regulation 2000* or the *Environment Protection and Biodiversity Conservation Act 1999*.



Threatened Ecological Communities (TECs)		Yes	Yes	200m
Environmentally Sensitive Areas (ESAs)	Category A ESA	Yes	Yes	200m
	Category B ESA	Yes	Yes	200m
	Category C ESA	Yes	Yes	200m
Regional Ecosystems (REs)		Yes	Yes (Endangered and Of Concern REs only)	200m
Vegetation Communities (quaternary assessment)		Yes	No	N/A
EVNT Flora Species (NC/EPBC Acts)		Yes <sup>4</sup>	Yes	200m
Declared Weeds		Yes	No <sup>2</sup>	100m
Type A Restricted Plants		Yes	No	N/A
Impacts on Ecosystem functionality		Yes	No	N/A
Soils (Dispersive or highly erodible)		Yes	No	N/A
<b>Fauna</b>				
Habitat Values		Yes	No	N/A
EPBC Fauna Habitat		Yes	Yes <sup>1</sup>	200m
Koala Habitat		Yes	Yes	200m
Breeding places		Yes	Yes	200m
Fauna Observations		Yes	Yes	200m

\* Comment on likelihood of area to support EPBC fauna based on general observations on the presence of habitat features etc.

\*\* Report any obvious features likely to require mitigation. Detailed assessment not required.

\*\*\* If a watercourse is present and proposed infrastructure will create a barrier to fish movement a Waterway Barrier Works Permit may be required.

### 3.2.1. Water

During the field assessment, all mapped watercourses, referable wetlands, lakes and springs were field verified. Mapped watercourses were field verified in accordance with the definition of a watercourse under the *Water Act 2000* as stipulated by the EA, with mapped watercourses being field verified as either a watercourse or drainage feature.

Mapped referable wetlands were field verified in accordance with the definition of a wetland under the Queensland Wetlands Program as stipulated by the EA. Mapped wetlands were field assessed in accordance with the *Santos GLNG Upstream Procedure for Conducting Wetland Assessments*. Mapped lakes and springs were field verified in accordance with the definition in the EA.

### 3.2.2. Land

All Category A, B and C Environmentally Sensitive Areas (ESAs) as defined by the Fairview EA and mapped within 200m of the CDZ were field assessed. Vegetation communities within the CDZ were also field assessed. All vegetation communities within the CDZ and Endangered and Of Concern

regional ecosystems (REs) that are classed as Category B and C ESAs within the Site were field assessed at a quaternary level of detail (as per Nelder *et. al.*, 2012). The Santos Quaternary Data Sheet (see Attachment 8.2) was used to record data representing each vegetation community within the CDZ. Data collected included information on soils, habitat value and ecosystem functioning as stipulated in the relevant EA conditions. Where applicable, sufficient data was captured to confirm mapped vegetation community polygons in accordance with regional ecosystem (biodiversity status) and EPBC Threatened Ecological Community (TEC) criteria.

In order to capture the diversity of flora of the Site, the area was slowly traversed and searched for the presence of threatened flora species, Type A restricted plants, and/or flora species identified by the desktop assessment. Where threatened flora were identified within the CDZ, these flora were quantified and the spatial locations were recorded. A list of observed flora along with representative photographs of each observed community was recorded within the Site.

### 3.2.3. Fauna

Fauna were recorded opportunistically in association with the vegetation survey. All fauna present was recorded through direct observation and/or through call verification.

Where applicable, ground searches were undertaken throughout the Site using the following methods:

- active searches for cryptic fauna (such as reptiles) via methods such as turning over logs, disturbing woodpiles, lifting loose bark on trees, investigating hollow logs and disturbing leaf litter;
- tracks, scats, animal remains, movement pathways, feeding signs and any other traces of animal presence were recorded when observed; and
- trees were closely observed for scratch marks, nests and hollows to determine their potential value as habitat.

The SSMP describes “General / Indicative” and “Essential microhabitat” for numerous terrestrial and migratory fauna species listed under the EPBC Act and NC Act that may occur at times within the CSG fields. The field survey undertaken on Site considered the habitat requirements of these and other significant species identified during the desktop assessment. In addition, koala habitat as defined under the *Nature Conservation (Koala) Conservation Plan 2006* was field assessed.

### 3.2.4. Survey Limitations

Ecological surveys often fail to record all flora and fauna species present within a site due to a variety of reasons, particularly the seasonality of the survey. In this context, it is noted that some flora species do not persist over all seasons, and some flora species are more prominent in certain seasons when flowers and/or fruits are produced.

In addition, the limited time spent on Site, the scope of the fauna survey (i.e. no trapping and no nocturnal survey) and the time of day the survey was undertaken (birds are generally more active at dawn and dusk, however the field assessments were undertaken between approximately 8am and 3pm,) all limit the overall survey effort and associated species detected. The assessment of the Site was limited to a 2 hour and a 4 hour diurnal survey over two consecutive days and therefore nocturnal and cryptic species were highly unlikely to be detected. Furthermore, it is to be noted that it was not within the current scope of this project to conduct a dedicated fauna assessment, but

rather to assess the fauna habitat values of the Site based on ecological characteristics of the vegetation communities.

## **4. Results and discussion**

### **4.1. Water**

#### **4.1.1. Referable Wetlands**

##### Desktop Assessment

A map of referable wetlands sourced from the DEHP shows no referable wetlands are located within the Site (Attachment 8.3). The nearest referable wetland is a GES wetland, mapped as a spring, approximately 5.6km to the northwest of the Site.

##### Field Assessment Results

Consistent with the desktop assessment, the field ecological assessment verified the absence of referable wetlands within the Site. The proposed activities are unlikely to have an impact on any GES and HES wetlands due to the distance between these wetlands and the proposed CDZ.

#### **4.1.2. Lakes**

##### Desktop Assessment

A desktop review of the Santos GIS database (source: Geoscience Australia 250k) indicated there are no lakes (hydrology waterbodies) in and around the Site. The nearest lake occurs approximately 7km north of the Site.

##### Field Assessment Results

Consistent with the desktop assessment, the field ecological assessment verified the absence of lakes on the Site.

#### **4.1.3. Springs**

##### Desktop Assessment

A desktop review of the Santos GIS database (source: DERM 2011) indicated there are no springs in and around the Site. The nearest spring occurs approximately 5.6km to the northwest of the Site.

##### Field Assessment Results

Consistent with the desktop assessment, the field ecological assessment verified the absence of springs within the Site.

#### **4.1.4. Watercourses**

##### Desktop Assessment

Three mapped stream order 1 (SO1) watercourses traversed the CDZ as illustrated in Attachment 8.1. No other watercourses were mapped within the CDZ or within 100m of the CDZ.

#### Field Assessment Results

The field ecological assessment verified that each of the mapped SO1 watercourses satisfied the definition of a drainage feature under the *Water Act 2000*, that being:

**drainage feature** means a natural landscape feature, including a gully, drain, drainage depression or other erosion feature that—

- (a) is formed by the concentration of, or operates to confine or concentrate, overland flow water during and immediately after rainfall events; and
- (b) flows for only a short duration after a rainfall event, regardless of the frequency of flow events; and
- (c) commonly, does not have enough continuing flow to create a riverine environment.

In addition, the mapped watercourses did not:

- have defined banks and beds (cattle intrusion has compromised the bank structure); and
- support water favoring riparian vegetation (plant species composition was consistent with the surrounding environs and did not adequately exhibit water-favoring riparian vegetation); and
- demonstrate it was capable of flowing other than during and immediately after a rainfall event.

Photo plates 1 and 2 illustrate two of the mapped stream order 1 watercourses, considered to be a drainage feature.



Plate 1 – Drainage feature (Community 2)



Plate 2 – Drainage feature (Community 1)

## **4.2. Land**

### **4.2.1. Threatened Ecological Communities**

#### Desktop Assessment

Commonwealth Matters of National Environmental Significance (MNES) identified by a search of the Protected Matters Database using a 5 kilometre buffer around the Site included three Threatened Ecological Communities (TECs). No TECs were identified by the desktop assessment which included an analysis of RE mapping as occurring on Site. The nearest mapped TEC - Brigalow *Acacia harpophylla* dominant and co-dominant) Endangered regional ecosystem (RE 11.9.5a) is located approximately 0.76km to the north northwest of the Site.

#### Field Assessment

No TECs were identified within the Site.

### **4.2.2. Environmentally Sensitive Areas (ESAs)**

#### Desktop Assessment

Two Category C ESAs were mapped as occurring within the Site and were:

1. Category C ESA associated with an area of State Forest (Stephenton State Forest) located to the immediate south of the first half of the access track; and
2. Category C ESAs associated with an Of Concern Regional Ecosystem (OCRE) including an area located approximately 195m north-east of the CDZ; and an area south of the access track CDZ.

All mapped Category C ESA areas are illustrated in Attachment 8.1.

#### Field Assessment Results

Two Category C ESAs were identified within 200m of the CDZ during the field survey, i.e. Stephenton State Forest and an Of Concern RE.

Although, the area south and within 200m of the access track mapped as OCRE 11.3.2 was not consistent with the current mapping, this area is still a Category C ESA. A visual inspection identified the area supports remnant vegetation consistent with OCRE 11.5.13.

### **4.2.3. Regional Ecosystems (Biodiversity status)**

#### Desktop Assessment

A review of Regional Ecosystem Mapping (Biodiversity status) Version 7.0 shows the Site contains non-remnant vegetation and remnant vegetation. As illustrated in Attachment 8.4, the majority of the Site supports non-remnant vegetation with areas mapped as RE 11.10.9 (No concern at present Biodiversity Status) and RE 11.3.2 (Of Concern Regional Ecosystem Biodiversity Status).

## Field Assessment Results

The areas mapped as non-remnant and remnant (RE 11.9.10) vegetation within the CDZ were found to be consistent with RE mapping and are discussed (including their composition and status) in detail in Section 4.2.4.

An inspection of vegetation within the 200m buffer of CDZ found inconsistencies with the RE mapping. Whilst the area mapped as OCRE 11.3.2, located approximately 195m to the east of the well lease CDZ was found to be mapped correctly, the areas mapped as OCRE 11.3.2 and NCAP RE 11.10.9 located approximately 60m south of the access track were found to be consistent with the OCRE 11.5.13 (Of Concern Biodiversity status).

### **4.2.4. Vegetation Communities**

The CDZ is located among undulating low hills characterised by medium to coarse grained sedimentary rocks with predominantly shallow soils (typical of Landzone 10).

The CDZ supports three distinct vegetation communities described as:

**Vegetation Community 1** – Disturbed open paddock with sparsely scattered individual trees, clumps of trees and shrubs on the lower slope of a low hill.

**Vegetation Community 2** – White cypress pine (*Callitris glaucophylla*) dominated woodland with a sparse shrublayer on the mid-slope of a low hill.

**Vegetation Community 3** – Disturbed open paddock with scattered regrowth of shrubs and heavily grazed ground layer on narrow ridgelines and crests of hills.

The distribution of these communities throughout the Site is illustrated in Attachment 8.1. Quaternary data sheets for each community are included as Attachment 8.2; and a full floristic inventory for the Site is provided in Attachment 8.5.

**Vegetation Community 1** – Disturbed open paddock with sparsely scattered trees, clumps of trees and shrubs on the lower slope of a low hill.

Vegetation Community 1 has been predominantly cleared of trees and shrubs from recent and historical clearing with a heavily grazed ground storey and does not support a forest structure.

This community supported sparsely scattered individual paddock trees and clumps of trees (retained from clearing) dominated by Carbeen bloodwood (*Corymbia tessellaris*) with Queensland blue gum (*Eucalyptus tereticornis*), White cypress pine (*Callitris glaucophylla*), Kurrajong (*Brachychiton populneus*), Narrow-leaved bottle tree (*Brachychiton rupestris*) and Poplar box (*Eucalyptus populneus*) ranging in height from 6 – 27m with <5% foliage projective coverage.

Regenerating White cypress pine (*Callitris glaucophylla*) and native shrubs occurred sporadically throughout this community ranged in height from 1.5 to 5 metres with <5% foliage projective

coverage. The dominant shrubs included Black wattle (*Acacia leiocalyx*), Bull Oak (*Allocasuarina leuhmanii*), Pretty wattle (*Acacia decora*), Wilga (*Geijera parviflora*), and Ironwood (*Acacia excelsa*).

The heavily grazed groundstorey was dominated by Buffel grass (*Cenchrus ciliaris*) with Many-headed wiregrass (*Aristida caput-medusae*) and Jericho wiregrass (*Aristida jerichoensis*) also occurring and covered 60% of the groundstorey. Photo plates 3 and 4 illustrate the typical structure and condition of Vegetation Community 1.



Plate 3 – Vegetation Community 1 (facing east)



Plate 4 – Vegetation Community 1 (facing west)

**Vegetation Community 2** – White cypress pine (*Callitris glaucophylla*) dominated woodland with a sparse shrublayer on the mid-slope of a low hill.

Vegetation Community 2 was field verified as analogous to remnant vegetation regional ecosystem RE 11.10.9 (No concern at present Biodiversity Status) showing evidence of selective clearing.

Emergents dominated by Carbeen bloodwood (*Corymbia tessellaris*) with *Eucalyptus spp.* and Clarkson's bloodwood (*Corymbia clarksoniana*) were sparsely scattered establishing 5% foliage projective cover, a height range of 21 to 27m and an average height of 25m.

The canopy layer was dominated by White cypress pine (*Callitris glaucophylla*) with Silver-leaved ironbark (*Eucalyptus melanophloia*), Carbeen bloodwood (*Corymbia tessellaris*), Clarkson's bloodwood (*Corymbia clarksoniana*) and Poplar Box (*Eucalyptus populneus*). The canopy layer was the ecologically dominant layer with 15% foliage projective cover, a height range of 15 to 20m and an average height of 17m.

The sub-canopy layer was dominated by White cypress pine (*Callitris glaucophylla*) with Bull Oak (*Allocasuarina leuhmanii*), Kurrajong (*Brachychiton populneus*), Poplar box (*Eucalyptus populneus*), Quinine bush (*Petalostigma pubescens*) and Ironwood (*Acacia excelsa*) also present. The structural formation consisted of 40% foliage projective cover a height range of 7 to 14m and an average height of 10m.

The shrub layer was dominated by White cypress pine (*Callitris glaucophylla*) with a diverse range of other native species including Ironwood (*Acacia excelsa*), Black wattle (*Acacia leiocalyx*), Bull Oak (*Allocasuarina leuhmanii*), Kurrajong (*Brachycton populneus*), Pretty wattle (*Acacia decora*), Wilga (*Geijera parviflora*) and regenerating *Eucalyptus* spp. and *Corymbia* spp. The structural formation included 10% foliage projective cover, a height range of 1.5 to 6m and an average height of 3m.

The heavily grazed groundstorey was dominated by Buffel grass (*Cenchrus ciliaris*) with Many-headed wiregrass (*Aristida caput-medusae*) and Jericho wiregrass (*Aristida jerichoensis*) establishing 30% ground layer coverage with an average height of 0.2m.

Photo plates 5 and 6 illustrate the typical structure and condition of Vegetation Community 2.



Plate 5 – Vegetation Community 2 (facing north)



Plate 6 – Vegetation Community 2 (facing south)

**Vegetation Community 3** – Disturbed open paddock with scattered regrowth of shrubs and heavily grazed ground layer on narrow ridgelines and crests of hills.

This community contained scattered regrowth of a diverse range of shrub species including Sticky hop bush (*Dodonaea viscosa*), Brush Hovea (*Hovea longipes*), Brigalow (*Acacia harpophylla*), Bancroft's wattle (*Acacia bancroftiorum*), Doolan (*Acacia salicina*), White cypress pine (*Callitris glaucophylla*) and False sandalwood (*Eremophila mitchellii*). The structural formation consisted of 20% projective foliage coverage, height range of 1.5 to 8m and average height of 3m. The shrub layer established the ecologically dominant layer (EDL) of this community.

The heavily grazed groundstorey was dominated by Buffel grass (*Cenchrus ciliaris*) with Many-headed wiregrass (*Aristida caput-medusae*), Jericho wiregrass (*Aristida jerichoensis*), Kangaroo grass (*Themeda triandra*), Small-leaved bluebush (*Maireana microphylla*) and Currant bush (*Capparis lasiantha*) establishing 60% ground layer coverage with an average height of 0.2m.

Photo plates 7 and 8 illustrate the typical structure and condition of Vegetation Community 3.





Plate 7 – Vegetation Community 3 (facing north)



Plate 8 – Vegetation Community 3 (facing east)

#### 4.2.5. Essential Habitat Mapping

As illustrated in Attachments 8.4, the Site and its immediate surrounds are not mapped as supporting Essential Habitat for threatened flora or fauna species.

#### 4.2.6. MNES and EVNT Flora Species

##### Desktop Assessment

Commonwealth Matters of National Environmental Significance (MNES) identified by a search of the Protected Matters Database using a 5 kilometre buffer around the Site included two threatened flora species, those being ooline (*Cadellia pentastylis*) and slender tylophora (*Tylophora linearis*). Results from the Wildlife Online database search using a 5 kilometre buffer around the Site did not return any EVNT flora species.

##### Field Assessment Results

No MNES or EVNT flora were observed within the Site during the field assessment.

#### 4.2.7. Type A Restricted Plants

Two Type A Restricted Plants (pursuant to the *Nature Conservation (Administration) Regulation 2006*) occur on Site. Mature and juvenile Kurrajongs (*Brachychiton populneus*) and Narrow-leaved bottle trees (*Brachychiton rupestris*) were located within Vegetation Community 1 and Vegetation Community 2. The exact locations of the Type A plants (illustrated in plates 7 and 8) are shown in Attachment 8.1.



Plate 9 – Kurrajong (Vegetation Community 1)



Plate 10 – Juvenile Kurrajong (Vegetation Community 2)

## 4.3. Fauna

### 4.3.1. Fauna Habitat Values of the Site

The abundance and diversity of fauna (predominantly bird) species observed on Site was greater in Vegetation Community 2 than Vegetation Community 1 and Vegetation Community 3 owing to the different vegetation community structures in these communities.

The field survey indicated that Vegetation Community 2 supported high fauna habitat values including a high abundance of habitat trees and ground storey habitat features including logs with hollows. Vegetation Community 2 supports an intact forest structure including emergents, canopy, sub-canopy, shrub layer and a ground storey with woody debris derived from natural forest processes and selective clearing activities.

The disturbed open paddock communities including Vegetation Community 1 and Vegetation Community 3 lacked a distinct forest structure (canopy, mid-storey and understorey), limiting ecosystem functionality and potential for fauna utilisation.

Vegetation Community 1 contained scattered trees and clumps of trees observed to be utilised as a perch for birds, however, no active nests were recorded in this community. The ground layer of Vegetation Community 1 also contained a moderate abundance of ground storey habitat features, predominantly of fallen timber from clearing activities (including chain pulling of mature trees and shrubs).

Vegetation Community 3 contained a moderate amount of ground storey habitat features including fallen woody timber owing to historic and recent land use practices (predominantly clearing and grazing) and a moderate shrub layer coverage with the potential to provide shelter and foraging habitat for common and adaptable terrestrial fauna species.



Plate 11 – Dead tree with large hollows within Vegetation Community 2.



Plate 12 – Fallen timber from clearing activities within Vegetation Community 1.

#### 4.3.2. MNES and EVNT Fauna Species

##### Desktop Assessment

Commonwealth Matters of National Environmental Significance (MNES) identified by a search of the Protected Matters Database using a 5 kilometre buffer around the Site included 13 threatened fauna species and 9 migratory species.

The Wildlife Online search returned 5 fauna species as being recorded within a 5km radius of the well lease, however none of these five species are listed under the provisions of the NC Act.

##### Field Assessment

A pair of Squatter pigeons (*Geophaps scripta scripta*) listed as Vulnerable under the EPBC Act and NC Act were directly observed during the survey of Vegetation Community 1 at 713277E 7147515N. A Rainbow Bee-eater (*Merops ornatus*) listed as a Migratory species under the EPBC Act and Special least concern under the NC Act was sighted during the survey of Vegetation Community 1 at 713307E 7147504N. Rainbow Bee-eater (*Merops ornatus*) illustrated in Plate 13.



Plate 13 – Rainbow bee-eater (*Merops ornatus*) (Vegetation Community 1)

#### 4.3.3. Fauna Habitat Assessment for MNES and EVNT Fauna Species

For each MNES and EVNT species that was identified through the desktop assessment, their potential to occur on Site was determined based upon the habitat assemblages present on Site. From this assessment, two species were identified confirmed on Site, those being the squatter pigeon (*Geophaps scripta scripta*) and rainbow bee-eater (*Merops ornatus*) (all other MNES and EVNT species identified during the desktop assessment are unlikely to occur on Site). Table 3 lists these two species, discusses their likelihood of occurring in each vegetation community and provides an assessment against their General Habitat requirements as defined in the SSMP. Attachment 8.6 provides a full list of MNES and EVNT species sourced from the database searches, their potential to occur on Site and an assessment against their General Habitat requirements as defined in the SSMP.

Table 3: MNES and EVNT Species Confirmed or Possibly Occurring within the Site

Species Name	Status	Likelihood of occurrence in Vegetation Community 1	Likelihood of occurrence in Vegetation Community 2	Likelihood of occurrence in Vegetation Community 3	Assessment against GENERAL HABITAT requirements
<i>Geophaps scripta scripta</i> (Squatter Pigeon)	V (EPBC Act) V (NC Act)	Confirmed	Possible	Possible	Two Squatter pigeons ( <i>Geophaps scripta scripta</i> ) were observed during the survey within the ground storey of Vegetation Community 1  GENERAL HABITAT: Yes
<i>Merops ornatus</i> Rainbow bee-eater	Migratory (EPBC)	Confirmed	Possible	Possible	A Rainbow bee-eater ( <i>Merops ornatus</i> ) was observed during the survey perched on a tree within Vegetation Community 1. No

Species Name	Status	Likelihood of occurrence in Vegetation Community 1	Likelihood of occurrence in Vegetation Community 2	Likelihood of occurrence in Vegetation Community 3	Assessment against GENERAL HABITAT requirements
					active nest sites were observed during the field survey. GENERAL HABITAT: Yes

#### 4.3.4. Koalas

##### Desktop Assessment

Mapping illustrating Koala habitat (as defined by the Koala Plan) shows that the Site falls within Koala District C. Although there is evidence of koala decline in this district, koalas are classified as *special least concern wildlife* under the NC Act due to a generally lower perceived threat to their survival.

Unlike Koala District A which falls within South-east Queensland where the koala is listed as Vulnerable (SEQ Bioregion), Koala District C is not supported by Koala Habitat mapping. Under the Koala Plan there are no specific conditions relating to koala management for Koala District C areas.

Condition 5 (b) of the CG Report however, stipulates "Preconstruction surveys of the activities in gas fields ..... must identify koala habitat as defined under the *Nature Conservation (Koala) Conservation Plan 2006*. Specific mitigation measures and habitat offsets for residual impacts to koala habitat must be provided." The Koala Plan defines "koala habitat" as:

- (a) a woodland where koalas currently live; or
- (b) a partially or completely cleared area that is used by koalas to cross from 1 woodland where koalas currently live to another woodland where koalas currently live; or
- (c) a woodland where koalas do not currently live, if the woodland -
  - (i) primarily consists of koala habitat trees; and
  - (ii) is reasonably suitable to sustain koalas.

Koala habitat trees are defined under the Koala Plan as "a tree of any of the following genera:

- (a) *Angophora*;
- (b) *Corymbia*;
- (c) *Eucalyptus*;
- (d) *Lophostemon*;
- (e) *Melaleuca*."

## Field Assessment Results

The field assessment identified one vegetation community, Vegetation Community 2 (illustrated in Attachment 8.1) which was analogous with regional ecosystem RE 11.10.9, as containing koala habitat trees. This community consisted of koala habitat trees within the canopy layer including Poplar box (*Eucalyptus populnea*) and Carbeen bloodwood (*Corymbia tessellaris*). However, no evidence of koala activity (i.e. scats or scratches) was observed during the survey and overall this community and the remainder of the Site are not considered suitable to sustain koalas.

The likelihood of koalas utilising the Site is discussed further in Attachment 8.6.

### **4.3.5. Pest Fauna Species Observed on Site**

One pest fauna species (declared under the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act)) was observed on Site. European rabbit (*Oryctolagus cuniculus*) faecal pellets were located within Vegetation Community 1.

### **4.4. Ecosystem functionality**

The EA defines ecosystem functioning as “the interactions between and within living and non-living components of an ecosystem and generally correlates with the size, shape and location of an area of vegetation.”

The condition of the CDZ and its ecosystem functionality is considered to be high within the area mapped and field verified as remnant regional ecosystem RE 11.10.9 (No concern at present Biodiversity Status). This high ecosystem functionality can be attributed to a high degree of connectivity between the Site and bushland remnants.

The white areas within and surrounding the CDZ in Figure 2 represent non-remnant vegetation which are predominantly pastoral properties resulting from anthropogenic disturbance (e.g. clearing and grazing pressures). Ecosystem functionality within the non-remnant vegetation is low due to a predominantly depauperate community structure, the presence of introduced pasture grasses, minimal native species regeneration and little evidence of fauna utilisation. These non-remnant areas also potentially limit the movement of mobile and/or common and adaptable terrestrial fauna species between patches of vegetation.

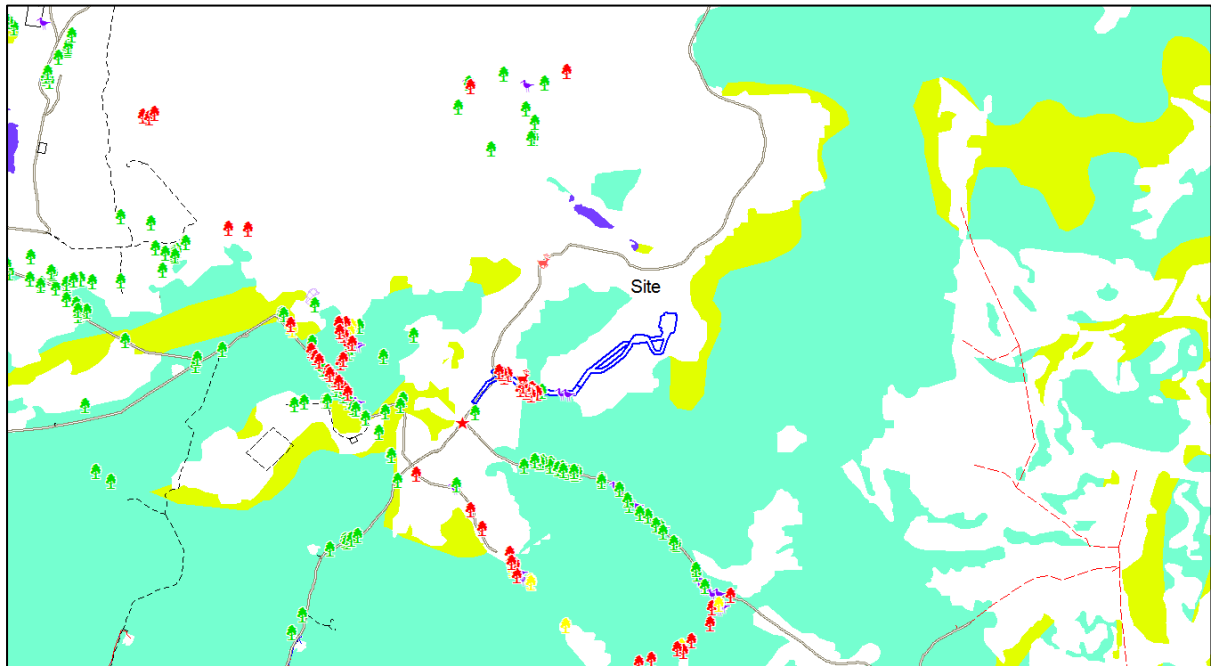


Figure 2 – Landscape context view

## 5. Summary and Recommendations

### 5.1. Summary

The ecological survey conducted for FV18-03 was carried out in accordance with the environmental conditions required by relevant GLNG Project approvals and revealed the following key information:

- No Environmentally Sensitive Areas occur within the CDZ.
- Two Category C ESAs, a State Forest and an Of Concern RE (RE 11.5.13) were observed within 200m of the CDZ.
- The CDZ was found to support remnant regional ecosystem RE 11.10.9 (No concern at present Biodiversity Status).
- The CDZ was not found to support Endangered or Of Concern Regional Ecosystems (Biodiversity Status).
- The CDZ supports three distinct vegetation communities.
- The Site and its immediate surrounds are not mapped as supporting Essential Habitat for threatened flora or fauna species.
- Two Type A restricted plants, Kurrajongs (*Brachychiton populneus*) and Narrow-leaved bottle trees (*Brachychiton rupestris*), were located on Site with a high abundance of juveniles recorded within Vegetation Community 2.
- One threatened species, the Squatter pigeon (*Geophaps scripta scripta*), protected under the EPBC Act and NC Act was detected.
- One migratory species, Rainbow bee-eater (*Merops ornatus*), protected under the EPBC Act and listed as “special least concern” under the NC Act was detected.

- General habitat for MNES species including collared delma, cattle egret, squatter pigeon and rainbow bee-eater, was identified within the CDZ.
- No threatened ecological communities protected under the EPBC Act were detected within the Site.
- The Site is not mapped as Koala habitat as defined by the Koala Plan. No Koalas or signs of Koala activity (scats or scratches) were observed during the Site survey.
- No watercourses (as defined under the *Water Act 2000*) were located on or within 100 metres of the CDZ.
- The field ecological assessment verified the absence of wetlands, lakes and springs on or within the Site.

## 5.2. Recommendations

Considering two threatened fauna species were identified as utilising the resources on Site, project managers should consider using an experienced fauna handler (i.e. spotter-catcher) holding a valid State Rehabilitation Permit to undertake a preclearance fauna habitat survey prior to and as close as practicable to clearing operations taking place. The fauna handler must also be on Site during all clearing operations to undertake all fauna management responsibilities in accordance with the Upstream Species Management Plan for Roma, Arcadia and Fairview CSG Fields (231733-002-002) and the RSGPA Fauna Management Plan (0020-GLNG-4-1.3-0073).

Management of the TAR species located within Vegetation Community 1 and Vegetation Community 2 must be undertaken in accordance with the Type A Restricted Plant Species Salvage Management Plan for the Coal Seam Gas Fields (TARPSMP).

Clearing and grading activities must be conducted in conjunction with the implementation of erosion and sediment control measures in accordance with the GLNG Erosion and Sediment Control Manual. The current condition of the area relies on the mix of grassy ground cover to maintain soil stability. Any clearing activity is likely to increase the potential risk of erosion and loss of sediment.

## 6. Reference Documents

### 6.1. Project References

- GLNG (2013) 3380-GLNG-3-1.3-0006 Santos GLNG Upstream - Pest and Weed Management Plan;
- GLNG. 0020-GLNG-4-1.3-0053, Rev 0 Santos GLNG Upstream – Type A Restricted Plant Species Salvage Management Plan for the Coal Seam Gas Fields (TARPSMP);
- GLNG (2012) 0020-GLNG-41.3-0003, CSG Fields Significant Species Management Plan;
- GLNG (2011) Roma Shallow Gas Project Area Fauna Management Plan (RSGPAFMP) - 0020-GLNG-4-1.3-0073.



## 6.2. Other Reference Documents

- Aurecon (2012) Upstream Species Management Plan for Roma, Arcadia and Fairview CSG Fields (231733-002-002);
- Aurecon (2011) GLNG Project Upstream Activities Erosion and Sediment Control Manual, Ref 213885, 27 July 2011.
- Bostock, P.D. & Holland, A.E. (eds) (2010). Census of the Queensland Flora 2010. Queensland Herbarium, Department of Environment and Resource Management, Brisbane.
- DEHP (2013)., *Environmental Protection Act 1994* Fairview Project Area Environmental Authority: Permit number EPPG00928713 (PEN100178208) dated 18 December 2013;
- DERM (2011) QH\_Springs\_db.zip data, Dataset Custodian – QLD Herbarium DERM, Dataset Date – September 2011, Metadata Date – 16-09-2011.
- EPBC Act Approval (2010). EPBC Approval to develop, construct, operate and decommission coal seam gas resources in the Surat and Bowen Basins between Roma and Emerald in Queensland to supply gas for a related proposal for a natural gas liquefaction and export facility near Gladstone as described in referral EPBC No 2008/4059. Australian Government Department of Sustainability, Environment, Water, Population and Communities dated 22 October 2010;
- Geoscience Australia (2013) Geoscience Australia (formerly AUSLIG) 250k raster;
- Neldner, V., Wilson, B., Thompson, E., Dillewaard, H. (2012). Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.2), Environmental Protection Agency, Queensland.
- Queensland Government (2010) Coordinator-General's evaluation report for an environmental impact statement Gladstone Liquefied Natural Gas - GLNG project. May 2010.

## **7. Attachments**

Attachment 8.1 - Ecological Assessment Area

Attachment 8.2 - Quaternary Data Sheets

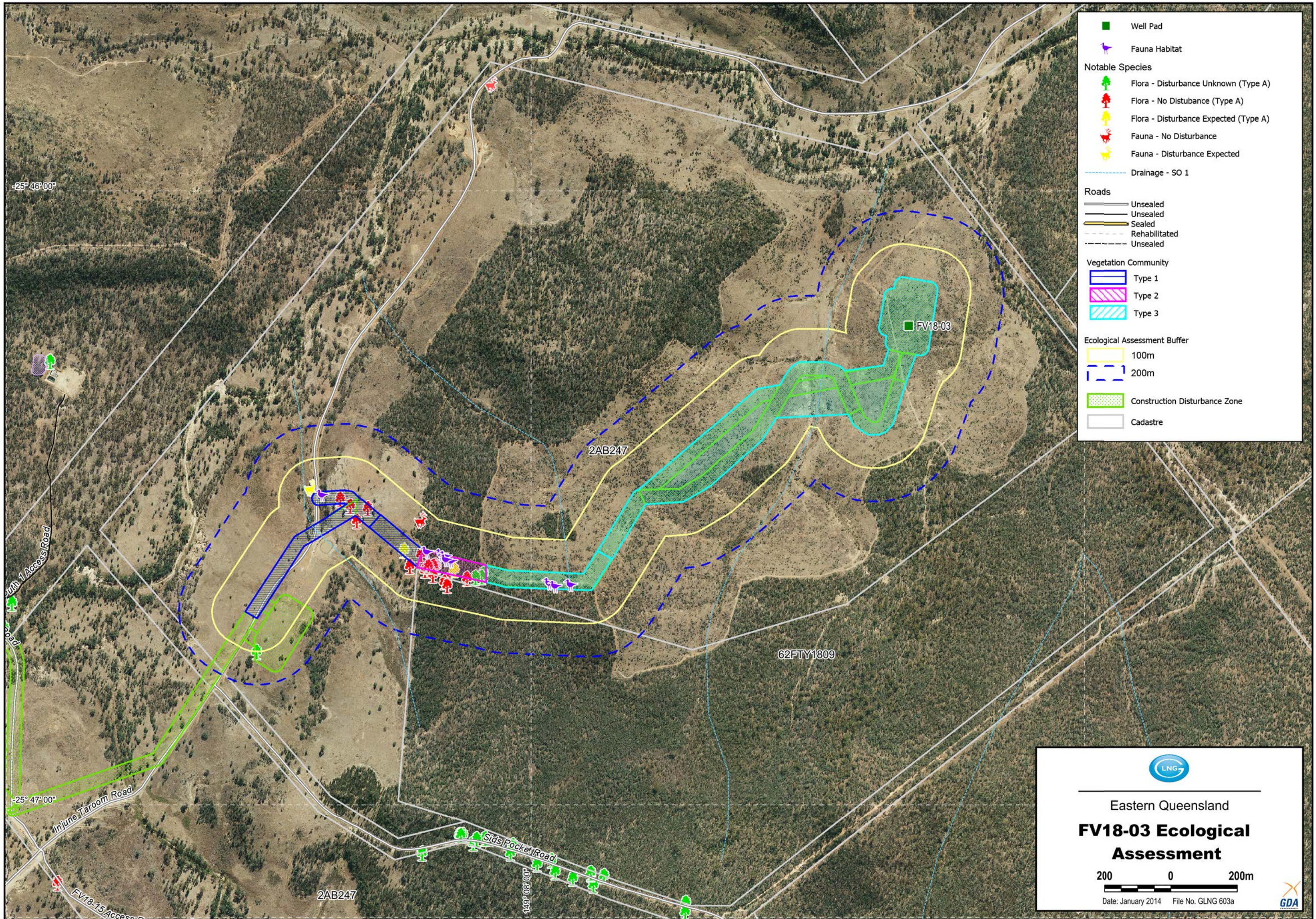
Attachment 8.3 - DEHP Referable Wetlands Mapping

Attachment 8.4 - DEHP Vegetation Management Supporting Map


Attachment 8.5 - Native Plant Species List

Attachment 8.6 - Habitat Assessment and Likelihood of Occurrence of MNES and EVNT Species

**Attachment 8.1 - Ecological Assessment Area**



- Well Pad
- 🐦 Fauna Habitat
- Notable Species**
- 🌳 Flora - Disturbance Unknown (Type A)
- 🌳 Flora - No Disturbance (Type A)
- 🌳 Flora - Disturbance Expected (Type A)
- 🐘 Fauna - No Disturbance
- 🐘 Fauna - Disturbance Expected
- Drainage - SO 1
- Roads**
- Unsealed
- Unsealed
- Sealed
- Rehabilitated
- Unsealed
- Vegetation Community**
- Type 1
- Type 2
- Type 3
- Ecological Assessment Buffer**
- 100m
- 200m
- Construction Disturbance Zone
- Cadastre




Eastern Queensland

## FV18-03 Ecological Assessment

200
0
200m

Date: January 2014
File No. GLNG 603a



## Attachment 8.2 - Quaternary Data Sheets

<b>Site no:</b> FV18-03 Q1 (Start of access track from Injune Taroom road to edge of RE11.10.9).	<b>Date:</b> 12 Dec 2013	<b>Recorder:</b> Lincoln Smith
<b>Locality/coordinates:</b> 713493E 7147403N		

### Flora (representing species richness and diversity)

Tree layer 1 Percentage Foliage Cover : <5%      Av Height: 20m      Height range: 15 – 27m			
Species	Rel Dom	Species	Rel Dom
<i>Corymbia tessellaris</i> (Carbeen)	D	<i>Eucalyptus populnea</i> (Poplar box)	
<i>Eucalyptus tereticornis</i> (Blue Gum)		<i>Brachychiton rupestris</i> (Bottle Tree)	
<i>Callitris glaucophylla</i> (White cypress pine)		<i>Brachychiton populneus</i> (Kurrajong)	
Tree layer 2 Cover: <5%      Av Height: 10m      Height range: 6 – 14m			
Species	Rel Dom	Species	Rel Dom
<i>Eucalyptus tereticornis</i> (Blue Gum)	D	<i>Allocasuarina luehmannii</i> (Bulloak)	
<i>Brachychiton populneus</i> (Kurrajong)		<i>Callitris glaucophylla</i> (White cypress pine)	
<i>Eucalyptus populnea</i> (Poplar box)			
Shrub layer 1 Cover: 5%      Av Height: 2m      Height range: 1.5 – 5m			
Species	Rel Dom	Species	Rel Dom
<i>Callitris glaucophylla</i> (White cypress pine)	D	<i>Acacia decora</i> (Pretty wattle)	
<i>Acacia excelsa</i> (Ironwood)		<i>Carissa ovata</i> (Currant bush)	
<i>Acacia leiocalyx</i> (Black wattle)		<i>Geijera parviflora</i> (Wilga)	
<i>Allocasuarina luehmannii</i> (Bulloak)		<i>Alstonia constricta</i> (Bitter bark)	
Ground layer. Cover: 60%      Av Height: 0.2m			
Species	Rel Dom	Species	Rel Dom
<i>Wahlenbergia gracilis</i> (Sprawling Bluebell)		<i>Sporobolus creber</i> (Western Rat-tail Grass)	
<i>Aristida caput-medusae</i> (Many Headed Wiregrass)		<i>Cymbopogon refractus</i> (Barbed wiregrass)	
<i>Aristida jerichoensis</i> (Jericho wiregrass)		<i>Einadia nutans subsp. nutans</i> (Climbing saltbush)	
<i>Boerhavia dominie</i> (Tarvine)		<i>Enteropogon ramosus</i> (Curly windmill grass)	

<i>Carissa ovata</i> (Currant bush)			
<i>Capparis lasiantha</i> (Wait-a-while)			
<i>Sclerolaena birchii</i> (Galvanised burr)			
<i>Bothriochloa bladhii</i> (Forest bluegrass)			
<i>Maireana microphylla</i> (Small-leaf bluebush)			
<i>Chrysocephalum apiculatum</i> (Yellow buttons)			
<i>Brunoniella australis</i> (Blue trumpet)			

Geology, landform, soils	Woody Stem Counts 10m X 10m	
	Geology code and rock types: Coarse grained sedimentary rocks	T1
Landform: lower - slope of gentle sloping hill	T2	<1
Soils: sandy light brown loam	S1	<1

### Regional Ecosystems (RE) / Threatened Ecological Community (TEC)

Mapped RE: Non remnant	Landzone: 10
Corresponding TEC (mapped):	
Ground truthed RE: Non remnant	Landzone: 10
Corresponding TEC (ground truthed):	

### Vegetation Short Description

Highly disturbed (recent and historical clearing of trees and shrubs) open paddock containing sparsely scattered trees and clumps of trees; sparsely scattered shrubs; heavily grazed groundlayer with moderate coverage.

### Connectivity/Patch Characteristics

Low in area of highly disturbed (recent and historical clearing) open paddock containing scattered paddock trees and shrubs.

High in area adjacent to the east containing remnant RE11.10.9.

### EVNT /Type A Flora Present

### EVNT /Type A Flora Likely

<i>Brachychiton populneus</i> (Kurrajong)	
<i>Brachychiton rupestris</i> (Narrow-leaved bottle tree)	

### Fauna Habitat Features

Density scores: **0** = 0%; **1** = <25%; **2** = 26-50%; **3** = 51-75%; **4** = 75-99%; **5** = 100% abundance.

Rocks - embedded	0	Boulders	0	Shrub layer	1	Organic litter cover	1
Rocks - loose	0	Fallen Bark	1	Leaf litter	1	Bare ground	2

Abundance Scores: **0** = absent; **1** = 1-5; **2** = 6-20; **3** = 21-50; **4** = 51-75; **5** = 76-100; **6** = >100. In a 1 ha area.

Crevices/ledges	<b>0</b>	Large logs (>30cm diameter)	<b>1</b>	Trees/logs bearing loose bark	<b>2</b>
Underhangs/overhangs/caves	<b>0</b>	Logs with hollows	<b>1</b>	Termite mounds	<b>0</b>
Small logs (<30cm diameter)	<b>5</b>			Mistletoe	<b>0</b>
Trees with hollows ≥ 10cm diameter		1		Fallen woody material ≥ 10cm	<b>4</b>

diameter number		
<b>EVNT Fauna Present</b>		<b>EVNT Fauna Likely</b>
<i>Merops ornatus</i> (Rainbow Bee eater)		
<i>Geophaps scripta scripta</i> (Squatter Pigeon)		
<b>Disturbances</b> (e.g. grazed, ploughed, flooded)		
recent and historical clearing of trees and shrubs, grazed		
<b>Incidental Fauna Observations</b>		
<b>Rainbow Bee eater, Squatter pigeon,</b> Common bronze-wing pigeon, Australian magpie, Rainbow lorikeet, Apostlebird, White-throated gerygone, Grey-crowned babbler, Pied butcherbird, noisy miner, Red-backed fairy-wren, Australian raven, Pied currawong, Macropod scats, European rabbit, Eastern grey kangaroo		
<b>Notes on watercourses, wetlands, lakes or springs</b>		
No watercourse in or within 100m of the CDZ. The access track crosses a Stream Order 1 located at 714782, 714759 that was recorded as a drainage feature and not a watercourse. No wetlands in or within 200m of the CDZ.		

<b>Site no:</b> FV18-03 Q2 (Area traversed by access track mapped RE11.10.9)	<b>Date:</b> 12 Dec 2013	<b>Recorder:</b> Lincoln Smith
<b>Locality/coordinates:</b> 713649E 7147314N		

Emergents: Sparsely scattered emergents dominated by *Corymbia tessellaris* (Carbeen) with *Eucalyptus* spp. and *Corymbia clarksoniana* (Clarkson's bloodwood) establishing ~ 5% FPC, average height 25m, height range 21 – 27m.

**Flora (representing species richness and diversity)**

Tree layer 1 Percentage Foliage Cover : 15%      Av Height: 17m      Height range: 15 – 20m			
Species	Rel Dom	Species	Rel Dom
<i>Callitris glaucophylla</i> (White cypress pine)	D	<i>Corymbia clarksoniana</i> (Clarkson's bloodwood)	
<i>Eucalyptus melanophloia</i> ( Silver leaved ironbark)		<i>Eucalyptus populnea</i> (Poplar box)	
<i>Corymbia tessellaris</i> (Carbeen)			
Tree layer 2 Cover: 40%      Av Height: 10m      Height range: 7 – 14m			
Species	Rel Dom	Species	Rel Dom
<i>Callitris glaucophylla</i> (White cypress pine)	D	<i>Allocasuarina luehmannii</i> (Bulloak)	
<i>Brachychiton populneus</i> (Kurrajong)		<i>Petalostigma pubescens</i> (Quinine Bush)	
<i>Eucalyptus populnea</i> (Poplar box)		<i>Acacia excelsa</i> (Ironwood)	
Shrub layer 1 Cover: 10%      Av Height: 3m      Height range: 1.5 – 6m			
Species	Rel Dom	Species	Rel Dom
<i>Callitris glaucophylla</i> (White cypress pine)	D	Regenerating <i>Eucalyptus</i> spp.	
<i>Acacia excelsa</i> (Ironwood)		<i>Bursaria incana</i> (Prickly Pine)	
<i>Acacia leiocalyx</i> (Black wattle)		<i>Carissa ovata</i> (Currant bush)	
<i>Allocasuarina luehmannii</i> (Bulloak)		<i>Eremophila mitchellii</i> (False sandalwood)	
<i>Brachychiton populneus</i> (Kurrajong)		<i>Geijera parviflora</i> (Wilga)	
<i>Brachychiton rupestris</i> (Narrow-leaved bottle tree)		<i>Alstonia constricta</i> (Bitter bark)	
<i>Alphitonia excelsa</i> (Red ash)		<i>Capparis canescens</i> (Wild Orange)	
<i>Petalostigma pubescens</i>		<i>Acacia harpophylla</i> (Brigalow)	
<i>Acacia decora</i> (Pretty wattle)			
Ground layer. Cover: 30%      Av Height: 0.2m			
Species	Rel Dom	Species	Rel Dom



<i>Sclerolaena birchii</i> (Galvanised burr)		<i>Commelina diffusa</i> (Wandering dew)	
<i>Aristida caput-medusae</i> (Many Headed Wiregrass)		<i>Cymbopogon refractus</i> (Barbed wiregrass)	
<i>Aristida jerichoensis</i> (Jericho wiregrass)		<i>Einadia nutans subsp. nutans</i> (Climbing saltbush)	
<i>Boerhavia dominie</i> (Tarvine)		<i>Enteropogon ramosus</i> (Curly windmill grass)	
<i>Carissa ovata</i> (Currant bush)		<i>Glandularia aristigera</i> (Mayne's pest)	
<i>Capparis lasiantha</i> (Wait-a-while)		<i>Glycine tomentella</i> Hayata (Woolly Glycine)	
<i>Cheilanthes sieberi</i> Kunze subsp. <i>sieberi</i> (Mulga fern)		<i>Rhynchosia minima</i> (Least snout-bean)	
<i>Chrysocephalum apiculatum</i> (Yellow buttons)			

#### Geology, landform, soils

Geology, landform, soils	Woody Stem Counts 10m X 10m	
	Geology code and rock types: Coarse grained sedimentary rocks	T1
Landform: mid-slope of gentle sloping hill	T2	3
Soils: sandy light brown loam	S1	2

#### Regional Ecosystems (RE) / Threatened Ecological Community (TEC)

Mapped RE: 11.10.9	Landzone: 10
Corresponding TEC (mapped):	
Ground truthed RE: 11.10.9	Landzone: 10
Corresponding TEC (ground truthed):	

#### Vegetation Short Description

Woodland dominated by *Callitris glaucophylla* disturbed by selective clearing; sparsely scattered emergents dominated by *Corymbia tessellaris*; moderate shrub layer dominated by *Callitris glaucophylla*; moderate groundstorey dominated by *Cenchrus ciliaris*

#### Connectivity/Patch Characteristics

High in area of remnant RE11.10.9.  
Low in adjacent areas to the east and west that contain heavily grazed open paddocks containing scattered paddock trees and shrubs as described in FV18-03 Q1 and Q3.

**EVNT /Type A Flora Present**

**EVNT /Type A Flora Likely**

*Brachychiton populneus* (Kurrajong)  
*Brachychiton rupestris* (Narrow-leaved bottle tree)

**Fauna Habitat Features**

Density scores: **0** = 0%; **1** = <25%; **2** = 26-50%; **3** = 51-75%; **4** = 75-99%; **5** = 100% abundance.

Rocks - embedded	0	Boulders	0	Shrub layer	1	Organic litter cover	2
Rocks - loose	0	Fallen Bark	1	Leaf litter	2	Bare ground	2

Abundance Scores: **0** = absent; **1** = 1-5; **2** = 6-20; **3** = 21-50; **4** = 51-75; **5** = 76-100; **6** = >100. In a 1 ha area.

Crevices/ledges	<b>0</b>	Large logs (>30cm diameter)	<b>2</b>	Trees/logs bearing loose bark	<b>3</b>
Underhangs/overhangs/caves	<b>0</b>	Logs with hollows	<b>2</b>	Termite mounds	<b>0</b>
Small logs (<30cm diameter)	<b>5</b>			Mistletoe	<b>0</b>
Trees with hollows ≥ 10cm diameter diameter number		1		Fallen woody material ≥ 10cm	<b>5</b>

**EVNT Fauna Present**

**EVNT Fauna Likely**

Nil

**Disturbances** (e.g. grazed, ploughed, flooded)

Selective clearing (Logging), grazed

**Incidental Fauna Observations**

Crested pigeon, Australian raven, Red-backed fairy-wren, Noisy miner, Noisy friarbird, Willie wagtail

**Notes on watercourses, wetlands, lakes or springs**

No watercourse in or within 100m of the CDZ.  
 No wetlands in or within 200m of the CDZ.

Site no: FV18-03 Q3 (Lease)	Date: 13 Dec 2013	Recorder: Lincoln Smith
Locality/coordinates: 715084E 7148002N		

**Flora (representing species richness and diversity)**

Tree layer 1			
Percentage Foliage Cover : -		Av Height: -	
		Height range: -	
Species	Rel Dom	Species	Rel Dom
Absent			
Tree layer 2			
Cover: -		Av Height: -	
		Height range: -	
Species	Rel Dom	Species	Rel Dom
Absent			
Shrub layer 1			
Cover: 20%		Av Height: 3m	
		Height range: 1.5 – 8m	
Species	Rel Dom	Species	Rel Dom
<i>Dodonaea viscosa</i> (Sticky hop bush)		<i>Eremophila mitchellii</i> (False sandalwood)	
<i>Hovea longipes</i> (Brush Hovea)		<i>Atalaya hemiglauca</i> (White wood)	
<i>Acacia harpophylla</i> (Brigalow)		<i>Acacia decora</i> (Pretty wattle)	
<i>Acacia bancroftiorum</i> (Bancroft's wattle)		<i>Carissa ovata</i> (Currant bush)	
<i>Acacia salicina</i> (Doolan)		<i>Geijera parviflora</i> (Wilga)	
<i>Callitris glaucophylla</i> (White cypress pine)		<i>Alstonia constricta</i> (Bitter bark)	
<i>Acacia excelsa</i> (Ironwood)		<i>Apophyllum anomalum</i> (Warrior bush)	
<i>Acacia leiocalyx</i> (Black wattle)		<i>Owenia acidula</i> (Emu apple)	
<i>Allocasuarina luehmannii</i> (Bulloak)		<i>Eucalyptus populnea</i> (Poplar box)	
<i>Alectryon diversifolius</i> (Scrub boonaree)		<i>Grevillea striata</i> (Beefwood)	
<i>Pittosporum spinescens</i> (Wallaby apple)		<i>Maireana microphylla</i> (Small-leaf bluebush)	
Ground layer.			
Cover: 60%		Av Height: 0.2m	
Species	Rel Dom	Species	Rel Dom
<i>Cenchrus ciliaris</i> (Buffel grass)	D	<i>Chrysocephalum apiculatum</i> (Yellow buttons)	
<i>Aristida caput-medusae</i> (Many Headed Wiregrass)		<i>Cymbopogon refractus</i> (Barbed wiregrass)	
<i>Themeda avenacea</i> (Oat kangaroo grass)		<i>Themeda triandra</i> (Kangaroo grass)	
<i>Aristida jerichoensis</i> (Jericho wiregrass)		<i>Enteropogon ramosus</i> (Curly	

		windmill grass)	
<i>Boerhavia dominie</i> (Tarvine)		<i>Sclerolaena birchii</i> (Galvanised burr)	
<i>Carissa ovata</i> (Currant bush)		<i>Lomandra longifolia</i> (Spiny-head Mat-rush)	
<i>Capparis lasiantha</i> (Wait-a-while)		<i>Maireana microphylla</i> (Small-leaf bluebush)	

<b>Geology, landform, soils</b>	<b>Woody Stem Counts 10m X 10m</b>		
Geology code and rock types: Coarse grained sedimentary rocks	T1	-	
Landform: flat - gentle sloping on plateau of hill amongst undulating hills	T2	-	
Soils: light brown and reddish loam	S1	5	

### Regional Ecosystems (RE) / Threatened Ecological Community (TEC)

Mapped RE: Non remnant	Landzone: 10
Corresponding TEC (mapped):	
Ground truthed RE: Non remnant	Landzone: 10
Corresponding TEC (ground truthed):	

### Vegetation Short Description

Disturbed (historical clearing of trees and shrubs) open paddock containing a moderate shrublayer of regrowth; heavily grazed groundlayer with moderate coverage.

### Connectivity/Patch Characteristics

Low in area surrounding lease, disturbed (historical clearing) open paddock containing moderate shrublayer.

### EVNT /Type A Flora Present

Nil

### EVNT /Type A Flora Likely

### Fauna Habitat Features

Density scores: **0** = 0%; **1** = <25%; **2** = 26-50%; **3** = 51-75%; **4** = 75-99%; **5** = 100% abundance.

Rocks - embedded	1	Boulders	1	Shrub layer	2	Organic litter cover	2
Rocks - loose	1	Fallen Bark	1	Leaf litter	1	Bare ground	2

Abundance Scores: **0** = absent; **1** = 1-5; **2** = 6-20; **3** = 21-50; **4** = 51-75; **5** = 76-100; **6** = >100. In a 1 ha area.

Crevices/ledges	<b>0</b>	Large logs (>30cm diameter)	<b>1</b>	Trees/logs bearing loose bark	<b>0</b>
Underhangs/overhangs/caves	<b>0</b>	Logs with hollows	<b>1</b>	Termite mounds	<b>1</b>
Small logs (<30cm diameter)	<b>5</b>			Mistletoe	<b>0</b>
Trees with hollows ≥ 10cm diameter number	0	Fallen woody material ≥ 10cm	1		

### EVNT Fauna Present

Nil

### EVNT Fauna Likely

# Santos

## GLNG Project

**Disturbances** (e.g. grazed, ploughed, flooded)

historical clearing of trees and shrubs, grazed, fire, vehicle access track

**Incidental Fauna Observations**

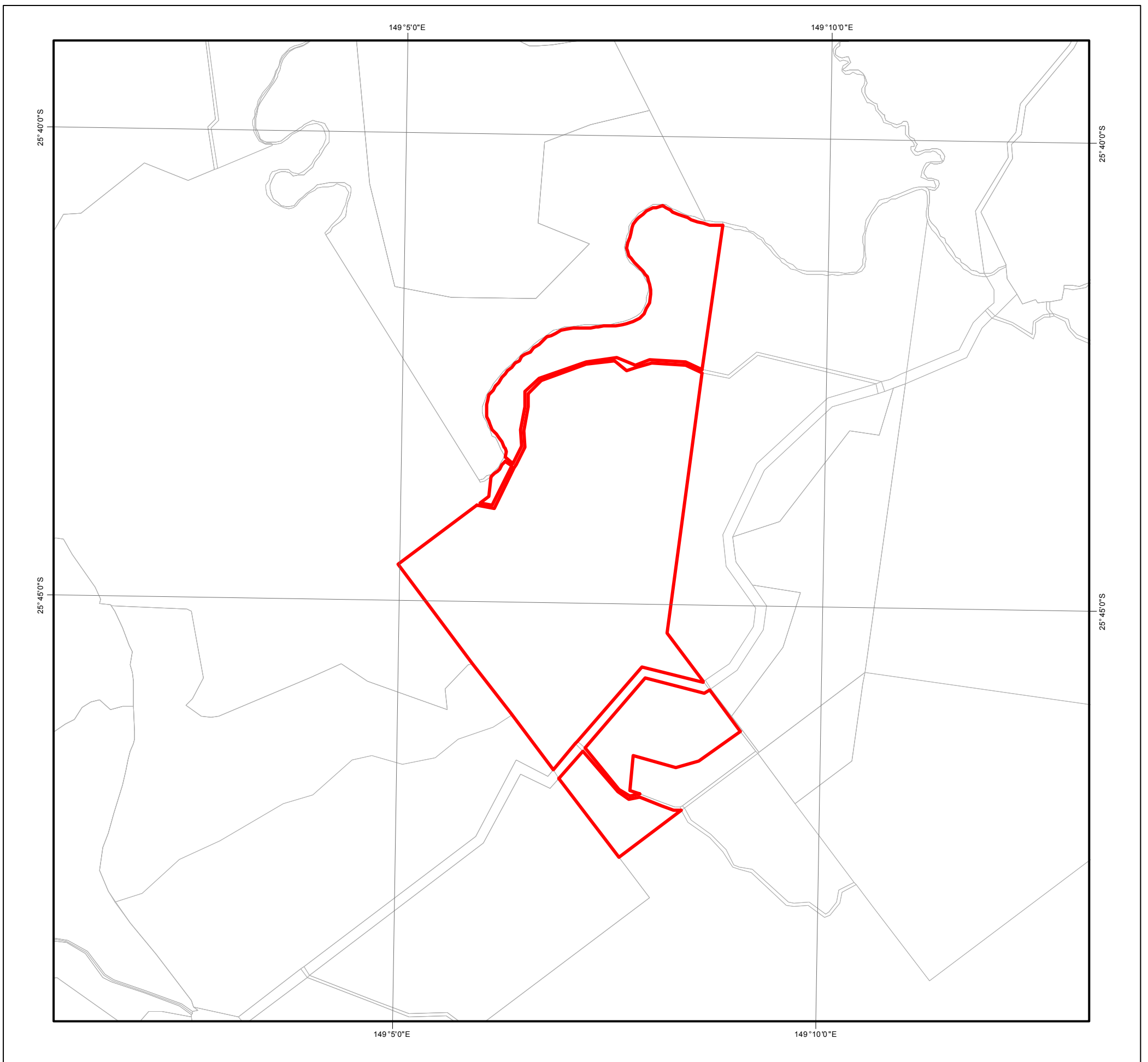
Willie wagtail, Australian King Parrot, Wedge-tailed Eagle, Brown honeyeater, Pale-headed Rosella

**Notes on watercourses, wetlands, lakes or springs**

No watercourse in or within 100m of the CDZ. The access track crosses a Stream Order 1 that was recorded as a drainage feature and not a watercourse.

No wetlands in or within 200m of the CDZ.

## Attachment 8.3 - DEHP Referable Wetlands Mapping

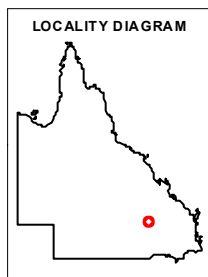


## Map of Referable Wetlands Wetland Protection Areas

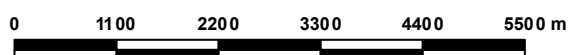
Requested By: SUSSAN.LEMON@SANTOS.COM

Date: 23 Dec 13 Time: 15.22.14

Centred on Lot on Plan:  
2 AB247



N



This product is projected into GDA 1994 MGA Zone 55

**Note:**

This map shows the location of wetland protection areas which are defined under the Environmental Protection Regulation 2008.





Within wetland protection areas, certain types of development involving high impact earthworks are made assessable under Schedule 3 of the Sustainable Planning Regulation 2009.

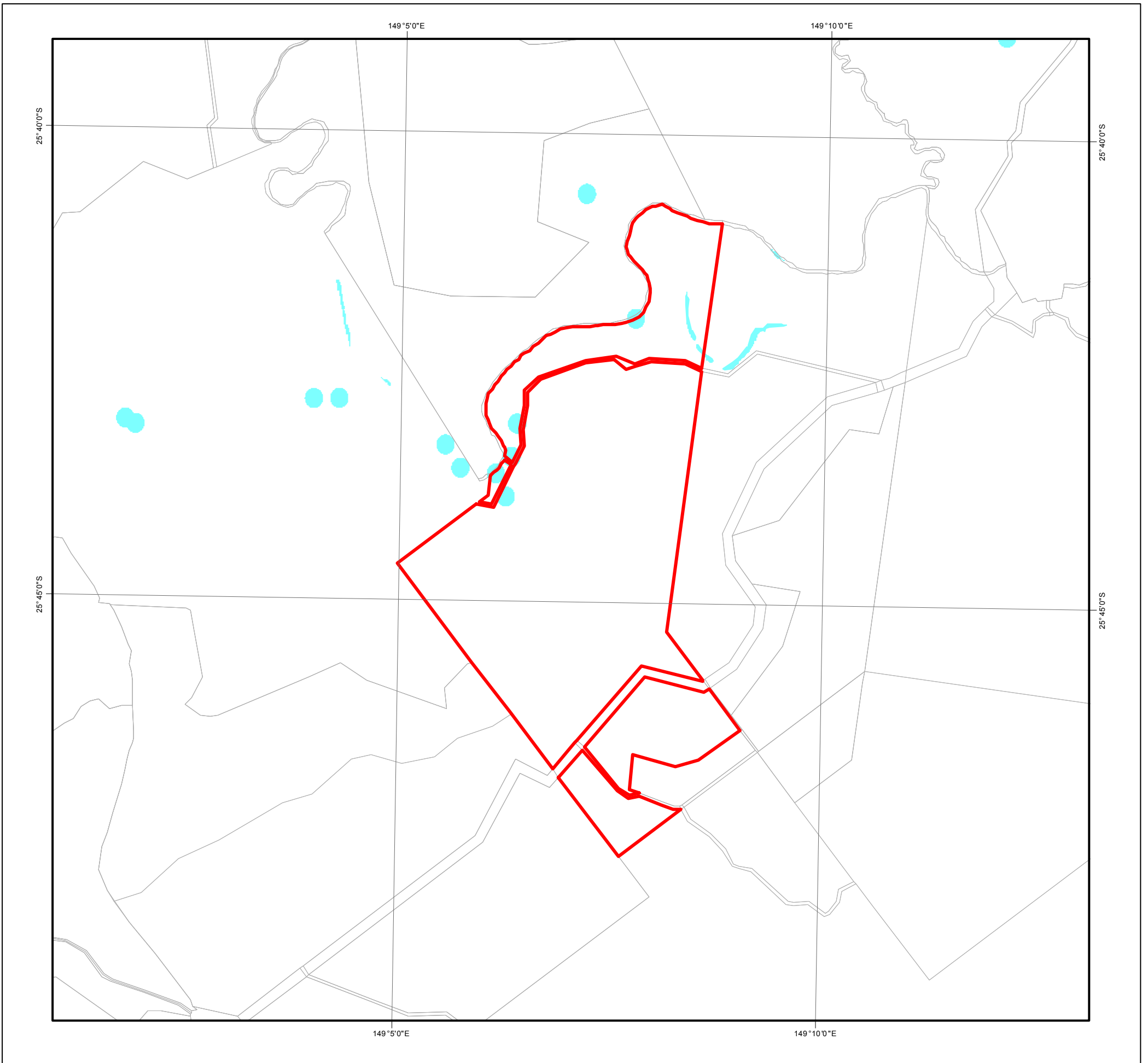
The Department of Environment and Heritage Protection has been made a concurrence agency under Schedule 7 of the Sustainable Planning Regulation 2009 for assessable development involving high impact earthworks within wetland protection areas.

The policy outcome and assessment criteria for assessing these applications are described in the State Planning Policy 4/11: Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments.

This map is produced at a scale relevant to the size of the lot on plan identified and should be printed at A4 size in portrait orientation. Consideration of the effects of mapped scale is necessary when interpreting data at a large scale.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Heritage Protection at [www.ehp.qld.gov.au](http://www.ehp.qld.gov.au) or email [planning.support@ehp.qld.gov.au](mailto:planning.support@ehp.qld.gov.au).

-  Selected Land Parcel
-  Cadastral Boundary
- Wetland Protection Areas**
-  HES Wetland
-  Trigger Area



## Map of Referable Wetlands for the Environmental Protection Act 1994

Requested By: SUSSAN.LEMON@SANTOS.COM

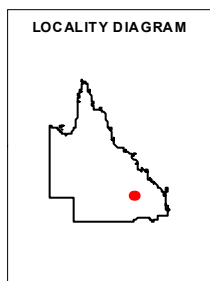
Date: 23 Dec 13 Time: 15.22.17

Centred on Lot on Plan:  
2 AB247

-  Selected Land Parcel
-  Cadastral Boundary
-  HES Wetland GBR Catchments
-  HES Wetland
-  GES Wetland



Queensland  
Government



**Note:**

This map shows the location of wetlands on the Map of Referable Wetlands which are defined under the Environmental Protection Regulation 2008.

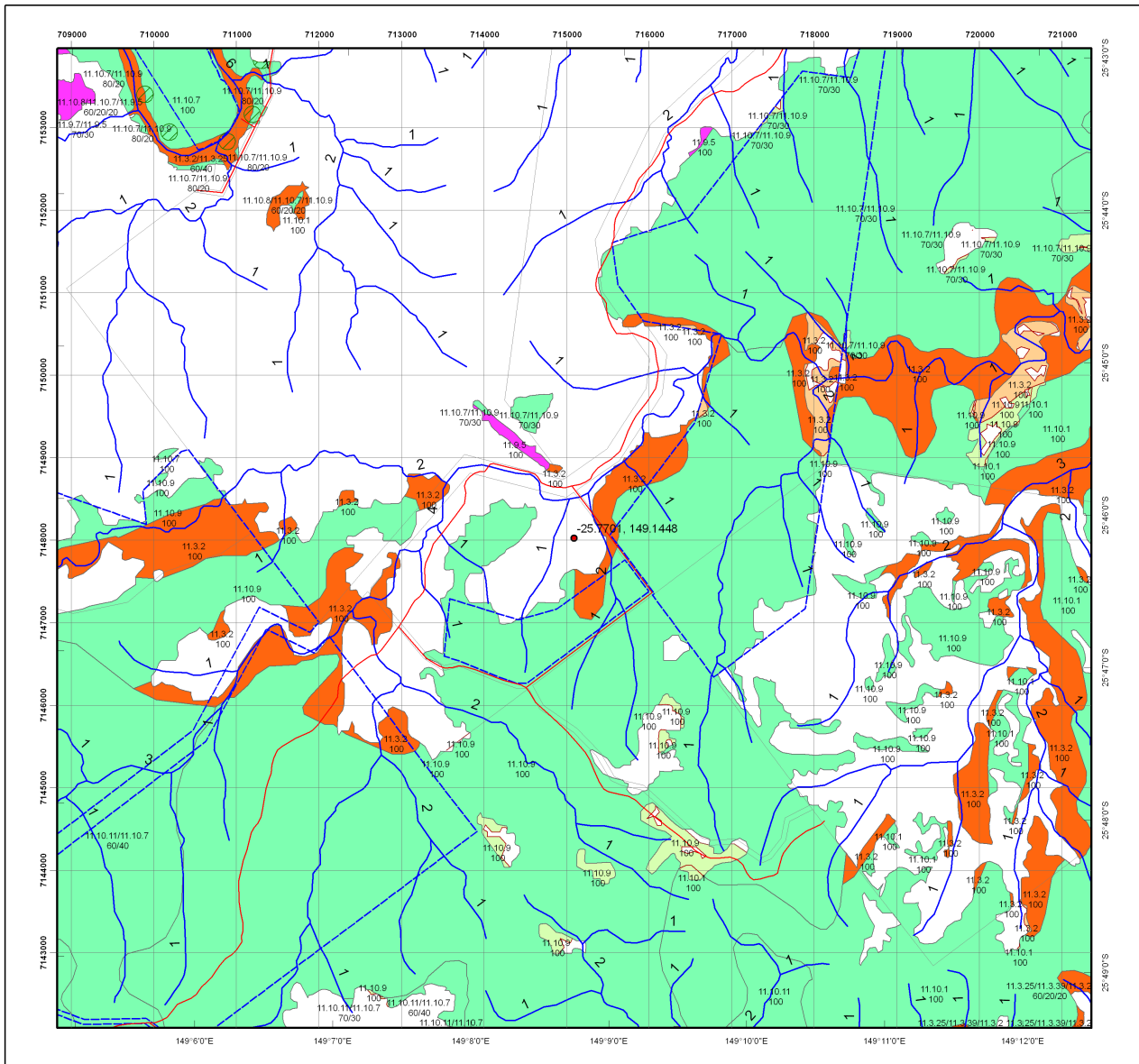
Wetlands are assessed for ecological significance using the environmental values for wetlands in section 81A of the Environmental Protection Regulation 2008. Wetlands are considered either High Ecological Significance (HES) or of General Ecological Significance (GES) for the purposes of the environmental values.

This map is produced at a scale relevant to the size of the lot on plan identified and should be printed at A4 size in portrait orientation. Consideration of the effects of mapped scale is necessary when interpreting data at a large scale.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Heritage Protection at <[www.ehp.qld.gov.au](http://www.ehp.qld.gov.au)> or email <[planning.support@ehp.qld.gov.au](mailto:planning.support@ehp.qld.gov.au)>



**Attachment 8.4 - DEHP Vegetation Management Supporting Map**



## Vegetation Management Supporting Map

### Legend

- Coordinates
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category A or B area containing remnant vegetation
- Category A or B area under Section 20AH  
These areas are edged in yellow and filled with the remnant RE Status
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem
- Category C area containing high value regrowth vegetation
- Category C area under Section 20AI  
These areas are edged in purple and filled with the remnant RE Status
- Non Remnant
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourse on the vegetation management watercourse map  
(Stream order shown as black number against stream where available)
- Roads
- © Pitney Bowes Software Pty Ltd
- National Parks, State Forest and other reserves
- Cadastral line
- Property boundaries shown as provided as a locational aid only

Labels for Essential Habitat are centred on the area of enquiry.

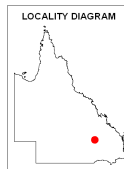
Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

### Disclaimer:

While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Mines and Pitney Bowes Software, makes no representations or warranties about its accuracy, reliability, completeness or suitability or any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: [www.dnrm.qld.gov.au](http://www.dnrm.qld.gov.au) or contact the Department of Natural Resources and Mines.

Digital data for the vegetation management watercourse map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at <http://www.information.qld.gov.au/>



0 490 980 1,470 1,960 2,450 m

This product is projected into:  
GDA 1994 MGA Zone 55



## Vegetation Management Act 1999 - Extract from the essential habitat database - version 4.0

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - Module 8: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Sustainable Planning Act 2009*; and
- Self-assessable vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s or on and within 2.2 km of an identified coordinate on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Natural Resources and Mines website (<http://www.dnrm.qld.gov.au>) has more information on how the layer is applied under the State Development Assessment Provisions - Module 8: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

- (a) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or
- (b) in which the protected wildlife, at any stage of its life cycle, is located.

Essential habitat identifies endangered or vulnerable native wildlife prescribed under the *Nature Conservation Act 1994*.

**Essential habitat in Category A and B (Remnant vegetation species record) areas:2200m Species Information - (no results)**

**Essential habitat in Category A and B (Remnant vegetation species record) areas:2200m Regional Ecosystems Information - (no results)**

**Essential habitat in Category A and B (Remnant vegetation) areas:2200m Species Information - (no results)**

**Essential habitat in Category A and B (Remnant vegetation) areas:2200m Regional Ecosystems Information - (no results)**

**Essential habitat in Category C (High value regrowth vegetation) areas:2200m Species Information - (no results)**

**Essential habitat in Category C (High value regrowth vegetation) areas:2200m Regional Ecosystems Information - (no results)**

**Attachment 8.5 – Flora and Fauna Species Lists**

**Flora species List**

Common name	Scientific name	Status		Qld Declared Plant Category	WONS	NEAL	Type A Species
		Census of Qld Flora (includes NC Act)	EPBC Act				
Bancroft's wattle	<i>Acacia bancroftiorum</i>	LC	-	-	-	-	
Pretty wattle	<i>Acacia decora</i>	LC	-	-	-	-	
Ironwood	<i>Acacia excelsa</i>	LC	-	-	-	-	
Brigalow	<i>Acacia harpophylla</i>	LC	-	-	-	-	
Black wattle	<i>Acacia leiocalyx</i>	LC	-	-	-	-	
Doolan	<i>Acacia salicina</i>	LC	-	-	-	-	
Scrub boonaree	<i>Alectryon diversifolius</i>	LC	-	-	-	-	
Bullock	<i>Allocasuarina luehmannii</i>	LC	-	-	-	-	
Red ash	<i>Alphitonia excelsa</i>	LC	-	-	-	-	
Bitter bark	<i>Alstonia constricta</i>	LC	-	-	-	-	
Warrior bush	<i>Apophyllum anomalum</i>	LC	-	-	-	-	
Many Headed Wiregrass	<i>Aristida caput-medusae</i>	LC	-	-	-	-	
Jericho wiregrass	<i>Aristida jerichoensis</i>	LC	-	-	-	-	
White wood	<i>Atalaya hemiglauca</i>	LC	-	-	-	-	
Tarvine	<i>Boerhavia dominii</i>	LC	-	-	-	-	
Forest bluegrass	<i>Bothriochloa bladhii</i>	LC	-	-	-	-	
Kurrajong	<i>Brachychiton populneus</i>	LC	-	-	-	-	Type A
Narrow-leaved bottle tree	<i>Brachychiton rupestris</i>	LC	-	-	-	-	Type A
Blue trumpet	<i>Brunoniella australis</i>	LC	-	-	-	-	
Prickly Pine	<i>Bursaria incana</i>	LC	-	-	-	-	
White cypress pine	<i>Callitris glaucophylla</i>	LC	-	-	-	-	
Wild Orange	<i>Capparis canescens</i>	LC	-	-	-	-	
Wait-a-while	<i>Capparis lasiantha</i>	LC	-	-	-	-	
Currant bush	<i>Carissa ovata</i>	LC	-	-	-	-	

Common name	Scientific name	Status		Qld Declared Plant Category	WONS	NEAL	Type A Species
		Census of Qld Flora (includes NC Act)	EPBC Act				
Mulga fern	<i>Cheilanthes sieberi</i> <i>Kunze subsp. sieberi</i>	LC	-	-	-	-	
Yellow buttons	<i>Chrysocephalum apiculatum</i>	LC	-	-	-	-	
Grape water vine	<i>Clematicissus opaca</i>	LC	-	-	-	-	
Wandering dew	<i>Commelina diffusa</i>	LC	-	-	-	-	
Clarkson's bloodwood	<i>Corymbia clarksoniana</i>	LC	-	-	-	-	
Carbeen	<i>Corymbia tessellaris</i>	LC	-	-	-	-	
Barbed wiregrass	<i>Cymbopogon refractus</i>	LC	-	-	-	-	
Sticky hop bush	<i>Dodonaea viscosa</i>	LC	-	-	-	-	
Climbing saltbush	<i>Einadia nutans subsp. nutans</i>	LC	-	-	-	-	
Curly windmill grass	<i>Enteropogon ramosus</i>	LC	-	-	-	-	
False sandalwood	<i>Eremophila mitchellii</i>	LC	-	-	-	-	
Silver leaved ironbark	<i>Eucalyptus melanophloia</i>	LC	-	-	-	-	
Poplar box	<i>Eucalyptus populnea</i>	LC	-	-	-	-	
Wilga	<i>Geijera parviflora</i>	LC	-	-	-	-	
Woolly Glycine	<i>Glycine tomentella</i> <i>Hayata</i>	LC	-	-	-	-	
Beefwood	<i>Grevillea striata</i>	LC	-	-	-	-	
Black speargrass	<i>Heteropogon contortus</i>	LC	-	-	-	-	
Brush Hovea	<i>Hovea longipes</i>	LC	-	-	-	-	
Common rush	<i>Juncus usitatus</i>	LC	-	-	-	-	
Spiny-head Mat-rush	<i>Lomandra longifolia</i>	LC	-	-	-	-	
Small-leaf bluebush	<i>Maireana microphylla</i>	LC	-	-	-	-	
Doubah	<i>Marsdenia viridiflora</i>	LC	-	-	-	-	
Emu apple	<i>Owenia acidula</i>	LC	-	-	-	-	

Common name	Scientific name	Status		Qld Declared Plant Category	WONS	NEAL	Type A Species
		Census of Qld Flora (includes NC Act)	EPBC Act				
Quinine	<i>Petalostigma pubescens</i>	LC	-	-	-	-	
Spurge	<i>Phyllanthus virgatus</i>	LC	-	-	-	-	
Wallaby apple	<i>Pittosporum spinescens</i>	LC	-	-	-	-	
Canthium	<i>Psyrax odorata</i>	LC	-	-	-	-	
Myrtle tree	<i>Psyrax oleifolius</i>	LC	-	-	-	-	
Galvanised burr	<i>Sclerolaena birchii</i>	LC	-	-	-	-	
Black roly poly	<i>Sclerolaena muricata</i> var. <i>muricata</i>	LC	-	-	-	-	
Butter bush	<i>Senna artemisoides</i> subsp. <i>zygophylla</i>	LC	-	-	-	-	
Western Rat-tail Grass	<i>Sporobolus creber</i>	LC	-	-	-	-	
Oat kangaroo grass	<i>Themeda avenacea</i>	LC	-	-	-	-	
Kangaroo grass	<i>Themeda triandra</i>	LC	-	-	-	-	
Sprawling Bluebell	<i>Wahlenbergia gracilis</i>	LC	-	-	-	-	

## Key

Census of Qld Flora (includes Nature Conservation Act "NC Act")	
<b>E</b> - Endangered <b>V</b> - Vulnerable <b>N</b> - Near Threatened <b>X</b> - Presumed Extinct <b>P</b> - Planted	<b>Naturalised</b> - Naturalised species are those that are considered to have successfully established populations outside their native range, by reproducing there without cultivation or other human intervention.  <b>Doubtfully Naturalised</b> - Doubtfully naturalised species are those that occur outside of their native range and are not cultivated, but do not meet the criteria for naturalisation.
<i>Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)</i>	

# Santos

## GLNG Project

<b>Ex</b> - Extinct <b>EW</b> - Extinct in the wild <b>CE</b> - Critically Endangered <b>E</b> - Endangered <b>V</b> - Vulnerable	
---	--

## Fauna Species List


Common Name	Species Name	Status	
		EPBC	NC Act
<b>Birds</b>			
<i>Alisterus scapularis</i>	Australian King Parrot	-	LC
<i>Aquila audax</i>	Wedge-tailed Eagle	-	LC
<i>Corvus coronoides</i>	Australian raven	-	LC
<i>Corvus orru</i>	Torresian crow	-	LC
<i>Coturnix pectoralis</i>	Stubble quail	-	LC
<i>Cracticus nigrogularis</i>	Pied butcherbird	-	LC
<i>Cracticus tibicen</i>	Australian magpie	-	LC
<i>Dacelo novaeguineae</i>	Laughing kookaburra	-	LC
<i>Eolophus roseicapilla</i>	Galah	-	LC
<i>Falco cenchroides</i>	Nankeen kestrel	-	LC
<b><i>Geophaps scripta scripta</i></b>	<b>Squatter pigeon</b>	<b>Vulnerable</b>	<b>Vulnerable</b>
<i>Gerygone albogularis</i>	White-throated gerygone	-	LC
<i>Grallina cyanoleuca</i>	Pee wee	-	LC
<i>Lichmera indistincta</i>	Brown honeyeater	-	LC
<i>Malurus melanocephalus</i>	Red-backed fairy-wren	-	LC
<i>Manorina melanocephala</i>	Noisy miner	-	LC
<b><i>Merops ornatus</i></b>	<b>Rainbow Bee-eater</b>	<b>Migratory</b>	<b>Special Least Concern</b>
<i>Ocyphaps lophotes</i>	Crested pigeon	-	LC
<i>Phaps chalcoptera</i>	Common bronzewing pigeon	-	LC
<i>Philemon corniculatus</i>	Noisy friarbird	-	LC
<i>Platycercus adscitus</i>	Pale-headed rosella	-	LC
<i>Pomatostomus temporalis</i>	Grey-crowned babbler	-	LC
<i>Rhipidura leucophrys</i>	Willie wagtail	-	LC
<i>Strepera graculina</i>	Pied currawong	-	LC
<i>Struthidea cinerea</i>	Apostlebird	-	LC
<i>Trichoglossus haematodus</i>	Rainbow lorikeet	-	LC
<b>Mammals</b>			
<i>Oryctolagus cuniculus</i> *	European rabbit	-	-
<i>Macropus giganteus</i>	Eastern grey kangaroo	-	LC

\* Declared Pest species under LP Act




**Attachment 8.6 - Habitat Assessment and Likelihood of Occurrence of MNES and EVNT Species**

## Flora


<b>Scientific Name</b>	<i>Cadellia pentastylis</i>	
<b>Common name</b>	Ooline	
<b>Status</b>	Vulnerable - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.7.1, RE11.7.2, RE11.9.4, RE 11.9.5	
<b>Habitat requirements</b>	As detailed in the GLNG CSG Fields SSMP, <i>Cadellia pentastylis</i> grows in dry rainforest, semi-evergreen vine thickets and sclerophyll woodlands of Bendee ( <i>Acacia catenulata</i> ), Brigalow ( <i>A. harpophylla</i> ) and Mountain Yapunyah ( <i>Eucalyptus thozetiana</i> ), often locally dominant or as an emergent (TSSC 2008b).	
<b>Habitat supported on Site</b>	Given that no suitable habitat for this species occurs on Site and that this species was not identified during the survey it is considered unlikely to occur.  The Site is considered unlikely habitat for this species.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	


Source: The Codley One 2007 (Flickr)


<b>Scientific Name</b>	<i>Tylophora linearis</i>	
<b>Common name</b>	Slender tylophora	
<b>Status</b>	Endangered - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.3.14, RE 11.5.4, RE 11.7.7	
<b>Habitat requirements</b>	<i>Tylophora linearis</i> grows in dry scrub, open forest and woodlands associated with species such as <i>Eucalyptus fibrosa</i> , <i>Callitris endlicheri</i> , <i>C. glaucophylla</i> , <i>Allocasuarina luehmannii</i> , <i>Myoporum</i> spp, and <i>Casuarina</i> spp. (DOTE 2013).	
<b>Habitat supported on Site</b>	Given the Site does not support suitable habitat for this species and that it was not recorded during the field survey, this species is considered an unlikely occurrence.  The Site is therefore considered unlikely habitat for this species.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	

Source: Geoff Carr


## Fauna

<b>Scientific Name</b>	<i>Erythrotriorchis radiatus</i>	
<b>Common name</b>	<b>Red goshawk</b>	
<b>Status</b>	Vulnerable - EPBC, Endangered - NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.3.2, RE 11.3.25	
<b>General / Indicative habitat</b>	Inhabits open forests, woodlands especially near rivers, wetlands and rainforest fringes in coastal and sub-coastal north and northeast Australia from the Kimberley (WA) to the Queensland / New South Wales border (Pizzey and Knight 2007).	
<b>Essential microhabitat</b>	The Red Goshawk occurs in woodlands and forests, ideally with a mosaic of vegetation types and permanent water, particularly riverine forests. The species also occurs in natural grasslands and open paddocks, but avoids both very dense and very open habitats (DOTE 2013). Essential microhabitat includes any active nests.	
<b>Habitat supported on Site</b>	A section of the Site did support woodland and open forest vegetation communities analogous with RE 11.10.9 containing potential nesting trees within 1km of a stream order 4 watercourse (area containing permanent water). Given no active nests were recorded within the Site and the Site is not located near a river, wetland, and rainforest fringe it is considered this species is unlikely to occur within the Site.	
<b>Likelihood of occurrence</b>	Unlikely	Source: Collaertsbrothers, 2007 (Flickr)
<b>General habitat</b>	No	


<b>Scientific Name</b>	<i>Geophaps scripta scripta</i>	
<b>Common name</b>	<b>Squatter pigeon (southern)</b>	
<b>Status</b>	Vulnerable - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.3.2 , RE 11.3.3 , RE 11.3.4 , RE 11.3.14 , RE 11.3.18 , RE 11.3.19 , RE 11.3.25 , RE 11.3.27 , RE 11.3.39, RE 11.10.1 , RE 11.10.3 , RE 11.10.4, RE 11.10.9 , RE 11.10.11 , RE 11.10.13 , RE 11.10.14	
<b>General / Indicative habitat</b>	The Squatter Pigeon (southern) is never far from water in grassed woodlands; foothills, watercourses, riverflats, grassy plains; environs of homesteads (Pizzey and Knight 2007). The Squatter Pigeon has been observed foraging along roads and railway lines (DOTE 2013) and is known to inhabit other disturbed habitats associated with CSG infrastructure e.g. gas wells, flowlines and camps.	
<b>Essential microhabitat</b>	The species occurs in open dry sclerophyll woodland with grassy understorey, near permanent water (DEWHA 2010a). Essential microhabitat for this species is defined as sites that are highly likely or known to be actively utilised for breeding.	
<b>Habitat supported on Site</b>	Squatter pigeons were observed within the grassy understorey at the Site and were also observed on the Site during a field survey conducted in December 2012. The potential impact to this species is considered high as the access track is proposed to traverse the location of both siting's and a section of the Site containing RE 11.9.10 (a vegetation community associated with supporting general habitat for this species).	
<b>Likelihood of occurrence</b>	<b>Confirmed</b>	Source: Joe McKenna 2011 (Flickr)
<b>General habitat</b>	Yes	

<b>Scientific Name</b>	<i>Neochmia ruficauda ruficauda</i>	
<b>Common name</b>	Star Finch	
<b>Status</b>	Endangered - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.3.2, RE 11.3.12, RE 11.3.25, RE 11.3.27, RE 11.3.37, RE 11.5.14	
<b>General / Indicative habitat</b>	The Star Finch (eastern) occurs mainly in grasslands and grassy woodlands that are located close to bodies of fresh water (Garnett 1993)	
<b>Essential microhabitat</b>	Essential microhabitat consists mainly of woodland. These habitats are dominated by trees that are typically associated with permanent water or areas that are regularly inundated; the most common species are <i>Eucalyptus coolabah</i> , <i>E. tereticornis</i> , <i>E. tessellaris</i> , <i>Melaleuca leucadendra</i> , <i>E. camaldulensis</i> and <i>Casuarina cunninghamiana</i> (Holmes 1996).	
<b>Habitat supported on Site</b>	This species is considered to be locally extinct within the area (EPA 2003) and thus unlikely to occur on Site.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	


Source: Roger Smith 2011 (Flickr)


<b>Scientific Name</b>	<i>Rostratula australis (aka Rostratula benghalensis (sensu lato))</i>	
<b>Common name</b>	Australian Painted Snipe	
<b>Status</b>	Endangered – EPBC, Vulnerable - NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.3.10, RE 11.3.12, RE 11.3.15, RE 11.3.2, RE 11.3.24, RE 11.3.25, RE 11.2.27, RE 11.3.3, RE 11.3.31, RE 11.3.38, RE 11.3.4, RE 11.4.3, RE 11.4.8, RE, 11.5.17, RE 11.5.3	
<b>General / Indicative habitat</b>	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (Marchant & Higgins 1993).	
<b>Essential microhabitat</b>	They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i> or canegrass or sometimes tea-tree ( <i>Melaleuca</i> ) (Marchant & Higgins 1993).	
<b>Habitat supported on Site</b>	This species is considered unlikely to occur due to an absence of suitable wetland habitat. The Site is therefore regarded as unlikely habitat for this species.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	


Source: Eric SJ Tan, 2011 (Flickr)


<b>Scientific Name</b>	<i>Chalinolobus dwyeri</i>	
<b>Common name</b>	<b>Large-eared pied bat</b>	
<b>Status</b>	Vulnerable - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.10.1, RE 11.10.2, RE 11.10.3, RE 11.10.4, RE 11.10.13 , RE 11.3.2, RE 11.3.25 , RE 11.3.39, RE 11.9.5	
<b>General / Indicative habitat</b>	Known foraging habitat includes Cypress-pine dominated forest, tall open eucalypt forest with a rainforest sub-canopy, sub-alpine woodland, and sandstone outcrop country. In southeast Queensland the species has primarily been recorded from higher altitude, moist, tall, open forest adjacent to rainforest (DOTE 2013).	
<b>Essential microhabitat</b>	Roosts are primarily in cavities, overhangs, caves and holes among sandstone outcrops/escarpments, however this species has been observed roosting in disused mine shafts and disused Fairy Martin ( <i>Hirundo ariel</i> ) nests. It also possibly roosts in the hollows of trees in dry and wet sclerophyll forest ((DOTE 2013). Essential microhabitat for the Large-eared Pied Bat includes cavities, overhangs, caves and holes among sandstone outcrops/escarpments and remnant vegetation with hollow-bearing trees that are known, or highly likely to support this species.	
<b>Habitat supported on Site</b>	The Site did contain White cypress – pine dominated woodland and forest that may be utilised for foraging however roosting habitat for this species (overhangs, caves, mine shafts and abandoned fairy martin nests) which this species depends, are void within the Site. Subsequently, the Site is considered unlikely habitat for the Large-eared pied bat.	
<b>Likelihood of occurrence</b>	Possible (During foraging)	
<b>General habitat</b>	Yes	

Source: Michael Pennay, Flickr

<b>Scientific Name</b>	<i>Dasyurus hallucatus</i>	 <p>© Henry Cook Source: Henry Cook, 2012 (Flickr)</p>
<b>Common name</b>	Northern quoll	
<b>Status</b>	Endangered - EPBC	
<b>Regional Ecosystem Associations</b>	RE 11.8.3, RE 11.9.4, RE 11.9.5, RE 11.10.1, RE 11.10.2, RE 11.10.3, RE 11.10.4, RE 11.10.13, RE 11.3.2, RE 11.3.39, RE 11.7.1, RE 11.7.2, RE 11.7.4, RE 11.7.6, RE 11.7.7, RE 11.9.8, RE 11.10.7, RE 11.10.8, RE 11.10.9, RE 11.10.11	
<b>General / Indicative habitat</b>	The Northern Quoll occupies a diversity of habitats across its range which includes rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. Northern Quoll are also known to occupy non rocky lowland habitats such as beach scrub communities in Queensland and are more likely to be present in high relief areas that have shallower soils, greater cover of boulders, less fire impact and closer to permanent water (DOTE 2013). They make dens in rock crevices and tree hollows (Menkhorst and Knight 2004).	
<b>Essential microhabitat</b>	Essential microhabitat for the Northern Quoll includes Intact Eucalypt woodlands, shrublands or grasslands with rocky areas including mesas, gorges, boulder fields or breakaways that are known or highly likely to support this species.	
<b>Habitat supported on Site</b>	The Site supports an area containing general habitat features including forests and woodlands analogous with RE 11.10.9. Essential microhabitat features likely to support this species were limited (not entirely void) within the remnant and non remnant areas of the Site providing sub optimal habitat for this species.	
<b>Likelihood of occurrence</b>	Possible	
<b>General habitat</b>	Yes	


<b>Scientific Name</b>	<i>Nyctophilus corbeni</i>	 <p>Source: Office of Environment and Heritage, 2005 (Michael Murphy).</p>
<b>Common name</b>	South-eastern long-eared bat	
<b>Status</b>	Vulnerable - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.3.2, RE 11.3.39, RE 11.5.1, RE 11.10.1, RE 11.10.9, RE 11.3.3, RE 11.3.25, RE11.5.4, RE 11.9.5, RE 11.10.1, RE 11.10.4, RE 11.10.7, RE 11.10.13	
<b>General / Indicative habitat</b>	<p>This species occurs in a range of inland woodland vegetation types, including Box, Ironbark, Cypress Pine, Mallee, Bulloak, Brigalow and Belah woodlands / forests and will roost in tree hollows, crevices and under loose bark within these communities, particularly in larger remnants with a well-developed understory (DOTE 2013).</p> <p>The South-eastern Long-eared Bat forages within 3 km from the roost in the understorey of the above mentioned communities, including the ground (Churchill 2010, (DOTE 2013).</p>	
<b>Essential microhabitat</b>	Essential microhabitat includes cavities, overhangs, caves and holes among sandstone outcrops, escarpments and remnant vegetation with hollow-bearing trees that are known or highly likely to support this species.	
<b>Habitat supported on Site</b>	This site is largely void of optimal microhabitat features including cavities, overhangs, caves and holes among sandstone outcrops, escarpments and remnant vegetation, however, the site does supports an area supporting remnant RE 11.10.9 and therefore this species is considered as possible to occur.	
<b>Likelihood of occurrence</b>	Possible	
<b>General habitat</b>	Yes	


<b>Scientific Name</b>	<i>Phascolarctos cinereus</i>	 <p>Source: Eugenijus Mockaitis, 2010 (Flickr)</p>
<b>Common name</b>	Koala (combined populations Qld, NSW, ACT)	
<b>Status</b>	Vulnerable – EPBC, Vulnerable – NC Reg (South-east Queensland bioregion)	
<b>Regional Ecosystem Associations</b>	Entire Brigalow Belt Bioregion	
<b>General / Indicative habitat</b>	On the western slopes, tablelands and plains in Queensland, NSW and Victoria, Koalas are found in sub-humid <i>Eucalyptus</i> -dominated forests and woodlands in riparian and non-riparian environments, and some <i>Acacia</i> -dominated forests and woodlands in non-riparian environments (Koala Workshop 2012; Melzer et al. 2000).	
<b>Essential microhabitat</b>	Essential microhabitat for the Koala includes vegetation communities dominated by known Koala food trees where there is evidence of Koala being present.	
<b>Habitat supported on Site</b>	The Site is considered sub-optimal habitat for the Koala and no evidence of koala activity was observed on Site during the pre-clearance survey. The Site does support remnant RE 11.10.9 containing Koala food trees and is therefore considered possible habitat for this species.	
<b>Likelihood of occurrence</b>	Possible	
<b>General habitat</b>	Yes	


<b>Scientific Name</b>	<i>Delma torquata</i>	
<b>Common name</b>	Collared delma	
<b>Status</b>	Vulnerable - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.10.1, RE 11.10.3, RE 11.10.4, RE 11.10.7, RE 11.10.9, RE 11.10.11, RE 11.10.13 RE 11.3.2	
<b>General / Indicative habitat</b>	This species has been recorded in eucalypt-dominated woodlands and open-forests, within remnant and disturbed habitats. It occurs in a variety of woodland types, with dominant species often including Spotted Gum, Narrow-leaved Ironbark, Smooth-barked Apple, and Poplar Box. It is found under rocks, logs and other ground cover. The Collared delma is a burrowing species, found about 15cm below the ground (DOTE 2013); Cogger (2000).	
<b>Essential microhabitat</b>	Important microhabitats include sandstone slabs, loose rocks, fallen bark sheets, logs, dense leaf litter and grass tussocks (Wilson & Swan 2008). Essential microhabitat includes intact RE's comprising large hollow logs, tree stumps, root cavities, loose rocks, dense ground cover and many grass tussocks that are known or highly likely to support this species.	
<b>Habitat supported on Site</b>	Given that Vegetation Community 2 supports intact RE 11.10.9 comprising important and essential microhabitat features, this species may occur.	
<b>Likelihood of occurrence</b>	Possible	
<b>General habitat</b>	Yes	

Source: Angus McNab, 2013 (Flickr)




<b>Scientific Name</b>	<i>Denisonia maculata</i>	 <p>Source: Stephen Zozaya, 2013 (Flickr)</p>
<b>Common name</b>	Ornamental snake	
<b>Status</b>	Vulnerable - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.3.3, RE 11.3.25, RE 11.3.27, RE 11.3.2, RE 11.3.4, RE 11.3.17, RE 11.3.21, RE11.3.22, RE 11.4.3, RE 11.4.7, RE 11.4.8, RE 11.9.1, RE 11.9.3, RE 11.9.5	
<b>General / Indicative habitat</b>	The Ornamental Snake's habitat is within, or close to habitat that is favoured by its prey, frogs. The species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions, but also lake margins and wetlands. Ornamental Snake habitat is likely to be found in Brigalow, Gidgee ( <i>Acacia cambagei</i> ), Blackwood ( <i>Acacia argyrodendron</i> ) or Coolibah ( <i>Eucalyptus coolabah</i> ) dominated vegetation communities, or pure grassland associated with gilgais (SEWPaC 2010d).	
<b>Essential microhabitat</b>	Ornamental Snakes show a preference for moist areas and need ample ground cover in the form of fallen timber, thick shrub and ground cover and dense tussock grasses. They also show a preference for melon holes and depressions (DOTE 2013). Essential microhabitat is defined as intact moist areas, including wetlands and lakes, in suitable vegetation communities known or highly likely to support this species.	
<b>Habitat supported on Site</b>	The Site does not support moist areas and other associated microhabitat this species requires. Therefore the site is regarded as unlikely habitat for this species.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	


<b>Scientific Name</b>	<i>Egernia rugosa</i>	 <p>Source: Dan Lynch, 2012 (Flickr)</p>
<b>Common name</b>	Yakka skink	
<b>Status</b>	Vulnerable - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.3.2, RE 11.4.3, RE 11.4.10, RE 11.4.12, RE 11.5.1, RE 11.5.4, RE 11.5.5, RE 11.7.1 RE 11.7.2, RE 11.7.4, RE 11.7.6, RE 11.7.7, RE 11.9.5, RE 11.9.7, RE 11.10.1, RE 11.10.9, RE 11.10.11, RE 11.3.6, RE 11.3.14, RE 11.3.17, RE 11.3.18, RE 11.3.19, RE11.3.39, RE 11.9.1, RE 11.9.2, RE 11.9.13	
<b>General / Indicative habitat</b>	The Yakka Skink is known to occur in open dry sclerophyll forest, woodland and scrub. This species often takes refuge in large hollow logs and has been known to excavate deep burrow systems, sometimes under dense ground vegetation.	
<b>Essential microhabitat</b>	Yakka Skinks are often found in cavities under and between partly buried rocks, hollow logs or tree stumps, root cavities and abandoned animal burrows. In cleared habitat, Yakka Skinks can persist where there are shelter sites such as raked log piles, deep gullies, tunnel erosion / sinkholes and rabbit warrens (Cogger 2000, Richardson 2008, DOTE 2013).	
<b>Habitat supported on Site</b>	Given that Vegetation Community 2 supports intact RE 11.10.9 comprising important and essential microhabitat features, this species may occur.	
<b>Likelihood of occurrence</b>	Possible	
<b>General habitat</b>	Yes	


<b>Scientific Name</b>	<i>Furina dunmalli</i>	
<b>Common name</b>	Dunmall's snake	
<b>Status</b>	Vulnerable - EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.5.1, RE 11.9.5, RE 11.10.1, RE 11.3.2, RE 11.3.14, RE 11.3.17, RE 11.3.18, RE11.3.19, RE 11.3.39, RE 11.4.3, RE 11.4.10, RE 11.4.12, RE 11.5.4, RE 11.5.5, RE11.7.1, RE 11.7.2, RE 11.7.4, RE 11.7.7, RE 11.9.7, RE 11.10.9	
<b>General / Indicative habitat</b>	Dunmall's Snake has been found in a broad range of habitats, including forests and woodlands on black alluvial cracking clay and clay loams dominated by Brigalow, other Wattles ( <i>Acacia. burrowii</i> , <i>A. deanei</i> , <i>A. leiocalyx</i> ), White Cypress Pine ( <i>Callitris glaucophylla</i> ), Bulloak ( <i>Allocasuarina luehmannii</i> ); Spotted Gum ( <i>Corymbia citriodora</i> ), Ironbark ( <i>Eucalyptus crebra</i> and <i>E. melanophloia</i> ) open forests and woodland associations on sandstone derived soils (DOTE 2013).	
<b>Essential microhabitat</b>	Essential microhabitat is defined as intact, remnant vegetation with limited ground cover vegetation and grassy tussocks and extensive microhabitat features such as large hollow logs, root cavities, or tree stumps that are highly likely or known to support this species (DOTE 2013).	
<b>Habitat supported on Site</b>	Given the site largely occurs within non-Brigalow, and does not support extensive microhabitat features but does contain White Cypress Pine ( <i>Callitris glaucophylla</i> ) forests and woodland associations on sandstone derived soils this Site is regarded as possible habitat for this species.	
<b>Likelihood of occurrence</b>	Possible	
<b>General habitat</b>	Yes	


Source: Dan Lynch, 2012 (Flickr)


<b>Scientific Name</b>	<i>Rheodytes leukops</i>	 <p>Source: Stephen Zozaya 2012 (Flickr)</p>
<b>Common name</b>	<b>Fitzroy River Turtle</b>	
<b>Status</b>	Vulnerable – EPBC and NC Reg	
<b>Regional Ecosystem Associations</b>	RE 11.3.25	
<b>General / Indicative habitat</b>	The Fitzroy River Turtle is found in rivers with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles. Preferred areas have high water clarity, and often with Ribbonweed ( <i>Vallisneria</i> sp.) beds (Cogger et al. 1993). Riparian vegetation associated with the Fitzroy River Turtle includes Blue Gums ( <i>Eucalyptus tereticornis</i> ), River Oaks ( <i>Casuarina cunninghamiana</i> ), Weeping Bottlebrushes ( <i>Melaleuca viminalis</i> ) and Paperbarks ( <i>Melaleuca linariifolia</i> ) (Tucker et al. 2001).	
<b>Essential microhabitat</b>	Microhabitat for the Fitzroy River Turtle includes rivers with large, deep, well oxygenated pools with rocky, gravelly or sandy substrates, connected by shallow riffles (SEWPaC 2011aa). The presence of ribbonweed is also a feature of essential microhabitat of this species. Essential microhabitat is defined as rivers with microhabitat features that are known or highly likely to support this species.	
<b>Habitat supported on Site</b>	The Site does not provide suitable habitat for this species.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	


### Migratory


<b>Scientific Name</b>	<i>Apus pacificus</i>	 <p>Source: Rob Hutchinson 2008 (Flickr)</p>
<b>Common name</b>	<b>Fork-tailed swift</b>	
<b>Status</b>	Migratory Marine - EPBC	
<b>Regional Ecosystem Associations</b>	Entire Brigalow Belt Bioregion	
<b>General / Indicative habitat</b>	This species spends night and day on the wing and flies over a range of habitats including rainforest to semi-desert (Morecombe 2004).  The Fork-tailed Swift does not breed in Australia.	
<b>Essential microhabitat</b>	The fork-tailed swift does not rely on terrestrial microhabitats.	
<b>Habitat supported on Site</b>	Given that this species does not utilise terrestrial based habitats it is unlikely to occur within the Site.  The Site is considered unlikely habitat for this species.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	


<b>Scientific Name</b>	<i>Haliaeetus leucogaster</i>	
<b>Common name</b>	<b>White-bellied sea-eagle</b>	
<b>Status</b>	Migratory Terrestrial and Marine - EPBC	
<b>Regional Ecosystem Associations</b>	Marine, estuarine, lacustrine and palustrine wetland REs	
<b>General / Indicative habitat</b>	This species is a local migrant throughout Australia and inhabits coastal areas, islands, estuaries, inlets, rivers, inland lakes and nearby woodlands. The nest of the White-bellied Sea eagle is quite large and often found in tall trees near water, remote coastal cliffs or on the ground on islands (Pizzey and Knight 2007).	
<b>Essential microhabitat</b>	Essential microhabitat is defined as remnant woodland nearby to rivers and inland lakes, tall trees near water with suitable breeding resources, rocky cliffs and active nesting sites.	
<b>Habitat supported on Site</b>	Given that the Site is void of these features, the Site is considered unlikely habitat for this species.	Source: Richard Waring, 2013 (Flickr)
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	


<b>Scientific Name</b>	<i>Hirundapus caudacutus</i>	
<b>Common name</b>	<b>White-throated needletail</b>	
<b>Status</b>	Migratory Terrestrial and Marine - EPBC	
<b>Regional Ecosystem Associations</b>	Entire Brigalow Belt Bioregion	
<b>General / Indicative habitat</b>	This species is regularly observed flying over forests, woodlands, pastoral areas, floodplains, lakes and coastlines (Pizzey and Knight 2007).  Indicative habitat also includes near margins of wetlands and human settlements.	
<b>Essential microhabitat</b>	This species occurs over most types of habitat, as described above and may also fly between trees or in clearings, below the canopy, but are less commonly recorded flying above woodland ((DOTE 2013).  Essential microhabitat is defined as forests, woodlands, lakes, coastlines and active nesting sites.	
<b>Habitat supported on Site</b>	This species spends night and day on the wing and flies over a range of habitats (Morcombe 2004). Given that this species does not utilise terrestrial based habitats it is unlikely to occur within the Site. The Site is considered unlikely habitat for this species.	Source: <a href="http://generationtechhits.wordpress.com/tag/fastest-flying-bird-is-white-throated-needletail">http://generationtechhits.wordpress.com/tag/fastest-flying-bird-is-white-throated-needletail</a>
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	


<b>Scientific Name</b>	<i>Merops ornatus</i>	
<b>Common name</b>	<b>Rainbow Bee-eater</b>	
<b>Status</b>	Migratory Terrestrial and Marine - EPBC	
<b>Regional Ecosystem Associations</b>	Entire Brigalow Belt Bioregion	
<b>General / Indicative habitat</b>	This species inhabits open woodlands with sandy/loamy soils, sand ridges, sandpits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves and rainforest communities. On migration, the Rainbow bee-eater may also fly over the top of non-preferred habitats such as rainforest or treeless plains (DOTE 2013); Pizzey and Knight 2007).	
<b>Essential microhabitat</b>	The Rainbow Bee-eater prefers areas with a good supply of accessible artificial structures, such as barns, sheds and bridges for nesting and plenty of overhead wires or bare branches and twigs for perching, sunning and preening (DOTE 2013). Essential microhabitat is defined as riparian woodlands, sandy creek banks, intact wetlands, and active nesting sites.	
<b>Habitat supported on Site</b>	A Rainbow bee-eater was observed perched on a tree branch within the Site. The location of the siting was within an area containing mature paddock trees and a dam with moderate-steep earth-fill embankments.	
<b>Likelihood of occurrence</b>	<b>Confirmed</b>	
<b>General habitat</b>	Yes	Source: Julian Robinson 2009 (Flickr)

<b>Scientific Name</b>	<i>Myiagra cyanoleuca</i>	
<b>Common name</b>	<b>Satin Flycatcher</b>	
<b>Status</b>	Migratory Terrestrial and Marine - EPBC	
<b>Regional Ecosystem Associations</b>	Entire Brigalow Belt Bioregion	
<b>General / Indicative habitat</b>	This species inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests (DOTE 2013). Indicative habitat also includes swampy woodlands and mangrove communities.	
<b>Essential microhabitat</b>	Essential microhabitat includes woodlands and mangrove communities which are in good condition and active nesting sites.	
<b>Habitat supported on Site</b>	The Site supports an area containing general habitat features including forests and woodlands. Essential microhabitat features likely to support this species including a woodland community in good condition was present however no active nesting sites were recorded.	
<b>Likelihood of occurrence</b>	Possible	
<b>General habitat</b>	Yes	Source: Greg Miles, 2009 (Flickr)

<b>Scientific Name</b>	<i>Ardea alba</i>	 <p>Source: Arto hakola, 2009 (Flickr)</p>
<b>Common name</b>	<b>Great egret</b>	
<b>Status</b>	Migratory Wetland and Marine - EPBC	
<b>Regional Ecosystem Associations</b>	RE 11.3.10, RE 11.3.12, RE 11.3.15, RE 11.3.2, RE 11.3.24, RE 11.3.25, RE 11.2.27, RE11.3.3, RE 11.3.31, RE 11.3.38, RE 11.3.4, RE 11.4.3, RE 11.4.8, RE 11.5.17, RE 11.5.3	
<b>General / Indicative habitat</b>	This species is a local migrant throughout Australia and inhabits shallow points of rivers, estuaries, mudflats, freshwater wetlands, irrigated pastures, dams and sewerage ponds (Pizzey and Knight 2007).	
<b>Essential microhabitat</b>	Essential microhabitat is defined as includes swampy woodlands and mangrove communities which are in good condition and active nesting sites. The Great Egret usually nests in colonies and builds its nest as a platform of sticks in treetops over water in swampy woodlands and mangrove communities (Pizzey and Knight 2007).	
<b>Habitat supported on Site</b>	This species is considered unlikely to occur due to an absence of suitable habitat. The site is therefore regarded as unlikely habitat for this species.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	

<b>Scientific Name</b>	<i>Ardea ibis</i>	 <p>Source: John C Avise, 2008 (Flickr)</p>
<b>Common name</b>	<b>Cattle egret</b>	
<b>Status</b>	Migratory Wetland and Marine - EPBC	
<b>Regional Ecosystem Associations</b>	Preference for non-remnant vegetation within 3 km of a watercourse or wetland	
<b>General / Indicative habitat</b>	The Cattle Egret usually nests in colonies and builds its nest as a small, untidy platform of sticks in foliage in swampy woodlands (Pizzey and Knight 2007). Indicative habitat includes swampy woodlands, grazing paddocks and natural grasslands.	
<b>Essential microhabitat</b>	It uses predominately shallow, open and fresh wetlands, including; meadows and swamps with low emergent vegetation and abundant aquatic flora. They have sometimes been observed in swamps with tall emergent vegetation (DOTE 2013). It is commonly associated with the habitats of farm animals, particularly cow ( <i>Bos taurus</i> ), but also feral pigs, sheep ( <i>Ovis spp</i> ), horse ( <i>Equus spp</i> ) and deer (various species). Essential microhabitat is defined as good condition swampy woodlands, meadows and swamps and active nesting sites.	
<b>Habitat supported on Site</b>	Given this species association with cattle; this species is considered to possibly utilise the Site.	
<b>Likelihood of occurrence</b>	Possible	
<b>General habitat</b>	Yes	

<b>Scientific Name</b>	<i>Gallinago hardwickii</i>	 <p>Source: Jun Matsui, 2010 (Flickr)</p>
<b>Common name</b>	Latham's snipe	
<b>Status</b>	Migratory Wetland and Marine - EPBC	
<b>Regional Ecosystem Associations</b>	RE 11.3.10, RE 11.3.12, RE 11.3.15, RE 11.3.2, RE 11.3.24, RE 11.3.25, RE 11.2.27, RE11.3.3, RE 11.3.31, RE 11.3.38, RE 11.3.4, RE 11.4.3, RE 11.4.8, RE 11.5.17, RE 11.5.3	
<b>General / Indicative habitat</b>	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) (DOTE 2013).	
<b>Essential microhabitat</b>	The structure and composition of the vegetation that occurs around these wetlands is not important in determining the suitability of habitat. As such, snipe may be found in a variety of vegetation types or communities including tussock grasslands with rushes, reeds and sedges, coastal and alpine heathlands, lignum or tea-tree scrub, buttongrass plains, alpine herb fields and open forest (DOTE 2013). Essential microhabitat is defined as good condition open, freshwater wetlands with low, dense vegetation and active nesting sites.	
<b>Habitat supported on Site</b>	This species is considered unlikely to occur due to an absence of suitable wetland habitat. The Site is therefore regarded as unlikely habitat for this species.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	

<b>Scientific Name</b>	<i>Anseranas semipalmata</i>	 <p>Source: Andy Burton (Flickr) 2012</p>
<b>Common name</b>	Magpie goose	
<b>Status</b>	Marine – EPBC Act	
<b>Regional Ecosystem Associations</b>	RE 11.3.10, RE 11.3.12, RE 11.3.15, RE 11.3.2, RE 11.3.24, RE 11.3.25, RE 11.2.27, RE11.3.3, RE 11.3.31, RE 11.3.38, RE 11.3.4, RE 11.4.3, RE 11.4.8, RE 11.5.17, RE 11.5.3	
<b>General / Indicative habitat</b>	The Magpie goose frequents marshy areas with dense vegetation, both in fresh and brackish waters. It is often seen in grasslands in floodplains along tropical rivers. These areas are usually subject to great variation of water levels. This species is never far from the coasts (del Hoyo et al, 1992).	
<b>Essential microhabitat</b>	Essential habitat for the Magpie goose includes wetland ecosystems and vegetation communities subject to seasonal inundation.	
<b>Habitat supported on Site</b>	The Site does not support these habitat features and therefore the Site is regarded as unlikely habitat for this species.	
<b>Likelihood of occurrence</b>	Unlikely	
<b>General habitat</b>	No	

## Key

## Status

<b>Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)</b>	<b>Nature Conservation (Wildlife) Regulation 2006 (NC Reg)</b>
<b>Ex</b> - Extinct <b>EW</b> - Extinct in the wild <b>CE</b> - Critically Endangered <b>E</b> - Endangered <b>V</b> - Vulnerable	<b>E</b> - Endangered <b>V</b> - Vulnerable <b>N</b> - Near Threatened <b>X</b> - Presumed Extinct

## References

Cogger (2000), *Reptiles and Amphibians of Australia*, (6th edition) Ralph Curtis Books, NSW.

Cogger, H.G., E.E. Cameron, R.A. Sadler & P. Egger (1993). *The Action Plan for Australian Reptiles*. [Online]. Canberra, ACT: Australian Nature Conservation Agency. Available from: <http://www.environment.gov.au/biodiversity/threatened/action/reptiles/index.html>

DEWHA (2010a) *Survey Guidelines for Australia's Threatened Birds*, EPBC Act survey guidelines 6.2, Canberra

EPA 2003, 'BPA BRB South Fauna Expert Panel in Brigalow Belt South Biodiversity Planning Assessment', Environmental Protection Agency, Brisbane.

Pizzey, G. & Knight, F. (2007), *The Field Guide to the Birds of Australia* (8th edition) Harper Collins Publishers, NSW, Australia. 580pp.

del Hoyo, J., Elliott, A. and Sargatal, J. (1992) *Handbook of the Birds of the World*. Volume 1: Lynx Edicions - ISBN: 8487334105.

Department of the Environment (2013). *Chalinolobus dwyeri* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2013). *Denisonia maculata* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2013). *Delma torquata* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2013). *Egernia rugosa* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.



Department of the Environment (2013). *Erythrotriorchis radiatus* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2013). *Furina dunmalli* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2013). *Hirundapus caudactus* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2013). *Nyctophilus corbeni* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2013). *Merops ornatus* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2013). *Myiagra cyanoleuca* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2014). *Rheodytes leukops* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment (2013). *Turnix melanogaster* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Garnett, S.T., ed. (1993). Threatened and Extinct Birds of Australia. *Royal Australasian Ornithologists Union Report 82 2nd (corrected) Edition*. Melbourne: Royal Australian Ornithology Union and Canberra: Australian National Parks and Wildlife Service

Holmes, G. (1996). Distribution and status of the Southern Star Finch. *Sunbird*. 26:49-59.

*Koala Workshop (2012). Proceedings from the workshop for the Koala. 10-11 September 2012. Brisbane: University of Queensland.*

Marchant, S. & P.J. Higgins, eds. (1993). *Handbook of Australian, New Zealand and Antarctic Birds. Volume 2 - Raptors to Lapwings*. Melbourne, Victoria: Oxford University Press

Melzer, A., F. Carrick, P. Menkhorst, D. Lunney & B.S. John (2000). Overview, critical assessment, and conservation implications of koala distribution and abundance. *Conservation Biology*. 14:619-628

Morcombe (2004). *Field guide to Australian Birds*. Steve Parish Publishing. Archerfield, Australia.

Richardson, R. (2008). *Queensland Brigalow Belt Reptile Recovery Plan 2008 – 2012*. Report to the Department of the Environment, Water, Heritage and the Arts, Canberra. WWF-Australia, Brisbane. Available online: <http://www.qmdc.org.au/publications/download/52/fact-sheets-case-studies/reptilerecovery/draft-reptile-recovery-plan.pdf>.

Threatened Species Scientific Committee (2008b) Commonwealth Conservation Advice on *Cadellia pentastylis* (Ooline). Available at:  
<http://www.environment.gov.au/biodiversity/threatened/species/pubs/9828-conservation-advice.pdf>

Threatened Species Scientific Committee (2008f) Commonwealth Conservation Advice on *Homopholis belsonii*. Available at:  
<http://www.environment.gov.au/biodiversity/threatened/species/pubs/2406-conservation-advice.pdf>

Tucker, A.D., C.J. Limpus, T.E. Priest, J. Cay, C. Glen & E. Guarino (2001). Home ranges of Fitzroy River turtles (*Rheodytes leukops*) overlap riffle zones: potential concerns related to river regulation. *Biological Conservation*. 102(2):171-181

Wilson, S. and Swan, G (2008), *A Complete Guide to Reptiles of Australia*, 2nded, New Holland Publishers, Sydney, NSW, Australia